

# **Rapid Ecological Assessment for State Ice Age Trail Areas in Chippewa, Dane, Lincoln, Marathon, Polk, Portage, and Waushara Counties**

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



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Wisconsin Natural Heritage Inventory Program,  
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February 2014  
PUB-NH-847 2014

# Acknowledgments

We extend special thanks to Dawn Bishop, Kurt Dreger, Mike Bergum, Brenda Rederer, and Mike Rivers for their assistance with property access and field surveys. Funding for this project was provided by the Wisconsin DNR Bureau of Parks and Recreation.

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**Cover Photo:** Haas SIATA, Polk County by Amy Staffen

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# State Ice Age Trail Area Property Group at a Glance:

## Exceptional Characteristics of the Study Area

- **Older Mesic and Dry-mesic Forest.** Several significant blocks of moderate to high-quality dry-mesic and mesic forest occur on the SIATA. Opportunities for their conservation within ecological landscapes pertinent to this property group are noted in the Wisconsin Wildlife Action Plan. In addition, the WDNR has identified a need to conserve, protect, and manage old-growth forests. The juxtaposition of the SIATA forests 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.
- **Grassland Wildlife Conservation.** Grasslands have declined extensively throughout Wisconsin due to fire suppression and conversion to agriculture. Grassland areas on the SIATA are Surrogate Grasslands dominated by non-native plant species that function as good wildlife habitat. Numerous grassland bird species are found on the SIATA, and brushy areas within and on the edges of the grasslands can provide habitat for a number of Special Concern birds. Grasslands also provide important habitat for a number of butterfly and moth species, including many that are rare. Several SIATA are in the Karner Blue Butterfly Federal High Potential Range.
- **High Quality Wetlands.** The wetlands on the SIATA 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.

## Site Specific Opportunities for Biodiversity Conservation

Three ecologically important sites, or “Primary Sites,” were identified at Larrabee Lake, Firth Lake, and Wausau Paper 2. “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:

#### Larrabee Lake

- Larger block of Southern Dry-mesic Forest
- Good quality Poor Fen
- 2 SGCN bird species documented

#### Firth Lake

- Good quality wetlands
- Ephemeral Ponds
- Firth Lake: a good quality shallow, softwater, seepage lake
- 4 SGCN bird species documented

#### Wausau Paper 2

- Larger block of moderate to good quality Northern Dry-mesic Forest
- Ephemeral Ponds
- 5 SGCN bird species documented plus a heron rookery

# Introduction

## Purpose and Objectives

This report is intended to be used as a source of information for developing a new master plan for the State Ice Age Trail Areas (SIATA; Figure 1). The regional ecological context for the SIATA is provided to assist in developing the Regional and Property Analysis that is part of the master plan. This report continues previous biotic inventory work on SIATA in the Kettle Moraine area of southeastern Wisconsin (WDNR 2011a). SIATA parcels included in this assessment are:

- Haas (Polk County, A)
- Straight Lake (Polk County, A)
- Hibbs (Polk County, A)
- Firth Lake (Chippewa County, B)
- Larrabee Lake (Chippewa County, B)
- WDOT Hwy 51 (Lincoln County, C)
- Wausau Paper 1 (Marathon County, D)
- Wausau Paper 2 (Marathon County, D)
- Mecan Springs (Waushara County, E)
- Maierhafer/Siler (Waushara County, E)
- Llewellyn (Portage County, E)
- Montrose (Fahey) (Dane County, F)

For descriptive purposes within this report the parcels listed above can be grouped in local property groups. Each group is indicated by a letter code following county.

The primary purpose of State Ice Age Trail Areas is to permanently protect segments of the Ice Age Trail and the natural resources along it for present and future public use and enjoyment. Congress designates *national scenic trails*, such as the Ice Age Trail, "in order to provide for the ever-increasing outdoor recreation needs of an expanding population and in order to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the Nation..." National Scenic Trails are to be "extended trails so located as to provide maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass."

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

Survey efforts for the SIATA were limited to a "rapid ecological assessment" for 1) identifying and evaluating ecologically important areas, 2) documenting breeding passerine bird occurrences, and 3) documenting occurrences of high quality natural communities. 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 [www.NatureServe.org](http://www.NatureServe.org) for more information), coordinates the network.

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

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

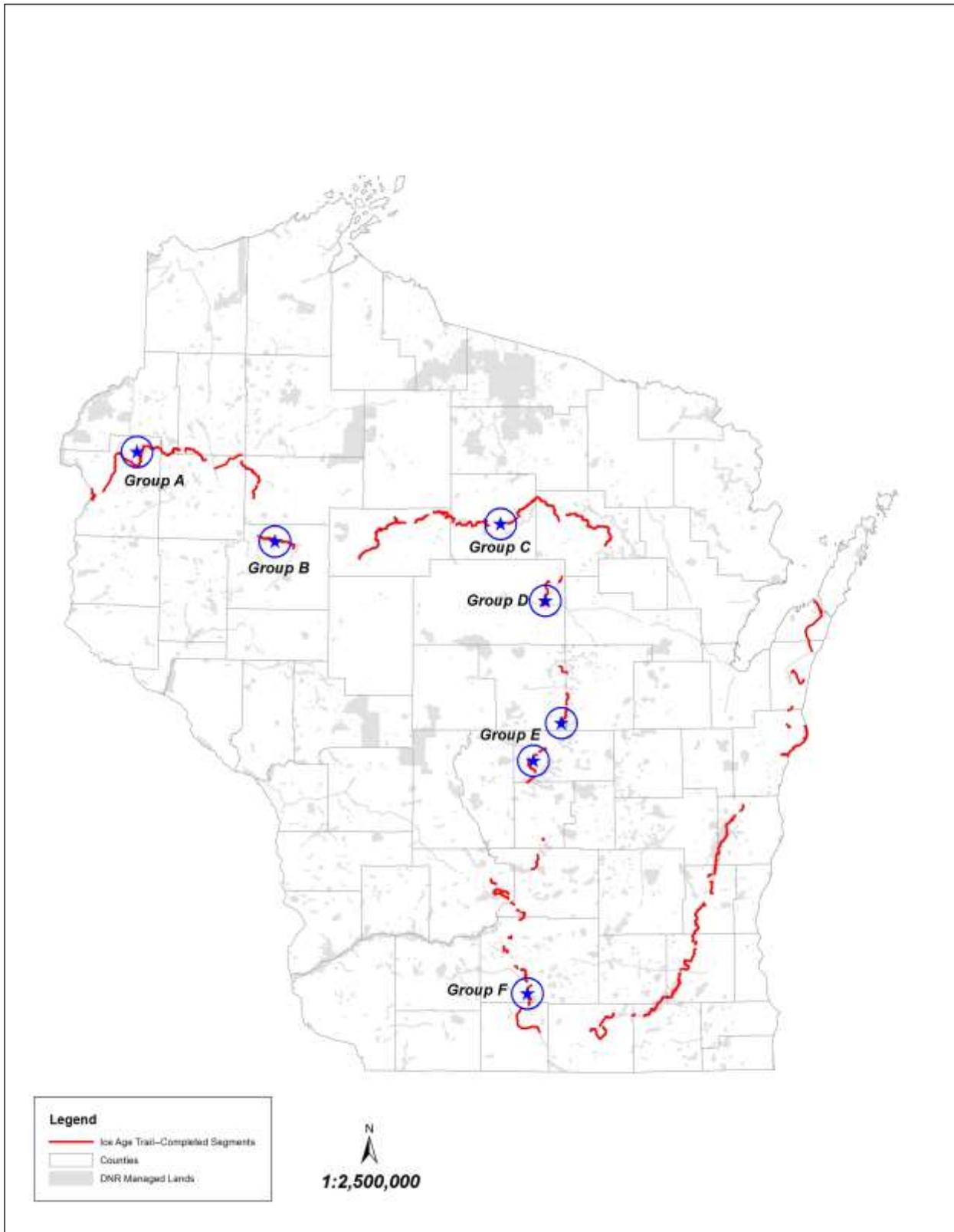
Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, NHI data for the SIATA were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR's Bureaus of Research and Endangered Resources 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 and breeding passerine birds. The collective results from all of these surveys were used, along with other information, to identify the ecologically important areas ("Primary Sites") of the SIATA.

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 SIATA were not surveyed.

Scientific names for common names of all species mentioned in the text are included in the table starting on page 73.

Figure 1. Location of the State Ice Age Trail Areas in this study.



## Background on Past Efforts

Various large-scale research and planning efforts have identified the SIATA landscape 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”, “Comstock Bog & Germania Marsh”, and “Straight Lake” as Conservation Opportunity Areas (Appendix B). Conservation Opportunity Areas are places in Wisconsin that contain ecological features, natural communities, or Species of Greatest Conservation Need (SGCN) habitat for which Wisconsin has a unique responsibility for protection when viewed from the global, continental, upper Midwest, or state perspective.

### 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 Firth Lake SIATA, as well as 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. 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.

### Important Bird Areas

**Straight Lake SIATA** is contiguous with the Straight Lake Important Bird Area (IBA; *Wisconsin Important Bird Areas*) which is located within the most intact deciduous forest in Polk County. It encompasses Straight Lake State Park, Straight Lake State Wildlife Area, and two State Natural Areas: Tunnel Channel Woods and Straight Lake Tamarack Fen both of which are within Straight Lake State Park. The site includes Straight Lake, a wild, undeveloped lake drained by the Straight River; the adjacent wetlands, which are a diverse mosaic of sedge meadows, alder thicket, open and forested bogs, hardwood swamp, and ephemeral ponds; and a core of mature forest surrounding the wetlands. Oaks and hickories are common, with maples, basswood, and birches on north-facing slopes. Pockets of white pine, yellow birch, and tamarack are found throughout. Straight Lake IBA is significant for breeding forest birds, notably Cerulean Warbler, found here breeding in unusually high densities and well north of the core of its range in Wisconsin. Other breeders include Black-throated Blue Warbler (at its westernmost range limit), Red-shouldered Hawk, American Woodcock, Eastern Wood-pewee, Yellow-throated Vireo, Veery, and Canada Warbler.

### Priority Grassland Bird Habitat

Managing Habitat for Grassland Birds: A Guide for Wisconsin (Sample and Mossman 1997) listed the Coloma Barrens and Savannas as a secondary landscape for grassland bird management in the oak or river barrens, young conifer plantation, dry or sand prairie, and dry old field habitats. Greenwood Wildlife Area which is immediately to the west of the Maierhafer/Siler SIATA was identified as a specific site for grassland bird management for oak savanna, idle warm season grass/forb, and southern sedge meadow habitats (Sample and Mossman 1997). The remaining SIATA in Waushara County are contained within the Coloma Barrens and Savannas landscape.

## Special Management Designations

The primary purpose of State Ice Age Trail Areas is to permanently protect segments of the **Ice Age National Scenic Trail** and the natural resources along it for present and future public use and enjoyment. The Ice Age National Scenic Trail 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. Purpose, use, and management are found in NR 1.29.

**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.

## Regional Ecological Context

### Ecological Landscapes

*This section is largely reproduced from two sources: The Ecological Landscapes of Wisconsin Handbook (WDNR In prep. a); and Wisconsin Wildlife Action Plan (WDNR 2006a) for the following ecological landscapes: Forest Transition, North Central Forest, Central Sand Hills, Western Coulee and Ridges, and Southeast Glacial Plains.*

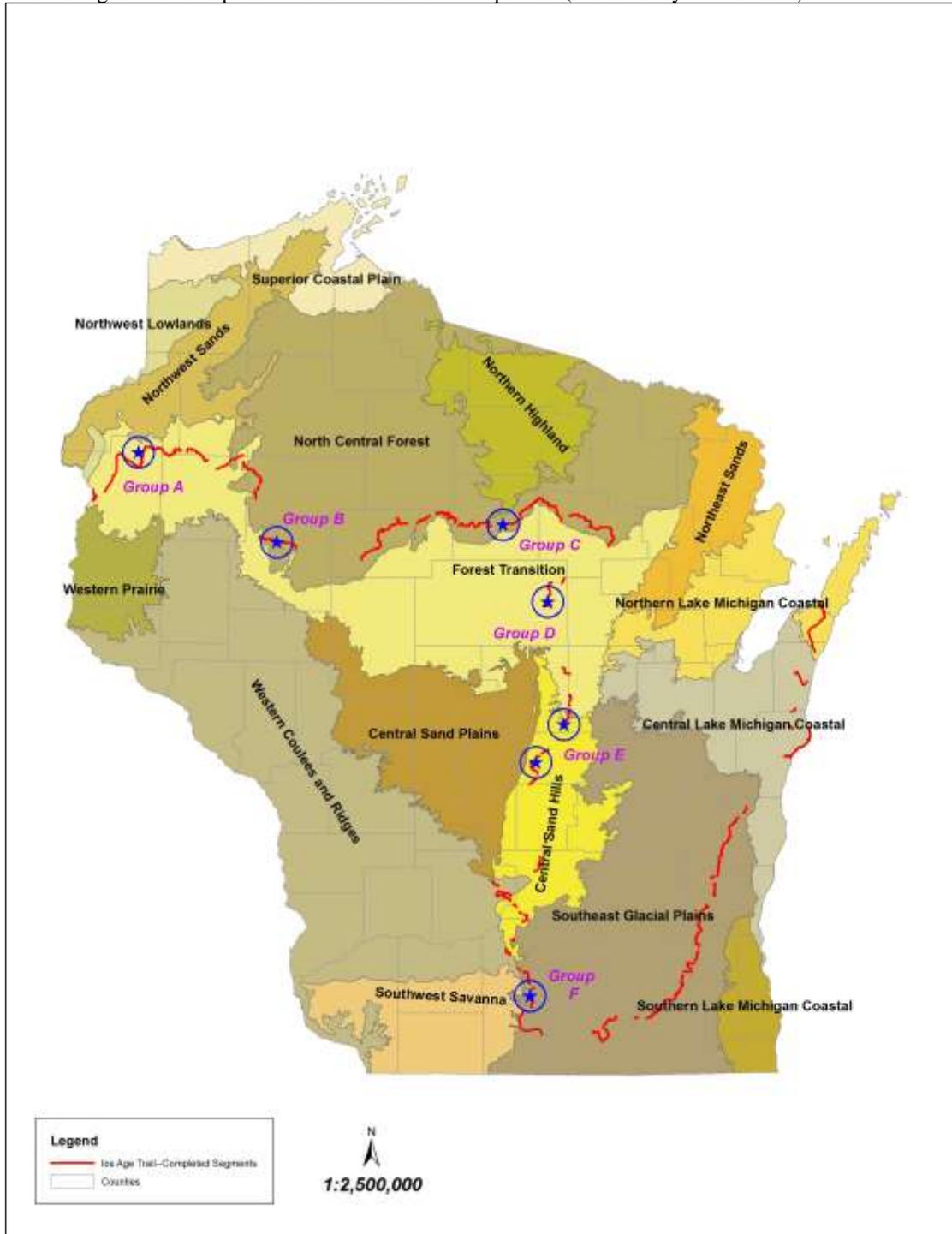
The WDNR has mapped the state into areas of similar ecological potential and geography called Ecological Landscapes. The Ecological Landscapes are based on aggregations of smaller ecoregional units (Subsections) from a national system of delineated ecoregions known as the National Hierarchical Framework of Ecological Units (NHFEU) (Cleland et al. 1997). These ecoregional classification systems delineate landscapes of similar ecological pattern and potential for use by resource administrators, planners, and managers. SIATA parcels and their associated Ecological Landscapes are in Table 1. See Figure 2 for the study area in relation to Ecological Landscapes.

**Table 1.** SIATA parcels and Ecological Landscapes

Parcel Name	County	Group	Ecological Landscape
Haas	Polk	A	Forest Transition
Straight Lake	Polk	A	Forest Transition
Hibbs	Polk	A	Forest Transition
Firth Lake	Chippewa	B	North Central Forest
Larrabee Lake	Chippewa	B	North Central Forest (50%), Forest Transition (50%)
WDOT Hwy 51	Lincoln	C	North Central Forest
Wausau Paper 1	Marathon	D	Forest Transition
Wausau Paper 2	Marathon	D	Forest Transition
Llewellyn	Portage	E	Central Sand Hills

Mecan Springs	Waushara	E	Central Sand Hills
Maierhafer/Siler	Waushara	E	Central Sand Hills
Montrose (Fahey)	Dane	F	Western Coulee & Ridges (90%), Southeast Glacial Plains (10%)

**Figure 2.** Ecological Landscapes of Wisconsin and SIATA parcels (indicated by circled stars).



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 **Central Sand Hills Ecological Landscape** is located in central Wisconsin at the eastern edge of what was once Glacial Lake Wisconsin. The landforms in this ecological landscape are a series of glacial moraines that were later partially covered by glacial outwash. The area is characterized by a mixture of farmland, woodlots, wetlands, small kettle lakes, and cold water streams, all on sandy soils. The mosaic of glacial moraine and pitted outwash throughout this ecological landscape has given rise to extensive wetlands in the outwash areas and the headwaters of cold-water streams that originate in glacial moraines. The growing season is long enough for agriculture, but the sandy soils limit agricultural productivity somewhat.

Historic upland vegetation consisted of oak forest, oak savanna, and tallgrass prairie. Fens were common in this ecological landscape and occurred along with wet-mesic prairie, wet prairie, and the rare coastal plain marshes. Current vegetation is composed of more than one-third agricultural crops and almost 20% grasslands with smaller amounts of open wetland, open water, shrubs, barrens, and urban areas. Forest cover is about 28%. The major forested type is oak-hickory, with smaller amounts of white, red, and jack pine, maple-basswood, lowland hardwoods, aspen-birch, and spruce-fir.

There are numerous small kettle lakes and ponds associated with the glacial outwash. There are many soft-water lakes with sand bottoms that have been or are being developed for recreational uses.

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, and yellow birch. There were some smaller areas of white and red pine 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.

Many small drainages and lakes are found throughout this ecological landscape as well as larger streams.

**The Western Coulee and Ridges Ecological Landscape** in southwestern and west central Wisconsin is characterized by its lack of glacial features. It is part of the region called the “Driftless Area” because it lacks glacial deposits known as “drift” (although glacial outwash materials do occur in river valleys). The topography is unique in the state due to the long periods of erosion which have created dissected ridges, steep-sided valleys, and extensive stream networks with dendritic drainage patterns. The Western Coulee and Ridges is more forested than the rest of southern Wisconsin. Soils are mostly silt loams (loess) and sandy loams, over dolomite and sandstone bedrock. Several large rivers flow through or border the ecological landscape.

Historical vegetation consisted of upland southern hardwood forests of several major types, oak savanna, and prairie, with extensive floodplain forests, sedge meadows, and marshes along the major rivers. With Euro-American settlement, most of the more level lands on ridge tops and in valley bottoms was cleared of native vegetation for agricultural uses. The steep slopes between valley bottom and ridge top, unsuitable for raising crops, either remained in forest or former savannas and prairies grew up into oak- or maple-dominated forests after the wildfires common in Native American times were suppressed.

Current vegetation is a mix of forest (the largest land cover component, at over 40%), agriculture, and grassland (mostly non-native); wetlands are restricted almost entirely to the river valleys. The primary forest cover is oak-hickory (51%) dominated by oak species and shagbark hickory. Mesic forests (28%), dominated by sugar maple, basswood, and red maple, are common in areas that were not subjected to repeated wildfires prior to Euro-American settlement. Bottomland hardwoods (10%) are restricted to the valley bottoms of the larger rivers and are dominated by silver maple, ashes, elms, and cottonwood. Coniferous forests are not extensive, and include the so-called “relict” conifer stands of white and red (rarely jack) pines on dry sites and mesic stands of hemlock and yellow birch on steep slopes with cool, moist micro-climates. In a few valley locations there are lowland forests dominated by tamarack, though many, if not most of these are now in serious decline.

The vast majority of natural lakes in this ecological landscape are oxbows associated with the large rivers.

**The Southeast Glacial Plains Ecological Landscape** makes up the bulk of the non-coastal land area in southeast Wisconsin. This ecological landscape is situated on glacial till plains and outwash landforms, as well as rolling, ground, and interlobate moraines. Most of this ecological landscape is composed of glacial materials deposited during the Wisconsin Ice Age, but the southwest portion consists of older,

pre-Wisconsin till with a more dissected topography. Soils are lime-rich tills overlain in most areas by a silt-loam loess cap. Agricultural and residential interests throughout the landscape have significantly altered the historical vegetation and the hydrology. Most of the rare natural communities that remain are associated with large moraines or in areas where the Niagara Escarpment occurs close to the surface.

Historically, vegetation in the Southeast Glacial Plains consisted of a mix of prairie, oak forests and savanna, and maple-basswood forests. Wet-mesic prairies, southern sedge meadows, emergent marshes, calcareous fens, and tamarack swamps were found in poorly drained, wetter portions of the landscape. End moraines and drumlins supported savannas and forests. Agricultural and urban land use practices have drastically changed the land cover of the Southeast Glacial Plains since Euro-American settlement. The current vegetation is primarily agricultural cropland. Remaining forests occupy only about 10% of the land area and important cover types include oak, maple-basswood, and lowland hardwoods. No large areas of contiguous forest exist today except on the Kettle Interlobate Moraine, which has relatively rugged topography that is often ill-suited for agricultural uses. In the southern Kettle Moraine, much of the historic oak savanna cover has succeeded to dense hardwood forests due to fire suppression. The total land area for the ecological landscape is approximately 4.9 million acres, of which only 10% is classified as timberland.

The Southeast Glacial Plains has the highest aquatic productivity for plants, insects, invertebrates, and fish of any ecological landscape in the state. The ecological landscape contains several large lakes such as those in the Madison area and in the Lake Winnebago Pool system. Kettle lakes are common on end moraines and in outwash channels. There are a number of significant river systems.

## **Regional Biodiversity Needs and Opportunities**

Different opportunities for sustaining natural communities in the Forest Transition, Central Sand Plains, North Central Forest, Western Coulee and Ridges, and Southeast Glacial Plains 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, Central Sand Plains, North Central Forest, Western Coulee and Ridges, and Southeast Glacial Plain 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 2).

**Table 2.** Natural Communities Management Opportunities in the Forest Transition Ecological Landscape (WDNR 2006a, EMPT 2007). Communities present on the SIATA in this ecological landscape are highlighted with an asterisk.

<b>Major Opportunities</b>	<b>Important Opportunities</b>
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



Photos by Amy Staffen, WDNR

There are management opportunities for 46 natural communities in the **Central Sand Hills** Ecological Landscape. Of these, 14 are considered “major” opportunities and an additional 19 natural communities are considered “important” in the Central Sand Plains Ecological Landscape (Table 3).

**Table 3.** Natural Communities Management Opportunities in the Central Sand Hills Ecological Landscape (WDNR 2006a). Communities present on the SIATA in this ecological landscape are highlighted with an asterisk.

<b>Major Opportunity</b>	<b>Important Opportunity</b>
Calcareous Fen	Alder Thicket
Central Sands Pine - Oak Forest	Bedrock Glade
Coastal Plain Marsh	Bog Relict
Coldwater streams	Coolwater streams
Emergent Marsh	*Dry Prairie
Impoundments/Reservoirs	Floodplain Forest
Inland lakes	Inland Beach
Northern Wet Forest	Moist Cliff
Shrub Carr	Northern Hardwood Swamp
*Southern Dry Forest	Northern Sedge Meadow
Southern Sedge Meadow	Oak Barrens
Submergent Marsh	Open Bog
Warmwater rivers	Pine Barrens
Wet-mesic Prairie	Sand Prairie
	Southern Dry-mesic Forest
	Southern Tamarack Swamp (rich)
	*Surrogate Grasslands
	Warmwater streams

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 4).

**Table 4.** Natural Communities Management Opportunities in the North Central Forest Ecological Landscape (WDNR 2006a). Communities present on the SIATA in this ecological landscape are highlighted with an asterisk.

<b>Major Opportunity</b>	<b>Important Opportunity</b>
*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	



Photo by Craig Anderson, WDNR

There are management opportunities for 45 natural communities in the **Western Coulee and Ridges Ecological Landscape**. Of these, 24 are considered “major” opportunities and an additional 13 natural communities are considered “important” in the Western Coulee and Ridges Ecological Landscape (Table 5).

**Table 5.** Natural Communities Management Opportunities in the Western Coulee and Ridges Ecological Landscape (WDNR 2006a). Communities present on the SIATA in this ecological landscape are highlighted with an asterisk.

<b>Major Opportunity</b>	<b>Important Opportunity</b>
Algific Talus Slope	Alder Thicket
Bedrock Glade	Emergent Marsh - Wild Rice
Cedar Glade	Ephemeral Pond
Coldwater streams	Mesic Prairie
Coolwater streams	Northern Dry-mesic Forest
Dry Cliff	Northern Sedge Meadow
*Dry Prairie	Northern Wet Forest
Dry-mesic Prairie	Pine Barrens
Emergent Marsh	Southern Sedge Meadow
Floodplain Forest	Southern Tamarack Swamp (rich)
Hemlock Relict	Wet Prairie

Moist Cliff	Wet-mesic Prairie
Oak Barrens	White Pine - Red Maple Swamp
*Oak Opening	
Oak Woodland	
Pine Relict	
Sand Prairie	
Shrub Carr	
Southern Dry Forest	
*Southern Dry-mesic Forest	
Southern Mesic Forest	
Submergent Marsh	
Surrogate Grasslands	
Warmwater rivers	

There are management opportunities for 38 natural communities in the **Southeast Glacial Plains Ecological Landscape**. Of these, 21 are considered “major” opportunities and an additional 13 natural communities are considered “important” in the Southeast Glacial Plains Ecological Landscape (Table 6). No natural community management opportunities were identified on the SIATA in this ecological landscape.

**Table 6.** Natural Communities Management Opportunities in the Southeast Glacial Plains Ecological Landscape (WDNR 2006a). Communities present on the SIATA in this ecological landscape are highlighted with an asterisk.

<b>Major Opportunity</b>	<b>Important Opportunity</b>
Bog Relict	Cedar Glade
Calcareous Fen	Coolwater streams
Dry Cliff	Emergent Marsh - Wild Rice
Dry Prairie	Ephemeral Pond
Dry-mesic Prairie	Moist Cliff
Emergent Marsh	Northern Hardwood Swamp
Floodplain Forest	Northern Sedge Meadow
Impoundments/Reservoirs	Northern Wet Forest
Inland lakes	Northern Wet-mesic Forest
Mesic Prairie	Southern Hardwood Swamp
Oak Opening	Southern Mesic Forest
Oak Woodland	Submergent Marsh
Shrub Carr	Wet Prairie
Southern Dry Forest	
Southern Dry-mesic Forest	
Southern Sedge Meadow	
Southern Tamarack Swamp (rich)	
Surrogate Grasslands	

## Rare Species of the Five Ecological Landscapes

Numerous rare species are known from the Forest Transition, Central Sand Hills, North Central Forest, Western Coulee and Ridges, and Southeast Glacial Plains ecological landscapes. “Rare” species include all of those species that appear on the WDNR’s NHI Working List (*Wisconsin Natural Heritage Working*

List) classified as “Endangered,” “Threatened,” or “Special Concern.” Table 7 lists the number of species known to occur in each landscape based on information stored in the NHI database as of December 2012.

**Table 7.** Listing status for rare species in the five ecological landscapes (FT=Forest Transition, CSH=Central Sand Hills, NCF=North Central Forest, SGP=Southeast Glacial Plains, WCR=Western Coulee and Ridges) as of January 2013. Source is the NHI database. Listing status is based on the NHI Working List published June 2011.

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	5	5	0	5
	CSH	0	0	0	0	2	2	0	4
	NCF	0	0	0	0	1	1	0	2
	SGP	0	0	0	0	3	3	0	3
	WCR	0	0	0	0	5	5	0	5
Federally Threatened	FT	0	0	0	0	0	0	0	0
	CSH	0	0	0	0	0	0	2	2
	NCF	0	0	0	0	0	0	1	1
	SGP	0	0	0	0	0	0	2	2
	WCR	0	0	0	0	0	0	2	2
Federal Candidate	FT	0	0	0	0	0	0	0	0
	CSH	0	0	0	0	0	0	0	0
	NCF	0	0	0	0	0	0	0	0
	SGP	0	0	1	0	1	2	0	2
	WCR	0	0	1	0	0	1	0	1
State Endangered	FT	0	4	1	2	9	16	3	19
	CSH	0	6	3	1	5	15	11	41
	NCF	1	2	0	1	6	10	14	34
	SGP	0	9	6	5	11	31	11	42
	WCR	0	5	4	7	17	33	18	51
State Threatened	FT	1	6	2	4	7	20	6	26
	CSH	3	10	2	7	7	29	14	72
	NCF	3	6	2	3	4	18	13	49
	SGP	4	10	3	6	5	28	26	54
	WCR	4	9	2	8	11	34	25	59
State Special Concern	FT	2	13	1	6	25	47	20	67
	CSH	3	14	5	9	35	66	28	160
	NCF	3	15	0	3	46	67	26	160
	SGP	2	19	2	7	56	86	50	136
	WCR	5	14	11	10	90	130	65	195

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.

- Of unknown status in Wisconsin and suspected to be vulnerable.

The number of vertebrate SGCN significantly associated with each of the five ecological landscapes is shown in Table 8. See the Wisconsin Wildlife Action Plan for the individual species associated with each ecological landscape ([Wisconsin Wildlife Action Plan](#)). This means that these species are (and/or historically were) significantly associated with these ecological landscapes, and that restoration of natural communities with which these species are associated would significantly improve conditions for them.

**Table 8.** The number of vertebrate SGCN strongly associated with the five ecological landscapes.

<b>Ecological Landscape</b>	<b>Number of Vertebrate SGCN</b>
Forest Transition	32
Central Sand Hills	42
North Central Forest	36
Western Coulee and Ridges	72
Southeast Glacial Plains	62

## Description of the Study Area

### Location and Size

There are about 3220 acres of SIATA within the study area. Study acreage by county ranges from a low of 35 in Dane to over 900 in Marathon (Table 9). All acreages are based on fee simple ownership from DNR Facilities and Lands database as of January 2013; acreage may not include leases and some permanent water bodies.

**Table 9.** SIATA parcel acreage by county.

<b>County</b>	<b>Parcel</b>	<b>Acres</b>
<b>Chippewa, Group B</b>	Larrabee Lake	126
	Firth Lake	733
<b>Dane, Group F</b>	Montrose (Fahey)	35
<b>Lincoln, Group C</b>	Highway 51	213
<b>Marathon, Group D</b>	Wausau Paper 1	157
	Wausau Paper 2	757
<b>Polk, Group A</b>	Haas	200
	Hibbs	132
	Straight Lake	80
<b>Portage, Group E</b>	Llewellyn	132
<b>Waushara, Group E</b>	Maierhafer/Siler	240
	3 parcels (north to south): Motola, Mecan Springs, Fenske	419
	<b>Total</b>	3224

## Ecoregion

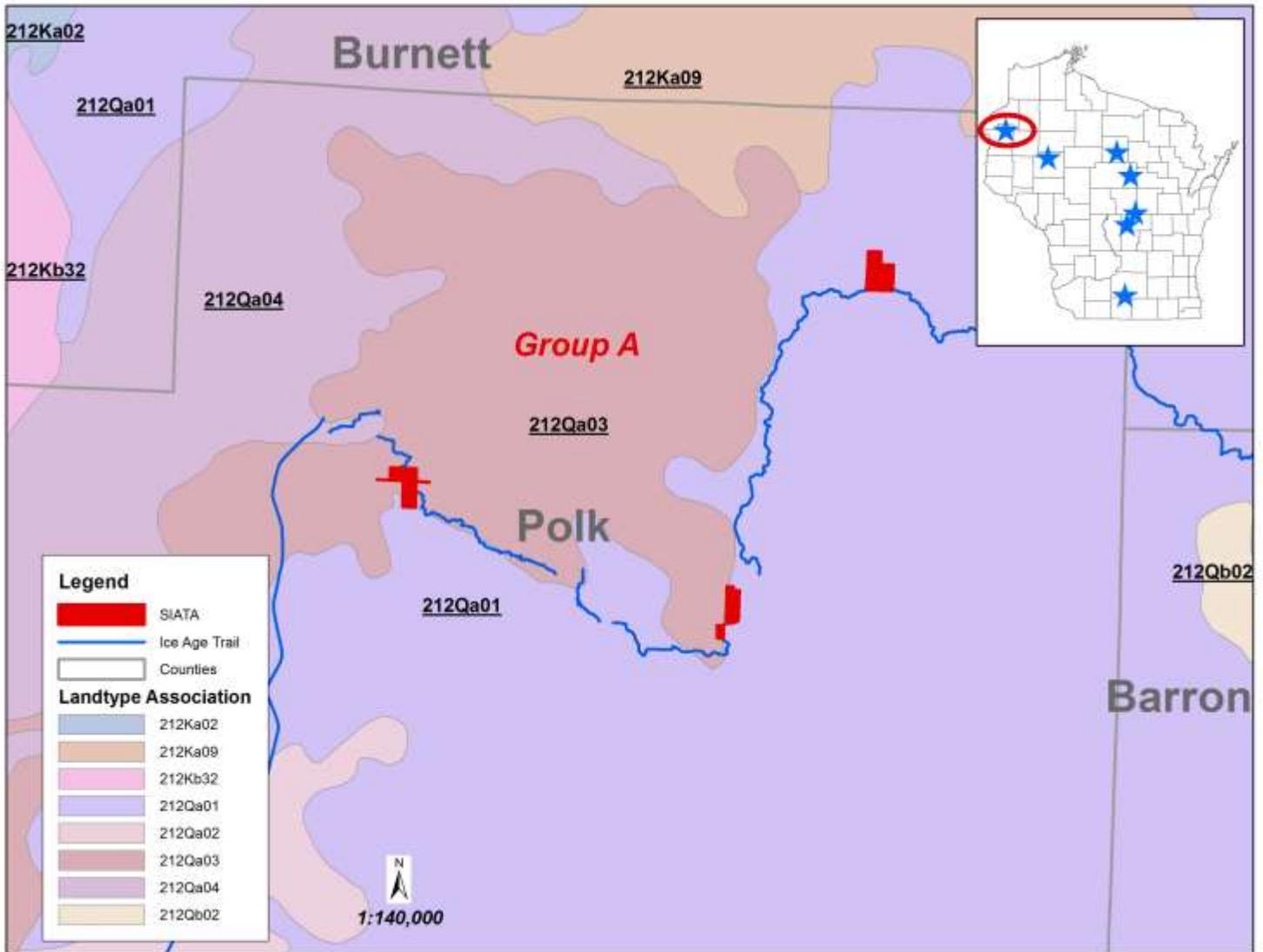
Land Type Associations (LTAs) of Wisconsin represent a finer division of the National Hierarchical Framework of Ecological Units (NHFEU; Cleland 1997). The NHFEU is a classification system that divides landscapes into ecologically significant regions at multiple scales. Ecological types are classified 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. Table 10 shows the LTAs with which each SIATA parcel is associated. Many of the parcels fall within two LTAs so a rough percentage is also provided. LTAs and property groups are shown in Figures 3a-f.

**Table 10.** SIATA parcel by Landtype Association and percentage of affiliation

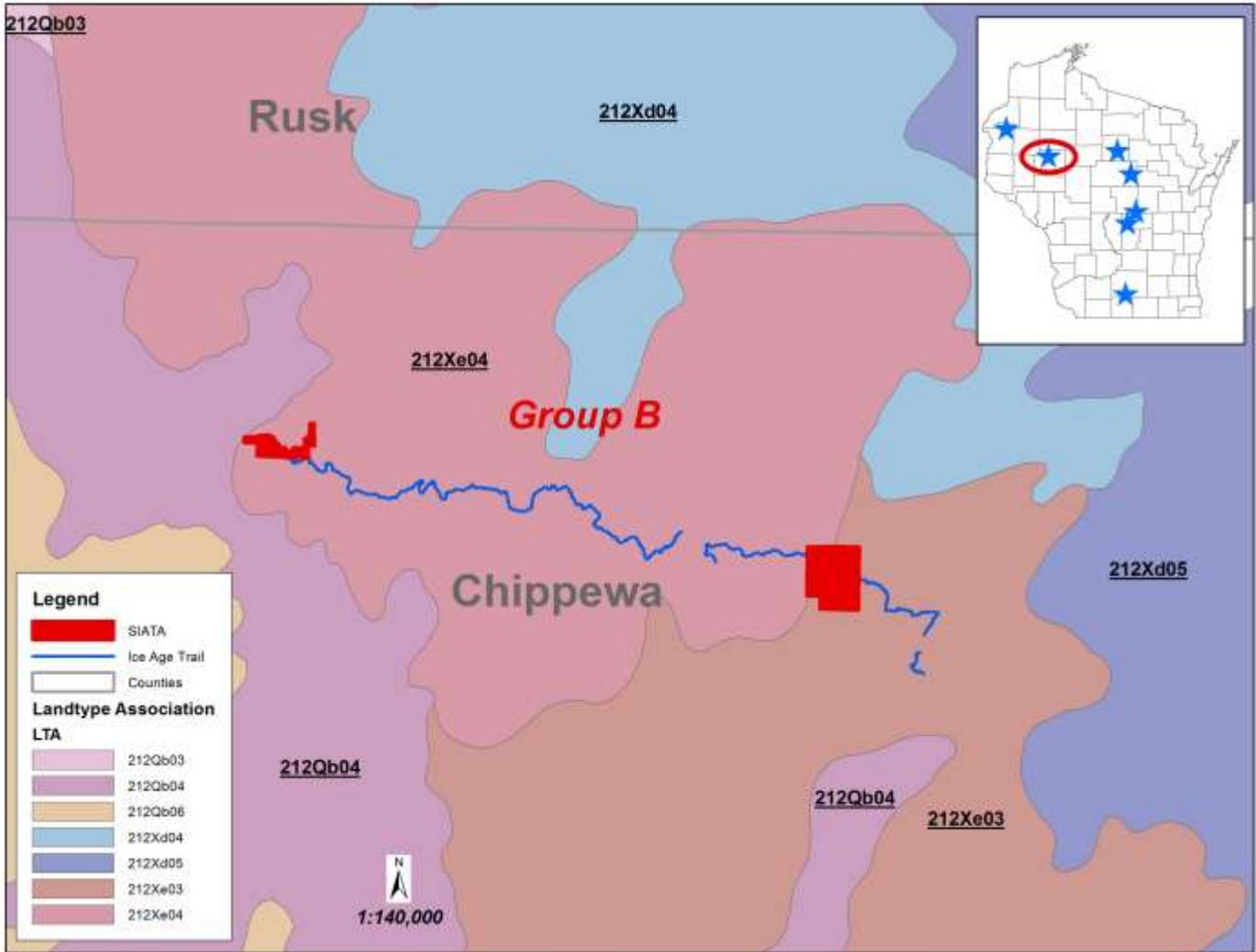
County	Parcel Name	LTA	%
<b>Chippewa, Group B</b>	Larrabee Lake	Pikes Peak Moraines, 212Jf04	50
	Larrabee Lake	Chetek Plains, 212Jg04	50
	Firth Lake	Maple Hill Moraines, 212Jf 03	75
	Firth Lake	Pikes Peak Moraines, 212Jf04	25
<b>Dane, Group F</b>	Montrose (Fahey)	Hills & Valleys--Wisconsin River Drainage, 222Lc18	90
	Montrose (Fahey)	Sugar River Valley, 222Kh02	10
<b>Lincoln, Group C</b>	Highway 51	Irma Moraines, 212Jf12	100
<b>Marathon, Group D</b>	Wausau Paper 1	Hatley Moraines, 212Jj03	75
	Wausau Paper 1	Marathon Uplands, 212Ji02	25
	Wausau Paper 2	Hatley Moraines, 212Jj03	50
	Wausau Paper 2	Marathon Uplands, 212Ji02	50
<b>Polk, Group A</b>	Haas	Lake St Croix Moraines, 212Jd01	100
	Hibbs	Lake St Croix Moraines, 212Jd01	75
	Hibbs	Polk Basalt Moraines, 212Jd05	25
	Straight Lake	Polk Basalt Moraines, 212Jd05	90
	Straight Lake	Lake St Croix Moraines, 212Jd01	10
<b>Portage, Group E</b>	Llewellyn	Arnott-Almond Moraine Complex, 222Kb01	50
	Llewellyn	Wild Rose-Wautoma Moraine Complex, 222Kb03	50
<b>Waushara, Group E</b>	Maierhafer/Siler	Coloma Plain, 222Kb04	100
	Motola, Mecan Springs	Coloma Plain, 222Kb04	100
	Fenske	Coloma Plain, 222Kb04	50
	Fenske	Buffalo Lake Outwash Channels, 222Kb05	50

**Figure 3. Landtype Associations for the study area.**

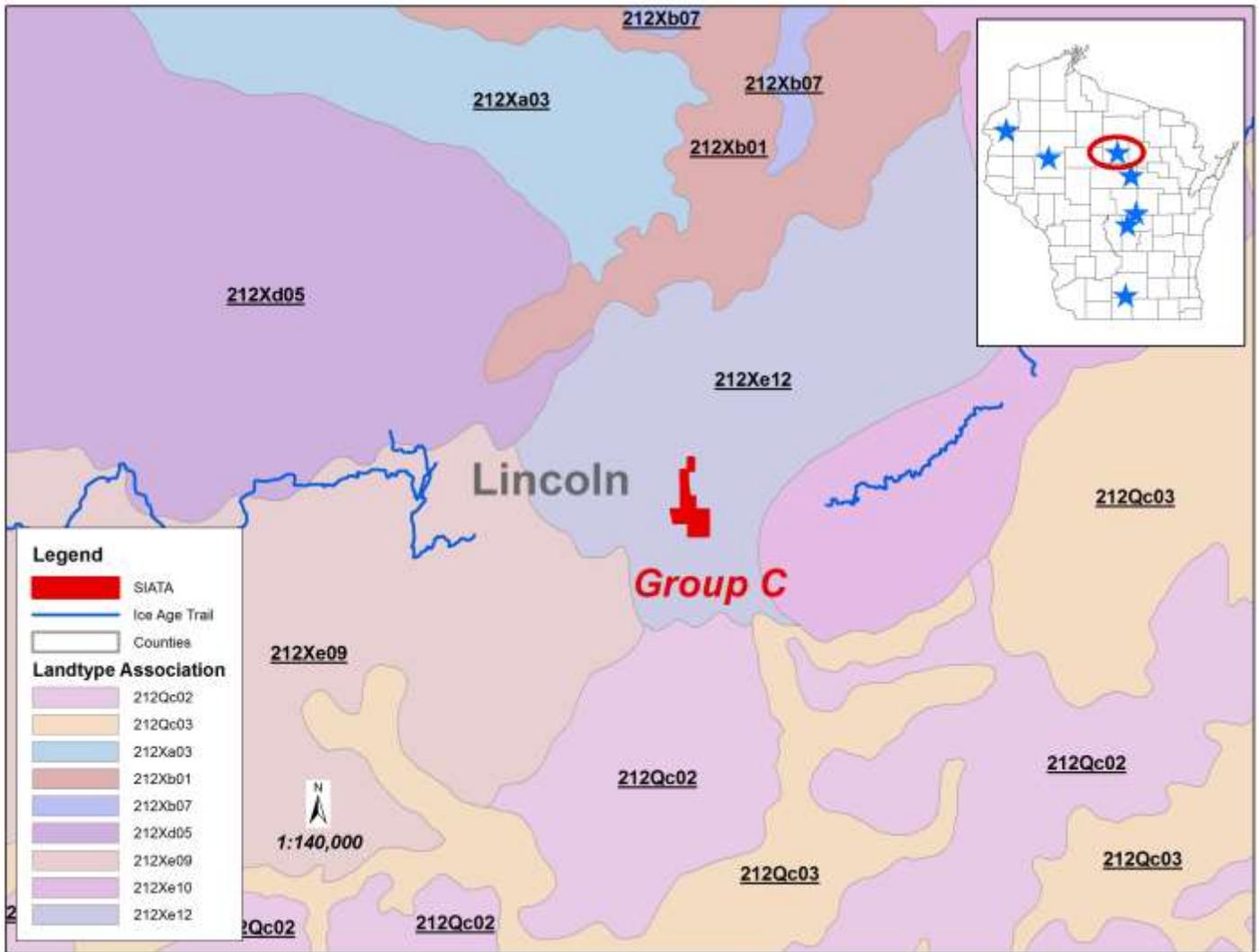
**Figure 3a.** Landtype Association and SIATA in Polk County, Property Group A.



**Figure 3b.** Landtype Association and SIATA in Chippewa County, Property Group B.



**Figure 3c.** Landtype Association and SIATA in Lincoln County, Property Group C.



**Figure 3d.** Landtype Association and SIATA in Marathon County, Property Group D.

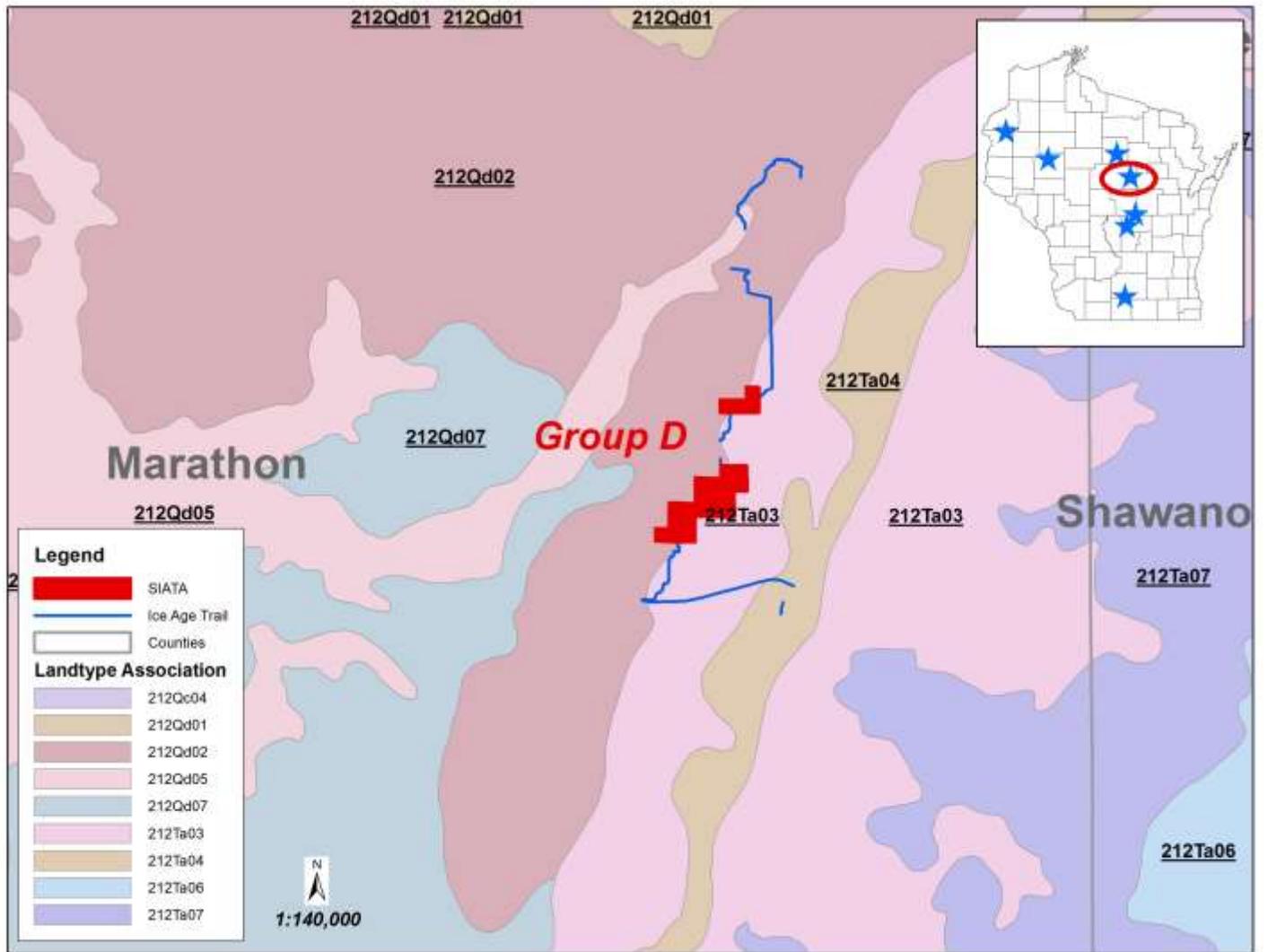
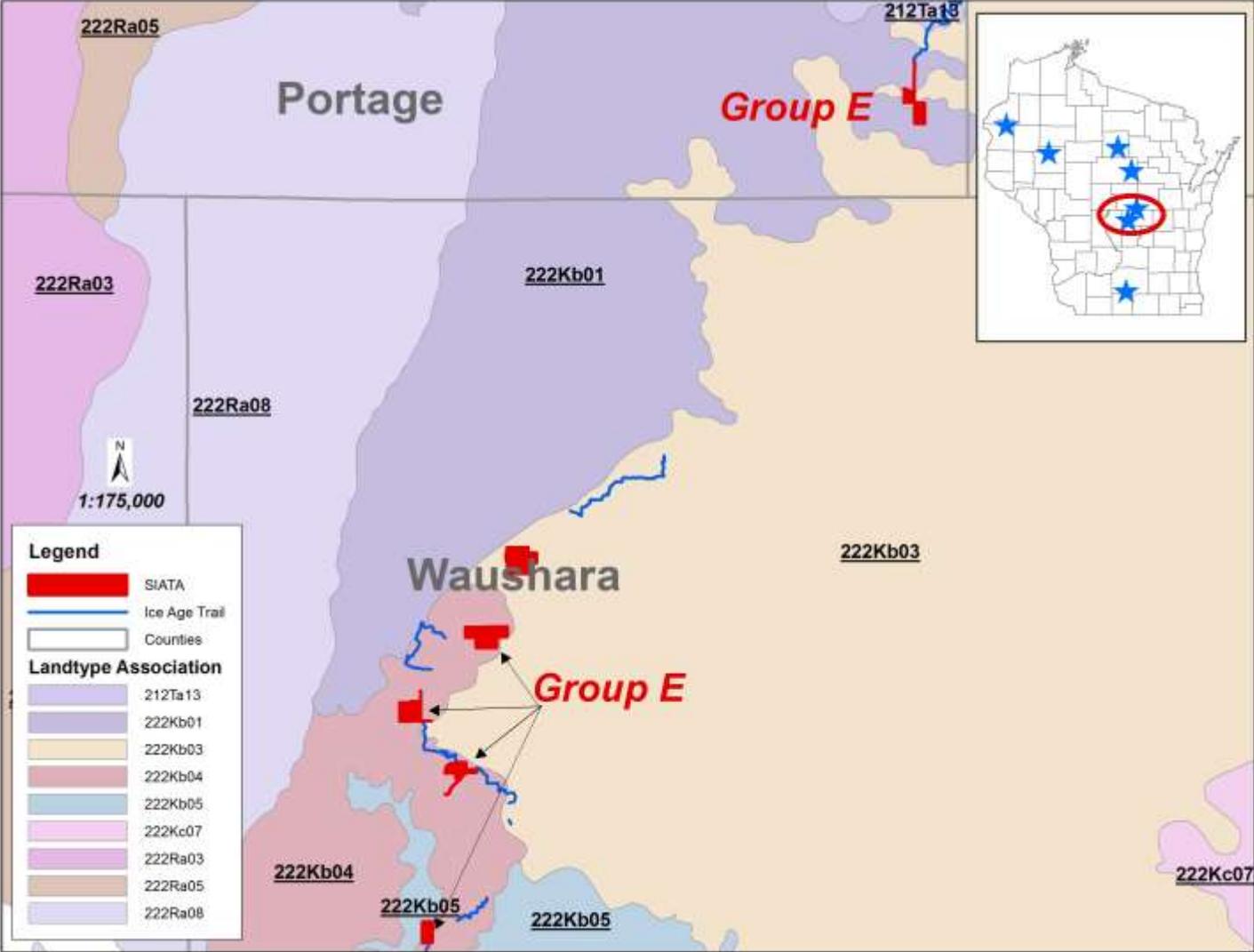
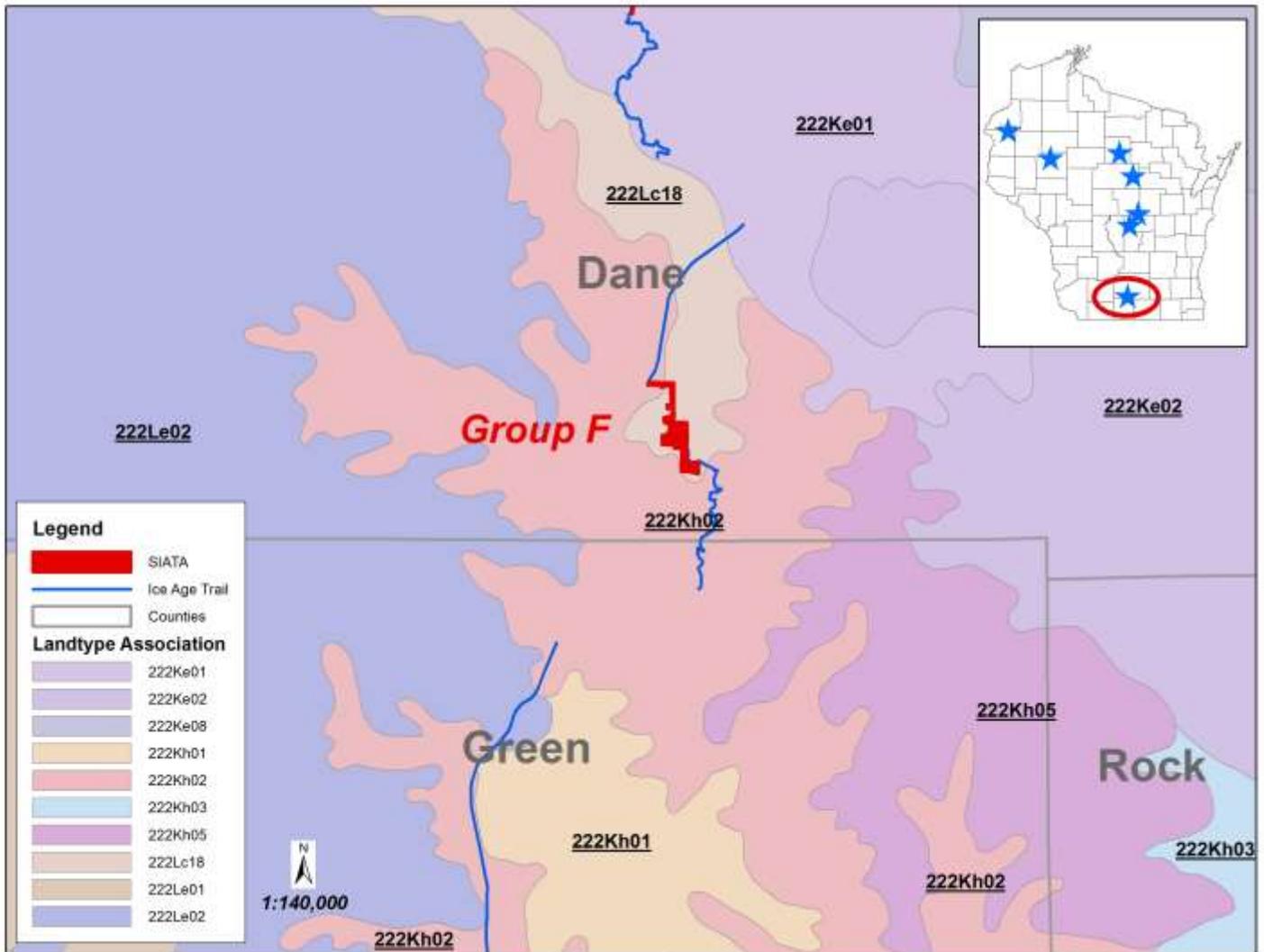


Figure 3e. Landtype Association and SIATA in Portage & Waushara Counties, Property Group E.



**Figure 3f.** Landtype Association and SIATA in Dane County, Property Group F.



Descriptions of the associated Landtype Associations, arranged alphabetically by LTA name.

**Arnott-Almond Moraine Complex (222Kb01).** The characteristic landform pattern is rolling, hummocky moraine formed from till and glacial meltwater deposition. Bedrock types are carbonates and are between 100 feet and 50 feet of the land surface. Soils are well drained, excessively drained, and somewhat excessively drained sandy and loamy soils with a loamy sand, loamy fine sand, or sandy loam surface over non-calcareous loamy sand till or drift or over sand outwash.

**Buffalo Lake Outwash Channels (222Kb05).** The characteristic landform pattern is undulating lake plain with outwash plains and hummocky moraines formed from lake, till, and glacial meltwater deposition. Bedrock is sandstone and is between 100 feet and 50 feet of the land surface. Soils are well-drained and moderately well-drained sandy, loamy, and clayey soils with a loamy fine sand, sandy loam, or silt loam surface over non-calcareous and calcareous fine sand or gravelly sand outwash or clayey lacustrine, along with very poorly drained.

**Chetek Plains (212Jg04).** 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.

**Coloma Plain (222Kb04).** The characteristic landform pattern is rolling hummocky moraine formed from till and glacial meltwater deposition. Bedrock is sandstone and is between 100 feet and 50 feet of the land surface. Soils are somewhat excessively drained, well drained, and excessively drained sandy and loamy soils with a loamy sand surface over non-calcareous and calcareous loamy sand or sand drift, sandy loam till, or non-calcareous sand outwash.

**Hatley Moraines (212Jj03).** The characteristic landform pattern is rolling collapsed moraine dissected with stream terraces. Soils are predominantly well drained sandy loam over acid loamy sand till.

**Hills & Valleys--Wisconsin River Drainage (222Lc18).** The characteristic landform pattern is hilly erosional surface formed from hillslope erosion\deposition and wind deposition. Bedrock is sandstone, and greater than 70% of the area has bedrock within 5 feet of the land surface. Soils are well drained and moderately well drained silty and loamy soils with a silt loam or sandy loam surface over non-calcareous clayey or loamy residuum or over silty loess; most areas over limestone, sandstone, or shale bedrock.

**Irma Moraines (212Jf12).** The characteristic landform pattern is rolling collapsed moraine. Soils are predominantly well drained sandy loam over acid loamy sand till.

**Lake St Croix Moraines (212Jd01).** The characteristic landform pattern is rolling collapsed moraine interlaced with outwash terraces and intermixed with ice-walled lake plains. Soils are predominantly moderately well drained sandy loam over dense, acid sandy loam till.

**Maple Hill Moraines (212Jf03).** The characteristic landform pattern is undulating and rolling collapsed moraine complex. Soils are predominantly moderately well drained silt loam over dense, acid sandy loam till.

**Marathon Uplands (212Ji02).** The characteristic landform pattern is rolling bedrock-controlled erosional surface. Soils are predominantly well drained silt loam over acid loam till, loamy residuum, or igneous/metamorphic bedrock.

**Pikes Peak Moraines (212Jf04).** The characteristic landform pattern is hilly collapsed moraine. Soils are predominantly well drained sandy loam over dense, acid sandy loam till.

**Polk Basalt Moraines (212Jd05).** The characteristic landform pattern is undulating rolling collapsed moraines intermixed with ice-walled lake plains, bedrock knolls and ridges. Soils are predominantly well drained sandy loam over dense, acid sandy loam till or igneous/metamorphic bedrock.

**Sugar River Valley (222Kh02).** The characteristic landform pattern is undulating valley floor with floodplains, terraces, beaches, lake plains, and scattered bedrock knolls. Soils are predominantly well drained loam and silt over gravelly sandy outwash, silty alluvium, silty and clayey lacustrine, or silty loess.

**Wild Rose-Wautoma Moraine Complex (222Kb03).** The characteristic landform pattern is rolling, drumlin and hummocky moraine and outwash terrace complex formed from till and glacial meltwater deposition. Bedrock is sandstone and is between 100 feet and 50 feet of the land surface. Soils are excessively drained, well drained, and poorly drained sandy soils with a loamy sand or muck surface over

non-calcareous sand outwash or sandy loam or loamy sand till or drift, along with very poorly drained nonacid organic soils.

## Physical Environment

### Geology and Glaciation

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

Much of the Ice Age Trail follows the outermost end moraine that formed mostly between 26,000 and 20,000 calendar years ago. The Polk County SIATA (property group A) were affected by the Lake Superior Lobe. The Haas parcel has a mix of rolling till surface, high relief hummocky terrain, and kettles. Straight Lake is characterized by rolling till topography with Precambrian basalt bedrock close to the surface. The geologic formation at the Hibbs tract is high relief hummocky topography; note that the Ice Age Trail on this parcel follows the edge of an ice-walled lake plain. Cambrian System sandstone with some dolomite (dolostone) and shale is the primary bedrock for the Haas and Hibbs tracts.

Larrabee Lake and Firth Lake (property group B, Chippewa County) formed in the Chippewa Moraine on the western edge of the Chippewa Lobe. Larrabee Lake is high relief hummocky topography with numerous kettles. The landforms at Firth Lake are more complex. Firth Lake itself is a shallow kettle that is partly filled with peat. South of the lake is glacial outwash. To the east is low relief hummocky topography with high relief hummocky topography to the west of the lake. Cambrian System sandstone with some dolomite and shale is the primary bedrock for both of these properties.

Highway 51 (planning group C, Lincoln County) is located between the western edge of the Harrison Moraine and the eastern edge of the Wood Lake Moraine, both part of the Wisconsin Valley Lobe. The landform is, in part, high relief hummocky topography. The uppermost layer of bedrock is Precambrian igneous and metamorphic rock that was formed during volcanic activity that occurred over 1 billion years ago.

Wausau Paper 1 and 2 (planning group D, Marathon County) were on the western edge of the Green Bay Lobe on the Hancock Moraine. It has hummocky topography with some ice-walled lake plains. Boulders of Wolf River granite are abundant. The uppermost layer of bedrock is Precambrian igneous and metamorphic rock that was formed during volcanic activity that occurred over 1 billion years ago.

The Llewellyn (Portage County) and Waushara County SIATA (planning group E) are all on the western edge of the Green Bay Lobe. From north to south, Llewellyn is on a series of steps of outwash heads that formed from sand and gravel deposited in braided rivers flowing mostly southward along and on top of the ice margin. Maierhafer/Siler SIATA consists of pitted outwash. The Motola tract is pitted outwash between the Almond and Elderon ice margins. Mecan Springs parcel lays crosswise on the Elderon phase ice margin. Here the Ice Age Trail crosses pitted outwash. The Fenske tract is also on pitted outwash; it is near the eastern edge of the end moraine. Cambrian System sandstone with some dolomite and shale is the primary bedrock for all of these SIATA parcels.

The Montrose (Fahey) tract (planning group F, Dane County) is near the southern edge of the Green Bay Lobe and is on glaciated bedrock hills. The Johnstown Moraine is just to the northeast. In a few places the ice may have extended further than the Johnstown Moraine and then retreated to build the moraine. This site is underlain by Ordovician orthoquartzitic sandstone with minor amounts of limestone, shale, and conglomerate.

## Soils

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

The proportion of upland and hydric soils varies across the SIATA in this study. Specific soil types in each property group can be found in Appendix H. Hydric soils are an important component of the three parcels comprising property group A (Polk County), with about 25% coverage. Many of the hydric soils are mucks; there are also inclusions of hydric soils in depressions, drainage-ways, and, in some soils, on moraines. Examples of hydric inclusions include Adolph silt loam and Barronett silt loam. Roughly 75% of the site is covered by an admixture of upland silt loams, sandy loams, loamy sands, and loam with slopes ranging from 0 to 35%. Less than 1% of the properties within this group are classified as water.

Hydric soils have significant coverage in Chippewa County (property group B) too. At Larrabee Lake, about one-third 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%. The Firth Lake property is more complex; roughly 60% are silt loam, sandy loam, and loamy sand upland soils with slopes from 0 to 25%. The hydric muck and peat soils cover about 30% of the site. There are inclusions of hydric soils in depressions and drainage-ways in some of the silt loam and sandy loam soils such as Almena silt loam and Compstock silt loam. The balance (about 10%) is water.

The majority of the Highway 51 SIATA (property group C, Lincoln County), about 90% is covered by upland soils of silt loam and sandy loam with slopes of 0 to 35%. Hydric soils, all mucks, cover the remaining 10%. Hydric soils are also found in depressions and drainage-ways for some soils such as Ossmer silt loam and Comstock silt loam.

About 90% of the soils on Wausau Paper 1 and 2 (property group D, Marathon County) are associated with uplands and consist of cobbly silt loam, silt loam, sandy loam, loamy sand, and loam. Hydric soils (about 10% of the SIATA) are mostly mucks with inclusions of hydric soils in drainage-ways elsewhere on the two sites.

Property group E consists of five parcels in Portage and Waushara counties. Soils on the Llewellyn tract in Portage County are upland types (93%) of loamy sand, loam, and sandy loam. Hydric soils cover the remainder of the site and are dominated by muck. Depressions in Leola loamy sand and Oesterle loam hold hydric soils. All of the soils at sites in Waushara County are upland with a mixture of loamy sand, sand, and fine sandy loam.

The soils of the Montrose (Fahey) SIATA (property group F, Dane County) are upland and a mix of silt loam, sandy loam, and a small amount of loam.

## Hydrology

*Main reference: Water resources, WDNR 2011b.*

Areal coverage of wetlands, streams, lakes, and ponds varies quite a bit on the SIATA in this study. In Polk County (property group A), the Haas tract is bisected, north to south, by Gillespie Creek which is a Cool (Cold Transition) Headwater and is a tributary to the Clam River. There are also unnamed tributaries to Gillespie Creek. While no ponds or lakes are the parcel proper, there is an unnamed pond on the northern edge of the Haas tract. The Straight Lake SIATA contains several unnamed ponds, some of which have been affected by beavers. This parcel is the headwaters of North Branch Trade River which is classified as Cool (Cold Transition) Headwater and is a Class II trout stream. There are no

streams on the Hibbs parcel. The only surface water is an unnamed pond in that is partly within the property boundary in the northeast corner.

The largest, named lakes within this study area are on the SIATA in Chippewa County (property group B). The Larrabee Lake site 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 extensive wetlands on the site which lacks streams.

Firth Lake is the centerpiece of the Firth Lake tract. Firth Lake is a 51-acre soft-water, seepage lake drained by a small feeder stream to Bob Creek. The lake outlet has a four foot high beaver dam that has elevated lake levels. The lake has a diverse assemblage of emergent and submerged aquatic vegetation. Its fish population consists of northern pike, largemouth bass and slow growing pan fish. The encroaching cattail shore line provides habitat for muskrat and nesting Mallards, Blue-winged Teal, Wood Ducks, and mergansers. The feeder to Bob Creek is Firth Lake Outlet Creek which is a Cool (Warm Transition) Headwater stream. There are also two small unnamed ponds on the property that may have originated from beaver activity.

The Highway 51 SIATA (Lincoln County, property group C) has no significant hydrologic resources. One corner in the west-central part of the property is bisected by Little Hay Meadow Creek which is a Cool (Warm Transition) Mainstem and is a Class II trout stream. Wetlands cover roughly a quarter of the tract.

The two SIATA, Wausau 1 and 2, in Marathon County (property group D), have unnamed tributaries that flow westward into Mole Brook. Mole Brook is a Class I trout stream that is listed as an Exceptional Resource Water. It is classified as a Cool (Cold Transition) Headwater and feeds into the Eau Claire River. The Wausau 2 tract also has an unnamed tributary that flows east into the Plover River. The tributary is also a Class 1 trout stream and an Exceptional Resource Water. It is classified as a Cool (Cold Transition) Headwater. There are at least five unnamed small ponds on Wausau 2. Wetlands on these properties are a relatively small but potentially important component of biological diversity, especially on Wausau 2.

Of the five tracts within planning group E (Portage and Waushara counties), only one has a direct hydrologic connection. The Llewellyn SIATA is bisected by Murry Creek (aka North Fork Radley Creek) and is close to the headwaters of that stream. Murry Creek is classified as Cool (Cold Transition) Headwater, Cold Headwater. It is a Class I trout stream and is listed as an Exceptional Resource Water. Wetlands are present but limited on Llewellyn. While the remaining four tracts have no direct hydrologic connections or wetlands, the Mekan Springs SIATA is less than 150m from Mekan Springs and the Mekan River.

The Montrose (Fahey) tract (Dane County, property group F) does not have any direct hydrologic connections or wetlands. A small, unnamed tributary to the Sugar River is just to the west of the parcel.

# Vegetation

## Historical Vegetation

There is value in determining the nature of a site's vegetation before 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 In prep. a). Public Land Surveys for the area comprising SIATA were conducted mostly between 1847 and 1857, although Dane County was surveyed between 1832 and 1835.

The early vegetation of Wisconsin was mapped by Finley (1976) using surveyors' notes and maps from the original Public Land Survey. The early vegetation of the property groups are shown in Figures 4a-f. Based on Finley's map, as might be expected with the distribution of SIATA over multiple ecological landscapes in this study, there was a wide range of early vegetation. The Hobbs and Straight Lake parcels in Polk County, Highway 51 in Lincoln County, and Wausau 1 and 2 in Marathon County in Lincoln and Marathon counties were dominated by northern mesic forests of hemlock, sugar maple, yellow birch, and white and red pine. The Haas tract in Polk County was predominately white and red pine. In Chippewa County, Larrabee Lake had a mix of swamp conifers and upland oak (white, black, and bur) whereas Firth Lake was mostly white and red pine with some northern mesic forest. The remaining SIATA in Portage, Waushara, and Dane counties were dominated by oak forests (white, black, and bur) and oak openings (bur, white, and black), except for Maierhafer/Siler (Waushara County) which was covered by brush.

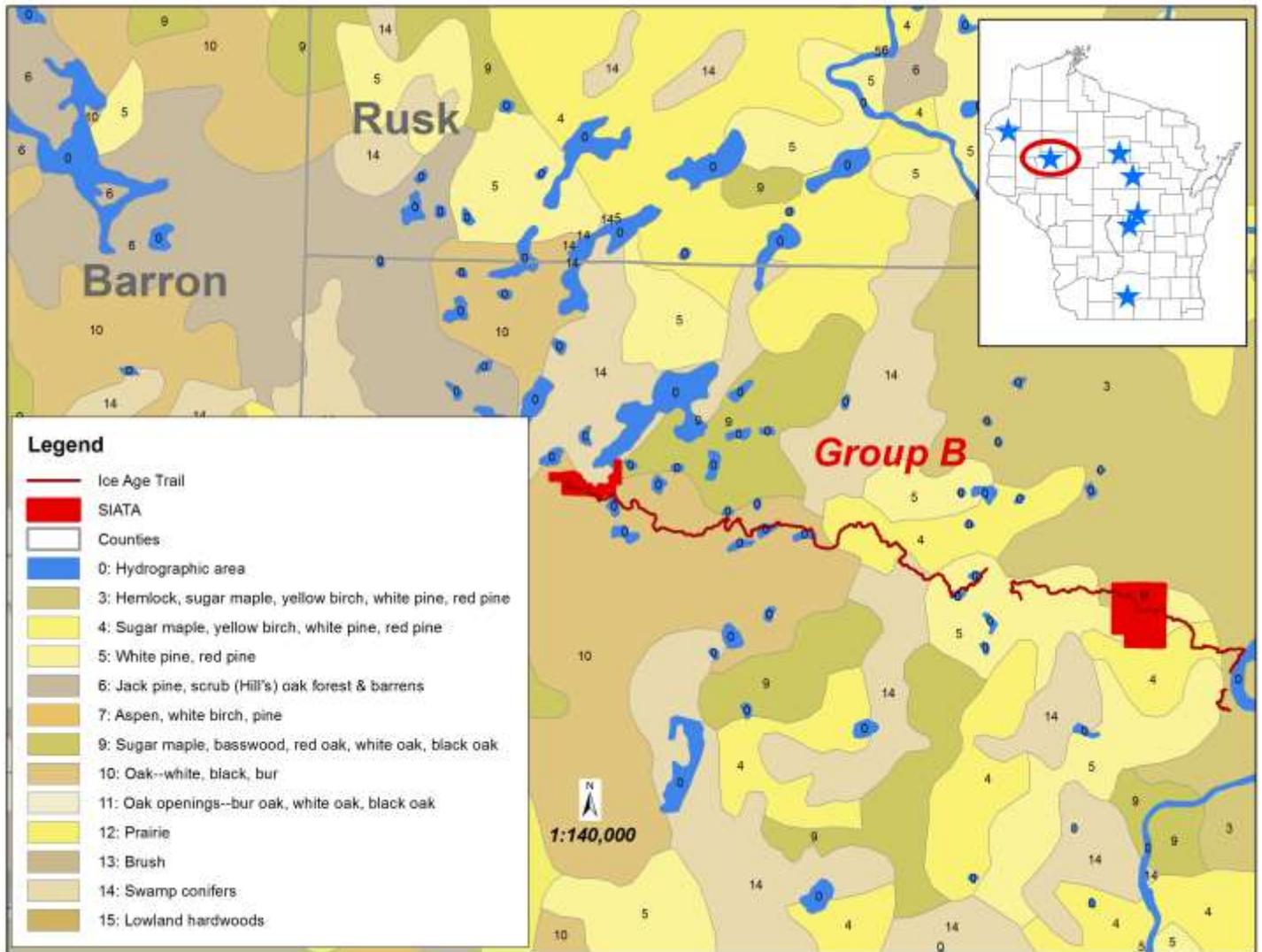
## Current Vegetation

Current vegetation of the SIATA has been influenced by many historical factors including logging in the mid- to late-1800s, homesteading and farming attempts, invasive species, 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.

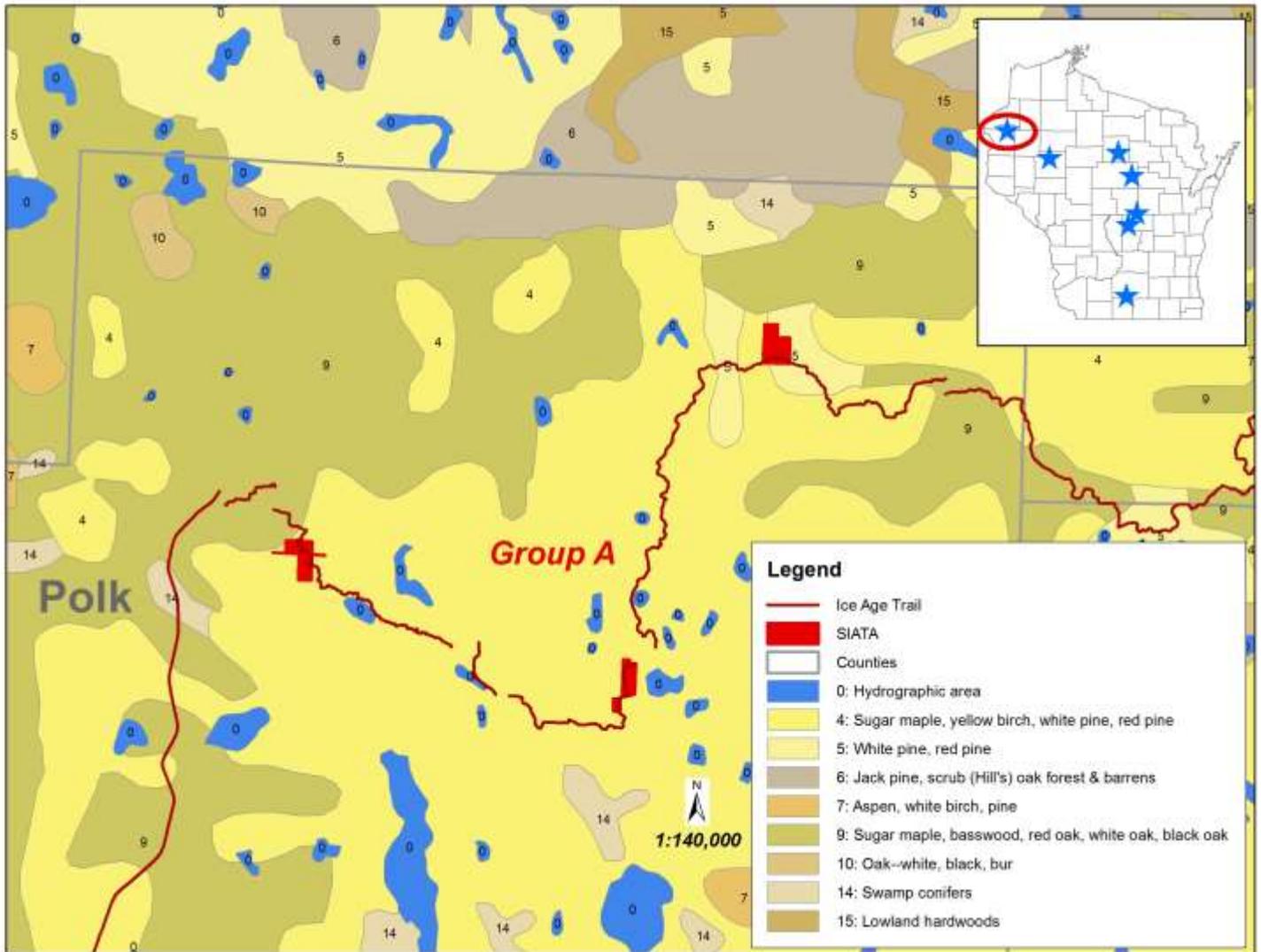
The vegetation surrounding each property varies across the study area (Figure 5a-f). SIATA in Polk County (property group A) is in a matrix of deciduous forest and agriculture with scattered lakes and streams. There are a few small cities and villages but no large urban areas.

The tracts in Chippewa County (group B) are within a larger block of forest, including the Chippewa County Forest and the Chippewa Moraine State Recreation Area, but are near the edge of extensive agriculture. There are also many, often small, lakes. Firth Lake is close to the Chippewa River. 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.

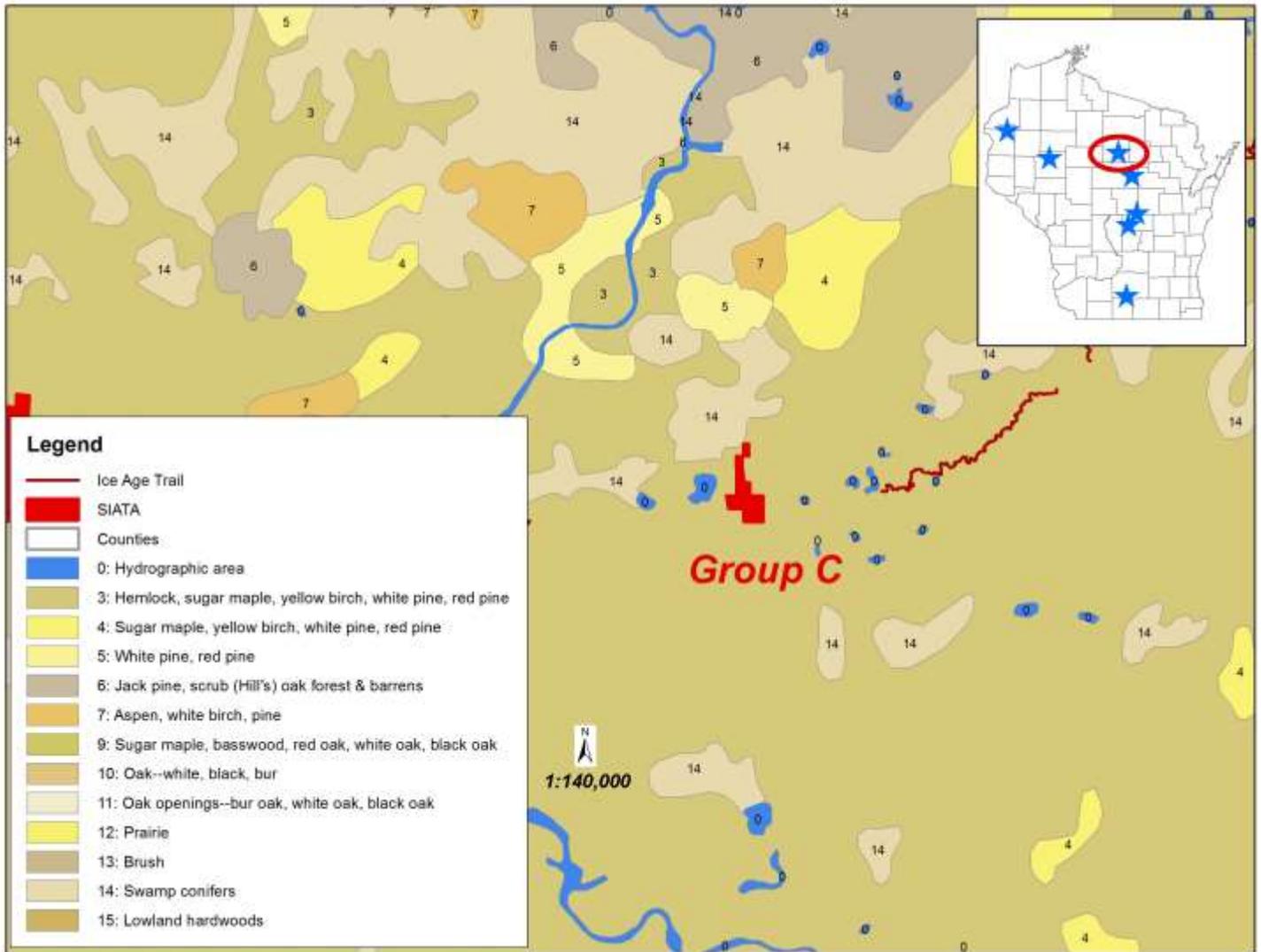
**Figure 4.** Vegetation of the SIATA in the study area prior to Euro-American settlement (Finley 1976).  
**Figure 4a.** Early vegetation in Polk County, Property Group A



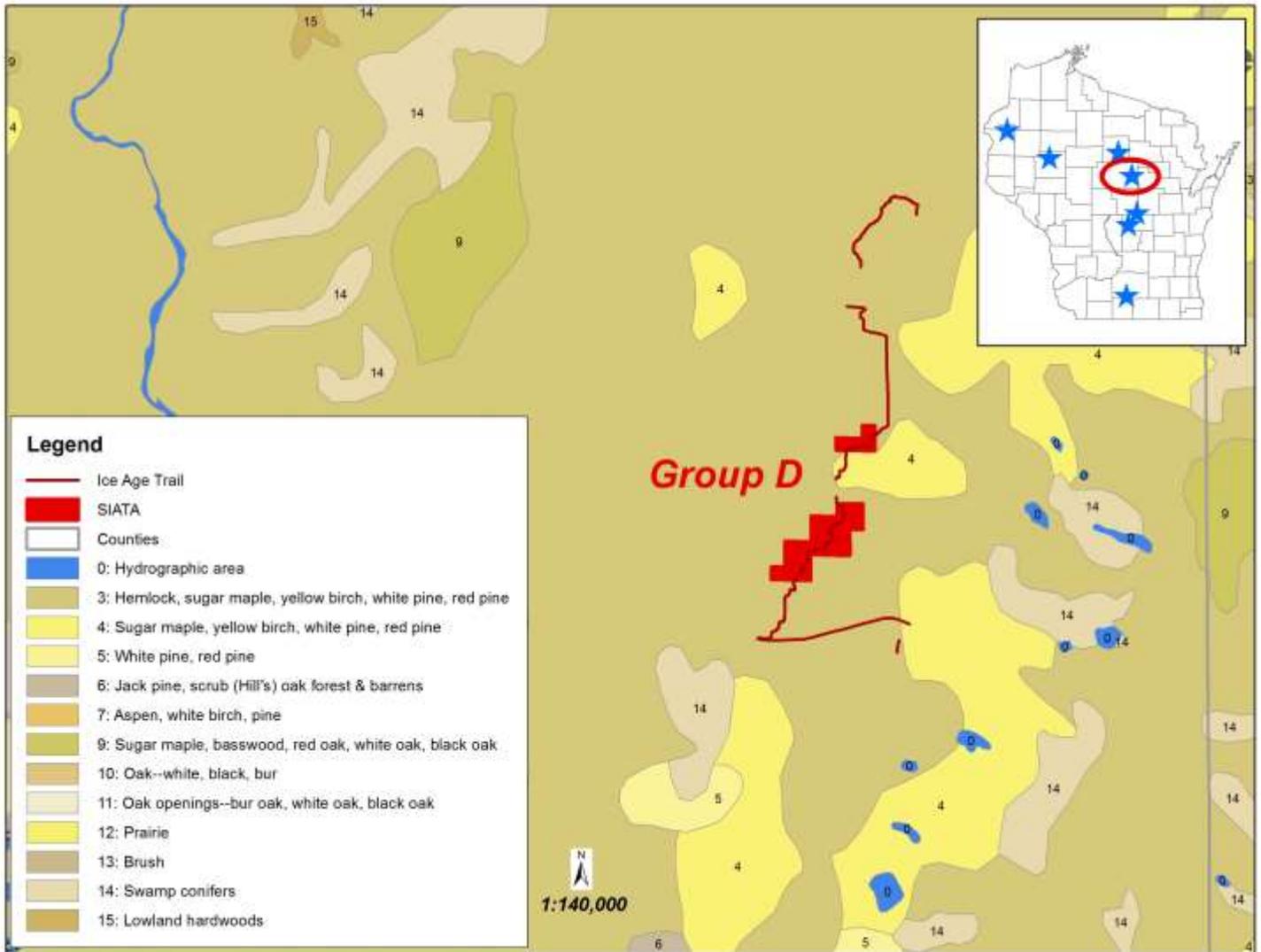
**Figure 4b.** Early vegetation in Chippewa County, Property Group B



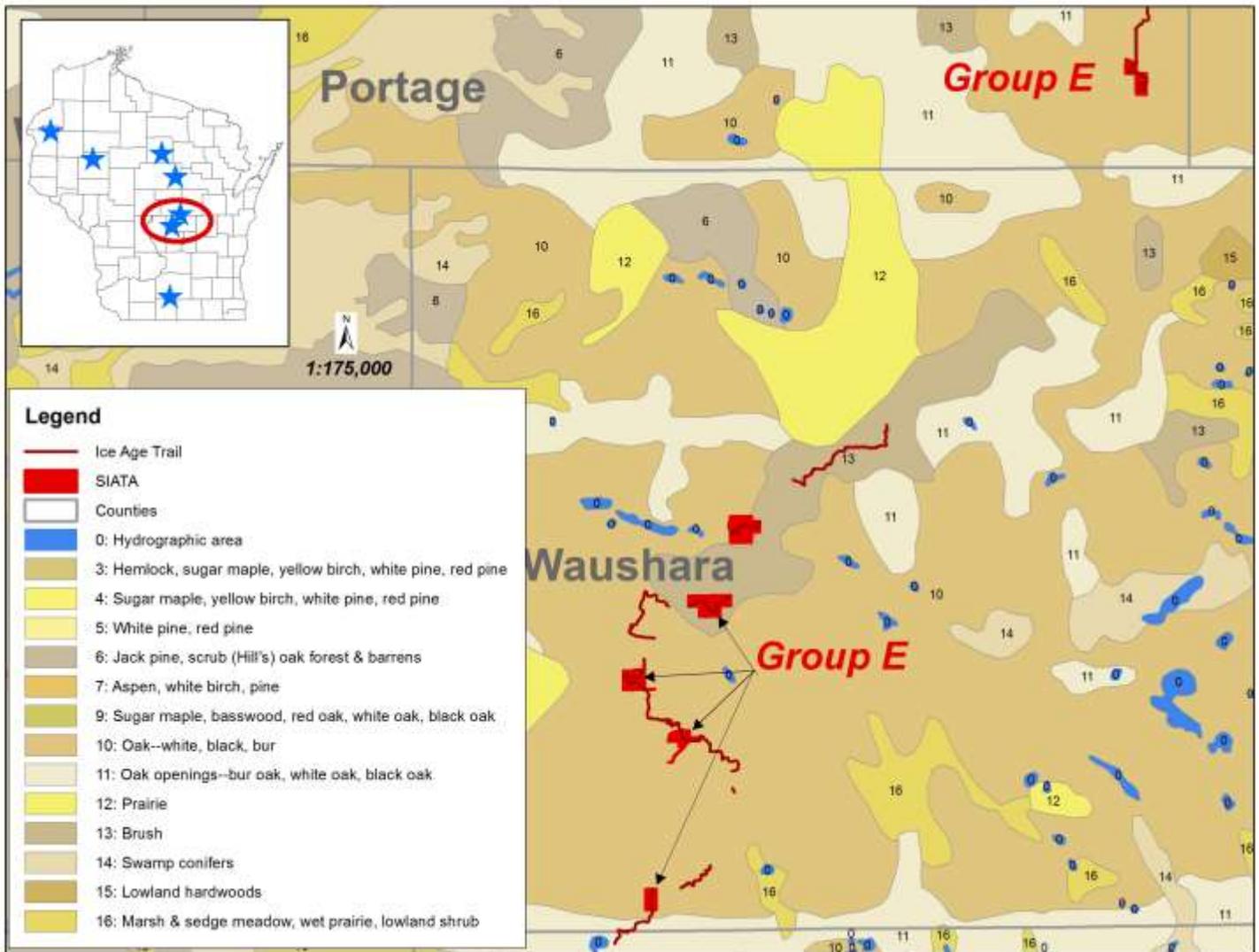
**Figure 4c.** Early vegetation in Lincoln County, Property Group C



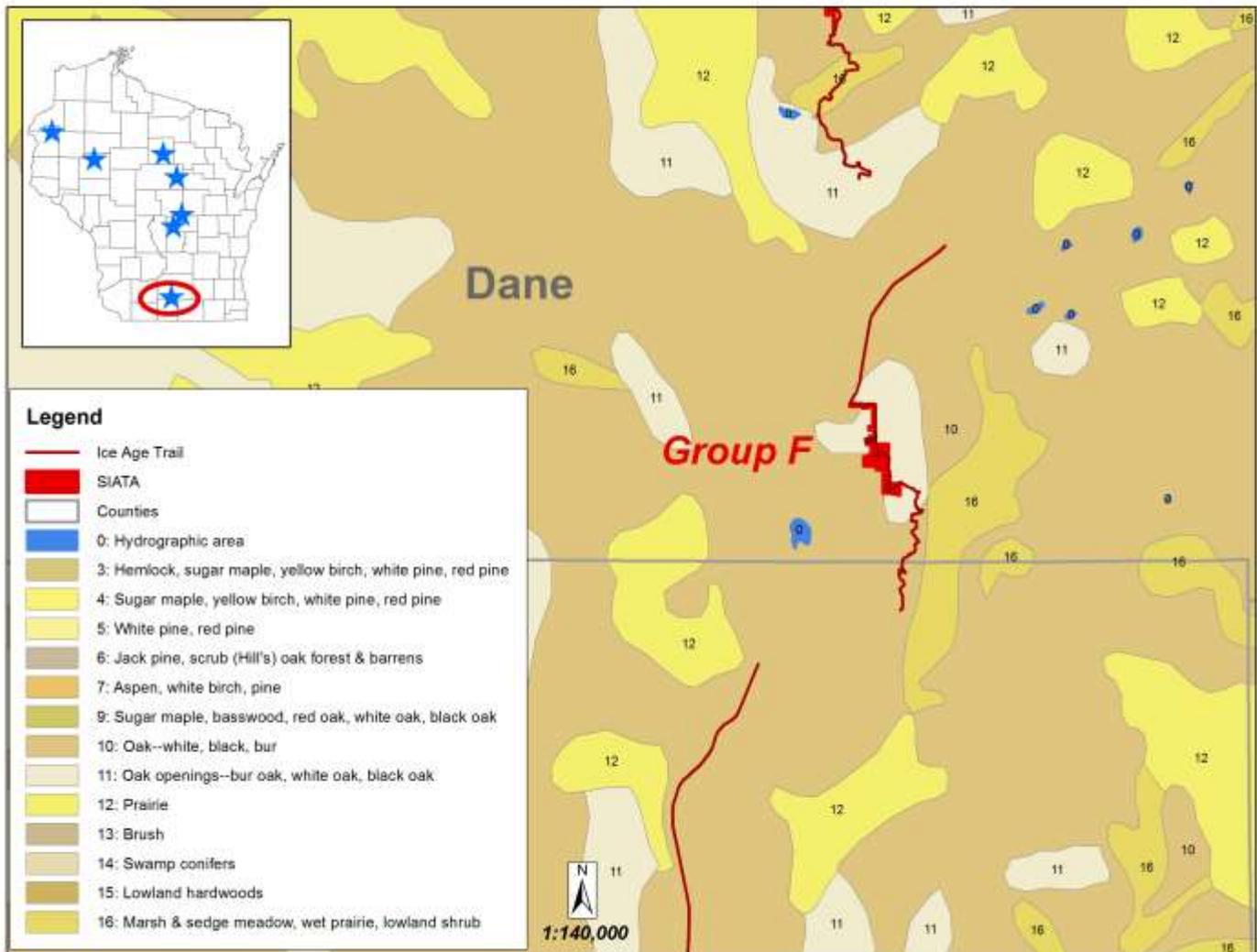
**Figure 4d.** Early vegetation in Marathon County, Property Group D



**Figure 4c.** Early vegetation in Portage & Waushara Counties, Property Group E



**Figure 4f.** Early vegetation in Dane County, Property Group F



The parcel in Lincoln County (group C) is in a largely forested block with limited agriculture. Wetlands are common with scattered streams and lakes; the Wisconsin River is just to the west. Merrill is several miles to the south and Irma just to the north, otherwise urbanization is limited with scattered homes and cabins.

Wausau 1 and 2, in Marathon County (group D), are embedded in a mix of forest, agriculture, and wetlands. The Eau Claire and Plover rivers are nearby; other streams and small lakes are in the vicinity. The Wausau metropolitan area is within several miles to the west of these tracts.

The sites in Portage and Waushara counties (group E) are in a mosaic of grasslands, agriculture, deciduous forests, and conifer plantations. There are few lakes, streams, and wetlands. The cities of Waupaca and Wautoma are in the vicinity. Homes are scattered in the landscape.

The Montrose (Fahey) parcel in Dane County (group F) lies in a highly agricultural landscape with scattered wood lots and wetlands. These wetlands are mostly associated with streams, one of which is

the Sugar River. With Belleville just to the southwest and Madison to the northeast, there is increasing pressure from development of suburban and rural residences.

Within the SIATA study area are numerous upland and wetland natural community types (Figure 5a-f). 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 Muskeg, Northern Wet Forest, Tamarack (Poor) Swamp, and Northern Hardwood Swamp. Uplands include Northern Mesic Forest, Northern Dry-mesic Forest, Northern Dry Forest, Southern Dry-mesic Forest, Southern Dry Forest, Oak Opening, Oak Barrens, Dry Prairie, and Surrogate Grassland. Conifer plantations (red pine, white pine, jack pine, white spruce) are also present. Current vegetation for each property is described in greater detail below, organized by property group and county.

## Property Level Current Vegetation

### Polk County (Property group A)

The Haas tract has a mix of Southern Dry and Dry-mesic Forest, Northern Sedge Meadow, and Alder Thicket. Conifer plantations are also present. The highest quality communities are Southern Dry Forest in the southeastern third of the site and Northern Sedge Meadow and Alder Thicket on the north end. Although these natural communities are of fair to good quality, they did not meet the element occurrence standards and hence were not entered into the NHI database. The parcel is bisected, north to south, by Gillespie Creek which is a Cool (Cold-Transition) Headwater.

Southern Dry Forest covers about 83 acres on a gentle, primarily west-facing slope east of Gillespie Creek. The mostly closed canopy is dominated by mostly pole-sized white, bur, and red oak (*Quercus alba*, *Q. macrocarpa*, and *Q. rubra*) and aspen (*Populus tremuloides* and *P. grandidentata*). The moderate coverage subcanopy is dominated by red maple (*Acer rubrum*), musclemwood (*Carpinus caroliniana*), and elm (*Ulmus* spp), with lesser amounts of green ash (*Fraxinus pennsylvanica*) and aspen present. Red maple and ash seedlings along with pagoda dogwood (*Cornus alternifolia*) dominate the shrub layer. Big-leaved aster (*Aster macrophyllus*) and Pennsylvania sedge (*Carex pennsylvanica*) are the most common species in the ground flora. Southern Dry Forest grades to the north and west into low quality Southern Dry-mesic Forest, which is in the early stages of recovering from timber harvest.

The Southern Dry-mesic Forest is dominated by white oak, red oak, and aspen with 85-90% canopy closure. A subcanopy of red maple and ash has variable cover, ranging from 50-75%. The shrub layer supports many red maple and green ash saplings and seedlings. The ground flora includes blue-bead lily (*Clintonia borealis*), early meadow rue (*Thalictrum dioicum*), northern maidenhair fern (*Adiantum pedatum*), and intermediate wood fern (*Dryopteris intermedia*).

A 25-acre Northern Sedge Meadow occupies the northern end of the tract. The community is mostly open and fairly monotypic, with lake sedge (*Carex lacustris*) dominating. Cattails (*Typha* spp) and white meadowsweet (*Spiraea alba*) are occasional. Alder Thicket is associated with Northern Sedge Meadow as are a series of small ponds near the northern boundary of the tract.

Gillespie Creek and its tributaries and associated wetlands combine with the upland forests to create a variety of habitats for birds and other wildlife. The oak forest connects disjunct county forest parcels to create a larger block of forest, providing important habitat for forest interior birds like Wood Thrush and Cerulean Warbler. 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 5.** Land cover for SIATA Planning Group from the WISCLAND GIS coverage (WDNR 1993).  
**Figure 5a.** Current vegetation in Polk County, property group A.

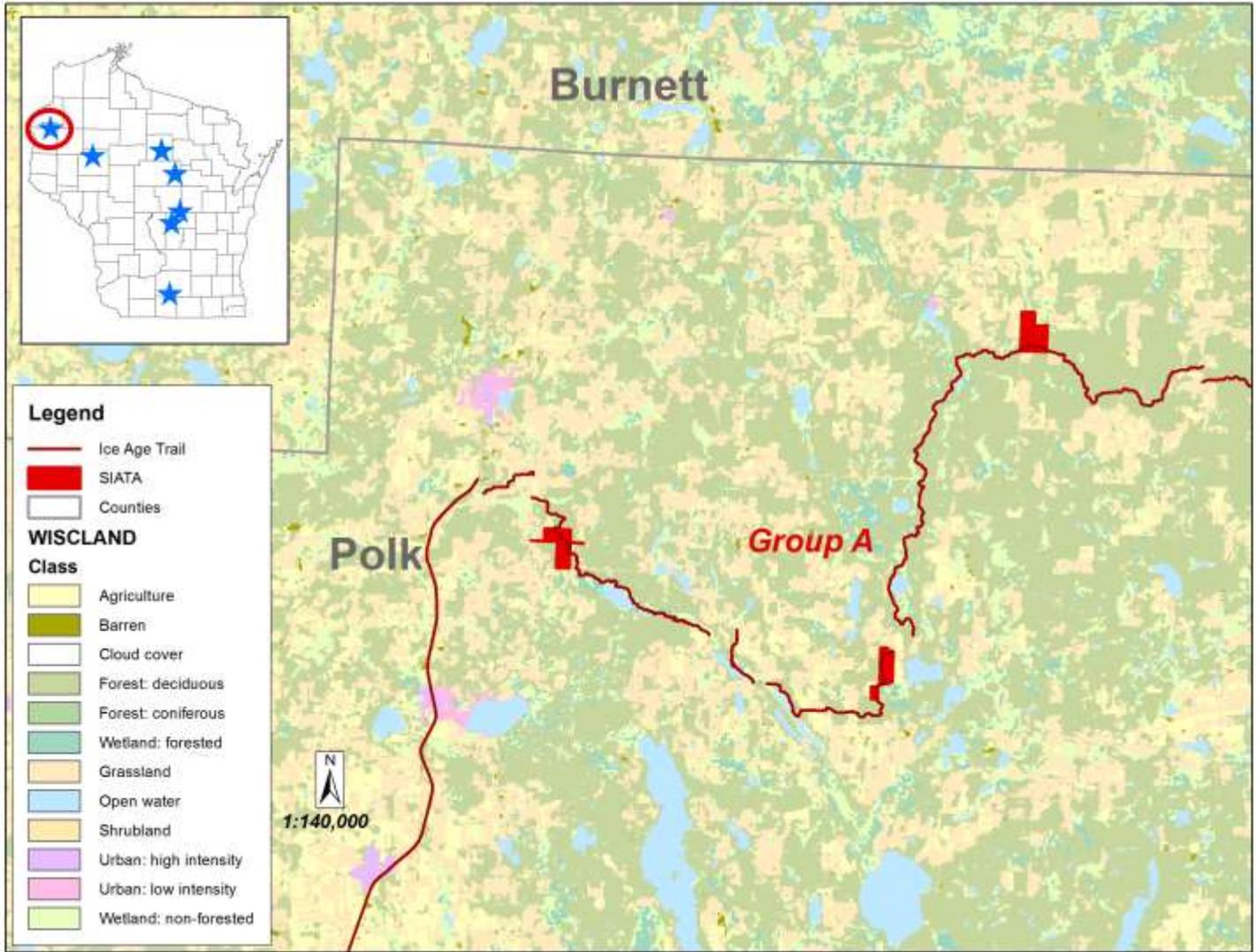


Figure 5b. Current vegetation in Chippewa County, property group B.

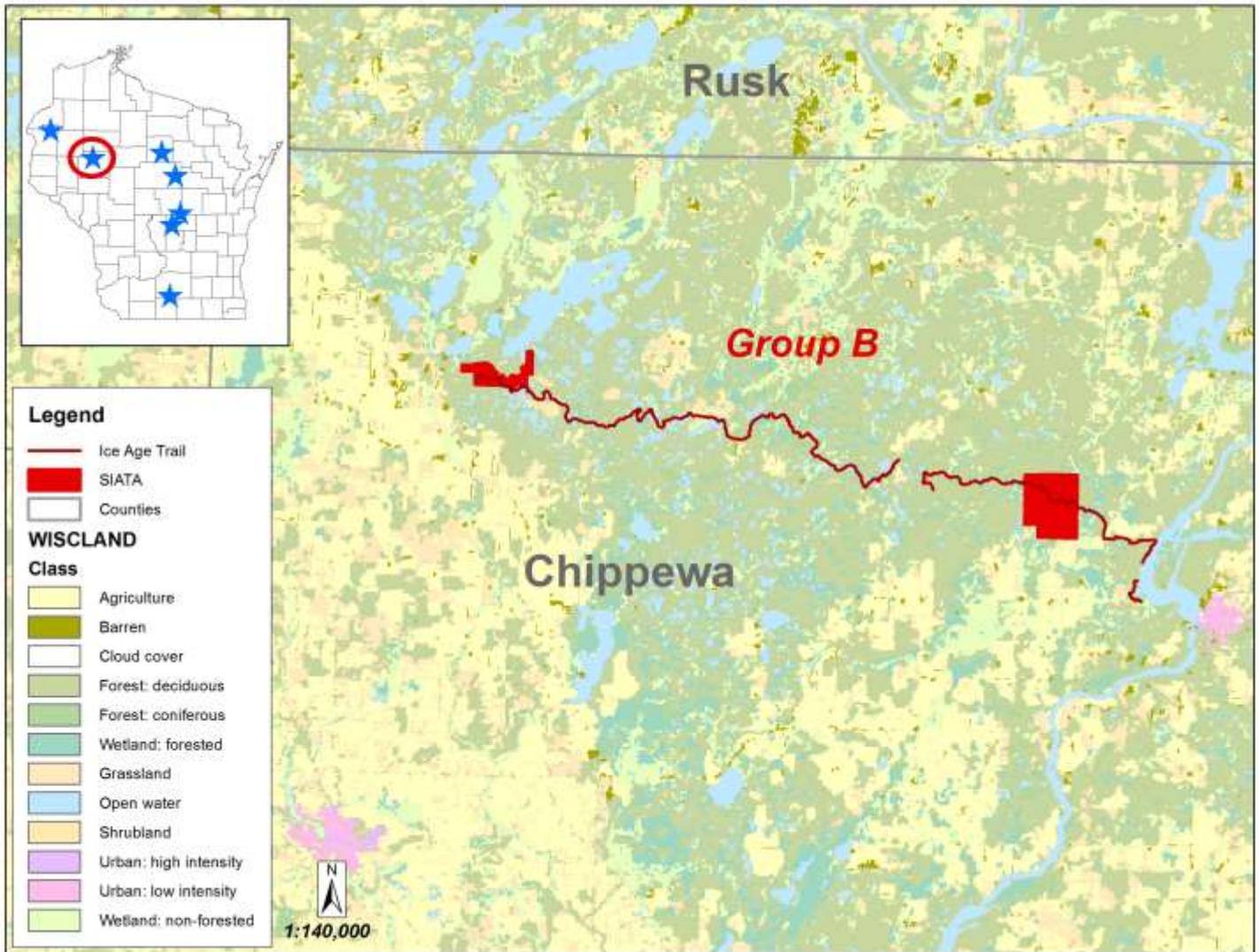
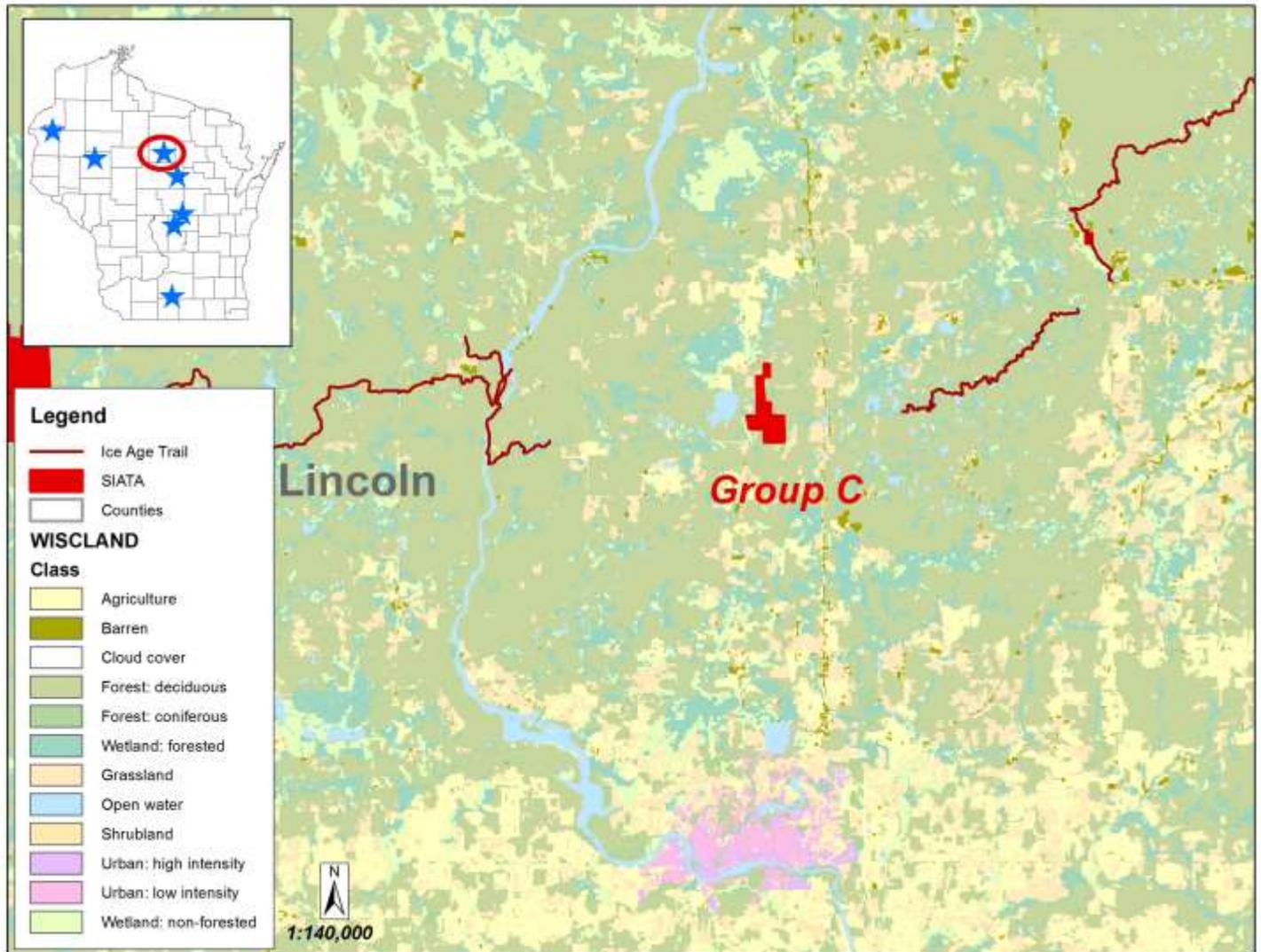


Figure 5c. Current vegetation in Lincoln County, property group C.



**Figure 5d.** Current vegetation in Marathon County, property group D.

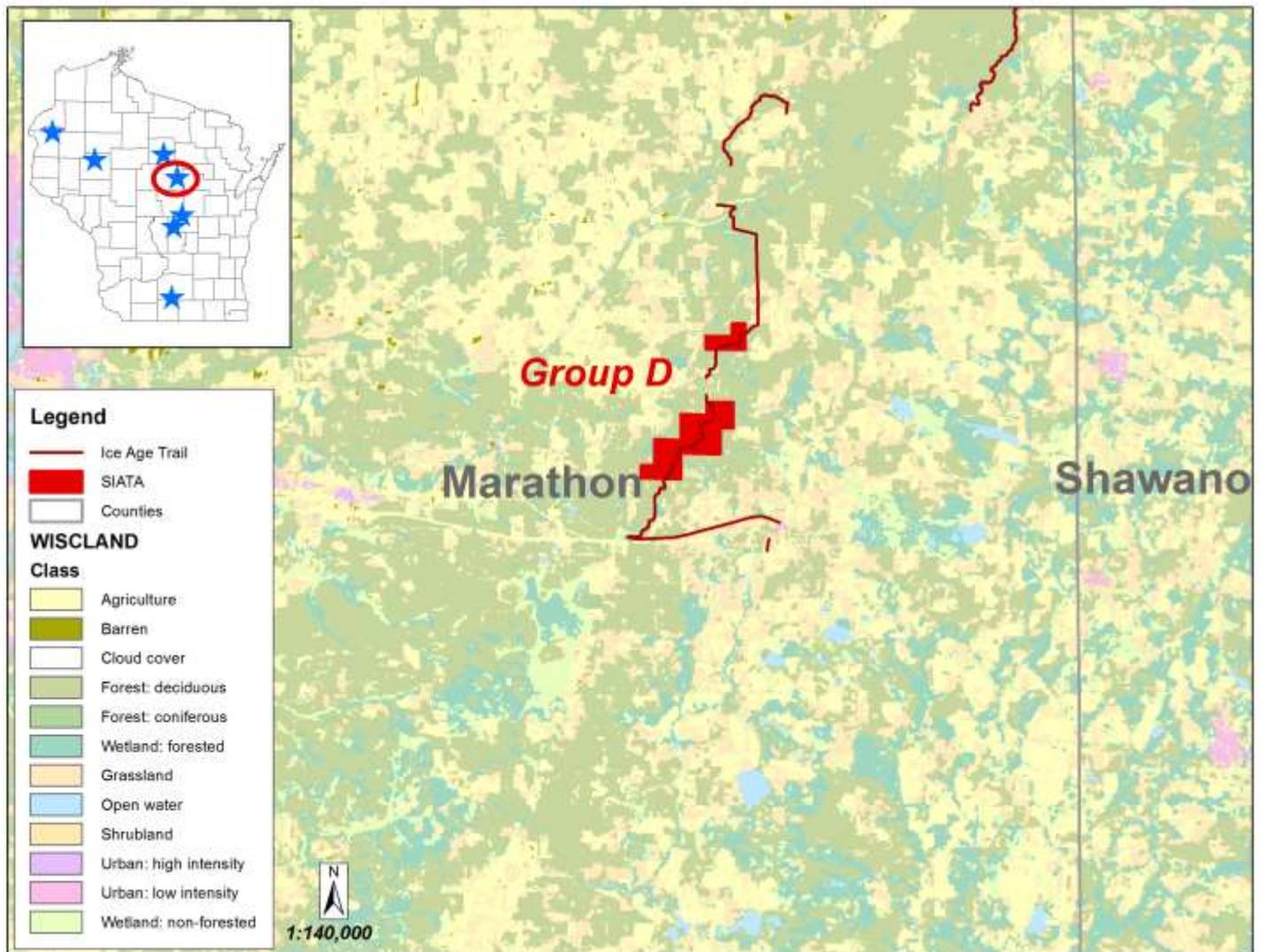
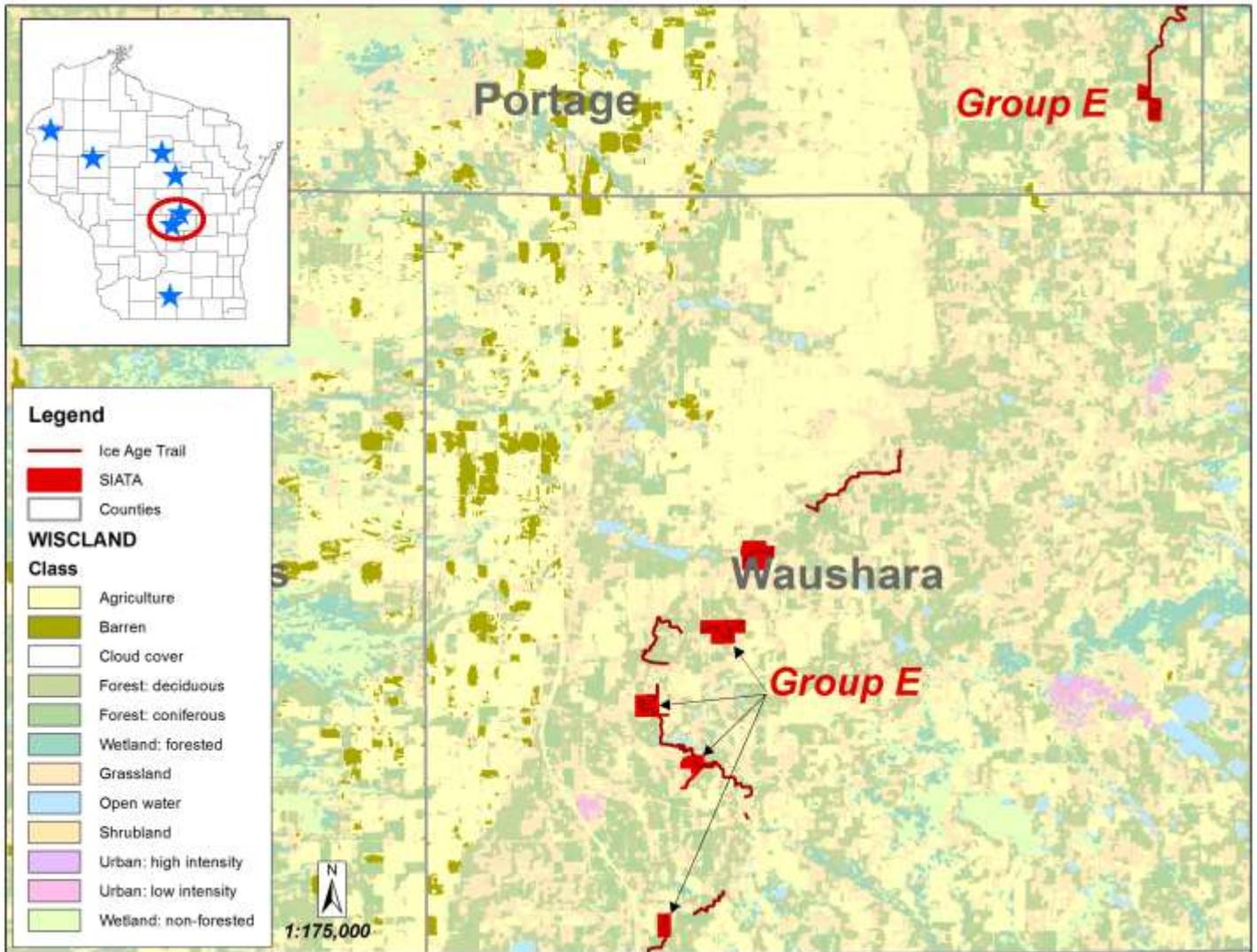
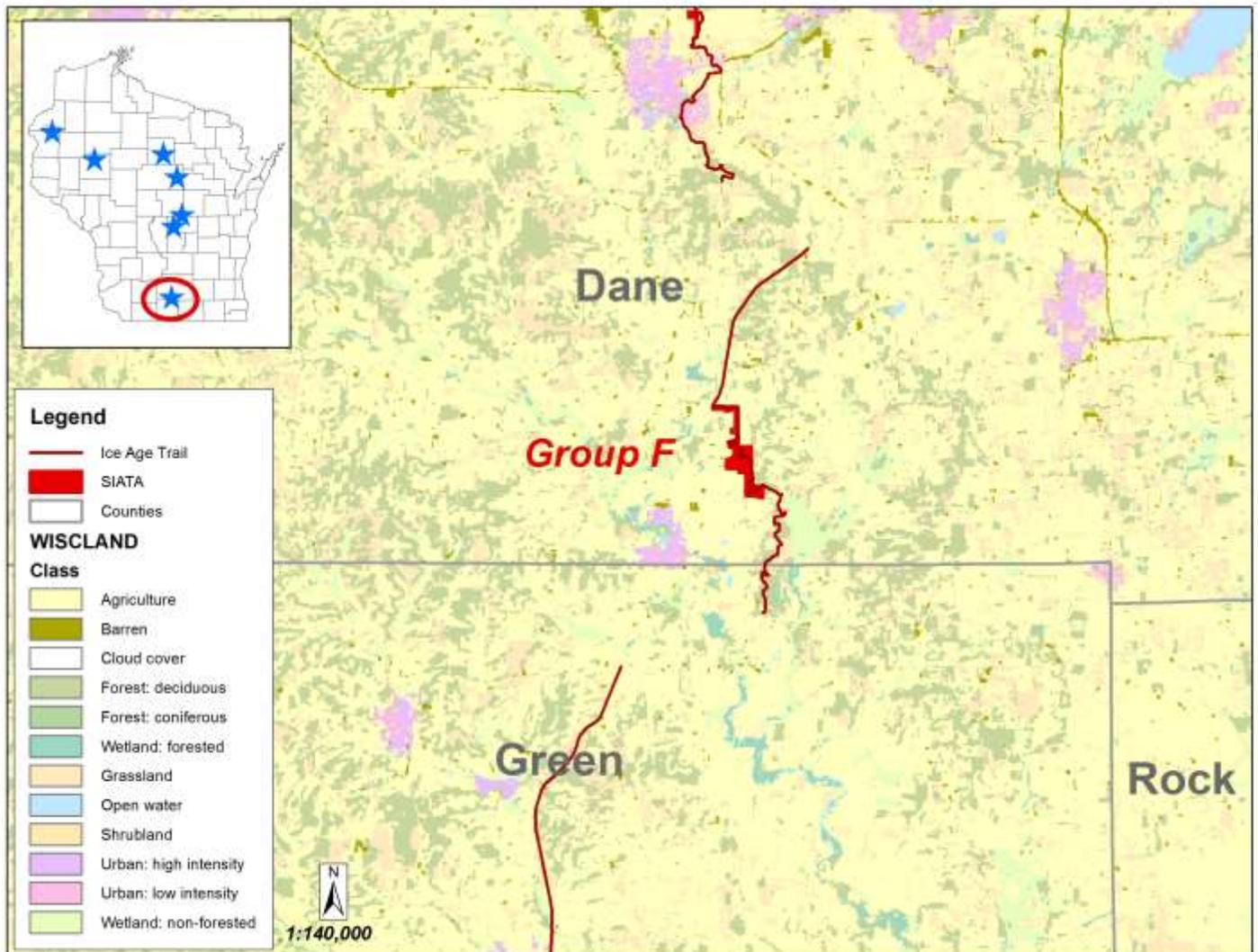


Figure 5e. Current vegetation in Portage and Waushara counties, property group E.



**Figure 5f.** Current vegetation in Dane County, property group F.



The **Straight Lake** parcel supports Southern Dry Forest, Southern Dry-mesic Forest, Northern Hardwood Swamp, Emergent Marsh, Northern Sedge Meadow, Alder Thicket, the headwaters of the Trade River, and several unnamed ponds, mostly formed by beavers. The highest quality natural communities are the Southern Dry Forest that grades into Southern Dry-mesic Forest. Although this forest complex is of fair to good quality, it did not meet the element occurrence standards and hence was not entered into the NHI database.

The rocky uplands support young second-growth Southern Dry and Dry-mesic Forest with a 75-80% canopy cover of mostly white oak and lesser amounts of red oak, quaking aspen, and sugar maple (*Acer saccharum*). The canopy trees average 8-14 inches diameter at breast height (d.b.h.) with occasional trees to 24 inches d.b.h. The subcanopy has low to moderate cover and consists of white and red oak and quaking aspen. The shrub/sapling layer has very low cover and is dominated by green ash and quaking aspen seedlings and beaked hazelnut (*Corylus cornuta*). The ground flora has moderate cover with big-

leaved aster, Pennsylvania sedge, and bracken fern (*Pteridium aquilinum*) being the most common species.

Northern Sedge Meadow and Emergent Marsh are scattered throughout the tract and are dominated by cattails and reed canary grass (*Phalaris arundinacea*). While the wetlands are too small and isolated to support rare birds, they could provide valuable habitat for herptiles. 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.

The **Hibbs** tract is dominated by Surrogate Grasslands with Open Bog, Emergent Marsh, Northern Sedge Meadow, northern hardwoods, and a small degraded Oak Opening is also present. There is a small, unnamed lake on the northern end of the property. The highest quality natural community is the Open Bog complex although it does not meet the element occurrence standards and hence was not entered into the NHI database.

The Surrogate Grassland is dominated by non-native cool-season grasses with a few scattered common prairie species. The grasslands provide valuable habitat for a number of obligate grassland bird species including several that listed as Species of Greatest Conservation Need. Various aspects of Surrogate Grasslands, including their importance to grassland birds and management opportunities are discussed below in the section on Management Considerations and Opportunities for Biodiversity Conservation.

The Open Bog grades into Northern Sedge Meadow and Emergent Marsh. Scattered tamaracks (*Larix laricina*) occur on a large portion of the bog while another sizeable area is dominated by leatherleaf (*Chamaedaphne calyculata*). The diversity of the flora is low overall with few herbaceous species present; herbs include tussock cotton-grass (*Eriophorum vaginatum* ssp *spissum*), northern blue flag (*Iris versicolor*), and three-fruited sedge (*Carex trisperma*). Other woody species include marsh cinquefoil (*Comarum palustre*), white meadowsweet, and bog birch (*Betula pumila*).

Between the upland grasslands and bog is a tiny degraded Oak Opening, which transitions to a small block of low-quality northern hardwoods toward the north. The brushy edges of this mostly linear wooded habitat provide important habitat for a number of different bird species such as Blue-winged Warbler.

### **Chippewa County (Property group B)**

The **Larrabee Lake** parcel is covered by good quality Southern Dry-mesic Forest and Poor Fen. A good quality Ephemeral Pond has been documented just south of this tract, and there may be similar ponds on this parcel. Both the Southern Dry-mesic Forest and Poor Fen met the element occurrence standards and have been entered into the NHI database.

The Southern Dry-mesic Forest encompasses the southern two-thirds of the tract and is dominated by oaks, especially red oak, with average diameters over 15 inches d.b.h. 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 (*Betula alleghaniensis*), and white pine (*Pinus strobus*) in low numbers. 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.

Poor Fen covers the northern third of the 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 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.

The uplands of the **Firth Lake** tract are dominated by younger northern hardwood forest and stands of aspen and red maple; there is also a smaller area of higher quality Northern Mesic Forest, Ephemeral Ponds, and scattered permanent wildlife openings and food plots. The lowlands consist of Emergent Marsh, Tamarack (poor) Swamp, Northern Hardwood Swamp, and Alder Thicket. Elements of Northern Sedge Meadow and Poor Fen are embedded in the Emergent Marsh. The centerpiece of the site is the namesake Firth Lake which is drained by Firth Lake Outlet Creek. The Emergent Marsh, Northern Mesic Forest, and Lake—shallow, soft, seepage have been entered into the NHI database. The remaining communities did not meet the element occurrence standards and hence were not entered into the NHI database.

The Northern Mesic Forest is to the northwest of Firth Lake and extends north across the property line. Sugar maple is the dominant tree species, ranging from 12 to 14 inches d.b.h. in the canopy, and 8 to 12 inches in the subcanopy. Red oak, black ash (*Fraxinus nigra*), and basswood (*Tilia americana*) are canopy associates. Ironwood is common and bitternut hickory (*Carya cordiformis*) is present in the shrub/sapling layer into the subcanopy. The ground flora is diverse, with a rich layer of spring ephemerals including spring beauty (*Claytonia virginica*), yellow trout-lily (*Erythronium americanum*), and cut-leaved toothwort (*Dentaria laciniata*). Other herbs present are large-flowered trillium (*Trillium grandiflorum*), wood anemone (*Anemone quinquefolia*), dwarf ginseng (*Panax trifolius*), and sharp-lobed hepatica (*Anemone acutiloba*). Ephemeral Ponds are embedded within the mesic forest. There is some structural diversity within the mesic forest community including snags, fallen logs, and tip-up mounds, all of which are indicators of older forest. Stumps remain from previous selective logging.

Firth Lake is a shallow, soft, seepage lake with a maximum depth of 18 feet. There is a 4-foot tall beaver dam at the outlet of the lake which has elevated the water levels of the lake. The dam is apparently a long-term feature of this site, as it was noted here in the 1963 Surface Waters Inventory. The aquatic plant community is diverse with a variety of submergent, emergent, and floating species. Konkel (2006) reported a total of 16 aquatic macrophytes in her survey of Firth Lake. Coon-tail (*Ceratophyllum demersum*) and white water lily (*Nymphaea odorata*) were the most frequently occurring species; yellow pond lily (*Nuphar variegata*) and pickerel weed (*Pontederia cordata*) were common. At least three species of pondweed (*Potamogeton* spp.) were noted during this survey, as well a species of quillwort (*Isoetes* sp.). The emergent vegetation was difficult to survey due to the floating, quaking nature of the sedge mat under higher water conditions.

Emergent Marsh is on the eastern side of Firth Lake; the topography on the west side of the lake is too steep to support extensive wetlands. The marsh consists of an open to somewhat closed floating sedge mat. Lake sedge (*Carex lacustris*) is dominant with *Sphagnum* mosses, tussock sedge (*C. stricta*), woolly-fruit sedge (*C. lasiocarpa*), and broad-leaved cattail (*Typha latifolia*) as major associates. The shrub layer varies from 30-40% cover. Willows (*Salix* spp.) and white meadowsweet are scattered throughout in the low shrub layer. Tamaracks are also present. The marsh has elements of Northern Sedge Meadow and Poor Fen as well. While reed canary grass is not yet widespread, it has been noted near the boat landing on the north end of the lake and the beaver dam on the south end.

There are pockets of Tamarack (poor) Swamp and Northern Hardwood Swamp in the northern half of the property. The tamarack swamp is small and has low diversity. The hardwood swamp is dominated by black ash. Forested wetlands in the southern half of the property are more extensive, with red maple dominating in some stands.

### **Lincoln County (Property group C)**

This site is bisected, north to south, by US Highway 51. About two-thirds of the **Highway 51** parcel is dominated by low quality upland forest, primarily Northern Mesic Forest and Northern Dry-mesic Forest. There are also red pine plantations and white pine stands, Northern Sedge Meadow, Muskeg, Alder Thicket, and scattered ponds.

The highest quality natural community is the Northern Sedge Meadow west of Highway 51 which grades into Muskeg and Alder Thicket and that is influenced by a beaver dam. The sedge meadow is intact but has low plant species diversity. It is dominated by lake sedge and Canada bluejoint grass (*Calamagrostis canadensis*). White panicle aster (*Aster lanceolatus*) is the dominant forb. Ferns are represented by sensitive fern (*Onoclea sensibilis*), interrupted fern (*Osmunda claytoniana*), and marsh fern (*Thelypteris palustris*). Lake sedge is the dominant graminoid in both the Muskeg and the Alder Thicket. The Muskeg has a firm mat of *Sphagnum* mosses and has scattered tamaracks and small paper birches (*Betula papyrifera*). Reed canary grass is rare, and there is an opportunity to control the invasive grass before it becomes dominant. Railroad ties have been tossed into the wetland along the west boundary.

The upland forest is a mix of low quality Northern Mesic Forest and Northern Dry Forest. Dominant canopy species include quaking and big-tooth aspen, paper birch, red oak, Hill's oak (*Quercus ellipsoidalis*), sugar and red maple, and some balsam fir and yellow birch. East of the highway, many of the Hill's oaks have an open-grown character and are quite large (16 to 24 inch d.b.h. average, with one up to 36 inches), suggesting historical savanna conditions. The upland forest subcanopy is variably dense and includes species found in the canopy. American hazelnut, green ash seedlings, white spruce seedlings and saplings, and non-native bush honeysuckles (*Lonicera* spp.) are found in the shrub layer. The ground flora, depending on the soil moisture, includes cinnamon fern (*Osmunda cinnamomea*) and interrupted fern at the moister end of the spectrum and bracken fern and Pennsylvania sedge at the drier end.

None of the natural communities at this property met element occurrence standards of quality, size, and context and hence were not entered into the NHI database.

### **Marathon County (Property group D)**

#### **Wausau 1**

Northern Dry-mesic Forest is the dominant natural community with Northern Mesic Forest in richer sites at Wausau Paper 1 (Wausau 1). Northern Hardwood Swamp, Northern Wet Forest, and a couple of small ponds are also present. None of the natural communities met element occurrence standards for quality, size, and context and hence were not entered into the NHI database.

Northern Dry-mesic Forest is the most intact community on the property, and is of fair to good quality. The canopy has 90% cover, and is dominated by red maple and red oak. Most trees are 5 to 11 inches d.b.h. with a good representation of 12 to 16 inch trees and a few up to 20 inches d.b.h. Basswood, white and green ash, and quaking aspen are also in the canopy. The subcanopy is dominated by red maple and has 50-75% cover. The shrub/sapling layer has similar areal coverage and is dominated by beaked hazelnut, leatherwood (*Dirca palustris*), and tree seedlings/saplings (especially green ash). The ground flora is dominated by Pennsylvania sedge and blue cohosh (*Caulophyllum thalictroides*) with 50-75% cover. Other species in the ground flora include wild sarsaparilla (*Aralia nudicaulis*), bracken fern, blue-bead lily, Canada mayflower, and bloodroot (*Sanguinaria canadensis*).

The poor quality Northern Mesic Forest is confined to low areas and moist kettles. The forest has been logged in the recent past, and the canopy is dominated by eastern hemlock, yellow birch, and white pine (*Pinus strobus*). Few trees reach the canopy, and closure is only 6 to 25%. The subcanopy is dense (75-95%) with the same species as the canopy. Hemlock regeneration is moderate to good. The shrub layer is virtually non-existent, and the ground layer is mostly bare ground with occasional Canada mayflower, blue-bead lily, and star-flower.

Wetlands are a small component of the site, covering perhaps less than 20 acres in total of the 157-acre site. From 2010 aerial photographs, the wetlands appear to be mostly forested with Northern Hardwood Swamp and Northern Wet Forest, or a mix of those types. One poor quality wetland was surveyed as part of this study; the remainder represents future natural community inventory needs. Results from this study show a wetland with very few scattered yellow birch of canopy size and a dense subcanopy, approaching 100% cover, of ash saplings in mucky soil. The shrub layer was sparse and included black chokecherry (*Aronia melanocarpa*). The ground flora, overall, had moderate to high coverage and was dominated by nodding sedge (*Carex gynandra*), northern blue flag, and cinnamon fern. Orange jewelweed (*Impatiens capensis*), *Sphagnum* species, skunk cabbage (*Symplocarpus foetidus*), waterarum (*Calla palustris*), fowl manna grass (*Glyceria striata*), and shallow sedge (*C. lurida*) were noted as well. Older black and white aerial photographs show that this wetland was formerly dominated by conifers.

Few invasive species were noted during recent surveys, other than a patch of common tansy (*Tanacetum vulgare*) along a logging road.

## **Wausau Paper 2**

Wausau Paper 2 (Wausau 2) is a large (>750 acre site) that is predominately a mosaic of Northern Dry-mesic and Mesic Forest in early to medial stages of recovery from past logging, with scattered forested wetlands (Northern Hardwood Swamp, Northern Wet Forest) and very limited open wetlands associated with beaver ponds. There is a 10-acre red pine plantation and a small old field at Klaver Kame. Ephemeral ponds may be present too although none were documented by this study. While the Northern Dry-mesic Forest is of fair to good quality, it did not meet the element occurrence standards for quality, size, and/or context and hence were not entered into the NHI database. The Northern Mesic Forest had lower quality and did not meet the element occurrence standards either. The forested wetlands were not surveyed during this study and represent a future inventory need.

There are two blocks totaling about 180 acres of moderate to good quality Northern Dry-mesic Forest dominated by mostly pole-sized sugar maple and northern red oak with varying amounts of basswood, yellow birch, hemlock, balsam fir, and white ash. There are occasional trees up to 18 inches d.b.h., mostly red oak and hemlock. Canopy closure averages 85%, varying from 75 to 95%. The subcanopy has moderate cover with sugar and red maple, American elm (*Ulmus americana*), and eastern hop-hornbeam as the dominant species. There is excellent regeneration of hemlock and oak. There is good

representation of all size classes in many areas. The shrub/sapling layer is highly variable in coverage, ranging from 20 to 80%, and averages about 37%; it is dominated by beaked and American hazelnut and green ash seedlings. Other species of the shrub/sapling layer include northern bush-honeysuckle (*Diervilla lonicera*), American black currant (*Ribes americanum*), and American witch-hazel (*Hamamelis virginiana*). The ground flora has moderate diversity and moderate to high cover, with Pennsylvania sedge and big-leaved aster dominant. Ground-nut (*Amphicarpaea bracteata*), wild sarsaparilla, blue-bead lily, Canada mayflower, hairy sweet-cicely (*Osmorhiza claytonia*), and large-flowered bellwort (*Uvularia grandiflora*) are common to abundant in the ground flora. Few invasive species were noted during recent surveys except for some spotted knapweed (*Centaurea biebersteinii*) in the logging trails.

Three patches of young, fair quality Northern Mesic Forest dominated by eastern hemlock and yellow birch collectively cover about 36 acres in low-lying areas of gently undulating topography. Other dominant species in the 85-95% closed canopy are sugar maple, basswood, and red oak. Tree diameter ranges from 6 to 24 inches d.b.h. The subcanopy has moderate cover and is dominated by hemlock and sugar maple; eastern hop hornbeam is locally important. The shrub/sapling layer has low (1-5%) cover and includes sugar maple, balsam fir, green ash, and hazelnut. The ground flora has moderate to high cover and is dominated by a number of sedges, ferns, and meadow horsetail (*Equisetum pratense*). Very old, decayed, cut stumps are extant throughout. Transitions from this mesic forest to young Northern Dry-mesic Forest are abrupt.

Very young northern hardwood forest occupies at least 300 acres, and is characterized by dense maple, birch, and aspen seedlings.

## **Property group E**

### **Portage County Llewellyn**

Roughly two-thirds of this site consists of conifer plantation and one-third Southern Dry Forest. There are two small Dry Prairie openings and Alder Thicket and non-native grasses along Murry Creek. None of the native communities met element occurrence standards and have not been entered into the NHI database.

Most of the conifer plantations are red originating from 1964 to 1984. White pine and white spruce were planted in 1962 and 1966, respectively.

The Southern Dry Forest is dominated by black oak (*Quercus velutina*) and white oak in the 11- to 15-inch d.b.h. range. There is also a smaller cohort of oaks in the 5- to 11-inch range. No other information about this community is available.

The small prairie openings are embedded in the Southern Dry Forest. They are in proximity with Karner blue butterfly habitat on the adjacent Radley Creek Fishery Area, so there is potential to expand habitat for the butterfly; wild lupine, (*Lupinus perennis*) which is the host plant for Karner blue butterfly larvae, is present in the openings.

### **Waushara County Maierhafer/Siler**

The Maierhafer/Siler tract consists of a mix of Southern Dry Forest, conifer plantations, Surrogate Grasslands, and “mixed deciduous forest” that is dominated by black locust (*Robinia pseudoacacia*).

The Southern Dry Forest is the most extensive natural community on the parcel, and in the western two-thirds of the site is dominated by black and white oaks that are 15 inches d.b.h. or bigger. A second cohort of oaks is in the 5- to 11-inch range. Oak stands in the eastern third of the site vary in date of origin; a stand dominated by 0- to 5-inch d.b.h. black and white oak was established in 1989. An adjacent stand of black and white oak originated in 1971 and dominant trees are in the 5- to 11-inch size class. A 10-acre stand is dominated by black locust. Other species in the canopy, subcanopy, or sapling layers include red maple, black cherry (*Prunus serotina*), and quaking aspen. The shrub/sapling layer is patchily distributed and includes hazelnut, blueberry, white oak seedlings, roses (*Rosa* spp.), and brambles (*Rubus* spp.). The ground flora is sparse and dominated by Pennsylvania sedge. Other species include bracken fern, pussytoes (*Antennaria* spp.), milkweeds (*Asclepias* spp.), and wild geranium. Some savanna indicators present include bird's-foot violet (*Viola pedata*), leadplant (*Amorpha canescens*), frostweed (*Helianthemum* sp.), long-leaved bluets (*Houstonia longifolia*), and linear-leaved panic grass (*Dichantherium linearifolium*). There are numerous invasive species present, increasing in abundance toward the eastern side of the property including garlic mustard (*Alliaria petiolata*), leafy spurge (*Euphorbia esula*), spotted knapweed, and crown-vetch (*Coronilla varia*). There are two stands with patch clear-cuts embedded within the older oak. There is potential for oak savanna restoration at this site.

The conifer plantings are largely red pine with smaller amounts of white pine (3 acres) and a 21-acre stand of mixed conifers (Scots pine, white pine, red pine). Most of the conifers were planted in the late 1950s through the mid-1960s. The white pines were planted in 1998 and the stand of mixed conifers in 1984.

### **Mecan Springs**

The Mecan Springs cluster consists of three tracts. **Parcel 1 (Motola)**, just north of Mecan Springs, is the most northerly of the tracts and covers about 160 acres. Nearly three-quarters of this tract is Surrogate Grassland. Roughly 22 acres are oak forest (probably Southern Dry Forest), and 25 acres are in pine plantation. The Surrogate Grassland is dominated by non-native cool-season grasses. The oak forest was not surveyed during this study and may represent a future inventory need.

The **second parcel, Mecan Springs**, is immediately south of Mecan Springs and covers slightly over 100 acres. Surrogate Grassland and farmland cover most of the property. There are also about 30 acres of Southern Dry Forest, 4 acres of white pine plantation, and 3 acres of miscellaneous hardwood forest. The Surrogate Grassland is dominated by non-native cool-season grasses. The Southern Dry Forest consists of three separate stands and is dominated by black oak and white oak with some white pine in the canopy that are likely volunteer trees from the white pine plantation. The eastern-most stand is the oldest and has the largest trees, ranging in size from 11 to 15 inches d.b.h.; oaks in the younger stands are in the 5- to 11-inch range. Other species in the canopy, subcanopy, or sapling layer include black cherry, red maple, bur oak (*Quercus macrocarpa*), and black locust. Hazelnut occurs in the shrub layer. Pennsylvania sedge is the dominant species in the ground layer. Others include bracken fern, wild geranium, wild columbine, and pussytoes. Some savanna indicators are present including bird's-foot violets, leadplant, frostweed, and long-leaved bluets. Invasive species are present including spotted knapweed and motherwort (*Leonurus cardiaca*).

The 80-acre **third parcel, Fenske**, is just north of Chaffee Creek. About half of the tract is in farmland. About half of the remaining is Southern Dry Forest with the rest in white or red pine plantation. The dry forest is dominated by black and white oak in the 5- to 15-inch d.b.h. range, depending on the stand. The site was visited in the winter of 2011-2012 and determined not to need additional survey work.

## Dane County

### Montrose (Fahey)

The Montrose (Fahey) tract is topographically interesting with wide, level ridge tops, steep upper slopes, and gentle lower slopes. The ridge tops and lower slopes are in row crops and alfalfa. The steep slopes have a small Dry Prairie, degraded Oak Opening, and low quality Southern Dry-mesic Forest.

Although the Dry Prairie has good condition and quality, it is small (about 2 acres), has poor landscape context, and therefore does not meet the element occurrence standards needed to be entered into the NHI database. The prairie is situated on the upper quarter of a steep, south-facing slope and has rocky ledges and outcrops. It is dominated by stiff aster (*Aster linariifolius*), little bluestem (*Schizachyrium scoparium*), Ohio spiderwort (*Tradescantia ohioensis*), and side-oats grama (*Bouteloua curtipendula*). Indicators of higher quality include leadplant, purple prairie clover (*Dalea purpurea*), and prairie dropseed (*Sporobolus heterolepis*). Other species include aromatic aster (*Aster oblongifolius*), needle grass (*Stipa spartea*), common milkweed (*Asclepias syriaca*), whorled milkweed (*A. verticillata*), and flowering spurge (*Euphorbia corollata*). Invasive species are present on the prairie; some, like Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*P. compressa*), smooth brome (*Bromus inermis*), and sulfur cinquefoil (*Potentilla recta*) are common, even dominant in places. Other species like yellow sweet-clover (*Melilotus officinalis*) and common buckthorn (*Rhamnus cathartica*) are rare and can easily be controlled at this stage. Black raspberries (*Rubus occidentalis*) and river bank grape (*Vitis riparia*) are common in disturbed areas such as where trees have been removed. In addition to invasive non-native species and aggressive native woody species, the largest threat to the prairie is shading from surrounding trees. The prairie has good restoration potential, and a local group of volunteers is conducting management (e.g., invasive species control) at this site.

The Dry Prairie grades into degraded Oak Opening in a narrow strip 30-50 feet wide along the upper slopes. The lower edge of the Oak Opening is formed by a steep ledge. The canopy cover of the Oak Opening is about 80% and is dominated by bur oak; shagbark hickory (*Carya ovata*) and black cherry are canopy associates. Bur oaks average 18 to 24 inches d.b.h., ranging from about 12 inches up to 26 inches. Shagbark hickories average 18 to 20 inches d.b.h., and the cherries are smaller, averaging only 6 to 10 inches d.b.h. The ground flora has low floral diversity, lacks conservative savanna indicator species, and is dominated mostly by forest species, disturbance-associated species, and non-native invasive species. Dominant ground layer species include Virginia creeper (*Parthenocissus quinquefolia*), broad-leaf enchanter's-nightshade (*Circaea lutetiana* ssp. *canadensis*), and black raspberry. Other species in the ground flora include river bank grape, white snakeroot (*Eupatorium rugosum*), wild columbine (*Aquilegia canadensis*), and common ragweed (*Ambrosia artemisiifolia*). Invasive species present include garlic mustard, yellow sweet clover, multiflora rose (*Rosa multiflora*), Japanese hedge-parsley (*Torilis japonica*), and burdock (*Arctium* sp.). There is restoration work being done by local volunteers. Below the Oak Opening is a degraded forest that is dominated by small black walnut (*Juglans nigra*) and black locust trees.

## Rare Species of the State Ice Age Trail Area Planning Group

Rare species have been documented at the SIATA properties (Table 11). Appendix C shows the rare species currently known at these sites listed by property; see Appendix D for summary descriptions of the species. Bird occurrences refer only to breeding activity.

**Table 11. Documented rare species and high quality natural communities of the State Ice Age Trail Area Planning Group.**

For an explanation of state and global ranks, as well as state status, see Appendix E. State status, tracking status, and ranks are based on the working list published June 1, 2011. Species with a “W” in the “Tracked by NHI” column are on the Watch List and are not mapped in the NHI database. Various sources were used to determine the Watch List species and SGCN present and this may not be a complete list. \*Species reported but not confirmed or did not meet criteria as an element occurrence.

Common Name	Scientific Name	Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Animals</b>								
American Woodcock	<i>Scolopax minor</i>	2012	S3S4B	G5	SC/M		Y	W
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	2012	S3S4B	G5	SC/M		Y	W
Blanding's Turtle	<i>Emydoidea blandingii</i>	1991	S3S4	G4	THR		Y	Y
Blue-winged Warbler	<i>Vermivora pinus</i>	2012	S4B	G5	SC/M		Y	W
Bobolink	<i>Dolichonyx oryzivorus</i>	2012	S3S4B	G5	SC/M		Y	W
Canada Warbler	<i>Wilsonia canadensis</i>	2012	S3S4B	G5	SC/M		Y	W
Cerulean Warbler	<i>Dendroica cerulea</i>	2012	S2S3B	G4	THR		Y	Y
Dickcissel	<i>Spiza americana</i>	2012	S3B	G5	SC/M		Y	W
Eastern Meadowlark	<i>Sturnella magna</i>	2012	S3S4B	G5	SC/M		Y	W
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	2012	S3S4B	G4	SC/M		Y	W
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	2012	S3B	G5	SC/M		Y	W
Great Blue Heron	<i>Ardea herodias</i>	2012	S4B	G5	SC/M		N	W
Greater Prairie-Chicken	<i>Tympanuchus cupido</i>	1979	S1B,S2N	G4	THR		Y	Y
Henslow's Sparrow	<i>Ammodramus henslowii</i>	2012	S2S3B	G4	THR		Y	Y
Least Flycatcher	<i>Empidonax minimus</i>	2012	S4B	G5	SC/M		Y	W
Red-shouldered Hawk*	<i>Buteo lineatus</i>	2012	S3S4B,S1N	G5	THR		Y	Y
Veery	<i>Catharus fuscescens</i>	2012	S3S4B	G5	SC/M		Y	W
Vesper Sparrow	<i>Poocetes gramineus</i>	2012	S3S4B	G5	SC/M		Y	W
Willow Flycatcher	<i>Empidonax traillii</i>	2012	S4B	G5	SC/M		Y	W
Wood Thrush	<i>Hylocichla mustelina</i>	2012	S4B	G5	SC/M		Y	W
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	2012	S3S4B	G5	SC/M		N	W
<b>Other</b>								
Bird Rookery		2012	SU	G5	SC		n/a	Y
Karner Blue Federal High Potential Range		2012	n/a	n/a	n/a		n/a	Y

Common Name	Scientific Name	Last Observed	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Plants</b>								
Large-flowered Ground-cherry	<i>Leucophysalis grandiflora</i>	1916	S1	G4?	SC		n/a	Y
<b>Natural Communities</b>								
Emergent Marsh		2012	S4	G4	n/a		n/a	Y
Ephemeral Pond		2012	SU	GNRQ	n/a		n/a	Y
Lake—deep, soft, seepage		2012	S3	GNR	n/a		n/a	Y
Lake--shallow, soft, seepage		2012	S3	GNR	n/a		n/a	Y
Northern Mesic Forest		2002	S4	G4	n/a		n/a	Y
Poor Fen		2012	S3	G3G4	n/a		n/a	Y
Southern Dry-mesic Forest		2012	S3	G4	n/a		n/a	Y

\*Species observed but not found.

# Management Considerations and Opportunities for Biodiversity Conservation

## Landscape Level Opportunities and Considerations

### Wildlife Action Plan Conservation Opportunity Area

Conservation Opportunity Areas (COAs) 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. Larrabee Lake lies within the Chippewa Moraine Lakes COA, identified as having state significance for diverse aquatic communities (see Appendix B for maps). The Polk County parcels (Haas, Hibbs, and Straight Lake) lie within the Straight Lake COA which has been identified as having upper Midwest/regional significance for large blocks of predominately older northern forest. Maierhafer/Siler and the three Mecan Springs parcels lie within the Comstock Bog and Germania Marsh COA, identified as having upper Midwest significance for large sedge meadows, fens, and prairies.

### 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.

These 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 SIATA planning efforts in regard to opportunities to maintain or enhance biological diversity (Table 12, WDNR 2010b).

**Table 12. Selected Wisconsin Statewide Forest Strategies Relevant to the SIATA.**

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.

### 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).

### 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. b). 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 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).

Non-native invasive species that are widespread in the SIATA and pose the greatest immediate threat to native species diversity, rare species habitats, or high-quality natural communities are listed in Table 13.

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, in fact, new or are not yet widespread at SIATA properties, or are known in the vicinity (Table 14); monitoring for these species and rapid response to small infestations represent high-impact actions.

**Table 13. Non-native invasive species currently known at the SIATA.**  
Chapter NR 40 classification codes in superscript: P = Prohibited, R = Restricted.

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Comments
		Open	Wooded	Open	Wooded	
<b>Plants</b>						
Butter & eggs	<i>Linaria vulgaris</i>	x				Waushara County sites, sandy & gravelly soils
Bindweed	<i>Convolvulus arvensis</i>	x				Noted at 2 sites in Waushara County
Common mullein	<i>Verbascum thapsus</i>	x				Noted at 2 sites in Waushara County
Common St. John's-wort	<i>Hypericum perforatum</i>	x				Noted at 1 site in Waushara County
Bush honeysuckle*	<i>Lonicera</i> spp*	x	x			Only noted in Waushara County. Specific species not identified
Crown vetch	<i>Coronilla varia</i>	x				Noted at 1 site in Waushara County
Leafy spurge*	<i>Euphorbia esula</i> *	x				Noted at 1 site in Waushara County
Spotted knapweed*	<i>Centaurea biebersteinii</i> *	x				Noted in 3 counties
Garlic mustard*	<i>Alliaria petiolata</i> *		x			Noted at 1 site in Waushara County
Black locust	<i>Robinia pseudoacacia</i>	x	x			Noted at 1 site in Waushara County; a dominant in places at Maierhafer/Siler
Smooth brome	<i>Bromus inermis</i>	x				Prairie remnant in Dane County, openings at 1 site in Waushara County
Yellow hawkweed	<i>Hieracium</i> sp	x				Species not named; noted at 1 site in Waushara County

Orange hawkweed	<i>Hieracium aurantiacum</i>	x				Noted at 1 site in Waushara County
Motherwort	<i>Leonurus cardiaca</i>	x				Noted at 1 site in Waushara County
Red clover	<i>Trifolium pratense</i>	x				Noted in 2 counties
White clover	<i>Trifolium repens</i>	x				Noted at 1 site in Waushara County
Hoary allyssum	<i>Berteroa incana</i>	x				Noted at 1 site in Waushara County
Bird's-foot trefoil	<i>Lotus corniculatus</i>	x				Noted at 1 site in Chippewa County
Reed canary grass	<i>Phalaris arundinacea</i>			x	x	Most widespread invasive species noted, in wetlands at sites in 3 counties
Narrow-leaved cattail*	<i>Typha angustifolia</i> *			x		Noted in 2 counties; dominant in wetlands at 1 site
Common tansy*	<i>Tanacetum vulgare</i> *	x				Noted at 2 sites
Canada bluegrass	<i>Poa compressa</i>	x				Prairie remnant in Dane County
Kentucky bluegrass	<i>Poa pratensis</i>	x				Prairie remnant in Dane County
White sweet clover	<i>Melilotus officinalis</i>	x				Prairie remnant in Dane County
Common buckthorn*	<i>Rhamnus cathartica</i> *	x	x			In woodlands at site in Dane County
Sulfur cinquefoil	<i>Potentilla recta</i>	x				Prairie remnant in Dane County
Quackgrass	<i>Elytrigia repens</i>	x				Prairie remnant in Dane County
Orchard grass	<i>Dactylis gomerata</i>	x				Prairie remnant in Dane County
Burdock	<i>Arctium minus</i>	x	x			In woodlands, including restoration areas, at site in Dane County
Multi-flora rose*	<i>Rosa multiflora</i> *	x	x			In woodlands at site in Dane County
Japanese hedge-parsley*	<i>Torilis japonica</i> *		x			In woodlands at site in Dane County
<b>animals</b>						
Gypsy moth*	<i>Lymantria dispar</i> *		x			Noted at 1 site in oak woods in Waushara County; likely at other sites in Waushara, Marathon, Dane, and Portage counties
<b>Fungi</b>						
Oak Wilt	<i>Ceratocystis fagacearum</i>		x		x	

\*NR-40 Restricted Species

**Table 14. Non-native invasive species currently unknown at SIATA but could appear there in the future.**

Common Name	Latin Name	Upland Habitats		Wetland Habitats		Aquatic	Comments
		Open	Wooded	Open	Wooded		
<b>Plants</b>							
Bigleaf lupine	<i>Lupinus polyphyllus</i>	x					Known in Marathon Co.
Black swallow-wort***	<i>Vincetoxicum nigrum</i> ***	x	x				Known from Dane Co.
Canada thistle*	<i>Cirsium arvense</i> *	x		x			Potentially at all sites
Celandine***	<i>Chelidonium majus</i> ***	x	x				Known from Dane Co, possible in Polk Co
Curly-leaf pondweed	<i>Potamogeton crispus</i>					x	Known from lakes in Chippewa, Marathon, & Polk counties
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, Marathon, & Polk counties
False spiraea	<i>Sorbaria sorbifolia</i>			x			Known from Dane Co, possible in Polk Co
Garden valerian	<i>Valeriana officinalis</i>	x	x	x	x		Known from Dane Co. Possible in Polk Co.
Garlic mustard*	<i>Alliaria petiolata</i> *		x				Known from all counties in study area.
Giant hogweed**	<i>Heraclium mantegazzianum</i> **	x					Known in Portage Co. (Stevens Point area)
Hemp nettle*	<i>Galeopsis tetrahit</i>	x	x				Potentially at all sites
Hounds tongue*	<i>Cynoglossum officinale</i> *	x					Known in Marathon Co.
Japanese hedge parsley***	<i>Torilis japonica</i> ***	x	x				Known from Dane & Waushara counties.
Japanese knotweed*	<i>Polygonum cuspidatum</i> *			x			Polk, Lincoln, Marathon
Narrow-leaf & hybrid cattails*	<i>Typha angustifolia, T. x glauca</i> *			x			Potentially wetlands at all sites where not already present
Oriental bittersweet*	<i>Celastrus orbiculatus</i> *	x	x				Known from Dane Co. Grows in a wide variety of habitats.
Poison hemlock***	<i>Conium maculatum</i> ***	x	x	x	x		Known from Dane Co
Purple loosestrife*	<i>Lythrum salicaria</i> *			x			Potentially wetlands at all sites
Queen-of-the-prairie	<i>Filipendula rubra</i>			x			Known from Portage Co. Possible in Polk Co.
Siberian pea shrub	<i>Caragana arborescens</i>	x	x				Known in Marathon Co. Possible in Polk Co.

Spotted knapweed*	<i>Centaurea biebersteinii</i> (=C. <i>stoebe</i> , C. <i>maculosa</i> )*	x					Possibly at all dry, especially sandy, sites
Tree of heaven*	<i>Ailanthus altissima</i> *	x	x				Known from Dane Co.
Wild chervil***	<i>Anthriscus sylvestris</i> *		x				Known from Dane & Polk counties
Wild parsnip*	<i>Pastinaca sativa</i>	x					Polk, Lincoln, Marathon

<b>Animals</b>							
Banded mystery snail	<i>Viviparus georgianus</i>					x	Known from lakes in Chippewa, Marathon, & Polk counties
Chinese mystery snail*	<i>Bellamya chinensis</i> *					x	Known from lakes in Chippewa, Marathon, & Polk counties
Emerald ash borer**	<i>Agrilus planipennis</i> **		x			x	Currently not known from study area. Infestations know from vicinity of Dane Co (Rock Co.) and Polk Co (Minneapolis/St Paul area).
European gypsy moth*	<i>Lymantria dispar</i> *		x			x	All counties, except Polk, are in the gypsy moth quarantine zone.
Rusty crayfish*	<i>Orconectes rusticus</i> *					x	Known from lakes in Chippewa, Marathon, & Polk counties
Zebra mussel*	<i>Dreissena polymorpha</i> *					x	Known from lakes in Chippewa, Marathon, & Polk counties

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

\*NR-40 Restricted Species, \*\*NR-40 Prohibited Species, \*\*\*NR-40 Split Restricted/Prohibited Designation

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 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.

For recommendations on controlling specific invasive species consult with DNR staff, refer to websites on invasive species, such as that maintained by the DNR (<http://dnr.wi.gov/topic/Invasives/>) and by the Invasive Plants Association of Wisconsin (<http://www.ipaw.org>), and seek assistance from local invasive species groups:

- Citizen-based lake monitoring groups coordinated through WDNR and UW-Extension.
- South West Weed Management Area (includes Dane County). Mark Horn (608)836-0054 [mark.horn@monarda.biz](mailto:mark.horn@monarda.biz).

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

The following are descriptions of potential forest health issues.

#### Emerald Ash Borer

The emerald ash borer (EAB, *Agilus planipennis*), an invasive, wood-boring beetle that attacks ash trees, was positively identified for the first time in Wisconsin in 2008, and is now found in 13 counties. Fifteen 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 and lowland forests of the SIATA and hence are vulnerable to the effects of emerald ash borer, as white, green, and black ash are important tree species within these systems. 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), elevated water tables, and infestation of disturbance-loving invasive species such as reed canary grass (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. In 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 <http://dnr.wi.gov/topic/foresthealth/gyps moth.html>. Gypsy moth was observed at Maierhafer/Siler.

Non-native Invasive Earthworms

The invasion of forests by European earthworms of the families *Acanthodrilidae*, *Lumbricidae*, and *Megascolecidae* is a concern throughout Wisconsin. While native earthworms were absent from this landscape after the last glaciation, non-native invasive earthworms have been introduced since Euro-American settlement, primarily as discarded fishing bait (Hendrix and Bohlen 2002, Hale et al. 2005). Non-native invasive earthworms can have dramatic impacts on forest floor properties by greatly reducing organic matter (Hale et al. 2005), microbial biomass (Groffman et al. 2004), nutrient availability (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 at the SIATA 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. Oak wilt is often not a major concern for woodland or barrens restoration areas where open canopy conditions are favored, and dead oak trees can make long-lasting wildlife cavity trees. It can, however, have significant impacts to forested stands with a heavy oak component such as at Wausau Paper 1 and 2 in Marathon County.

## Community Level Opportunities and Considerations

### Natural Community Management Opportunities

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006a) identifies 11 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Forest Transition** Ecological Landscape (Table 15). The WAP identifies 3 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Central Sand Hills** Ecological Landscape (Table 16) and 8 in the **North Central Forest** Ecological Landscape (Table 17). The WAP identifies 3 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Western Coulee and Ridges** Ecological Landscape (Table 18); no “Major” or “Important” opportunities were identified in the **Southeast Glacial Plains** Ecological Landscape.

**Table 15.** Major and Important Natural Community Management Opportunities in the **Forest Transition** Ecological Landscape that occur in the SIATA (WDNR 2006a).

<b>Major Opportunities</b>	<b>Important Opportunities</b>
Coolwater streams	Alder Thicket
Northern Mesic Forest	Inland lakes
Northern Wet Forest	Northern Dry-mesic Forest
Emergent Marsh	Northern Hardwood Swamp
	Northern Sedge Meadow
	Open Bog
	Surrogate Grasslands

**Table 16.** Major and Important Natural Community Management Opportunities in the **Central Sand Hills** Ecological Landscape that occur in the SIATA (WDNR 2006a).

<b>Major Opportunity</b>	<b>Important Opportunity</b>
Southern Dry Forest	Dry Prairie Surrogate Grasslands

**Table 17.** Major and Important Natural Community Management Opportunities in the **North Central Forest** Ecological Landscape that occur in the SIATA (WDNR 2006a).

<b>Major Opportunity</b>	<b>Important Opportunity</b>
Alder Thicket	Northern Dry-mesic Forest
Emergent Marsh	
Ephemeral Pond	
Inland lakes	
Northern Hardwood Swamp	
Northern Mesic Forest	
Northern Wet Forest	

**Table 18.** Major and Important Natural Community Management Opportunities in the **Western Coulee and Ridges** Ecological Landscape that occur in the SIATA (WDNR 2006a).

<b>Major Opportunity</b>	<b>Important Opportunity</b>
Dry Prairie	none
Oak Opening	
Southern Dry-mesic Forest	

### **Dry-mesic and Mesic Forest: an Opportunity for Older Forest Management**

Several significant blocks of moderate to high-quality dry-mesic and mesic forest occur on the SIATA, including areas at Larrabee Lake, Firth Lake, and Wausau Paper 2. Additional areas of mesic and dry-mesic forest occur at Haas, Straight Lake, Highway 51, Wausau 1, Llewellyn, Maierhafer/Siler, and Montrose (Fahey), although they are of lower quality, are smaller, or have poorer landscape context. Although the stands at Larrabee Lake, Firth Lake and Wausau Paper 2 are somewhat fragmented by early successional forest management, they represent the best quality remaining upland forests on the SIATA and provide habitat that is uncommon in the property group. In addition, mesic and dry-mesic forests have been noted as a major or important Natural Community Management Opportunities in the Forest Transition and the North Central Forest ecological landscapes in the Wisconsin WAP (WDNR 2006a). Due to their species composition and geographic relationship within or south of the Tension Zone, the dry-mesic and mesic forests at Montrose (Fahey), Maierhafer/Siler, Llewellyn, Larrabee Lake, and the Polk County sites have been classified as Southern Dry-mesic Forest and Southern Mesic Forest; mesic and dry-mesic forest at all other sites are classified as the northern types..

The juxtaposition of the forests at Straight Lake, Larrabee Lake, Firth Lake, and Wausau Paper 1 and 2 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 stands are sometimes 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. b). The structural diversity provided by old-growth and older forests support unique assemblages of plants, birds, and other animals. Old-growth forest management is one important facet of providing the diverse range of habitats needed for sustainable forest management (WDNR 2010b).

Older forests can provide habitat for many rare and declining species, including Cerulean Warbler (*Dendroica cerulea*), Acadian Flycatcher (*Empidonax vireescens*), Least Flycatcher (*Empidonax minimus*), Wood Thrush (*Hylocichla mustelina*), Veery (*Catharus fuscescens*), Red-shouldered Hawk (*Buteo lineatus*), and Northern Goshawk (*Accipiter gentilis*). Of the birds noted above, Cerulean Warbler, Least Flycatcher, Wood Thrush, and Veery were found in mesic and dry-mesic forests on or adjacent to the SIATA in the study area. A Red-shouldered Hawk was observed at Wausau 2, but it's uncertain if it is nesting at the site. 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 imminent threat of White-nose Syndrome.

### **High-quality wetlands**

The wetlands on the SIATA 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. These communities are generally small and often occur in small basins with their distribution and extent based on hydrology, geology, and past disturbance. The largest, highest quality wetlands are the Poor Fen at Larrabee Lake (ca. 87 acres) and the Emergent Marsh complex at Firth Lake (ca. 29 acres). While other wetlands, including Northern Sedge Meadow at the Hibbs tract and the Open Bog at the Haas property, do not meet standards for inclusion into the NHI database, they have fair to good quality. As such they are important for local diversity and provide valuable habitat for a number of species. It is interesting to note that all of the wetlands in the current study are north of the Tension Zone. These wetlands provide significant habitat for numerous rare and SGCN birds (see separate section below for further details).

In addition, Blanding's turtles have been documented in the vicinity of the Llewellyn tract.

A relative lack of non-native invasive species also contributes to the high quality of these wetlands, although reed canary grass was noted as just beginning to invade some areas and was dominant in the wetlands at Straight Lake. Narrow-leaved cattails have also been identified as a dominant at Straight Lake and other properties.

## **Species Level Opportunities and Considerations**

### **Ecological Priorities for SGCN**

The Wisconsin Wildlife Action Plan identifies ecological priorities in each Ecological Landscape. Ecological priorities are the natural communities in each Ecological Landscape that are most important to the Species of Greatest Conservation Need. Note that these Ecological Priorities include all of the natural communities and associated SGCN that we have determined to provide the best opportunities for management at the SIATA 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 SIATA. Priority Conservation Actions identified in the Wisconsin Wildlife Action Plan (WDNR 2006a) for the North Central Forest, Forest Transition, Central Sand Hills, and Western Coulee and Ridges ecological landscapes that apply to SIATA are found in Table 19.

**Table 19.** 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.
Central Sand Hills	Identify and restore oak barrens and oak forest on appropriate sites, such as old fields and pasture lands, to expand and connect existing stands.
	Manage oaks as a large-scale mosaic of patches along a successional gradient that includes oak forest, oak woodland, oak opening, and native or surrogate grassland.
	Maintain or restore mixed pine-oak forests to represent the full natural range of variability in patch sizes and age classes.
	Restore oak/conifer barrens and shrub habitats on public lands in appropriate Conservation Opportunity Areas through fire, ground layer enhancement, and timber management.
	Implement Karner Blue Butterfly conservation strategies.
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.
Western Coulee and Ridges	Restore oak openings and woodlands and expand and enhance dry prairie and shrub habitats on public lands in appropriate Conservation Opportunity Areas through fire, ground layer enhancement, and timber management.
	Identify additional sites containing high quality or restorable oak barrens, oak savannas and woodlands.
	Partner with prairie/savanna/forest restoration groups to manage and protect habitats to effectively keep SGCN on the landscape.

Conduct inventories to better delineate Cerulean Warbler populations on public and private lands.
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## Grassland Wildlife Conservation

Grasslands have declined extensively throughout Wisconsin due to fire suppression and conversion to agriculture. Grassland areas on the SIATA, especially in Polk and Waushara counties, are Surrogate Grasslands dominated by non-native plant species (e.g., smooth brome, timothy) but function as good wildlife habitat. Rare and declining wildlife supported by grasslands on the SIATA includes birds, small mammals, butterflies, and reptiles. From a wildlife habitat perspective, plant species composition in these grasslands is important primarily from a structural and functional habitat standpoint (e.g., density and height of vegetation, proportion and density of grasses to wildflowers, etc.). Also important in these grasslands is the size of functional habitat and the surrounding landscape content (e.g., proximity and spatial arrangement of adjacent natural communities).

Biologists and birders are concerned about population declines of many grassland bird species. Since the North American Breeding Bird Survey (BBS) began in 1966, grassland birds have declined more steeply than any other group of birds in North America and the Midwest (Sample and Mossman 1997, Askins et al. 2007). In 1997, Sample and Mossman identified 26 “priority landscapes” in Wisconsin that represent unique opportunities for landscape-scale grassland management for grassland birds. Numerous grassland bird species are found on the SIATA including one State Threatened species (Henslow's Sparrow) and several Special Concern species (Dickcissel (*Spiza americana*), Vesper Sparrow, Grasshopper Sparrow, Field Sparrow, Bobolink, and Eastern Meadowlark). There are historical records of Greater Prairie-chicken for the Waushara County properties. Brushy areas within and on the edges of the grasslands can provide habitat for a number of other Special Concern birds such as Blue-winged Warbler, Brown Thrasher, and Willow Flycatcher.

Blanding's turtles are known to occur near the Llewellyn parcel in Portage County. There may be opportunities for turtle nest management at this site. The juxtaposition of wetlands and sandy uplands may be attractive nesting sites for turtles at other SIATA within the study area.

Finally, grasslands provide important habitat for a number of butterfly and moth species, including many that are rare. At the Mecan Springs tract, an opportunity exists to expand habitat for the federally endangered Karner blue butterfly by restoring grassland/oak barrens habitat and connecting it to similar habitat at Radley Creek Fishery Area, where the butterfly is already known to occur. The host plant of Karner blue butterfly is wild lupine, which is already present at the SIATA.

## Marsh Bird and Lowland Shrub Bird Conservation

The wetlands of the SIATA provide important habitat for rare species, including birds. 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 open or brushy wetland habitats that were observed at SIATA include Golden-winged Warbler (*Vermivora chrysoptera*), Veery, and Willow Flycatcher (*Empidonax traillii*); Black-billed Cuckoo (*Coccyzus erythrophthalmus*) will also use Alder Thicket and Shrub-Carr. These habitat types occur at Hobbs, Straight Lake, Firth Lake, and Highway 51.

SGCN breeding birds associated with forested wetlands (Tamarack (Poor) Swamp, Northern Wet Forest, Black Spruce Swamp, Northern Hardwood Swamp) that were observed at SIATA include Hermit Thrush (*Catharus guttatus*) and Veery. These habitat types occur at Firth Lake, Larrabee Lake, Highway 51, and possibly at Wausau 2.

SGCN breeding birds associated with open wetlands (Open Bog, sedge meadow, Emergent Marsh) that were observed at SIATA include Golden-winged Warbler, Least Flycatcher, and Willow Flycatcher. These habitat types occur at Hibbs, Straight Lake, Haas, and Highway 51.

Golden-winged Warblers were found at three SIATA, two in Polk County and one in Chippewa County. 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

Four ecologically important sites, or “Primary Sites,” were identified on three parcels within the SIATA (Figure 6, Table 20). 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.

A complete description of the Primary Sites can be found in Appendix F. Information provided in the summary paragraphs includes location information, a site map, a brief summary of the natural features present, the site’s ecological significance, and management considerations. Appendix G lists the rare species and high-quality natural communities currently known from these Primary Sites in the SIATA.

**Table 20. State Ice Age Trail Area Planning Group Primary Sites.**

<b>Code</b>	<b>Name</b>
SIATA01	Larrabee Lake
SIATA02	Firth Lake
SIATA03	Wausau Paper 2 Forest

**Figure 6.** Primary Sites of the State Ice Age Trail Area Planning Group  
**Figure 6a.** Chippewa County

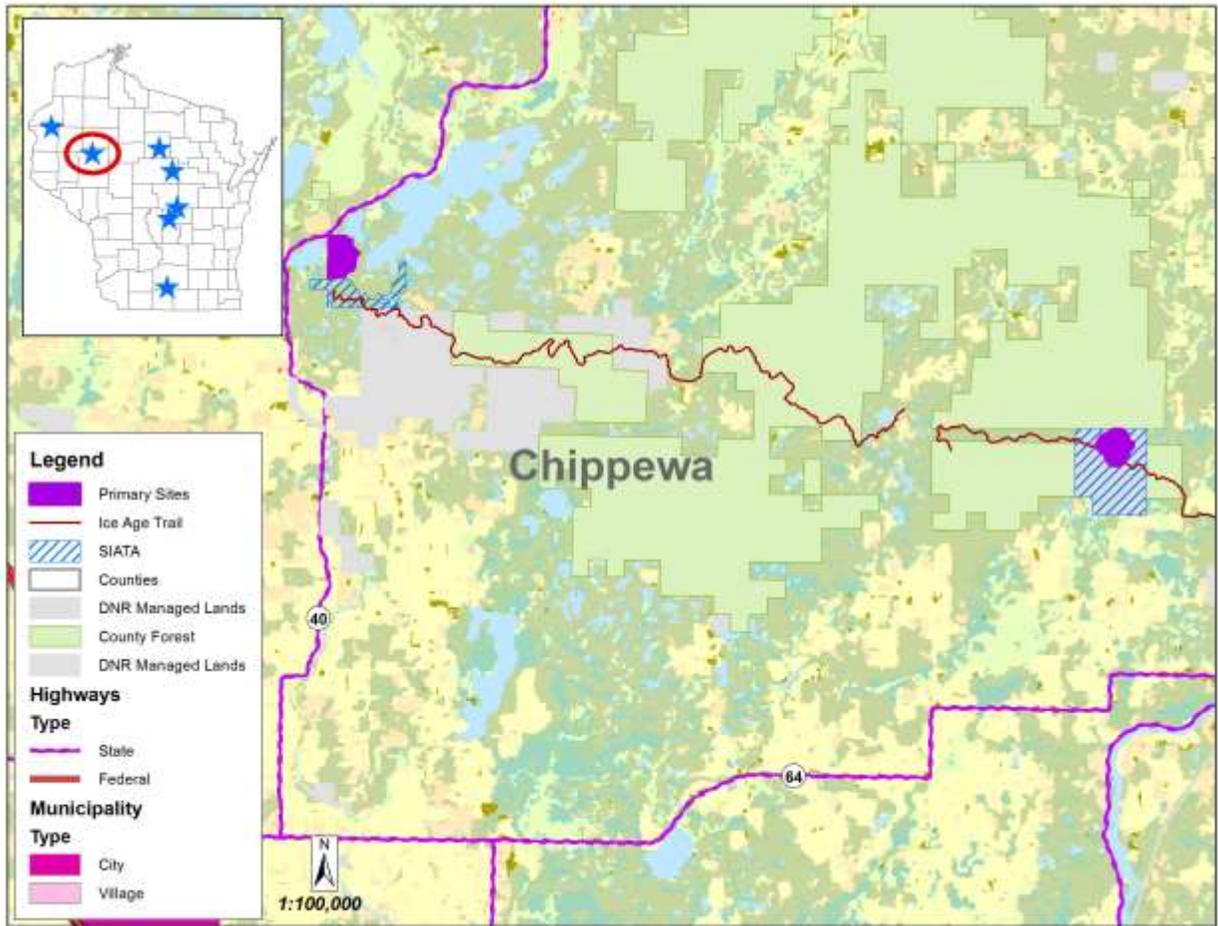
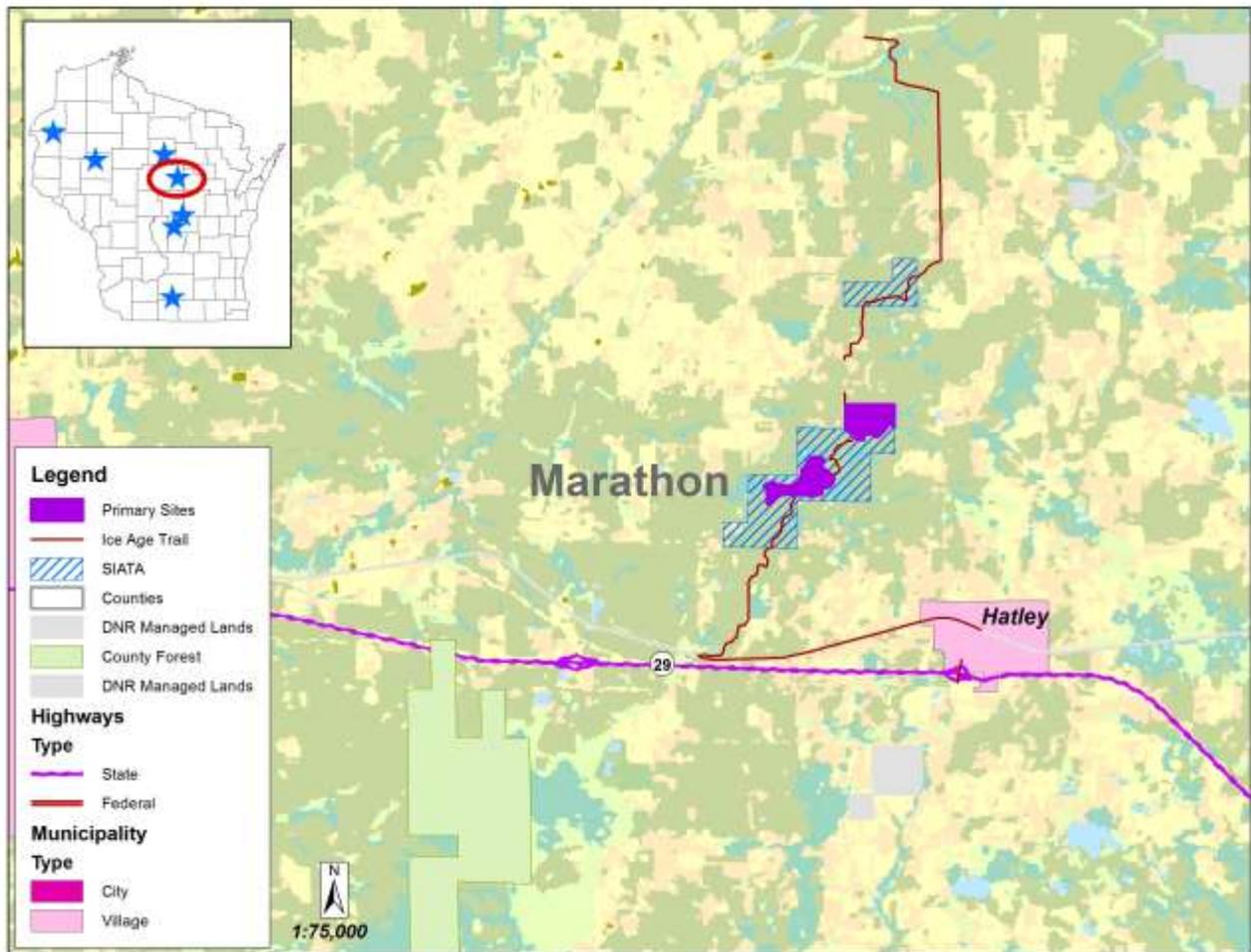


Figure 6b. Marathon County.



## Future Needs

This project was designed to provide a rapid assessment of the biodiversity values with an emphasis on natural communities and breeding passerine birds for the State Ice Age Trail Area Planning Group. Although the report should be considered adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species of the SIATA.

- Several wetlands were noted but were not fully surveyed during this study, including open wetland in Polk County and forested wetlands in Marathon County.
- Additional plant/community surveys of oak forest at Mecan Springs, and of grassland/barrens habitat at Llewellyn (particularly to further evaluate potential for Karner blue habitat restoration).
- Baseline inventory of invasive species is needed to augment what is already known at the parcels. 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 the SIATA, a comprehensive invasive species monitoring and control plan will be needed for detecting and rapidly responding to new invasive threats.

- Surveys for rare plants should be conducted in likely habitats.
- Breeding surveys for Red-shouldered Hawks should be done at Wausau Paper 2, where an individual was observed but no nest was found.
- Additional wetland and marsh bird breeding surveys could be done at selected sites including the Haas tract.
- Bat surveys should be done in appropriate habitat to help determine how widely used these parcels are.
- Additional surveys are recommended for rare herptiles, particularly Blanding's turtle.
- Surveys for selected terrestrial invertebrates of uplands would be beneficial, particularly in grassland and barrens habitats. For example, surveys for lepidopterans, including Karner blue butterflies, should be done at the central Wisconsin parcels, and red-tailed leafhoppers (*Aflexia rubranura*) at the Montrose (Fahey) tract.
- Surveys for wetland lepidopterans (butterflies, moths, and close relatives) are needed. This taxa group was not surveyed, and habitat for rare species is present on the SIATA, especially the Poor Fen at Larrabee Lake and Emergent Marsh at Firth Lakes.

# Glossary

**Crevasse fill** - generally, a short, straight ridge made up of unconsolidated sediments (till or sand and gravel) that were initially deposited in a crevasse and subsequently deposited on the earth's surface as the glacier's ice melted.

**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.

**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
<b>Plants</b>	
American black currant	<i>Ribes americanum</i>
American cancer-root	<i>Conopholis americana</i>
American elm	<i>Ulmus americana</i>
American hazelnut	<i>Corylus americana</i>
American witch-hazel	<i>Hamamelis virginiana</i>
Aromatic aster	<i>Aster oblongifolius</i>
Ash	<i>Fraxinus</i> spp.
Aspen	<i>Populus</i> spp.
Balsam fir	<i>Abies balsamea</i>
Basswood	<i>Tilia americana</i>
Beaked hazelnut	<i>Corylus cornuta</i>
Big-leaved aster	<i>Aster macrophyllus</i>
Big-tooth aspen	<i>Populus grandidentata</i>
Bird's-foot violet	<i>Viola pedata</i>
Bitternut hickory	<i>Carya cordiformis</i>
Black ash	<i>Fraxinus nigra</i>
Black cherry	<i>Prunus serotina</i>
Black chokeberry	<i>Aronia melanocarpa</i>
Black locust	<i>Robinia pseudoacacia</i>
Black oak	<i>Quercus velutina</i>
Black raspberry	<i>Rubus occidentalis</i>
Black spruce	<i>Picea mariana</i>
Black walnut	<i>Juglans nigra</i>
Bloodroot	<i>Sanguinaria canadensis</i>
Blue cohosh	<i>Caulophyllum thalictroides</i>
Blue-bead lily	<i>Clintonia borealis</i>
Bog birch	<i>Betula pumila</i>
Bracken fern	<i>Pteridium aquilinum</i>
Brambles	<i>Rubus</i> spp.
Broad-leaf enchanter's-nightshade	<i>Circaea lutetiana</i> ssp <i>canadensis</i>
Broad-leaved cat-tail	<i>Typha latifolia</i>
Bur oak	<i>Quercus macrocarpa</i>
Burdock	<i>Arctium</i> sp.
Bush honeysuckle	<i>Lonicera</i> spp.
Canada bluegrass	<i>Poa compressa</i>
Canada blue-joint grass	<i>Calamagrostis canadensis</i>
Canada mayflower	<i>Maianthemum canadense</i>
Cattails	<i>Typha</i> spp.
Cinnamon fern	<i>Osmunda cinnamomea</i>
Common buckthorn	<i>Rhamnus cathartica</i>
Common milkweed	<i>Asclepias syriaca</i>
Common ragweed	<i>Ambrosia artemisiifolia</i>

<b>Common Name</b>	<b>Scientific Name</b>
Common tansy	<i>Tanacetum vulgare</i>
Coon-tail	<i>Ceratophyllum demersum</i>
Cotton-grasses	<i>Eriophorum</i> spp.
Crown vetch	<i>Coronilla varia</i>
Cut-leaved toothwort	<i>Dentaria laciniata</i>
Dwarf ginseng	<i>Panax trifolius</i>
Early meadow-rue	<i>Thalictrum dioicum</i>
Eastern cottonwood	<i>Populus deltoides</i>
Elms	<i>Ulmus</i> spp.
Few-seeded sedge	<i>Carex oligosperma</i>
Flowering spurge	<i>Euphorbia corollata</i>
Fowl manna grass	<i>Glyceria striata</i>
Frostweed	<i>Helianthemum</i> sp.
Garlic mustard	<i>Alliaria petiolata</i>
Green ash	<i>Fraxinus pennsylvanica</i>
Ground nut	<i>Amphicarpaea bracteata</i>
Hairy sweet-cicely	<i>Osmorhiza claytoniana</i>
Hemlock	<i>Tsuga canadensis</i>
Hill's oak	<i>Quercus ellipsoidalis</i>
Hop-hornbeam	<i>Ostrya virginiana</i>
Intermediate wood fern	<i>Dryopteris intermedia</i>
Interrupted fern	<i>Osmunda claytoniana</i>
Jack pine	<i>Pinus banksiana</i>
Japanese hedge-parsley	<i>Torilis japonica</i>
Kentucky bluegrass	<i>Poa pratense</i>
Lake sedge	<i>Carex lacustris</i>
Large cranberry	<i>Vaccinium macrocarpon</i>
Large-flowered bellwort	<i>Uvularia grandiflora</i>
Large-flowered trillium	<i>Trillium grandiflorum</i>
Leadplant	<i>Amorpha canescens</i>
Leafy spurge	<i>Euphorbia esula</i>
Leatherleaf	<i>Chamaedaphne calyculata</i>
Linear-leaved panic grass	<i>Dichanthelium linearifolium</i>
Long-leaved bluet	<i>Houstonia longifolia</i>
Low-bush blueberry	<i>Vaccinium angustifolium</i>
Maple-leaf arrow-wood	<i>Viburnum acerifolium</i>
Marsh cinquefoil	<i>Comarum palustre</i>
Marsh fern	<i>Thelypteris palustris</i>
Meadow horsetail	<i>Equisetum pratense</i>
Milkweeds	<i>Asclepias</i> spp.
Motherwort	<i>Leonurus cardiaca</i>
Multiflora rose	<i>Rosa multiflora</i>
Muscle-wood	<i>Carpinus caroliniana</i>
Narrow-leaved cattail	<i>Typha angustifolia</i>
Needle grass	<i>Stipa spartea</i>
Nodding sedge	<i>Carex gynandra</i>
Northern blue flag	<i>Iris versicolor</i>
Northern bush-honeysuckle	<i>Diervilla lonicera</i>

<b>Common Name</b>	<b>Scientific Name</b>
Northern maidenhair fern	<i>Adiantum pedatum</i>
Northern red oak	<i>Quercus rubra</i>
Oaks	<i>Quercus</i> spp.
Ohio spiderwort	<i>Tradescantia ohioensis</i>
Orange jewelweed	<i>Impatiens capensis</i>
Pagoda dogwood	<i>Cornus alternifolia</i>
Paper birch	<i>Betula papyrifera</i>
Pennsylvania sedge	<i>Carex pennsylvanica</i>
Pickereel weed	<i>Pontederia cordata</i>
Pitcher plant	<i>Sarracenia purpurea</i>
Pod-grass	<i>Scheuchzeria palustris</i>
Pondweed	<i>Potamogeton</i> spp.
Prairie dropseed	<i>Sporobolus heterolepis</i>
Purple prairie clover	<i>Dalea purpurea</i>
Pussy-toes	<i>Antennaria</i> spp.
Quaking aspen	<i>Populus tremuloides</i>
Quillwort	<i>Isoetes</i> sp.
Red maple	<i>Acer rubrum</i>
Red pine	<i>Pinus resinosa</i>
Reed canary grass	<i>Phalaris arundinacea</i>
Roses	<i>Rosa</i> spp.
Rough-leaved sunflower	<i>Helianthus strumosus</i>
Sensitive fern	<i>Onoclea sensibilis</i>
Shagbark hickory	<i>Carya ovata</i>
Shallow sedge	<i>Carex lurida</i>
Sharp-lobed hepatica	<i>Anemone acutiloba</i>
Side-oats grama	<i>Bouteloua curtipendula</i>
Silver maple	<i>Acer saccharinum</i>
Skunk cabbage	<i>Symplocarpus foetidus</i>
Small cranberry	<i>Vaccinium oxycoccos</i>
Smooth brome	<i>Bromus inermis</i>
Sphagnum moss	<i>Sphagnum</i> spp.
Spotted knapweed	<i>Centaurea biebersteinii</i>
Spring beauty	<i>Claytonia virginica</i>
Starflower	<i>Trientalis borealis</i>
Stiff aster	<i>Aster linariifolius</i>
Sugar maple	<i>Acer saccharum</i>
Sulfur cinquefoil	<i>Potentilla recta</i>
Tamarack	<i>Larix laricina</i>
Three-fruited sedge	<i>Carex trisperma</i>
Timothy	<i>Phleum pratense</i>
Tussock cotton-grass	<i>Eriophorum vaginatum</i> ssp <i>spissum</i>
Tussock sedge	<i>Carex stricta</i>
Velvet-leaved blueberry	<i>Vaccinium myrtilloides</i>
Virginia creeper	<i>Parthenocissus quiquefolia</i>
Water-arum	<i>Calla palustris</i>
White ash	<i>Fraxinus americana</i>
White meadowsweet	<i>Spiraea alba</i>

<b>Common Name</b>	<b>Scientific Name</b>
White oak	<i>Quercus alba</i>
White panicle aster	<i>Aster lanceolatus</i>
White pine	<i>Pinus strobus</i>
White snakeroot	<i>Eupatorium rugosum</i>
White spruce	<i>Picea glauca</i>
White water-lily	<i>Nymphaea odorata</i>
Whorled milkweed	<i>Asclepias verticillata</i>
Wild columbine	<i>Aquilegia canadensis</i>
Wild geranium	<i>Geranium maculatum</i>
Wild lupine	<i>Lupinus perennis</i>
Wild sarsaparilla	<i>Aralia nudicaulis</i>
Willows	<i>Salix</i> spp.
Wood anemone	<i>Anemone quinquefolia</i>
Woolly-fruit sedge	<i>Carex lasiocarpa</i>
Yellow birch	<i>Betula alleghaniensis</i>
Yellow pond lily	<i>Nuphar variegata</i>
Yellow sweet-clover	<i>Melilotus officinalis</i>
Yellow trout-lily	<i>Erythronium americanum</i>
<b>Fungi</b>	
Oak wilt	<i>Ceratocystis fagacearum</i>
<b>Animals</b>	
Acadian flycatcher	<i>Empidonax vireescens</i>
American woodcock	<i>Scolopax minor</i>
Beaver	<i>Castor canadensis</i>
Big brown bat	<i>Eptesicus fuscus</i>
Blanding's turtle	<i>Emydoidea blandingii</i>
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Black-throated blue warbler	<i>Setophaga caerulescens</i>
Blue-winged teal	<i>Anas discors</i>
Blue-winged warbler	<i>Vermivora pinus</i>
Bobolink	<i>Dolichonyx oryzivorus</i>
Brown thrasher	<i>Toxostoma rufum</i>
Canada warbler	<i>Cardellina canadensis</i>
Cerulean warbler	<i>Dendroica cerulea</i>
Common loon	<i>Gavia immer</i>
Dickcissel	<i>Spiza americana</i>
Eastern meadowlark	<i>Sturnella magna</i>
Eastern wood-pewee	<i>Contopus virens</i>
Emerald ash borer	<i>Agrilus planipennis</i>
Field sparrow	<i>Spizella pusilla</i>
Golden-winged warbler	<i>Vermivora chrysoptera</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Greater prairie chicken	<i>Tympanuchus cupido</i>
Gypsy moth	<i>Lymantria dispar</i>
Henslow's sparrow	<i>Ammodramus henslowii</i>
Hermit thrush	<i>Catharus guttatus</i>

<b>Common Name</b>	<b>Scientific Name</b>
Karner blue butterfly	<i>Lycaeides melissa samuelis</i>
Largemouth bass	<i>Micropterus salmoides</i>
Least flycatcher	<i>Empidonax minimus</i>
Little brown bat	<i>Myotis lucifugus</i>
Mallard	<i>Anas platyrhynchos</i>
Mergansers	<i>Mergus spp.</i>
Muskellunge	<i>Esox masquinongy</i>
Muskrat	<i>Ondatra zibethicus</i>
Northern goshawk	<i>Accipiter gentilis</i>
Northern long-eared bat	<i>Myotis septentrionalis</i>
Northern pike	<i>Esox lucius</i>
Red-shouldered hawk	<i>Buteo lineatus</i>
Red-tailed leafhopper	<i>Aflexia rubranura</i>
Veery	<i>Catharus fuscescens</i>
Vesper sparrow	<i>Pooecetes gramineus</i>
Willow flycatcher	<i>Empidonax traillii</i>
Wood duck	<i>Aix sponsa</i>
Wood thrush	<i>Hylocichla mustelina</i>
Yellow-throated vireo	<i>Vireo flavifrons</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. [dnr.wi.gov/org/land/er/biodiversity/](http://dnr.wi.gov/org/land/er/biodiversity/)
- 2. Wisconsin Natural Heritage Inventory Working List**  
The Wisconsin Natural Heritage Working List contains species known or suspected to be rare in the state and natural communities native to Wisconsin. It includes species legally designated as "Endangered" or "Threatened" as well as species in the advisory "Special Concern" category. This Web page offers a printable pdf file and a key to the Working List for use in conjunction with the information provided in #1 above. [dnr.wi.gov/org/land/er/wlist/](http://dnr.wi.gov/org/land/er/wlist/)
- 3. Ecological Landscapes of Wisconsin Handbook**  
Wisconsin's 16 Ecological Landscapes have unique combinations of physical and biological characteristics such as climate, geology, soils, water, or vegetation. This handbook will contain a chapter for each of these landscapes with detailed information about their ecology, socioeconomics, and ecological management opportunities. An additional introductory chapter will compare the 16 landscapes in numerous ways, discuss Wisconsin's ecology on the statewide scale, and introduce important concepts related to ecosystem management in the state. The full handbook is in development as of this writing, and chapters will be made available online as they are published. Currently, a set of Web pages provide brief Ecological Landscape descriptions, numerous maps, and other useful information, including management opportunities for natural communities and Species of Greatest Conservation Need. [dnr.wi.gov/topic/landscapes/](http://dnr.wi.gov/topic/landscapes/)
- 4. The Wisconsin Wildlife Action Plan**  
This plan is the result of a statewide effort to identify native Wisconsin animal species of greatest conservation need. The plan also presents priority conservation actions to protect the species and their habitats. The plan itself is available online, and there are several online tools to explore the data within the plan. The Web pages are closely integrated with the pages provided in items #1 and #3 above. The Wildlife Action Plan Web pages are quite numerous, so we recommend the following links as good starting points for accessing the information.
  - the plan itself: [dnr.wi.gov/org/land/er/wwap/](http://dnr.wi.gov/org/land/er/wwap/)
  - explore Wildlife Action Plan data: [dnr.wi.gov/org/land/er/wwap/explore/](http://dnr.wi.gov/org/land/er/wwap/explore/)
  - Wildlife Action Plan Implementation: [dnr.wi.gov/org/land/er/wwap/implementation/](http://dnr.wi.gov/org/land/er/wwap/implementation/)
- 5. Wisconsin's Biodiversity as a Management Issue - A Report to Department of Natural Resources Managers**  
This now out-of-print report presents a department strategy for conserving biological diversity. It provides department employees with an overview of the issues associated with biodiversity and

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

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

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

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

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

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

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

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

**8. Oak Savanna State Natural Area Management Guide (Oak Opening, Oak Woodland, Oak Barrens). Chapter 100.60 of WDNR State Natural Areas Handbook.**

This management guide contains the Wisconsin Department of Natural Resources' format for addressing actions on State Natural Areas where the primary feature is oak savanna (more specifically, Oak Opening, Oak Woodland and Oak Barrens). The guide was developed in consultation with Department of Natural Resources savanna management specialists and property managers, and further supported by an analysis of peer-reviewed literature, and leads the reader through the process of developing a detailed management plan. An overview of management techniques is provided, along with pertinent regulations. This resource can be found on the "Manual Codes and Handbooks" Intranet website.

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## Appendix A

### Natural Heritage Inventory Overview and General Methodology

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

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

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

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

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

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

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

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

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

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

The following are descriptions of standard tools used by the NHI Program for conducting biotic inventories. Some of these may be modified, dropped, or repeated as appropriate to the project.

**File Compilation:** Involves obtaining existing records of natural communities, rare plants and animals, and aquatic features for the study area and surrounding lands and waters from the NHI Database. Other databases with potentially useful information may also be queried, such as: forest reconnaissance data; the DNR Surface Water Resources series for summaries of the physical, chemical, and biological characteristics of lakes and streams (statewide, by county); the Milwaukee Public Museum's statewide Herp Atlas; the Wisconsin Breeding Bird Atlas; other NHI “atlas” and site databases; museum/herbarium collections for various target taxa; soil surveys; geological surveys; and the department’s fish distribution database.

Additional data sources are sought out as warranted by the location and character of the site, and the purpose of the project. Manual files maintained within the Bureau of Endangered Resources, including the State Natural Area files, often contain information on a variety of subjects relevant to the inventory of natural features for an area.

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

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

**Compilation of Maps and Other Spatial Data:** USGS 7.5 minute topographic quadrangles, most often in digital form, serve along with aerial photos as the base maps for field survey and often yield useful clues regarding access, extent of area to be surveyed, developments, and the presence and location of special features. These are used in conjunction with numerous GIS layers, which are now a basic resource tool for the efficient and comprehensive planning of surveys and the analysis of their results.

WDNR wetland maps consist of aerial photographs upon which all wetlands down to a scale of 2 or 5 acres have been delineated. Each wetland polygon is classified based on characteristics of vegetation, soils, and water depth. These polygons have been digitized for most counties, and the resulting GIS layers can be superimposed onto other maps.

Ecoregion GIS layers are useful for comprehensive projects covering large geographic areas such as counties, national and state forests, and major watersheds. These maps integrate basic ecological information on climate, landforms, geology, soils, and vegetation. Ecological Landscapes provide the broad framework most often used in Wisconsin; however smaller units, including Landtype Associations, can be very helpful for evaluating ecoregions at finer scales.

**Aerial photographs:** These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time. The Wisconsin NHI Program uses several different types of both color and black and white air photos. Typically, these are in digital format, although paired photos in print format can be valuable for stereoscopic viewing. High-resolution satellite imagery is often cost-prohibitive but is available for some portions of the state and is desirable for certain applications.

**Original Land Survey Records:** The surveyors who laid out the rectilinear Town-Range-Section grid across the state in the mid-nineteenth century recorded trees by species and size at all section corners and along section lines. Their notes also included general impressions of vegetation, soil fertility, and topography, and note aquatic features, wetlands, and recent disturbances such as windthrow and fire. As these surveys typically occurred prior to extensive settlement of the state by Europeans, they constitute a valuable record of conditions prior to extensive modification of the landscape by European technologies and settlement patterns. The tree data are available in GIS format as raw points or interpreted polygons, and the notes themselves can provide helpful clues regarding the study area's potential ecological capabilities.

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

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

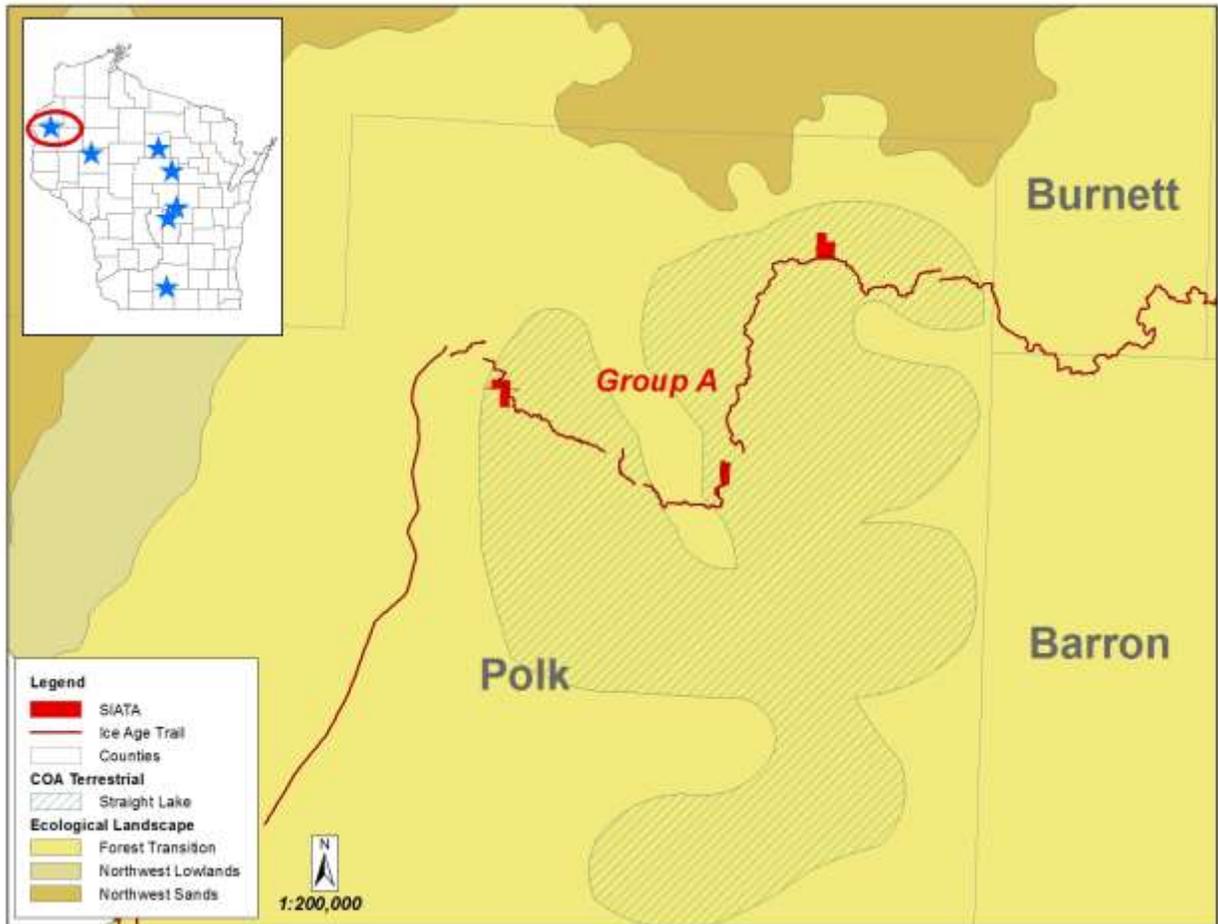
**Aerial Reconnaissance:** Fly-overs are desirable for large sites, and for small sites where contextual issues are especially important. When possible, this should be done both before and after ground level work. Flights are scheduled for those times when significant features of the study area are most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

## **APPENDIX B**

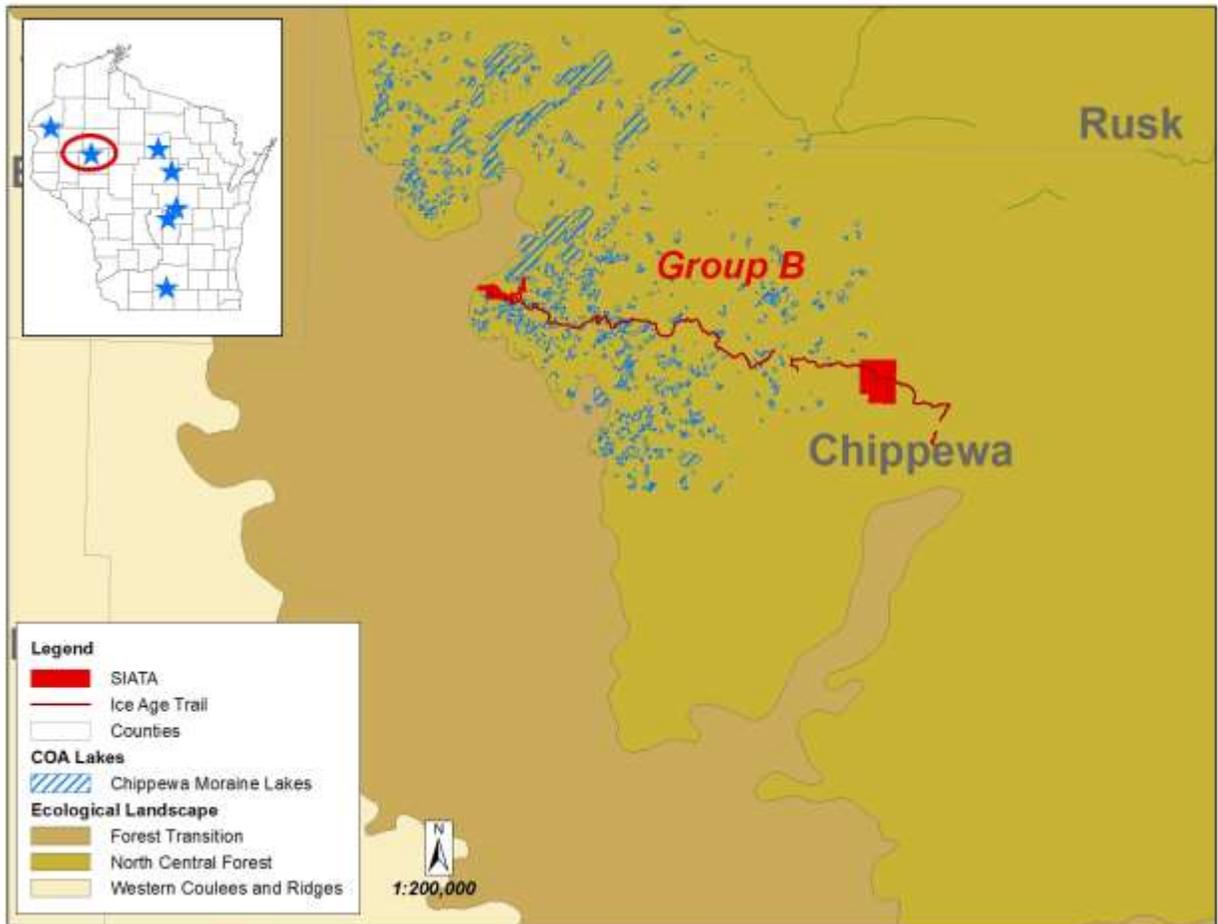
### **Conservation Opportunity Areas**

Three property groups (partly or entirely) are associated with Conservation Opportunity Areas (COA). These include group A (Polk County), group B (Chippewa County), and sites in Waushara County in group E. The COAs are in the following Ecological Landscapes: Forest Transition (group A), North Central Forest (group B), and Central Sand Hills (group E).

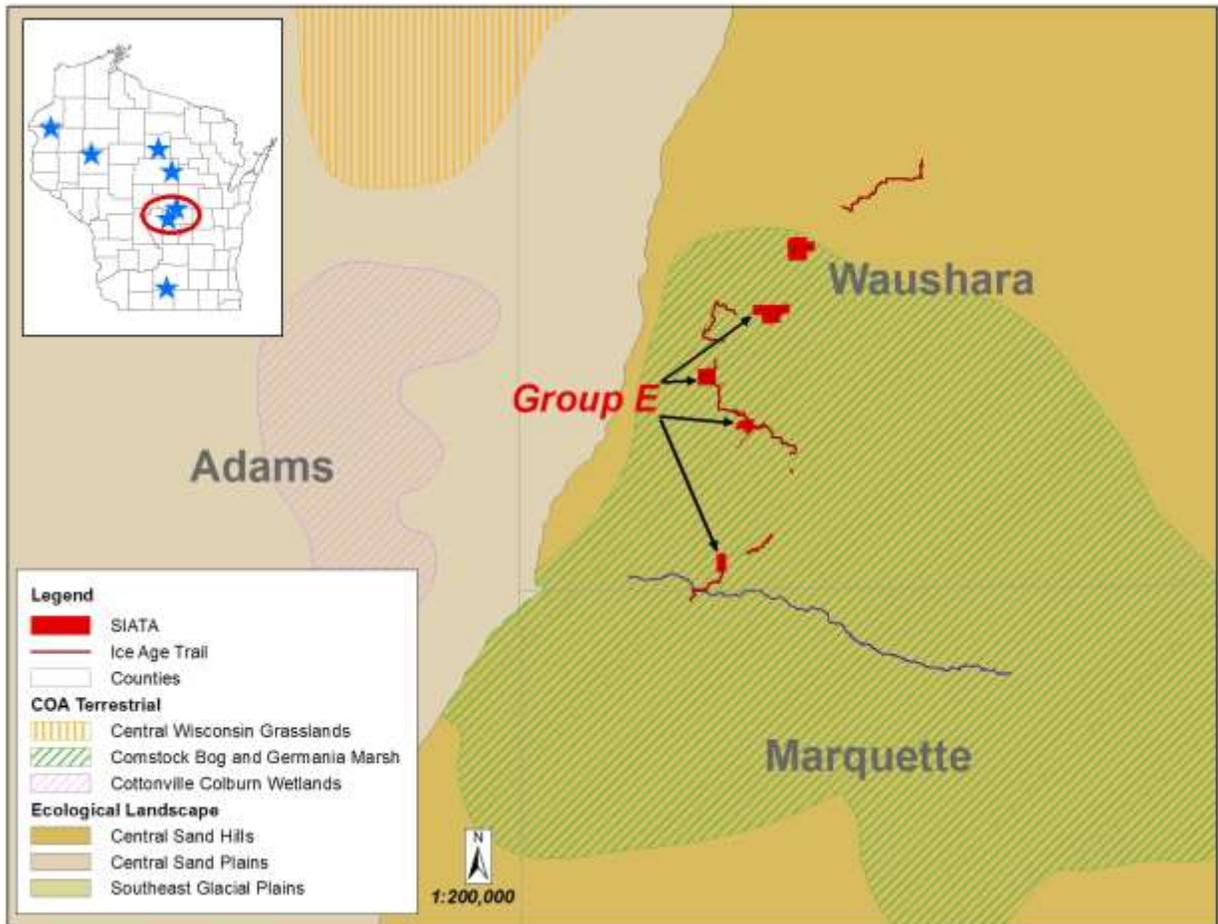
# POLK COUNTY—GROUP A



## CHIPPEWA COUNTY—GROUP B



# WAUSHARA COUNTY—GROUP E



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## Appendix D

### Descriptions of Rare Species and High Quality Natural Communities Documented at State Ice Age Trail Area Property Group

The following paragraphs give brief summary descriptions for some of the rare species documented State Ice Age Trail Area parcels and mapped in the NHI Database. More information can be found on the Endangered Resources Web site ([dnr.wi.gov](http://dnr.wi.gov), keyword “ER”) for several of these species. Not all species documented on the properties have descriptive paragraphs available.

#### Rare Animals

##### **American Woodcock**

American woodcock (*Scolopax minor*) is a Special Concern species in Wisconsin. During the breeding season, woodcock require three distinct types of habitat: clearings for singing grounds and roosting, young second-growth hardwoods for nesting and brood rearing, and moist shrubby sites for feeding. Nests are scrapes and are often found at the base of a small conifer tree. Hazelnut is often the most abundant shrub near nests. Nesting occurs from early April through mid-May.

##### **Blanding's Turtle**

Blanding's turtles (*Emydoidea blandingii*) are listed as a Threatened species in Wisconsin. They utilize a wide variety of aquatic habitats including deep and shallow marshes, shallow bays of lakes and impoundments where areas of dense emergent and submergent vegetation exists, sluggish streams, oxbows and other backwaters of rivers, drainage ditches (usually where wetlands have been drained), and sedge meadows and wet meadows adjacent to these habitats. This species is semi-terrestrial and individuals may spend a good deal of time on land. They often move between a variety of wetland types during the active season, which can extend from early March to mid-October. They overwinter in standing water that is typically more than 3 feet in deep and with a deep organic substrate but will also use both warm and cold-water streams and rivers where they can avoid freezing. Blanding's generally breed in spring, late summer or fall. Nesting occurs from about mid-May through June depending on spring temperatures. They strongly prefer to nest in sandy soils and may travel well over a mile to find suitable soils. This species appear to display nest site fidelity, returning to its natal site and then nesting in a similar location annually. Hatching occurs from early August through early September but hatchlings can successfully overwinter in the nest, emerging the following late April or May. This species takes 17 to 20 years or more to reach maturity.

##### **Black-billed Cuckoo**

Black-billed cuckoo (*Coccyzus erythrophthalmus*) is a Special Concern species in Wisconsin. They typically nest in deciduous and mixed deciduous-coniferous woodlands near lakes or streams, and less often in coniferous forests. Their breeding season occurs from mid-May to late August.

**Blue-winged Warbler** (*Vermivora pinus*) is a Special Concern species in Wisconsin. During breeding season, this species prefers early- to mid-successional habitats with dense vegetation, especially young trees, shrubs, and thickets. Its nesting season occurs from early May to mid-June.

**Bobolink** (*Dolichonyx oryzivorus*) is a Special Concern species in Wisconsin. During breeding season, this species prefers open grasslands with a moderate litter layer and standing residual vegetation, including hay fields, pastures, idle grasslands, old fields, mesic prairies, and sedge meadows. Their breeding season occurs from mid-May to mid-July.

#### **Canada Warbler**

Canada Warblers (*Wilsonia canadensis*) are typically most abundant in moist, mixed coniferous-deciduous forests with a well-developed understory. In Wisconsin they occur in conifer forests dominated by white pine or white cedar, as well as black ash swamps, sugar maple-hemlock-yellow birch forests, and alder thickets. Important components of breeding habitat include conifers, tall shrubs, a lush herb layer, and often creeks and streams. The Canada Warbler nests in dense vegetation, often in areas with mosses, ferns, and coarse woody debris. The breeding season occurs from early June to early July.

#### **Cerulean Warbler**

Cerulean Warbler (*Dendroica cerulea*), a bird listed as Threatened and a Species of Greatest Conservation Need in Wisconsin, prefers lowland deciduous forests dominated by mature stands of American elm, cottonwood, and green ash and large upland blocks of mature dry-mesic to mesic forests. The breeding season extends from late April through mid-July.

#### **Dickcissel**

Dickcissel (*Spiza americana*), a bird of Special Concern and a Species of Greatest Conservation Need in Wisconsin, prefers open pasture and fields of clover and alfalfa. Grasslands, meadows, and savanna are also important nesting areas. This bird requires vegetation with medium to tall height-density and a significant component of forbs, some stiff-stemmed. Breeding occurs from late May to early August.

**Eastern Meadowlark** (*Sturnella magna*) is a Special Concern species in Wisconsin. This species frequents pastures, idle grasslands, old fields, dry-mesic prairies and oak savannas, reflecting their preference for moderate density vegetation, a high litter layer, and few shrubs. Their breeding season occurs from early April to early August.

#### **Golden-winged Warbler**

Golden-winged Warbler (*Vermivora chrysoptera*) is a Special Concern species in Wisconsin. Although once thought to be associated with early-successional habitats, this species requires a diverse landscape mosaic of habitat types to fulfill all of its life history needs. This habitat mosaic includes brushy forest openings, shrubby wetlands, or brushy grasslands and adjacent areas of more mature forest. This species builds well-concealed nests on the ground. Nesting occurs from late May to late July.

#### **Grasshopper Sparrow**

Grasshopper Sparrow (*Ammodramus savannarum*), a bird listed as Special Concern, prefers prairies, retired cropland, unmowed highway right-of-ways, pastures (Kentucky bluegrass and timothy), shrub-carr wetlands, northern sedge meadows, and managed grasslands maintained for duck production. This bird will nest in areas of 5-25 cm height-density that has bare patches and a diverse structure with stiff forbs for song perches. The breeding season extends from early May through mid-August.

#### **Great Blue Heron**

Great Blue heron (*Ardea herodias*), a bird of Special Concern in Wisconsin, is found in freshwater marshes, along lakes, rivers, bays, lagoons, fields, and meadows. Nests are commonly high in trees in swamps and forested areas, less commonly in bushes, or on the ground and rock ledges. Great Blue Herons often nests with other herons.

### **Greater Prairie-Chicken**

Greater Prairie chicken (*Tympanuchus cupido*), a bird listed as Threatened in Wisconsin, prefers mixed grasslands and managed grasslands including wheatgrass, switchgrass, timothy, bromegrass, hoary alyssum, yarrow, blue vervain, daisy fleabane and goldenrods. The recommended avoidance period is from early March to late September.

### **Henslow's Sparrow**

Henslow's Sparrow (*Ammodramus henslowii*) a bird listed as Threatened and a Species of Greatest Conservation Need in Wisconsin, prefers old fields, open grasslands, wet meadows, unmowed highway right-of-ways, undisturbed pastures, timothy hay fields, and fallow land grown up to tall weeds. The breeding season extends from mid-May through mid-July.

### **Least Flycatcher**

The Least Flycatcher (*Empidonax minimus*) is a State Special Concern species that is found in almost every major type of deciduous and mixed forest, although less commonly in conifers. Although Least Flycatcher historically bred throughout Wisconsin, the breeding range shifted mostly to the northern part of the state as deciduous forest cover was lost in the south. Nesting occurs from mid-May to mid-July.

### **Red-shouldered Hawk**

Red-shouldered Hawk (*Buteo lineatus*) is a bird listed as Threatened in Wisconsin. This species prefers larger stands of medium-aged to mature lowland deciduous forests, dry-mesic and mesic forest with small wetland pockets. The recommended avoidance period is from March 1 - July 31.

### **Veery**

Veeries (*Catharus fuscescens*), a Special Concern species, are found in a wide variety of forest habitats, provided there is thick deciduous undergrowth present, resulting in a broad distribution throughout the state. They are most common in northern and central Wisconsin forests, but also occur southward in large forested tracts such as the Baraboo Hills. Veeries nest on the ground or within approximately three feet of the ground. Nesting occurs from late May to early July.

### **Vesper Sparrow**

The Vesper Sparrow (*Pooecetes gramineus*) is a Special Concern species in Wisconsin. It prefers dry, open habitats with short, sparse vegetation, some bare ground, and short to moderate shrub or tall forb cover. In Wisconsin, this includes Dry to Dry-mesic Prairie, short to medium height idle grasslands, shrubby grasslands, dry old fields, pastures, hay fields, small grain fields, weedy fence lines and roadsides, orchards, woodland edges, and shelterbelts. Nesting occurs from late April to mid-July.

### **Willow Flycatcher**

Willow Flycatcher (*Empidonax traillii*) is a Special Concern species that prefers shrubby wetlands and uplands. They commonly nest in elderberry, dogwood, honeysuckle, and willow, which are often placed over water. Nesting occurs from early June to early July.

### **Wood Thrush**

The Wood Thrush (*Hylocichla mustelina*) is a Special Concern species that prefers large blocks of upland moist forests with mature trees, moderate to dense canopy cover, moderate undergrowth, and ample leaf litter. Nesting occurs from mid-May to late July.

### **Yellow-bellied Flycatcher**

Yellow-bellied flycatcher (*Empidonax flaviventris*), is a species of Special Concern in Wisconsin. It prefers extensive black spruce, tamarack, and white cedar swamps for habitat. Nesting areas are heavily vegetated, with mosses, herbs, sedges, ferns, shrubs, and small trees. Nests are built on or near ground and are usually well hidden. Nesting occurs from June to mid-July.

## **Rare Plants**

### **Large-flowered Ground-cherry**

Large-flowered Ground-cherry (*Leucophysalis grandiflora*), a State Special Concern plant, is found mostly in recently burned moist to dry forests, as well as gravel bars of large rivers. Blooming occurs throughout July; fruiting occurs throughout August. The optimal identification period for this species is throughout July.

## **Natural Communities**

### **Emergent Marsh**

These open, marsh, lake, riverine and estuarine communities with permanent standing water are dominated by robust emergent macrophytes, in pure stands of single species or in various mixtures. Dominants include cattails, bulrushes, bur-reeds, giant reed, pickerel-weed, water-plantains, arrowheads, the larger species of spikerush, and wild rice.

Aquatic plants, including both emergent and submergent aquatic vegetation, form the foundation of healthy and flourishing aquatic ecosystems - both within lakes and rivers and on the shores and wetlands around them. They not only protect water quality, but they also produce life-giving oxygen. Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus and nitrogen that could stimulate algal blooms. Plant beds stabilize soft lake and river bottoms and reduce shoreline erosion by reducing the effect of waves and current.

Aquatic plants also serve as spawning habitat for fish and amphibians, as shelter for various life stages of a variety of species, and as nesting habitat for birds. Plant beds support populations of aquatic insects that serve as a food base for other species. Seeds and other plant parts provide vital nutrition to a number of waterfowl and other bird species. Healthy, native aquatic plant communities also help prevent the establishment of invasive exotic plants like Eurasian watermilfoil.

### **Lake—Deep, Soft, Seepage**

These lakes do not have an inlet or an outlet, and only occasionally overflow. As landlocked waterbodies, the principal source of water is precipitation or runoff, supplemented by groundwater from the immediate drainage area. Since seepage lakes commonly reflect groundwater levels and rainfall patterns, water levels may fluctuate seasonally. Seepage lakes are the most common lake type in Wisconsin. In deep lakes a thermocline develops during the summer and winter. In the spring and fall this zone of marked temperature difference breaks down, allowing for the mixing of bottom and surface waters and a redistribution of oxygen and nutrients. Soft lakes have total alkalinity that is less than 50 ppm.

### **Lake—Shallow, Soft, Seepage**

These lakes do not have an inlet or an outlet, and only occasionally overflow. As landlocked waterbodies, the principal source of water is precipitation or runoff, supplemented by groundwater from the immediate drainage area. Since seepage lakes commonly reflect groundwater levels and rainfall patterns, water levels may fluctuate seasonally. Seepage lakes are the most common lake type in Wisconsin. Shallow lakes do not stratify thermally, and can become oxygen depleted as the water warms and decomposition exceeds primary production. This can also occur during the winter when ice and snow cover the surface,

inhibiting photosynthesis. "Freezeout" conditions may then prevail. Soft lakes have total alkalinity that is less than 50 ppm.

### **Northern Mesic Forest**

This forest complex covered the largest acreage of any Wisconsin vegetation type prior to European settlement. Sugar maple is dominant or co-dominant in most stands, while hemlock was the second most important species, sometimes occurring in nearly pure stands with white pine. Beech can be a co-dominant with sugar maple in the counties near Lake Michigan. Other important tree species were yellow birch, basswood, and white ash. The groundlayer varies from sparse and species poor (especially in hemlock stands) with woodferns (especially *Dryopteris intermedia*), blue-bead lily, clubmosses, and Canada mayflower prevalent, to lush and species-rich with fine spring ephemeral displays. After old-growth stands were cut, trees such as quaking and big-tooth aspens, white birch, and red maple became and still are important in many second-growth Northern Mesic Forests.

### **Poor Fen**

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

### **Southern Dry-mesic Forest**

Red oak is a common dominant tree of this upland forest community type. White oak, basswood, sugar and red maples, white ash, shagbark hickory, and black cherry are also important. The herbaceous understory flora is diverse and includes many species listed under southern dry forest plus jack-in-the-pulpit, enchanter's-nightshade, large-flowered bellwort, interrupted fern, lady fern, tick-trefoils, and hog peanut.

Southern dry-mesic forests occur on loamy soils of glacial till plains and moraines, and on erosional topography with a loess cap, south of the tension zone. This community type was common historically, although white oak was considerably more dominant than red oak, and the type is still common today. However, to the detriment of the oaks, mesophytic tree species are becoming increasingly important under current management practices and fire suppression policies. Oak forests are succeeding to more mesic species (e.g., central and northern hardwood forest types), or to brush.

### **Other**

#### **Bird Rookery**

A bird rookery is an area where more than one pair of birds nest in a group. The number of nests can vary from just a few to hundreds and can include one to many different species of birds. Sites can include rare and non-rare species. The breeding time will vary based on the species present at the site. Rookeries are typically located in inaccessible locations including forests, shrub communities, wetlands adjacent to water (lakes, rivers or streams), and islands. These sites are important as large numbers of breeding individuals can be found in a single place.

#### **Karner Blue Federal High Potential Range**

High Potential Range are the areas in Wisconsin that contain both all of the documented records of Karner blue butterflies and the areas with similar habitat, soils, and climate, where the Karner blue butterfly is most likely to occur within 5 miles of known occurrences.

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## Appendix E

### Wisconsin Natural Heritage Working List Explanation

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

## APPENDIX H

### Soils of the SIATA within the study area

Individual soil types by property group and county.

<i>Property Group/County</i>	<i>Soil Types</i>
<b>Group A/Polk</b>	Adolph silt loam
	Amery complex, 1 to 6 percent slopes
	Amery complex, 12 to 20 percent slopes
	Amery complex, 6 to 12 percent slopes
	Amery sandy loam, 6 to 12 percent slopes
	Amery silt loam, 1 to 6 percent slopes
	Amery silt loam, 6 to 12 percent slopes
	Antigo silt loam, 0 to 2 percent slopes
	Antigo silt loam, 2 to 6 percent slopes
	Barronett silt loam
	Cathro muck
	Cromwell sandy loam, 2 to 6 percent slopes
	Cromwell sandy loam, 6 to 12 percent slopes
	Emmert gravelly sandy loam, 12 to 35 percent slopes
	Fluvaquents, wet
	Magnor silt loam, 0 to 2 percent slopes
	Magnor silt loam, 2 to 6 percent slopes
	Menahga loamy sand, 12 to 25 percent slopes
	Menahga loamy sand, 6 to 12 percent slopes
	Mora loam, 1 to 4 percent slopes
	Pits, gravel
	Poskin silt loam, 0 to 3 percent slopes
	Rifle muck
	Rosholt loam, 12 to 20 percent slopes
	Rosholt loam, 2 to 6 percent slopes
	Rosholt loam, 6 to 12 percent slopes, eroded
	Rosholt-Cromwell complex, 12 to 20 percent slopes
	Rosholt-Cromwell complex, 20 to 30 percent slopes
	Rosholt-Cromwell complex, 6 to 12 percent slopes
	Santiago silt loam, 1 to 6 percent slopes
	Santiago silt loam, 6 to 12 percent slopes
	Saprists and Aquents
	Seelyeville muck
	Warman variant sandy loam
<b>Group B/Chippewa</b>	Alban fine sandy loam, 2 to 6 percent slopes
	Almena silt loam, 1 to 6 percent slopes
	Amery sandy loam, 12 to 25 percent slopes
	Antigo silt loam, 6 to 12 percent slopes, eroded
	Barronett mucky silt loam, ponded, 0 to 2 percent slopes
	Barronett silt loam, 0 to 2 percent slopes
	Chetek-Mahtomedi complex, 12 to 25 percent slopes,

	eroded
	Comstock silt loam, 0 to 2 percent slopes
	Crystal Lake silt loam, 0 to 3 percent slopes
	Friendship loamy sand, 0 to 3 percent slopes
	Greenwood peat, 0 to 1 percent slopes
	Lupton muck, 0 to 1 percent slopes
	Menahga loamy sand, 0 to 6 percent slopes
	Otterholt silt loam, 6 to 12 percent slopes, eroded
	Poskin silt loam, 0 to 2 percent slopes
	Santiago silt loam, 12 to 20 percent slopes, eroded
	Santiago silt loam, 6 to 12 percent slopes, eroded
	Seelyeville muck, 0 to 1 percent slopes
	Spencer silt loam, 6 to 12 percent slopes, eroded
	Spencer silt loam, gravelly substratum, 2 to 6 percent slopes
<b>Group C/Lincoln</b>	Comstock silt loam, 0 to 3 percent slopes
	Goodman silt loam, 6 to 15 percent slopes
	Hatley silt loam, 0 to 4 percent slopes
	Lupton, Cathro, and Markey mucks, 0 to 1 percent slopes
	Minocqua and Capitola mucks, 0 to 2 percent slopes
	Ossmer silt loam, 0 to 3 percent slopes
	Padwet sandy loam, 1 to 6 percent slopes
	Sarona-Pence sandy loams, 15 to 35 percent slopes
	Sarona-Pence sandy loams, 6 to 15 percent slopes
	Sconsin silt loam, 1 to 6 percent slopes
<b>Group D/Marathon</b>	Cathro muck, 0 to 1 percent slopes
	Cathro muck, 0 to 1 percent slopes
	Fenwood silt loam 2 to 15 percent slopes, stony
	Fenwood silt loam, 15 to 30 percent slopes, stony
	Hatley cobbly silt loam, 1 to 6 percent slopes, bouldery
	Hatley silt loam, 1 to 6 percent slopes
	Kennan sandy loam, 15 to 30 percent slopes, bouldery
	Kennan sandy loam, 2 to 8 percent slopes, bouldery
	Kennan sandy loam, 8 to 15 percent slopes
	Kennan sandy loam, 8 to 15 percent slopes, bouldery
	Mahtomedi loamy sand, 15 to 45 percent slopes
	Oesterle loam, 0 to 2 percent slopes
	Rietbrock silt loam, 1 to 8 percent slopes, stony
	Scott Lake sandy loam, 0 to 3 percent slopes
	Seelyeville muck, 0 to 1 percent slopes
<b>Group E</b>	
<b>Portage</b>	Coloma loamy sand, 2 to 6 percent slopes
	Coloma loamy sand, 6 to 12 percent slopes
	Leola loamy sand, 0 to 3 percent slopes
	Markey muck
	Oesterle loam, silty subsoil variant
	Plainfield and Kranski soils

	Richford loamy sand, 2 to 6 percent slopes
	Richford loamy sand, 6 to 12 percent slopes
	Rosholt complex, 12 to 20 percent slopes
	Rosholt sandy loam, 6 to 12 percent slopes, eroded
<b>Waushara</b>	Coloma loamy sand, 12 to 30 percent slopes
	Coloma loamy sand, 6 to 12 percent slopes
	Hortonville fine sandy loam, 2 to 6 percent slopes
	Okee loamy sand, 6 to 12 percent slopes
	Plainfield sand, 12 to 30 percent slopes
	Plainfield sand, 2 to 6 percent slopes
	Plainfield sand, 6 to 12 percent slopes
	Richford loamy sand, 0 to 2 percent slopes
	Richford loamy sand, 2 to 6 percent slopes
	Richford loamy sand, 6 to 12 percent slopes
<b>Group F/Dane</b>	Basco silt loam, 2 to 6 percent slopes, eroded
	Dunbarton silt loam, 12 to 20 percent slopes, eroded
	Dunbarton silt loam, 2 to 6 percent slopes, eroded
	Dunbarton silt loam, 6 to 12 percent slopes, eroded
	Eleva sandy loam, 6 to 12 percent slopes, eroded
	Elkmound sandy loam, 20 to 30 percent slopes, eroded
	Elkmound sandy loam, 30 to 60 percent slopes
	Hixton loam, 2 to 6 percent slopes
	Meridian loam, 2 to 6 percent slopes
	Salter sandy loam, 2 to 6 percent slopes
	Seaton silt loam, 2 to 6 percent slopes
	Troxel silt loam, 1 to 3 percent slopes