



## **Rapid Ecological Assessment for the Upper Wolf River Fishery Area**

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

**Properties included in this report are:**

Upper Wolf River Fishery Area  
Oxbow Rapids, Upper Wolf River State Natural Area

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

February 2012

PUB-ER-835-2012

# Acknowledgments

We extend our appreciation to Gary Bartz, property manager at Upper Wolf River Fishery Area; David Seibel, Fisheries Biologist; Pam Freeman-Gillen, Forester; Ryan Brown, Forestry Technician; Richard Weide, Wildlife Biologist; Eric Borchert, Wildlife Technician; and Kate Fitzgerald for their support and assistance throughout the project. Funding for this project was provided by the Bureau of Facilities and Lands, the Endangered Resources Fund, and Sport Fish Restoration Funds.

**Primary Author:** Richard Staffen

## **Contributors:**

- Julie Bleser – data management
- Tyler Brandt – bats
- Gary Emerson – bats
- Drew Feldkirchner – report contributions
- Doug Fields – community ecology, rare plants
- Bob Hay – herptiles
- Dawn Hinebaugh – maps
- Terrell Hyde- zoology data processing, report contributions
- Christina Isenring – community ecology, inventory coordination, report contributions
- Heather Kaarakka – bats
- Ryan Magana – community ecology, report editing
- Ryan O’Connor – botany and ecology data processing
- Stacy Rowe – ecology data processing
- William A. Smith – zoology
- Elizabeth Slavinski - maps
- Amy Staffen – report editing
- Rich Staffen – zoology data processing, passerine birds and raptors
- Todd Thayer – herptiles
- Roland Wang – report contributions
- Paul White - bats

**Cover Photo:** Rocky Rips Rapids at Upper Wolf River Fishery Area. Photo by: Richard Staffen

# Table of Contents

<b>Executive Summary .....</b>	<b>5</b>
<b>Introduction .....</b>	<b>6</b>
Purpose and Objectives.....	6
Overview of Methods .....	6
Background on Past Efforts .....	9
Special Management Designations .....	10
<b>Regional Ecological Context.....</b>	<b>12</b>
Regional Biodiversity Needs and Opportunities.....	13
Rare Species of the Superior Coastal Plain and Northwest Lowlands Ecological Landscapes .....	14
<b>Description of the Study Area.....</b>	<b>16</b>
Location and Size.....	16
Ecoregions .....	16
Physical Environment .....	18
Vegetation.....	20
<b>Rare Species and High Quality Natural Communities of the Upper Wolf River Fishery Area .....</b>	<b>26</b>
<b>Management Considerations and Opportunities for Biodiversity Conservation... </b>	<b>31</b>
High Conservation Value Forests .....	34
Ecological Priorities for SGCN .....	34
Priority Conservation Actions.....	34
Wisconsin’s Statewide Forest Strategy.....	35
Natural Community Management Opportunities.....	36
Invasive Plants .....	36
<b>Primary Sites: Site-specific Opportunities for Biodiversity Conservation.....</b>	<b>39</b>
<b>Future Needs .....</b>	<b>41</b>
<b>Glossary.....</b>	<b>42</b>
<b>Species List .....</b>	<b>44</b>
<b>Reference List .....</b>	<b>47</b>
<b>Additional Resources .....</b>	<b>51</b>

## List of Figures

Figure 1: Location of the Upper Wolf River Fishery Area.....	9
Figure 2: Ecological Landscapes of Wisconsin and the study area.....	12
Figure 3: Landtype Associations for the area comprising the Upper Wolf River Fishery Area. ....	17
Figure 4: Vegetation for the study area prior to Euro-American settlement. Data are from Finley (1976).....	21
Figure 5: Landcover for the Upper Wolf River Fishery Area from the Wisconsin DNR Wiscland GIS coverage (WDNR 1993).....	25
Figure 6: NHI Locations of Northern Wet-mesic Forests in Wisconsin.....	32
Figure 7: Primary Sites of the Upper Wolf River Fishery Area.....	40

## List of Tables

Table 1. Major Natural Communities Management Opportunities in the North Central Forest Ecological Landscape.....	14
Table 2. Major Natural Communities Management Opportunities in the Forest Transition Ecological Landscape.....	14
Table 3. Listing Status for rare species in the North Central Forest Ecological Landscape .....	14
Table 4. Listing Status for rare species in the Forest Transition Ecological Landscape.....	14
Table 5. Documented rare species and high-quality natural communities for the Upper Wolf River Fishery Area.....	26
Table 6. Invasive Plants detected in the Upper Wolf River Fishery Area during 2011 Biotic Inventory.....	37

## Appendices

- A. Natural Heritage Inventory Methods Overview and Working List Explanation
- B. Map of Conservation Opportunity Areas for the North Central Forest and Forest Transition Ecological Landscapes
- C. Descriptions for Rare Species and High Quality Natural Communities Documented on the Upper Wolf River Fishery Area
- D. Upper Wolf River Fishery Area Species of Greatest Conservation Need
- E. Primary Sites within the Upper Wolf River Fishery Area and Table of Rare Species Listed by Primary Site

## Upper Wolf River Fishery Area At a Glance

### Exceptional Characteristics of the Study Area

- **Rare Animals and Plants.** The diverse terrestrial and aquatic habitats of Upper Wolf River Fishery Area (UWRFA) support numerous rare species. Fifty-five rare animal species are known from the UWRFA, including seven State Threatened species, and forty-eight Special Concern species. Two rare plants are also known from the project area.
- **Coniferous Forests.** The coniferous forest types of the UWRFA add significantly to the biodiversity found on the property. Some structural attributes associated with old growth forests exist in the Northern Mesic and Northern Wet-mesic Forests in the UWRFA. Ephemeral Ponds are common in the Northern Mesic Forests supporting important breeding habitat for invertebrates and herptiles. The three designated scenic areas, along the Wolf River, contain high-quality, mature coniferous forests serving to protect the outstanding aesthetic quality of this ecosystem, but also provide habitat for rare species and enhance water quality.
- **Wolf River and Tributaries.** The free-flowing stretches of the Wolf and Hunting Rivers within the UWRFA provide important habitat for many rare species. Protecting the exceptional water quality of these rivers benefits the macroinvertebrate life and the species that depend upon them as a food source. Protecting the aquatic and terrestrial corridor of UWRFA and adjacent lands allows for element passage to and from the extensive forests of the north.

### Site Specific Opportunities for Biodiversity Conservation

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

- **Wolf River and Wolf River Scenic Area.** The Wolf River is an Outstanding Resource Water, supporting numerous rare aquatic elements. There are four scenic area segments designated to protect the aesthetic value of the river but also protect a large acreage of high-quality Northern Wet-mesic Forest serving as an important travel corridor for bats and other mammals as well as habitat for uncommon birds and rare plants.
- **County Highway M Woods, Boy Scout Woods, and Gilmore’s Mistake Rapids Coniferous Forest.** These sites represents a large block of older-aged, high-quality, Northern Mesic Forests connected to the Menominee County Forest and the Nicolet National Forest. Managing these stands for old-growth characteristics and their associated structural complexity would be an important consideration for the property.
- **Oxbow Rapids, Upper Wolf River SNA.** This primary site contains a Northern Wet-mesic Forest with exceptionally large northern white-cedars, a wet seepage slope and Springs and Spring Runs. The slope supports old-growth scattered eastern hemlock, northern white-cedar, black ash, and American basswood.
- **Hunting River Lowland Swamp and Marsh.** This primary site includes a small, shallow unnamed lake basin surrounded by an Emergent Marsh. The lake outlet flows south to the Hunting River, which is bordered by good quality stands of Alder Thicket, Northern Sedge Meadow, and Northern Wet Forest. The site adjoins the Hunting River Alders State Natural Area and protects Springs and Spring Runs.

# Introduction

## Purpose and Objectives

This report is intended to be used as a source of information for developing a new master plan for the Upper Wolf River Fishery Area (UWRFA; Figure 1). The regional ecological context for the UWRFA is also provided to assist in developing the Regional and Property Analysis that is part of the master plan. Properties included in this assessment are:

- Upper Wolf River Fishery Area
- Oxbow Rapids, Upper Wolf River State Natural Area (SNA)

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

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

## Overview of Methods

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

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

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

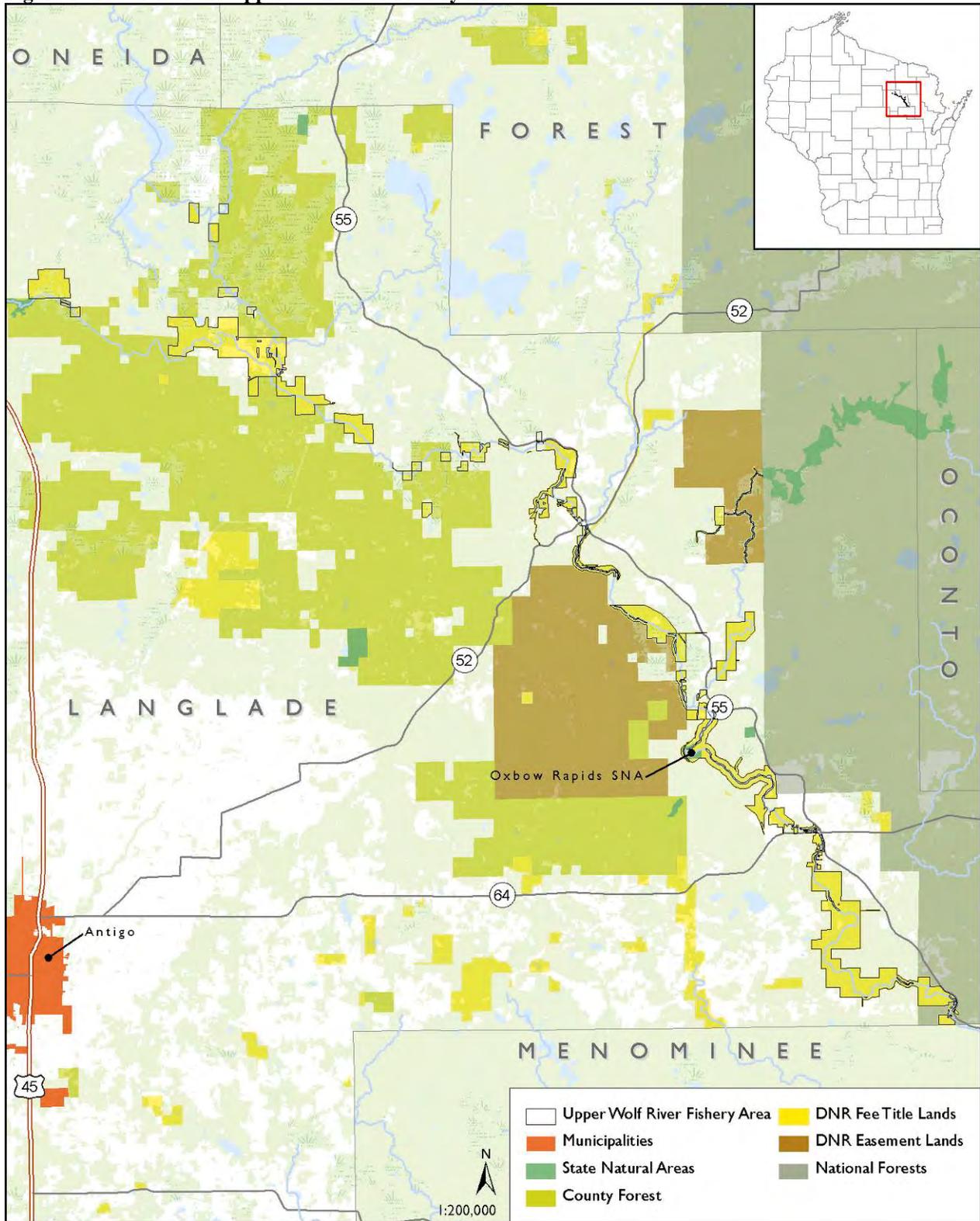
Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, NHI data for the UWRFA were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR's Bureaus of Research and Endangered Resources between 1969 and 1984 that focused on natural communities but included some surveys for rare plants and animals, 2) Wolf River Basin Biotic Inventory and Analysis, 3) WDNR's eagle and osprey aerial surveys, and 4) other taxa-specific surveys.

The most recent taxa-specific field surveys for the study area were conducted during 2011. Surveys were limited in scope and focused on documenting high-quality natural communities, rare plants, breeding birds including forest raptors, bats, aquatic invertebrates, and rare herptiles. The collective results from all of these surveys were used, along with other information, to identify ecologically important areas (Primary Sites) within the UWRFA.

Survey locations were identified using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, forest reconnaissance data, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or with similar habitats in the region. Based on the location and ecological setting of the UWRFA, key inventory considerations included the identification of remaining high-quality Northern Mesic Forests, along with intact Northern Wet-mesic and Wet Forests, rare forest bird communities, representative rare fauna associated with aquatic features found at the property, and the location of additional habitats that had the potential to support rare species. Private lands surrounding the fishery area were not surveyed.

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

**Figure 1: Location of the Upper Wolf River Fishery Area**



## Background on Past Efforts

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

The **Land Legacy Report** (WDNR 2006a) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. The report identifies the Upper Wolf River as an opportunity to link the Menominee Reservation and its tremendous natural resource base with the Nicolet National Forest. Additionally, there are important tributaries to the Wolf River that fall within the UWRFA including Ninemile Creek, Hunting River, and Lily River, all contributing to the Wolf River's excellent water quality.

The **Nature Conservancy (TNC): Superior Mixed Forest Ecoregional Plan** (TNC 2002) identified a portfolio of terrestrial and aquatic "Conservation Areas" representing viable natural community types, globally rare native species, and other selected features. The UWRFA comprises a portion of a terrestrial TNC Conservation Area called the Wolf River Headwaters Conservation Area, a 671,885-acre site that includes the Wolf River Mainstem Aquatic Conservation Area (identified in Great Lakes Ecoregional Plan), the Menominee Reservation, and portions of the Nicolet National Forest.

The **Wolf River State of the Basin Report** (WDNR 2001) was prepared in consultation with local units of government, other agencies, private citizens and other conservation organizations in the Wolf River Basin. The report is designed to give an overall assessment of the health and status of land and water resources throughout the basin. Issues and threats that affect the basin are discussed as are their impact on statewide resources.

The **Wolf River Basin Biotic Inventory and Analysis** (Epstein et al. 2002) was initiated with the purpose of gathering data on natural communities, rare plants and animals, aquatic invertebrates, and other selected natural features for the entire basin. In the Upper Wolf River portion of the basin, work was largely limited to aquatic invertebrates, rare plants, and natural communities.

The **Wisconsin Wildlife Action Plan: Conservation Opportunity Areas** (COA; WDNR 2006b) recognized two COA's occurring within the UWRFA: Upper Wolf River Aquatic COA and the Menominee Forest Terrestrial COA, both of Upper Midwest significance. Conservation Opportunity Areas are places in Wisconsin containing ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility for protecting when viewed from the global, continental, upper Midwest, or state perspective.

The **Natural Heritage Inventory Peatlands Project** (Anderson et al. 2008) was a four field season statewide study conducted by the Bureau of Endangered Resources. The primary goals of the project were 1) to obtain baseline data on the presence / absence, abundance, and distribution of species in multiple taxon groups associated with peatland communities in Wisconsin, and 2) to document selected biotic and abiotic variables that could potentially influence the organisms being studied. Taxonomic groups were breeding passerine birds, amphibians, small mammals, selected groups of terrestrial and aquatic invertebrates, selected secretive marsh birds, and rare plants. The surveys were designed to be replicated in 5-10 years and used to detect changes in biota related to climate change. The project included one site within the UWRFA at the Emil Springs area along Ninemile Creek.

## Special Management Designations

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

- Oxbow Rapids, Upper Wolf River State Natural Area

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

**Forest Legacy Program** was created by Congress as part of the 1990 Farm Bill to identify and protect environmentally important private forestlands threatened with conversion to non-forest uses. The Wolf River Forest Legacy project of 18,511 acres lies entirely within Langlade County, and is composed of state, federal, county, tribal, and private forests with good-quality wetlands, lakes, and streams.

**Outstanding and Exceptional Resource Waters** (ORW and ERW) are officially designated (Wisconsin Administrative Code NR 102.11) waters that provide outstanding recreational opportunities, support valuable fish and wildlife habitat, have good water quality, are not significantly impacted by human activities, and, thereby recognized as being the highest quality waters in the state. Outstanding Resource Waters typically do not have any point sources discharging pollutants directly to the water (for instance, no industrial sources or municipal sewage treatment plants) and no increases of pollutant levels are allowed. If a waterbody has existing point sources at the time of designation, it is more likely to be designated as an ERW. Of Wisconsin's 53,413 streams and rivers, 254 are designated as ORW—fewer than 1 %. The Wolf River (upstream from the Menominee County Line), is a designated Outstanding Resource Water, while Hunting River, Spring Creek, and several other unnamed tributaries within the UWRFA are designated Exceptional Resource Waters.

**Scenic Area** designations have been afforded for four large sections of the UWRFA through the existing master plan to preserve, and if possible, improve the natural aesthetics of the property. Timber management activities in the Scenic Area, 300 feet from the banks of the river, are controlled by the provisions contained in the Master Planning Handbook and the Forest Aesthetics Handbook (WDNR 1979). In addition, the segment of the Wolf River from the Langlade and Menominee County line downstream to Keshena Falls is federally designated as a National Wild and Scenic River. The Wolf Wild and Scenic River was administered by the National Park Service in 1968 as one of the eight original rivers formally designated by the Wild and Scenic Rivers Act and currently protects 24 miles of the Wolf River through the Menominee Reservation.

**Fisheries and Wildlife Management Areas** make up the remainder of the state-owned lands within the UWRFA. These areas are designated as resource development areas. The intent of this designation is to develop wildlife and fish habitat which may be marginal, but has potential for wildlife production (WDNR 1979). These areas include fish and game habitat as well as areas to protect animals, plants or whole communities that are endangered or of changing status (WDNR 1979).

**Important Bird Areas** (IBA; WDNR 2007) are critical sites for the conservation and management of Wisconsin's birds. The very southern extent of the UWRFA falls within the Menominee Forest IBA. The Menominee Forest IBA is especially significant for: 1) the long-term sustained-yield management by the Menominee Tribe, which maintains tree species until biological maturity, resulting in a diverse, uneven

aged forest with a very rich breeding avifauna, particularly for neotropical migrants, 2) providing core habitat for black-throated blue warbler (*Setophaga caerulescense*) and Canada warbler (*Wilsonia canadensis*), and 3) supporting large populations of red-shouldered hawk (*Buteo lineatus*), least flycatcher (*Empidonax minimus*), veery (*Catharus fuscescens*), wood thrush (*Hylocichla mustelina*), Blackburnian warbler (*Setophaga fusca*), and black-throated green warbler (*Setophaga virens*).



**Wolf River from bridge over Ninemile Rapids (Photo by Richard Staffen)**

# Regional Ecological Context

This section is largely reproduced from the Ecological Landscapes of Wisconsin Handbook (WDNR In Prep. a). This handbook was developed by the WDNR Ecosystem Management Planning Team (EMPT) and identifies the best areas of the state to manage for natural communities, key habitats, aquatic features, native plants, and native animals from an ecological perspective.

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

The Upper Wolf River Fishery Area is nearly equally split between the *North Central Forest* Ecological Landscape (northern half) and the *Forest Transition* Ecological Landscape (southern half) Figure 2). The North Central Forest Ecological Landscape occupies much of the northern third of Wisconsin. Its landforms are characterized by end and ground moraines with some pitted outwash and bedrock controlled areas. Soils consist of sandy loam, sand, and silts. Forests here are extensive, and this Landscape contains over 28% of the total forests in the state. Both forested and unforested wetlands are numerous. Agriculture is much less prevalent than much of the state, partially due to the less favorable growing season here.

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

Currently, forests cover approximately 80% of this Ecological Landscape. The northern hardwood forest is dominant, made up of sugar maple, American basswood, and red maple (*Acer rubrum*), with some scattered eastern hemlock, yellow birch, northern red oak (*Quercus rubra*), white ash (*Fraxinus americana*), balsam fir (*Abies balsamea*) and eastern white pine pockets within stands. The aspen-birch forest type group is also relatively abundant, followed by spruce-fir. In general, there has been a substantial decrease of eastern hemlock, yellow birch, and eastern white pine. A variety of forested and non-forested wetland community types are also present, and wet-mesic forests are more numerous here than elsewhere in the state.



**Figure 2: Ecological Landscapes of Wisconsin and the study area**

The Forest Transition Ecological Landscape lies along the northern border of Wisconsin's Tension Zone, through the central and western part of the state, and supports both forested and agricultural areas. The eastern and western portions are on moraines of the Wisconsin glaciation from 14,000 to 18,000 years ago. Soils are diverse, ranging from sandy loam to loam or shallow silt loam, and from poorly drained to well-drained.

The historic vegetation of the Forest Transition Ecological Landscape was primarily northern hardwood and hemlock hardwood forests. These mesic forests were dominated by sugar maple and eastern hemlock, and contained some yellow birch, red pine and eastern white pine. Currently, 44% of this Ecological Landscape is forested, as compared to 86% forested before Euro-American settlement. Forested areas now consist primarily of northern hardwoods and aspen (*Populus* spp.), with smaller amounts of oak and lowland hardwoods. Conifer and deciduous swamps are scattered throughout the Ecological Landscape and are often found near the headwaters of streams, and are associated with lakes in kettle depressions on moraines. The eastern portion of the Ecological Landscape differs from the remainder, being primarily forested and including numerous ecologically significant areas, some of which are extensive. The Ecological Landscape's flora shows characteristics of both northern and southern Wisconsin, corresponding to its position along the north side of the Tension Zone (Curtis 1959).

## Regional Biodiversity Needs and Opportunities

Opportunities for sustaining natural communities in the North Central Forest and Forest Transition Ecological Landscapes were developed in 2005 by the Ecosystem Management Planning Team (EMPT; not published until 2007) and later focused on wildlife Species of Greatest Conservation Need and their habitat in the Wisconsin Wildlife Action Plan (WDNR 2006b). The goal of sustaining natural communities is to manage for natural community types that historically occurred in a given landscape and have a high potential to maintain their characteristic composition, structure, and ecological function over a long period of time (e.g., 100 years). This list can help guide land and water management activities so that they are compatible with the local ecology of the Ecological Landscape while maintaining important components of ecological diversity and function. These are the most appropriate community types that could be considered for conservation/management activities within the North Central Forest and Forest Transition Ecological Landscapes.

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

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

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

There are management opportunities for 23 natural communities in the Forest Transition Ecological Landscape. Of these, 8 are considered “major” opportunities (Table 2) and an additional 15 natural communities are considered “important” in this landscape.

**Table 2.** Major Natural Communities Management Opportunities in the Forest Transition Ecological Landscape (EMPT 2007; WDNR 2006b)

Coldwater Streams	Impoundments/Reservoirs	Northern Wet Forest	Warmwater Rivers
Coolwater Streams	Northern Mesic Forest	Northern Wet-mesic Forest	Warmwater Streams

## Rare Species of the North Central Forest and Forest Transition Ecological Landscapes

Numerous rare species are known from the North Central Forest and Forest Transition Ecological Landscapes. “Rare” species include all of those species that appear on the WDNR’s NHI Working List (*Wisconsin Natural Heritage Working List*) classified as “Endangered,” “Threatened,” or “Special Concern.” Tables 3 and 4 list the number of species known to occur in the North Central Forest and Forest Transition Ecological Landscapes based on information stored in the NHI database as of November 2011 (WDNR In Prep. a).

**Table 3.** Listing Status for rare species in the North Central Forest Ecological Landscape as of November 2011

Listing Status	Mammals	Birds	Herptiles	Fishes	Invertebrates	Total Fauna	Total Flora	Total Rare
Federally Endangered	1	0	0	0	0	1	0	1
Federally Threatened	0	0	0	0	0	0	1	1
Federal Candidate	0	0	0	0	1	1	0	1
State Endangered	1	2	0	1	6	10	15	25
State Threatened	1	6	2	5	5	19	15	34
State Special Concern	4	13	0	5	45	67	39	106
NHI Total	7	21	2	11	57	98	70	168

**Table 4.** Listing Status for rare species in the Forest Transition Ecological Landscape as of November 2011

Listing Status	Mammals	Birds	Herptiles	Fishes	Invertebrates	Total Fauna	Total Flora	Total Rare
Federally Endangered	1	0	0	0	3	4	0	4
Federally Threatened	0	0	0	0	0	0	0	0
Federal Candidate	0	0	0	0	2	2	0	2

State Endangered	0	4	1	2	9	16	3	19
State Threatened	0	6	2	8	7	23	9	32
State Special Concern	4	13	1	8	22	48	21	69
NHI Total	4	23	4	18	43	93	33	126

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

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

There are 35 vertebrate SGCN significantly associated with the North Central Forest Ecological Landscape and 26 vertebrate SGCN significantly associated with the Forest Transition Ecological Landscape (See Appendix D). This means that the species is (and / or historically was) significantly associated with the Ecological Landscape, and restoration of natural communities this species is associated with, in the Ecological Landscape, would significantly improve conditions for the species.

# Description of the Study Area

## Location and Size

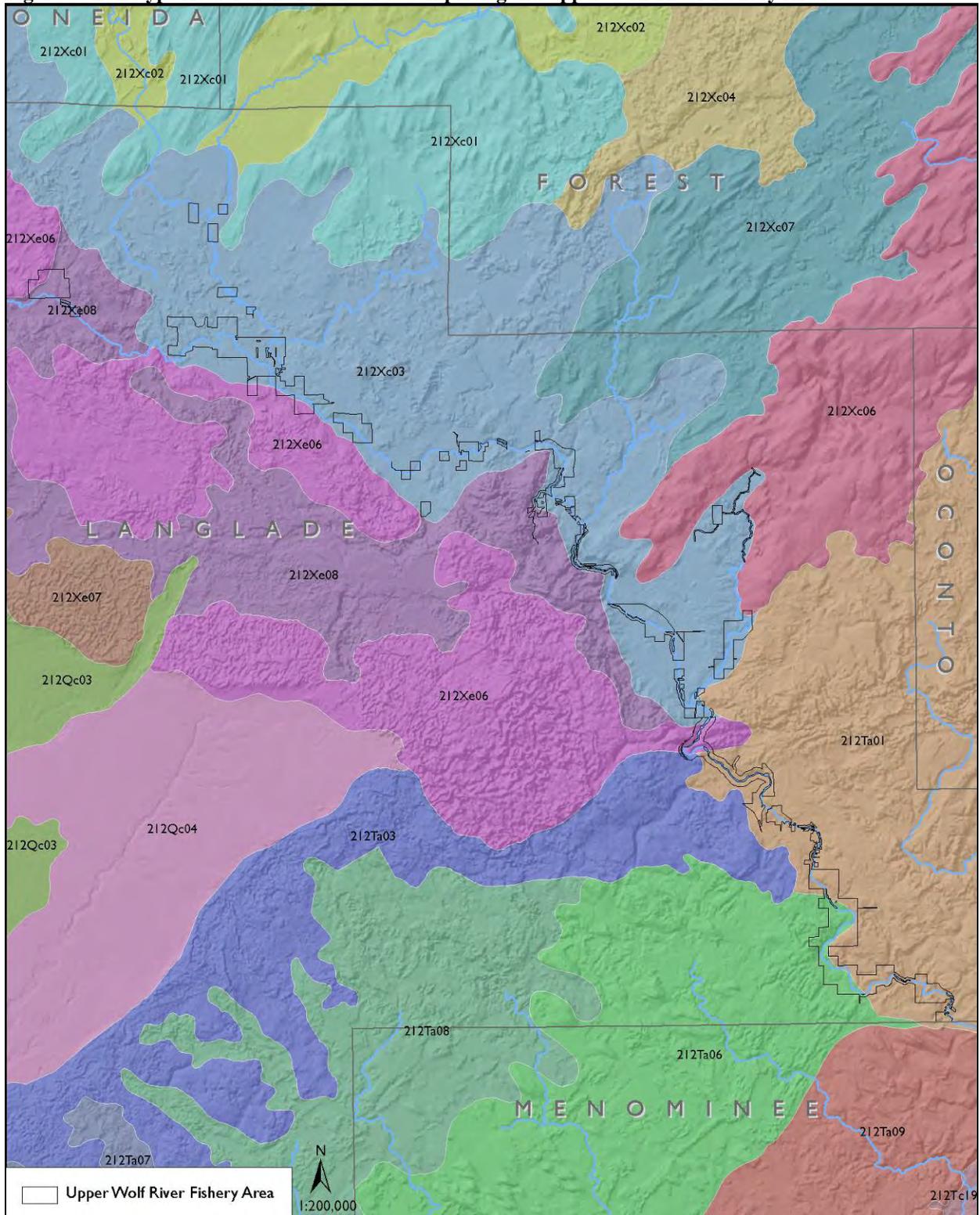
The linear UWRFA, comprising 9,274 acres, spans nearly the entire eastern portion of Langlade County to its southern border with Menominee County (Figure 1). Located within the North Central Forest and Forest Transition Ecological Landscapes, the UWRFA is located approximately 20 miles east and northeast of the city of Antigo along State Highway 55. The small towns of Markton, Langlade, Hollister, and Pearson occur near the property boundaries. These towns are significantly associated with the regionally important Wolf River, bringing in numerous outdoor enthusiasts, fisherman, and hunters.

## Ecoregions

From the National Hierarchical Framework of Ecological Units (NHFEU), the units most relevant to this study are two Subsections: the Green Bay Lobe Stagnation Moraine (212Ta) and the Brule and Paint Rivers Drumlinized Ground Moraine (212Xc), and primarily two Landtype Associations (LTA; Figure 3). The following Landtype Associations are within the study area, with the first two encompassing the vast majority of the property:

- Pickerel Plains (212Xc03). The characteristic landform pattern is undulating pitted and unpitted outwash plain with stream terraces, fans, swamps, and bogs common. Soils are predominantly well drained silt loam over outwash. This LTA comprises 57% of the study area.
- Lakewood Plains and Moraines (212Ta01). The characteristic landform pattern is rolling pitted and unpitted outwash plains, kames, and hummocky moraine complex with lakes, and bogs common. Soils are predominantly well drained loam over acid gravelly sandy outwash, loamy, sand till, or drift. This LTA comprises 31% of the study area.
- Summit Lake Moraines (212Xe08). The characteristic landform pattern is rolling collapsed moraine. Soils are predominantly well drained silt loam over outwash. This LTA comprises less than 5% of the study area.
- Elcho Moraines (212Xe06). The characteristic landform pattern is rolling collapsed moraine. Soils are predominately well drained sandy loam over acid loamy sandy till. This LTA comprises less than 5% of the study area.
- Elderon-Bowler Drumlins and Moraines (212Ta06). The characteristic landform patterns are rolling recessional moraines and outwash plains with many drumlins and swamps. Soils are predominately well drained loam over acid gravelly sand outwash or loamy sand to sandy loam till. This LTA comprises less than 5% of the study area.
- Hatley Moraines (212Ta03). The characteristic landform pattern is rolling collapsed moraine dissected with stream terraces. Soils are predominately well drained sandy loam over acid loamy sand till. This LTA comprises less than 5% of the study area.

**Figure 3: Landtype Associations for the area comprising the Upper Wolf River Fishery Area**



# Physical Environment

## Geology and Geography

The physiography, relief, and drainage of Langelade County are primarily the result of glaciation. Elevation ranges from around 1,070 feet above sea level where the Wolf River leaves Langelade County to about 1,903 feet in Langelade Township. The Wolf River drops about 440 feet in Langelade County, mostly between Lily and Markton (Mitchell 1986). The Brule and Paint Rivers Drumlinized Ground Moraine occupies the northern portion of the project area and has surface features deposited by the Langelade Lobe about 22,000 years ago with calcareous sediments buried beneath the surface deposits from an earlier advance of the Green Bay Lobe. There are numerous drumlins containing materials from both the Langelade and Green Bay Lobes in the headwaters area of the Wolf River. Areas between drumlins, and in non-drumlin areas, are outwash filled with sand and gravel sediments from meltwater streams, and are often covered with silty loess deposits.

The southern portion of the UWRFA is a glaciated area dominated by interlobate moraines and outwash head landforms interspersed with outwash plains (WDNR In Prep. a.). It includes the glacial landforms that make up the Mapleview Member of the Holy Hill Formation. Landforms of the Mapleview Member were deposited along the outermost western margin of the Green Bay Lobe as it melted during the last part of the Wisconsin Glaciation, about 14,000 years ago (McCartney 1983). Many small glacial advances and retreats formed the land surface, so the landscape is varied and includes parallel morainal and outwash head ridges trending in a northeast-southwest direction. Outwash heads were formed as the glacier melted rapidly and deposited sand and gravel in relatively high ridges along the ice margin. These ridges were left as high points in the landscape after the ice melted. They have a similar appearance to moraines, but are built of sand and gravel (Attig and Ham 1999). Much of the till deposited in till plains and moraines as the glacier advanced was buried in outwash sands and gravels that flowed from meltwater streams at the ice margin at each stage of retreat, so the morainal ridges protrude from areas of outwash-mantled till. Landforms created by meltwater stream sediments include outwash plains, both pitted and unpitted, terraces, and fans. The outwash-mantled till surface is hummocky due to the uneven deposition of till as it melted out of the ice sheet, and from the collapse of the till and outwash materials after buried stagnant ice blocks melted (WDNR In Prep. a.).

The Wolf River Batholith is an important geologic feature that underlies the east end of the Forest Transition Ecological Landscape, including all of Menominee County and portions of Oconto, Langelade, Marathon, Shawano, Waupaca, and Portage Counties. It is made up of Precambrian rock produced by volcanic activity at about 1,450 million years ago. This volcanic event occurred over a wide area, including Missouri, Colorado, and Arizona, but its cause is unknown (Dott and Attig 2004). Granitic magma from deep in the Earth's crust intruded toward the surface and cooled and crystallized at the relatively shallow depth of 1 to 2 miles (La Berge 1994). The Wolf River rocks are predominantly granites and syenite, with smaller amounts of anorthosite and gabbro, and underlie about 3,600 square miles in Wisconsin. Outcrops are common along the Wolf River.

## Soils

(An excerpt from the Ecological Landscapes of Wisconsin Handbook [WDNR In Prep. a])

Soils in the UWRFA are formed in brown non-calcareous loamy till, non-calcareous sandy loam and loamy sand till and in outwash. The dominant general soil type, Antigo-Pence, is well drained and loamy with a sandy loam surface, moderate permeability, and moderate available water capacity. Overall, the upland soils formed in loamy alluvium

over acid outwash sand and gravel on moraines or outwash plains, in brown non-calcareous sandy loam and loamy sand till or mudflow sediments on moraines and drumlins, or entirely in outwash sand on outwash plains. They range from excessively drained to somewhat poorly drained and generally have sandy loam to loamy sand surface textures, moderate to very rapid permeability, and moderate to low available water capacity. Soils on drumlins and moraines formed in brown non-calcareous loamy sand to sandy loam till with a fragipan. Some soils have carbonates within a 6 foot depth, but in most soils the carbonates have leached to a level below that. There are large areas of lowland soils due to impeded drainage from the underlying dense till; most lowland soils are very poorly drained acid peat or non-acid mucks, but some are poorly drained outwash sands.

Antigo soils are common in the UWRFA, are typically found on gently sloping, rolling, or undulating slopes, and are well-drained. Areas with these soils are usually retained as woodlands, though some are used as cropland or pasture. This soil is suited to trees, especially of sugar maple, but American elm (*Ulmus americana*), trembling aspen (*Populus tremuloides*), white ash, black cherry (*Prunus serotina*), yellow birch, and American basswood are associates in most stands (Mitchell 1986). Balsam fir, paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), eastern white pine, eastern hemlock, northern red oak, and red pine are in some stands (Mitchell 1986). Pence soils are typically on steeper slopes, hills and ridges. Most areas with these soils are retained as woodlands as these soils are suited to trees. Common trees in this soil are sugar maple, red pine, eastern white pine, American basswood, balsam fir, trembling aspen, paper and yellow birch (Mitchell 1986). Pence soils are generally not suited to cultivated crops because of the slope, the very low available water capacity, and a severe hazard of erosion (Mitchell 1986).

## Hydrology

The Upper Wolf River Fishery Area is within the Wolf River Basin. The Wolf River flows in a southerly direction until it joins the Upper Fox River just above the Lake Winnebago Pool lakes. There are five principle tributaries that flow into the Upper Wolf River in Langlade County: Swamp Creek, Pickerel Creek, Hunting River, Lily River, and Ninemile Creek, with all of these flowing to certain extents within the UWRFA. There are several important Springs and Spring Runs present within the UWRFA. The hardwater, spring-fed Turtle Lake is the only named lake found within the property boundary. A short navigable channel connects the lake to the Wolf River.

The Wolf River is a medium, hard water stream having slightly alkaline, light brown water. From the headwaters in Pearson to its terminus in Langlade County at Markton, the river gradient increases with 10 major rapids of variable length occurring between the Lily to Markton stretch (Steuck et al 1977). The entire stretch of the Wolf River within the UWRFA is a Class 2 trout stream. The Wolf River was a log highway for more than 20 years during the late 1800's. Log drives down the Wolf River changed the physical dimensions of the channel. Dams were built on the river to control flow and facilitate log storage and drives; boulders were moved to avoid log jams. The likely end result was a wider and flatter channel in the low gradient stretches of the river. Due to these changes, a 1998 Wolf River Rehabilitation Project was undertaken by WDNR fisheries biologists and the local chapter of Trout Unlimited benefitting habitat for trout populations. The goals of the project were to restore the stream channel to a narrower, deeper channel, restore pool-riffle sequences, and increase the meander pattern, all closer to pre-logging condition.

Swamp Creek, a tributary to the Wolf River, is a hard water stream having slightly acid, clear water (Steuck et al 1977). Fish inhabiting this stream include northern pike (*Esox lucius*), perch (*Perca* sp.),

black bullhead (*Ameiurus melas*), rock bass (*Ambloplites rupestris*), pumpkinseed (*Lepomis gibbosus*) and a variety of minnows (Steuck et al 1977).

Pickereel Creek is a medium hard water stream having slightly alkaline, light brown water that meets the Wolf River just north of the town of Pearson. It originates in a large wetland area in Forest County in the Town of Mole Lake. Fish species known to inhabit this stream include largemouth bass (*Micropterus salmoides*), perch, and forage minnows (Steuck et al 1977).

The Hunting River, flowing through the upper portions of the UWRFA, is a medium hard water stream having slightly alkaline light brown water; it is a major tributary to the Wolf River (Steuck et al 1977). The entire stream length is a Class 2 trout stream with several named and unnamed springs contributing spring water to the river.

The Lily River is a hard water stream having slightly alkaline, light brown water (Steuck et al 1977). The entire 6.4-mile length of the Lily River is a Class 2 trout stream. It meets the Wolf River at the village of Lily.

Ninemile Creek is a hard water stream having slightly acid, clear water with three named and three unnamed spring ponds and three spring lakes contributing spring water to the creek (Steuck et al 1977). Ninemile Creek originates within the Diamond Roof State Natural Area within the Chequamegon – Nicolet National Forest at Upper Hiawanka Lake; the entire creek is a Class 2 trout stream.

Turtle Lake is a hard water, spring lake having alkaline, clear water of high transparency (Steuck et al 1977). The immediate shoreline is predominately upland hardwoods with the remainder being shrub and forested wetland. The littoral materials are diverse with silt, sand, gravel, rubble, and boulders, while submergent aquatic vegetation is dense and emergent and floating vegetation is sparse (Steuck et al 1977).

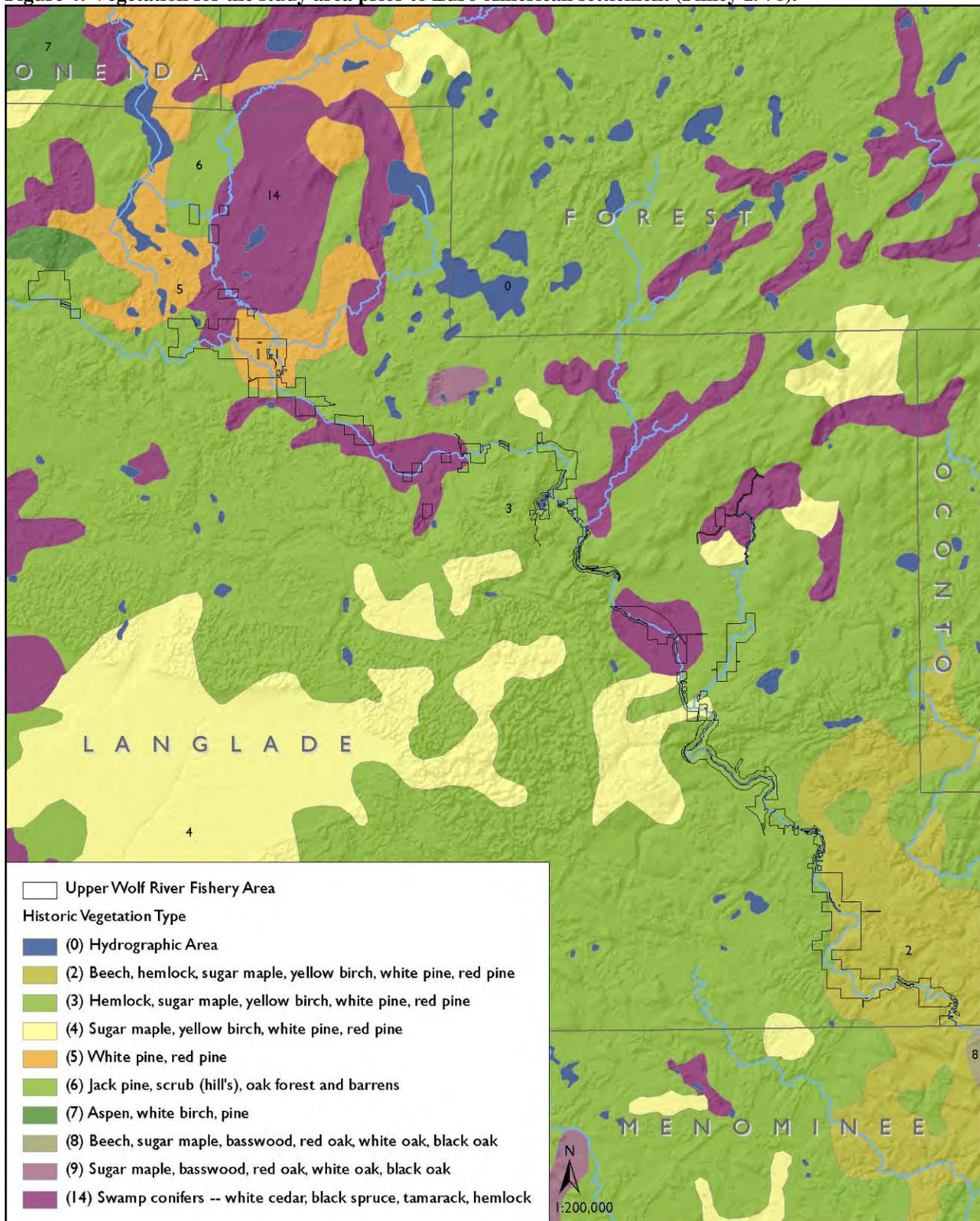
## Vegetation

### Historical Vegetation

Data from the original Public Land Surveys are often used to infer forest composition and tree species dominance for large areas in Wisconsin prior to widespread Euro-American settlement. The purpose of examining historical conditions is to identify ecosystem factors that formerly sustained species and communities that are now altered in number, size, or extent, or which have been changed functionally (for example, by constructing dams, or suppressing fires). Although data are limited to a specific snapshot in time, they provide valuable insights into Wisconsin's ecological capabilities. Maintaining or restoring some lands to more closely resemble historic systems and including some structural or compositional components of the historic landscape within actively managed lands can help conserve important elements of biological diversity (WDNR In Prep. a). Public Land Surveys for the area comprising the UWRFA were conducted between 1811 and 1870.

Finley's (1976) Pre-settlement Vegetation map (Figure 3) identifies the study area as being dominated by mixed forests of eastern hemlock, American beech (*Fagus grandifolia*), sugar maple, yellow birch, eastern white pine, and red pine. There are pockets of swamp conifer scattered throughout the property that were historically dominated by northern white-cedar, black spruce (*Picea mariana*) and tamarack (*Larix laricina*). In the northern part of the UWRFA, there are small areas of coniferous upland forests of eastern white pine and red pine.

**Figure 4: Vegetation for the study area prior to Euro-American settlement (Finley 1976).**



## Current Vegetation

The UWRFA is embedded within two largely forested ecological landscapes, the North Central Forest and Forest Transition Ecological Landscapes. Currently, much of the landscape within and surrounding the project area is largely dominated by deciduous forest, with scattered inclusions of conifers and forested wetlands, and agricultural land and high density development as you move west toward the city of Antigo (Figure 4). Forest Reconnaissance data (WDNR 2011) for the UWRFA reflects this forest cover, as 69% of the property is in forested acreage, with the three most dominant cover types on the property being northern hardwoods (35% of forested acres), aspen (31% of forested acres), and northern white-cedar (11% of forested acres). Cross-walking these forest reconnaissance cover types to NHI natural community types can be challenging. For this report, based upon geographic location in the state and soil moisture conditions, these three forest cover types are discussed below as Northern Dry-mesic Forest, Northern Mesic Forest, and Northern Wet-mesic Forest. Springs, spring lakes and seeps are commonly scattered throughout much of the property and supply steady coldwater flows to the Wolf River. Ephemeral Ponds are scattered throughout some of the Northern Mesic Forest areas. Wetland inclusions of Northern Sedge Meadow, Alder Thicket, Northern Wet Forest, and Hardwood Swamp vary in size on the property and add to the overall diversity of native plant communities. Current vegetation for the property is described in detail by natural community type below.

### Northern Mesic Forest

Northern Mesic Forests of variable quality are found throughout the UWRFA with some of the best quality examples being found at the very southern end of the property, where the diverse tree composition and structure of some stands is noteworthy. These forests have canopies dominated by sugar maple, eastern hemlock (in some stands), yellow birch, American beech, American basswood, white ash, northern red oak, and occasionally bitternut hickory. Eastern white pine was historically an important component of these forests, but is currently present at significantly lower levels. The shrub layer typically varies from sparse to moderate with Canadian yew (*Taxus canadensis*), maple-leaved viburnum (*Viburnum acerifolium*), American hazelnut (*Corylus americana*), ironwood (*Ostrya virginiana*), eastern leatherwood (*Dirca palustris*), and balsam fir. The groundlayer is sparse under many eastern hemlock stands with Canada mayflower (*Maianthemum canadense*), intermediate wood fern (*Dryopteris intermedia*), clubmosses (*Lycopodium* spp.), and blue-bead lily (*Clintonia borealis*) most common. Many of the hardwood dominated sites have species-rich, spring ephemeral displays of wild leek (*Allium tricoccum*), bloodroot (*Sanguinaria canadensis*), Dutchman's-breeches (*Dicentra cucullaria*), Canadian white violet (*Viola canadensis*) and blue cohosh (*Caulophyllum thalictroides*). Other common groundlayer species include maidenhair fern (*Adiantum pedatum*), large-leaved aster (*Aster macrophyllus*), wild sarsaparilla (*Aralia nudicaulis*), common lady fern (*Athyrium filix-femina*), Pennsylvania sedge (*Carex pensylvanica*), Virginia waterleaf (*Hydrophyllum virginianum*), Clayton's sweet-root (*Osmorhiza claytonii*), yellow violet (*Viola pubescens*), early meadow-rue (*Thalictrum dioicum*), Jack-in-the-pulpit (*Arisaema triphyllum*), big white trillium (*Trillium grandiflorum*), and sharp-lobed hepatica (*Hepatica acutiloba*). Deer browse was noted as moderate to heavy at many of these sites and limits some conifer regeneration. Ephemeral ponds are common occurrences throughout many of these stands.

### Northern Wet-mesic Forest

Northern Wet-mesic Forest is one of the more common forest types on the UWRFA, found in lowland areas primarily on the floodplain terraces adjacent to the Wolf River and Ninemile Creek. Many of these stands are small in size, but good-quality examples remain, with the best examples having snags and good amounts of coarse woody debris contributing to a well-developed structure. The canopy of these stands is dominated by northern white-cedar with common canopy associates including eastern hemlock, black ash, balsam fir, yellow birch, red maple, and black spruce. Eastern hemlock seemed to be reproducing adequately in many of these stands during 2011 surveys, but northern white-cedar regeneration appeared

to be lacking as deer browsing pressure seemed to be an issue. The shrub layer varies from sparse to moderate and includes sapling eastern hemlock and balsam fir along with mountain maple (*Acer spicatum*), American fly honeysuckle (*Lonicera canadensis*), American black currant (*Ribes americanum*), and alder buckthorn (*Rhamnus alnifolia*). Common groundlayer species are wild sarsaparilla, long-stalk sedge (*Carex pedunculata*), Canadian wild-ginger (*Asarum canadense*), bunchberry (*Cornus canadensis*), blue-bead-lily, three-leaved gold-thread (*Coptis trifolia*), orange jewelweed (*Impatiens capensis*), Canadian wood-nettle (*Laportea canadensis*), and naked miterwort (*Mitella nuda*). Additional species present include mountain wood-sorrel (*Oxalis montana*), dwarf red raspberry (*Rubus pubescens*), common lady fern, toothed wood fern (*Dryopteris carthusiana*), intermediate wood fern, creeping-snowberry (*Gaultheria hispidula*), Canada mayflower, dwarf scouring rush (*Equisetum scirpoides*), and shining club-moss (*Huperzia lucidula*).

### **Ephemeral Pond**

There are numerous examples of Ephemeral Ponds scattered throughout the mesic forests of the UWRFA, adding greatly to the biological diversity of the property. Ephemeral Ponds are depressions with impeded drainage, holding water for a period of time following snowmelt and typically drying out by mid-summer. The ephemeral nature is critical habitat for aquatic invertebrates like fairy shrimp (*Eubranchipus* spp.) and for amphibians like wood frogs (*Rana sylvatica*) and several species of salamanders. Little vegetation data was collected from within the ponds, but stand data from areas surrounding the ponds should be considered, as closed canopy forests with good amounts of downed woody debris are important structural components for making these attractive as amphibian breeding and foraging areas. The variability of vegetation in ponds is evident on the south end of the property near Markton, where one pond was largely dominated by broad-leaved sedges while another had tamarack, eastern white pine, and black spruce with good amounts of Sphagnum moss (*Sphagnum* spp.) and ericaceous shrubs (the former had blue-spotted (*Ambystoma laterale*) and spotted salamander (*Ambystoma maculatum*) egg masses). Other locations where Ephemeral Ponds were found on the property include south of Pearson and near The Ledge on the Wolf River. Collecting additional vegetation, herptile and aquatic invertebrate data from all of these ponds has been identified as a future need for the project area.

### **Springs and Seeps**

Springs and Spring Runs are fairly common occurrences on the UWRFA and in eastern Langlade County. Springs and Spring Runs generally originate from and have direct outflow attributed to artesian openings in the underground dolomite (FFWCC 2005). Springs typically have high water clarity, low sedimentation, and are a stable system with very little change in water temperature, water flow, or chemical composition. A good-quality Spring and seep area is located in the mature Northern Mesic Forest block adjacent to Gilmore's Mistake Rapids. The springs and seeps coalesce to run through a small Northern Sedge Meadow and eventually through a Northern Wet-mesic Forest before emptying into the Wolf River. Numerous tall northern bog orchids (*Platanthera huronensis*), along with American brooklime (*Veronica americana*) and orange jewelweed are common here. There is a Spring and Spring Run in the Little Sheen Rapids area running through a fairly large Northern Sedge Meadow dominated by Canada bluejoint grass (*Calamagrostis canadensis*).

Forested Seeps are shaded seepage areas with active spring discharges that typically occur in hardwood forest. These seeps may host a number of uncommon to rare species. Most documented occurrences in Wisconsin are from the southwest part of the state, but are locally found along major rivers flanked by steep bluffs. Examples are found at the UWRFA along the steep seepage bluffs at Oxbow Rapids under northern white-cedar, eastern hemlock and yellow birch. The groundlayer is primarily jewelweed, naked miterwort, and alpine enchanter's-nightshade (*Circaea alpina*).

### **Additional Natural Communities**

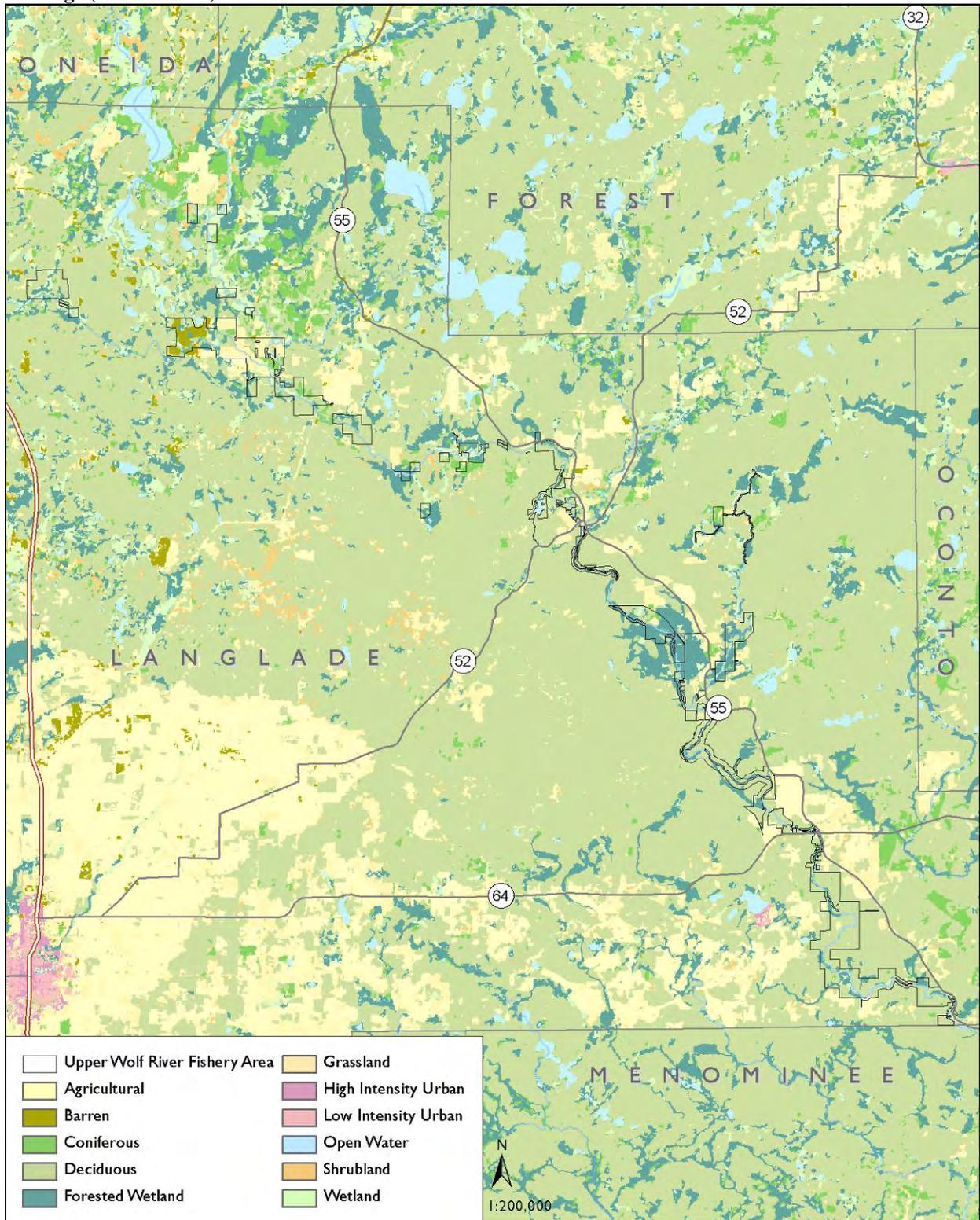
Also within the UWRFA are small areas of Northern Dry-mesic Forest, and Northern Wet Forest, as well as Hardwood Swamp with black ash as a canopy dominant. The majority of the **Northern Dry-mesic Forest** areas are dominated by young trees, most of which are trembling aspen. One exception is a moderate quality eastern white pine dominated stand, south of a parking area at the terminus of Rocky Rips Road, with canopy associates including red pine, northern red oak, red maple, sugar maple, and aspen. Canopy trees are pole- to timber-sized with some super canopy pines present. The shrub layer is moderate to dense and consists of maple-leaved viburnum, American hazelnut, American hornbeam (*Carpinus caroliniana*), American witch-hazel (*Hamamelis virginiana*) and balsam fir. The groundlayer consists of large-leaved aster, bracken fern (*Pteridium aquilinum*), Pennsylvania sedge, hog-peanut (*Amphicarpaea bracteata*), Canada mayflower, American starflower (*Trientalis borealis*), early meadowrue, and wood anemone (*Anemone quinquefolia*).

**Northern Wet Forests** in the UWRFA are very limited in extent and are typically found as small inclusions within pitted landforms of larger upland forests or as a matrix of wetland types varying from open to closed canopy. They are dominated by black spruce and tamarack with some eastern white pine as a lesser canopy component. The shrub layer typically includes Labrador-tea (*Ledum groenlandicum*), bog birch (*Betula pumila*), red maple, and some speckled alder (*Alnus incana*) along the edges or transition zones. The groundlayer has a dense mat of Sphagnum, along with sedges, small cranberry (*Vaccinium oxycoccos*), and purple pitcher-plant (*Sarracenia purpurea*).

There are larger open wetlands found in the northernmost parcels of the Fishery Area and along the Hunting River including Northern Sedge Meadows, Poor Fen, Emergent Marsh – Wild Rice, Alder Thicket, and Muskeg. These areas add to the diversity of plant and animals present on the property, as open and shrubby wetlands are uncommon on the UWRFA. Several bird SGCN (northern harrier [*Circus cyaneus*], golden-winged warbler [*Vermivora chrysoptera*], bobolink [*Dolichonyx oryzivorus*], eastern meadowlark [*Sturnella magna*]) were found here and no where else on the property. The **Emergent Marsh** is located in a shallow lake basin and is very densely covered with wild rice (*Zizania* sp.) along with cat-tails (*Typha* spp.), bulrushes (*Scirpus* spp.), and bur-reeds (*Sparganium* spp.). The **Alder Thicket** is an undisturbed shrub community of tall shrubs dominated by speckled alder with willow (*Salix* spp.) and dogwoods (*Cornus* spp.) within a matrix of open sedge meadow, shrubby meadow and conifer swamp. The herbaceous layer includes turtlehead (*Chelone glabra*), orange jewelweed and asters (*Aster* spp.).

The **Northern Sedge Meadow** at Gilmore's Mistake Rapids appears to have been formed when an old filled road or railroad grade blocked the Spring Run but has since been breached to allow the free flow of the stream. The vegetation of the meadows in the UWRFA is dominated by Canada blue-joint grass with spotted Joe-Pye-weed (*Eupatorium maculatum*), boneset (*Eupatorium perfoliatum*), cat-tails, numerous sedges, and occasional purple loosestrife (*Lythrum salicaria*). These meadows are important amphibian foraging areas as they are adjacent to fishless breeding ponds or springs. Numerous species of adult frogs were captured or observed here during spring and summer inventories.

**Figure 5: Landcover for the Upper Wolf River Fishery Area from the Wisconsin DNR Wisland GIS coverage (WDNR 1993).**



# Rare Species and High Quality Natural Communities of the Upper Wolf River Fishery Area

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

**Table 5.** Documented rare species and high-quality natural communities for Upper Wolf River Fishery Area. Years listed in Property column indicate the most recent documented observation. More than one element occurrence of a particular species or natural community may be at each property. For an explanation of state and global ranks, as well as state status, see Appendix A. **Note: Listing status is based on the NHI Working List published 06/01/11.**

\* These records are not yet mapped in the NHI database or do not meet some aspect of the criteria for inclusion in the NHI Database.

Common Name	Scientific Name	Upper Wolf River Fishery Area	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Animal</b>								
<b>Amphibians</b>								
Four-toed Salamander	<i>Hemidactylium scutatum</i>	2000	S3?	G5	SC/H		Yes	No
Mink Frog	<i>Lithobates septentrionalis</i>	1981	S3	G5	SC/H		Yes	No
Northern Leopard Frog	<i>Lithobates pipiens</i>	2011	S4?	G5	SC/H		No	No
<b>Aquatic Invertebrates</b>								
A Caddisfly	<i>Agarodes distinctus</i>	2011	S3S4	G5	SC/N		Yes	No
A Caddisfly	<i>Hydropsyche phalerata</i>	1992	S4	G5	SC/N		Yes	No
A Common Burrower Mayfly	<i>Litobrancha recurvata</i>	2011	SU	G5	SC/N		No	No
A Fingernet Caddisfly*	<i>Wormaldia moesta</i>	2011	S2S3	G5	SC/N		Yes	Yes
A Flat-headed Mayfly	<i>Maccaffertium pulchellum</i>	2000	S2S4	G5	SC/N		Yes	Yes
A Flat-headed Mayfly	<i>Rhithrogena jejuna</i>	1992	S3	G5	SC/N		Yes	No

**Table 5.** Documented rare species and high-quality natural communities for Upper Wolf River Fishery Area. Years listed in Property column indicate the most recent documented observation. More than one element occurrence of a particular species or natural community may be at each property. For an explanation of state and global ranks, as well as state status, see Appendix A. **Note: Listing status is based on the NHI Working List published 06/01/11.**

\* These records are not yet mapped in the NHI database or do not meet some aspect of the criteria for inclusion in the NHI Database.

Common Name	Scientific Name	Upper Wolf River Fishery Area	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
A Predaceous Diving Beetle	<i>Ilybius incarinatus</i>	2011	S3S4	GNR	SC/N		Yes	No
A Riffle Beetle	<i>Stenelmis bicarinata</i>	1992	S3S4	GNR	SC/N		Yes	No
A Riffle Beetle	<i>Stenelmis mera</i>	1992	S3S4	GNR	SC/N		Yes	No
A Small Square-gilled Mayfly	<i>Sparbarus maculates</i>	2000	S2S3	G5	SC/N		Yes	Yes
A Water Scavenger Beetle	<i>Hydrobius melaenum</i>	2011	S4	GNR	SC/N		Yes	No
Creek Heelsplitter	<i>Lasmigona compressa</i>	2004	S3S4	G5	SC/P		No	No
Elfin Skimmer	<i>Nannothemis bella</i>	2011	S3	G4	SC/N		Yes	No
Elktoe	<i>Alasmidonta marginata</i>	1994	S3	G4	SC/P		No	Yes
Lancet Clubtail	<i>Gomphus exilis</i>	1998	S4	G5	SC/P		Yes	No
Pygmy Snaketail	<i>Ophiogomphus howei</i>	1999	S4	G3	THR		Yes	Yes
Round Pigtoe	<i>Pleurobema sintoxia</i>	1994	S3	G4G5	SC/P		No	No
Ski-tailed Emerald	<i>Somatochlora elongata</i>	1994	S2S3	G5	SC/N		No	No
Subarctic Darner*	<i>Aeshna subarctica</i>	2011	S1S2?	G5	SC/N		Yes	Yes
<b>Birds</b>								
Acadian Flycatcher	<i>Empidonax virescens</i>	2011	S3B	G5	THR		Yes	Yes
American Bittern	<i>Botaurus lentiginosus</i>	2010	S3B	G4	SC/M		Yes	Yes
Bald Eagle	<i>Haliaeetus leucocephalus</i>	2011	S4B,S4N	G5	SC/P		Yes	Yes
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	2010	S3S4B	G5	SC/M		Yes	No
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	2011	S3B	G5	SC/M		Yes	No
Bobolink	<i>Dolichonyx oryzivorus</i>	2010	S3S4B	G5	SC/M		Yes	No
Canada Warbler	<i>Wilsonia canadensis</i>	2011	S3B	G5	SC/M		Yes	No

**Table 5.** Documented rare species and high-quality natural communities for Upper Wolf River Fishery Area. Years listed in Property column indicate the most recent documented observation. More than one element occurrence of a particular species or natural community may be at each property. For an explanation of state and global ranks, as well as state status, see Appendix A. **Note: Listing status is based on the NHI Working List published 06/01/11.**

\* These records are not yet mapped in the NHI database or do not meet some aspect of the criteria for inclusion in the NHI Database.

Common Name	Scientific Name	Upper Wolf River Fishery Area	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Cape May Warbler	<i>Dendroica tigrina</i>	2011	S3B	G5	SC/M		No	No
Common Nighthawk*	<i>Chordeiles minor</i>	1982	S2S3B	G5	SC/M		No	Yes
Eastern Meadowlark	<i>Sturnella magna</i>	2010	S3S4B	G5	SC/M		Yes	No
Field Sparrow	<i>Spizella pusilla</i>	2011	S3S4B	G5	SC/M		Yes	No
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	2010	S3S4B	G4	SC/M		Yes	No
Least Flycatcher	<i>Empidonax minimus</i>	2011	S4B	G5	SC/M		Yes	No
Northern Harrier	<i>Circus cyaneus</i>	2010	S3B,S2N	G5	SC/M		Yes	No
Osprey	<i>Pandion halieatus</i>	2011	S4B	G5	SC/M		Yes	No
Spruce Grouse	<i>Falcapennis canadensis</i>	2003	S1S2B,S1S2N	G5	THR		Yes	Yes
Veery	<i>Catharus fuscescens</i>	2011	S4B	G5	SC/M		Yes	No
Vesper Sparrow	<i>Pooecetes gramineus</i>	2011	S3S4B	G5	SC/M		Yes	No
Wood Thrush	<i>Hylocichla mustelina</i>	2011	S4B	G5	SC/M		Yes	No
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	2011	S3B	G5	SC/M		Yes	No
<b>Mammals</b>								
Big Brown Bat*	<i>Eptesicus fuscus</i>	2011	S2S4	G5	THR		No	Yes
Eastern Red Bat	<i>Lasiurus borealis</i>	2011	S3	G5	SC/N		Yes	No
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>	1990	S2	G5	SC/N		Yes	Yes
Gray Wolf	<i>Canis lupus</i>	2011	S2	G4	SC/P		Yes	Yes
Hoary Bat	<i>Lasiurus cinereus</i>	2011	S3	G5	SC/N		Yes	No
Little Brown Bat*	<i>Myotis lucifugus</i>	2011	S2S4	G5	THR		No	Yes
Northern Flying Squirrel*	<i>Glaucomys sabrinus</i>	1990	S3	G5	SC/P		Yes	Yes

**Table 5.** Documented rare species and high-quality natural communities for Upper Wolf River Fishery Area. Years listed in Property column indicate the most recent documented observation. More than one element occurrence of a particular species or natural community may be at each property. For an explanation of state and global ranks, as well as state status, see Appendix A. **Note: Listing status is based on the NHI Working List published 06/01/11.**

\* These records are not yet mapped in the NHI database or do not meet some aspect of the criteria for inclusion in the NHI Database.

Common Name	Scientific Name	Upper Wolf River Fishery Area	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Northern Long-eared Bat*	<i>Myotis septentrionalis</i>	2011	S1S3	G4	THR		Yes	Yes
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	2011	S2S4	G5	SC/N		Yes	No
<b>Terrestrial Invertebrates</b>								
Bog Fritillary	<i>Boloria eunomia</i>	2000	S3S4	G5	SC/N		No	No
Tawny Crescent Spot	<i>Phyciodes batesii</i>	2000	S3S4	G4	SC/N		No	No
<b>Reptiles</b>								
Northern Ringneck Snake	<i>Diadophis punctatus</i>	1972	S3	G5T5	SC/H		No	No
Wood Turtle	<i>Glyptemys insculpta</i>	2011	S2	G4	THR		Yes	Yes
<b>Plants</b>								
American Ginseng	<i>Panax quinquefolias</i>	2011	S4	G3G4	SC		NA	No
Canadian Yew	<i>Taxus canadensis</i>	2011	S4	G5	SC		NA	No
<b>Natural Community</b>								
Alder Thicket		1982	S4	G4	NA		NA	Yes
Emergent Marsh – wild rice		1982	S3	G3G4	NA		NA	Yes
Ephemeral Pond*		2011	SU	GNRQ	NA		NA	Yes
Lake – shallow, hard, drainage		1982	SU	GNR	NA		NA	Yes
Lake - Spring		1982	S3	GNR	NA		NA	Yes
Muskeg		2000	S4	G4G5	NA		NA	Yes

**Table 5.** Documented rare species and high-quality natural communities for Upper Wolf River Fishery Area. Years listed in Property column indicate the most recent documented observation. More than one element occurrence of a particular species or natural community may be at each property. For an explanation of state and global ranks, as well as state status, see Appendix A. **Note: Listing status is based on the NHI Working List published 06/01/11.**

\* These records are not yet mapped in the NHI database or do not meet some aspect of the criteria for inclusion in the NHI Database.

Common Name	Scientific Name	Upper Wolf River Fishery Area	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
Northern Mesic Forest		2011	S4	G4	NA		NA	Yes
Northern Sedge Meadow		1982	S3	G4	NA		NA	Yes
Northern Wet-mesic Forest		2011	S3S4	G3?	NA		NA	Yes
Northern Wet Forest		1982	S4	G4	NA		NA	Yes
Poor Fen		2000	S3	G3G4	NA		NA	Yes
Springs and Spring Runs, Soft		2011	S4	GNR	NA		NA	Yes
Stream – fast, hard, cold		1982	S4	GNR	NA		NA	Yes
Stream – slow, hard, cold		1982	SU	GNR	NA		NA	Yes

# Management Considerations and Opportunities for Biodiversity Conservation

## Forest Patch Size and Ecological Connections

Forest fragmentation and the overall loss of forests have been identified as major threats to northern forests in the Lake States (Hawbaker et al. 2006, Radeloff et al. 2005). As many forested areas in the state become parcelized and developed, the UWRFA and vast forests of Langlade County, Menominee Nation, Wolf River Legacy Forest, and Chequamegon – Nicolet National Forest collectively represent an important opportunity to maintain an intact forested landscape, serving critical functions on a statewide and regional level.

The UWRFA presents opportunities to maintain or re-establish connectivity between ecologically significant sites (as identified in this inventory) and adjacent forested tracts within the surrounding landscape (WDNR 2006b). It is important to recognize forest patterns and processes, as well as the context of ecologically important areas and how forest stands function within the regional landscape. For example, the UWRFA contains a rich mosaic of forested uplands, wetlands, and streams and rivers in a mostly remote, forested context. These areas offer opportunities to connect with other more remote wetlands and forested features surrounding the UWRFA (within the adjacent National Forest property, for example) and to provide habitat for a diverse group of species. This part of the state has the potential to provide an important travel corridor via roadless areas, riverine corridors, and other contiguous wilderness areas for immigration of several mammal species including the gray wolf (*Canis lupus*) and American marten (*Martes americana*) (WDNR in Prep. b, Wydeven et al. 2009). Opportunities to enhance these connections through protecting and expanding both forested uplands and wetlands on a landscape scale would be beneficial to these and other species.

## Older Forests / Old-growth Forests

The WDNR has identified a need to conserve, protect, and manage old-growth forests (WDNR 2006b, WDNR 2004, WDNR 1995). Older forests (e.g., those with trees older than 120 years) are rare in the state, especially upland forests with a range of tree diameter sizes (especially very large), large diameter coarse woody debris, abundant large dead snags and cavity trees, and pit-and-mound micro-topography (WDNR 2005). Old-growth forests can support high densities of uncommon forest herbs, as well as assemblages of birds and other animals that are rare in the state. The State Endangered American marten is known from Oneida and Forest Counties just north of the UWRFA. This species requires older forest attributes including a closed canopy, good amounts of downed woody debris, stands with greater structural diversity, and high numbers of snags and cavities (WDNR in Prep. b). Mature, unfragmented forests are known to support breeding populations of two forest interior raptors, the northern goshawk (*Accipiter gentilis*) and red-shouldered hawk (*Buteo lineatus*) (Kopitzke & Sweeney 2000, Curnutt in Prep.). Populations of both species are known from adjacent properties (Nicolet National Forest, Menominee Forest Preserve) but surprisingly, were not found to be nesting on the UWRFA during the 2011 surveys.

Currently, much of the hardwood forest types within the UWRFA are represented by young and medium-aged stands; these stands are often dominated by early successional species such as aspen within a mosaic of small patches of older forests. In contrast, larger areas of older, less disturbed Northern Dry-mesic and Northern Mesic Forests are not well-represented in this landscape. The UWRFA offers opportunities to manage for tracts of older forests within a context of outstanding aquatic features, relatively undisturbed forested and open wetlands, and vast public landholdings of forested landscapes in all directions. Within the UWRFA, older aged stands (>90 yrs old) with large diameter trees of oak, hardwoods, and northern white-cedar exist but are limited in extent (WDNR 2011). Additionally, some of these stands have a

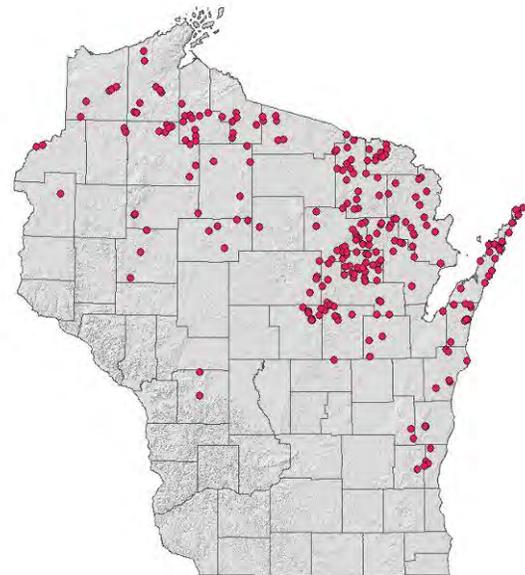
diverse tree composition, a significant ecological attribute that is lacking in many stands on the property. Many of these stands are within the 300-foot designated Scenic Area or occur on the very southern end of the property. Allowing these areas to continue to mature within the context of an unfragmented forest would provide important habitat for species dependant on large blocks of older forests and old-growth forest components. Old-growth forest management is one important facet of providing the diverse range of habitats needed for sustainable forest management (WDNR 2006c).

### Coniferous Forests

Northern Mesic Forest, prior to Euro-American settlement, covered the largest acreage of any Wisconsin vegetation type. It is still very extensive, but large patches, older forests, and conifers in the forest canopy are underrepresented (WDNR 2006b). Historically, sugar maple was either a dominant or co-dominant canopy species in these forests along with conifers, particularly eastern hemlock and eastern white pine. Super canopy eastern white pine was historically an important component of this system and is still commonly seen on the Menominee Reservation but is largely missing from the Northern Mesic Forests in the UWRFA. Eastern hemlock is also missing or regenerating poorly in many stands on the property. Identification of stands that support one or both of these species in an intact setting was a priority for this inventory and the best are represented as primary sites for consideration during the planning process.

The coniferous forest types of the UWRFA add significantly to the biodiversity found on the property. Northern Mesic Forest forms the matrix for most of the other community types found in northern Wisconsin, and provides habitat for at least some portion of the life cycle of many species (WDNR 2006b). These forests offer the preferred nesting habitat for several SGCN birds including black-throated blue warbler, least flycatcher, veery, and Canada warbler. Older examples of Northern Mesic Forest support habitat characteristics required of two rare mammals, the American marten and northern flying squirrel (*Glaucomys sabrinus*) -- known on or nearby the UWRFA. Northern Wet-mesic Forests are regionally significant because they are one of the most diverse plant communities in the state, providing habitat for many rare plants, including orchids and over 80 wildlife species (Forester et al. 2008). Northern Wet-mesic Forests are found in particular abundance in the northeast portion of Wisconsin

(see Figure 6) with the best examples of good-quality Northern Wet-mesic Forests in the UWRFA being found along the terraces of the Wolf River. Here, large diameter northern white-cedar dominates the canopy and a rich and diverse ground flora is present.



**Figure 6: NHI Locations of Northern Wet-mesic Forests in Wisconsin**

Herbivory by white-tailed deer (*Odocoileus virginianus*) has been identified as having major impacts on tree and herb species in northern forests of the Lake States (e.g., Schulte et al. 2007, WDNR 2006c, WDNR 2004, Rooney et al. 2004, Rooney and Waller 2003, Alverson et al. 1988), and the Michigan Society of American Foresters (2006) recently released a position statement addressing the need to control the impacts caused by white-tailed deer. In addition to direct impacts on plants, deer density has been shown to negatively impact species richness and abundance levels of songbirds that nest in the intermediate canopy layer (DeCalesta 1994, McShea and Rappole 2000). Excessive deer herbivory is known to inhibit reproduction of certain trees, especially those species that are preferred forage, as well as species growing in areas where deer “yard” during portions of winter months. Northern white-cedar and

eastern hemlock are, perhaps, most notably impacted by heavy deer browse, and regeneration of both species is now severely limited throughout the state. Many other tree species are impacted to varying degrees as well.

### **Ephemeral Ponds**

Ephemeral Ponds are an important contributor to the biodiversity of the UWRFA. Ephemeral Ponds are abundant in Northern Mesic Forests and are an important breeding area for invertebrates and amphibians, support foraging birds and mammals, and may provide habitat for unusual assemblages of vascular and non-vascular plants (WDNR 2005). Ephemeral Ponds provide high quality habitat for numerous species where they are embedded within forested habitats, especially if efforts are made to minimize or prevent negative impacts to hydrology by limiting road, ditch, or dike construction. These areas are of particular importance to several salamanders known from the UWRFA (spotted, blue-spotted, and red-backed salamanders), but also provide favorable microhabitat for four-toed salamanders (SGCN) where abundant Sphagnum moss is found immediately adjacent to standing water. The timing of management activities around Ephemeral Ponds can be critical. By recognizing Ephemeral Pond communities and their associated species distributions throughout the forest, proactive steps can be taken in the development of forest management plans that will help amphibians without hindering other management activities.

### **Wolf River and Tributaries**

The free-flowing, upper reaches of the Wolf and Hunting Rivers are protected within the UWRFA providing important habitat for many rare animal species (e.g., turtles, mussels, bats, aquatic macroinvertebrates). Management of lands adjacent to the river will have important effects on water quality directly impacting all of these species. No rare fish species are known from these stretches, owing largely to the cool water temperatures, (evidenced by the abundant trout populations), and to the barrier created by Keshena Falls that impedes movement of uncommon fishes like lake sturgeon (*Acipenser fulvescens*) known from the lower reaches of the Wolf River (John Lyons, s. per comm.).

The largely aquatic wood turtle (*Glyptemys insculpta*) tends to nest communally in sandy uplands and is often associated with trails and roads when natural, open, sandy areas are lacking. Turtle nest locations may be protected by limiting disturbance in their vicinity (especially from recreational activities), keeping the areas open by limiting forest succession, and controlling spotted knapweed invasions. Several potential wood turtle nesting management sites were identified by Hay and Thayer (2011). Placement should take into consideration the forested landscape context to best minimize fragmentation of existing intact forested areas. For all turtle species, including the wood turtle, it is vital to limit road-building near rivers, streams, and wetlands and to maintain riparian forest habitat, as wood turtles spend summer months foraging in adjacent upland forests. Hay and Thayer (2011) also noted the importance of islands with brush that are above high water marks and Alder Thickets bordering waterways as important gestating and basking areas for wood turtles.

Populations of rare aquatic invertebrates are found throughout the UWRFA. The aquatic invertebrate diversity in the Langlade County portion of the Wolf River is exceptional with 91 taxa known there from 1998, ranking this segment among the top five richest segments in the state (Smith pers comm.). Current information show the UWRFA streams are home to 18 Special Concern and one state Threatened species of aquatic invertebrates. These include rare mussels, beetles, dragonflies, mayflies, and caddisflies.

Acoustical bat surveys scattered throughout the river corridor, identified six of the possible seven bat species known to summer in Wisconsin, with only the eastern pipistrelle (*Perimyotis subflavus*) not documented. The Wolf River and associated forests is an important corridor for bat movement, foraging, and roosting. Maintaining good water quality is important for all aquatic invertebrates but also for bats as their food source of flying insects is directly correlated to water quality. A river buffer that accounts for steepness of slope, soil type, vegetative cover, and the habitat needs of sensitive species would be most

effective for protecting these species and others associated with the river. Issues pertaining to any future Wolf River, tributary, or Spring Pond dredging or channeling projects, like those that occurred in the 1990's, should be addressed during the master planning process with participation from multiple WDNR programs.

## High Conservation Value Forests

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

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

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

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

## Ecological Priorities for SGCN

The Wisconsin Wildlife Action Plan (WDNR 2006b) identifies ecological priorities in each Ecological Landscape. Ecological priorities are the natural communities in each Ecological Landscape that are most important to the Species of Greatest Conservation Need. Appendix D highlights the Ecological Priorities for vertebrate SGCN on the UWRFA. Note that these Ecological Priorities include all of the natural communities that have been determined to provide the best opportunities for management on the UWRFA from an ecological biodiversity perspective.

## Priority Conservation Actions

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

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

- Landscape scale forest management to retain or restore the compositional, structural, and functional attributes of northern forest ecosystems.
- Restoration of older successional stages and larger forest patches.

- Maintaining larger blocks of northern hardwood forest, especially those in public ownership, is important for forest-interior species such as the black-throated blue warbler, hermit thrush (*Catharus guttatus*), and many other neotropical migrants.
- Restore the missing or diminished conifer component of forests, especially eastern hemlock, eastern white pine, and northern white-cedar.
- Continue efforts to manage for uncommon species such as common loons (*Gavia immer*), bald eagles (*Haliaeetus leucocephalus*), ospreys (*Pandion haliaetus*) and wolves, especially since these species have responded favorably to past management attention.
- Management for additional rare or otherwise sensitive species.
- Management and protection of kettle lakes, cedar swamps, and other wetlands that is especially important for their biotic components.
- Preservation and management of the Wolf River, to enhance water quality and maintain populations of sensitive aquatic organisms.
- Establish ecological linkages within this landscape along major river corridors. Some of these can be extended to adjacent Ecological Landscapes.
- Non-native invasive plants are a particular problem due to the interspersed land uses. They impact natural areas, wildlife forage, and forest regeneration.

## Wisconsin’s Statewide Forest Strategy

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

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

Strategy Number	Strategy
1	Encourage planting to enhance, protect, and connect larger tracts of forested land in appropriate locations consistent with ecological landscapes.
5	Pursue the conservation and protection of large, unfragmented blocks of forest lands
6	Strengthen collaborative and large scale planning at the town, county, state and federal levels
7	Increase the functional size of forest blocks by encouraging coordination of management of clusters of forest ownerships
11	Encourage the management of under-represented forest communities
12	Improve all forested communities with a landscape management approach that considers the representation of all successional stages

13	Increase forest structure and diversity
14	Encourage the use of disturbance mechanisms to maintain diverse forest communities
15	Maintain the appropriate forest types for the ecological landscape while protecting forest health and function
22	Strive to prevent infestations of invasive species before they arrive
23	Work to detect new (invasive species) infestations early and respond rapidly to minimize impacts to forests
24	Control and management of existing (invasive species) infestations.
25	Rehabilitate, restore, or adapt native forest habitats and ecosystems
29	Attempt to improve the defenses of the forest and increase the resilience of natural systems to future climate change impacts

## Natural Community Management Opportunities

The Wisconsin Wildlife Action Plan (WDNR 2006b) identifies 26 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the North Central Forest and Forest Transition Ecological Landscapes. Twelve of these natural communities are present on the UWRFA:

- Alder Thicket
- Coldwater Streams
- Coolwater Streams
- Emergent Marsh – Wild Rice
- Ephemeral Pond
- Inland Lakes
- Northern Dry-mesic Forest
- Northern Hardwood Swamp
- Northern Mesic Forest
- Northern Sedge Meadow
- Northern Wet Forest
- Northern Wet-mesic Forest

## Invasive Plants and Animals

A number of invasive plants are present in and around the UWRFA. Non-native invasive plants establish quickly, tolerate a wide range of conditions, are easily dispersed, and are free of the diseases, predators, and competitors that kept their populations in check in their native range. In terrestrial settings, invasive plants out-compete and even kill native plants by monopolizing light, water, and nutrients, and by altering soil chemistry and, in the case of garlic mustard (*Alliaria petiolata*), mycorrhizal relationships. In situations where invasive plants become dominant, they may even alter ecological processes by limiting one’s ability to use prescribed fire (a striking example being common buckthorn [*Rhamnus cathartica*]), by modifying hydrology (e.g., reed canary grass (*Phalaris arundinacea*) can alter surface flow and clog culverts), and by limiting tree regeneration and ultimately forest composition (WDNR In prep.c). In addition to the threats on native communities and native species diversity, terrestrial invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation (by degrading wildlife habitat and limiting access), agriculture, and human health (plants that cause skin rashes or blisters).

Similarly to terrestrial invasives, aquatic invasives are successful because they originate in other regions or continents, thus lacking natural checks and balances. Early and abundant growth of aquatic plants not only overwhelms native plants, it may disrupt aquatic predator-prey relationships by fencing out larger

fish, and may limit important aquatic food plants for waterfowl. The die-off of plants such as curly-leaf pondweed (*Potamogeton crispus*) in summer can cause oxygen depletion in waterbodies, and decaying plants can contribute to nutrient loading and algal blooms. Aquatic invasive animals similarly present overwhelming competition to their native counterparts (e.g., rusty crayfish [*Orconectes rusticus*] versus native crayfish).

In the Upper Wolf River Fishery Area, invasive plants are concentrated along the riverbanks (of particular note, purple loosestrife and reed canary grass). European marsh thistle (*Cirsium palustre*) has arrived in the area only in recent years and is just becoming firmly established; to date, it is mostly scattered and in low numbers in the UWRFA. In a few places, like Ninemile Creek, it has formed fairly dense colonies of rosettes. The species occurs in numerous wet-mesic forest stands and should be a priority for control. It is not disturbance dependent and is able to colonize otherwise pristine sites. Glossy buckthorn (*Rhamnus frangula*) was found in open wetlands along the Hunting River widely scattered within the Hunting River Lowland Swamp and Marsh primary site (Appendix E). Possibly the first occurrence in Langlade County of the non-native Helleborine orchid (*Epipactis helleborine*) was documented in the UWRFA in 2011 in a rich upland forest south of Nine Mile Rapids. Garlic mustard and other legally “Prohibited and Restricted Invasive Species” under Wisconsin Chapter NR 40 have the potential to be found in or near the UWRFA, and if located, they should be reported and controlled.

**Table 6.** Invasive Plants detected in the Upper Wolf River Fishery Area during 2011 Biotic Inventory.

<i>Scientific Name</i>	<b>Common Name</b>	<b>NR40 Classification</b>	<b>UWRFA occurrence</b>
<i>Cirsium palustre</i>	European marsh thistle	Restricted	scattered
<i>Epipactis helleborine</i>	Helleborine orchid	Restricted	single specimen
<i>Lonicera tatarica</i>	tartarian honeysuckle	Restricted	one site
<i>Lonicera x bella</i>	Bell's honeysuckle	Restricted	one site
<i>Lythrum salicaria</i>	purple loosestrife	Restricted	widespread
<i>Phalaris arundinacea</i>	reed canary grass	NA	widespread
<i>Rhamnus frangula</i>	glossy buckthorn	Restricted	widely scattered

In 2003, the invasive and aquatic rusty crayfish was documented in Hunting River, and fisheries biologists noted it in the Wolf River within the UWRFA. It occurs in multiple lakes and rivers in the Wolf River Watershed in Langlade County. Other aquatic invasive species to look out for that have been found within Langlade County and the Wolf River Watershed include: banded mystery snail, Chinese mystery snail, curly leaf pondweed, and Eurasian water milfoil (*Myriophyllum spicatum*). Species not known from with the Wolf River Watershed but with the potential for showing up in these aquatic habitats include New Zealand mud snails (*Potamopyrgus antipodarum*) which could potentially be found in the UWRFA as they are found in fast, rocky streams and can be transported by fisherman on waders. These snails are known currently known from some tributaries of Lake Superior. Common reed grass (*Phragmites australis*) should be watched for along the slow water shores and in wetlands.

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as that maintained by the WDNR (<http://dnr.wi.gov/invasives>) and by the Invasive Plants Association of Wisconsin (<http://www.ipaw.org>). Also refer to invasive species Best Management Practices (BMPs) for forestry, recreation, urban forestry, and rights-of-way, which were developed by the Wisconsin Council on Forestry (<http://council.wisconsinforestry.org/>).

### **Exotic Earthworms**

The invasion of forests by European earthworms of the families Amyntas, Acanthodrilidae, Lumbricidae, and Megascloedidae is a concern throughout Wisconsin. While native earthworms were absent from this landscape after the last glaciation, exotic earthworms have been introduced since Euro-

American settlement, primarily as discarded fishing bait (Hendrix and Bohlen 2002, Hale et al. 2005). Exotic earthworms can have dramatic impacts on forest floor properties by greatly reducing organic matter (Hale et al. 2005), microbial biomass (Groffman et al. 2004), nutrient availability (Bohlen et al. 2004, Suarez et al. 2004), and fine-root biomass (Groffman et al. 2004). These physical changes in the forest floor reduce densities of tree seedlings and rare herbs (Gundale 2002) and can favor invasive plants (Kourtev et al. 1999) and reduce habitats for animals. In a study of 51 Northern Wisconsin forest stands, Wiegmann (2006) found that shifts in understory plant community composition due to exotic earthworms were more severe in stands with high white-tailed deer densities. In 2011, most upland stands surveyed for this Biotic Inventory report in the UWRFA are infested with earthworms. A few small upland areas still retain a healthy duff layer.

# Primary Sites: Site-specific Opportunities for Biodiversity Conservation

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

Descriptions for each of the Primary Sites and rare species associated with each of them can be found in Appendix E. Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site’s ecological significance, and management considerations.

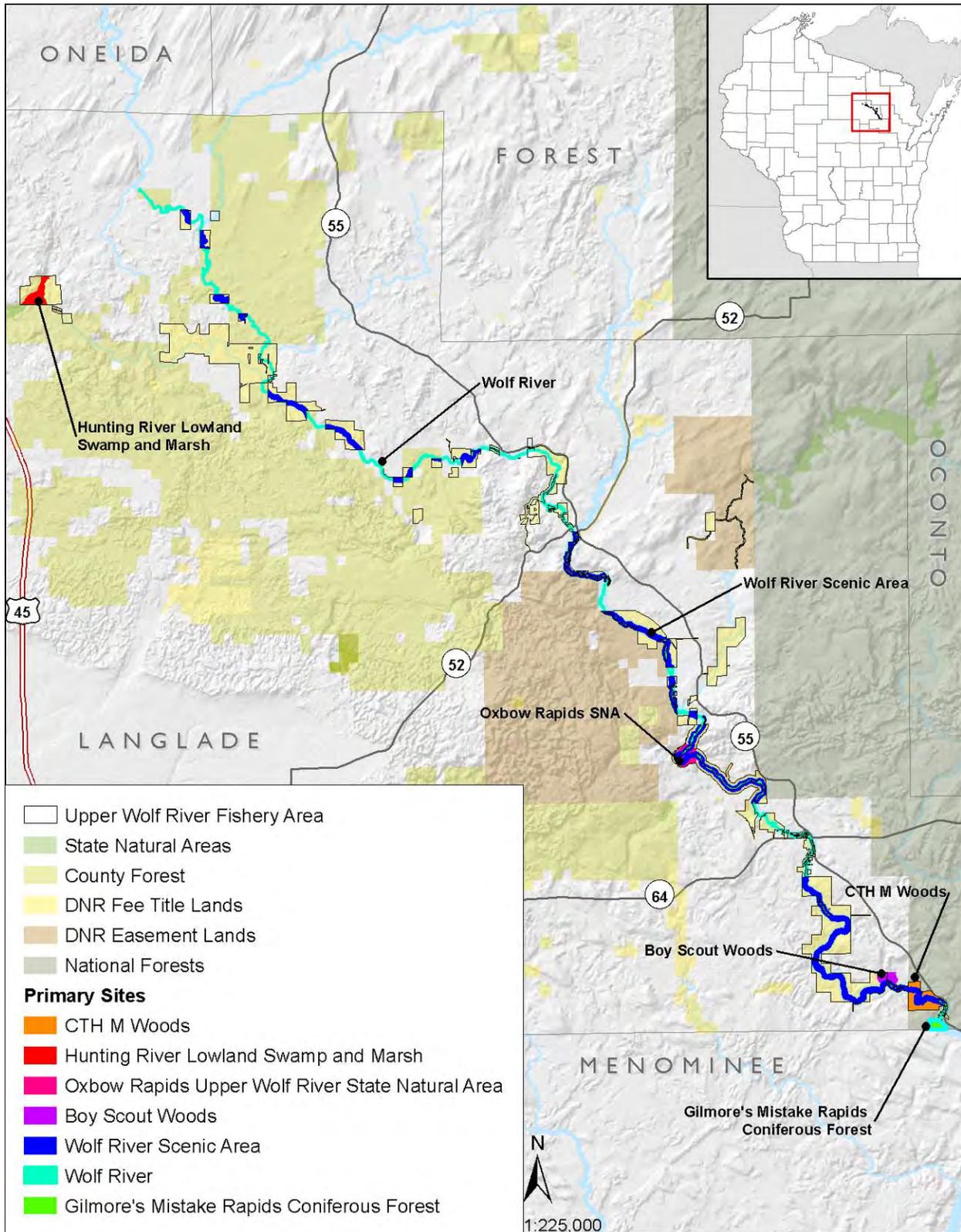
## Upper Wolf River Fishery Area Primary Sites

- UWRFA01 Wolf River
- UWRFA02 Wolf River Scenic Areas
- UWRFA03 Gilmore’s Mistake Rapids Coniferous Forest
- UWRFA04 CTH M Woods
- UWRFA05 Boy Scout Woods
- UWRFA06 Oxbow Rapids, Upper Wolf River State Natural Area
- UWRFA07 Hunting River Lowland Swamp and Marsh



**Boy Scout Woods at Upper Wolf River Fishery Area (Photo by Richard Staffen)**

**Figure 7: Primary Sites of the Upper Wolf River Fishery Area**



## Future Needs

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

- Invasive species monitoring and control – establishing an invasives early detection and monitoring protocol will be critical for the UWRFA. State properties and many other public lands throughout Wisconsin are facing major management problems because of serious infestations of highly invasive species such as garlic mustard, purple loosestrife, reed canary grass, European swamp thistle, rusty crayfish, exotic earthworms, European buckthorns (*Rhamnus* spp.), and Eurasian honeysuckles (*Lonicera* spp.). Some of these species are easily dispersed by humans and vehicles; others are spread by birds, mammals, insects, water, or wind. In order to protect the important biodiversity values of the UWRFA, a comprehensive plan will be needed for prevention, detection, and rapidly responding to new invasive threats. Providing information to the public regarding invasive non-native aquatic and terrestrial species of plants, fish and invertebrates and monitoring inland lakes and rivers for these species will be critical in controlling them. Citizens, such as trail users, hunters, or water enthusiasts could be encouraged to report new sightings of invasive plants and animals and, perhaps, cooperate with property managers in control efforts
- Revisiting and updating high-quality plant and natural community occurrences from the open wetland types in the northern portion of property would be desirable, as many were not assessed during this inventory effort. There are good examples of Northern Sedge Meadow, Emergent Marsh – Wild Rice, Poor Fen, and Alder Thicket that should be further investigated.
- Focused plant and natural community surveys and inventory of Forested Seeps, Springs, and Spring Runs, as these areas are known to harbor rare species.
- In Wisconsin, there has been a need to better understand the link between forest management and the management of Ephemeral Ponds. Collecting additional vegetative, herptile, and invertebrate data from Ephemeral Ponds within the UWRFA could add to the knowledge base of the physical and biotic parameters for Ephemeral Ponds and their surrounding habitats, and the wildlife species they support. This additional data could be used to inform adaptive management strategies for forests and other activities around ephemeral wetlands in Wisconsin.
- Additional inventory and monitoring is needed for amphibians on the UWRFA. A frog and toad survey route could be established for lakes, streams, and wetland areas in or near the UWRFA and monitoring salamanders of Ephemeral Ponds through the Wisconsin Statewide Salamander Survey would be beneficial.
- Additional mammal inventory efforts are needed within the UWRFA, focusing primarily on American marten (documented from near the study area) and small mammals including northern flying squirrel and Franklin’s ground squirrel (*Spermophilus franklinii*), both uncommon in Wisconsin but known historically from the UWRFA.

# Glossary

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

**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.

**ecological priority** – the natural communities (habitats) in each Ecological Landscape that are most important to the Species of Greatest Conservation Need, as identified in the Wisconsin Wildlife Action Plan (WDNR 2006b). Three sources of data were used to derive this information: 1) the probability that a species will occur in a given landscape, 2) the degree to which a species is associated with a particular natural community, and 3) the degree to which there are opportunities for sustaining a given natural community in any given Ecological Landscape. See [dnr.wi.gov/org/land/er/wwap/explore/tool](http://dnr.wi.gov/org/land/er/wwap/explore/tool) for more information.

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

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

**Forest Certification** – a market-based, non-regulatory forest conservation tool designed to recognize and promote environmentally-responsible forestry and sustainability of forest resources. The certification process involves an evaluation of management planning and forestry practices by a third-party according to an agreed-upon set of standards (from <http://www.pinchot.org/project/59>). See <http://dnr.wi.gov/forestry/certification/> regarding certification of WDNR managed lands.

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

**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.

**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.

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

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

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

**Tension Zone** – a narrow region extending from northwest to southeast across Wisconsin. The tension zone separates the mixed conifer-hardwood forests of the north from the prairie/savanna/hardwood forests of the south. Many native plant and animal species occupy ranges roughly delineated by the tension zone.

# Species List

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

Common Name	Scientific Name
<b>Animals</b>	
American marten	<i>Martes americana</i>
banded mystery snail	<i>Viviparus georgianus</i>
black bullhead	<i>Ameiurus melas</i>
Blackburnian warbler	<i>Setophaga fusca</i>
black-throated blue warbler	<i>Setophaga caerulescens</i>
black-throated green warbler	<i>Setophaga virens</i>
blue-spotted salamander	<i>Ambystoma laterale</i>
Canada warbler	<i>Wilsonia canadensis</i>
Chinese mystery snail	<i>Cipangopaludina chinensis</i>
gray wolf	<i>Canis lupus</i>
hermit thrush	<i>Catharus guttatus</i>
largemouth bass	<i>Micropterus sal</i>
least flycatcher	<i>Empidonax minimus</i>
northern flying squirrel	<i>Glaucomys sabrinus</i>
northern goshawk	<i>Accipiter gentilis</i>
northern pike	<i>Esox lucius</i>
osprey	<i>Pandion haliaetus</i>
perch	<i>Perca flavescens</i>
pumpkinseed	<i>Lepomis gibbosus</i>
red-shouldered hawk	<i>Buteo lineatus</i>
rock bass	<i>Ambloplites rupestris</i>
rusty crayfish	<i>Orconectes rusticus</i>
spotted salamander	<i>Ambystoma maculatum</i>
veery	<i>Catharus fuscescens</i>
white tailed deer	<i>Odocoileus virginianus</i>
wood frog	<i>Rana sylvatica</i>
wood thrush	<i>Hylocichla mustelina</i>
wood turtle	<i>Glyptemys insculpta</i>
<b>Plants</b>	
alder buckthorn	<i>Rhamnus alnifolia</i>
alpine enchanter's-nightshade	<i>Circaea alpina</i>
American basswood	<i>Tilia americana</i>
American beech	<i>Fagus grandifolia</i>
American black currant	<i>Ribes americanum</i>
American brooklime	<i>Veronica americana</i>
American elm	<i>Ulmus americana</i>
American fly honeysuckle	<i>Lonicera canadensis</i>
American hazelnut	<i>Corylus americana</i>
American hornbeam	<i>Carpinus caroliniana</i>
American starflower	<i>Trientalis borealis</i>
American witch-hazel	<i>Hamamelis virginiana</i>
aspen	<i>Populus spp.</i>
aster	<i>Aster spp.</i>
balsam fir	<i>Abies balsamea</i>
balsam poplar	<i>Populus balsamifera</i>
big white trillium	<i>Trillium grandiflorum</i>
bird's-foot trefoil	<i>Lotus corniculatus</i>
bitternut hickory	<i>Carya cordiformis</i>
black ash	<i>Fraxinus nigra</i>
black cherry	<i>Prunus serotina</i>
black spruce	<i>Picea mariana</i>

bloodroot	<i>Sanguinaria canadensis</i>
blue cohosh	<i>Caulophyllum thalictroides</i>
blue-bead-lily	<i>Clintonia borealis</i>
bog birch	<i>Betula pumila</i>
boneset	<i>Eupatorium perfoliatum</i>
bracken fern	<i>Pteridium aquilinum</i>
bulrush	<i>Scirpus</i> spp.
bunchberry	<i>Cornus canadensis</i>
bur-reed	<i>Sparganium</i> spp.
Canada bluejoint grass	<i>Calamagrostis canadensis</i>
Canada mayflower	<i>Maianthemum canadense</i>
Canadian white violet	<i>Viola canadensis</i>
Canadian wild-ginger	<i>Asarum canadense</i>
Canadian wood-nettle	<i>Laportea canadensis</i>
Canadian yew	<i>Taxus canadensis</i>
cat-tail	<i>Typha</i> spp.
Clayton's sweet-root	<i>Osmorhiza claytonii</i>
clubmosses	<i>Lycopodium</i> spp.
common buckthorn	<i>Rhamnus cathartica</i>
common lady fern	<i>Athyrium filix-femina</i>
creeping-snowberry	<i>Gaultheria hispidula</i>
curly-leaf pondweed	<i>Potamogeton crispus</i>
dogwood	<i>Cornus</i> spp.
Dutchman's-breeches	<i>Dicentra cucullaria</i>
dwarf red raspberry	<i>Rubus pubescens</i>
dwarf scouring rush	<i>Equisetum scirpoides</i>
early meadow-rue	<i>Thalictrum dioicum</i>
eastern hemlock	<i>Tsuga canadensis</i>
eastern leatherwood	<i>Dirca palustris</i>
eastern white pine	<i>Pinus strobus</i>
Eurasian honeysuckles	<i>Lonicera</i> spp.
European buckthorns	<i>Rhamnus</i> spp.
European swamp thistle	<i>Cirsium palustre</i>
garlic mustard	<i>Alliaria petiolata</i>
hog-peanut	<i>Amphicarpaea bracteata</i>
intermediate wood fern	<i>Dryopteris intermedia</i>
ironwood	<i>Ostrya virginiana</i>
Labrador-tea	<i>Ledum groenlandicum</i>
large-leaved aster	<i>Aster macrophyllus</i>
maidenhair fern	<i>Adiantum pedatum</i>
maple-leaved viburnum	<i>Viburnum acerifolium</i>
mountain maple	<i>Acer spicatum</i>
mountain wood-sorrel	<i>Oxalis montana</i>
naked miterwort	<i>Mitella nuda</i>
narrow-leaved cat-tail	<i>Typha angustifolia</i>
northern red oak	<i>Quercus rubra</i>
northern white-cedar	<i>Thuja occidentalis</i>
orange jewelweed	<i>Impatiens capensis</i>
paper birch	<i>Betula papyrifera</i>
Pennsylvania sedge	<i>Carex pensylvanica</i>
purple loosestrife	<i>Lythrum salicaria</i>
purple pitcher-plant	<i>Sarracenia purpurea</i>
red maple	<i>Acer rubrum</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaris arundinacea</i>
sharp-lobed hepatica	<i>Hepatica acutiloba</i>
shining club-moss	<i>Huperzia lucidula</i>
Bell's honeysuckle	<i>Lonicera X bella</i>
Siberian pea-shrub	<i>Caragana arborescens</i>

small cranberry	<i>Vaccinium oxycoccos</i>
speckled alder	<i>Alnus incana</i>
sphagnum moss	<i>Sphagnum</i> spp.
spotted Joe-Pye-weed	<i>Eupatorium maculatum</i>
sugar maple	<i>Acer saccharum</i>
tall northern bog orchid	<i>Platanthera huronensis</i>
tamarack	<i>Larix laricina</i>
three-leaved gold-thread	<i>Coptis trifolia</i>
toothed wood fern	<i>Dryopteris carthusiana</i>
trembling aspen	<i>Populus tremuloides</i>
turtlehead	<i>Chelone glabra</i>
Virginia waterleaf	<i>Hydrophyllum virginianum</i>
white ash	<i>Fraxinus americana</i>
white spruce	<i>Picea glauca</i>
wild leek	<i>Allium tricoccum</i>
wild rice	<i>Zizania</i> sp.
wild sarsaparilla	<i>Aralia nudicaulis</i>
willow	<i>Salix</i> spp.
wood anemone	<i>Anemone quinquefolia</i>
yellow birch	<i>Betula alleghaniensis</i>
yellow violet	<i>Viola pubescens</i>

# Reference List

- Alverson, W.W., D.M. Waller, and S.L. Solheim. 1988. Forests Too Deer: Edge effects in Northern Wisconsin. *Conserv. Biol.* 2:348-358.
- Anderson, C., L. Ayers, T. Bergeson, K. Grveles, K. Kirk, W.A. Smith, & S. Zolkowski. 2008. Biodiversity in selected natural communities related to global climate change. Final report to Wisconsin Focus on Energy, Environmental Research Program. Bureau of Endangered Resources, Department of Natural Resources, Madison, WI.
- Attig, J.W., and N.R. Ham. 1999. Quaternary Geology of Northern Oconto County, Wisconsin. *Bulletin 97. Wisconsin Geological and Natural History Survey.* 13 p.
- Bohlen, P.J., D.M. Pelletier, P.M. Groffman, T.J. Fahey and M.C. Fisk. 2004. Influence of earthworm invasion on redistribution and retention of soil carbon and nitrogen in northern temperate forests. *Ecosystems* 7:13–27.
- Cleland, D.T.; Avers, P.E.; McNab, W.H.; Jensen, M.E.; Bailey, R.G., King, T.; Russell, W.E. 1997. National Hierarchical Framework of Ecological Units. Published in, Boyce, M. S.; Haney, A., ed. 1997. *Ecosystem Management Applications for Sustainable Forest and Wildlife Resources.* Yale University Press, New Haven, CT. pp. 181-200.
- Curnutt, J. In Prep. DRAFT Conservation Assessment for Northern Goshawk. in the Western Great Lakes. U. S. Forest Service, Milwaukee, Wisconsin.
- Curtis, J. T. 1959. *The Vegetation of Wisconsin.* University of Wisconsin Press, Madison, WI. 657p.
- De Calesta, D.S. 1994. Effect of white-tailed deer on songbirds within managed forests in Pennsylvania. *J. Wildl. Manage.* 58(4):711-718.
- Dott, R.H. Jr. and J.W. Attig. 2004. *Roadside Geology of Wisconsin.* Mountain Press Publishing Company. Missoula, Montana. 345 p.
- Ecosystem Management Planning Team (EMPT). 2007. Table of Opportunities for Sustaining Natural Communities by Ecological Landscape. Available online: <http://dnr.wi.gov/landscapes/ecoloppstable.pdf>
- Epstein, E. W. A. Smith, C. Anderson, E. Spencer, J. Lyons, and D. Feldkirchner. 2002. Wolf River Basin Biotic Inventory and Analysis. A Baseline and Analysis of Natural Communities, Rare Plants and Animals, and other Selected Features. Wisconsin's Natural Heritage Inventory Program, Bureau of Endangered Resources. Wisconsin Department of Natural Resources, Madison, WI Pub # ER-802 2002.
- Finley, R.W. 1976. *Original Vegetation Cover of Wisconsin.* Map compiled from General Land Office.
- Forest Stewardship Council. 2009. *Draft 7 FSC-US Forest Management Standard.* Minneapolis, MN.
- Groffman, P.M, P.J. Bohlen, M.C. Fisk, and T.J. Fahey. 2004. Exotic earthworm invasion and microbial biomass in temperate forest soils. *Ecosystems* 7:45-54.

- Florida Fish and Wildlife Conservation Commission (FFWCC). 2005. Florida's Wildlife Legacy Initiative. Florida's Comprehensive Wildlife Conservation Strategy. Tallahassee, Florida, USA.
- Forester, J.D., Anderson, D.P., and Turner, M.G., 2008. Landscape and Local Factors Affecting Northern White-cedar (*Thuja occidentalis*) Recruitment in the Chequamegon-Nicolet National Forest, Wisconsin (U.S.A.). *Am. Midl. Nat.* 160:438-453.
- Gundale, M.J. 2002. Influence of exotic earthworms on soil organic horizon and the rare fern *Botrychium mormo*. *Conservation Biology* 16:1555–1561.
- Hale, C.M., L.E. Frelich and P.B. Reich. 2005. Exotic European earthworm invasion dynamics in northern hardwood forests of Minnesota, USA. *Ecological Applications* 15:848–860.
- Hawbaker, T.J., V.C. Radeloff, C.E. Gonzalez-Abraham, R.B. Hammer, and M.K. Clayton. 2006. Changes in the road network, relationships with housing development, and the effects on landscape pattern in northern Wisconsin: 1937 to 1999. *Ecological Applications* 16: 1222-1237.
- Hay, R.W. and T. Thayer. 2011. Upper Wolf River Fishery Area Amphibians and Reptile Habitat Assessment and Species Observations, Langlade County, WI. A report conducted for the Natural Heritage Inventory, Bureau of Endangered Resources.
- Hendrix, P.F. and P.J. Bohlen. 2002. Exotic earthworm invasions in North America: ecological and policy implications. *Bioscience* 52:801–811.
- Kopitzke, D.A., and M. Sweeney. 2000. Threatened and Endangered Species in Forests of Wisconsin: A Guide to Assist with Forestry Activities. International Paper Company. 170 p.
- Kourtev, P.S., W.Z. Huang and J.G. Ehrenfeld. 1999 Differences in earthworm densities and nitrogen dynamics in soils under exotic and native plant species. *Biological Invasions* 1:237–245.
- LaBerge, G.L. 1994. Geology of the Lake Superior Region. Geoscience Press, Inc. Phoenix, AZ. 313 p.
- McCartney, M.C. 1983. Stratigraphy of till sheets in part of northeastern Wisconsin. Wisconsin Geological and Natural History Survey. *Geoscience Wisconsin* 8:1-21.
- McShea, W.J. and J.H. Rappole. 2000. Managing the abundance and diversity of breeding bird populations through manipulation of deer population. *Conservation Biology* 14(4):1161-1179.
- Michigan Society of American Foresters. 2006. Position statement on white-tailed deer management in Michigan. <http://michigansaf.org/Business/PosStates/Deer.htm>
- Mitchell, M. J. 1986. Soil Survey of Langlade County, Wisconsin. United State Department of Agriculture, Soils Conservation Service and Forest Service, in cooperation with the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin.
- Radeloff, V.C., R.B. Hammer, and S.I. Stewart. 2005. Sprawl and forest fragmentation in the U.S. Midwest from 1940 to 2000. *Conservation Biology* 19: 793-805.
- Rooney, T.P. and D.M. Waller. 2003. Direct and indirect effects of deer in forest ecosystems. *Forest Ecology & Management* 181:165-176.

- Rooney, TP, SM Wiegmann, DA Rogers, and DM Waller. 2004. Biotic impoverishment and homogenization in unfragmented forest understory communities. *Conservation Biology* 18:787-798.
- Schulte, L.A., D.J. Mladenhoff, T.R. Crow, L. Merrick, and D.T. Cleland. 2007. Homogenization of northern U.S. Great Lakes forests as a result of land use. *Landscape Ecology* 22:1089-1103.
- Suarez, E.R., D.M. Pelletier, T.J. Fahey, P.M. Groffman, P.J. Bohlen, and M.C. Fisk. 2004. Effects of exotic earthworms on soil phosphorous cycling in two broadleaf temperate forests. *Ecosystems* 7:28-44.
- Steuck, R., Andrews, L.M., and H. Carlson. 1977. *Surface Water Resources of Langlade County*. Wisconsin DNR. Madison, WI.
- The Nature Conservancy [TNC]. 2002. *The Superior Mixed Forest Ecoregion: a Conservation Plan*. 115pp.
- Wiegmann, S.M. 2006. Fifty years of change in northern forest understory plant communities of the upper Great Lakes. Ph.D. Dissertation. University of Wisconsin, Madison. 206 pp.
- Wisconsin Department of Natural Resources [WDNR]. In Prep. a. DRAFT Ecological Landscapes of Wisconsin. State of Wisconsin, Dept. of Nat. Resources, Handbook. 1805.1. Madison, WI
- Wisconsin Department of Natural Resources [WDNR]. In Prep. b. DRAFT Management and Conservation Plan for American Marten in Wisconsin. Wisconsin DNR, Bureau of Endangered Resources. Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 1979. Upper Wolf River Fishery Area Master Plan Conceptual Phase Langlade County. Wisconsin Department of Natural Resources, Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 1993. Wisconsin DNR Wisland GIS coverage.
- Wisconsin Department of Natural Resources [WDNR]. 1995. Wisconsin's biodiversity as a management issue: a report to Department of Natural Resources managers. Wisconsin Department of Natural Resources, Madison, WI. RS-915-95.
- Wisconsin Department of Natural Resources [WDNR]. 2001. State of the Wolf River Basin Report. A report by the Wisconsin Department of Natural Resources in cooperation with the Wolf Basin partnership team and stakeholders. Aug. 2001. Available online: <http://www.dnr.state.wi.us/org/gmu/wolf/index.htm>
- Wisconsin Department of Natural Resources [WDNR]. 2004. Wisconsin's Statewide Forest Plan: Ensuring a Sustainable Future. Available online: <http://dnr.wi.gov/forestry/assessment/>.
- Wisconsin Department of Natural Resources [WDNR]. 2005. Wisconsin Ecological Landscapes Handbook. Ecosystem Management Planning Team. Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 2006a. Wisconsin Land Legacy Report: an inventory of places critical in meeting Wisconsin's future conservation and recreation needs. Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 2006b. Wisconsin Wildlife Action Plan. Available online: <http://dnr.wi.gov/org/land/er/wwap/plan/>.
- Wisconsin Department of Natural Resources [WDNR]. 2006c. Old-growth and Old Forests Handbook. In preparation. Madison, WI.

- Wisconsin Department of Natural Resources [WDNR]. 2007. Important Bird Areas of Wisconsin: Critical Sites for the Conservation and Management of Wisconsin's Birds. Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 2009. DNR Land Certification. Available online: <http://dnr.wi.gov/forestry/certification/dnrland.html>
- Wisconsin Department of Natural Resources [WDNR]. 2010a. Wisconsin's Statewide Forest Assessment. Available online: <http://dnr.wi.gov/forestry/assessment/strategy/assess.htm>.
- Wisconsin Department of Natural Resources [WDNR]. 2010b. Wisconsin's Statewide Forest Strategy. Available online: <http://dnr.wi.gov/forestry/assessment/strategy/overview.htm>.
- Wisconsin Department of Natural Resources [WDNR]. 2011. WISFIRS. Data accessed October 27, 2011.
- Wisconsin Natural Heritage Working List*. Wisconsin Department of Natural Resources. Available online: <http://dnr.wi.gov/org/land/er/wlist/>.
- Wydeven, A. P., T.R. Van Deelen, and E.J. Heske. 2009. Recovery of Gray Wolves in the Great Lakes Region of the United States: An Endangered Species Success Story. Springer Publishing Co. New York, NY. 350p.

# Additional Resources

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

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

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

## 2. Wisconsin Natural Heritage Inventory Working List

The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category. This Web page offers a printable pdf file and a key to the Working List for use in conjunction with the information provided in #1 above. [dnr.wi.gov/org/land/er/wlist/](http://dnr.wi.gov/org/land/er/wlist/)

## 3. Ecological Landscapes of Wisconsin Handbook

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

## 4. The Wisconsin Wildlife Action Plan

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

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

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

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

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

*[dnr.wi.gov/org/es/science/publications/rs915\\_95.htm](http://dnr.wi.gov/org/es/science/publications/rs915_95.htm)*

6. **Wisconsin's Statewide Forest Strategy**

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

*[dnr.wi.gov/forestry/assessment/strategy/overview.htm](http://dnr.wi.gov/forestry/assessment/strategy/overview.htm)*

7. **2010 Wisconsin's Statewide Forest Assessment**

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

*[dnr.wi.gov/forestry/assessment/strategy/assess.htm](http://dnr.wi.gov/forestry/assessment/strategy/assess.htm)*

---

## Appendix A

### Natural Heritage Inventory Overview and General Methodology

This biotic inventory and analysis was conducted by the Wisconsin Natural Heritage Inventory (NHI) program. The Wisconsin NHI program is part of the Wisconsin DNR's Bureau of Endangered Resources and a member of an international network of Natural Heritage programs representing all 50 states, as well as portions of Canada, Latin America, and the Caribbean. These programs share standardized methods for collecting, processing, and managing data for rare species, natural communities, and certain other natural features (e.g., bird rookeries). NatureServe, an international non-profit organization, coordinates the network. This appendix provides a general overview of the methodology we use for these projects. Please see the NatureServe Web site for more detailed information about standard methods used by the Heritage Network ([www.NatureServe.org](http://www.NatureServe.org)) for locating, documenting, and ranking rare species and natural community occurrences.

#### General Process Used when Conducting Biotic Inventories for Master Planning

The Wisconsin NHI Program typically uses a "coarse filter-fine filter" approach to conducting biotic inventory projects for master planning. This approach begins with a broad assessment of the natural communities and aquatic features present, along with their relative quality and condition. The area's landforms, soils, topography, hydrology, current land uses, and the surrounding matrix are also evaluated using Geographic Information Systems (GIS) and other electronic and hardcopy data sources. Data that describe conditions for the area prior to Euro-American settlement are often used during this step and at other times to further understand the ecological capabilities of the area. Often, we consult with local managers, biologists, or others familiar with the ecology of the area when preparing for an inventory project. The goals for this step are to identify the important ecological attributes and biological processes present, as well as to focus our inventory efforts.

The level of survey intensity varies based on the size and ecological complexity of the property or group of properties, as well as the resources available. For larger properties such as state forests, biotic inventory efforts typically take more than one year. Ideally, taxa surveys are conducted following a coarse-filter analysis that sometimes include extensive natural community surveys. There is often time for "mop-up work" during the year following the completion of the main survey effort, whereby additional surveys are conducted for areas that could not be reached the first year or for which new information has become available. For smaller properties, a "Rapid Ecological Assessment" often takes the place of a full-scale biotic inventory. The level of effort for these projects varies based on the needs of the study area, although surveys are almost always completed during one field season. Coarse filter work for rapid assessments is often done based on GIS data, aerial photos, data acquired from previous efforts, and information from property managers and others knowledgeable about the area.

Taxa-specific surveys can be costly and intensive and sometimes must be completed during a very narrow period of time. For example, bird surveys must be completed within an approximately one-month time window. For this and several other reasons, ***our surveys cannot locate every rare species occurrence within a given area.*** Therefore, it is important to use resources as efficiently as possible, making every effort to identify the major habitats present in the study area from the start. This approach concentrates inventory efforts on those sites most likely to contain target species to maximize efficient use of resources. Communication among biologists during the field season can help identify new areas of interest or additional priorities for surveys. The goal is to locate species populations with the highest conservation value whenever possible.

After all of the data are collected, occurrences of rare species, high-quality natural communities, and certain other features are documented, synthesized, and incorporated into the NHI Database. The NHI program refers to this process as “mapping” the data and uses a tabular and spatial database application designed specifically for the Heritage Network. Other secondary databases are also used by the Wisconsin NHI Program for storing additional species and community information such as species lists, GPS waypoints, photos, and other site documentation.

Once the data mapping and syntheses are completed, the NHI Program evaluates data from the various department biologists, contractors, and other surveyors. This information is examined along with many other sources of spatial and tabular information including topographic maps, various types of aerial photography, digital soil and wetland maps, hydrological data, forest reconnaissance data, and land cover data. Typically, GPS waypoints and other spatial information from the various surveys are superimposed onto these maps for evaluation by NHI biologists.

In addition to locating important rare species populations and high-quality natural community occurrences, the major products culminating from all of this work are the “Primary Sites.” These areas contain relatively undisturbed, high-quality, natural communities; provide important habitat for rare species; offer opportunities for restoration; could provide important ecological connections; or some combination of the above factors. The sites are meant to highlight, based on our evaluation, the best areas for conserving biological diversity for the study area. They often include important rare species populations, High Conservation Value Forests, or other ecologically important areas.

The final report describes the Primary Sites, as well as rare or otherwise notable species, and other ecological opportunities for conserving or enhancing the biological diversity of the study area. The report is intended for use by department master planning teams and others and strives to describe these opportunities at different scales, including a broad, landscape context that can be used to facilitate ecosystem management.

### **Select Tools Used for Conducting Inventory**

The following are descriptions of standard tools used by the NHI Program for conducting biotic inventories. Some of these 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 NHI Database. Other databases with potentially useful information may also be queried, such as: forest reconnaissance data; 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; the Wisconsin Breeding Bird Atlas; other NHI “atlas” and site databases; museum/herbarium collections for various target taxa; soil surveys; geological surveys; and the department's fish distribution database.

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, including the State Natural Area files, often contain information on a variety of subjects relevant to the inventory of natural features for an area.

**Literature Review:** Field biologists involved with a given project consult basic references on the natural history and ecology of the area, as well as any documented rare species. This sometimes broadens and/or sharpens the focus of the inventory efforts.

**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.

**Compilation of Maps and Other Spatial Data:** USGS 7.5 minute topographic quadrangles, most often in digital form, serve along with aerial photos 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. These are used in conjunction with numerous GIS layers, which are now a basic resource tool for the efficient and comprehensive planning of surveys and the analysis of their results.

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. These polygons have been digitized for most counties, and the resulting GIS layers can be superimposed onto other maps.

Ecoregion GIS layers 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. Ecological Landscapes provide the broad framework most often used in Wisconsin; however smaller units, including Landtype Associations, can be very helpful for evaluating ecoregions at finer scales.

**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. The Wisconsin NHI Program uses several different types of both color and black and white air photos. Typically, these are in digital format, although paired photos in print format can be valuable for stereoscopic viewing. High-resolution satellite imagery is often cost-prohibitive but is available for some portions of the state and is desirable for certain applications.

**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. Their notes also included 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. The tree data are available in GIS format as raw points or interpreted polygons, and the notes themselves can provide helpful clues regarding the study area's potential ecological capabilities.

**Interviews:** Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield invaluable information.

**Global Positioning Systems (GPS):** Small, portable GPS units are now a routine piece of field equipment used for virtually all NHI survey work. Collecting coordinates (waypoints) facilitates mapping and makes it easy to quickly communicate specific locations among biologists. Often waypoints are paired with photos and/or other information and stored in a waypoint tracking database.

**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

## Wisconsin Natural Heritage Working List Explanation

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

### Key

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

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

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

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

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

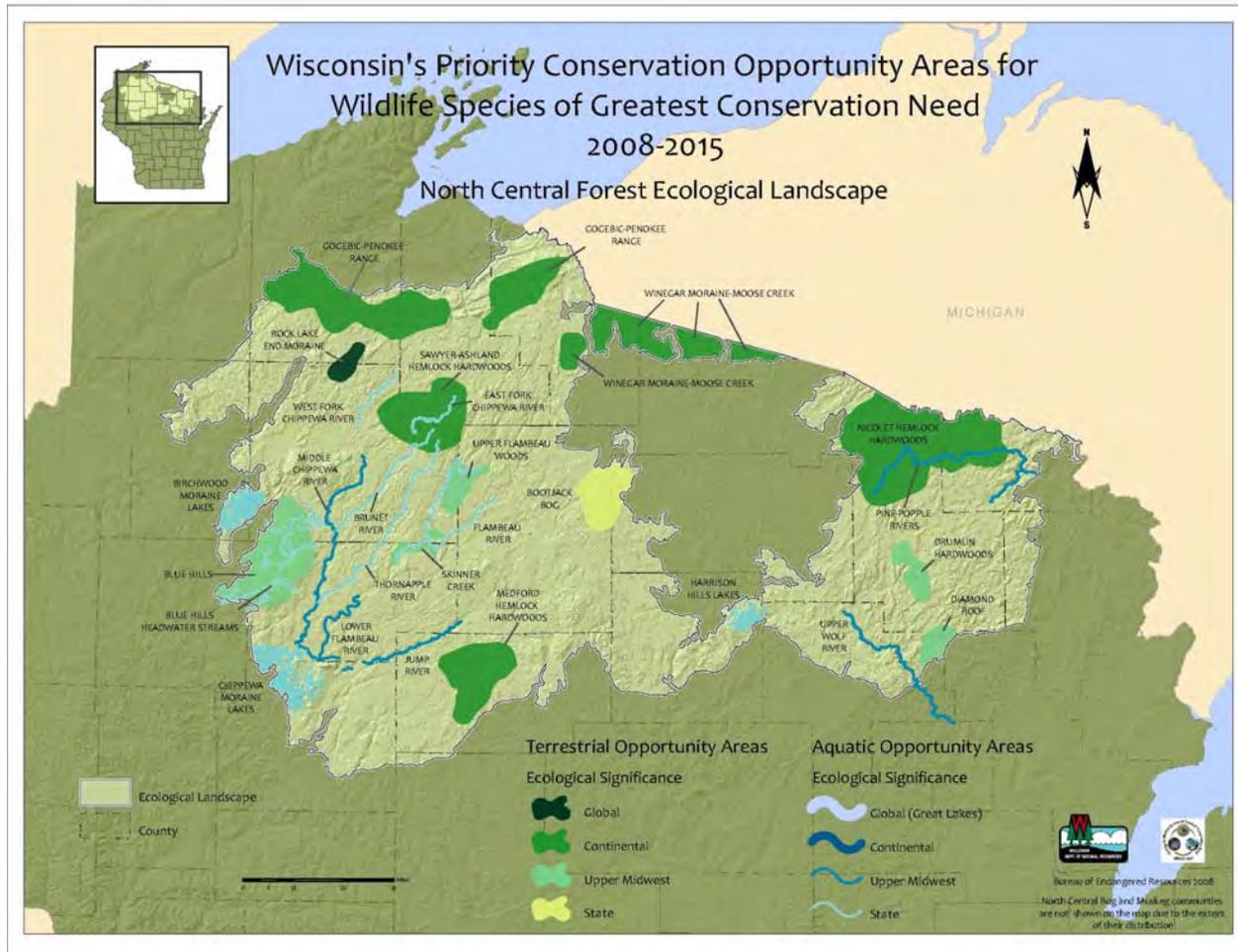
SU = Possibly in peril in the state, but their status is uncertain. More information is needed.

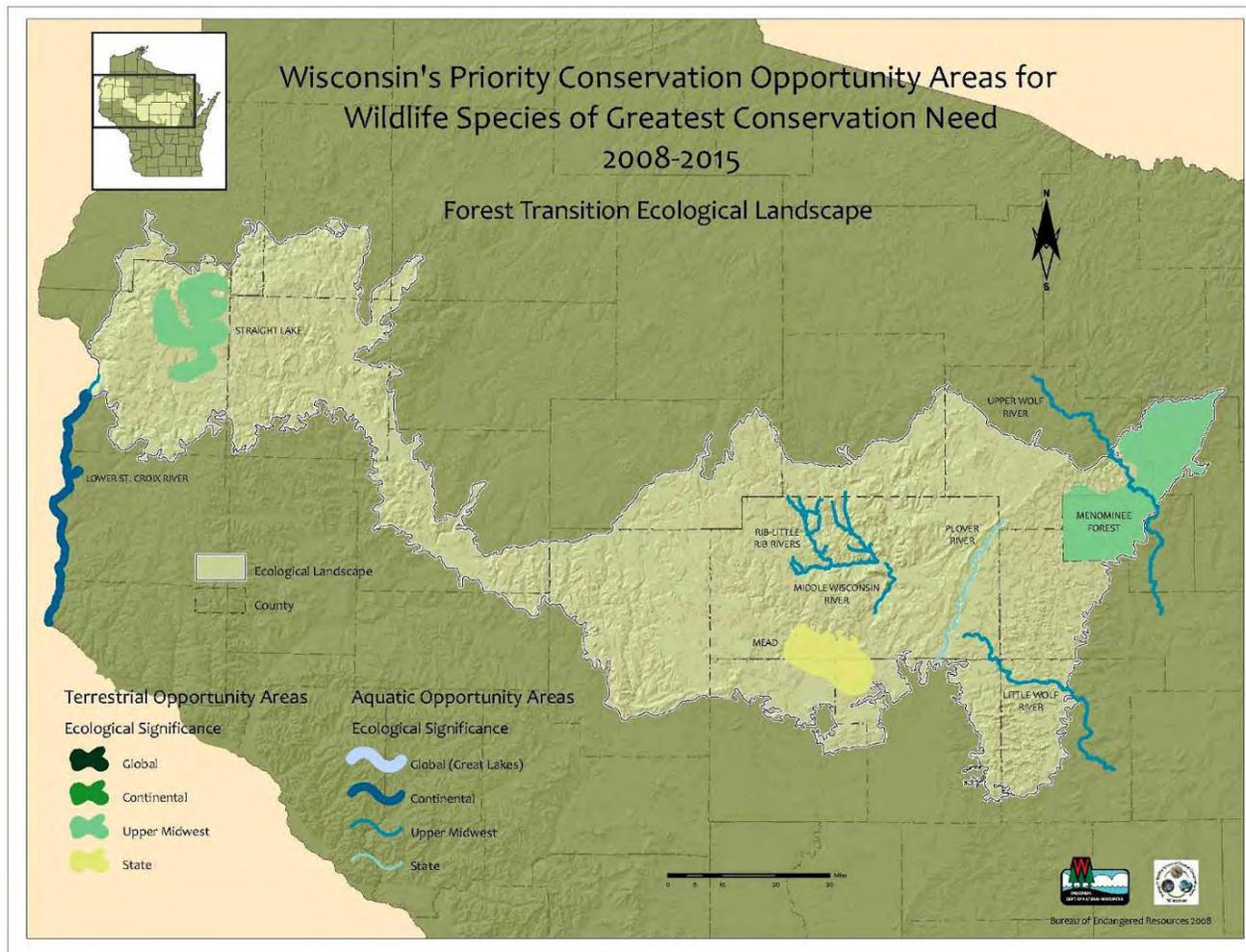
SX = Apparently extirpated from the state.

#### **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 B





---

## Appendix C

### Summary Descriptions for Rare Species and High Quality Natural Communities Documented on the Upper Wolf River Fishery Area

The following paragraphs give brief summary descriptions for some of the rare species and high quality natural communities documented on the Upper Wolf River Fishery Area. More information can be found on the Endangered Resources Web site ([www.dnr.wi.gov/org/land/er/](http://www.dnr.wi.gov/org/land/er/)) for several of these species and natural communities.

#### Rare Animals

##### **A Fingernet Caddisfly**

A fingernet caddisfly (*Wormaldia moesta*), a State Special Concern caddisfly, has been found in small, cold, rapid streams.

##### **A Riffle Beetle**

A riffle beetle (*Stenelmis bicarinata*), a State Special Concern beetle, has been found in submerged wood in large sandy rivers.

##### **Acadian Flycatcher**

Acadian Flycatcher (*Empidonax virescens*), a State Threatened bird, prefers lowland deciduous forests and heavily wooded hillsides in large blocks of southern forests. The breeding season extends from mid-May through late July.

##### **American Bittern**

American bittern (*Botaurus lentiginosus*), a bird listed as Special Concern, preferred breeding habitat is thick marsh grass, sometimes adjacent to stands of willow and tamarack, and usually within 6 meters of water. Habitat degradation is the greatest threat to its survival. The most urgent management need is the preservation of grasslands and large, shallow, freshwater wetlands with dense emergent growth. The breeding season extends from mid-May through mid-July.

##### **Bald Eagle**

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

##### **Black-throated Blue Warbler**

Black-throated blue warbler (*Dendroica caerulescens*), a State Special Concern bird. This species is found in dense hardwood or coniferous undergrowth of mesic deciduous forests of mature sugar maple, basswood and aspen. The breeding season extends from June through August.

### **Canada Warbler**

Canada Warblers (*Wilsonia canadensis*) are typically most abundant in moist, mixed coniferous-deciduous forests with a well-developed understory. In Wisconsin they occur in spruce, eastern hemlock, and balsam fir forest types in the northern counties. Important components of breeding habitat include conifers and often creeks and streams. The Canada Warbler nests in dense vegetation, often in areas with mosses, ferns, and decaying stumps or logs. The breeding season occurs from early June to early July.

### **Cape May Warbler**

Cape May Warblers (*Dendroica tigrina*) breed in northern Wisconsin, primarily in somewhat open coniferous forests of spruce, balsam fir, cedar, and tamarack. Nests are usually placed near the top or crown of spruce or fir trees and near the main stem. Locating nests from the ground or trying to follow females to the nest are difficult, as nest is usually 30-60 feet high in thick foliage and females tend to land near base and work up through the tree. Populations are generally uncommon for this highly insectivorous species but strong localized populations can occur in areas associated with spruce budworm.

### **Elfin Skimmer**

Elfin skimmer (*Nannothemis bella*), a State Special Concern dragonfly, has been found in shallow water wetlands, usually with sphagnum or other underwater vegetation. The flight period is from mid June through early August.

### **Elktoe**

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

### **Franklin's Ground Squirrel**

Franklin's Ground Squirrel (*Spermophilus franklinii*), a mammal listed as Special Concern, this semi-colonial species prefers brushy and partly wooded areas, dense grassy, shrubby marshland, as well as, prairie edges, rather than open prairie. Mating occurs from the late April to mid-May and young are born between late May to mid-June.

### **Gray Wolf**

Gray wolf (*Canis lupis*), also referred to as timber wolf, is the largest wild member of the dog family. Males average about 10% larger in size than females. In addition, gray wolves have a massive head and neck important in killing prey, which results in larger fore feet than hind feet. Body weight, height, and foot prints are important distinguishing characteristics when comparing gray wolves to other wild and domestic canids (shown in detail at <http://dnr.wi.gov/org/land/er/mammals/wolf/identification.htm>). Wolves are social animals, living in a family group, or pack. Pack sizes in Wisconsin average 2-6 individuals with a few packs as large as 8-10 animals. A wolf pack's territory may cover 20-120 square miles.

### **Mink Frog**

Mink frogs (*Rana septentrionalis*), a species of special concern, prefer rivers and lakes with bog shoreline habitats. They are a shoreline-dependent species but also forage on and around floating mats of vegetation away from the shoreline in the littoral zone. They may sometimes be found in permanent waters where no bog characteristics exist, although they are usually associated with tannin-stained waters. Mink frogs overwinter in water to avoid freezing. They are active from April through October and breed from June through July. Larvae overwinter before transforming the following summer.

### **Northern Harrier**

Northern Harrier (*Circus cyaneus*), a bird listed as Special Concern, prefer retired cropland (timothy/quackgrass), old field habitat, sedge meadow, and restored prairies. The breeding season extends from early April through late August.

### **Northern Long-eared Bat**

Northern Long-eared Bat, (*Myotis septentrionalis*), a mammal listed as Special Concern, is usually dull light brown, with a gray underbelly. Habitat for the summer may include day roosts in buildings, under tree bark or shutters, or caves during the night. Hibernation sites are often in mines or caves, and this species may co-hibernate with other species. Foraging habitat includes forested hillsides and ridges, and small ponds or streams. Mating occurs in the fall with delayed fertilization in the spring, and one young produced between May and July.

### **Northern Ring-necked Snake**

Northern ring-necked snakes (*Diadophis punctatus edwarsii*), a species of Special Concern, prefer moist to moderately dry deciduous forests. They also are found in openings within the woods or near woods edges, but almost always are under cover such as rocks, downed woody debris or artificial materials. Within the forest, this species may also be found between the bark and core wood of tree stumps or within rotting logs. No specific overwintering habitat has been described in Wisconsin, although they likely use rotted out root channels and other structures that offer a moist, no-freeze environment. They are active from mid-April through early October, breed late April through early June and lay their eggs between late-June and early July. Eggs may be laid communally by two or more females. Hatching occurs in August or early September.

### **Pygmy Snaketail**

Pygmy snaketail (*Ophiogomphus howei*), a dragonfly presently listed as a Federal Species of Concern and Threatened in Wisconsin has been found in small to large, clean, fast-flowing warm streams with gravel- sand substrates. Adults apparently forage and perch on the stream-side forest canopy. The flight period extends from late May through late June.

### **Round Pigtoe**

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

### **Ski-tailed Emerald**

Ski-tailed emerald (*Somatochlora elongata*), a State Special Concern dragonfly has been found in forest streams with rapids, outlets of lakes and ponds. The flight period extends from early June through late July.

### **Spruce Grouse**

Spruce Grouse (*Dendragapus (Canachites) canadensis*), a bird listed as Threatened in Wisconsin, prefers lowland coniferous forest with swampy regions. The breeding season extends from May through August.

### **Subarctic Darner**

Subarctic darner (*Aeshna subartica*) a State Special Concern dragonfly has been found in wet sphagnum in muskeg habitat. The flight period is in early September.

## **Wood Turtle**

Wood turtles (*Glyptemys insculpta*), a Threatened species in Wisconsin, prefer clean rivers and streams with moderate to fast flows and adjacent riparian wetlands and upland deciduous forests. This species often forages in open wet meadows or in shrub-carr habitats dominated by speckled alder. They overwinter in streams and rivers in deep holes or undercut banks where there is enough water flow to prevent freezing. This semi-terrestrial species tends to stay within about 300 meters of rivers and streams but exceptions certainly occur, especially within the Driftless Area of southwestern and western Wisconsin. This species becomes active in spring as soon as the ice is gone and air temperatures reach around 50 degrees in March or April. They can remain active into mid-October but have been seen breeding under the ice. Wood turtles can breed at any time of year, but primarily during the spring or fall. Nesting usually begins in late May in northern WI and early June in southern WI and continues through June. This species nests in sand or gravel, usually very close to the water, although it is known to nest along sand and gravel roads or in abandoned gravel pits some distance from water. Hatching occurs in 55-75 days (August) depending on air temperatures.

## **Natural Communities**

### **Alder Thicket**

The alder thicket is a minerotrophic wetland community dominated by tall shrubs, especially speckled alder. Shrub associates may include red-osier dogwood, nannyberry, cranberry viburnum, wild currants, and willows. Among the characteristic herbaceous species are Canada bluejoint grass, orange jewelweed, asters, boneset, rough bedstraw, marsh fern, arrow-leaved tearthumb, and sensitive fern. This community type is sometimes a seral stage between northern sedge meadow and northern conifer swamp or northern hardwood swamp, but occurrences can be stable and persist at given locations for long periods of time. This type is common and widespread in northern and central Wisconsin, but also occurs at isolated locales in the southern part of the state. Alder thicket often occurs as a relatively stable community along streams and around lakes, but can occupy large areas formerly covered by conifer swamps that were logged during the Cutover and/or where water tables were raised. Stands of alder that originated following logging and/or wildfire will usually revert to forest, although on heavy, poorly drained soils, forest re-growth can be problematic owing to “swamping” effects.

Groundwater seepage is an important attribute of alder thickets. Seepage areas are often indicated by the presence of skunk-cabbage, marsh-marigold, swamp saxifrage, American golden saxifrage, and marsh pennywort.

### **Emergent Marsh – Wild Rice**

Emergent aquatic – wild rice is closely related to the emergent aquatic community, but has wild rice as the dominant macrophyte. Substrates supporting wild rice usually consist of poorly-consolidated, semi-organic sediments. Water fertility is low to moderate, and a slow current is present. Wild rice beds have great cultural significance to native peoples, and are important wildlife habitats.

### **Ephemeral Pond**

These ponds are depressions with impeded drainage (usually in forest landscapes), that hold water for a period of time following snowmelt but typically dry out by mid-summer. Common aquatic plants of these habitats include yellow water crowfoot (*Ranunculus flabellaris*), mermaid weed (*Proserpinaca palustris*), Canada bluejoint grass, floating manna grass (*Glyceria septentrionalis*), spotted cowbane (*Cicuta maculata*), smartweeds (*Polygonum* spp.), orange jewelweed (*Impatiens*

*capensis*), and sedges. Ephemeral ponds provide critical breeding habitat for certain invertebrates, as well as for many amphibians such as frogs and salamanders.

### **Muskeg**

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

### **Northern Mesic Forest**

Prior to Euro-American settlement, the northern mesic forest covered the largest acreage of any Wisconsin vegetation type. It is still very extensive, but made up of second-growth forests that developed following the Cutover. It forms the matrix for most of the other community types found in northern Wisconsin, and provides habitat for at least some portion of the life cycle of many species. It is found primarily north of the Tension Zone, on loamy soils of glacial till plains and moraines deposited by the Wisconsin glaciation. Sugar maple (*Acer saccharum*) is dominant or co-dominant in most stands. Historically, eastern hemlock (*Tsuga canadensis*) was the second most important species, sometimes occurring in nearly pure stands with eastern white pine; both of these conifer species are greatly reduced in today's forests. American 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*), American basswood (*Tilia americana*), and white ash (*Fraxinus americana*). The groundlayer varies from sparse and species poor (especially in eastern hemlock stands) with woodferns, blue-bead lily (*Clintonia borealis*), club-mosses (*Lycopodium* spp.), and Canada mayflower (*Maianthemum canadense*), to lush and species-rich with fine spring ephemeral displays. Historically, Canada yew was an important shrub, but it is now absent from nearly all locations. Historic disturbance regimes were dominantly gap-phase windthrow; large windstorms occurred with long return periods. 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 abundant and still are important in many second-growth northern mesic forests. Several distinct associations within this complex warrant recognition as communities, and draft abstracts of these are currently undergoing review.

### **Northern Sedge Meadow**

This open wetland community is dominated by sedges and grasses and occurs primarily in northern Wisconsin. There are several common, fairly distinctive, subtypes: Tussock meadow, dominated by tussock sedge and Canada bluejoint grass; Broad-leaved sedge meadow, dominated by the robust sedges (*Carex lacustris* and/or *C. utriculata*); and Wire-leaved sedge meadow, dominated by woolly sedge and/or few-seeded sedge. Frequent associates include blue flag, marsh fern, marsh bellwort, manna grasses, paniced aster, Joe-Pye weed, and the bulrushes (*Schoenoplectus tabernaemontani* and *Scirpus cyperinus*). Sphagnum mosses are either absent or they occur in scattered, discontinuous patches. Sedge meadows occur on a variety of landforms and in several ecological settings that include depressions in outwash or ground moraine landforms in which there is groundwater movement and internal drainage, on the shores of some drainage lakes, and on the margins of streams and large rivers.

### **Northern Wet-mesic Forest**

This forested minerotrophic wetland is dominated by northern white cedar, and occurs on rich, neutral to alkaline peats and mucks throughout much of northern Wisconsin. Balsam fir, black ash, and spruces are among the many potential canopy associates. The understory is rich in

mosses, lichens, liverworts, ferns, sedges, orchids, and wildflowers such as goldthread, fringed polygala, and naked miterwort, and trailing sub-shrubs such as twinflower and creeping snowberry. A number of rare plants occur more frequently in the cedar swamps than in any other habitat. Older cedar swamps are often structurally complex, as the easily wind-thrown cedars are able to root from their branch tips. Some of the canopy associates have the potential to reach heights considerably beyond those usually attained by cedar, producing a multi-layered canopy. The tall shrub layer is often well-developed and may include speckled alder, alder-leaved buckthorn, wild currants, and mountain maple. Canada yew was formerly an important tall shrub in cedar swamps but is now rare or local.

Seepages, springs, and spring runs contribute to stand complexity and provide critical habitat for additional plants and animals. Cedar swamps are relatively common in depressions that receive mineral-enriched groundwater, and can be associated with both ground moraine and outwash landforms.

### **Northern Wet Forest**

Northern wet forest encompasses a group of weakly minerotrophic, conifer-dominated, acid peatlands located mostly north of the Tension Zone. The dominant trees are black spruce and tamarack. Jack pine is a significant component in parts of the type's range. This community is found primarily in kettle depressions or partially filled basins, on glacial outwash landforms, moraines, and till plains, where the water table is near the surface or where drainage is somewhat impeded. The community also occurs along the margins of lakes and low-gradient streams. On the wetter side of the moisture gradient, this community tends to grade into muskeg, open bog, or poor fen. On the drier side, the spruce-tamarack swamps may grade into "rich" swamp forests of northern white cedar or black ash, if a source of nutrient-enriched groundwater is present. In much of the type's current range the adjacent uplands are still forested, most often with second-growth stands of northern hardwoods, pine, or aspen. A minerotrophic "moat" (or "lagg") may occur at the upland-wetland interface, and can support a diverse assemblage of tall shrubs, swamp hardwoods, and "rich" swamp conifers such as northern white cedar.

Northern wet forest was widespread and relatively common historically, although due to the landforms with which it was associated, it did not typically occur in large patches in Wisconsin. Northern wet forest remains relatively common in much of its range today. WDNR's Natural Heritage Inventory Program has recently split northern wet forest into two types (described below) to better reflect community variability. Community composition and water chemistry were used as the primary factors that differentiate the types. Because the Natural Heritage Inventory Program's older inventory information did not consider those factors when classifying coniferous wetlands, northern wet forest (Curtis 1959) has been retained as a type.

Black spruce swamp represents the more acid "bog" forests. The understory is characterized by a deep, continuous carpet of sphagnum mosses (*Sphagnum* spp.). Other representative plants include ericaceous shrubs such as leatherleaf, Labrador-tea, creeping snowberry, small cranberry, and herbs that are adapted to or tolerant of saturated substrates and high acidity, such as swamp false Solomon's-seal, three-seeded bog sedge, and boreal bog sedge. A deep accumulation of sphagnum mosses partially isolates the plant assemblage from the influence of mineral-enriched groundwater, limiting composition to a relatively small group of specialists, and also limiting the growth of trees. Black spruce swamp is widespread in much of northern Wisconsin, locally common in the central part of the state, and occurs in disjunct outliers as far south as Columbia and Ozaukee counties.

Tamarack swamp is a less acid, wet conifer forest community that can support nutrient-demanding understory plants that are also tolerant of relatively high pH levels. Tamarack is the dominant tree, sometimes to the virtual exclusion of other tree species. In some stands, hardwoods such as paper birch, red maple, black ash, and American elm occur as canopy associates, saplings, or subcanopy trees. The understory may be more diverse and structurally complex than in the more acid spruce-dominated swamps, and sometimes features a well-developed tall shrub layer composed of plants with relatively high nutrient demands such as speckled alder, alder-leaved buckthorn, bog holly, and winterberry holly. Ericaceous shrubs and many sedge species are usually present, and in the “poorer” swamps dominate their respective strata. The bryophytes may include more minerotrophic Sphagnum mosses, as well as additional genera of mosses that do not usually occur in the acid bog forests. Stands that receive groundwater seepage may support plants such as skunk-cabbage, marsh-marigold, cinnamon fern, and royal fern. Seepage swamps have been treated as distinct communities, or as recognizable subtypes, in some nearby states and provinces (e.g., Minnesota and Ontario). Tamarack seepage swamps occur statewide but may be more common south of the Tension Zone (note that the Natural Heritage Inventory Program now tracks the southernmost occurrences as southern tamarack swamp).

### **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.).

## Appendix D

### Upper Wolf River Fishery Area Species of Greatest Conservation Need

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

	Major										Important	
	Alder Thicket	Coldwater streams	Coolwater streams	Ephemeral Pond	Inland lakes	Northern Hardwood Swamp	Northern Mesic Forest	Northern Sedge Meadow	Northern Wet Forest	Northern Wet-mesic Forest	Emergent Marsh - Wild Rice	Northern Dry-mesic Forest
<b>Species that are Significantly Associated with the North Central Forest Landscape</b>												
American Bittern	L							S			L	
American Marten						L	S		L	L		S
American Woodcock	S			L		M	M	L	L	L		L
Bald Eagle					S						L	
Black-backed Woodpecker							L		S	L		L
Black-billed Cuckoo	S					L	M	L	L			L
Black-throated Blue Warbler							S					M
Boreal Chickadee									S	L		
Boreal Chorus Frog				S	S			S				
Canada Warbler	M					S	M		M	S		M
Four-toed Salamander	S	M	M	S		M	S	M	M	S		
Golden-winged Warbler	S					M	M		M	L		M
Gray Wolf	S					M	S	L	S	S		S
Hoary Bat	M	S	S	S	M	M	M	M	M	M		M
Lake Sturgeon					S							
Least Flycatcher						M	S			L		M
Lesser Scaup					M						M	
Longear Sunfish					M							
Mink Frog	M	M	S	M	S	L	L	S	L	L	M	

Northern Flying Squirrel						M	S		S	S		S
Northern Goshawk						L	S			L		M
Northern Harrier	L							S			L	
Olive-sided Flycatcher	L								S	M		L
Osprey					S						L	
Red Crossbill							L		L			S
Red-shouldered Hawk				S		L	M			L		M
Silver-haired Bat	M	S	S	S	M	M	M	M	M	M		M
Spruce Grouse									S			
Trumpeter Swan					M			L			S	
Veery	S					S	M		M	L		M
Water Shrew	M	S	S		M	S	M	L	S	S		
Whip-poor-will							L					M
Wood Thrush						L	M		L	L		L
Wood Turtle	S	S	S	M		M	S	M	M	M		
Woodland Jumping Mouse	L			M		M	S	L	M	M		L
<b>Species that are Moderately Associated with the North Central Forest Landscape</b>												
Black Tern					M			M				M
Bobolink								S				
Canvasback					M							M
Cerulean Warbler							L					
Connecticut Warbler									M			L
Eastern Red Bat	M	S	S	S	M	M	M	M	M	M		M
Greater Redhorse					M							
Moose	S	L	L		S	S	M	M	M	S		L
Mudpuppy		M	L		S							
Northern Long-eared Bat	M	S	S	S	M	M	M	M	L	L		M
Pickerel Frog	M	S	S	S	M		M	S	M	M		
Rusty Blackbird	M			M								
Sharp-tailed Grouse								M				
Solitary Sandpiper	L	M	M	S				L				

Major					Important					
Coldwater streams	Coolwater streams	Northern Mesic Forest	Northern Wet Forest	Northern Wet-mesic Forest	Alder Thicket	Ephemeral Pond	Inland lakes	Northern Dry-mesic Forest	Northern Hardwood Swamp	Northern Sedge Meadow

**Species that are Significantly Associated with the Forest Transition Landscape**

American Bittern						L					S
American Woodcock			M	L	L	S	L		L	M	L
Bald Eagle								S			
Black Tern								M			M
Black-billed Cuckoo			M	L		S			L	L	L
Black-throated Blue Warbler			S						M		
Blue-winged Teal							L	M			M
Bobolink											S
Eastern Red Bat	S	S	M	M	M	M	S	M	M	M	M
Four-toed Salamander	M	M	S	M	S	S	S			M	M
Golden-winged Warbler			M	M	L	S			M	M	
Greater Prairie-Chicken											M
Least Flycatcher			S		L				M	M	
Lesser Scaup								M			
Northern Harrier						L					S
Osprey								S			
Redfin Shiner		L						L			
Red-headed Woodpecker									L		
Red-shouldered Hawk			M		L		S		M	L	
Trumpeter Swan								M			L
Veery			M	M	L	S			M	S	
Vesper Sparrow											
Whip-poor-will			L						M		
Wood Thrush			M	L	L				L	L	
Wood Turtle	S	S	S	M	M	S	M			M	M

**Species that are Moderately Associated with the Forest Transition Landscape**

Canada Warbler			M	M	S	M			M	S	
Canvasback								M			
Cerulean Warbler			L								
Gray Wolf			S	S	S	S			S	M	L
Henslow's Sparrow											L
Hoary Bat	S	S	M	M	M	M	S	M	M	M	M
Le Conte's Sparrow											S
Louisiana Waterthrush	S	S									
Mudpuppy	M	L						S			
Northern Flying Squirrel			S	S	S				S	M	

Northern Goshawk			S		L				M	L	
Northern Long-eared Bat	S	S	M	L	L	M	S	M	M	M	M
Northern Prairie Skink									M		
Pickrel Frog	S	S	M	M	M	M	S	M			S
Redside Dace	M	M									
Rusty Blackbird						M	M				
Silver-haired Bat	S	S	M	M	M	M	S	M	M	M	M
Solitary Sandpiper	M	M				L	S				L
Upland Sandpiper											L
Water Shrew	S	S	M	S	S	M		M		S	L
Woodland Jumping Mouse			S	M	M	L	M		L	M	L
Yellow Rail											S
Yellow-billed Cuckoo			L								

---

## **APPENDIX E**

### **Primary Inventory Sites within the Upper Wolf River Fishery Area<sup>1</sup>**

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

Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site’s ecological significance, and management considerations.

#### **Primary Sites**

**UWRFA01. Wolf River**

**UWRFA02. Wolf River Scenic Areas**

**UWRFA03. Gilmore’s Mistake Rapids Coniferous Forest**

**UWRFA04. CTH M Woods**

**UWRFA05. Boy Scout Woods**

**UWRFA06. Oxbow Rapids, Upper Wolf River State Natural Area**

**UWRFA07. Hunting River Lowland Swamp and Marsh**

---

<sup>1</sup> A list of species referred to by common name is found at the end of this appendix.

## UWRFA01. Wolf River

Property:	Upper Wolf River Fishery Area
County:	Langlade
Landtype Association:	212Xc03. Pickerel Plains 212Xe06. Elcho Moraines 212Ta01. Lakewood Plains and Moraines 212Ta06. Elederon-Bowler Drumlins and Moraines
Approximate Size (acres):	935

### Description of Site

The site encompasses the entire reach of the upper Wolf River occurring within the Fishery Area from its beginning at Post Lake to where it leaves Langlade County to flow through the Menominee Reservation. The Wolf River is a medium, hard water stream having slightly alkaline, light brown water. Starting in Pearson to the terminus in Langlade County at Markton, the gradient increases with 10 major rapids of variable length occurring between the Lily to Markton stretch (Steuck et al 1977). The entire stretch of the Wolf River within the UWRFA is a Class 2 trout stream and a popular destination for whitewater enthusiasts.

### Significance of Site

The Wolf River is an aquatic Conservation Opportunity Area of Upper Midwest / Regional significance and an Outstanding Resource Water. The river provides habitat for numerous rare species from many taxa (mammals, reptiles, aquatic invertebrates). The Wolf River is significant for bald eagles as 12 current or historical nests are located on the UWRFA. This makes up a large percentage of bald eagle territories in Langlade County (Eckstein s. per comm.). River corridors are important travel and foraging areas for bats. Surveys at the UWRFA detected six of a possible seven summer resident bats known to occur in Wisconsin. The river is an important overwintering area and active season foraging and basking habitat for a good population of wood turtles (*Glyptemys insculpta*). There are 3 rare mussels, and numerous additional aquatic insects known from the Wolf River within the project area. The aquatic invertebrate diversity in the Langlade Co. portion of the Wolf River is exceptional with 91 taxa known here from a 1998 analysis, placing this segment among the top five richest segments in the state.

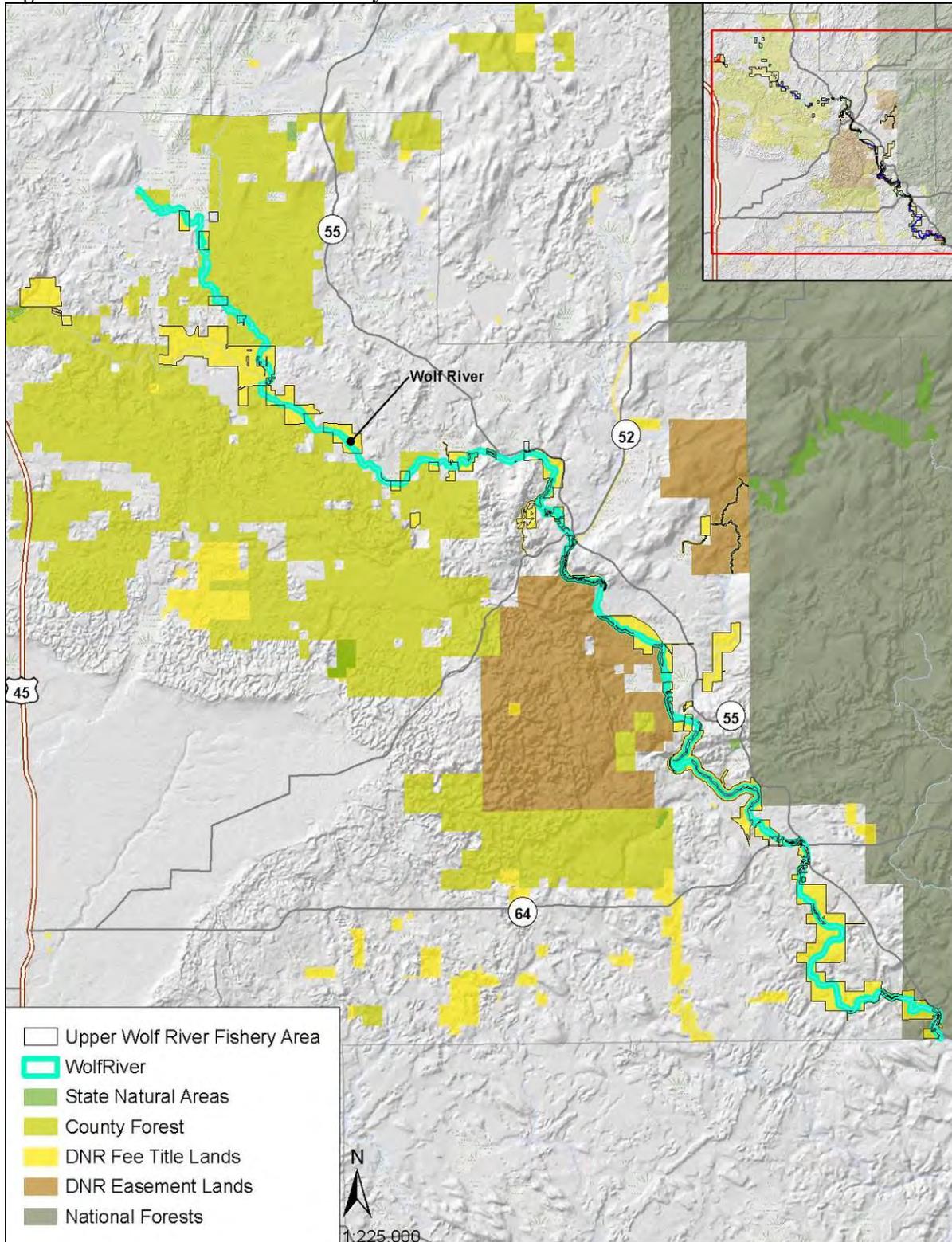
### Management Considerations

Sedimentation, erosion, and nutrient-laden runoff into waterways are threats facing mussel survivability. Measures aimed at reducing water-quality issues associated with organic and inorganic pollutants, controlling land-use changes (development and urban sprawl), limiting fragmentation of populations, losses to fish hosts, and controlling invasive aquatic species like zebra and quagga mussels (*Dreissena polymorpha* and *D. bugensis*) are crucial to protecting mussel beds throughout the UWRFA. In addition, maintaining water quality can ensure a diverse aquatic insect presence, important from a biodiversity perspective and as a food source for bats and birds. Future aquatic habitat restoration and dredging work on the Wolf River, Spring Ponds, and headwater streams should be addressed during the master planning process.

Rusty crayfish (*Orconectes rusticus*) have been documented in the Wolf River Basin including in the Hunting and Wolf Rivers. Additional aquatic, non-native invasive species are found within the Wolf

River Watershed and have the potential to occur in the Wolf River. These include zebra mussel, banded mystery snail (*Viviparus georgianus*), Chinese mystery snail (*Cipangopaludina chinensis*), curly leaf pondweed (*Potamogeton crispus*), and Eurasian water milfoil (*Myriophyllum spicatum*).

**Figure 7: Location of Wolf River Primary Site**



## UWRFA02. Wolf River Scenic Areas

Property:	Upper Wolf River Fishery Area
County:	Langlade
Landtype Associations:	212Xc03. Pickerel Plains 212Xe06. Elcho Moraines 212Ta03. Hatley Moraines 212Ta01. Lakewood Plains and Moraines 212Ta06. Elderon-Bowler Drumlins and Moraines
Approximate Size (acres):	2206

### Description of Site

The site is made up of four distinct segments of high-quality forest adjacent to the Wolf River. These four segments were delineated in the initial master plan to protect the aesthetic value of the Wolf River and encompass a 300 foot no-cut buffer on each side of the river. The primary cover types of the site are mesic to wet forest types that make up the majority of the acreage on these alluvial terraces of the Wolf River. Northern Wet-mesic Forest dominates these areas with numerous seeps and Springs, occasionally interrupted by small, good-quality mesic hemlock/ hardwood stands and small hardwood swamps dominated by black ash (*Fraxinus nigra*) occur in places. Dominant canopy species include northern white-cedar (*Thuja occidentalis*), balsam fir (*Abies balsamea*), eastern hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*), and yellow birch (*Betula alleghaniensis*). Tree sizes range up to 30' dbh for eastern hemlock, and nearly as large for northern white-cedar and yellow birch, with 10-18' dbh being more typical. These good-quality forests are enhanced by snags and coarse woody debris contributing to a well-developed structure. Groundlayer diversity is fairly high and is increased by the wide range of micro-habitats.

### Significance of Site

In addition to preserving the aesthetics of this important recreational river the scenic areas have protected mature conifer and conifer / hardwood forests providing habitat for uncommon plant and animal species and protecting water quality of this Outstanding Resource Waterway. American ginseng (*Panax quinquefolia*) was found at one location within the site and at no other locations on the property. In addition, there are numerous Springs and seeps associated with this primary site that have the potential to support rare or uncommon plant species. Bald eagles (*Haliaeetus leucocephalis*) nest along this corridor and wood turtles use the upland forest for summer foraging and brushy areas along the river for basking and gestating.

The riparian zone is an important travel corridor for many mammal species including bats. The intact forest buffer of the primary site provides ideal forested cover for foraging and tree roosting bats and helps to maintain the water quality of the Wolf River to ensure a diverse aquatic insect presence, the sole food source for bats.

### Management Considerations

Continuing the existing passive management of the primary site to emphasize older-growth structure will continue to benefit a diverse assemblage of animals. Retention of large cavity trees, snags, would benefit bats and many bird species. Protection of the numerous Springs and seeps found within this corridor should be a priority, as they are particularly susceptible to soil / hydrological disturbance. Maintaining or

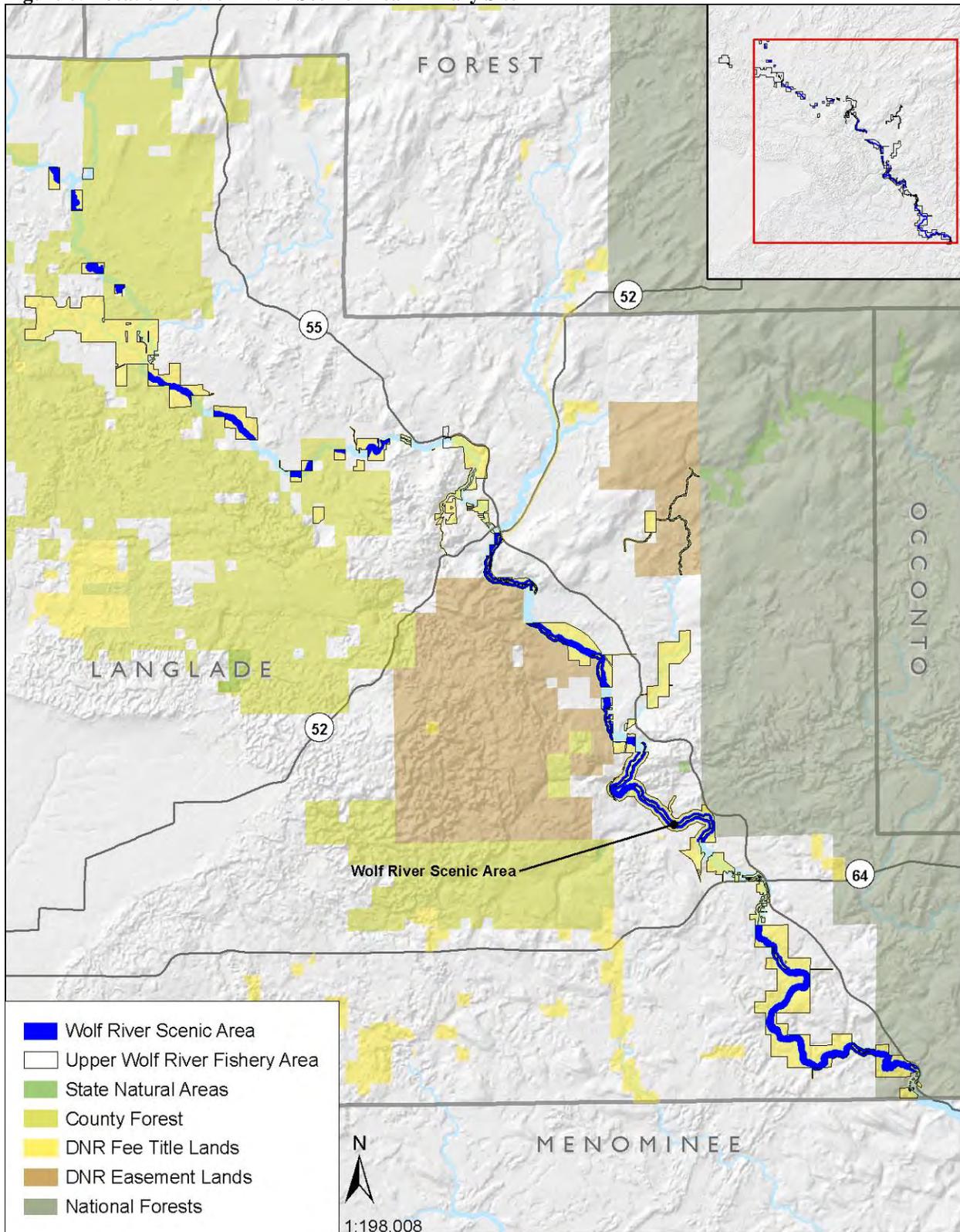
providing nesting areas for turtles along shore or in close proximity to the Wolf River would be an important consideration. Nesting areas should be open, southerly exposed sandy areas that are elevated enough to avoid most low to moderate floods. These areas need to be carefully sited so they can be protected from trampling or collection and do not conflict with other key property objectives like providing for contiguous forested corridors.

Several wetland, non-native invasive plants were noted in manageable populations within the primary site and should be a priority for control. Reed canary grass (*Phalaris arundinacea*) was noted in fairly small, scattered patches but throughout a good portion of the corridor. Purple loosestrife (*Lythrum salicaria*) was noted in small numbers between Crowle and Horserace Rapids and Nine Mile to Burnt Point Rapids. European marsh thistle (*Cirsium palustre*) was found in a few large patches in the Northern Wet-mesic Forest between Nine Mile and Burnt Point Rapids.



Spring Run through Wolf River Scenic Area Primary Site near Burnt Point Rapids (photo by Douglas Fields)

**Figure 8: Location of Wolf River Scenic Area Primary Site**



## UWRFA03. Gilmore's Mistake Rapids Coniferous Forest

Property: Upper Wolf River Fishery Area  
County: Langlade  
Landtype Association: 212Ta01. Lakewood Plains and Moraines  
Approximate Size (acres): 55

### Description of Site

This primary site is bordered by the Menominee Reservation to the south and the Wolf River on the east, and consists of three distinct communities and a diverse topography of rolling to hummocky uplands surrounding nearly flat to gently sloping lowlands through the center of the site. The uplands support a high-quality hemlock-hardwood forest (Northern Mesic Forest) on a low rolling ridge bordering the river from the parking area in the northeast corner of the site, south to the Menominee Reservation border. The upland widens out in the southwest quarter of the site and supports a rich, high-quality forest of sugar maple, American beech (*Fagus grandifolia*), basswood (*Tilia americana*), eastern hemlock, yellow birch, and northern red oak (*Quercus rubra*), with numerous large trees on a fairly rugged, hummocky terrain. Trees sizes range up to about 24" dbh for sugar maple, 18" for basswood and yellow birch, 26" for American beech, and 28" for northern red oak. A portion of this stand has an intact duff layer, which is unusual in the UWRFA, as most areas have long been infested with earthworms. No recent stumps are evident, though the adjoining Menominee lands and the private land to the west have seen some cutting in recent years.

Along the Menominee Reservation border, the terrain is hummocky-hilly, descending to a high-quality Northern Wet-mesic Forest stand of several acres on the north. The south half of the cedar-dominated stand is on a very slight north slope and is the source of several small springs and seeps which coalesce to form a north-flowing spring run. The area around the seeps contains numerous tipped and downed trees, probably indicative of the unstable substrate. A few super-canopy eastern white pine (*Pinus strobus*) occur in the flatter, dryer portion of the stand. The northeast corner of the site contains a hemlock-dominated stand on flat terrain that is somewhere between mesic and wet-mesic. Creeping rattlesnake-plantain (*Goodyera repens*) is fairly numerous in this area, often occurring in groups of closely-spaced rosettes.

From the southwest corner of the site, the uplands wrap around to the north and east, enclosing a Northern Sedge Meadow, the source of another complex of Springs and a Spring Run which flows east and is joined by the north-flowing stream near the center of the site. The combined stream enters the Wolf River just above Gilmore's Mistake Rapids through a break in the ridge bordering the river. The wet meadow is about four or five acres in size and was apparently formed when an old filled road or railroad grade



Northern Sedge Meadow at Gilmore's Mistake Rapids  
Coniferous Forest Primary Site (Photo by Douglas Fields)

blocked the spring run on the east end of the meadow. This has since been breached to allow the free flow of the stream. The meadow is currently dominated by Canada bluejoint grass (*Calamagrostis canadensis*), spotted Joe-pye-weed (*Eupatorium maculatum*) and boneset (*E. perfoliatum*) but is being reclaimed by cedar and other woody species. A few old cedar snags still stand in the meadow, indicating its former state, and perhaps its future.

## Significance of Site

The site encompasses a range of habitats that are representative of this portion of the upper Wolf River, including a high quality white cedar-hemlock swamp, rich hemlock-hardwood uplands that include a good mix of species, including possibly the western most extent of American beech, and a complex of seeps, Springs and Spring Runs which are entirely contained on state-owned land. Much of the site has an early old-growth feel and is developing an old-growth structure, thus serving as an important link between the old-growth stands on the Menominee Forest to the south and the Boy Scout Woods primary site just to the north. The site is fairly well buffered from both human activity and high deer numbers decreasing the impacts of deer herbivory. Though several other sites in the UWRFA contain high quality Northern Wet-mesic Forest, including Oxbow Rapids State Natural Area, apparently none has the combination found here of a high quality sequence of upland and lowland stands lacking any evidence of recent cutting.



Range of American beech (*Fagus grandifolia*) in Wisconsin from General Land Survey data

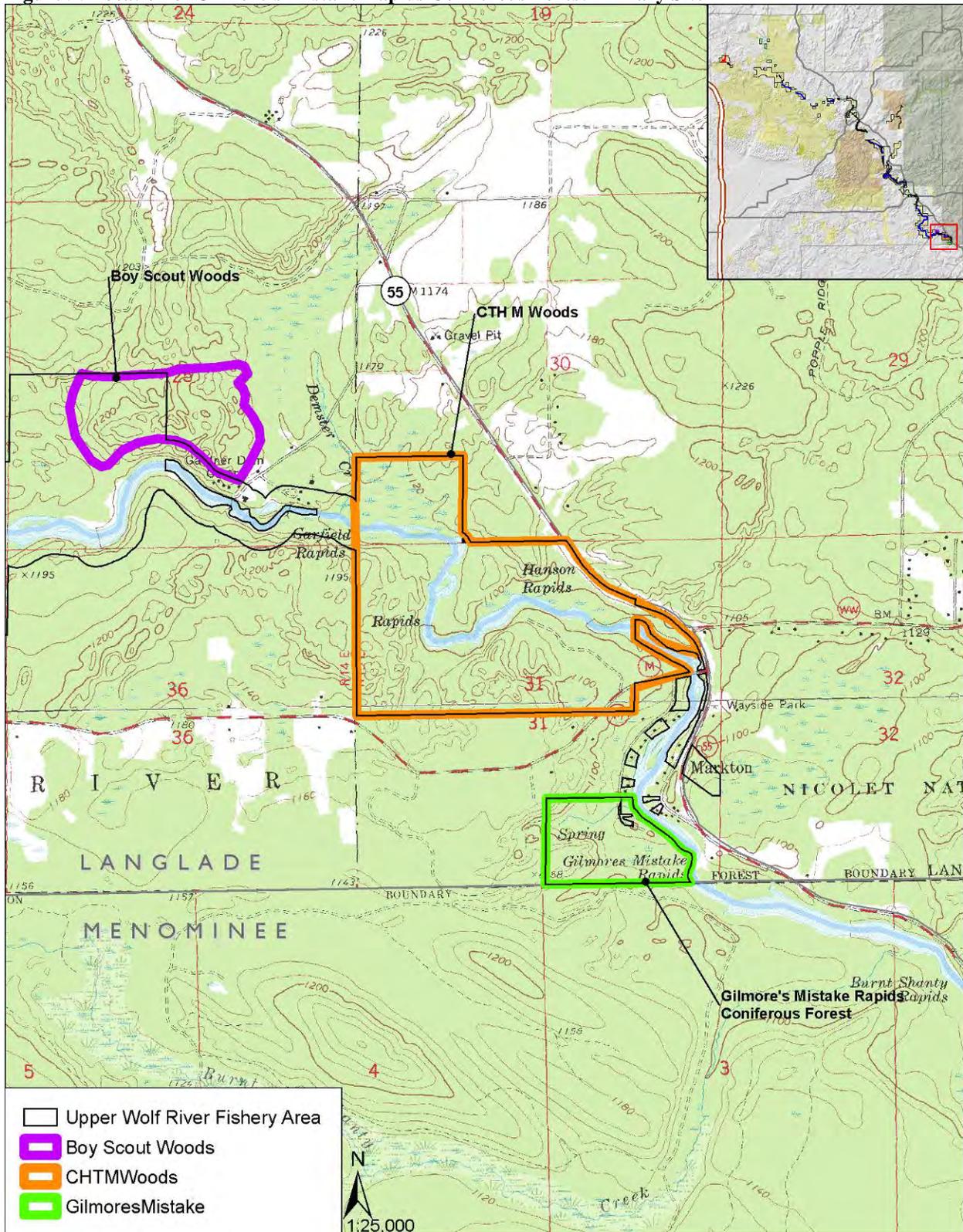
The site holds fairly large populations of several uncommon shrubs and herbaceous plants and serves as an important area for uncommon forest interior birds. Uncommon amphibians were found utilizing the wet meadow for breeding and foraging and a wetland on the very northeast portion of the site appeared to have good potential as a breeding pond for salamanders. A few small upland areas retain a healthy duff layer, which is the exception in the UWRFA, as nearly all upland stands are infested with earthworms. The site is located within the Menominee Forest Conservation Opportunity Area., recognized for Upper Midwest significance (WDNR 2006a).

## Management Considerations

There is a small population of purple loosestrife in the wet meadow bordering the main spring run on the west. This species poses significant threats to wetlands and control and monitoring should be a priority. The site appears to be free of non-native earthworms, as it has retained a healthy duff layer. Promoting public awareness at fishing entry points, of the damages that releasing earthworms can have on plant communities should be considered.

Springs and seeps are present at this site. These warrant protection and are particularly susceptible to soil / hydrological disturbance. Several rare or uncommon plants have the potential to occur in these areas. Special care may be needed when conducting management activities in the nearby uplands. The forested areas at the site are developing old-growth characteristics. Promoting and enhancing an uneven-aged structure with many different size classes of canopy trees and some large diameter, standing and downed coarse woody debris through extended rotation management should be adaptively applied (WDNR 2006b).

**Figure 9: Location of Gilmore's Mistake Rapids Coniferous Forest Primary Site**



## UWRFA04. CTH M Woods

Property:	Upper Wolf River Fishery Area
County:	Langlade
Landtype Associations:	212Ta01. Lakewood Plains and Moraines
Approximate Size (acres):	304

### Description of Site

The site extends from the CTH M bridge west and north nearly to Garfield Rapids, on both sides of the Wolf River. The terrain along the river is generally flat and supports a high-quality hemlock-hardwood forest, of nearly pure eastern hemlock in places. Many trees are in the 16-20" dbh range with some larger, up to approximately 32" dbh for eastern hemlock and sugar maple. Away from the river, the topography is mostly rolling-hummocky with at least one fairly high esker-like ridge and some steep slopes. A few Springs and seeps emerge at the base of north-facing slopes. Hardwoods dominate most areas outside of the river corridor, but at least a few eastern hemlock are usually present. The forest here is quite diverse in composition with sugar maple and American beech dominating (with eastern hemlock, in places), while basswood, yellow birch, and white ash (*Fraxinus americana*) are important associates, and a few bitternut hickory (*Carya cordiformis*) are also present. Common groundlayer species include Canada mayflower (*Maianthemum canadense*) and Virginia waterleaf (*Hydrophyllum virginianum*), large-flowered bellwort (*Uvularia grandiflora*), and Spring-beauty (*Claytonia virginica*) perhaps indicating a rich ephemeral spring flora. Numerous ferns including Maidenhair fern (*Adiantum pedatum*), common lady fern (*Athyrium filix-femina*), wood fern (*Dryopteris intermedia*), and silver false spleenwort (*Deparia acrostichoides*) are also present. Ephemeral Ponds are abundant and scattered throughout the site. The entire area is quite scenic due to the interesting terrain, the many large trees, and the diverse nature of the flora.

### Significance of Site

The site is located within the Menominee Forest Conservation Opportunity Area., recognized for Upper Midwest significance (WDNR 2006). As Epstein et al. (2002) noted, the forest type and terrain found on the primary site are well represented on the Menominee Reservation a half mile to the south, but good examples of mature hemlock-hardwood upland forest are uncommon in the UWRFA. As such, this site could provide an important link between the high-quality old-growth (or near old-growth) stands on the Boy Scout Woods primary site to the north and the high-quality, Gilmore's Mistake Rapids Coniferous Forest site, a quarter mile south (and the Menomonee County Forest beyond that). Recovery potential is enhanced by a full complement of rich upland forest species still existing on site.

Ephemeral Ponds are scattered throughout the forest and are important breeding areas for many invertebrates and amphibians. Blue-spotted and spotted salamanders (*Ambystoma laterale* and *A. maculatum*) were found in the Ephemeral Ponds and are indicator species of good-quality forests. Some of these ponds have high potential for supporting four-toed salamander, a Species of Greatest Conservation Need. Several SGCN birds, are breeding within the site, that require large blocks of unfragmented and older-aged forests.



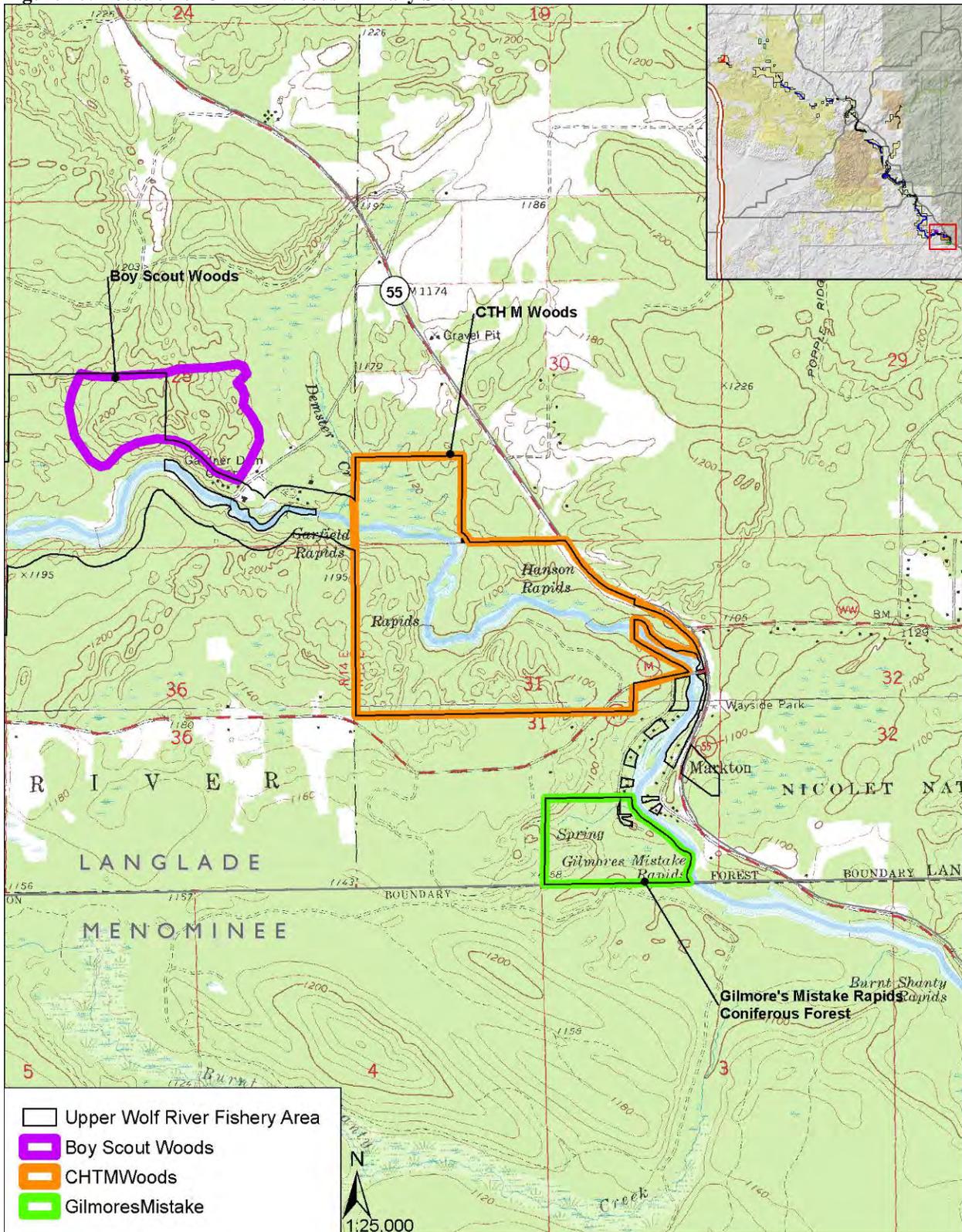
Ephemeral Pond at CTH M Woods Primary Site (photo by Richard Staffen)

## Management Considerations

Enhancing the conifer component (eastern hemlock and white pine) at the site would be desirable. These were historically co-dominant canopy species in Northern Mesic Forests and provide important structural components required by some uncommon animal species. Control measures for white-tailed deer (*Odocoileus virginianus*) should be explored to protect these conifers and Canadian yew (*Taxus canadensis*) found at the site, a favorite browsing shrub of deer. An unidentified honeysuckle (*Lonicera* sp.) occurs in an old logging road atop a rather high ridge within the site. It covers an area approximately 100 square meter area and appears to be invasive. Controlling non-native invasive species before they become established is of high importance.

Ephemeral Ponds with minimally fragmented, closed canopy forest are important habitat components for pond-breeding amphibians that require adjacent, older, humid forests for carrying out their terrestrial life-cycle. Early identification of Ephemeral Ponds and their associated species distributions throughout the forest would enable adaptive management to protect pond amphibians and invertebrates.

**Figure 10: Location of CTH M Woods Primary Site**



## UWRFA05. Boy Scout Woods

Property: Upper Wolf River Fishery Area  
County: Langlade  
Landtype Association: 212Ta01. Lakewood Plains and Moraines  
Approximate Size (acres): 78

### Description of Site

This site is located along the Wolf River in southern Langlade County, and is just upstream from the CTH M Woods primary site. It occupies the sandy loam capped gravelly hummock complex north of the Wolf River with approximately half of the site occurring on state-owned Fisheries property and the remainder located within the privately owned Gardener Dam Boy Scout Camp. The forest features a mixture of dry-mesic and mesic northern forest types of very good quality. Included are an old growth stand of hemlock hardwoods and a small, older growth character white pine stand. The Northern Mesic Forest has a canopy dominated by sugar maple, hemlock, yellow birch, American beech, northern red oak, and basswood. There is a good mix of sizes present with the largest in the 20-30" dbh range. All size classes represented, canopy, sapling layers best developed. Important sapling species are American beech, yellow birch, and advanced regeneration of eastern hemlock common. There is a fair amount of coarse woody debris, both standing snags and fallen logs. The Northern Dry-mesic Forest has some large red (*Pinus resinosa*) and eastern white pines present.

### Significance of Site

This site represents one of the best examples of hemlock-hardwood forest and Northern Dry-mesic Forest in the UWRFA along with good eastern hemlock reproduction. Epstein et al (2002) note this as one of only a hand-full of upland forest stands in the entire northern Wolf River basin that has developed old growth characteristics and the stand is of local, regional, and statewide importance. It would connect three similarly important, intact, older growth forests, to the regionally significant Menominee Forest Conservation Opportunity Area. These forest connections and increased patch-sizes would benefit many plants and animals requiring large tracts of unfragmented, older forests. Several SGCN birds including black-throated blue warbler (*Dendroica caerulescens*), veery (*Catharus fuscescens*), and wood thrush (*Hylocichla mustelina*) are known from the site.

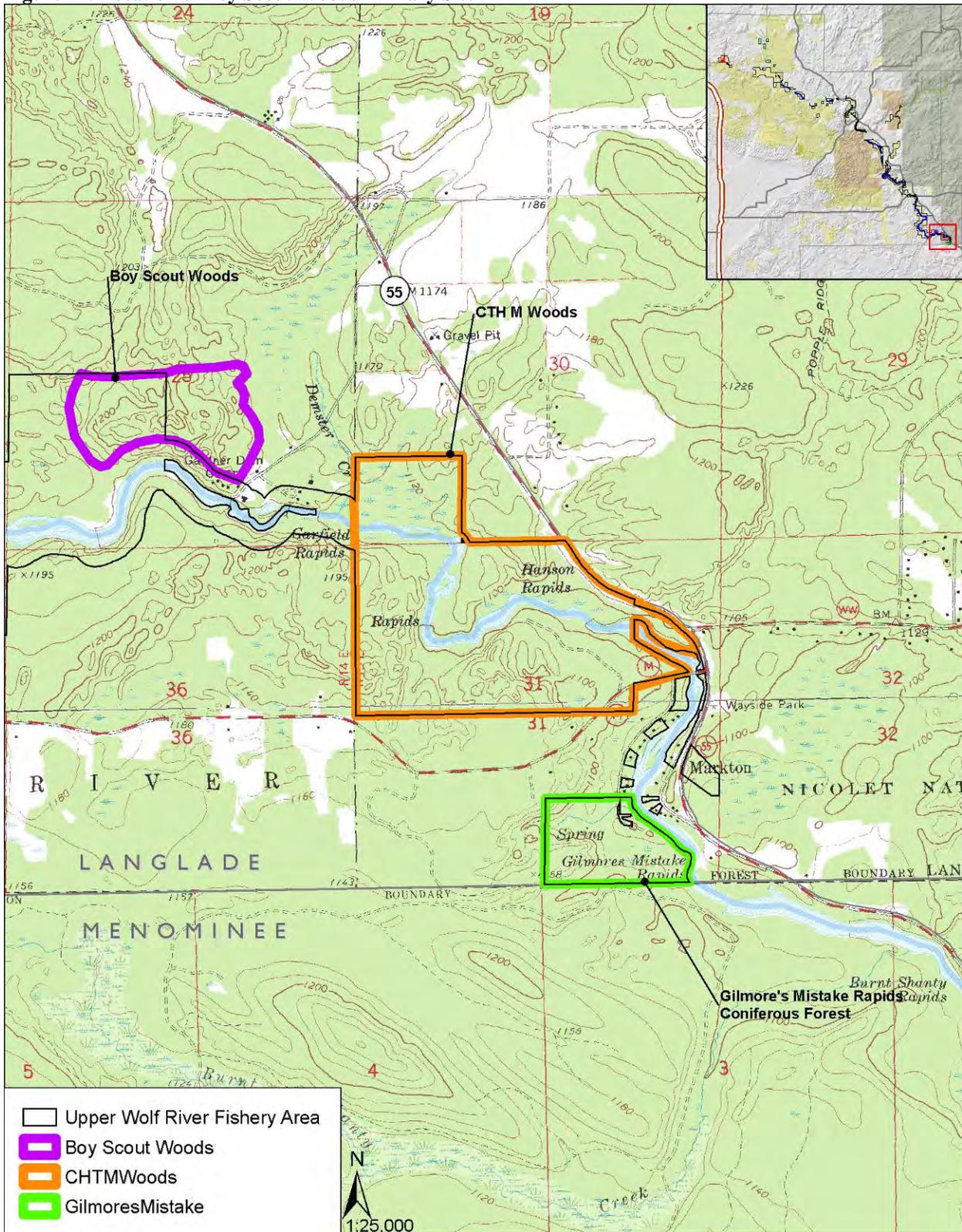


**Singing Black-throated Blue Warbler (Photo by Brian M. Collins)**

### Management Considerations

The site is bisected by access roads, numerous hiking and biking trails, and camp facility development just to the east. Trampling of groundlayer species may result from high use of these areas. There is a fairly large, well-established infestation of Asian honeysuckle (*Lonicera* sp.) just to the south of the site along the north shore of the Wolf River. Managing the site as an old-growth reference area should be considered during the master planning process.

**Figure 11: Location of Boy Scout Woods Primary Site**



## UWRFA06. Oxbow Rapids, Upper Wolf River State Natural Area

Property:	Upper Wolf River Fishery Area
County:	Langlade
Landtype Association:	212Xe06. Elcho Moraines 212Ta01. Lakewood Plains and Moraines 212Ta03. Hatley Moraines
Approximate Size (acres):	164

### Description of Site

The site is located on both sides of the Wolf River and is bordered on the west by a recreational ATV / snowmobile trail. This area of the Wolf River is known as the oxbow as it cuts through a substantial interlobate moraine producing steep and wet seepage slopes with numerous seeps, Springs and Spring Runs. Tip-up mounds and Ephemeral Ponds are present. The west slope of the river supports old-growth Northern Wet-mesic Forest with scattered hemlock, exceptionally large northern white-cedar, black ash, and basswood as was designated a State Natural Area (SNA) in 1980. The groundlayer is dominated by orange jewelweed (*Impatiens capensis*) and contains the uncommon lance-leaved grape fern (*Botrychium lanceolatum*). The bottomland downstream from the oxbow rapids has several pockets of old-growth northern white-cedar and eastern hemlock. On the east side of the river is a good quality stand of medium-age hemlock-hardwoods with a significant eastern hemlock component in a large forested landscape. The stand has a sparse understory and groundlayer, and some seeps with northern white-cedar present. Slopes are steep to the river and there are scattered, large erratics found here.

### Significance of Site

The site protects uncommon examples of an older northern white-cedar, eastern hemlock, and yellow birch forest in a sloping, springy wet-mesic situation not commonly found on the property or the county. There are two additional State Natural Areas located within a mile of the site protecting sensitive aquatic and archeological resources. There is a high abundance of Springs, Spring Runs, and seeps found within the site. The site offers high conservation value due to the good forest context present with state, county, and private forest lands making up large acreages. These forest connections and increased patch-sizes benefit numerous plants and animals requiring large tracts of forest. Rare birds are known to nest within the site.

### Management Considerations

There is no advanced regeneration of northern white-cedar and little regeneration of hemlock due to heavy deer browsing pressure at the site. This combined with the duff layer lacking, likely due to the presence of earthworms, have resulted in the loss of species richness at the site. A few purple loosestrife plants are growing at the river's edge within the natural area and need controlling.

Management of the site should be as an old growth Northern Wet-mesic Forest reserve and an ecological reference area with natural processes determining the structure of the natural communities represented here. Because of the many seeps and Springs present, much of the site is quite fragile. These areas warrant protection and are particularly susceptible to soil / hydrological disturbance. Much of this site has been passively managed, but special care may be needed if conducting management activities in the nearby uplands. Due to its relative remoteness and steep slopes, ATV or other vehicle use is likely not a

consideration and even foot travel is probably rare. This could change however, with the opening of the adjacent recreational trail bordering the site to the west.



**Spring Run within Oxbow Rapids, Upper Wolf River State Natural Area (photo by Douglas Fields)**



## UWRFA07. Hunting River Lowland Swamp and Marsh

Property: Upper Wolf River Fishery Area  
County: Langlade  
Landtype Association: 212Xe06. Elcho Moraines  
212Xe08. Summit Lake Moraines  
Approximate Size (acres): 152

### Description of Site

The site adjoins the Hunting River Alders State Natural Area occurring on Langlade County Forest. Hunting River Lowland Swamp and Marsh is also hydrologically connected via the Hunting River, a medium hard water stream with several springs within the site and on the SNA contributing fresh, cold water to the river. The primary site includes a small, shallow unnamed lake basin surrounded by an Emergent Marsh dominated by cattails (*Typha* spp.) with wild rice (*Zizana* sp.) on the lake borders. The lake outlet flows south to the Hunting River, which is bordered by good quality stands of Alder Thicket, Northern Sedge Meadow, and tamarack-dominated (*Larix laricina*) Northern Wet Forest. The Alder Thicket is an undisturbed shrub community of tall shrubs dominated by speckled alder (*Alnus incana*) with willow (*Salix* spp.) and dogwoods (*Cornus* spp.) within a matrix of open sedge meadow, shrubby meadow and conifer swamp. The herbaceous layer includes turtlehead (*Chelone glabra*), orange jewelweed and asters (*Aster* spp.).

### Significance of Site

A very good diversity of wetland species (plant and animal) are found at the site including several uncommon species of birds and butterflies. Potential exists for rare species to occur in the aquatic resources of the site.

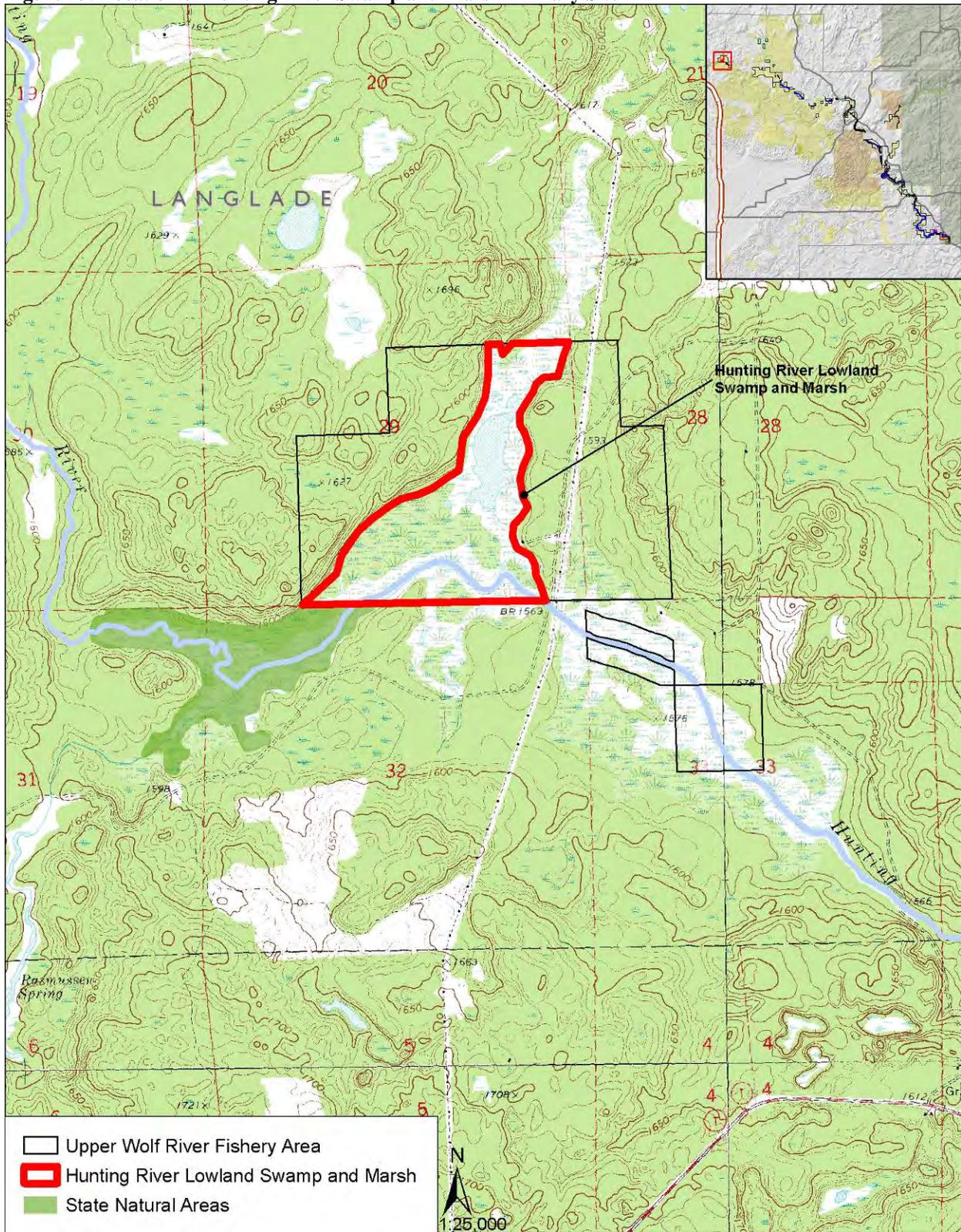
The site serves as a significant expansion and buffer to the Hunting River Alders State Natural Area. This wetland basin protects the water quality of the headwaters of the Hunting River an important tributary to the regionally significant Wolf River. The natural communities represented at the site are found at a very limited extent or not at all throughout the remainder of the UWRFA.

### Management Considerations

Any restoration or manipulation of the Springs and Spring Runs should be assessed for impacts to rare species and to protect the water-quality and temperature of the Springs and Spring Runs. Special care may also be needed when conducting management activities in the nearby uplands to limit the threats of erosion and siltation to these aquatic systems.

The aquatic invasive rusty crayfish is documented in the Hunting River, within the UWRFA. Glossy buckthorn (*Rhamnus frangula*) was found widely scattered at the site and still at a manageable level. Terrestrial invasive species known from the property but not yet noted on the primary site include reed canary grass, purple loosestrife, and European marsh thistle. Monitoring for futures invasions and control of existing wetland invasive plants and animals should be a priority for the site.

**Figure 13: Location of Hunting River Swamp and Marsh Primary Site**



## Species List

List of species referred to by common name in Appendix E.

Common Name	Scientific Name
<b>Animals</b>	
bald eagle	<i>Haliaeetus leucocephalis</i>
black-throated blue warbler	<i>Dendroica caerulescens</i>
four-toed salamander	<i>Hemidactylum scutatum</i>
white tailed deer	<i>Odocoileus virginianus</i>
wood turtle	<i>Glyptemys insculpta</i>
rusty crayfish	<i>Orconectes rusticus</i>
zebra mussel	<i>Dreissena polymorpha</i>
<b>Plants</b>	
American beech	<i>Fagus grandifolia</i>
basswood	<i>Tilia americana</i>
black ash	<i>Fraxinus nigra</i>
Canadian yew	<i>Taxus canadensis</i>
eastern hemlock	<i>Tsuga canadensis</i>
eastern white pine	<i>Pinus strobus</i>
European marsh thistle	<i>Cirsium palustre</i>
northern red oak	<i>Quercus rubra</i>
northern white-cedar	<i>Thuja occidentalis</i>
orange jewelweed	<i>Impatiens capensis</i>
purple loosestrife	<i>Lythrum salicaria</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaroides arundinacea</i>
sugar maple	<i>Acer saccharum</i>
yellow birch	<i>Betula alleghaniensis</i>

## REFERENCES

Epstein, E. W. A. Smith, C. Anderson, E. Spencer, J. Lyons, and D. Feldkirchner. 2002. Wolf River Basin Biotic Inventory and Analysis. A Baseline and Analysis of Natural Communities, Rare Plants and Animals, and other Selected Features. Wisconsin's Natural Heritage Inventory Program, Bureau of Endangered Resources. Wisconsin Department of Natural Resources, Madison, WI.

Steuck, R., Andrews, L.M., and H. Carlson. 1977. Surface Water Resources of Langlade County. Wisconsin DNR. Madison, WI.

Wisconsin Department of Natural Resources [WDNR]. 2006a. Wisconsin Wildlife Action Plan. Available online: <http://dnr.wi.gov/org/land/er/wwap/plan/>.

Wisconsin Department of Natural Resources [WDNR]. 2006b. Old-growth and Old Forests Handbook. In preparation. Madison, WI.