

The Sybaquay and Larrabee Lake Tracts: An Addendum to the Rapid Ecological Assessment for State Ice Age Trail Areas in Chippewa, Dane, Lincoln, Marathon, Polk, Portage, and Waushara Counties

A Rapid Ecological Assessment Focusing on Breeding Passerine Birds, Amphibians, and High-quality Natural Communities



Bureau of Parks and Recreation and
Wisconsin Natural Heritage Inventory Program,
Bureau of Natural Heritage Conservation
Department of Natural Resources
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Primary Author: Craig Anderson

Contributors:

- Rich Staffen – breeding bird, amphibian, and ephemeral pond surveys, data processing, addendum review
- Kevin Doyle—ephemeral pond surveys
- Randy Hoffman – breeding bird and natural community surveys
- Andy Clark – natural community and rare plant surveys
- Ryan O'Connor – primary site delineation, addendum review

Cover Photo: Chippewa Moraine State Recreation Area, Chippewa County by Rich Staffen

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- A. Natural Heritage Inventory Methods Overview
- B. Documented Rare Species and High-Quality Natural Communities of the Study Area*
- C. Descriptions of Rare Species and High Quality Natural Communities of the Study Area*
- D. Wisconsin Natural Heritage Working List Explanation

* This appendix contains locational information on rare species and is not for public distribution.

Sybaquay and Larrabee Lake Tracts at a Glance:

Exceptional Characteristics of the Study Area

- **Older Southern Dry-mesic Forest.** Several significant blocks of fair to high-quality southern dry-mesic forest occur. The WDNR has identified a need to conserve, protect, and manage old-growth forests. The juxtaposition of the forests on these within larger forested blocks is important for area-dependent species such as forest interior birds. Additional maturation of these forests will enhance their value to many plant and animal species. Southern Dry-mesic Forests are unusual in the landscape and provide habitat for more southerly bird species.
- **High Quality Wetlands.** The wetlands on these tracts are diverse and include Muskeg, Tamarack (Poor) Swamp, Northern Wet Forest (likely Black Spruce Swamp), Northern Hardwood Swamp, Alder Thicket, Emergent Marsh, Open Bog, Poor Fen, and Northern Sedge Meadow. The quality of these communities ranges from fair to good. The wetlands are important for local diversity and provide valuable habitat for a number of species, including rare and SGCN birds.
- **Ephemeral Ponds and Associated Fauna.** Ephemeral ponds are scattered on these two tracts. Ephemeral ponds provide habitat for a range of species, including SGCN amphibians and invertebrates that require fishless ponds for their life cycles.

Site Specific Opportunities for Biodiversity Conservation

One ecologically important site, or “Primary Site,” was identified. “Primary Sites” are typically delineated because they 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.

Primary site highlights:

Sybaquay and Larrabee Lake

- Larger block of Southern Dry-mesic Forest
- Good quality Poor Fen, Ephemeral Ponds, and other wetlands
- 10 rare bird species documented, including 8 that are SGCN
- Admixture of northern and southern bird species
- 2 rare amphibians documented

Introduction

Purpose and Objectives

This report is intended to be used as a source of information for developing a new master plan for the new additions to the Chippewa Moraine State Recreation Area (Figure 1). The new additions consist of two tracts: Sybaquay and Larrabee Lake (Figure 2). The regional ecological context for the study area, which includes a State Ice Age Trail Area, is provided to assist in developing the Regional and Property Analysis that is part of the master plan. This report continues previous work on SIATAs in Chippewa, Dane, Lincoln, Marathon, Polk, Portage, and Waushara Counties (WDNR 2013).

Survey efforts for the project were limited to a “rapid ecological assessment” for 1) identifying and evaluating ecologically important areas, 2) documenting breeding passerine bird occurrences, 3) documenting occurrences of high quality natural communities, and 4) documenting herptiles associated with ephemeral ponds. Any rare species or other important natural features were noted. This report can serve as the “Biotic Inventory” document used for master planning although inventory efforts were reduced compared to similar projects conducted on much larger properties such as state forests. There will undoubtedly be gaps in our knowledge of the biota of this property, especially for certain taxa groups; these groups have been identified as representing either opportunities or needs for future work.

Overview of Methods

The Wisconsin Natural Heritage Inventory (NHI) program is part of the Wisconsin DNR’s Bureau of Natural Heritage Conservation 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 <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 website (dnr.wi.gov, keyword “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.

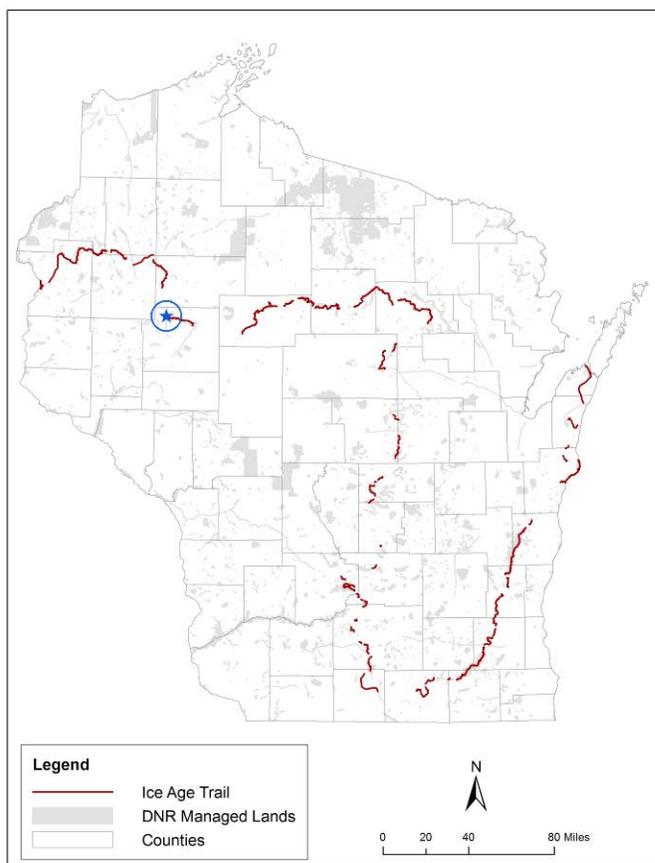
Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, NHI data for the study area were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR’s Bureaus of Research and Endangered Resources between 1969 and 1984 that focused on natural communities but included some surveys for rare plants and animals and 2) taxa specific surveys.

The surveys for this study were limited in scope and focused on documenting high quality natural communities, breeding passerine birds, and herptiles associated with Ephemeral Ponds. The collective results from all of these surveys were used, along with other information, to identify the ecologically important areas (“Primary Sites”) of the study area.

Survey locations were identified or guided by using recent aerial photos, USGS 7.5 minute topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or with similar habitats in the region. Private lands, including easements, surrounding the study area were not surveyed.

Scientific names for common names of all species mentioned in the text are included in the table starting on page 32.

Figure 1. Location of the study area (indicated by circled star).



Background on Past Efforts

Various large-scale research and planning efforts have identified the landscape of the study area as being ecologically significant. The following are examples of such projects and the significant features identified.

Wisconsin Wildlife Action Plan: Conservation Opportunity Area

The Wisconsin Wildlife Action Plan (WAP; WDNR 2006a) recognized “Chippewa Moraine Lakes” as a Conservation Opportunity Area. Conservation Opportunity Areas are places in Wisconsin that contain ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility for protection when viewed from the global, continental, upper Midwest, or state perspective.

Legacy Place

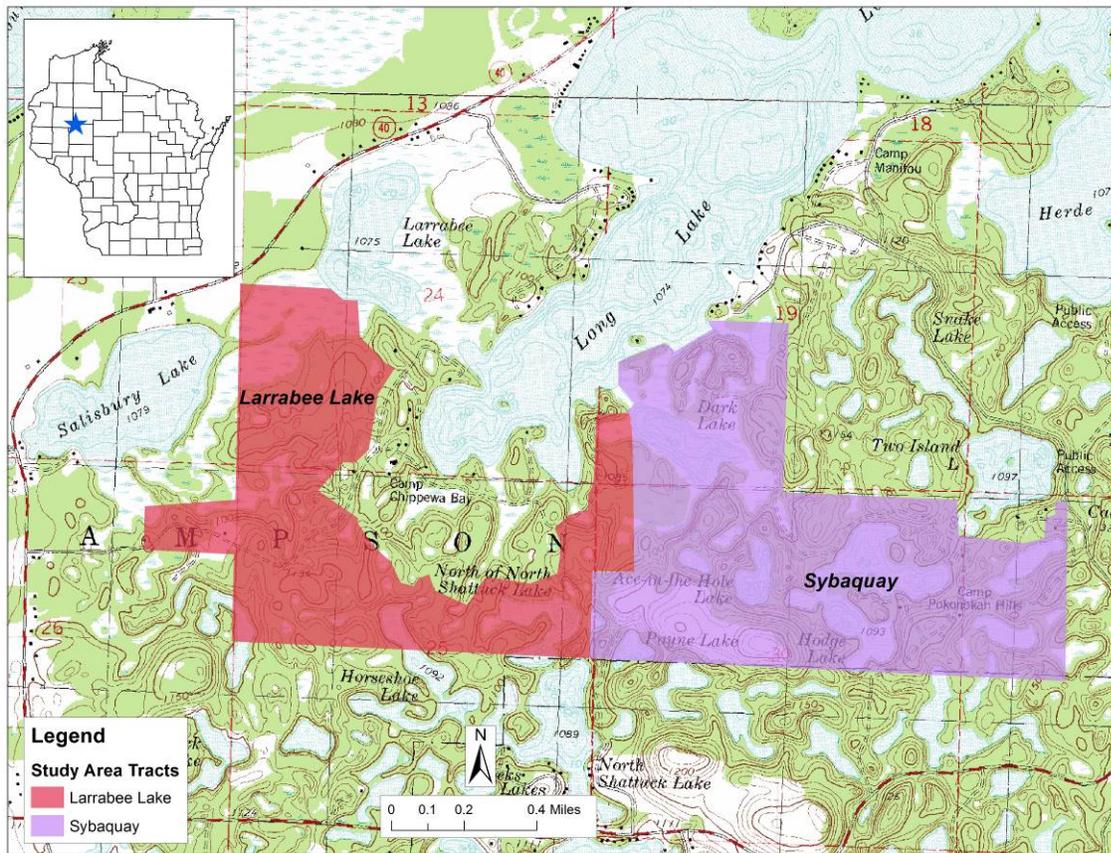
The Land Legacy Report (WDNR 2006b) was designed to identify Wisconsin’s most important conservation and recreation needs for the next 50 years. One related “Legacy Place” was identified: **Chippewa Glacial Lakes**, a large Legacy Place that encompasses Larrabee Lake and Sybaquay, as well as the Chippewa Moraine State Recreation Area and Chippewa County Forest. The site was given a four-star rating for conservation significance, i.e., it possesses outstanding ecological qualities, is of adequate size to meet the needs of critical components, and/or harbors natural communities or species of

global or continental significance. The forests in portions of this area are very high quality and contain a high diversity of forest interior birds including those with more of an affinity to southern Wisconsin. The area also contains an excellent representation of a variety of glacial features including moraines, ice block depression lakes, ice-walled lake plains, and a glacial meltwater channel.

Biotic Inventory and Analysis of the Chippewa County Forest

The Wisconsin Department of Natural Resources and the Chippewa County Forest developed a cooperative agreement to provide baseline information on the terrestrial and aquatic resources of the forest to assist with the preparation of a new forest master plan. The report (WDNR 2005) was undertaken by NHI and presents the results of a three-year project to inventory and analyze selected biotic resources of the Chippewa County Forest and portions of the surrounding landscape, as well as to provide baseline ecological information about the area. While the majority of the inventory occurred outside of the study area, the biological information and analysis contained in the report is relatable to this project.

Figure 2. Study area tracts.



Ephemeral Pond Studies

Researchers at **UW-Stout** are in the middle of conducting a five-year study of 57 Ephemeral Ponds within the Chippewa Moraine to identify the effects of environmental variability on aquatic macro-invertebrates, amphibians, plants, and water chemistry. To support the research, the investigators are sampling amphibians, macro-invertebrates, hydrology, water quality, and soils. Additional information can be found at <http://www.uwstout.edu/biology/ponds/index.cfm>.

WDNR has conducted studies of Ephemeral Ponds in northern Wisconsin, including the Chippewa Moraine, from 2011-2014. Project researchers collected data including water depth, water temperature, pH, and conductivity. They also collected information on pond use by amphibians, fairy shrimp, and other macro-invertebrates. One of the goals of the WDNR project is to inform the development of habitat management guidelines for Ephemeral Ponds.

Special Management Designations

The Chippewa Moraine State Recreation Area (SRA) is one of nine units of the **Ice Age National Scientific Reserve**. The reserve is an affiliated area of the National Park System. The Ice Age National Scientific Reserve was established in 1964 to protect the glacial landforms and landscapes in Wisconsin. Most of these units are connected by the Ice Age National Scenic Trail. The units protect different areas of scenic and scientific value and provide all kinds of opportunities, from studying Wisconsin's natural history at one of the interpretive centers, to hiking, camping, sightseeing and wildlife viewing.

The project area is bisected by the **Ice Age National Scenic Trail** (dnr.wi.gov, keyword "ice age trail") which is one of America's eleven National Scenic Trails and was authorized by the U.S. Congress in 1980. It is predominantly an off-road hiking trail. The route generally follows the edges of the last continental glacier in North America, a time known as the Wisconsin glaciation, and runs almost 1200 miles. Besides providing an excellent opportunity for hiking, the trail preserves some of the finest features of Wisconsin's glacial landscape as well as other scenic and natural resources.

Forest Certification is established on all DNR-managed lands, including state parks, wildlife and fishery areas, and 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 its lands, supporting economic activities, protecting wildlife habitat, and providing recreational opportunities.

The study area includes part of the **North of North Shattuck Lake State Natural Area** (dnr.wi.gov, keyword "state natural area"). Located within the rugged topography of glacial end moraine, North of North Shattuck Lake SNA features a southern dry-mesic forest of red and white oaks, red maple, big tooth aspen, and basswood. Other tree species include butternut, northern pin oak, white pine, red pine, and black cherry. The site varies from a dense oak forest that is rapidly approaching old-growth, through patches with a light harvest a few decades ago, to patches of oak woodland found on steep south-facing slopes. Characteristic herbs are big-leaf aster, naked tick-trefoil, hog-peanut, wood anemone, wild sarsaparilla, wood thistle, round-lobed hepatica, one-flowered broomrape, round-leaf pyrola, and American starflower. Small, shallow lakes and depressions are interspersed throughout the site and provide habitat for a diversity of invertebrates. This area is an important site for migratory birds, which use the area heavily during spring migration. Resident birds include Red-headed Woodpecker, Hairy Woodpecker, Scarlet Tanager, American Redstart, Yellow-throated Vireo, and Eastern Wood-pewee. North of North Shattuck Lake is owned by the DNR and was designated a State Natural Area in 2010.

Regional Ecological Context

Ecological Landscapes

*This section is largely reproduced from two sources: *The Ecological Landscapes of Wisconsin: an assessment of ecological resources and a guide to planning sustainable management.* (WDNR 2014);*

and Wisconsin Wildlife Action Plan (WDNR 2006a) for the following ecological landscapes: *Forest Transition and North Central Forest*.



Figure 3. Ecological Landscapes and the study area.

The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes. 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. All of the Sybaquay tract and most of the Larrabee Lake parcel are in the North Central Forest Ecological Landscape; the northern part of Larrabee Lake is in the Forest Transition Ecological Landscape (Figure 3).

The **Forest Transition Ecological Landscape** lies along the northern border of Wisconsin's Tension

Zone (Curtis 1959), through the central and western part of the state, and supports both northern forests and agricultural areas. Topography is typically undulating or rolling, but ranges from nearly level (wetlands, ice-walled lake plains, and outwash deposits) to hilly and steep (moraines, bedrock-cored hills, monadnocks, and along river valleys). Glacial till is the major type of material deposited throughout the ecological landscape, and most landforms are glacial till plains or moraines. Throughout the area, post-glacial erosion, stream cutting, and deposition formed floodplains, terraces, and swamps along major rivers. Wind-deposited silt material (loess) formed a layer 6 to 48 inches thick.

The ecological landscape's flora shows characteristics of both northern and southern Wisconsin, corresponding to its position along the Tension Zone. The historic vegetation of the Forest Transition Ecological Landscape was primarily northern hardwood and mixed hemlock (*Tsuga canadensis*) – northern hardwood forests. Currently, 44% of this Ecological Landscape is forested 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 (*Quercus* spp.) and lowland hardwoods. There are more than 686,000 acres of wetlands in the Forest Transition, over half of which are forested. Conifer and deciduous swamps are scattered throughout the ecological landscape and are often found near the headwaters of streams and associated with kettle lakes.

The **North Central Forest Ecological Landscape** occupies much of the northern third of Wisconsin. Its landforms are characterized by end and ground moraines with some pitted outwash and bedrock controlled areas. Kettle depressions and steep ridges are found in the northern portion. Two prominent areas in this Ecological Landscape are the Penokee-Gogebic Iron Range in the north extending into Michigan, and Timm's Hill, the highest point in Wisconsin (1,951 feet) in the south. 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 non-forested wetlands are numerous. Agriculture is much less prevalent than much of the state, partially due to the less favorable growing season here. Lake Superior

greatly influences the northern portion of the ecological landscape especially during the winter season, producing greater snowfall than in most areas in Wisconsin.

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

Currently, forests cover approximately 80% of this ecological landscape. The northern hardwood forest is dominant, made up of sugar maple, basswood, and red maple, with some scattered hemlock, yellow birch, northern red oak, white ash, balsam fir and white pine pockets. The aspen-birch forest type group is also relatively abundant followed by spruce-fir. In general, there has been a substantial decrease of hemlock, yellow birch, and white pine. A variety of forested and non-forested wetland community types are also present, and wet-mesic forests are more numerous here than elsewhere in the state.

Rivers, streams, and springs are common and found throughout this ecological landscape. There are several localized but significant concentrations of glacial kettle lakes associated with end and recessional moraines (e.g., the Perkinstown, Bloomer, Winegar, Birchwood Lakes, and Valhalla/Marenisco Moraines.)

Regional Biodiversity Needs and Opportunities

Different opportunities exist for sustaining natural communities in the Forest Transition and North Central Forest ecological landscapes. Ecological landscapes were developed in 2005 by the Ecosystem Management Planning Team (EMPT; not published until 2007) and later focused on wildlife SGCN and their habitat in the Wisconsin Wildlife Action Plan (WAP; WDNR 2006a). The goal of sustaining natural communities is to manage for natural community types that 1) historically occurred in a given landscape and 2) have a high potential to maintain their characteristic composition, structure, and ecological function over a long period of time (e.g., 100 years). This list can help guide land and water management activities so that they are compatible with the local ecology of the ecological landscape while maintaining important components of ecological diversity and function. Based on EMPT's criteria, these are the most appropriate community types that could be considered for management activities within the Forest Transition and North Central Forest ecological landscapes.

Natural community opportunities in the WAP were identified as “major”, “important”, or “present.” 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 “important” opportunity indicates that although the natural community does not occur extensively or commonly in the ecological landscape, one or more occurrences are present and are important in sustaining the community in the state. In some cases, important opportunities may exist because the natural community may be restricted to just one or a few ecological landscapes within the state, and there may be a lack of opportunities elsewhere.

There are management opportunities for 27 natural communities in the **Forest Transition** Ecological Landscape. Of these, eight are considered “major” and an additional 15 communities “important” in the Forest Transition Ecological Landscape (Table 1).

Table 1. Natural community management opportunities in the Forest Transition Ecological Landscape (WDNR 2006a, EMPT 2007). Communities present in the study area in this ecological landscape are highlighted with an asterisk.

Major Opportunities	Important Opportunities
Coldwater streams	*Alder Thicket
Coolwater streams	Bedrock Glade
Impoundments/Reservoirs	Dry Cliff
Northern Mesic Forest	*Emergent Marsh
*Northern Wet Forest	Ephemeral Pond
Northern Wet-mesic Forest	Floodplain Forest
Warmwater rivers	*Inland lakes
Warmwater streams	Moist Cliff
	Northern Dry-mesic Forest
	Northern Hardwood Swamp
	*Northern Sedge Meadow
	Open Bog
	Shrub Carr
	Submergent Marsh
	Surrogate Grasslands

There are management opportunities for 29 natural communities in the **North Central Forest** Ecological Landscape. Of these, 19 are considered “major” opportunities and an additional 6 natural communities are considered “important” in the North Central Forest Ecological Landscape (Table 2).

Rare Species of the Two Ecological Landscapes

Numerous rare species are known from the Forest Transition and North Central Forest ecological landscapes. “Rare” species include all of those species that appear on the WDNR’s NHI Working List (dnr.wi.gov, keyword “working list”) classified as “Endangered,” “Threatened,” or “Special Concern.” Table 3 lists the number of species known to occur in each landscape based on information stored in the NHI database as of December 2014.

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

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

There are 31 and 35 vertebrate SGCN significantly associated with the Forest Transition and the North Central Forest ecological landscapes, respectively. See the Wisconsin Wildlife Action Plan for information about the individual species associated with each ecological landscape (dnr.wi.gov, keyword “wildlife action plan”). This designation means that the species are (and/or historically were) significantly associated with each of these ecological landscapes. Also, restoration of natural

communities with which these species are associated would significantly improve conditions for the species.

Table 2. Natural community management opportunities in the North Central Forest Ecological Landscape (WDNR 2006a, EMPT 2007). Communities present in the study area in this ecological landscape are highlighted with an asterisk.

Major Opportunities	Important Opportunities
*Alder Thicket	Boreal Forest
Bedrock Glade	Boreal Rich Fen
Coldwater streams	Emergent Marsh - Wild Rice
Coolwater streams	Floodplain Forest
Dry Cliff	Northern Dry-mesic Forest
*Emergent Marsh	Shrub Carr
*Ephemeral Pond	
Impoundments/Reservoirs	
*Inland lakes	
Moist Cliff	
*Northern Hardwood Swamp	
Northern Mesic Forest	
*Northern Sedge Meadow	
*Northern Wet Forest	
Northern Wet-mesic Forest	
*Open Bog	
Submergent Marsh	
Warmwater rivers	

Table 3. Listing status for rare species in the two ecological landscapes (FT=Forest Transition, NCF=North Central Forest) as of October 2014. Source is the NHI database. Listing status is based on the NHI Working List published June 2014.

Listing Status	Ecological Landscape	Animal Taxa					Total Animals	Total Plants	Total Species Listed
		Mammals	Birds	Herptiles	Fishes	Invertebrates			
Federally Endangered	FT	0	0	0	0	4	4	0	4
	NCF	0	0	0	0	1	1	1	2
Federally Threatened	FT	0	0	0	0	1	1	0	1
	NCF	0	0	0	0	0	0	1	1
Federal Candidate	FT	0	0	0	0	0	0	0	0
	NCF	1	0	0	0	0	1	0	1
State Endangered	FT	0	4	1	2	9	16	6	22
	NCF	1	2	0	1	6	10	16	26
State Threatened	FT	1	6	1	7	7	22	9	31
	NCF	3	8	1	4	3	19	17	36
State Special Concern	FT	6	12	2	9	25	54	46	100
	NCF	5	14	2	5	49	75	52	127

Description of the Study Area

Location and Size

There are about 785 acres included in the two parcels. Sybaquay is larger at 440 acres; Larrabee Lake (including most of North of North Shattuck Lake) has about 345 acres. Acreage may not include some permanent water bodies.

Ecoregion

Land Type Associations (LTAs) of Wisconsin represent a finer division of the National Hierarchical Framework of Ecological Units (NHFEU; Cleland 1997). The NHFEU is a classification system that divides landscapes into ecologically significant regions at multiple scales. Ecological types are classified and units are mapped based on the associations of biotic and environmental factors which include climate, physiography, water, soils, air, hydrology, and potential natural communities. Each of the two ecological landscapes has its own LTA. Therefore, most of the Sybaquay and Larrabee Lake parcels are in the Pikes Peak Moraines (212Xe04) (North Central Forest EL); the northern part of the Larrabee Lake tract is in the Chetek Plains (212Qb04) LTA (Forest Transition EL). See Figure 4 for the study area and LTAs.

Descriptions of the associated Landtype Associations (WDNR 2014).

Pikes Peak Moraines (212Xe04). The characteristic landform pattern is hilly collapsed moraine. Soils are predominantly well drained sandy loam over dense, acid sandy loam till.

Chetek Plains (212Qb04). The characteristic landform pattern is nearly level outwash plain with terraces, fans, and sandstone hills common. Soils are predominantly well drained sandy loam over outwash.

Physical Environment

Geology and Glaciation

This section is largely based on Geology of the Ice Age National Scenic Trail (Mickelson et al. 2011).

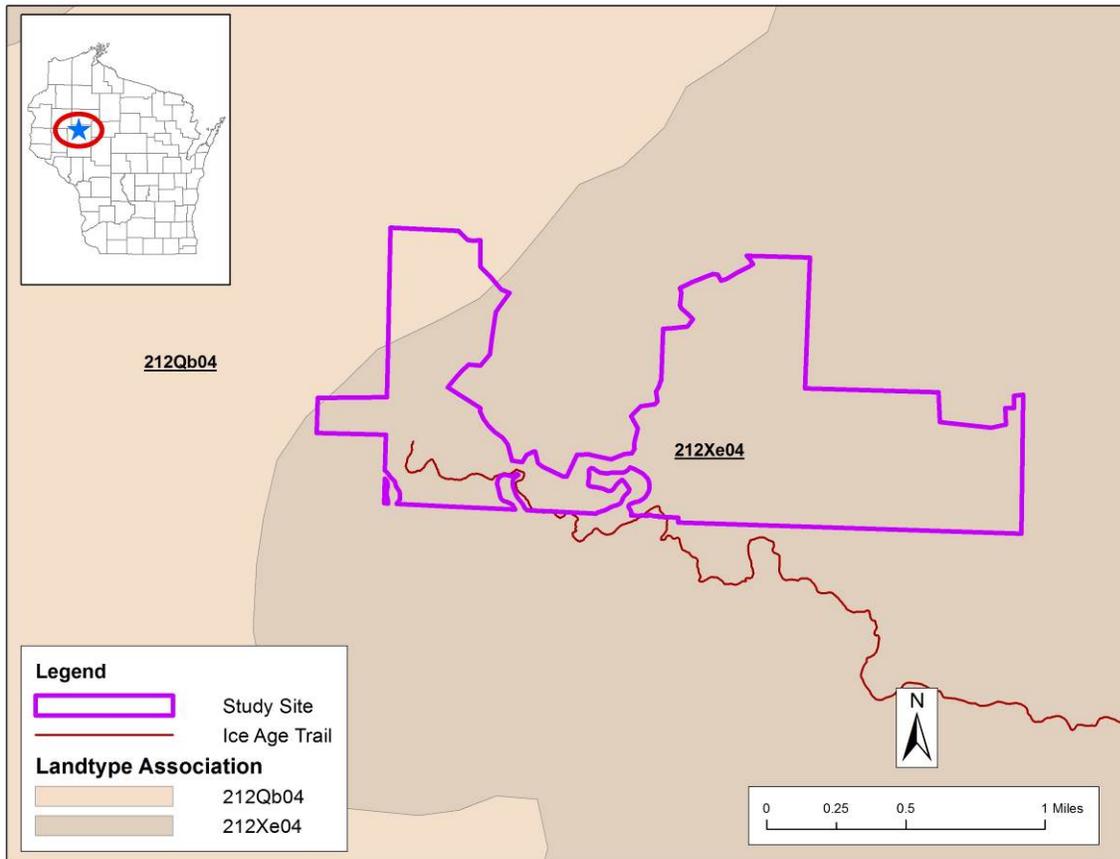
Larrabee Lake and Sybaquay formed in the Chippewa Moraine on the western edge of the Chippewa Lobe. The parcels occur on high relief hummocky topography with numerous kettles. Cambrian System sandstone with some dolomite and shale is the primary bedrock for both of these properties.

Soils

Main reference: Soil Survey Staff, Natural Resource Conservation Service, USDA. Web Soil Survey.

Hydric soils have significant coverage at the Sybaquay and Larrabee Lake parcels. About one-third of the Larrabee Lake tract is covered by peat. There are also inclusions of hydric soils in depressions in Amery sandy loam, 12 to 25% slopes. The remaining two-thirds of the site consist of upland soils of sandy loams and loamy sands. Slope is variable, ranging from 0 to 25%. There is a sizeable percentage of water on these tracts, especially on the Sybaquay side.

Figure 4. Landtype Associations for the study area.



Hydrology

Main reference: Water resources, WDNR 2011.

There are several named and unnamed lakes in the study area. For the purposes of this report the northern ends of North of North Shattuck and Horseshoe lakes are considered to be part of the Larrabee Lake tract. Descriptions of those lakes can be found at dnr.wi.gov, keyword “lakes.” The Larrabee Lake tract is bordered by the namesake Larrabee Lake on the northeast corner of the parcel. Larrabee Lake is a fifty-acre soft-water, seepage lake with an intermittent outlet to Long Lake. This lake is managed for fishing and swimming and is currently not considered impaired. Its fish population consists of northern pike, largemouth bass, and pan fish, with muskellunge also present. The lake with its encroaching shore wetlands provide habitat for nesting Mallards, Blue-winged Teal, Wood Ducks, mergansers, and loons (WCD 1965).

There are four named and several unnamed lakes on the Sybaquay tract. The largest lake, at 21 acres, is Dark Lake which is a soft water bog lake and has a maximum depth of 65 feet. There is a small channel to Long Lake. Fish present include northern pike, largemouth and smallmouth bass, bluegills, pumpkinseeds, bullheads, and largenose gar. Hodge Lake covers 19 acres and is a soft water, seepage lake. The fish population consists of largemouth bass and panfish. Mallards, teal, Wood Ducks, and mergansers use the lake for nesting. Both Ace-in-the-Hole and Payne lakes are less than six acres in size. Both are soft water seepage lakes with populations of bass and panfish.

The project area is in the Holcomb Flowage watershed which covers about 170 square miles. Land cover is a mix of forest (55%), wetland (24%), agriculture (15%), and other uses (6%). The watershed has 216 miles of streams, 6688 acres of lakes, 19,889 acres of wetlands.

Vegetation

Historical Vegetation

There is value in determining the nature of a site's vegetation before widespread Euro-American settlement as well as its historical alterations and uses. 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 conversion to row crop agriculture or by suppressing fires). 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 2014). Public Land Surveys for the study area were conducted in 1852.

The early vegetation of Wisconsin was mapped by Finley (1976) using surveyors' notes and maps from the original Public Land Survey. The early vegetation is shown in Figure 5. Based on Finley's map, the study area was a mixture of mostly upland oak (white, black, and bur), swamp conifers, and lakes. Sugar maple-basswood-oak forests were also present.

Current Vegetation

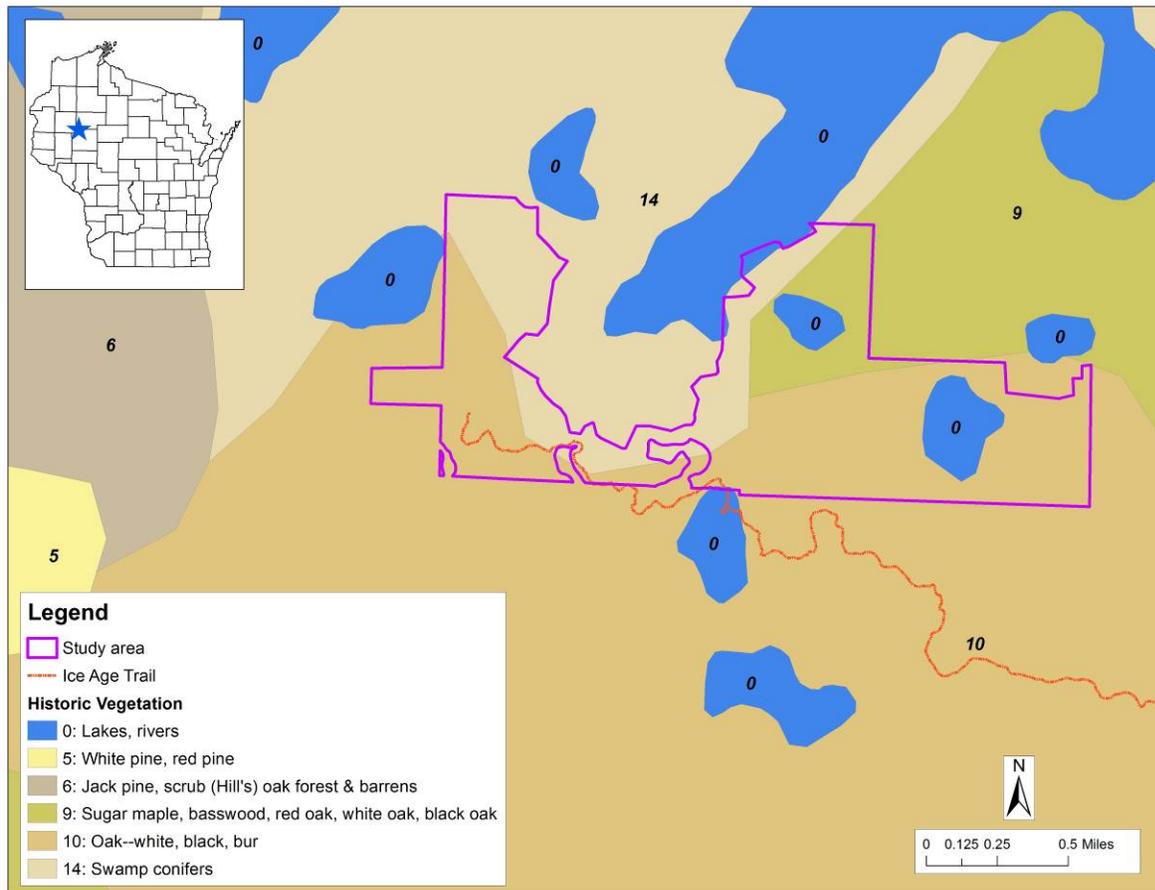
Current vegetation of the study area has been influenced by many historical factors including logging in the mid- to late-1800s, homesteading and farming attempts, wildfires, and, depending on the type of natural community, fire suppression. Current factors that influence the vegetation include wildlife and recreation management, forest management, and ecological restoration. Finally, broad environmental factors have a profound impact on the vegetation including geology, soils, natural hydrology, and weather and climate.

The two tracts in the study area are within a larger block of forest, including the Chippewa County Forest and the remainder of the Chippewa Moraine State Recreation Area; the study area is near the edge of extensive agriculture especially toward the west. Many, often small, lakes are widespread on the landscape. There are no major urban areas in the immediate vicinity although the cities of Chippewa Falls and Eau Claire are both within about 30 miles; homes and cabins are scattered.

The study area is a complex of uplands, wetlands, and lakes (Figure 6). The morainal ridges and hills are interspersed with wetlands and lakes. The uplands are largely covered by Southern Dry-mesic Forest and some old fields (Surrogate Grasslands). While the forest on the Larrabee Lake tract generally has good quality, the southern dry-mesic forest on Sybaquay is of variable quality. Canopy species dominance and tree size in the better quality forest is similar at the two tracts as is species composition.

Wetland communities include open wetlands such as Emergent Marsh, Northern Sedge Meadow, Alder Thicket, Poor Fen, Open Bog, and Shrub Carr. Forested wetland communities present include Northern Wet Forest, Tamarack (Poor) Swamp, and Northern Hardwood Swamp. Ephemeral Ponds are scattered across the study area. Upland communities include Northern Mesic Forest, Southern Dry-mesic Forest, and Surrogate Grassland. Current vegetation is described in greater detail below.

Figure 5. Vegetation of the study area prior to widespread Euro-American settlement (Finley 1976).



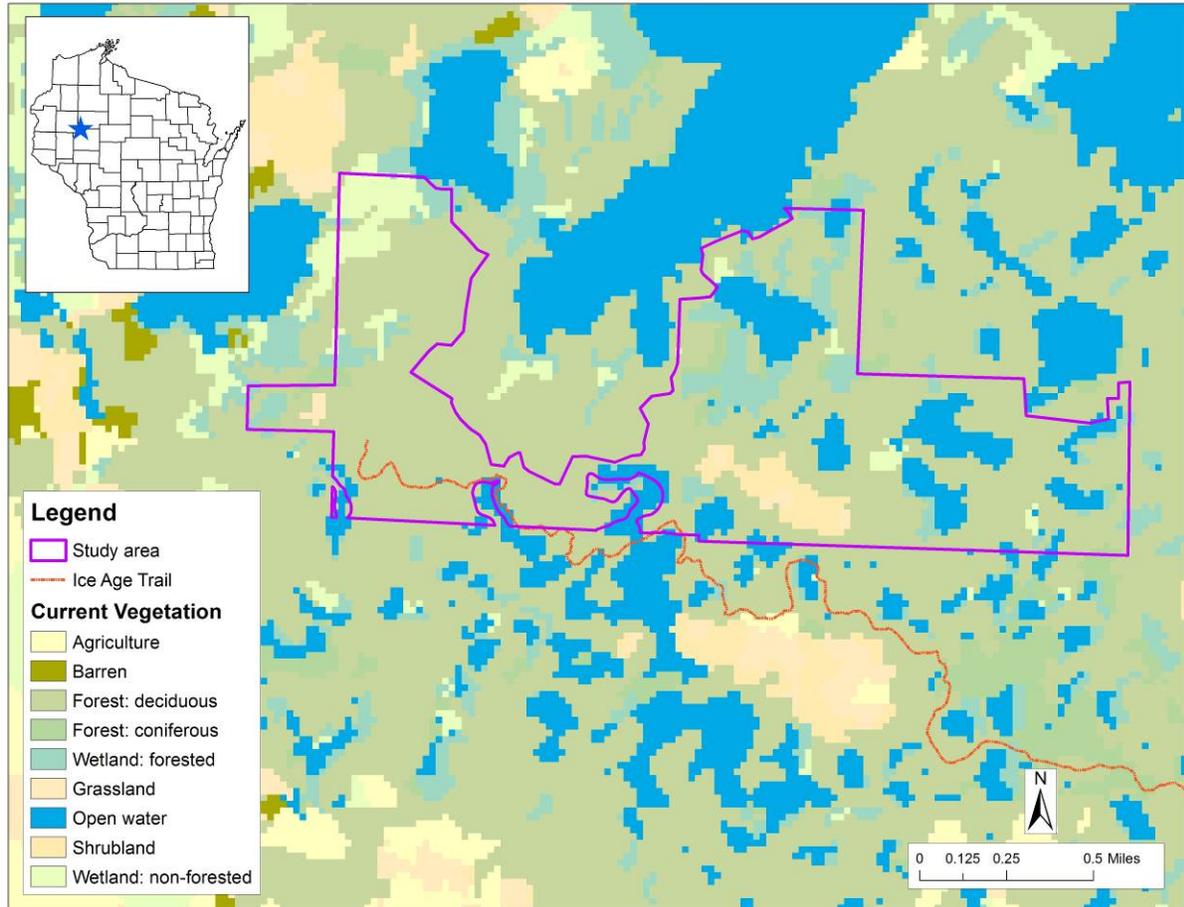
Property Level Current Vegetation

The **Larrabee Lake** parcel is covered by good quality Southern Dry-mesic Forest and Poor Fen. The uplands at **Sybaquay** are dominated by Southern Dry-mesic Forest of variable quality. Good quality Ephemeral Ponds have been documented, with most occurrences on the Sybaquay tract. Both the Southern Dry-mesic Forest and Poor Fen at Larrabee Lake met the element occurrence standards and have been entered into the NHI database.

The species composition of the Southern Dry-mesic Forest on both tracts is similar. The canopy dominants are oaks, especially red oak, with average diameters over 15 inches diameter at breast height (dbh) and some in the 20- to 26-inch range. Scattered pockets of red maple and sugar maple are present along with white ash (*Fraxinus americana*), yellow birch, and white pine in low numbers. There are pockets, especially on the Sybaquay side, of younger, lower quality forest including some that dominated by aspen and other early successional species. The subcanopy has moderate closure with saplings and young trees of canopy species, plus musclewood (*Carpinus caroliniana*) and hop-hornbeam (*Ostrya virginiana*). The shrub layer includes pagoda dogwood, beaked hazelnut, maple-leaf arrow-wood (*Viburnum acerifolium*), and blueberries (*Vaccinium angustifolium* and *V. myrtilloides*). The ground flora is not exceptionally diverse but has a good representation of characteristic dry-mesic forest species. It supports both northern and southern species including Pennsylvania sedge, wild geranium (*Geranium maculatum*), Canada mayflower (*Maianthemum canadense*), starflower (*Trientalis borealis*), rough-

leaved sunflower (*Helianthus strumosus*), and American cancer-root (*Conopholis americana*). The forest is part of a larger block of forest that occupies adjoining properties including the Chippewa Moraine State Recreation Area and Chippewa County Forest. Various aspects of upland forests, including their importance to birds and management opportunities are discussed below in the section on Management Considerations and Opportunities for Biodiversity Conservation.

Figure 6. Land cover for the study area from the WISCLAND GIS coverage (WDNR 1993).



Poor Fen covers the northern third of the Larrabee Lake site and features an acidic sphagnum lawn with abundant pod-grass (*Scheuchzeria palustris*), few-seeded sedge (*Carex oligosperma*), and cotton-grasses (*Eriophorum* spp). Cranberries (*Vaccinium oxycoccos* and *V. macrocarpon*) and pitcher plant (*Sarracenia purpurea*) are uncommon and scattered. Scattered pockets of Northern Wet Forest dominated by tamarack (*Larix laricina*) and black spruce (*Picea mariana*) dot the Poor Fen matrix. The lagg surrounding the fen is mucky and deep. Several small islands and a linear elevated feature (crevasse fill) within the fen complex are oak-dominated with some savanna indicator species in the ground flora and occasional canopy pines.

There is a small, good quality Open Bog at Sybaquay that is dominated by leatherleaf (*Ledum groenlandicum*) with low coverage of hardhack (*Spiraea tomentosa*), bog-laurel (*Kalmia polifolia*), and small cranberry (*Vaccinium oxycoccos*). There are widely scattered saplings of white pine, paper birch (*Betula papyrifera*), and tamarack. *Sphagnum* mosses dominate the ground flora and cover about two-

third of the ground layer. Herbs are mostly around the outer edges of the bog with lake sedge (*Carex lacustris*) and beaked sedge (*C. rostrata*) being the most common. Among other herbs, swamp loosestrife (*Lysimachia thyrsoiflora*), marsh-cinquefoil (*Potentilla palustris*), and marsh St. John's-wort (*Triadenum fraseri*) were noted.

The Ephemeral Ponds varied greatly in areal extent and depth. Vegetation also varied within the ponds, some with little vegetation present, others being fairly well vegetated.

Rare Species of the Study Area

A number of rare species have been documented in the study area (Appendix B). There are 14 species of rare animals (11 bird, 3 herptile) and one rare plant species. Two of the animals are listed as Threatened and eleven are Special Concern. Ten of the fourteen animals are Species of Greatest Conservation Need. One animal is a federal Species of Concern. The rare plant species is of state Special Concern. Appendix C provides summary descriptions of these species.

Management Considerations and Opportunities for Biodiversity Conservation

Landscape Level Opportunities and Considerations

Wildlife Action Plan Conservation Opportunity Area

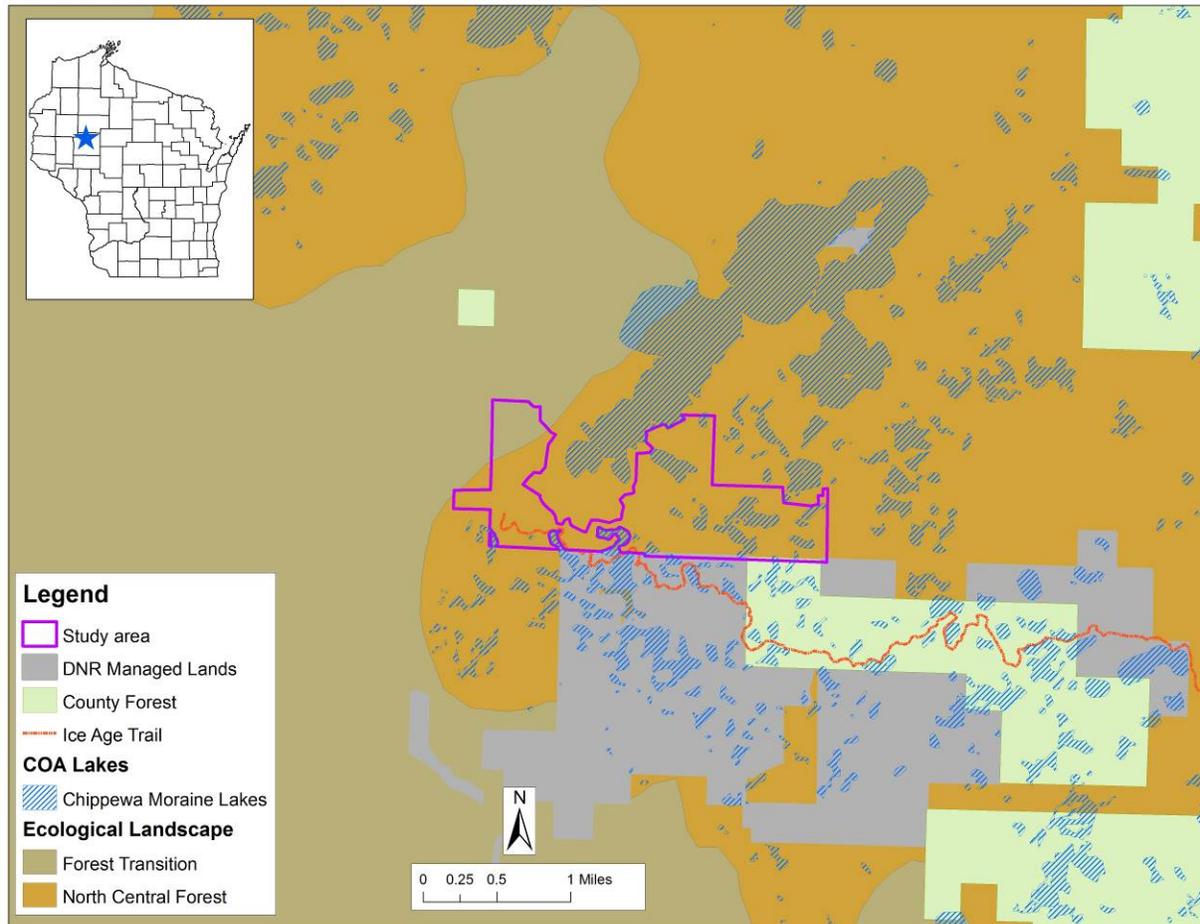
Conservation Opportunity Areas (COA, WDNR 2006a) are places in Wisconsin that contain ecological features, natural communities, or Species of Greatest Conservation Need habitat for which Wisconsin has a unique responsibility for protection when viewed from the global, continental, upper Midwest, or state perspective. The study area lies within the Chippewa Moraine Lakes COA (Figure 7), which has been identified as having state significance for diverse aquatic communities.

Wisconsin's Statewide Forest Strategy

Wisconsin's Statewide Forest Assessment (WDNR 2010a) was based on Wisconsin's Forest Sustainability Framework (Wisconsin Council on Forestry 2008) 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 guidelines intended to focus the actions of the forestry community.

The above documents noted above include topics related to biological diversity in Wisconsin's forests, and provide information useful for department master planning and management activities. Several Statewide Forest Strategies are particularly pertinent to the study area planning efforts in regard to opportunities to maintain or enhance biological diversity (Table 4, WDNR 2010b).

Figure 7. Relationship of the study area to the Chippewa Moraine Lakes COA (WDNR 2006a).



High Conservation Value Forests

The Wisconsin DNR manages 1.5 million acres that are certified by the Forest Stewardship Council (FSC) (Forest Stewardship Council 2009) 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).

Table 4. Selected Wisconsin Statewide Forest Strategies Relevant to the study area.

Strategy Number	Strategy
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.
18	Encourage the forestry community to be engaged in deer management issues with an understanding of the long term significance of deer impacts on sustainable forestry.
19	Adapt forest management practices to sustainably manage forests with locally high deer populations.
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 manage 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.
30	Intentionally accommodate (climate) change and enable forest ecosystems to adaptively respond.

Non-Native Invasive Species

While non-native invasive species thrive in newly disturbed areas, they also may invade and compromise high-quality natural areas. They establish quickly, tolerate a wide range of conditions, are easily dispersed, and are relatively free of the diseases, predators, and competitors that kept their populations in check in their native range. Non-native invasive plants can out-compete and even kill native plants by monopolizing light, water, and nutrients, and by altering soil chemistry and mycorrhizal relationships. In situations where non-native invasive plants become dominant, they may even alter ecological processes by limiting use of prescribed fire, by modifying hydrology, and by limiting tree regeneration and ultimately impacting forest composition (WDNR In Prep.).

In addition to the threats to native communities and native species diversity, non-native invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation, agriculture, and human health (by causing skin rashes and increasing incidence of tick-borne diseases). Non-native invasive plants and animals can also have negative impacts on fish and wildlife species by long-term displacement of native food sources (e.g., for deer and turkey; Gorchoff and Trisler 2003), diminishing habitat for ground-nesting birds (e.g., Ovenbirds and American Woodcock; Miller and Jordan 2011, Loss

et al. 2012), and altering aquatic macro-invertebrate communities in streams, thereby impacting fish that feed on them (McNeish et al. 2012).

No non-native invasive species were found to present an immediate threat to native species diversity, rare species habitats, or high-quality natural communities in the study area.

When resources for complete control of widespread invasive species are lacking, containment (i.e., limiting further spread) may be considered as an alternative action. Early detection and rapid control of new and/or small infestations, however, may be considered for higher prioritization in an invasive species management strategy (Boos et al. 2010). A number of non-native invasive species are not yet widespread at these tracts but are known to occur in the vicinity (Table 5); monitoring for these species and rapid response to small infestations represent high-impact actions.

Trails, access points for fishing, and other high-use areas are typical entry points for invasive species that are introduced by visitors' footwear, clothing, vehicle tires, boats, and other recreational equipment. Once established these invasive species may continue to spread along natural corridors (e.g., streams) and along recreational corridors (e.g., hiking trails). Invasive species may also be spread inadvertently through management activities such as timber operations, especially if best management practices (BMPs) are not followed.

Table 5. Non-native invasive species known to occur or currently unknown at the study area but could appear there in the future. The invasive species rule (NR-40) classifies species as *Restricted or **Prohibited

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
Plants							
Canada thistle*	<i>Cirsium arvense*</i>	x		x			Potentially at all sites
Curly-leaf pondweed	<i>Potamogeton crispus</i>					x	Known from lakes in Chippewa County
Dame's rocket*	<i>Hesperis matronalis</i>	x	x				Potentially at all sites
Eurasian water-milfoil*	<i>Myriophyllum spicatum*</i>					x	Known from lakes in Chippewa County
Garlic mustard*	<i>Alliaria petiolata*</i>		x				Known from all counties in study area.
Hemp nettle*	<i>Galeopsis tetrahit</i>	x	x				Potentially at all sites
Narrow-leaf & hybrid cattails*	<i>Typha angustifolia, T. x glauca*</i>			x			Potentially wetlands where not already present
Purple loosestrife*	<i>Lythrum salicaria*</i>			x			Potentially wetlands where not already present
Spotted knapweed*	<i>Centaurea biebersteinii (=C. stoebe, C. maculosa)*</i>	x					Possibly at all dry, especially sandy, sites

Animals							
Banded mystery snail	<i>Viviparus georgianus</i>					x	Known from lakes in Chippewa County
Chinese mystery snail*	<i>Bellamya chinensis*</i>					x	Known from lakes in Chippewa County

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
Emerald ash borer**	<i>Agrilus planipennis**</i>		x		x		Currently not known from study area. Infestations know from Buffalo & Trempealeau counties and from the Minneapolis/St Paul area.
European gypsy moth*	<i>Lymantria dispar*</i>		x		x		Chippewa County is not quarantined & is in the DATCP Slow the Spread program.
Rusty crayfish*	<i>Orconectes rusticus*</i>					x	Known from lakes in Chippewa County
Zebra mussel*	<i>Dreissena polymorpha*</i>					x	Known from lakes in Chippewa County

Fungi							
Oak wilt	<i>Ceratocystis fagacearum</i>		x		x		Known from all counties in study area.

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as that maintained by the DNR (dnr.wi.gov, keyword “invasive species”) and by the Invasive Plants Association of Wisconsin (<http://www.ipaw.org>), and seek assistance from local invasive species groups such as citizen-based lake monitoring groups coordinated through WDNR and UW-Extension. The DNR invasive species website provides more information about the invasive species rule, NR-40.

Also refer to invasive species BMPs for forestry, recreation, urban forestry, and rights-of-way, which were developed by the Wisconsin Council on Forestry (<http://www.wisconsinforestry.org/>, keyword “invasive species bmp”).

The following are descriptions of specific potential forest health issues.

Emerald Ash Borer

The emerald ash borer (EAB, *Agrilus planipennis*), an invasive, wood-boring beetle that attacks ash trees, was positively identified for the first time in Wisconsin in 2008, and, as of November 2014, 37 counties are under EAB quarantine regulations. The beetle attacks all species of ash (*Fraxinus* spp.) in Wisconsin, and the risk to forests is high: models predict that a healthy forest could lose 98% of its ash trees in six years (<http://www.emeraldashborer.wi.gov>).

Ash trees are a variable component of upland forests of the study area and are vulnerable to the effects of emerald ash borer, as white and green ash. Large-scale loss of ash in the forests, whether through EAB-caused mortality or harvesting, could cause a cascade of negative impacts. Degradation of diverse, high-quality forests and loss of forest cover could further lead to diminishment of important habitat for rare plants and animals (especially forest interior birds) (WDNR 2010a). It is important to note that removal of all ash as a stop-gap measure against EAB is not recommended; instead maintenance of a healthy forest and ash resource is suggested (WDNR 2010c).

Gypsy Moth

The gypsy moth (*Lymantria dispar*) was first found in Wisconsin in the mid-1970s in the eastern part of the state. By 1989, it had settled in along Wisconsin's eastern shore from Milwaukee to Green Bay. Since then, moths have been found in nearly every county and the eastern half of the state is considered infested. Gypsy moth is an invasive, leaf-eating insect that can feed on most types of trees and shrubs found in North America. When their populations are high, gypsy moth caterpillars can strip an entire neighborhood or forest of leaves in May and June. Additional information about gypsy moths can be found at (dnr.wi.gov, keyword "gypsy moth").

Non-native Invasive Earthworms

The invasion of forests by non-native earthworms of the families Acanthodrilidae, Lumbricidae, and Megascolecidae is a concern throughout Wisconsin. While native earthworms were absent from this landscape after the last glaciation, non-native invasive earthworms have been introduced since Euro-American settlement, primarily as discarded fishing bait (Hendrix and Bohlen 2002, Hale et al. 2005). Non-native invasive earthworms can have dramatic impacts on forest floor properties by greatly reducing organic matter (Hale et al. 2005), microbial biomass (Groffman et al. 2004), nutrient availability (Suárez et al. 2004, Bohlen et al. 2004), and fine-root biomass (Groffman et al. 2004). These physical changes in the forest floor reduce densities of tree seedlings and rare herbs (Gundale 2002) and can favor invasive plants (Kourtev et al. 1999). In a study of 51 Northern Wisconsin forest stands, Wiegmann (2006) found that shifts in understory plant community composition due to non-native invasive earthworms were more severe in stands with high white-tailed deer densities. Further assessments are needed to evaluate the effects of earthworms within the study area.

Oak Wilt

Oak wilt is caused by a fungus, *Ceratocystis fagacearum*, that effects water movement within oak trees, often killing the trees. The fungus was thought to be native, but the most recent science suggests that it is not (J. Cummings Carlson, WDNR, personal communication). It has been in the state for at least 100 years and is widespread throughout the southern part of the state. It can have significant impacts to forested stands with a heavy oak component such as at the study area.

Community Level Opportunities and Considerations

Natural Community Management Opportunities

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006a) identifies six natural communities for which there are "Major" or "Important" opportunities for protection, restoration, or management in the **Forest Transition** Ecological Landscape (Table 6). The WAP identifies opportunities for nine natural communities in the **North Central Forest** Ecological Landscape (Table 7).

Table 6. Major and important natural community management opportunities in the **Forest Transition** Ecological Landscape that occur in the study area (WDNR 2006a).

Major Opportunities	Important Opportunities
Northern Wet Forest	Alder Thicket
	Emergent Marsh
	Inland Lakes
	Northern Sedge Meadow
	Open Bog

Table 7. Major and important natural community management opportunities in the **North Central Forest Ecological Landscape** that occur in the study area (WDNR 2006a).

Major Opportunities	Important Opportunities
Alder Thicket	Shrub Carr
Emergent Marsh	
Ephemeral Pond	
Inland lakes	
Northern Hardwood Swamp	
Northern Sedge Meadow	
Northern Wet Forest	
Open Bog	

Southern Dry-mesic Forest: an Opportunity for Older Forest Management

Significant blocks of moderate to high-quality Southern Dry-mesic Forest occur at the Larrabee Lake and Sybaquay tracts. Although the forest stands at Sybaquay are somewhat fragmented by early successional forest management, Southern Dry-mesic Forest on both tracts represent the best quality remaining upland forests in the study area. The Southern Dry-mesic Forest at the study area is somewhat unusual for this landscape and provides an important element of habitat diversity for more southerly bird species (e.g., Cerulean Warbler, Red-shouldered Hawk) that are at the northern edge of their range.

The juxtaposition of the forests at Sybaquay and Larrabee Lake within larger forested blocks is important for area-dependent species such as forest interior birds. Additional maturation of these forests will enhance their value to many plant and animal species.

Older forests in Wisconsin are rare and declining, largely due to timber harvesting and conversion to other land uses (WDNR 2010a). The WDNR has identified a need to conserve, protect, and manage old-growth forests (WDNR 1995, 2004), and old-growth management is a component of forest certification. Old-growth forest management is one important facet of providing the diverse range of habitats needed for sustainable forest management (WDNR 2010b).

Old-growth stands can be characterized by a multi-layered, uneven age and size class structure; a high degree of compositional and structural patchiness and heterogeneity; and significant amounts of coarse woody debris and tip-up mounds (WDNR In Prep.). The structural diversity provided by old-growth and older forests support unique assemblages of plants, birds, and other animals.

Older forests can provide habitat for many rare and declining species, including Cerulean Warbler (*Dendroica cerulea*), Acadian Flycatcher (*Empidonax virescens*), Least Flycatcher (*Empidonax minimus*), Wood Thrush (*Hylocichla mustelina*), Veery (*Catharus fuscescens*), Red-shouldered Hawk (*Buteo lineatus*), and Northern Goshawk (*Accipiter gentilis*). Several of these species were found at Sybaquay and Larrabee Lake. Older forests also provide habitat for Wisconsin's summer resident forest bats, including big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and northern long-eared bat (*Myotis septentrionalis*), all of which were recently listed as State Threatened due to the threat of White-nose Syndrome. The northern long-eared bat is being evaluated for possible federal rare species listing.

High-quality wetlands

The wetlands on the study area are diverse and include Tamarack (Poor) Swamp, Northern Hardwood Swamp, Alder Thicket, Emergent Marsh, Open Bog, Poor Fen, Ephemeral Pond (see below), and Northern Sedge Meadow. These communities are generally small and often occur in small basins with

their distribution and extent based on hydrology, geology, and past disturbance. A relative lack of non-native invasive species also contributes to the high quality of these wetlands. The largest, good quality wetland is the Poor Fen at Larrabee Lake (ca. 87 acres). There are fairly extensive examples of Tamarack (poor) Swamp, Northern Hardwood Swamp, and Alder Thicket surrounding Dark Lake on the Sybaquay tract. While other wetlands, including the Open Bog on Hodge Lake, do not meet standards for inclusion into the NHI database, they are of fair to good quality. As such they are important for local diversity and provide valuable habitat for a number of species. The wetlands provide significant habitat for numerous rare and SGCN birds and amphibians.

Ephemeral Ponds

A number of ephemeral ponds were surveyed at both tracts. The ponds varied in size, vegetation, and animals that were present. Ephemeral ponds have been recognized as major and important Natural Community Management Opportunities in the North Central Forest and Forest Transition ecological landscapes, respectively (WDNR 2014). These ponds are depressions with impeded drainage (usually in forest landscapes), that hold water for a period of time following snowmelt and spring rains but typically dry out by mid-summer. They flourish with productivity during their brief existence and provide critical breeding habitat for certain invertebrates, as well as for many amphibians such as wood frogs and salamanders. They also provide feeding, resting and breeding habitat for songbirds and a source of food for many mammals.

Ephemeral ponds can provide habitat for many species. Rare animal species that are significantly associated with this type of habitat include Red-shouldered Hawk, eastern red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), northern long-eared bat, silver-haired bat (*Lasionycteris noctivagans*), boreal chorus frog (*Pseudacris maculata*), pickerel frog (*Rana palustris*), and four-toed salamander (*Hemidactylium scutatum*). Five other vertebrate species are moderately associated with ephemeral ponds. Most rare plants that are significantly or moderately associated with ephemeral ponds are sedges and include many-headed sedge (*Carex sychnocephala*), ravenfoot sedge (*C. crus-corvi*), and false hop sedge (*C. lupuliformis*). Several of the rare animal species have been found at these two tracts.

Trees adjacent to ephemeral ponds provide a variety of benefits such as maintaining cool water temperatures, preventing premature drying, and adding to the food web. The annual input of leaves from trees around the pool support a detritus-based food web and a variety of invertebrates that are part of that food web.

Species Level Opportunities and Considerations

Ecological Priorities for SGCN

Ecological priorities, as identified in the Wisconsin Wildlife Action Plan, are the natural communities in each Ecological Landscape that are most important to the Species of Greatest Conservation Need. Note that these Ecological Priorities include all of the natural communities and associated SGCN that have been determined to provide the best opportunities for management at the study area properties from an ecological/biodiversity perspective.

The Wildlife Action Plan also describes 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 at these tracts. Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006a) for the North Central Forest and Forest Transition ecological landscapes that apply to Sybaquay and Larrabee Lake are found in Table 8.

Wetland Bird Conservation

The wetlands of the study area provide important habitat for rare species, including birds and amphibians. The importance of this landscape-scale concept for preserving biodiversity holds true for other taxa as well, including reptiles, insects (including moths and butterflies), and mammals.

SGCN breeding birds associated with brushy wetland habitats include Golden-winged Warbler (*Vermivora chrysoptera*), Black-billed Cuckoo (*Coccyzus erythrophthalmus*), American Woodcock (*Scolopax minor*), and Veery (*Catharus fuscescens*). Four-toed salamander (*Hemidactylum scutatum*) will also use Alder Thicket and Shrub Carr. SGCN breeding birds associated with forested wetlands on the study area include Veery, Canada Warbler, and Least Flycatcher.

Table 8. Priority conservation actions by Ecological Landscape within the study area.

Ecological Landscape	Priority Conservation Actions
Forest Transition	Maintain the largest blocks of northern mesic and oak forest, especially in the identified Conservation Opportunity Areas.
	Increase connectivity of forest patches, especially in the identified conservation opportunity areas.
	Encourage regeneration and reestablishment of eastern hemlock, Canada yew, white cedar, other conifers and yellow birch, where appropriate through adaptive management techniques.
	Work towards a balance of age classes, especially in the oak conservation opportunity area.
North Central Forest	Work towards a balanced mosaic of age-classes; older age-classes are currently underrepresented.
	Encourage regeneration or reestablishment of eastern hemlock, Canada yew, white cedar, yellow birch, and other conifer, where appropriate through adaptive management techniques.
	Restore complexity to the entire forest landscape by retaining biological legacies such as large and cavity trees, snags, boles, large woody debris on the forest floor, herbaceous and understory plants, and forest floor organic matter.
	Inventory and map the locations of ephemeral ponds.
	Develop guidelines for silvicultural practices, water quality, and SGCN retention in and around ephemeral ponds.

Minnesota and Wisconsin have a unique responsibility to maintain the globally uncommon Golden-winged Warbler, as an estimated 57% of its global range is found in these two states (USFWS In prep.). While Golden-winged Warblers have traditionally been considered a species of early successional habitats, recent research indicates that they require more mature forests as well, particularly for fledgling and post-breeding adult survival (Cutright et al. 2006, Streby et al. 2012). When considering management focusing on enhancing habitat for Golden-winged Warblers, landscape-scale planning should be emphasized and equal consideration should be given to other important groups of declining bird species (i.e., grassland birds and forest interior birds).

Primary Sites: Site-specific Opportunities for Biodiversity Conservation

One ecologically important site, or “Primary Site,” was identified during this study. Primary Sites are 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.

The Primary Site has been designated as “SLL01 Sybaquay and Larrabee Lake” (Figure 8). Rare species and high quality natural communities known to occur at the Primary Site can be found in Appendix B.

Site Description

This primary site encompasses the entirety of the Larrabee Lake tract and the western half of Sybaquay. It includes high quality Southern Dry-mesic Forest and Poor Fen. Embedded within the Poor Fen are inclusions of other wetland types (e.g., Black Spruce Swamp) and ridges that support Southern Dry-mesic Forest. Various other wetlands, forested and non-forested, occur within the Primary Site. There is Tamarack (Poor) Swamp, Northern Hardwood Swamp, and Alder Thicket surrounding Dark Lake. Good quality Ephemeral Ponds are scattered throughout. There is frontage on Larrabee Lake, a fifty-acre soft-water, seepage lake with an intermittent outlet to Long Lake. The site also includes several other smaller named and unnamed lakes. Please refer to the “Property Level Current Vegetation” section above for more detailed descriptions of the natural communities.

Significance of Site

The Primary Site is near the eastern edge of the Chippewa Moraine and is in an area that is rich in all sizes of lakes, a diversity of wetlands, and geologic features such as ice walled lake plains. The site is part of a larger block of forest that in Chippewa County extends northward into the Blue Hills of Rusk and Barron counties and beyond. It includes large tracts of public lands including the Chippewa Moraine SRA and Chippewa, Rusk, and Barron county forests. The older Southern Dry-mesic Forest at Sybaquay and Larrabee Lake is somewhat unusual on this landscape and provides an important element of habitat diversity, especially when combined with the older Southern Dry-mesic Forest on the Chippewa Moraine SRA. Part of the North of North Shattuck Lake State Natural Area is included within the Primary Site. The remainder of the Primary Site lying outside of the current SNA boundary has characteristics of an ecological reference area and other biological values and may be considered as an addition to the SNA during planning.

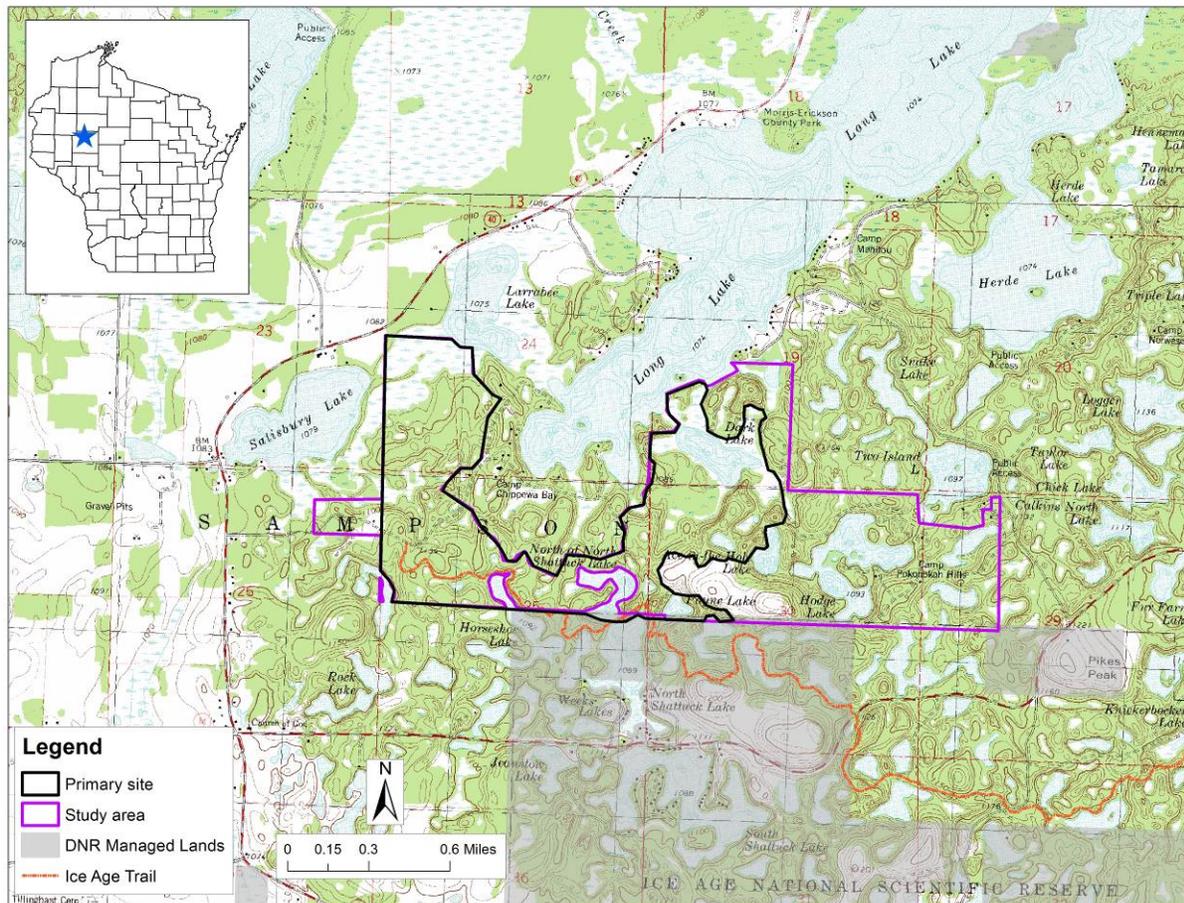
The good quality Southern Dry-mesic Forest can be considered as High Conservation Value Forest for forest certification.

Sybaquay and Larrabee Lake lies within the "Chippewa Moraine Lakes" Conservation Opportunity Area (COA) described in Wisconsin's Wildlife Action Plan (WAP; WDNR 2006); this COA is identified as having state significance for diverse aquatic communities. The high quality natural communities provide habitat for several rare/declining forest interior birds. Species of Greatest Conservation Need (SGCN) associated with early-successional forest habitat were also observed at the Primary Site. Rare herptiles are also associated with the Ephemeral Ponds and other natural communities here.

Management Considerations

Opportunities to manage older forest at a landscape level are high at this site because of the large size of the Southern Dry-mesic Forest and its adjacency to other large blocks of forest elsewhere on this and other public lands nearby. Management should seek to maintain older forest at this site and promote additional older forest on public lands nearby. The Ephemeral Ponds merit consideration during planning efforts as they provide important, good quality habitat for a host of vertebrate and invertebrate species. Given that no invasive species were noted at this site in recent surveys, consistent monitoring (especially along trails) and early eradication represent high-impact actions. Garlic mustard (*Alliaria petiolata*) has been found and eradicated nearby in the past.

Figure 8. Sybaquay and Larrabee Lake Primary Site.



Future Needs

This project was designed to provide a rapid assessment of the biodiversity values with an emphasis on natural communities, herptiles using Ephemeral Ponds, and breeding passerine birds for the Sybaquay and Larrabee Lake parcels. Although the report should be considered adequate for planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species of these tracts.

- A baseline inventory of invasive species is needed. The inventory will help determine priorities for control efforts. Public lands throughout Wisconsin are facing major management problems because

of serious infestations of highly invasive species. Some of these species are easily dispersed by humans and vehicles; others are spread by birds, mammals, insects, water, or wind. In order to protect the important biodiversity values of these tracts and the Chippewa Moraine State Recreation Area as a whole, a comprehensive invasive species monitoring and control plan will be needed for detecting and rapidly responding to new invasive threats.

- Additional wetland inventory work, especially Tamarack (Poor) Swamp and Northern Hardwood Swamp on the Sybaquay tract.
- Surveys for rare plants should be conducted in likely habitats.
- Additional wetland and marsh bird breeding surveys could be done.
- Small mammal surveys could be done in key habitats.
- Bat surveys should be done in appropriate habitat to help determine use patterns and density.
- Additional surveys are recommended for other rare herptiles, particularly Blanding's turtle.
- Surveys for wetland lepidopterans (butterflies, moths, and close relatives) are needed. This taxon group was not surveyed, and habitat for rare species is present.

Glossary

Ecological Landscape - landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin's sixteen Ecological Landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units.

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

element occurrence - an Element Occurrence (EO) is an area of land and/or water in which a rare species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or 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.

herptile - denoting, relating to, or characterizing both reptiles and amphibians

lagg - depressed margin of a peatland: generally wetter than the central area, often contains open water. Sometime referred to as a "moat."

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.

loess - an aeolian sediment formed by the accumulation of wind-blown silt, twenty percent or less clay and the balance equal parts sand and silt that are loosely cemented by calcium carbonate.

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.

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 2006a).

Tension Zone – a climatic transition area that crosses Wisconsin from northwest to southeast, and separates the conifer-hardwood forests of northern Wisconsin from the mosaic of prairie, savanna, and mainly deciduous forests of the south.

Species List

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

Common Name	Scientific Name
Plants	
American hazelnut	<i>Corylus americana</i>
Ash	<i>Fraxinus</i> spp.
Aspen	<i>Populus</i> spp.
Basswood	<i>Tilia americana</i>
Beaked hazelnut	<i>Corylus cornuta</i>
Beaked sedge	<i>Carex rostrata</i>
Big-leaved aster	<i>Aster macrophyllus</i>
Black spruce	<i>Picea mariana</i>
Blueberries	<i>Vaccinium angustifolium</i> , <i>V. myrtilloides</i>
Bog-laurel	<i>Kalmia polifolia</i>
Bur oak	<i>Quercus macrocarpa</i>
Canada mayflower	<i>Maianthemum canadense</i>
Cattails	<i>Typha</i> spp.
Cotton-grasses	<i>Eriophorum</i> spp.
Cranberries	<i>Vaccinium oxycoccos</i> , <i>V. macrocarpon</i>
False hop sedge	<i>Carex lupuliformis</i>
Few-seeded sedge	<i>Carex oligosperma</i>
Ground nut	<i>Amphicarpaea bracteata</i>
Hardhack	<i>Spiraea tomentosa</i>
Hemlock	<i>Tsuga canadensis</i>
Hop-hornbeam	<i>Ostrya virginiana</i>
Lake sedge	<i>Carex lacustris</i>
Leatherleaf	<i>Chamaedaphne calyculata</i>
Many-headed sedge	<i>Carex sychnocephala</i>
Maple-leaf arrow-wood	<i>Viburnum acerifolium</i>
Marsh cinquefoil	<i>Comarum palustre</i>
Marsh St. John's-wort	<i>Triadenum fraseri</i>
Muscle-wood	<i>Carpinus caroliniana</i>
Northern red oak	<i>Quercus rubra</i>
Oaks	<i>Quercus</i> spp.
Paper birch	<i>Betula papyrifera</i>
Pennsylvania sedge	<i>Carex pennsylvanica</i>
Pitcher plant	<i>Sarracenia purpurea</i>
Pod-grass	<i>Scheuchzeria palustris</i>
Red maple	<i>Acer rubrum</i>
Red pine	<i>Pinus resinosa</i>
Rough-leaved sunflower	<i>Helianthus strumosus</i>
Starflower	<i>Trientalis borealis</i>
Sugar maple	<i>Acer saccharum</i>
Tamarack	<i>Larix laricina</i>
White ash	<i>Fraxinus americana</i>
White oak	<i>Quercus alba</i>

Common Name	Scientific Name
White pine	<i>Pinus strobus</i>
Wild geranium	<i>Geranium maculatum</i>
Yellow birch	<i>Betula alleghaniensis</i>
Fungi	
Oak wilt	<i>Certacystis fagacearum</i>
Animals	
Acadian flycatcher	<i>Empidonax virescens</i>
American woodcock	<i>Scolopax minor</i>
Big brown bat	<i>Eptesicus fuscus</i>
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Bluegill	<i>Lepomis macrochirus</i>
Blue-winged teal	<i>Anas discors</i>
Boreal chorus frog	<i>Pseudacris maculata</i>
Bullhead	<i>Ameiurus spp</i>
Cerulean warbler	<i>Dendroica cerulea</i>
Common loon	<i>Gavia immer</i>
Earthworms	Families: Acanthodrilidae, Lumbricidae, Megascolecidae
Eastern red bat	<i>Lasiurus borealis</i>
Emerald ash borer	<i>Agilus planipennis</i>
Four-toed salamander	<i>Hemidactylium scutatum</i>
Golden-winged warbler	<i>Vermivora chrysoptera</i>
Gypsy moth	<i>Lymantria dispar</i>
Hoary bat	<i>Lasiurus cinereus</i>
Largemouth bass	<i>Micropterus salmoides</i>
Largenose gar	<i>Lepisosteus osseus</i>
Least flycatcher	<i>Empidonax minimus</i>
Little brown bat	<i>Myotis lucifugus</i>
Mallard	<i>Anas platyrhynchos</i>
Mergansers	<i>Mergus spp.</i>
Northern goshawk	<i>Accipiter gentilis</i>
Northern long-eared bat	<i>Myotis septentrionalis</i>
Northern pike	<i>Esox lucius</i>
Ovenbird	<i>Seiurus aurocapilla</i>
Pickerel frog	<i>Rana palustris</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Red-shouldered hawk	<i>Buteo lineatus</i>
Silver-haired bat	<i>Lasionycteris noctivagans</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Veery	<i>Catharus fuscescens</i>
Wood duck	<i>Aix sponsa</i>
Wood thrush	<i>Hylocichla mustelina</i>

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Additional Resources

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

- 1. Bureau of Natural Heritage Conservation's 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 Natural Heritage Conservation's main source of information for species and communities. <http://dnr.wi.gov>, keyword "*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. <http://dnr.wi.gov>, keyword "*working list*"
- 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. <http://dnr.wi.gov>, keyword "*ecological 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 as good starting points for accessing the information: the plan itself, the implementation page, and the "explore" option. <http://dnr.wi.gov>, keyword "*wildlife action plan*"
- 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.

<http://dnr.wi.gov/files/pdf/pubs/rs/rs0915.pdf>

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. <http://dnr.wi.gov>, keyword *“forestry strategy”*

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.

<http://dnr.wi.gov>, keyword *“forest assessment”*

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) 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 super-imposed 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

Appendix D

Wisconsin Natural Heritage Working List Explanation

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

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).