



## **Rapid Ecological Assessment for the Door and Kewaunee County State Wildlife and Natural Areas Planning Group**

---

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

#### **Properties included in this report are:**

- Baileys Harbor Boreal Forest and Wetlands State Natural Area
- C.D. (Buzz) Besadny Fish and Wildlife Area
- Gardner Swamp Wildlife Area
- Moonlight Bay Bedrock Beach State Natural Area
- Mud Lake State Natural Area
- Mud Lake Wildlife Area (Door)
- Reibolts Creek Public Access

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

April 2011

PUB ER-827 2011

# Acknowledgments

We extend our appreciation to Michelle Hefty and Aaron Buchholz, property managers for this planning group; all of the reviewers; and the Wildlife and State Natural Areas programs for their support and assistance.

**Primary Authors:** Christina Isenring, Terrell Hyde, Rich Staffen

**Contributors:**

- Craig Anderson – botany
- Jeff Baughman – birds
- Julie Bleser – data management
- Andy Clark – ecology
- Brian Collins – birds
- Stephanie Dolrenry – birds
- Kim Grveles – birds
- Dawn Hinebaugh – report editing
- Terrell Hyde – zoology data processing
- Christina Isenring – data processing, inventory coordination
- Janeen Laatsch – botany
- William A. Smith – zoology
- Amy Staffen – natural community data processing
- Rich Staffen – birds, zoology data processing
- Nate Stewart – GIS

**Cover Photo:** Bailey’s Harbor Boreal Forest and Wetlands SNA. Photo by State Natural Areas staff.

# Table of Contents

<b>Acknowledgments.....</b>	<b>2</b>
Table of Contents.....	3
List of Figures.....	4
List of Tables.....	4
Appendices.....	4
<b>Introduction.....</b>	<b>7</b>
Purpose and Objectives.....	7
Overview of Methods.....	7
Background on Past Efforts.....	10
Special Management Designations.....	11
<b>Regional Ecological Context.....</b>	<b>12</b>
Ecological Landscape.....	12
Regional Biodiversity Needs and Opportunities.....	14
Regional Biodiversity Needs and Opportunities.....	15
Rare Species of the Northern and Central Lake Michigan Coastal Ecological Landscapes.....	16
<b>Description of the Study Area.....</b>	<b>17</b>
Location and Size.....	17
Ecoregion.....	17
Physical Environment.....	18
Physical Environment.....	19
Vegetation.....	20
Rare Species and High Quality Natural Communities of the Door and Kewaunee County State Wildlife and Natural Areas Planning Group.....	24
<b>Management Considerations and Opportunities for Biodiversity Conservation... </b>	<b>28</b>
Rare snails.....	28
Migratory Bird Stopover Site.....	29
Old Growth/Older Forests.....	30
Coniferous Forests.....	31
Kewaunee Marsh.....	31
Invasive Species.....	31
Forest Fragmentation.....	34
Ecological Priorities for SGCN.....	35
Natural Community Management Opportunities.....	35
<b>Primary Sites: Site-specific Opportunities for Biodiversity Conservation.....</b>	<b>36</b>
<b>Primary Sites: Site-specific Opportunities for Biodiversity Conservation.....</b>	<b>37</b>
<b>Future Needs.....</b>	<b>38</b>

<b>Glossary</b> .....	<b>38</b>
<b>Glossary</b> .....	<b>39</b>
<b>Species List</b> .....	<b>41</b>
<b>Reference List</b> .....	<b>44</b>
<b>Additional Resources</b> .....	<b>47</b>

## List of Figures

Figure 1. Location of Properties within the Door and Kewaunee County State Wildlife and Natural Areas Planning Group.....	9
Figure 2. Ecological Landscapes of Wisconsin and the study area.....	12
Figure 3. Landcover for the DKPG from the Wisconsin DNR Wisconsin GIS coverage (WDNR 1993).....	14
Figure 4. Landtype Associations for the area comprising the Door and Kewaunee County State Wildlife and Natural Areas Planning Group.....	18
Figure 5. Vegetation for the study area prior to Euro-American settlement. Data are from Finley (1976).....	21

## List of Tables

Table 1. Major Natural Communities Management Opportunities in the Northern Lake Michigan Coastal Ecological Landscape (EMPT 2007 and WDNR 2006b).....	15
Table 2. Major Natural Communities Management Opportunities in the Central Lake Michigan Coastal Ecological Landscape (EMPT 2007 and WDNR 2006b).....	15
Table 3. Listing Status for rare species in Northern Lake Michigan Coastal Ecological Landscape as of 2009. Source is the NHI database.....	16
Table 4. Listing Status for rare species in the Central Lake Michigan Coastal Ecological Landscape as of 2009. Source is the NHI database.....	16
Table 5. Documented rare species and high-quality natural communities for the Door and Kewaunee County State Wildlife and Natural Areas Planning Group.....	24
Table 6. Rare species that are either 1) found within one mile of the DKPG and not found on the DKPG or 2) mapped at a low precision. ....	27
Table 7. Widespread non-native invasive species of the Door Peninsula.....	33
Table 8. New or not widespread non-native invasive species of the Door Peninsula.....	34
Table 9. Rare terrestrial snails of the DKPG.....	28
Table 10. Rare terrestrial snails not currently known from the DKPG but found within Door County.....	28
Table 11. Spring and fall migratory bird use at important sites within the DKPG.....	30

## Appendices

- A. Natural Heritage Inventory Overview and General Methodology
- B. Map of Conservation Opportunity Areas for the Northern Lake Michigan Coastal Ecological Landscape
- C. The Door and Kewaunee County State Wildlife and Natural Areas Planning Group Species of Greatest Conservation Need

- D. Rare Species and High-quality Natural Communities of the Door and Kewaunee County State Wildlife and Natural Areas Planning Group Listed by Property
- E. Summary Descriptions for Rare Species and High-quality Natural Communities Documented on the Door and Kewaunee County State Wildlife and Natural Areas Planning Group
- F. Wisconsin Natural Heritage Working List Inventory
- G. Primary Sites within the Door and Kewaunee County State Wildlife and Natural Areas Planning Group
- H. Rare Species and High-quality Natural Communities of the Door and Kewaunee County State Wildlife and Natural Areas Planning Group Listed by Primary Site

## The Door and Kewaunee County State Wildlife and Natural Areas Planning Group At a Glance

### **Exceptional Characteristics of the Study Area**

- **Rare Animals and Plants.** The diverse habitats of the Door and Kewaunee County State Wildlife and Natural Areas Planning Group (DKPG) support numerous rare species. Thirty-seven rare animal species are known from the DKPG, including one State Endangered (also Federally Endangered), two State Threatened, and 34 Special Concern species. Twenty-two rare plant species are known from the DKPG, including two State Endangered, three State Threatened (one of which is Federally Threatened), and 17 Special Concern species.
- **Rare Snails.** Rare terrestrial snails, some of which occur in few or no other locations in the world and date back to the last Ice Age, are found along the Niagara Escarpment. Outcrops of the Niagara Escarpment are uncommon on the DKPG, although where there is suitable habitat, management opportunities exist to protect these important species and their habitat.
- **Migratory Bird Stopover Habitat.** The Great Lakes shoreline plays a crucial role for millions of migrating birds. Mud Lake Wildlife Area (including Mud Lake SNA and Ridges Sanctuary SNA) and Gardner Swamp Wildlife Area are vital Migratory Bird Stopover Sites providing valuable resources to migrating waterfowl and landbirds during both spring and fall migrations.
- **Coniferous Forests.** Coniferous forests, including Boreal Forest and Northern Wet-mesic Forests, of the DKPG represent unique variants of these types in Wisconsin and provide habitat for many rare species.
- **Kewaunee Marsh.** An Emergent Marsh wetland complex (unusual for the western shore of Lake Michigan) lies along the Kewaunee River at the eastern end of C.D. (Buzz) Besadny Fish and Wildlife Area, and provides important habitat for breeding and migratory birds.

### **Site Specific Opportunities for Biodiversity Conservation**

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

- **Mud Lake State Natural Area.** This large site is critically important to the Door Peninsula and the rare species that rely on the regionally unique natural communities found there. This site is connected to other State Natural Areas and lands protected for conservation purposes, creating a large block of habitat used by State and Federally Threatened and Endangered species.
- **Bailey’s Harbor Boreal Forest and Wetlands State Natural Area.** This site supports a unique variant Boreal Forest and Great Lakes Alkaline Rockshore, both of which are restricted to the Door Peninsula. These high-quality habitats support rare species, including state imperiled birds and snails and a Federally Threatened plant.
- **Moonlight Bay Bedrock Beach State Natural Area.** The natural communities at this site are high-quality and represent intact examples of types that were more common on the Door Peninsula historically. The Boreal Forest at this site is a variant limited to northeastern Wisconsin, making protection of remaining examples critical. All of the habitats at this site provide important habitat to many rare plant species including those that are State and Federally Threatened.

# Introduction

## Purpose and Objectives

This report is intended to be used as a source of information for developing a new master plan for the Door and Kewaunee Counties State Wildlife and Natural Areas Planning Group (DKPG; Figure 1). The regional ecological context for the DKPG is also provided to assist in developing the Regional and Property Analysis that is part of the master plan. Properties included in this assessment are:

- Baileys Harbor Boreal Forest and Wetlands State Natural Area
- C.D. (“Buzz”) Besadny Fish and Wildlife Area
- Gardner Swamp Wildlife Area
- Moonlight Bay Bedrock Beach State Natural Area
- Mud Lake State Natural Area
- Mud Lake Wildlife Area
- Reibolts Creek Public Access (included as part of Mud Lake Wildlife Area in the remainder of the report)

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

## Overview of Methods

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

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

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

Existing NHI data are often the starting point for conducting a biotic inventory. Prior to this project, NHI data for the DKPG were limited to: 1) the Statewide Natural Area Inventory, a county-by-county effort conducted by WDNR's Bureau of Research and Endangered Resources between 1969 and 1984 that focused on natural communities but included some surveys for rare plants and animals, 2) breeding bird surveys on State Natural Areas, 3) surveys for the Coastal Wetlands Assessment (Epstein et. al 2002), 4) surveys for the Niagara Escarpment Report (Anderson et al. 2002), and 5) taxa specific surveys.

The most recent taxa-specific field surveys for the study area were conducted during 2008. Surveys were limited in scope and focused on documenting high quality natural communities, rare plants, and breeding birds. The collective results from all of these surveys were used, along with other information, to identify ecologically important areas (Primary Sites) on the DKPG.

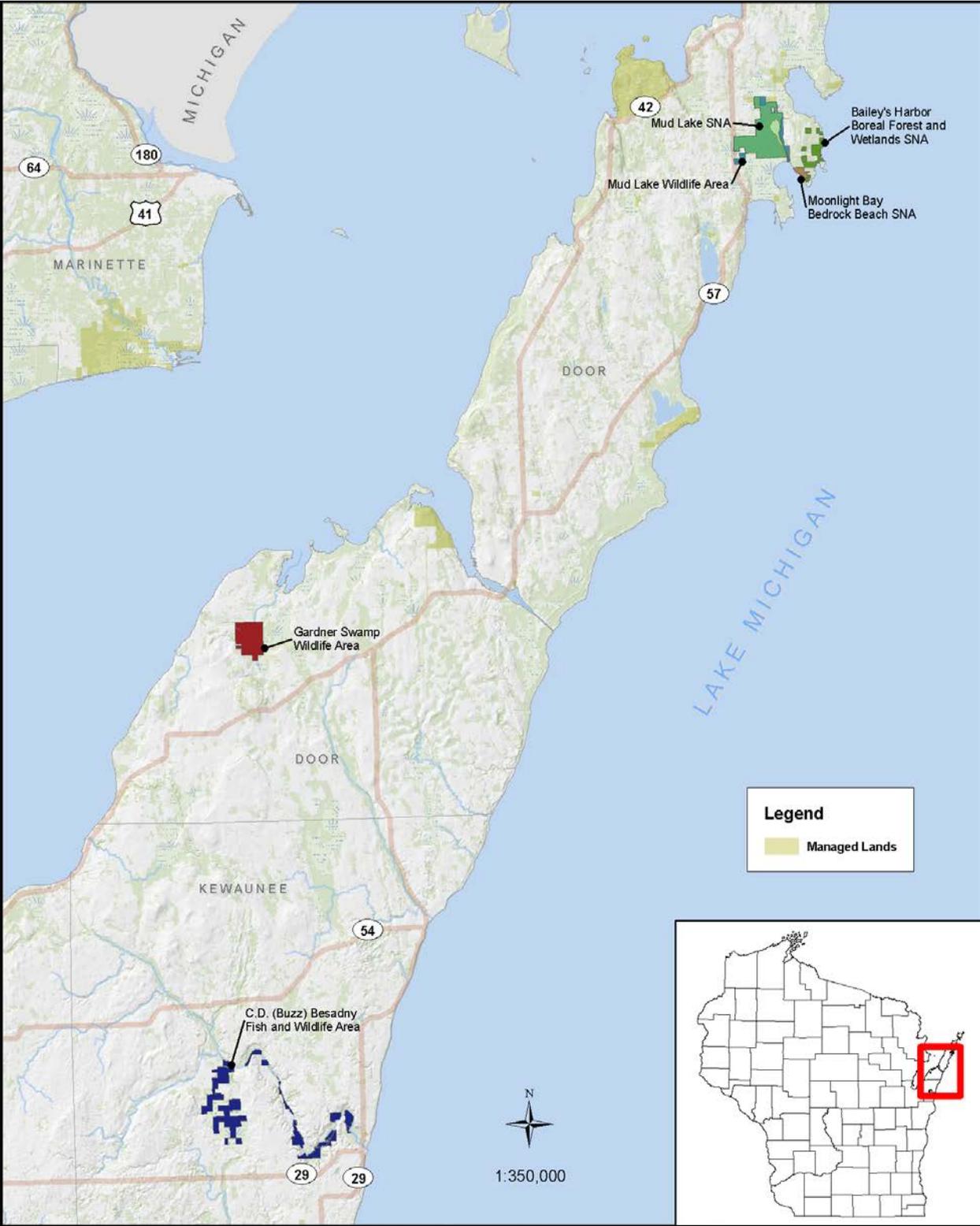
Survey locations were identified or guided by using recent aerial photos, USGS 7.5' topographic maps, various Geographic Information System (GIS) sources, information from past survey efforts, discussions with property managers, and the expertise of several biologists familiar with the properties or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

Scientific names for all species mentioned in the text are included in a list on page 39.



Arctic primrose. Photo by Drew Feldkirchner.

**Figure 1.** Location of Properties within the Door and Kewaunee County State Wildlife and Natural Areas Planning Group



## Background on Past Efforts

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

### Land Legacy Report

The Land Legacy Report (WDNR 2006a) was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years.

- The North Bay to Baileys Harbor Corridor including Moonlight Bay Bedrock Beach State Natural Area (SNA), Mud Lake SNA, Mud Lake Wildlife Area, and Baileys Harbor Boreal Forest and Wetlands SNA, was identified as important because it contains one of the most ecologically valuable shorelines in the Midwest.
- The Door Peninsula Hardwood Swamps site, including Gardner Swamp Wildlife Area, was recognized because of the importance of several large hardwood swamps for many wildlife species.

### Important Bird Area

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

- The Toft Point - Ridges Sanctuary - Mud Lake IBA includes Mud Lake SNA, Mud Lake Wildlife Area, and Moonlight Bay Bedrock Beach SNA and was recognized because it provides a significant stopover site for migratory birds and high-quality habitat for numerous breeding birds.

### Wisconsin Wildlife Action Plan: Conservation Opportunity Areas

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

- The Baileys Harbor to Peninsula COA, including Moonlight Bay Bedrock Beach SNA, Mud Lake SNA and Mud Lake Wildlife Area, and Gardner Swamp COA were recognized because of the natural community complexes present that provide habitat for numerous SGCN.
- The Hardwood Swamps COA, including Gardner Swamp Wildlife Area, was recognized because of the high-quality wetlands present.

### Wisconsin Wetlands Association Wetland Gems

The DKPG was recognized by the Wisconsin Wetlands Association (WWA) as having a "wetland gem" (WWA 2010). Wetland Gems have habitats that are critically important to Wisconsin's biodiversity, provide nearby communities with valuable functions and services, and serve as recreational and educational opportunities.

- The Moonlight Bay and Connected Wetlands Wetland Gem includes Moonlight Bay Bedrock Beach SNA, Mud Lake SNA and Mud Lake Wildlife Area. This area is a corridor of high-quality wetlands that support habitat for numerous rare species.

### Niagara Escarpment Final Report: Inventory Findings 1999-2001 and Considerations for Management

Anderson et al. (2002) recognized the importance of the Niagara Escarpment within Door and Kewaunee Counties as a prominent feature that provides habitat for numerous rare species. The DKPG was included within the study area for the project.

### **Coastal Wetlands Assessment**

Moonlight Bay Bedrock Beach SNA, Mud Lake SNA, Mud Lake Wildlife Area, and Baileys Harbor Boreal Forest and Wetlands SNA were surveyed as part of the Coastal Wetlands Assessment (Epstein et al. 2002).

### **A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin**

The Door County properties within this planning group were recognized as part of larger sites that are significant to Door County as wildlife habitat and natural areas (BLRPC 2003). The large sites described in this report often connect lands protected for conservation purposes with other regionally important areas to create landscape-level planning units.

### **Forest Certification**

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

## **Special Management Designations**

**State Natural Areas** are places on the landscape that protect outstanding examples of native natural communities, significant geological formations, and archaeological sites. They harbor natural features essentially unaltered by human-caused disturbances or that have substantially recovered from disturbance over time. Designation confers a significant level of land protection through state statutes, administrative rules, and guidelines. State Natural Areas within the DKPG are:

- Baileys Harbor Boreal Forest and Wetlands State Natural Area
- Moonlight Bay Bedrock Beach State Natural Area
- Mud Lake State Natural Area

**Critical Habitat for Hine's emerald dragonfly** (*Somatochlora hineana*) has been designated within this planning group. The Hine's emerald dragonfly is a Federal and State Endangered dragonfly that has been found in small, cool, calcareous marshy streams. Critical Habitat designation is a tool within the Endangered Species Act that identifies areas that are important to the conservation and recovery of a listed species. Critical Habitat is defined by the US Fish and Wildlife Service as a specific geographic area(s) that contains features essential for the conservation of a threatened and endangered species and that may require special management and protection. The *Federal Register* has published a final boundary detailing this Critical Habitat area (Federal Register 2007). Federal agencies are required to consult with the US Fish and Wildlife Service on actions they carry out, fund, or authorize to ensure that their actions will not destroy or adversely modify critical habitat for Hine's emerald dragonfly.

# Regional Ecological Context

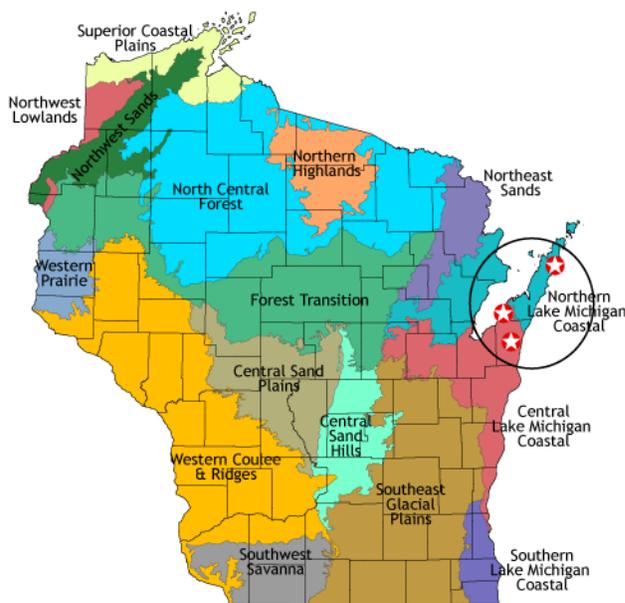
## Ecological Landscape

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

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

The majority of the DKPG is located in the Northern Lake Michigan Coastal Ecological Landscape (WDNR In Prep.) (Figure 2). C.D. (Buzz) Besadny Fish and Wildlife Area is located in the Central Lake Michigan Ecological Landscapes. The Northern Lake Michigan Coastal Ecological Landscape is located in the northeastern corner of Wisconsin bordered by Lake Michigan and the lake's largest bay, Green Bay. The Central Lake Michigan Coastal Ecological Landscape stretches from southern Door County west across Green Bay to the Wolf River drainage, then southward in a narrowing strip along the Lake Michigan shore to central Milwaukee County. Major landforms of both of these landscapes are the Niagara Escarpment and landforms associated with the Lake Michigan and Green Bay shorelines such as sand spits, clay bluffs, beach and dune complexes, and ridge and swale systems.

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



Historical vegetation of the Northern Lake Michigan Coastal Ecological Landscape included maple-basswood-beech forest, hemlock-hardwood forest, northern white-cedar swamp, hardwood-conifer swamp, wet meadows, and coastal marshes. Conifer dominated upland forests that resemble the boreal forest were present along Lake Michigan; they contained a significant component of white spruce (*Picea glauca*) and balsam fir (*Abies balsamea*).

Current vegetation of the Northern Lake Michigan Coastal Ecological Landscape consists of more than 60% non-forested land, most of which is in agricultural crops, with smaller amounts of grassland, wetland, shrubland, and urbanized areas. Forested lands are dominated by maple-basswood, with smaller amounts of lowland hardwoods, aspen-birch, and lowland conifers. High quality areas of exposed alkaline bedrock beach occur on the northern Door Peninsula, providing habitat for many rare plants. Several islands (the Grand Traverse Islands) lie off the Door Peninsula and also provide critical habitat for rare species and colonially nesting birds.

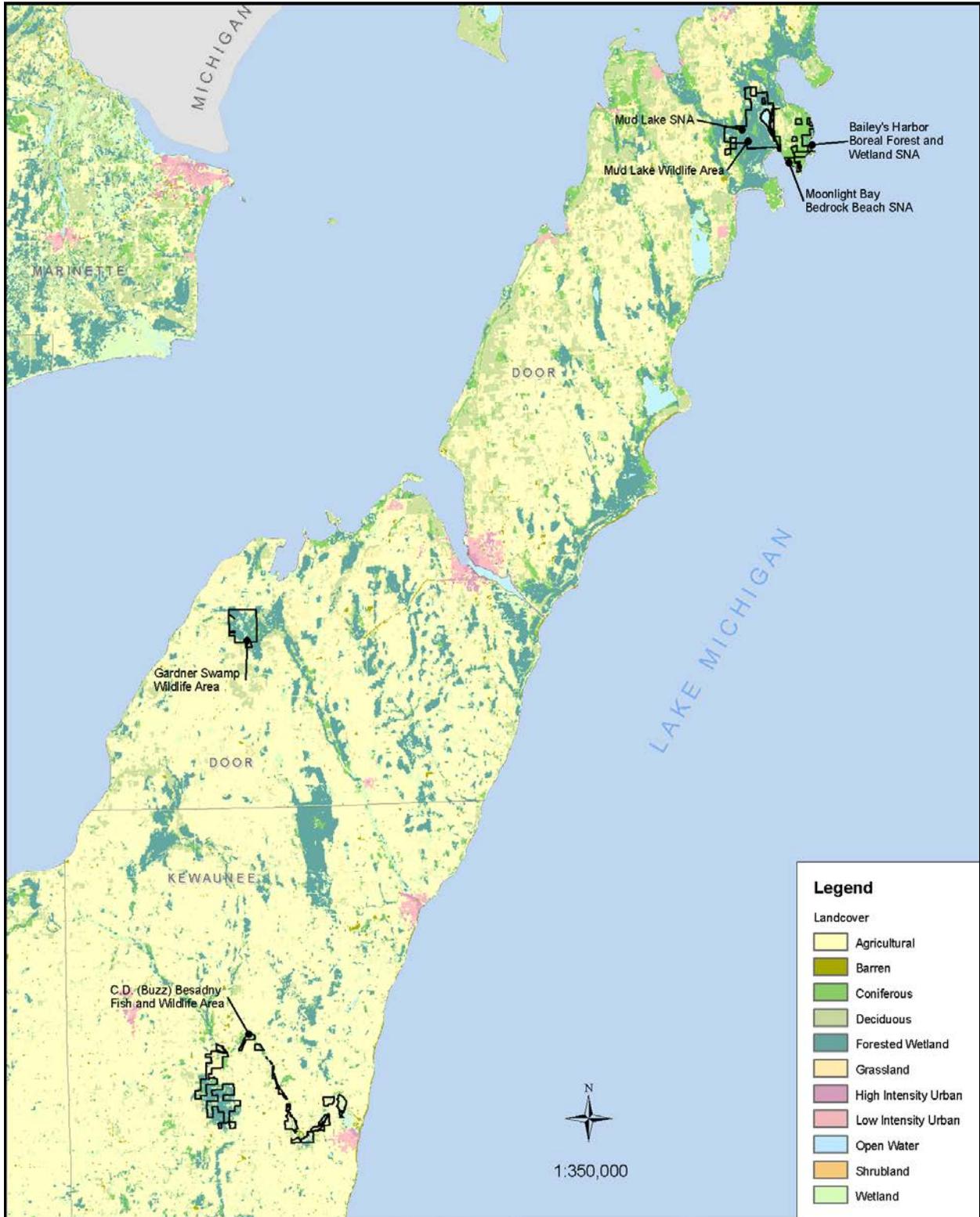
The Northern Lake Michigan Coastal Ecological Landscape includes an extensive shoreline along Green Bay, on the west coast of Lake Michigan. Also present are many small rivers and creeks that drain the numerous linear wetlands on the west side of Green Bay that trend southwest to northeast. Large rivers that flow through the Ecological Landscape are the Oconto, Peshtigo, and Menominee Rivers. There are few large inland lakes, but lakes that do occur have relatively high pollution levels.

Historically, most of the Central Lake Michigan Ecological Landscape was vegetated with mesic hardwood forest composed primarily of sugar maple (*Acer saccharum*), basswood (*Tilia americana*), and American beech (*Fagus grandifolia*). Hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*) were locally important, but hemlock was generally restricted to cool moist sites near Lake Michigan. Areas of poorly drained glacial lakeplain supported wet forests of tamarack (*Larix laricina*), northern white-cedar (*Thuja occidentalis*), black ash (*Fraxinus nigra*), red maple (*Acer rubrum*), and elm (*Ulmus* spp.), while the Wolf and Embarrass Rivers flowed through extensive Floodplain Forests of silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), and swamp white oak (*Quercus bicolor*). Emergent Marshes and wet meadows were common in and adjacent to lower Green Bay, while Lake Michigan shoreline areas featured beaches, dunes, interdunal wetlands, marshes, and highly diverse ridge and swale vegetation. Small patches of prairie and oak savanna were present in the southwestern portion of this landscape.

The majority of the mesic forest that dominated the Central Lake Michigan Coastal Ecological Landscape has been removed over the past 150 years as the land was converted to agricultural, residential, and industrial uses. Today approximately 84% of this Ecological Landscape is non-forested. The remaining forest consists mainly of mesic maple-basswood or maple-beech types, or lowland hardwoods. Fragmentation of upland habitats is severe throughout this landscape. Invasive species have become a major concern in both terrestrial and aquatic habitats. Reed canary grass (*Phalaris arundinacea*), giant reed grass (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), garlic mustard (*Alliaria petiolata*), Eurasian buckthorns (*Rhamnus* spp.) and honeysuckles (*Lonicera* spp.), as well as carp (*Hypophthalmichthys* spp.) are especially troublesome. Significant wetlands are still present, but most have been affected to some degree by hydrologic disruption, pollution, sedimentation, and the encroachment of invasive species.

Hydrological resources of The Central Lake Michigan Coastal Ecological Landscape include shorelines along Green Bay and Lake Michigan; many small lakes in the western and central portions of the Ecological Landscape; and streams characterized by extensive meandered sections. Rivers include the Wolf, Embarrass, Pigeon and Shioc rivers.

**Figure 3.** Landcover for the DPKG from the Wisconsin DNR Wisland GIS coverage (WDNR 1993)



## Regional Biodiversity Needs and Opportunities

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

There are management opportunities for 40 natural communities in the Northern Lake Michigan Coastal Ecological Landscape. Of these, 14 are considered “major” opportunities (Table 1). There are management opportunities for 37 natural communities in the Central Lake Michigan Coastal Ecological Landscape. Of these, eight are considered “major” opportunities (Table 2). 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.

**Table 1.** Major Natural Communities Management Opportunities in the Northern Lake Michigan Coastal Ecological Landscape (EMPT 2007 and WDNR 2006b)

Boreal Rich Fen	Great Lakes Beach	Northern Mesic Forest	Shrub Carr
Dry Cliff	Great Lakes Dune	Northern Sedge Meadow	Warmwater rivers
Emergent Marsh	Great Lakes Ridge and Swale	Northern Wet-mesic Forest	Warmwater streams
Great Lakes Alkaline Rockshore	Lake Michigan		

**Table 2.** Major Natural Communities Management Opportunities in the Central Lake Michigan Coastal Ecological Landscape (EMPT 2007 and WDNR 2006b)

Alvar	Great Lakes Beach	Great Lakes Ridge and Swale	Warmwater rivers
Dry Cliff	Great Lakes Dune	Lake Michigan	Warmwater streams

## Rare Species of the Northern and Central Lake Michigan Coastal Ecological Landscapes

Numerous rare species are known from the Northern and Central Lake Michigan Coastal 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 3 lists the number of rare species known to occur in the Northern Lake Michigan Coastal Ecological Landscape and Table 4 lists the number of rare species known to occur in the Central Lake Michigan Coastal Ecological Landscape based on information stored in the NHI database as of 2009.

**Table 3.** Listing Status for rare species in Northern Lake Michigan Coastal Ecological Landscape as of 2009.

Source is the NHI database.

Listing Status	Birds	Fishes	Herptiles	Invertebrate	Mammal	Plant	Total	Total	Total
				s	s	s	Faun	Flor	l
WI Endangered	7	0	2	5	0	14	14	14	28
WI Threatened	5	4	2	5	0	22	16	22	38
WI Special Concern	17	8	3	46	2	66	76	66	142
U.S. Endangered	1	0	0	1	1	0	3	0	3
U.S. Threatened	0	0	0	0	0	2	0	2	2
U.S. Candidate	0	0	0	0	0	0	0	0	0

**Table 4.** Listing Status for rare species in the Central Lake Michigan Coastal Ecological Landscape as of 2009.

Source is the NHI database.

Listing Status	Birds	Fishes	Herptiles	Invertebrate	Mammal	Plant	Total	Total	Total
				s	s	s	Faun	Flor	l
WI Endangered	0	0	0	2	0	0	2	0	2
WI Threatened	0	0	0	0	0	2	0	2	2
WI Special Concern	0	0	0	0	0	0	0	0	0
U.S. Endangered	7	1	1	3	0	5	12	5	17
U.S. Threatened	7	4	3	7	0	12	21	12	33
U.S. Candidate	20	7	3	66	2	28	98	28	126

The Wisconsin Wildlife Action Plan denoted Species of Greatest Conservation Need (SGCN) as 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.

There are 45 vertebrate SGCN significantly associated with the Northern Lake Michigan Coastal Ecological Landscape and 34 vertebrate SGCN significantly associated with the Central Lake Michigan Coastal Ecological Landscape (See Appendix C). This means that these species are (and/or historically were) significantly associated with the Ecological Landscape, and that restoration of natural communities with which they are associated would significantly improve conditions for their survival.

# Description of the Study Area

## Location and Size

The DKPG is a cluster of Wildlife Areas and State Natural Areas located in Door and Kewaunee counties (Figure 1) that comprise ca 6,970 acres.

Properties included in the DKPG are:

- **Baileys Harbor Boreal Forest and Wetlands SNA** (482 acres) is located in northern Door County along 1.5 miles of Lake Michigan shoreline northeast of the town of Baileys Harbor.
- **C.D. (Buzz) Besadny Fish and Wildlife Area** (2,755 acres), is located in central Kewaunee County along the Kewaunee River, just west of the city of Kewaunee.
- **Gardner Swamp Wildlife Area** (1,184 acres) is located in southwest Door County along Keys Creek, a small stream draining into Green Bay, about nine miles west of the city of Sturgeon Bay.
- **Moonlight Bay Bedrock Beach SNA** (112 acres) is located directly south of Baileys Harbor Boreal Forest and Wetlands SNA.
- **Mud Lake Wildlife Area** (2,325 acres), containing **Mud Lake State Natural Area** and **Reibolts Creek Public Access**, is located in northern Door County near Moonlight Bay northeast of the town of Baileys Harbor.

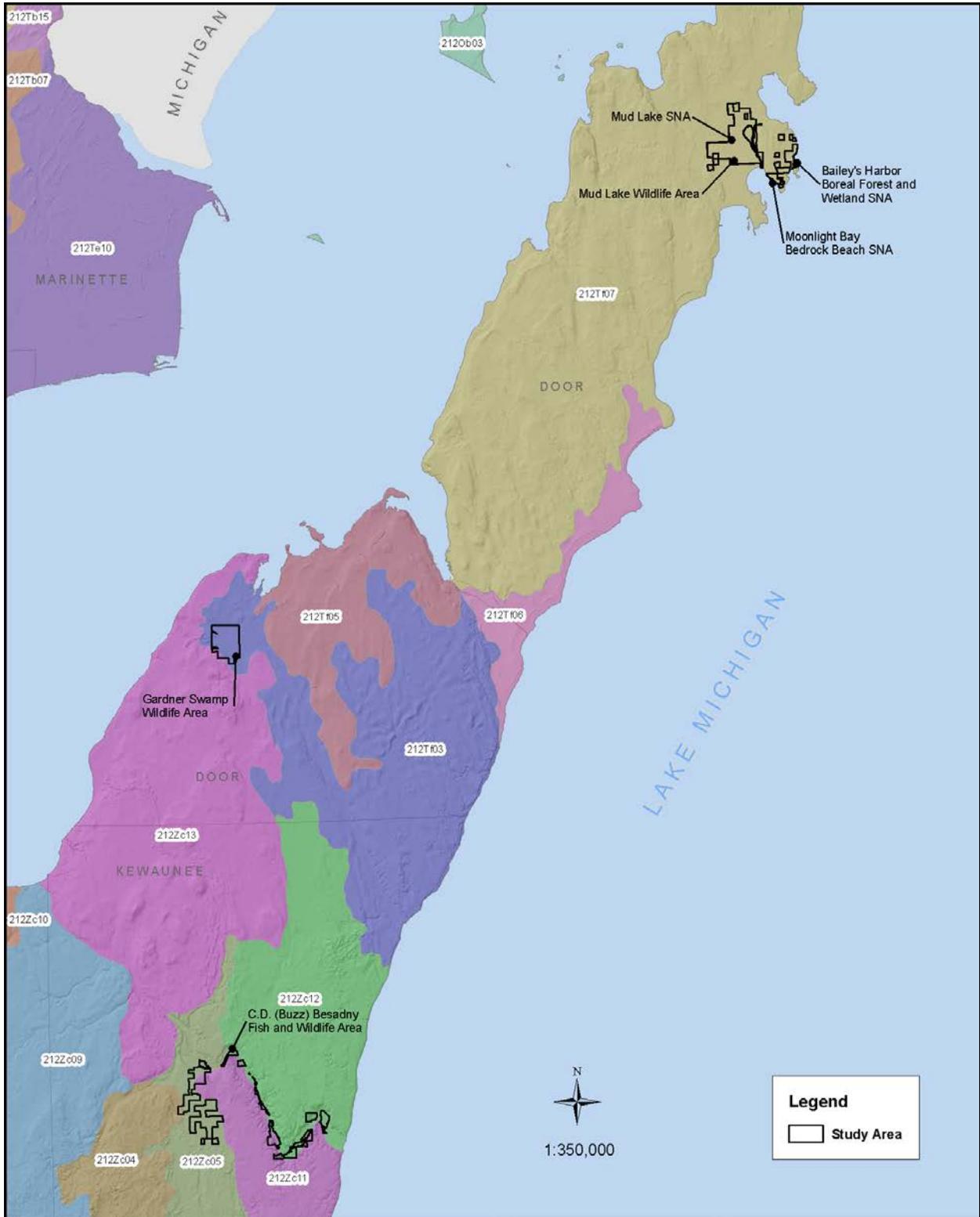
## Ecoregion

From the NHFEU, the units most relevant to this study are two Subsections: the Door Peninsula and the Manitowoc Till Plain, and seven Landtype Associations (LTA; Figure 4). Landtype Associations represent an area of 10,000 – 300,000 acres and contain similarities of landform, soil, and vegetation.

The following Landtype Associations are within the study area:

- **Door Peninsula (212Tf07)**. The characteristic landform pattern is undulating bedrock-controlled moraine with many swamps. Soils are predominantly well drained loam over dolomite bedrock. This LTA comprises 43% of the DKPG.
- **Krok Plains (212Zc05)**. The characteristic landform pattern is nearly level outwash plain intermixed with swamps. Soils are predominantly well drained sandy loam over calcareous outwash. This LTA comprises 21% of the DKPG.
- **Algoma Moraines (212Tf03)**. The characteristic landform pattern is undulating moraine with many small- and medium-sized swamps. Soils are predominantly well drained sandy loam over calcareous sandy loam till. This LTA comprises 17% of the DKPG.
- **Alaska Moraines (212Zc12)**. The characteristic landform pattern is undulating moraine with many small- and medium-sized swamps. Soils are predominantly well drained silty loam over calcareous loam till. This LTA comprises 10% of the DKPG.
- **Two Creeks Moraines (212Zc11)**. The characteristic landform pattern is undulating moraine. Soils are predominantly well drained silt loam over calcareous clay or loam till. This LTA comprises 7% of the DKPG.
- **Cooperstown Moraines (212Zc04)**. The characteristic landform pattern is rolling collapsed moraine dissected with stream terraces. Soils are predominantly well drained silt loam over calcareous loam till. This LTA comprises 1% of the DKPG.
- **Rosiere Moraines (212Zc13)**. The characteristic landform pattern is undulating bedrock-controlled moraine with common swamps. Soils are predominantly well drained silt loam over calcareous clay or loam till and dolomite bedrock. This LTA comprises 1% of the DKPG.

**Figure 4.** Landtype Associations for the area comprising the Door and Kewaunee County State Wildlife and Natural Areas Planning Group



# Physical Environment

## Geology and Geography

The DKPG is located on the Door Peninsula, a segment of the Niagara Escarpment formed from Silurian dolomite. The Niagara Escarpment is the exposed portion of a 650-mile sickle-shaped bedrock ridge that runs from the northeastern United States south of Rochester, New York, across portions of southeastern Canada, and then southward north and west of Lake Michigan to southeastern Wisconsin (Anderson et al. 2002). In Wisconsin, the Escarpment extends for over 230 miles (Martin 1965), from Rock Island, off the northern tip of the Door Peninsula, south to northern Waukesha and Milwaukee counties (Watermolen 1997). The term “Niagara Escarpment” refers to both the escarpment and the underlying cuesta formation. (See the Glossary for detailed definitions of these terms and others throughout the document.) The Niagara Escarpment characterizes the Door Peninsula, from the majestic bluffs on the west side of the peninsula to the broad horizontal bedrock “beaches” that are well developed on the east side of the peninsula. Sand dunes and beaches are found along the Lake Michigan shoreline, as are several areas of complex ridge and swale topography. Embayment lakes and freshwater estuaries are other physical features of the easternmost part of the peninsula.

Another characteristic landscape feature of the dolostone of the Niagara Escarpment are the fractures that have widened over time into valleys. Glacial and river erosion have resulted in northwest and southeast trending valleys along which many properties of the DKPG are found.

## Soils

DKPG soil drainage classes are predominately poorly drained, varying from very poorly drained (42% of the property acreage), to poorly drained (22%), to somewhat poorly drained (11%). Well-drained soil drainage classes comprise 25% of the DKPG. There are 91 different soil map units found within the DKPG boundaries.

Very poorly drained, nearly level, organic soils in glacial lake basins and stream valleys are the most common soil type present (Soil Survey Staff). These muck soils are over outwash sands and historically harbored northern white-cedar, balsam fir, white ash, and white birch (Link et al. 1978). Also common is a nearly level, poorly drained silt loam found in glacial lake basins that historically had a flora typical of hardwood swamp, with such species as American elm, white ash, red-osier dogwood, and marsh grasses (Link et al. 1978).

## Hydrology

All of the DKPG is within the Lake Michigan basin and the Upper Door County, Red River and Sturgeon Bay, Kewaunee River, and East Twin River watersheds. The flat topography and poorly drained soils have resulted in an abundance of large wetlands.

Mud Lake, a shallow 155-acre lake with a maximum depth of five feet and a predominately marl bottom (Corbisier et al. 2000), is located within Mud Lake Wildlife and State Natural Areas. Mud Lake empties into Moonlight Bay via Reiboldts Creek, a one-mile long stream.

Kayes (also known as Keyes) Creek is a seven-mile-long perennial stream that originates in a network of springs (Corbisier et al. 2000), flows through Gardner Swamp Wildlife Area and empties into Little Sturgeon Bay on the west side of the Door Peninsula.

The Kewaunee River is the predominant feature of C.D. (Buzz) Besadny Fish and Wildlife Area. This large, low gradient river is fed by Little Scarboro Creek and multiple unnamed feeder streams.

Moonlight Bay is hydrologically connected to Mud Lake Wildlife and State Natural Areas through Reiboldts Creek and Moonlight Bay Bedrock Beach SNA along almost 1-mile of shoreline. Wetlands are abundant in the surrounding landscape.

Spike Horn Bay, located at the southern end of Baileys Harbor Boreal Forest and Wetlands SNA, has an exposed shoreline of bedrock with some sand beach (Corbisier et al. 2000).

## Vegetation

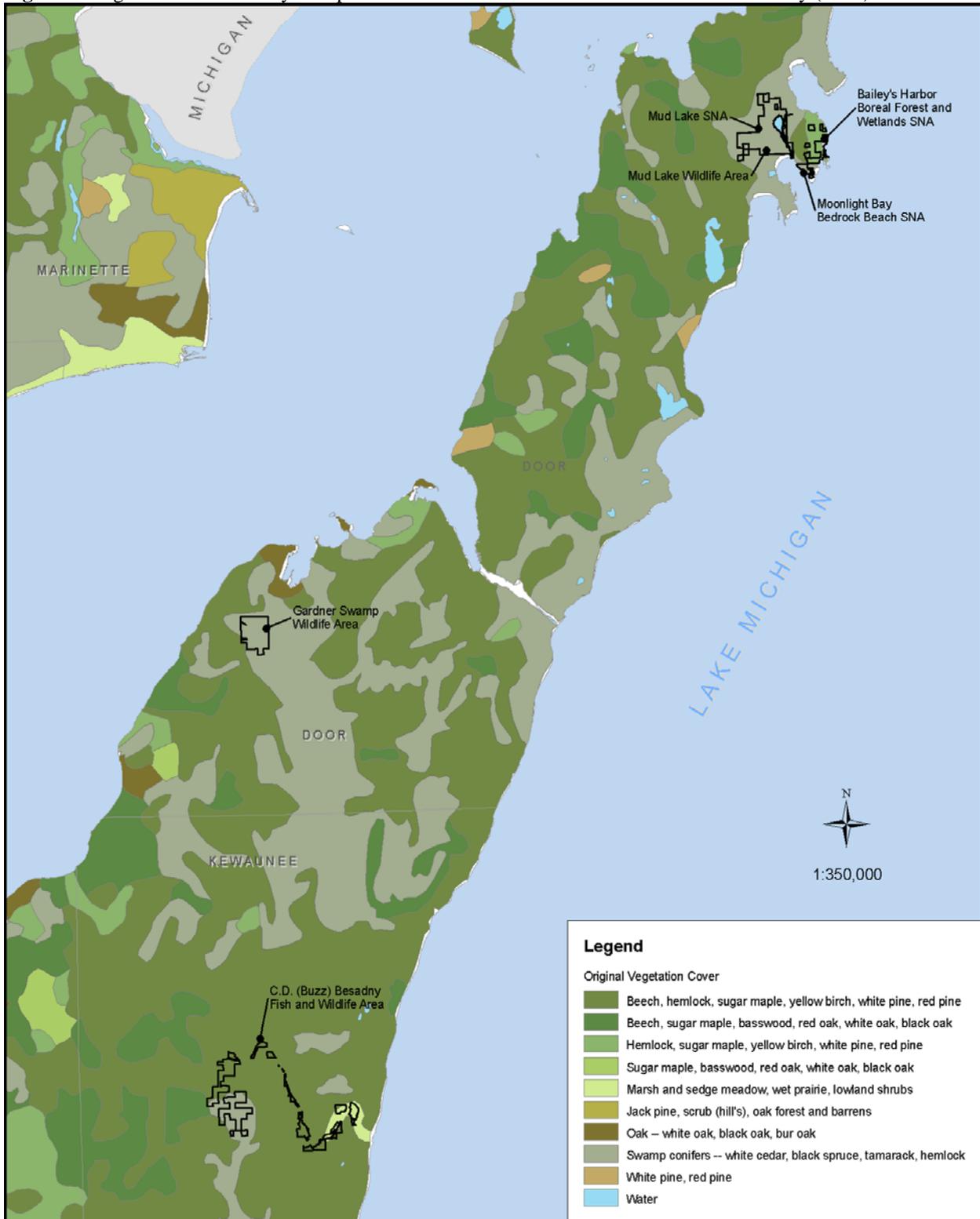
### Historical Vegetation of the Study Area

The DKPG is located north of the tension zone, a zone that separates two floristic provinces, the prairie-forest province and the northern hardwoods province (Curtis 1959). The study area is influenced by the moderating temperatures of Lake Michigan resulting in slightly warmer temperatures in the fall and early winter, and slightly cooler temperatures during spring and early summer (WDNR In Prep.).

Data from the original Public Land Surveys are often used to infer forest composition and tree species dominance for large areas in Wisconsin prior to widespread Euro-American settlement. The purpose of examining historical conditions is to identify ecosystem factors that formerly sustained species and communities that are now altered in number, size, or extent, or which have been changed functionally (for example, by constructing dams, or suppressing fires). Although data are limited to a specific snapshot in time, they provide valuable insights into Wisconsin's ecological capabilities. Maintaining or restoring some lands to more closely resemble historical systems and including some structural or compositional components of the historical landscape within actively managed lands can help conserve important elements of biological diversity (WDNR In Prep.). Public Land Surveys for the area comprising the DKPG were conducted between 1832 and 1835.

Finley's (1976) Early Vegetation of Wisconsin map (Figure 5) identifies the majority (67%) of the study area as forested coniferous wetland. Tree species included in this group are: northern white-cedar, black spruce (*Picea mariana*), tamarack, and hemlock. Mesic forests, including American beech, hemlock, sugar maple, yellow birch (*Betula alleghaniensis*), red pine (*Pinus resinosa*), and white pine were the next most common type (27% of the study area). Herbaceous wetlands, including the marsh and sedge meadow, wet prairie, and lowland shrubs group, were less common (6% of the study area).

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



## Current Vegetation

### Baileys Harbor Boreal Forest and Wetlands SNA

The current vegetation at Baileys Harbor Boreal Forest and Wetlands SNA consists of a Boreal Forest dominated by balsam fir and white spruce, which grades into Northern Wet-mesic Forest of northern white-cedar, white pine, white birch (*Betula papyrifera*), and hemlock. An extensive Great Lakes Alkaline Rockshore is exposed during periods of low lake levels. This community varies from exposed bedrock with vegetation growing only in crevices to areas with dense grass. Vegetation becomes very sparse at water's edge. Areas that have shallow soil are dense with blue-joint grass (*Calamagrostis canadensis*), tussock sedge (*Carex stricta*) and goldenrod (*Solidago* spp.). Bedrock areas have silverweed (*Potentilla anserina*), Indian paintbrush (*Castilleja coccinea*), low-growing sedges (*Carex* spp.), spike-rushes (*Eleocharis* spp.), rushes (*Juncus* spp.), black-eyed Susan (*Rudbeckia hirta*) and scattered - big blue-stem (*Andropogon gerardii*).

### C.D. (Buzz) Besadny Fish and Wildlife Area

C.D. (Buzz) Besadny Fish and Wildlife Area is a long property along the Kewaunee River. At the southwest end of the property is one of the largest remaining forests in Kewaunee County, a hardwood swamp that is a mix of green ash, black ash, and northern white-cedar with understory alder (*Alnus incana*). Along the river are areas of Northern Wet-mesic Forest dominated by northern white-cedar with some balsam fir, hemlock, and yellow birch. Characteristic groundlayer species include three-leaved gold-thread (*Coptis trifolia*), fringed polygala (*Polygala paucifolia*), and naked miterwort (*Mitella nuda*). Sphagnum moss is rare. This conifer dominated forest grades into a younger forest with white birch and red maple. At the eastern end of this property is a wetland complex with Emergent Marsh, sedge meadow, and Shrub-carr. Characteristic Emergent Marsh species include broad-leaved cat-tail (*Typha latifolia*), soft-stem bulrush (*Schoenoplectus tabernaemontani*), common bur-reed (*Sparganium eurycarpum*), giant reed grass, broad-leaved arrowhead (*Sagittaria latifolia*), and common spike-rush (*Eleocharis palustris*).

The scattered small parcels of this Wildlife Area include fragmented forested and open wetlands of varying quality, upland forests, pine plantations, and old fields.

### Gardner Swamp Wildlife Area

Current vegetation at Gardner Swamp Wildlife Area consists of an open Northern Sedge Meadow/Shrub-carr complex, from which Keyes Creek originates, surrounded by a Hardwood Swamp with varying amounts of black ash and northern white-cedar. Much of the Northern Sedge Meadow/Shrub-carr complex is dominated by narrow-leaved cattail (*Typha angustifolia*) and giant reed grass. The highest-quality examples of the Northern Sedge Meadow is characterized by a dense groundlayer of tussock sedge and blue-joint grass, with marsh fern (*Thelypteris palustris*), spotted Joe-Pye-weed (*Eupatorium maculatum*), broad-leaved cat-tail, and giant reed grass. The highest-quality example of the Shrub-carr has a moderately dense shrub layer with bog birch (*Betula pumila*), slender willow (*Salix petiolaris*), and poison sumac (*Toxicodendron vernix*). The herb layer is dense with common lake sedge (*Carex lacustris*) and tussock sedge, and lesser amounts of reed canary grass, spotted Joe-Pye-weed, marsh fern, blue-joint grass, and broad-leaved cat-tail. Scattered sapling white birch and tamarack are present.

The Hardwood Swamp is part of a much larger Hardwood Swamp within the surrounding landscape. Dominant trees are green and black ash, northern white-cedar, white birch, American elm (*Ulmus americana*), and aspen (*Populus* sp.), with some areas of tamarack. The shrub layer has high cover from common winterberry (*Ilex verticillata*) and speckled alder. A dense herb layer is characterized by fowl manna grass (*Glyceria striata*), small-spike false nettle (*Boehmeria cylindrica*), common lake sedge, and reed canary grass. Mosses, including Sphagnum, are sparse. The quality varies greatly throughout this

large swamp. Upland areas within the Hardwood Swamp have sugar maple, hemlock, basswood, red oak (*Quercus rubra*), beech, aspen, and white birch. Some of these areas have many spring ephemeral plants.

### **Moonlight Bay Bedrock Beach SNA**

The current vegetation at Moonlight Bay Bedrock Beach SNA consists of an undisturbed Great Lakes Alkaline Rockshore and adjacent Boreal Forest. The Great Lakes Alkaline Rockshore, a dolomite bedrock beach, is alternately covered and exposed, depending on Lake Michigan water levels. When exposed, plants indicative of these calcareous and unstable shorelines colonize the beach.

Common plant species on the Great Lakes Alkaline Rockshore include tickle grass (*Agrostis hyemalis*), creeping tickle grass (*A. stolonifera*), mat panic grass (*Dichanthelium acuminatum*), Bebb's sedge (*Carex bebbii*), little green sedge (*C. viridula*), few-flowered spike-rush (*Eleocharis quinqueflora*), hair beak-rush (*Rhynchospora capillacea*), Baltic rush (*Juncus arcticus*), silver-weed, smooth loosestrife (*Lysimachia quadriflora*), common water-horehound (*Lycopus americanus*), Indian paintbrush, purple false foxglove (*Agalinis purpurea*), northern three-lobed bedstraw (*Galium trifidum*), brook lobelia (*Lobelia kalmii*), common boneset (*Eupatorium perfoliatum*), ninebark (*Physocarpus opulifolius*), and fen grass-of-Parnassus (*Parnassia glauca*).

The Boreal Forest here is typical of the northeastern Door Peninsula, with northern white-cedar, white spruce, white birch, hemlock, balsam fir, and super-canopy white pine. The subcanopy and tall shrub layers are very sparse. Common shrubs are thimbleberry (*Rubus parviflorus*) and mountain maple (*Acer spicatum*). Although cover of groundlayer species is sparse, their diversity is high, with red baneberry (*Actaea rubra*), wild sarsaparilla (*Aralia nudicaulis*), large-leaved aster (*Aster macrophyllus*), drooping woodland sedge (*Carex arctata*), bristle-leaf sedge (*C. eburnea*), wild-basil (*Clinopodium vulgare*), twinflower (*Linnaea borealis*), Canada mayflower (*Maianthemum canadense*), narrow-leaved cow-wheat (*Melampyrum lineare*), long-styled sweet cicely (*Osmorhiza longistylis*), fringed polygala, thimbleberry, rattlesnake fern (*Botrychium virginianum*), bracken fern (*Pteridium aquilinum*), rough-leaved rice grass (*Oryzopsis asperifolia*), colonial oak sedge (*Carex communis*), Dewey's sedge (*C. deweyana*), naked miterwort, white violet (*Viola renifolia*), russet buffalo-berry (*Shepherdia canadensis*), American starflower (*Trientalis borealis*), spurred-gentian (*Halenia deflexa*), and sweet-scented bedstraw (*Galium triflorum*). Mosses and lichens are common.

### **Mud Lake Wildlife Area (including Mud Lake State Natural Area)**

Current vegetation at Mud Lake Wildlife Area (including Mud Lake SNA) varies across this large area. Surrounding Mud Lake (a shallow drainage lake) is an extensive complex of forested and shrub-dominated wetlands. Reibolts Creek, the outlet stream of Mud Lake, supports a diverse aquatic plant community including common bur-reed, coon's-tail (*Ceratophyllum demersum*), pondweed (*Potamogeton* sp.), and wild rice (*Zizania aquatica*). Within Mud Lake, soft-stem bulrush, yellow water-lily (*Nuphar advena*), giant reed grass, and cat-tail are found. Immediately surrounding the open water of Mud Lake is a narrow zone of shrubby Northern Sedge Meadow dominated by sedges, willows (*Salix* spp.), dogwoods (*Cornus* spp.), and sweet gale (*Myrica gale*). The open zone grades into Northern Wet-mesic Forest of northern white-cedar, white spruce, balsam fir, and black ash. Also present are areas of Boreal Rich Fen with woolly-fruit sedge (*Carex lasiocarpa*), twig-rush (*Cladium mariscoides*), naked bladderwort (*Utricularia cornuta*), rushes, bog birch, and speckled alder, through which carbonate-rich groundwater percolates. Two upland islands (and part of a third) of second-growth Boreal Forest lie within this complex as well. Here, the dominant tree is balsam fir, often in pure stands in the 3-12 inch dbh class. White spruce, white cedar, white birch, black ash and quaking aspen (*Populus tremuloides*) are occasional, particularly where the site grades into wet-mesic forest. The understory varies from open to brushy. Common groundlayer species include wild sarsaparilla, large-leaved aster, lady fern (*Athyrium filix-femina*), blue bead-lily (*Clintonia borealis*), three-leaved gold-thread, bunchberry (*Cornus canadensis*), Canada mayflower, naked miterwort, and American starflower.

## Rare Species and High Quality Natural Communities of the Door and Kewaunee County State Wildlife and Natural Areas Planning Group

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

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

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Animal</b>								
A Long-horned Casemaker Caddisfly	<i>Triaenodes nox</i>	1999	S1S3	G5	SC/N		Y	Y
A Small Square-gilled Mayfly	<i>Caenis diminuta</i>	1999	SNR	G5			Y	N
Acadian Flycatcher	<i>Empidonax virescens</i>	2008*	S3B	G5	S3B		Y	Y
Aurora Damselfly	<i>Chromagrion conditum</i>	1991	S3	G5	SC/N		N	Y
Bald Eagle	<i>Haliaeetus leucocephalus</i>	2008	S4B,S2N	G5	SC/P		Y	Y
Banded Killifish	<i>Fundulus diaphanus</i>	2008	S3	G5	SC/N		Y	Y
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	1972	S4B	G5	SC/M		Y	W
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	1979	S2B	G5	SC/M		N	Y
Black Striate	<i>Striatura ferrea</i>	1997	S2	G5	SC/N		Y	Y
Black Tern	<i>Chlidonias niger</i>	1978	S2B	G4	SC/M		Y	Y
Blue-winged Teal	<i>Anas discors</i>	1978	S4B	G5	SC/M		Y	W
Bobolink	<i>Dolichonyx oryzivorus</i>	2000	S4B	G5	SC/M		Y	W
Cherrystone Drop	<i>Hendersonia occulta</i>	1997	S3	G4	THR		Y	Y
Common Goldeneye	<i>Bucephala clangula</i>	2007	S2B	G5	SC/M		N	Y
Common Loon	<i>Gavia immer</i>	2007	S3S4B	G5	SC/M		N	W
Dentate Supercoil	<i>Paravitrea multidentata</i>	1997	S2S3	G5	SC/N		Y	Y
Eightfold Pinecone	<i>Strobilops affinis</i>	1997	S3	G4G5	SC/N		Y	Y
Field Sparrow	<i>Spizella pusilla</i>	2008	S4B	G5	SC/M		Y	W
Forcipate Emerald	<i>Somatochlora forcipata</i>	1990	S2	G5	SC/N		Y	Y

\*This record is not yet mapped in the NHI database.

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Animal</b>								
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	2000	S4B	G4	SC/M		Y	W
Hine's Emerald	<i>Somatochlora hineana</i>	2010	S1	G2G3	END	LE	Y	Y
Least Bittern	<i>Ixobrychus exilis</i>	1976	S3B	G5	SC/M		N	Y
Least Flycatcher	<i>Empidonax minimus</i>	2002	S4B	G5	SC/M		Y	W
Nashville Warbler	<i>Vermivora ruficapilla</i>	2008	S4?	G5	SC/M		N	W
Osprey	<i>Pandion haliaetus</i>	1998	S4B	G5	SC/M		Y	Y
Purple Martin	<i>Progne subis</i>	1972	S4S5B	G5	SC/M		N	W
Red-Headed Woodpecker	<i>Melanerpes erythrocephalus</i>	2008	S3B	G5	SC/M		Y	W
Red-shouldered Hawk	<i>Buteo lineatus</i>	2008	S3S4B,S1N	G5	THR		Y	Y
Sedge Wren	<i>Cistothorus platensis</i>	2000	S4B	G5	SC/M		N	W
Semirelict Underwing Moth	<i>Catocala semirelecta</i>	2005	S2S3	G5	SC/N		Y	Y
Swamp Darner	<i>Epiaeschna heros</i>	1993	S1?	G5	SC/N		Y	Y
Two-spotted Skipper	<i>Euphyes bimacula</i>	1984	S3	G4	SC/N		N	Y
Veery	<i>Catharus fuscescens</i>	2008	S4B	G5	SC/M		Y	W
White-eyed Vireo	<i>Vireo griseus</i>	2005	SNA	G5	SC/M		N	W
Willow Flycatcher	<i>Empidonax traillii</i>	1979	S4B	G5	SC/M		Y	W
Wilson's Phalarope	<i>Phalaropus tricolor</i>	1977	S1B	G5	SC/M		Y	Y
Wood Thrush	<i>Hylocichla mustelina</i>	2008	S4B	G5	SC/M		Y	W
<b>Plant</b>								
Alpine Cotton-grass	<i>Eriophorum alpinum</i>	2008	S2	G5	SC		NA	Y
Bird's-eye Primrose	<i>Primula mistassinica</i>	2008	S3	G5	SC		NA	Y
Common Bog Arrow-grass	<i>Triglochin maritima</i>	2008	S3	G5	SC		NA	Y
Cooper's Milkvetch	<i>Astragalus neglectus</i>	2000	S1	G4	END		NA	Y
Dwarf Lake Iris	<i>Iris lacustris</i>	2005	S3	G3	THR	LT	NA	Y
Elk Sedge	<i>Carex garberi</i>	1993	S2	G5	THR		NA	Y
Fairy Slipper	<i>Calypso bulbosa</i>	1973	S3	G5	THR		NA	Y
Few-flower Spikerush	<i>Eleocharis quinqueflora</i>	2008	S2	G5	SC		NA	Y
Hair-like Sedge	<i>Carex capillaris</i>	2000	S2	G5	SC		NA	Y
Lesser Fringed Gentian	<i>Gentianopsis procera</i>	1999	S3	G5	SC		NA	Y
Livid Sedge	<i>Carex livida var. radicaulis</i>	2000	S2	G5T5	SC		NA	Y
Long-spur Violet	<i>Viola rostrata</i>	1994	S2S3	G5	SC		NA	Y

Common Name	Scientific Name	Last Observed Date	State Rank	Global Rank	State Status	Federal Status	SGCN	Tracked by NHI
<b>Plant</b>								
Low Calamint	<i>Calamintha arkansana</i>	2007	S2	G5	SC		NA	Y
Northern Bog Sedge	<i>Carex gynocrates</i>	2008	S3	G5	SC		NA	Y
Northern Yellow Lady's-slipper	<i>Cypripedium parviflorum var. makasin</i>	2008	S3	G5T4Q	SC		NA	Y
Ohio Goldenrod	<i>Solidago ohioensis</i>	2000	S3	G4	SC		NA	Y
Showy Lady's-slipper	<i>Cypripedium reginae</i>	2008	S3	G4	SC		NA	Y
Slender Bog Arrow-grass	<i>Triglochin palustris</i>	1999	S3	G5	SC		NA	Y
Small-flower Grass-of-Parnassus	<i>Parnassia parviflora</i>	1985	S1	G4	END		NA	Y
Sparse-flowered Sedge	<i>Carex tenuiflora</i>	2008	S3	G5	SC		NA	Y
Variegated Horsetail	<i>Equisetum variegatum</i>	1999	S3	G5	SC		NA	Y
White Adder's-mouth	<i>Malaxis monophyllos var. brachypoda</i>	2008	S3	G4Q	SC		NA	Y
<b>Natural Community</b>								
Boreal Forest		2000	S2	G3?			NA	Y
Boreal Rich Fen		1999	S2	G4G5			NA	Y
Emergent Marsh		2004	S4	G4			NA	Y
Great Lakes Alkaline Rockshore		2008	S2	G3			NA	Y
Hardwood Swamp		2008	S3	G4			NA	Y
Lake--Shallow, Hard, Drainage		2000	SU	GNR			NA	Y
Northern Sedge Meadow		2008	S3	G4			NA	Y
Northern Wet-mesic Forest		2008	S3S4	G3?			NA	Y
Open Bog		1976	S4	G5			NA	Y
Shrub-carr		2008	S4	G5			NA	Y
Springs and Spring Runs, Hard		1976	S4	GNR			NA	Y
<b>Animal Assemblage</b>								
Migratory Bird Concentration Site		2006	SU	G3	SC		NA	Y

Rare species that are located within one mile of the DKPG or upstream in the Kewaunee River and not known from the DKPG or are mapped at a low mapping precision in the NHI Database are important to consider during planning efforts (Table 6). These species may be located on adjacent private lands or nearby State Natural Areas. Additional inventory can be done to determine whether or not these species are found within the study area and management may be considered that supports habitat for these species.

**Table 6.** Rare species that are either 1) found within one mile of the DKPG or upstream in the Kewaunee River and not found on the DKPG or 2) mapped at a low mapping precision.

Common Name	Scientific Name	State Rank	Global Rank	State Status
<b>Animal</b>				
Redside Dace	<i>Clinostomus elongatus</i>	S3	G3G4	SC/N
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	S4B	G5	
<b>Plant</b>				
Crawe Sedge	<i>Carex crawei</i>	S3	G5	SC
Giant Pinedrops	<i>Pterospora andromedea</i>	S1	G5	END
Lake Huron Tansy	<i>Tanacetum huronense</i>	S1	G5T4T 5	END
Large Roundleaf Orchid	<i>Platanthera orbiculata</i>	S3	G5	SC
Large-flowered Ground-cherry	<i>Leucophysalis grandiflora</i>	S1	G4?	SC
Limestone Oak Fern	<i>Gymnocarpium robertianum</i>	S2	G5	SC
Northern Comandra	<i>Geocaulon lividum</i>	S1	G5	END
Slim-stem Small-reedgrass	<i>Calamagrostis stricta</i>	S3	G5	SC



Hine's emerald dragonfly. Photo by Kathryn Kirk.

# Management Considerations and Opportunities for Biodiversity Conservation

## Rare snails

Rare terrestrial snails (terrestrial gastropods), some of which occur in few or no other locations in the world and date back to the last Ice Age, are found along the Niagara Escarpment (WDNR 2002). These snails were widespread in the Pleistocene and are now restricted in the Midwest to cool moist microhabitats found primarily along in the Niagara Escarpment and in the Driftless Area. Of the approximately 100 species of land snail in Wisconsin, almost one-third are tracked by NHI and seven are globally rare to globally imperiled (WDNR 2002); three species are currently protected as State Endangered or Threatened. Most are species of cliffs, though a few inhabit woodlands or wetlands. All of these rare snails are very small, with shell diameters of only a few millimeters. Rare terrestrial snails found within the DKPG are listed in Table 7.

**Table 7.** Rare terrestrial snails of the DKPG

Common Name	Scientific Name	State Rank	Global Rank	State Status
Cherrystone Drop	<i>Hendersonia occulta</i>	S3	G4	THR
Dentate Supercoil	<i>Paravitrea multidentata</i>	S2S3	G5	SC/N
Eightfold Pinecone	<i>Strobilops affinis</i>	S3	G4G5	SC/N
Midwest Pleistocene Vertigo	<i>Vertigo hubrichti</i>	S1	G3	END

Rare terrestrial snails not currently known from the DKPG but found within Door County are listed in Table 8. These species may be considered important for future survey efforts.

**Table 8.** Rare terrestrial snails not currently known from the DKPG but found within Door and Kewaunee counties

Common Name	Scientific Name	State Rank	Global Rank	State Status
Appalachian Pillar	<i>Cochlicopa morseana</i>	S2	G5	SC/N
Black Striate	<i>Striatura ferrea</i>	S2	G5	SC/N
Boreal Top	<i>Zoogenetes harpa</i>	S1	G5	SC/N
Brilliant Granule	<i>Guppya sterkii</i>	S2S3	G5	SC/N
Iowa Pleistocene Vertigo	<i>Vertigo</i> sp.	S1S2	G3Q	SC/N
Mystery Vertigo	<i>Vertigo paradoxa</i>	S1	G4G5Q	SC/N
Sculpted Glyph	<i>Glyphyalinia rhoadsi</i>	S2	G5	SC/N
Tapered Vertigo	<i>Vertigo elatior</i>	S3	G5	SC/N

In general, terrestrial snails have restricted ranges, are limited by their dispersal ability, and their presence is circumscribed by the biotic (e.g., vegetation) and abiotic (e.g., geology) features. Consequently, they are very vulnerable to management activities that alter temperature, moisture, and/or food supplies in populated sites. Impacts from activities that disturb the soil or open the forest canopy can create warmer and drier conditions due to changes in shade, increased interstitial sedimentation, introduction of invasive plant species, and vent compaction. Talus slopes, which are found along the Niagara Escarpment, contain vents which carry cold air, moisture, and nutrients that some snail species are dependant on. These vents, located throughout the slope and on bedrock outcrops, are vulnerable to compaction and filling-in.

Habitat for rare terrestrial snails on the DKPG is limited. Outcrops of the Niagara Escarpment are uncommon, but where there is suitable habitat, management opportunities exist to protect these important species and their habitat.

## **Migratory Bird Stopover Site**

The Great Lakes shoreline plays a crucial role for millions of migrating birds (Grveles and Matteson 2008). Mud Lake Wildlife Area (including Mud Lake SNA and Ridges Sanctuary SNA) and Gardner Swamp Wildlife Area were determined to be vital Migratory Bird Stopover Sites by the ongoing Wisconsin DNR's Strategy for Protecting Bird Migration Stopover Habitats in the Western Great Lakes project (Grveles and Matteson 2008; Table 9).

Many factors contribute to the important role the DKPG plays in the migration of landbirds. The Door Peninsula, being an isolated geographic feature, provides some of the first available habitat to landbirds crossing Lake Michigan. Habitat types that are important to migrating birds include Alder Thicket and mature forest on stabilized dunes and beach ridges (Grveles and Matteson 2008).

Threats to Migratory Bird Stopover Sites and migratory birds include habitat destruction and habitat alteration (Duncan et al. 2002). Habitat alteration includes the simplification of forest structure or the alteration of forest composition, including invasive species that may change the kinds, quantity, and quality of food resources (Duncan et al. 2002).

**Table 9.** Spring and fall migratory bird use at important sites within the DKPG

<b>C.D. (Buzz) Besadny Fish and Wildlife Area</b>		
	Spring	Fall
Estimated number of waterfowl	Unknown	Unknown
Estimated number of diurnal raptors	20-50	20-50
Estimated number of nocturnal raptors	Unknown	Unknown
Estimated number of shorebirds	Unknown	Unknown
Estimated number of waterbirds	Unknown	Unknown
Estimated number of neo-tropical landbirds	101-999	101-999

<b>Mud Lake (Wildlife Area and SNA and Ridges Sanctuary SNA)</b>		
	Spring	Fall
Estimated number of waterfowl	101-999	101-999
Estimated number of diurnal raptors	51-100	51-100
Estimated number of nocturnal raptors	51-100	51-100
Estimated number of shorebirds	20-50	20-50
Estimated number of waterbirds	51-100	51-100
Estimated number of neo-tropical landbirds	1,000-9,999	1,000-9,999

<b>Gardner Swamp Wildlife Area</b>		
	Spring	Fall
Estimated number of waterfowl	101-999	101-999
Estimated number of diurnal raptors	<20	<20
Estimated number of nocturnal raptors	<20	<20
Estimated number of shorebirds	Unknown	Unknown
Estimated number of waterbirds	20-50	20-50
Estimated number of neo-tropical landbirds	101-999	101-999

## Old Growth/Older Forests

Older forests (greater than 100-120 years old) in Wisconsin are rare and declining, largely due to timber harvesting and conversion to other land uses (WDNR 2010). The WDNR has identified a need to conserve, protect, and manage old-growth forests (WDNR 1995, WDNR 2004), and old-growth management is a component of Forest Certification. Old-growth and older forests provide structural diversity that can 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 2010).

The DKPG has the opportunity to promote old-growth characteristics that maintain the structure, composition, and functional values needed for the unique assemblage of species characteristic of older forests. The DKPG represents some of the very few opportunities for developing and maintaining old growth Boreal and Northern Wet-mesic Forests in the Northern Lake Michigan Coastal Ecological Landscape.

## Coniferous Forests

Coniferous forests of the DKPG include Boreal Forest, Northern Wet-mesic Forests, and Hardwood Swamps with a northern-white cedar component. Boreal Forests of this area represent a unique variant of this type in Wisconsin. These forests are maintained, in part, because of wind throw and high levels of humidity, snowfall, and summer fog and mist. Northern Wet-mesic Forests are regionally significant because they are one of the most diverse plant communities, providing habitat for many rare plants, including northern yellow lady's-slipper (*Cypripedium parviflorum* var. *makasin*), and important habitat to over 80 wildlife species (Forester et al. 2008).

Regeneration of northern white-cedar, an important component of the conifer forests of the DKPG, has been rare in the upper Great Lakes region for decades (Rooney et al 2002) because it is a preferred browse species for white-tailed deer (*Odocoileus virginianus*). The Door Peninsula is unique in that northern white-cedar regeneration may be more common here than many other places in Wisconsin. Regeneration of northern white-cedar can be enhanced if white-tailed deer population reduction occurs (Forester et al. 2008; Beals et al., 1960; Ullrey et al. 1968); without it, northern white-cedar may, in future centuries, become confined to 'browsing refugia,' or intentional exclosures (Rooney 1997; Borgmann et al. 1999).

An important component of preserving these unique conifer natural communities is maintaining or restoring hydrology in these areas. Activities associated with road or right-of-way construction, dams or levees, and beaver activity can negatively impact the hydrology. Control of non-native invasive plants such as reed canary grass and glossy buckthorn (*Rhamnus frangula*) is vital to preserving the integrity of these sites as these invasive plants out-compete native plant species. Timber or deer management practices, in association with attempts at northern white-cedar regeneration like strip-cutting, have been detrimental to regenerating northern white-cedar along with threatening the long-term viability of these sites (WDNR 2006b). This method of timber management should be evaluated and long-term monitoring established to track the changes to the forests and the biota associated with them over time. Increasing winter deer numbers in these conifer forests can have extremely negative effects on the persistence of these habitats. Creating larger blocks of these natural communities with surrounding hardwood swamp, upland forests, or open wetland types would benefit animal diversity, protect them from invasion of non-native plants, improve water quality, and aid in tree regeneration (WDNR 2006b).

## Kewaunee Marsh

The wetland complex along the Kewaunee River at the eastern end of C.D. (Buzz) Besadny Fish and Wildlife Area is unique on the western side of Lake Michigan because the dynamic wave and storm action of the lake limits the development of these natural communities. The low areas along the Kewaunee River have Emergent Marsh, sedge meadow, and Shrub-carr that provide important habitat for breeding and migratory birds. Marsh birds known to breed in the area include marsh wrens (*Cistothorus palustris*), sora (*Porzana carolina*), Virginia rails (*Rallus limicola*), mallards (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), American coot (*Fulica americana*), and Special Concern species.

## Invasive Species

### Widespread Invaders

Non-native invasive species thrive in newly disturbed areas because they establish quickly, tolerate a wide range of conditions, are easily dispersed, and are no longer limited by the diseases, predators, and competitors that kept their populations in check in their native range. Invasive plants can kill and out-compete native plants by monopolizing light, water, and nutrients and altering soil chemistry and mycorrhizal relationships. In situations where invasive plants become dominant, they may even alter ecological processes by modifying hydrology. In addition to the threats on native communities and native

species diversity, invasive species negatively impact forestry (by reducing tree regeneration, growth and longevity), recreation (by degrading fish and wildlife habitat and limiting access), agriculture, and human health (plants that cause skin rashes or blisters).

Non-native invasive species are numerous and widespread in the landscape surrounding the study area. Table 10 lists non-native invasive species, including plants, animals and pathogens, that are either found on the DKPG, or are not known from the DKPG but are potential threats to the habitats of the DKPG. Table 10 does not include non-native species that are not currently known to be invasive.

**Table 10.** Widespread non-native invasive species of the landscape surrounding the study area

Common Name	Latin Name	Type	Upland Habitats		Wetland Habitats		Aquatic
			Open	Wooded	Open	Wooded	
autumn olive	<i>Elaeagnus umbellata</i>	Plant	X				
birdsfoot trefoil	<i>Lotus corniculatus</i>	Plant	X				
Burnett saxifrage	<i>Pimpinella saxifraga</i>	Plant	X				
Canada thistle	<i>Cirsium arvense</i>	Plant	X				
common buckthorn	<i>Rhamnus cathartica</i>	Plant	X	X	X	X	
common hound's-tongue	<i>Cynoglossum officinale</i>	Plant	X	X			
common teasel	<i>Dipsacus sylvestris</i>	Plant	X		X		
Cypress spurge	<i>Euphorbia cyparissias</i>	Plant	X				
dame's rocket	<i>Hesperis matronalis</i>	Plant		X		X	
exotic bush honeysuckles	<i>Lonicera</i> spp.	Plant	X	X			
garden forget-me-not	<i>Myosotis sylvatica</i>	Plant	X	X			
garlic mustard	<i>Alliaria petiolata</i>	Plant		X		X	
giant reed grass	<i>Phragmites australis</i>	Plant			X		
glossy buckthorn	<i>Rhamnus frangula</i>	Plant	X	X	X	X	
gypsy moth	<i>Lymantria dispar</i>	Animal		X		X	
helleborine orchid	<i>Epipactis helleborine</i>	Plant		X			
Japanese barberry	<i>Berberis thunbergii</i>	Plant		X			
leafy spurge	<i>Euphorbia esula</i>	Plant	X				
narrow-leaved cattail	<i>Typha angustifolia</i>	Plant			X		
oak wilt	<i>Ceratocystis fagacearum</i>	Fungus		X		X	
ox-eye daisy	<i>Leucanthemum vulgare</i>	Plant	X				
orange hawkweed	<i>Hieracium aurantiacum</i>	Plant	X				
purple loosestrife	<i>Lythrum salicaria</i>	Plant			X		
quagga mussel	<i>Dreissena rostriformis bugensis</i>	Animal					X
Queen Anne's lace	<i>Daucus carota</i>	Plant	X	X			
reed canary grass	<i>Phalaris arundinacea</i>	Plant			X	X	
sheep sorrel	<i>Rumex acetosella</i>	Plant	X				
smooth brome	<i>Bromus inermis</i>	Plant	X				
spotted knapweed	<i>Centaurea biebersteinii</i>	Plant	X				
wayfaring-tree	<i>Viburnum lantana</i>	Plant	X	X			
wild parsnip	<i>Pastinaca sativa</i>	Plant	X		X		
yellow and white sweet clover	<i>Melilotus officinalis</i> and <i>M. alba</i>	Plant	X				
yellow sedum	<i>Sedum acre</i>	Plant	X				
zebra mussels	<i>Dreissena polymorpha</i>	Animal					X

\*Based on working knowledge of contributors to this report, plus maps and information on the WDNR website.

### New or Not-Widespread Invaders

When resources for complete control of widespread invasives are lacking, containment (i.e., limiting further spread) may be considered as an alternative action. Early detection and rapid control of new and/or small infestations, however, may be considered for higher prioritization in an invasive species management strategy (Boos et al. 2010). A number of invasive species are, in fact, new or are not yet widespread in the DKPG (Table 11); monitoring for these species and rapid response to small infestations represent high-impact actions.

**Table 11.** New or not widespread non-native invasive species of the landscape surrounding the study area

Common Name	Latin Name	Type	Upland Habitats		Wetland Habitats		Aquatic
			Open	Wooded	Open	Wooded	
a fungus	<i>Nectria coccinea</i> var. <i>faginata</i> .	Fungus		X			
baby's breath	<i>Gypsophila paniculata</i>	Plant	X				
beech scale	<i>Cryptococcus fagisuga</i>	Animal		X			
black swallowwort	<i>Vincetoxicum nigrum</i>	Plant	X	X			
European marsh thistle	<i>Cirsium palustre</i>	Plant			X		
Japanese hedge parsley	<i>Torilis japonica</i>	Plant		X			
Japanese knotweed	<i>Polygonum cuspidatum</i>	Plant	X	X	X	X	
lyme grass	<i>Leymus arenarius</i>	Plant	X				
water speedwell	<i>Veronica anagallis-aquatica</i>		X		X		

\*Based on working knowledge of contributors to this report, plus maps and information on the WDNR website.

### Emerald Ash Borer

The emerald ash borer (*Agrilus planipennis*), an invasive, wood-boring beetle that attacks ash trees, was positively identified for the first time in Wisconsin in 2008 and is now found in 6 counties. The beetle attacks all species of ash (*Fraxinus* spp.) in Wisconsin and the risk to forests is high with models predicting that a healthy forest will lose 98% of its ash trees in 6 years (<http://www.emeraldashborer.wi.gov>). Although not documented in Door and Kewaunee counties, the potential for introduction is high due to the large numbers of visitors to state parks and their potential to transport the beetle on firewood and that it has been found in nearby counties.

## **Forest Fragmentation**

Interpretation of historic vegetation indicates that the landscape surrounding the DKPG contained an extensive area of northern hardwood forest and swamp conifers (WDNR In Prep.). Much of this area, once dominated by forests, has been mostly converted to agricultural or residential uses.

The result of the fragmentation of the forests in the DKPG landscape is an increase in forest edge and a lack of habitat for forest interior species. The forest edge can be an “ecological trap” for ground-nesting bird species. Flaspohler et al. (1999) showed that the zone around a cleared area in a forest can extend up to 300 meters into the intact forest. Within this zone, ground-nesting bird nest density increases, but the nest success decreases. The decrease in nest success could be due to the increase in edge-abundant predators such as raccoons, skunks, and crows; nest parasitizing cowbirds; and competition from edge-adapted species.

## Ecological Priorities for SGCN

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

## Natural Community Management Opportunities

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006b) identifies 33 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Northern Lake Michigan Coastal Ecological Landscape**. Nineteen of these natural communities are present on the DKPG (see below). Natural communities with an asterisk are not represented by element occurrences in the NHI database.

- Boreal Rich Fen
- Dry Cliff\*
- Emergent Marsh\*
- Great Lakes Alkaline Rockshore
- Great Lakes Beach\*
- Great Lakes Dune\*
- Great Lakes Ridge and Swale\*
- Lake Michigan\*
- Northern Mesic Forest\*
- Northern Sedge Meadow
- Northern Wet-mesic Forest
- Shrub Carr
- Warmwater rivers\*
- Warmwater streams\*
- Boreal Forest
- Coolwater streams\*
- Inland lakes\*
- Northern Hardwood Swamp
- Surrogate Grasslands

The Wisconsin Wildlife Action Plan (WAP) (WDNR 2006b) identifies 28 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the **Central Lake Michigan Coastal Ecological Landscape**. Ten of these natural communities are present on the DKPG (see below). Natural communities with an asterisk are not represented by element occurrences in the NHI database.

- Dry Cliff\*
- Warmwater rivers\*
- Warmwater streams\*
- Coolwater streams\*
- Emergent Marsh
- Northern Hardwood Swamp\*
- Northern Sedge Meadow\*
- Northern Wet-mesic Forest
- Shrub Carr\*
- Surrogate Grasslands\*



Oblique aerial photo of Gardner Swamp Wildlife Area. Photo by Ryan O'Connor

# Primary Sites: Site-specific Opportunities for Biodiversity Conservation

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

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

## **Door and Kewaunee County State Wildlife and Natural Areas Planning Group Primary Sites**

- DKPG01. Mud Lake State Natural Area
- DKPG02. Bailey’s Harbor Boreal Forest and Wetland State Natural Area
- DKPG03. Moonlight Bay Bedrock Beach State Natural Area



Mud Lake Wildlife Area (and State Natural Area). Photo by Michael Mossman

## Future Needs

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

- Invasive species monitoring and control is essential to managing the biodiversity within the DKPG. Public lands throughout Wisconsin are facing major management problems because of serious infestations of highly invasive species.
- Locations and likely habitats should be identified for conducting additional rare plant and animal surveys during appropriate seasons. This should include additional vertebrate and invertebrate animal taxon groups.
- Additional bird surveys should be done focusing on spring and fall migratory bird concentration areas and bird abundance.



Large yellow Lady's-slipper in Mud Lake Wildlife Area. Photo by Janeen Laatsch.

# Glossary

**cuesta** - is a ridge formed by gently tilted sedimentary rock strata in which the strata are tilted in the same direction. Cuestas have a steep slope, where the rock layers are exposed on their edges, called an escarpment or, if more steep, a cliff.

**dolostone** – the rock equivalent of the mineral dolomite

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

**escarpment** - a transition zone between different physiogeographic provinces that involves a sharp, steep elevation differential, characterized by a cliff or steep slope. Most commonly, an escarpment is a transition from one series of sedimentary rocks to another series of a different age and composition. When sedimentary beds are tilted and exposed to the surface, erosion and weathering may occur differentially based on the composition. Less resistant rocks will erode faster, retreating until the point they are overlain by more resistant rock. When the dip of the bedding is gentle, a cuesta is formed. Steeper dips (greater than 30-40°) form hogbacks.

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

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

**mapping precision** – the locational accuracy to which an element occurrence is known.

**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.

**Niagara Escarpment** – commonly known as “the Ledge” in Wisconsin is a sickle-shaped ridge with a steep face on one side (an escarpment) and a gentle slope on the other (a cuesta) that begins in south-central Wisconsin, arches east through Michigan and southern Ontario and ends in western New York State.

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

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

**talus** - or scree, is loose rock created by physical weathering that typically lies on steep mountainsides or the base of cliffs.

# Species List

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

Common Name	Scientific Name
<b>Animals</b>	
American coot	<i>Fulica americana</i>
blue-winged teal	<i>Anas discors</i>
carp	<i>Hypophthalmichthys spp.</i>
Hine's emerald dragonfly	<i>Somatochlora hineana</i>
mallard	<i>Anas platyrhynchos</i>
marsh wren	<i>Cistothorus palustris</i>
sora	<i>Porzana carolina</i>
The emerald ash borer	<i>Agrilus planipennis</i>
Virginia rail	<i>Rallus limicola</i>
white-tailed deer	<i>Odocoileus virginianus</i>
<b>Plants</b>	
American beech	<i>Fagus grandifolia</i>
American elm	<i>Ulmus americana</i>
American starflower	<i>Trientalis borealis</i>
ash	<i>Fraxinus sp.</i>
aspen	<i>Populus sp.</i>
balsam fir	<i>Abies balsamea</i>
Baltic rush	<i>Juncus arcticus</i>
basswood	<i>Tilia americana</i>
Bebb's sedge	<i>Carex bebbii</i>
big blue-stem	<i>Andropogon gerardii</i>
black ash	<i>Fraxinus nigra</i>
black spruce	<i>Picea mariana</i>
black-eyed Susan	<i>Rudbeckia hirta</i>
blue bead-lily	<i>Clintonia borealis</i>
blue-joint grass	<i>Calamagrostis canadensis</i>
bog birch	<i>Betula pumila</i>
bracken fern	<i>Pteridium aquilinum</i>
bristle-leaf sedge	<i>Carex eburnea</i>
broad-leaved arrowhead	<i>Sagittaria latifolia</i>
broad-leaved cat-tail	<i>Typha latifolia</i>
brook lobelia	<i>Lobelia kalmii</i>
buckthorn	<i>Rhamnus sp.</i>
bunchberry	<i>Cornus canadensis</i>
Canada mayflower	<i>Maianthemum canadense</i>
Colonial oak sedge	<i>Carex communis</i>
common boneset	<i>Eupatorium perfoliatum</i>
common bur-reed	<i>Sparganium eurycarpum</i>
common lake sedge	<i>Carex lacustris</i>
giant reed grass	<i>Phragmites australis</i>
common spike-rush	<i>Eleocharis palustris</i>
common water-horehound	<i>Lycopus americanus</i>

<b>Common Name</b>	<b>Scientific Name</b>
common winterberry	<i>Ilex verticillata</i>
<b>Plants</b>	
coon's-tail	<i>Ceratophyllum demersum</i>
creeping tickle grass	<i>Agrostis stolonifera</i>
Dewey's sedge	<i>Carex deweyana</i>
dogwood	<i>Cornus</i> sp.
drooping woodland sedge	<i>Carex arctata</i>
elm	<i>Ulmus</i> spp.
fen grass-of-Parnassus	<i>Parnassia glauca</i>
few-flowered spike-rush	<i>Eleocharis quinqueflora</i>
fowl manna grass	<i>Glyceria striata</i>
fringed polygala	<i>Polygala paucifolia</i>
garlic mustard	<i>Alliaria petiolata</i>
glossy buckthorn	<i>Rhamnus frangula</i>
goldenrod	<i>Solidago</i> spp.
green ash	<i>Fraxinus pennsylvanica</i>
hair beak-rush	<i>Rhynchospora capillacea</i>
hemlock	<i>Tsuga canadensis</i>
honeysuckle	<i>Lonicera</i> sp.
Indian paintbrush	<i>Castilleja coccinea</i>
lady fern	<i>Athyrium filix-femina</i>
large-leaved aster	<i>Aster macrophyllus</i>
little green sedge	<i>Carex viridula</i>
long-styled sweet cicely	<i>Osmorhiza longistylis</i>
marsh fern	<i>Thelypteris palustris</i>
mat panic grass	<i>Dichanthelium acuminatum</i>
mountain maple	<i>Acer spicatum</i>
naked bladderwort	<i>Utricularia cornuta</i>
naked miterwort	<i>Mitella nuda</i>
narrow-leaved cow-wheat	<i>Melampyrum lineare</i>
ninebark	<i>Physocarpus opulifolius</i>
northern three-lobed bedstraw	<i>Galium trifidum</i>
northern white-cedar	<i>Thuja occidentalis</i>
northern yellow lady's-slipper	<i>Cypripedium parviflorum</i> var. <i>masakin</i>
poison sumac	<i>Toxicodendron vernix</i>
pondweeds	<i>Potamogeton</i> sp.
purple false foxglove	<i>Agalinis purpurea</i>
purple loosestrife	<i>Lythrum salicaria</i>
quaking aspen	<i>Populus tremuloides</i>
rattlesnake fern	<i>Botrychium virginianum</i>
red baneberry	<i>Actaea rubra</i>
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus rubra</i>
red pine	<i>Pinus resinosa</i>
reed canary grass	<i>Phalaris arundinacea</i>
rough-leaved rice grass	<i>Oryzopsis asperifolia</i>
rush	<i>Juncus</i> spp.

<b>Common Name</b>	<b>Scientific Name</b>
russet buffalo-berry	<i>Shepherdia canadensis</i>
sedges	<i>Carex</i> sp.
<b>Plants</b>	
silver maple	<i>Acer saccharinum</i>
silver-weed	<i>Potentilla anserina</i>
slender willow	<i>Salix petiolaris</i>
small-spike false nettle	<i>Boehmeria cylindrica</i>
smooth loosestrife	<i>Lysimachia quadriflora</i>
soft-stem bulrush	<i>Schoenoplectus tabernaemontani</i>
speckled alder	<i>Alnus incana</i>
spike-rushes	<i>Eleocharis</i> sp
spotted Joe-Pye-weed	<i>Eupatorium maculatum</i>
spurred-gentian	<i>Halenia deflexa</i>
sugar maple	<i>Acer saccharum</i>
swamp white oak	<i>Quercus bicolor</i>
sweet-scented bedstraw	<i>Galium triflorum</i>
sweet gale	<i>Myrica gale</i>
tamarack	<i>Larix laricina</i>
thimbleberry	<i>Rubus parviflorus</i>
three-leaved gold-thread	<i>Coptis trifolia</i>
tickle grass	<i>Agrostis hyemalis</i>
tussock sedge	<i>Carex stricta</i>
twig-rush	<i>Cladium mariscoides</i>
twinflor	<i>Linnaea borealis</i>
white birch	<i>Betula papyrifera</i>
white pine	<i>Pinus strobus</i>
white spruce	<i>Picea glauca</i>
white violet	<i>Viola renifolia</i>
wild rice	<i>Zizania aquatica</i>
wild sarsaparilla	<i>Aralia nudicaulis</i>
wild-basil	<i>Clinopodium vulgare</i>
willows	<i>Salix</i> spp.
woolly-fruit sedge	<i>Carex lasiocarpa</i>
yellow birch	<i>Betula alleghaniensis</i>
yellow water-lily	<i>Nuphar advena</i>

# Reference List

- Anderson, C., E. Epstein, W. Smith, N. Merryfield. 2002. The Niagara Escarpment Inventory Findings 1999-2001 and Considerations for Management. Wisconsin Department of Natural Resources, Madison, WI. PUBL ER-801
- Bay-Lake Regional Planning Commission [BLRPC]. A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin. 2003. First edition.
- Beals, E.W., Cottam, G., Vogl, R.J., 1960. Influence of deer on vegetation of the Apostle Islands, Wisconsin. *J. Wildl. Manage.* 24, 68-80.
- Boos, T., K. Kearns, C. LeClair, B. Panke, B. Sriver, and B. Williams. 2010. A Field Guide to Terrestrial Invasive Plants of Wisconsin. Wisconsin DNR, Madison, WI. 124 pp.
- Borgmann, K.L., Waller, D.M., Rooney, T.P., 1999. Does balsam fir (*Abies balsamea*) facilitate the recruitment of eastern hemlock (*Tsuga canadensis*)? *Am. Midland Naturalist* 141, 391-397.
- Cleland, D.T.; Avers, P.E.; McNab, W.H.; Jensen, M.E.; Bailey, R.G., King, T.; Russell, W.E. 1997. National Hierarchical Framework of Ecological Units. Published in, Boyce, M. S.; Haney, A., ed. 1997. *Ecosystem Management Applications for Sustainable Forest and Wildlife Resources*. Yale University Press, New Haven, CT. pp. 181-200.
- Corbisier, J., B. Hanson, K. Krebsbach, and K. Kuepper. 2000. Surface Water Inventory of Door County. Door County Soil and Water Conservation Department.
- Curtis, J. T. 1959. *The Vegetation of Wisconsin*. University of Wisconsin Press, Madison, WI. 657 pp.
- Duncan, C., B. Abel, D. Ewert, M.L. Ford, S. Mabey, D. Mehlman, P. Patterson, R. Sutter and M. Woodrey. 2002. Protecting Stopover Sites for Forest-Dwelling Migratory Landbirds. The Nature Conservancy, Arlington, VA. Unpublished report.
- Ecosystem Management Planning Team [EMPT]. 2007. Table of Opportunities for Sustaining Natural Communities by Ecological Landscape. Available online: <http://dnr.wi.gov/landscapes/ecoloppstable.pdf>
- Epstein, E.J., E.J. Judziewicz, and E.A. Spencer. 2002. Wisconsin Natural Community Abstracts. Department of Natural Resources, Bureau of Endangered Resources, Madison, WI. Available online: [dnr.wi.gov/org/land/er/communities/](http://dnr.wi.gov/org/land/er/communities/)
- Federal Register*. 2007. Designation of Critical Habitat for the Hine's Emerald Dragonfly; Final Rule. Volume 72, Number 171. Pg 51101-51152. [wais.access.gpo.gov](http://www.access.gpo.gov).
- Finley, R.W. 1976. Early Vegetation of Wisconsin. Map compiled from General Land Office
- Flaspohler, D.J., S.A. Temple, R.N. Rosenfield. 1999. Species-specific edge effects on nest success and breeding bird density in a forested landscape. *Ecological Applications*: Vol. 11, No. 1, pp. 32-46.

- Forester, J.D., Anderson, D.P., and Turner, M.G., 2008. Landscape and Local Factors Affecting Northern White-cedar (*Thuja occidentalis*) Recruitment in the Chequamegon-Nicolet National Forest, Wisconsin (U.S.A.). *Am. Midl. Nat.* 160:438-453.
- Grveles, K. and S. Matteson. 2008. Implementing a strategy for protecting bird migration stopover habitats in the western Great Lakes: 2008-2112, WI DNR, Unpublished report.
- Link, E.G., S.L. Elmer, and S.A. Vanderveen. 1978. Soil Survey of Door County, Wisconsin. United States Department of Agriculture Soil Conservation Service.
- Martin, L. 1965. *The Physical Geography of Wisconsin*. University of Wisconsin Press, Madison, WI.
- Rooney, T.P., 1997. Escaping herbivory: refuge effects on the morphology and shoot demography of the clonal forest herb, *Maianthemum canadense*, *J. Torrey Botanical Soc.* 124, 280-285.
- Rooney, T.P., Solheim, S.L., Waller, D.M., 2002. Factors Affecting the Regeneration of Northern White-cedar in Lowland Forests of the Upper Great Lakes Region, USA. *Forest Ecology and Management.* 163, 119-130.
- Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov/> accessed [09/24/2010].
- Ullrey, D.E., Youatt, W.G., Johnson, L.D., Fay, B.E., Brent and Kemp, K.E., 1968. Digestibility of cedar and balsam fir browse for the white-tailed deer. *Journal of Wildlife Management*, 32:162-171.
- Watermolen, D., S. Ugoretz, L. Hanson, and M. Rowe. October, 1997. "The Niagara Escarpment: An Assessment of Resources and Opportunities". Wisconsin Department of Natural Resources – Bureau of Integrated Science Services, Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. In Prep. DRAFT Ecological Landscapes of Wisconsin. State of Wisconsin, Dept. of Nat. Resources, Handbook. 1805.1. Madison, WI
- Wisconsin Department of Natural Resources [WDNR]. 1993. Wisconsin DNR Wiscland GIS coverage.
- Wisconsin Department of Natural Resources [WDNR]. 1995. Wisconsin's Biodiversity as a Management Issue: A Report to Department of Natural Resources Managers. Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 2002. The Niagara Escarpment: Inventory Findings 1999-2001 and Considerations for Management. Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 2004. Wisconsin's Statewide Forest Plan: Ensuring a Sustainable Future. Available on the WDNR Web site: [dnr.wi.gov/forestry/assessment/](http://dnr.wi.gov/forestry/assessment/).
- Wisconsin Department of Natural Resources [WDNR]. 2006a. Wisconsin Land Legacy Report: An inventory of places critical in meeting Wisconsin's future conservation and recreation needs. Madison, WI.
- Wisconsin Department of Natural Resources [WDNR]. 2006b. Wisconsin Wildlife Action Plan. Available at <http://dnr.wi.gov/org/land/er/wwap/plan/>.
- Wisconsin Department of Natural Resources [WDNR]. 2007. Important Bird Areas of Wisconsin: Critical Sites for the Conservation and Management of Wisconsin's Birds.

Wisconsin Department of Natural Resources [WDNR]. 2009. DNR Land Certification. Available at:  
<http://dnr.wi.gov/forestry/certification/dnrland.html>

Wisconsin Department of Natural Resources [WDNR]. 2010. Wisconsin's Statewide Forest Assessment.  
Available online: <http://dnr.wi.gov/forestry/assessment/strategy/assess.htm>.

*Wisconsin Natural Heritage Working List*. Wisconsin Department of Natural Resources. Web.  
<<http://dnr.wi.gov/org/land/er/wlist/>>.

Wisconsin Wetlands Association [WWA]. 2010. Wetland Gems. Wisconsin Wetlands Association. Madison, WI.

# Additional Resources

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

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

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

## 2. Wisconsin Natural Heritage Inventory Working List

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

## 3. Ecological Landscapes of Wisconsin Handbook

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

## 4. The Wisconsin Wildlife Action Plan

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

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

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

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

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

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

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

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

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

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

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

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

8. *A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin*. 2003. Author? Publisher?
9. *Index to Door County Natural Resource Districts and Corridors by Township*. 1988. James H. Zimmerman. Unpublished report.
10. *List of Natural Resource Maintenance Guidelines Papers: a supplement to the Index to Door County Natural Resource Districts and Corridors by Township*. 1988. James H. Zimmerman. Unpublished report.
11. *Vegetation on the Niagara Escarpment of Door County*. Unknown date. James H. Zimmerman. Unpublished report.

---

## 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



## Appendix C

### The Door and Kewaunee County State Wildlife and Natural Areas Planning Group Species of Greatest Conservation Need

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

	Major												Important					
	Boreal Rich Fen	Dry Cliff*	Emergent Marsh*	Great Lakes Beach*	Great Lakes Dune*	Great Lakes Ridge and Swale*	Lake Michigan*	Northern Mesic Forest*	Northern Sedge Meadow	Northern Wet-mesic Forest	Shrub Carr	Warmwater rivers*	Warmwater streams*	Boreal Forest	Coolwater streams*	Inland lakes*	Northern Hardwood Swamp	Surrogate Grasslands*
<b>Species that are Significantly Associated with the Northern Lake Michigan Coastal Landscape</b>																		
American Golden Plover			2	1					1									2
American Woodcock								2	1	1	3			1			2	1
Bald Eagle						1	2					3				3		
Banded Killifish							3					1				2		
Black Tern			3				1		2							2		
Black-billed Cuckoo						2		2	1		3			1			1	
Black-throated Blue Warbler								3						1				
Blue-winged Teal			3	1		1	1		2			1				2		2
Bobolink									3									3
Brown Thrasher						2												2
Canada Warbler	2					3		2		3	1			3			3	
Canvasback			1				1					3				2		
Caspian Tern				3			3											
Common Tern			2	3			3									1		
Dunlin			2	3								2						
Eastern Meadowlark																		3
Field Sparrow																		2
Forster's Tern			3				1									1		

\*Natural communities with an asterisk are not represented by an element occurrence in the NHI database.

	Major												Important					
	Boreal Rich Fen	Dry Cliff*	Emergent Marsh*	Great Lakes Beach*	Great Lakes Dune*	Great Lakes Ridge and Swale*	Lake Michigan*	Northern Mesic Forest*	Northern Sedge Meadow	Northern Wet-mesic Forest	Shrub Carr	Warmwater rivers*	Warmwater streams*	Boreal Forest	Coolwater streams*	Inland lakes*	Northern Hardwood Swamp	Surrogate Grasslands*
<b>Species that are Significantly Associated with the Northern Lake Michigan Coastal Landscape</b>																		
Great Egret			3				1					2						
Horned Grebe							3									1		
Hudsonian Godwit			3	1														
Lake Sturgeon							3					3				3		
Least Flycatcher						2		3		1	1			2			2	
Lesser Scaup			1				1					2				2		
Mink Frog	2		3					1	3	1	2	3	3	1	3	3	1	
Mudpuppy							3					3			1	3		
Northern Flying Squirrel						2		3		3				3			2	
Northern Goshawk								3		1				2			1	
Northern Harrier			1						3		1							3
Olive-sided Flycatcher						2				2	1			2				
Osprey							1					3				3		
Peregrine Falcon		3																
Red-headed Woodpecker																		
Red-shouldered Hawk						1		2		1							1	
Shoal Chub (Speckled Chub)												3						
Short-billed Dowitcher			3	1														
Upland Sandpiper									1									3
Veery						2		2		1	3			3			3	
Vesper Sparrow																		1
Water Shrew	1							2	1	3	1	1	2	3	3	2	3	
Whimbrel			2	3														
Whip-poor-will								1										
Willow Flycatcher						1					3							2
Wood Thrush						2		2		1							1	
Wood Turtle								3	2	2	3	3	3		3		2	
<b>Species that are Moderately Associated with the Northern Lake Michigan Coastal Landscape</b>																		
American Bittern			3						3		1							1
Blanding's Turtle			3						2		2	2	2		2	3		
Blue-winged Warbler											2							
Buff-breasted Sandpiper			2	1														2
Dickcissel																		3
Eastern Red Bat	2		2					2	2	2	2	2	2	2	3	2	2	
Four-toed Salamander			3			3		3	2	3	3			2	2		2	
Golden-winged Warbler	1							2		1	3			1			2	
Grasshopper Sparrow																		3

Natural communities with an asterisk are not represented by an element occurrence in the NHI database.

	Major												Important					
	Boreal Rich Fen	Dry Cliff*	Emergent Marsh*	Great Lakes Beach*	Great Lakes Dune*	Great Lakes Ridge and Swale*	Lake Michigan*	Northern Mesic Forest*	Northern Sedge Meadow	Northern Wet-mesic Forest	Shrub Carr	Warmwater rivers*	Warmwater streams*	Boreal Forest	Coolwater streams*	Inland lakes*	Northern Hardwood Swamp	Surrogate Grasslands*
<b>Species that are Moderately Associated with the Northern Lake Michigan Coastal Landscape</b>																		
Gray Wolf	1							3	1	3	2			3			2	
Greater Redhorse							2					2	3			2		
Henslow's Sparrow									1									3
Hoary Bat	2		2					2	2	2	2	2	2	2	3	2	2	
Loggerhead Shrike																		3
Longear Sunfish												2	2			2		
Marbled Godwit			3	1														2
Northern Long-eared Bat	2		2					2	2	1	2	2	2	1	3	2	2	
Pickering Frog			3					2	3	2	2	3	3		3	2		
Piping Plover				3	3													
Pugnose Shiner												2				2		
Redfin Shiner												3	2		1	1		
Rusty Blackbird			2			2					2							
Silver-haired Bat	2		2					2	2	2	2	2	2	2	3	2	2	
Snowy Egret			3				1											
Solitary Sandpiper			3	1		2			1		1		2		2			
Western Meadowlark																		3
Western Sand Darter												2						
Woodland Jumping Mouse						1		3	1	2	1			2			2	
Yellow Rail									3									
Yellow-billed Cuckoo						1		1			2							

Natural communities with an asterisk are not represented by an element occurrence in the NHI database.

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

	Major					Important				
	Dry Cliff*	Warmwater rivers*	Warmwater streams*	Coolwater streams*	Emergent Marsh	Northern Hardwood Swamp*	Northern Sedge Meadow*	Northern Wet-mesic Forest	Shrub Carr*	Surrogate Grasslands*
<b>Species that are Significantly Associated with the Central Lake Michigan Coastal Landscape</b>										
American Woodcock						2	1	1	3	1
Black Tern					3		2			
Black-billed Cuckoo						1	1		3	
Blue-winged Teal		1			3		2			2
Bobolink							3			3
Brown Thrasher										2
Cerulean Warbler										
Common Tern					2					
Dickcissel										3
Dunlin		2			2					
Eastern Meadowlark										3
Field Sparrow										2
Forster's Tern					3					
Four-toed Salamander				2	3	2	2	3	3	
Great Egret		2			3					
Horned Grebe										
Hudsonian Godwit					3					
Lake Sturgeon		3								
Least Flycatcher						2		1	1	
Lesser Scaup		2			1					
Mudpuppy		3		1						
Northern Harrier					1		3		1	3
Northern Ribbon Snake									2	
Osprey		3								
Peregrine Falcon	3									
Prothonotary Warbler										
Red-headed Woodpecker										
Short-billed Dowitcher					3					

Natural communities with an asterisk are not represented by an element occurrence in the NHI database.

	Major					Important				
	Dry Cliff*	Warmwater rivers*	Warmwater streams*	Coolwater streams*	Emergent Marsh	Northern Hardwood Swamp*	Northern Sedge Meadow*	Northern Wet-mesic Forest	Shrub Carr*	Surrogate Grasslands*
<b>Species that are Significantly Associated with the Central Lake Michigan Coastal Landscape</b>										
Upland Sandpiper							1			3
Veery						3		1	3	
Vesper Sparrow										1
Whimbrel					2					
Willow Flycatcher									3	2
Wood Thrush						1		1		
<b>Species that are Moderately Associated with the Central Lake Michigan Coastal Landscape</b>										
Acadian Flycatcher										
American Bittern					3		3		1	1
American Golden Plover					2		1			2
Bald Eagle		3								
Banded Killifish			1							
Black-throated Blue Warbler										
Blanding's Turtle		2	2	2	3		2		2	
Blue-winged Warbler									2	
Buff-breasted Sandpiper					2					2
Butler's Garter Snake					3		3		3	
Canada Warbler						3		3	1	
Canvasback		3			1					
Caspian Tern										
Eastern Red Bat		2	2	3	2	2	2	2	2	
Golden-winged Warbler						2		1	3	
Grasshopper Sparrow										3
Greater Redhorse		2	3							
Henslow's Sparrow							1			3
Hoary Bat		2	2	3	2	2	2	2	2	
Hooded Warbler										
King Rail					3		1			
Loggerhead Shrike										3
Marbled Godwit					3					2
Northern Long-eared Bat		2	2	3	2	2	2	1	2	
Pickerel Frog		3	3	3	3		3	2	2	
Piping Plover										
Redside Dace			2	2						
River Redhorse		2								
Rusty Blackbird					2				2	
Shoal Chub (Speckled Chub)		3								

Natural communities with an asterisk are not represented by an element occurrence in the NHI database.

	Major					Important				
	Dry Cliff*	Warmwater rivers*	Warmwater streams*	Coolwater streams*	Emergent Marsh	Northern Hardwood Swamp*	Northern Sedge Meadow*	Northern Wet-mesic Forest	Shrub Carr*	Surrogate Grasslands*
<b>Species that are Moderately Associated with the Central Lake Michigan Coastal Landscape</b>										
Short-eared Owl					1		2		2	3
Silver-haired Bat		2	2	3	2	2	2	2	2	
Snowy Egret					3					
Solitary Sandpiper			2	2	3		1		1	
Western Meadowlark										3
Western Sand Darter		2								
Whip-poor-will										
Wilson's Phalarope					3		3			
Wood Turtle		3	3	3		2	2	2	3	
Yellow-billed Cuckoo									2	
Yellow-crowned Night-Heron		2			2				2	

Natural communities with an asterisk are not represented by an element occurrence in the NHI database.

---

## Appendix E

### Summary Descriptions for Rare Species and High-quality Natural Communities Documented on the Door and Kewaunee County State Wildlife and Natural Areas Planning Group

The following paragraphs give brief summary descriptions for some of the rare species and high quality natural communities documented on the Door and Kewaunee County State Wildlife and Natural Areas Planning Group and mapped in the NHI Database. More information can be found on the Endangered Resources Web site ([www.dnr.wi.gov/org/land/er/](http://www.dnr.wi.gov/org/land/er/)) for several of these species and natural communities.

#### Rare Animals

##### **A Long-horned Casemaker Caddisfly**

A long-horned casemaker caddisfly (*Triaenodes nox*), a State Special Concern caddisfly, has been found in ponds, lake shores, and generally slow-flowing areas of streams and rivers.

##### **Acadian Flycatcher**

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

##### **Aurora Damselfly**

Aurora dancer (*Chromagrion conditum*), a State Special Concern damselfly has been found in pools and slow backwaters of clean, often spring-fed streams. Their flight period is from mid to late July.

##### **Bald Eagle**

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

##### **Banded Killifish**

Banded killifish (*Fundulus diaphanus*), a State Special Concern fish, prefers clear water of the bays and quiet backwaters of large lakes and medium to large streams with and sparse to no vegetation over gravel, sand, silt, marl, clay detritus or cobble. Spawning occurs from June through mid-August

##### **Black Striate**

Black Striate, (*Striatura ferrea*), a terrestrial snail listed as Special Concern, has a dull gray to translucent shell, which ranges from 2.5-3.4mm in width. It prefers undisturbed forests with moderate winter temperatures and more constant precipitation as its habitat.

##### **Black-crowned Night Heron**

Black-crowned Night-heron (*Nycticorax nycticorax*), a bird listed as Special Concern, prefers freshwater wetlands dominated by bulrush and cattail with small groves of alder, willow, or other brush. Their breeding season occurs from mid-April through mid-September.

**Black Tern**

Black Tern (*Chlidonias niger*), a bird listed as Special Concern, prefers large shallow marshes with abundant vegetation adjacent to open water. Nesting occurs from May through the end of July.

**Cherrystone Drop**

Cherrystone Drop (*Hendersonia occulta*) State Threatened, these terrestrial snails have a thick 6-8mm wide shell that is wider than it is high, usually reddish or yellowish in color, and lacks an opening in the center of the base of the shell. Inhabitants of small areas of algific habitat or the similar cool, moist, shaded sites of cliffs where algific conditions occur without substantial talus or ice. The species is most often found on wooded alluvial-soil banks and bluffs.

**Dentate Supercoil**

Dentate Supercoil, (*Paravitrea multidentata*), a terrestrial snail listed as Special Concern, has a smooth, glossy shell, which measures 2.5-3mm wide. It is often found in pockets of deep, moist leaf litter on wooded hillsides and in ravines.

**Eightfold Pinecone**

Eightfold Pinecone, (*Strobilops affinis*), a terrestrial snail listed as Special Concern, has a brown shell that ranges from 2.75-2.8mm in width. It is often found in forest habitat in leaf litter and woody debris.

**Forcipate Emerald**

Forcipate emerald (*Somatochlora forcipata*), a State Special Concern dragonfly, has been found in small spring-fed woodland streams and pools. The flight period extends from mid June through early August.

**Hine's Emerald**

Hine's Emerald Dragonfly (*Somatochlora hineana*), a Federal and State Endangered dragonfly, has been found in small cool calcareous marshy streams on bedrock. The flight period extends from early to late July.

**Least Bittern**

Least Bittern (*Ixobrychus exilis*), a Special Concern bird in Wisconsin. This species prefers freshwater marshes where cattails and reeds predominate in swamps and marshes and dense emergent vegetation. Breeding occurs from mid May to mid July.

**Osprey**

Osprey (*Pandion haliaetus*) prefer large trees in isolated areas in proximity to large areas of surface water, large complexes of deciduous forest, coniferous forest, wetland, and shrub communities. Large lakes and rivers with nearby tall pine trees are preferred for nesting. The breeding season extends from late April through August.

**Red-shouldered Hawk**

Red-shouldered Hawk (*Buteo lineatus*), 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. Breeding occurs from mid-March through early August.

**Swamp Darner**

Swamp darner (*Epiaschna heros*), a State Special Concern dragonfly, has been found in shady ponds, ditches, or sloughs bordering woods. The flight period extends from early June to late July.

### **Two-spotted Skipper**

Two-spotted skipper (*Euphyes bimacula*), a State Special Concern butterfly is found in sedge meadow, wet prairie, or marsh. Its host plants are grasses and sedges such as *Carex trichocarpa* and *C. stricta*. Adults fly in mid June through July, primarily early July in central Wisconsin. Overwinters as partially grown larvae.

### **Rare Plants**

#### **Alpine Cotton-grass**

Alpine Cotton-grass (*Eriophorum alpinum*), a State Special Concern plant, is found in bogs, fens, deciduous woods. Blooming occurs May-June; fruiting occurs late June-August. The optimal identification period for this species is late June through August.

#### **Bird's-eye Primrose**

Bird's-eye Primrose (*Primula mistassinica*), a State Special Concern plant, is found in neutral to calcareous rock splash pools and stabilized dunes near the Great Lakes, as well as inland on moist sandstone cliffs. Blooming occurs early May through late June; fruiting occurs early June through late July. The optimal identification period for this species is late May through early June.

#### **Common Bog Arrow-grass**

Common Bog Arrow-grass (*Triglochin maritima*), a State Special Concern plant, is found on fen mats, open neutral to calcareous conifers swamps, and Great Lakes swales. Blooming occurs late June through early August; fruiting occurs late July through early September. The optimal identification period for this species is early July through late August.

#### **Cooper's Milkvetch**

Cooper's Milkvetch (*Astragalus neglectus*), a State Endangered plant, is found on riverbanks, ravines, and lakeshores, especially on dolomite near Lake Michigan. It can also be found in old fields. Blooming occurs throughout June; fruiting occurs throughout July. The optimal identification period for this species is early June through late July.

#### **Dwarf Lake Iris**

Dwarf Lake Iris (*Iris lacustris*), a State Threatened and Federally Threatened plant, is found near Lake Michigan on beach ridges, stabilized dunes, limestone ridges, forest gaps and edges, and ditches. Blooming occurs early May through early July; fruiting occurs late June through late July. The optimal identification period for this species is late May through early July.

#### **Elk Sedge**

Elk Sedge (*Carex garberi*), a State Threatened plant, is found in moist to wet sandy, gravelly, or dolomitic beach flats. Blooming occurs late May through late June; fruiting occurs late June through late August. The optimal identification period for this species is late June through late August.

#### **Fairy Slipper**

Fairy Slipper (*Calypso bulbosa*), a State Threatened plant, is found only in old growth white cedar swamps. Blooming occurs early May through July; fruiting occurs late June through late July. The optimal identification period for this species is late May through early June.

#### **Few-flower Spikerush**

Few-flower Spikerush (*Eleocharis quinqueflora*), a State Special Concern plant, is found on cold coniferous poor fen mats but in a variety of moist meadows in calcareous areas. Blooming occurs late

June through late July; fruiting occurs early July through late September. The optimal identification period for this species is early July through late September.

#### **Hair-like Sedge**

Hair-like Sedge (*Carex capillaris*), a State Special Concern plant, is found in brushy white cedar thickets along Great Lakes, with dolomite or sandstone near the surface, as well as calcareous cedar swamps. Blooming occurs late May through early June; fruiting occurs late June through late July. The optimal identification period for this species is early June through early July.

#### **Lesser Fringed Gentian**

Lesser Fringed Gentian (*Gentianopsis procera*), a State Special Concern plant, is found on wet dolomite pavement near Lake Michigan, as well as cold fens, seeps, and meadows in calcareous areas. Blooming occurs late August through early October; fruiting occurs early September through early October. The optimal identification period for this species is late August through early October.

#### **Livid Sedge**

Livid Sedge (*Carex livida* var. *radicaulis*), a State Special Concern plant, is found in fen or, less commonly, on bog mats and occasionally in ditches. Blooming occurs late May through early June; fruiting occurs late June through late July. The optimal identification period for this species is late June through late July.

#### **Long-spur Violet**

Long-spur Violet (*Viola rostrata*), a State Special Concern plant, is found in rich hardwoods or mixed pine-hardwoods forests, mostly near Lake Michigan. Blooming occurs late May through late June; fruiting occurs throughout July. The optimal identification period for this species is late May through late June.

#### **Low Calamint**

Low Calamint (*Calamintha arkansana*), a State Special Concern plant, is found most typically on wet dolomite flats on Lake Michigan (Door County), as well as fens and wet prairies. Blooming occurs late June through late September; fruiting occurs late July through late September. The optimal identification period for this species is early July through late August.

#### **Northern Bog Sedge**

Northern Bog Sedge (*Carex gynocrates*), a State Special Concern plant, is found in cold, wet neutral to calcareous conifer swamps. Blooming occurs throughout June; fruiting occurs throughout July. The optimal identification period for this species is late June through early July.

#### **Northern Yellow Lady's-slipper**

Northern Yellow Lady's-slipper (*Cypripedium parviflorum* var. *makasin*), a State Special Concern plant, is found in fens, calcareous swales, and rich springy forest edges. Blooming occurs late May through late June; fruiting occurs late June through late July. The optimal identification period for this species is late May through early July.

#### **Ohio Goldenrod**

Ohio Goldenrod (*Solidago ohioensis*), a State Special Concern plant, is found most commonly on wet dolomite lake flats in Door County and in fens and moist calcareous prairies in the southeast portion of the state. Blooming occurs early August through late September; fruiting occurs throughout September. The optimal identification period for this species is late August through early September.

### **Showy Lady's-slipper**

Showy Lady's-slipper (*Cypripedium reginae*), a State Special Concern plant, is found in neutral to alkaline forested wetlands; it is also found in rich upland forests in seeps and moist to dry clay bluffs. Blooming occurs late June through late July; fruiting occurs late July through late August. The optimal identification period for this species is late June through early August.

### **Slender Bog Arrow-grass**

Slender Bog Arrow-grass (*Triglochin palustris*), a State Special Concern plant, is found on muddy to marly fen and bog edges, as well as calcareous sedge meadows. Blooming occurs throughout July; fruiting occurs throughout August. The optimal identification period for this species is early July through late August.

### **Small-flower Grass-of-parnassus**

Small-flower Grass-of-parnassus (*Parnassia parviflora*), a State Endangered plant, is found on the Lake Michigan shoreline in crevices in wet dolomite pavement, or moist, open sandy beaches and dunes. Its appearance is irregular. Blooming occurs throughout July; fruiting occurs throughout August. The optimal identification period for this species is early July through late August.

### **Sparse-flowered Sedge**

Sparse-flowered Sedge (*Carex tenuiflora*), a State Special Concern plant, is found in open- to closed canopy cold, wet, coniferous forests, usually on neutral to calcareous substrates. Blooming occurs late May through early June; fruiting occurs late June through late July. The optimal identification period for this species is early June through late July.

### **Variegated Horsetail**

Variegated Horsetail (*Equisetum variegatum*), a State Special Concern plant, is found in most characteristically on wet dolomite flats and gravelly swales near Lake Michigan but also in other wet, open, neutral to calcareous wetlands. The optimal identification period for this species is late May through late September.

### **White Adder's-mouth**

White Adder's-mouth (*Malaxis monophyllos* var. *brachypoda*), a State Special Concern plant, is found in neutral or calcareous conifer or black ash swamps. Blooming occurs throughout June; fruiting occurs early July through late August. The optimal identification period for this species is early July through late August.

## **Natural Communities**

### **Boreal Forest**

Mature stands of this upland forest community are dominated by white spruce and balsam fir, often mixed with white birch, northern white cedar, eastern white pine, eastern hemlock (within its range), balsam-poplar, and quaking aspen. Mountain-ash may also be present. Common understory herbs are large-leaved aster, blue-bead lily, Canada mayflower, wild sarsaparilla, and bunchberry. Most Wisconsin stands are associated with the Great Lakes, especially the clay plain of Lake Superior, and the eastern side of the northern Door Peninsula on Lake Michigan. The boreal forest in Wisconsin is transitional between the mixed deciduous-conifer forests to the south and the spruce-fir dominated forests of Canada, so tree species richness is often greater here. Of potential interest from the perspectives of vegetation classification and restoration, eastern white pine had the highest importance value of any tree in the Lake Superior region, as recorded during the original land survey of the mid-1800's.

### **Boreal Rich Fen**

Boreal rich fen is a rare open peatland community of northern Wisconsin that is associated with glacial moraines, or less commonly, outwash landforms, in which the underlying substrate includes calcareous materials. Like many other “northern” peatlands, nutrient levels are low, but pH is significantly higher than in the poor fen and open bog communities and influences the plant composition. Sphagnum mosses are of lesser importance in this type than are the so-called “brown” mosses (e.g., from the genera *Campyllum*, *Drepanocladus*, or *Scorpidium*). Characteristic vascular plants may include woolly sedge, twig-rush, white beak-rush, beaked bladderwort, rushes, Hudson Bay cotton-grass, rush aster, and buckbean.

The “richest” northern fens occur on the Door Peninsula, which is underlain by calcareous bedrock and mantled with calcareous till. Here, in addition to the species mentioned above, the open peatlands may support species such as coast sedge, linear-leaved sundew, brook lobelia, grass-of-Parnassus, shrubby cinquefoil, hair beak-rush, and tufted bulrush. The proximity of carbonate-enriched bedrock is almost certainly among the factors responsible for the composition of the northern fens in this region.

Shrub phases of the boreal rich fen community also occur, in which shrubby cinquefoil, bog birch, sage willow, and speckled alder may be present in significant amounts, and collectively form the dominant plant cover.

### **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 (particularly *Scirpus acutus*, *S. fluviatilis*, and *S. validus*), bur-reeds, giant reed, pickerel-weed, water-plantains, arrowheads, the larger species of spikerush (such as *Eleocharis smallii*), 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.

### **Great Lakes Alkaline Rockshore**

Great Lakes alkaline rockshore is a community that develops on creviced, wave-splashed, horizontal or gently sloping exposures of dolomite bedrock that dip toward Lake Michigan. These occur only along the Lake Michigan shoreline of the northern Door Peninsula, and on the margins of some of the Grand Traverse Islands, to the north. This is the same bedrock that forms the Niagara Escarpment which forms prominent cliffs on the west side of the Peninsula. The extent of the exposed rock is dependent on Lake Michigan water levels; large expanses of this habitat may be either inundated or exposed during a given year. Characteristic members of this community include the shrubs ninebark and shrubby cinquefoil, and the herbs silverweed, Arctic primrose, grass-leaved goldenrod, brook lobelia, gentians (*Gentiana* spp., *Gentianopsis* spp.), grasses-of-Parnassus, Indian paint-brush, low calamint, and many sedges and rushes. Plants endemic to the Great Lakes shores are significant components of some stands.

Because this community type is geographically restricted to those portions of the Lake Michigan coast with dolomite shoreline, it is, and has always been, rare here. Just inland of the exposed dolomite pavement there is often a narrow zone of rank herbs and tall shrubs, sometimes occupying a ridge of cobbles, gravel, or a low ledge. On the more stable habitats beyond this zone of herbs and shrubs, a very distinctive forest sometimes develops. Mature stands are usually composed of mixtures of northern white cedar, white spruce, balsam fir, eastern white pine, and paper birch.

### **Hardwood Swamp**

The northern hardwood swamp is a deciduous forested wetland that occurs along lakes or streams, or in insular basins in poorly drained morainal landscapes. This community occurs across the state, but is most common in the northern Ecological Landscapes. The dominant tree species is black ash, but in some stands red maple, yellow birch, and (formerly) American elm are also important. The tall shrub speckled alder may be locally common. The herbaceous flora is often diverse and may include many of the same species found in alder thickets. Typical species are marsh-marigold, swamp raspberry, skullcap, orange jewelweed, and many sedges. Soils may be mucks or mucky sands.

### **Northern Sedge Meadow**

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

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

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

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

### **Open Bog**

Bogs are acidic, low nutrient, northern Wisconsin peatlands dominated by sphagnum mosses that occur in deep layers and accumulate over time as peat. The bog surface is often uneven, with pronounced hummock and hollow microtopography. In northern Wisconsin, bogs are frequently found in the kettle depressions of pitted outwash and morainal landforms. They also frequently occur on the borders of lakes that have low nutrient inputs. Vascular plant diversity is very low in the most acidic sites, but includes

characteristic and distinctive specialists such as the narrow-leaved sedge species, cotton-grasses, and ericaceous shrubs, especially leatherleaf, bog laurel, bog rosemary, and small cranberry. Trees are absent or stunted and achieve very low cover values.

In the strictest sense, bogs receive nutrients only from precipitation and limited internal runoff. The thick layers of sphagnum isolate the bog from the influence of nutrient enriched groundwater, and create an environment characterized by high acidity, low oxygen and nutrient levels, and inhabited by a limited number of highly specialized plants that are able to tolerate or thrive in the extreme conditions. Poor fen, open bog, and muskeg often occupy different parts of the same wetland basin, which may include one or more types of lowland coniferous forest as well. Each of these communities responds to slight differences in local site conditions.

### **Shrub Carr**

This wetland community is dominated by tall shrubs such as red-osier dogwood, silky dogwood, meadowsweet, and various willows. Canada bluejoint grass is often very common. Associates are similar to those found in alder thickets and tussock-type sedge meadows. This type occupies areas that are transitional between open wetlands such as wet prairie, calcareous fen, or southern sedge meadow, and forested wetlands such as floodplain forest or southern hardwood swamp. Shrub-carr can persist at a given site for a very long time if natural hydrologic cycles are maintained. This type often occurs in bands around lakes or ponds, on the margins of river floodplains, or, more extensively, in glacial lakebeds. It is common and widespread in southern Wisconsin but also occurs in the north. In the south, shrub-carr was often an integral part of prairie-savanna landscapes, though it also occurred in wetlands within more forested regions. In the north, the landscape matrix around the shrub-carr type was usually upland forest. Statewide, shrub-carr remains quite common, and has fared considerably better than many of the other native wetland types within its range.

Past drainage and marsh hay mowing likely had a negative effect on shrub-carr, whereas clearing of conifer swamps likely produced more of this habitat. Once fire was controlled and hay mowing was discontinued in lowland meadows, shrub-carr likely increased in extent. Drainage of meadows and marshes has also allowed shrub-carr habitats to increase in some areas. As a result of wetland drainage and fire suppression, shrub-carr now occupies many sites that formerly supported much more extensive marsh, wet meadow, prairie, and fen vegetation, and therefore, it is sometimes targeted for elimination. However, it is an important native wetland type that has its place on our landscape and should be protected, managed, and restored at appropriate locations.

### **Other**

#### **Migratory Bird Concentration Site**

Migratory bird concentration sites are important resting and feeding areas for birds as they fly between their breeding and wintering grounds. These areas also can be locations where large numbers of migrating birds often become concentrated due to prevailing winds and or water barriers. Sites are used by many different species, both rare and non-rare.

---

## Appendix F

### Wisconsin Natural Heritage Working List Explanation

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

#### Key

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

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

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

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

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

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

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

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

## **Global & State Element Rank Definitions**

### **Global Element Ranks:**

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

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

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

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

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

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

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

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

G? = Not ranked.

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

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

### **State Element Ranks**

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

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

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

S4 = Apparently secure in Wisconsin, with many occurrences.

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

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

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

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

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

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

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

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

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

SX = Apparently extirpated from the state.

### **State Ranking of Long-Distance Migrant Animals:**

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

---

## APPENDIX G

### Primary Inventory Sites within the Door and Kewaunee County State Wildlife and Natural Areas Planning Group<sup>1</sup>

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

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

#### Primary Sites

	page
DKPG01. Mud Lake State Natural Area .....	2
DKPG02. Bailey’s Harbor Boreal Forest and Wetlands State Natural Area .....	4
DKPG03. Moonlight Bay Bedrock Beach State Natural Area .....	5
Species List .....	7



Moonlight Bay Bedrock Beach SNA. Photo by State Natural Areas staff.

---

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

---

## DKPG01. MUD LAKE STATE NATURAL AREA

### Location

Property:	Mud Lake Wildlife Area (Door)
County:	Door
Landtype Association:	212Tf07. Door Peninsula
Approximate Size (acres):	2257

### Description of Site

This site consists of Mud Lake Wildlife Area and the state-owned portion of Mud Lake State Natural Area (SNA). Mud Lake State Natural Area consists of a 155-acre shallow (maximum depth 5 feet) drainage lake surrounded by an extensive shrub and timber swamp. The bottom is predominantly marl, although dolomite bedrock is exposed in some areas. Many old snags along the shoreline attest to water levels that fluctuate with seasonal precipitation. Reibolts Creek, the outlet stream of Mud Lake supports a diverse aquatic plant community including common bur-reed (*Sparganium eurycarpum*), coon's-tail (*Ceratophyllum demersum*), pondweed (*Potamogeton* sp.), and wild rice (*Zizania aquatica*). Immediately surrounding the open water is a narrow zone of shrubby Northern Sedge Meadow dominated by sedges (*Carex* spp.), willows (*Salix* spp.), dogwoods (*Cornus* spp.), and sweet gale (*Myrica gale*). The open zone grades into Northern Wet-mesic Forest of northern white-cedar (*Thuja occidentalis*), white spruce (*Picea glauca*), balsam fir (*Abies balsamea*), and black ash (*Fraxinus nigra*). Also present are areas of Boreal Rich Fen with woolly-fruit sedge (*Carex lasiocarpa*), twig-rush (*Cladium mariscoides*), naked bladderwort (*Utricularia cornuta*), rushes (*Juncus* spp.), bog birch (*Betula pumila*), and speckled alder (*Alnus incana*), through which carbonate-rich groundwater percolates.

Two upland islands (and part of a third) of second-growth Boreal Forest lie within this complex as well. Here, the dominant tree is balsam fir, often in pure stands in the 3-12 inch dbh class. White spruce, northern white-cedar, white birch (*Betula papyrifera*), black ash and quaking aspen (*Populus tremuloides*) are occasional, particularly where the site grades into wet-mesic forest. The understory varies from open to brushy. Common groundlayer species include wild sarsaparilla (*Aralia nudicaulis*), large-leaved aster (*Aster macrophyllus*), lady fern (*Athyrium filix-femina*), blue bead-lily (*Clintonia borealis*), three-leaved gold-thread (*Coptis trifolia*), bunchberry (*Cornus canadensis*), Canada mayflower (*Maianthemum canadense*), naked miterwort (*Mitella nuda*), and American starflower (*Trientalis borealis*).

Reibolts Creek, which runs from Mud Lake to Lake Michigan, has been stocked with trout and supports a trout spawning run. Waterfowl use of the lake is occasionally heavy.

Mud Lake was designated a State Natural Area in 1975.

### Significance of Site

This large site is critically important to the Door Peninsula and the rare species that rely on the regionally unique natural communities found there. This site is connected to other State Natural Areas and lands protected for conservation purposes, creating a large block of habitat used by State and Federally Threatened and Endangered species.

### **Management Considerations**

Mud Lake SNA is managed as a reserve for Northern Wet-mesic Forest and Northern Sedge Meadow, and as an aquatic, wetland and estuarine reserve. The area that is within Mud Lake Wildlife Area but not the SNA should be managed as a buffer to the important habitats within the SNA. Many of the species that use this site are also using habitats on adjacent properties; working towards common management strategies will benefit these species. Reed canary grass (*Phalaris arundinacea*) is present within the Northern Sedge Meadow and is a threat to the rare species habitat present.

---

## DKPG02. BAILEY'S HARBOR BOREAL FOREST AND WETLANDS STATE NATURAL AREA

### **Location**

Property: Bailey's Harbor Boreal Forest and Wetlands State Natural Area  
County: Door  
Landtype Association: 212Tf07. Door Peninsula  
Approximate Size (acres): 456

### **Description of Site**

Baileys Harbor Boreal Forest and Wetlands encompasses a unique and diverse landscape, influenced by the local climate along the northeastern coast of the Door Peninsula. Cooler springs and summers, warmer falls and winters, and reduced evaporation rates have allowed northern species and a Boreal Forest to thrive here, far south of their normal range. Balsam fir and white spruce dominate the forest, which grades into Northern Wet-mesic Forest of northern white-cedar, white pine (*Pinus strobus*), white birch, and hemlock (*Tsuga canadensis*). The SNA protects over 1.5 miles of undeveloped Lake Michigan shoreline. An extensive Great Lakes Alkaline Rockshore, or bedrock beach, is exposed during periods of low lake levels. The forested communities support a wide variety of birds associated with boreal habitats. Migratory shorebirds and waterfowl are attracted to the undeveloped shoreline.

Baileys Harbor Boreal Forest and Wetlands was designated a State Natural Area in 1995.

### **Significance of Site**

This site supports a unique variant of Boreal Forest and Great Lakes Alkaline Rockshore, both of which are restricted to the Door Peninsula. These high-quality habitats support rare species, including state imperiled birds and snails and a Federally Threatened plant.

### **Management Considerations**

This site is managed as a reserve for Boreal Forest, Northern Wet-mesic Forest and Great Lakes Alkaline Rockshore, as an aquatic reserve, and a wetland protection site. The scattered parcels of this site are threatened by encroaching development which may further fragment the remaining habitats in the area.

---

## DKPG03. MOONLIGHT BAY BEDROCK BEACH STATE NATURAL AREA

### **Location**

Property:	Moonlight Bay Bedrock Beach State Natural Area
County:	Door
Landtype Association:	212Tf07. Door Peninsula
Approximate Size (acres):	108

### **Description of Site**

Moonlight Bay Bedrock Beach protects an undisturbed Great Lakes Alkaline Rockshore, rare plant and animal communities, geological features, and adjacent Boreal Forest, all of which are dependent on the dynamic influence of Lake Michigan. The primary feature is the Great Lakes Alkaline Rockshore, a dolomite bedrock beach, which is alternately covered and exposed, depending on Lake Michigan water levels. When exposed, several plants indicative of these calcareous and unstable shorelines colonize the beach. Ambient shorelines are present as low ledges in the forested portions of the site. The Boreal Forest is typical of the northeastern Door Peninsula with northern white-cedar, white spruce, white birch, white pine, hemlock, and balsam fir. Common understory plants are thimbleberry (*Rubus parviflorus*) and mountain maple (*Acer spicatum*). The groundlayer is sparse, with mosses and lichens predominating.

Moonlight Bay Bedrock Beach was designated a State Natural Area in 1990.

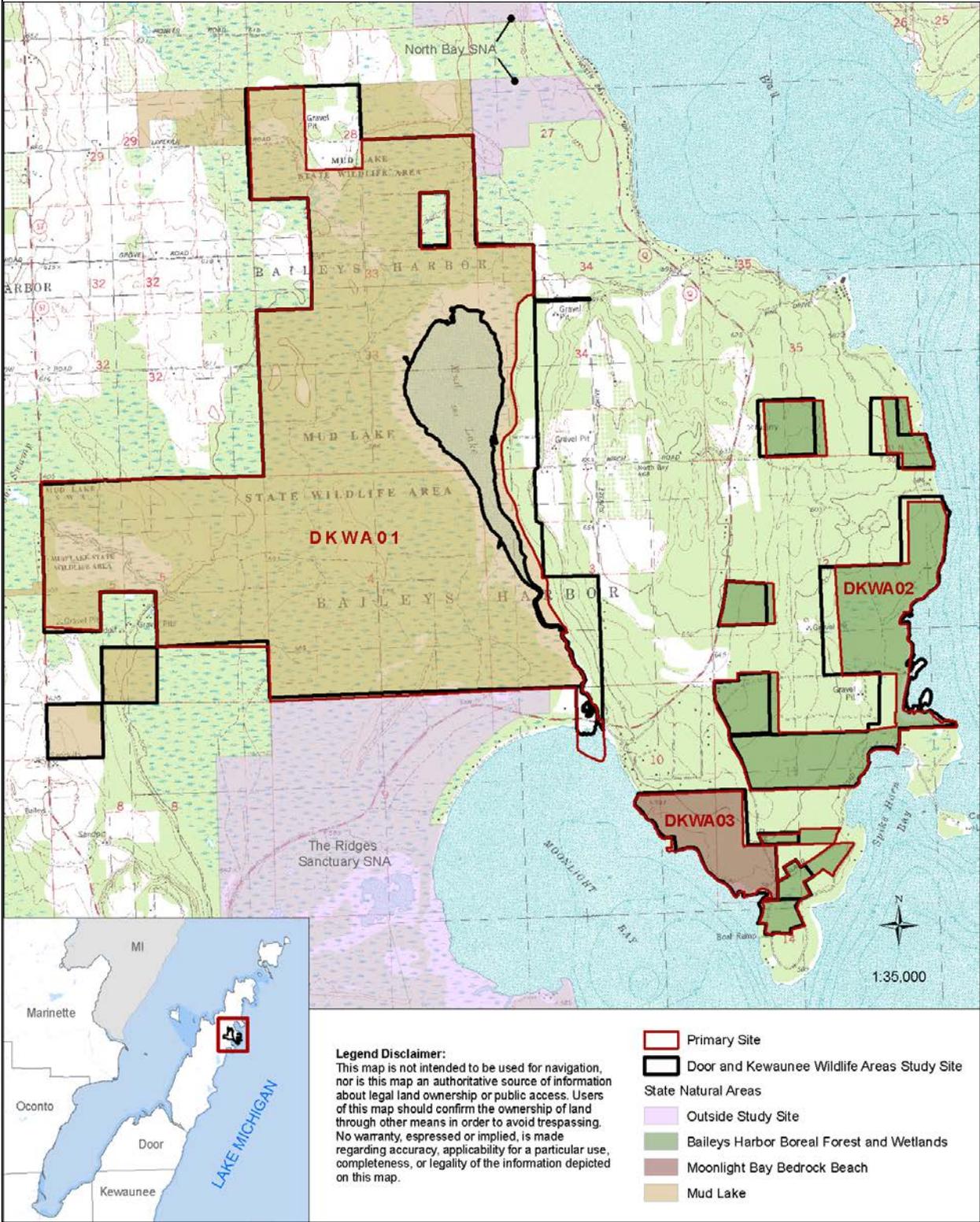
### **Significance of Site**

The natural communities at this site are high-quality and represent intact examples of types that may have been more common on the Door Peninsula historically. The Boreal Forest at this site is a variant limited to northeastern Wisconsin, making protection of remaining examples critical. All of the habitats at this site provide important habitat to many rare plant species including those that are State and Federally Threatened.

### **Management Considerations**

This site is managed as an old-growth Boreal Forest and Great Lakes Alkaline Rockshore reserve. Continued passive management of this site should insure the future presence of rare species and high-quality natural communities. Biological surveys are needed at this site to determine the continued presence of the many rare species that use this site.

**DKPG03. Moonlight Bay Bedrock Beach State Natural Area Primary Site**



## SPECIES LIST

Common Name	Scientific Name
<b>Plants</b>	
American starflower	<i>Trientalis borealis</i>
balsam fir	<i>Abies balsamea</i>
black ash	<i>Fraxinus nigra</i>
blue bead-lily	<i>Clintonia borealis</i>
bog birch	<i>Betula pumila</i>
bunchberry	<i>Cornus canadensis</i>
Canada mayflower	<i>Maianthemum canadense</i>
common bur-reed	<i>Sparganium eurycarpum</i>
coon's-tail	<i>Ceratophyllum demersum</i>
dogwood	<i>Cornus</i> sp.
hemlock	<i>Tsuga canadensis</i>
lady fern	<i>Athyrium filix-femina</i>
large-leaved aster	<i>Aster macrophyllus</i>
mountain maple	<i>Acer spicatum</i>
naked bladderwort	<i>Utricularia cornuta</i>
naked miterwort	<i>Mitella nuda</i>
northern white-cedar	<i>Thuja occidentalis</i>
pondweeds	<i>Potamogeton</i> sp.
quaking aspen	<i>Populus tremuloides</i>
reed canary grass	<i>Phalaris arundinacea</i>
rush	<i>Juncus</i> spp.
sedges	<i>Carex</i> sp.
speckled alder	<i>Alnus incana</i>
sweet gale	<i>Myrica gale</i>
thimbleberry	<i>Rubus parviflorus</i>
three-leaved gold-thread	<i>Coptis trifolia</i>
twig-rush	<i>Cladium mariscoides</i>
white birch	<i>Betula papyrifera</i>
white pine	<i>Pinus strobus</i>
white spruce	<i>Picea glauca</i>
wild rice	<i>Zizania aquatica</i>
wild sarsaparilla	<i>Aralia nudicaulis</i>
willow	<i>Salix</i> sp.
woolly-fruit sedge	<i>Carex lasiocarpa</i>