A Data Compilation and Assessment of Coastal Wetlands of Wisconsin's Great Lakes

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THE WISCONSIN COASTAL MANAGEMENT PROGRAM, part of the Wisconsin Department of Administration, and overseen by the **WISCONSIN COASTAL MANAGEMENT COUNCIL**, was established in 1978 to preserve, protect and manage the resources of the Lake Michigan and Lake Superior coastline for this and future generations.

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INTRODUCTION

Problem Identification and Project Description

The State of Wisconsin is bordered in part by portions of two of the Great Lakes: Lake Superior to the northwest and Lake Michigan to the east. The 820 miles of combined shorelines are a complex arrangement of ecosystems that include a rich variety of wetland types. Wetlands along the coasts of both lakes are important natural features of the landscape, providing rich habitat for plants and animals and contributing greatly to the larger ecosystem processes of the Great Lakes Ecosystem. As transition zones (or ecotones) between land and water, coastal wetlands are usually high in species diversity and provide critical habitat for migratory and nesting birds, spawning fish, and rare plants. However, development of various types and recreation are all impacting coastal wetlands and their important ecosystem functions.

Many inventories and reports have been completed concerning the state of coastal wetlands throughout Wisconsin. However, to date no comprehensive compilation of Great Lakes coastal wetland information has been completed. Significant inventory gaps exist throughout the coastal zone in Wisconsin. The identification of these gaps will help focus future inventory efforts and protection planning work for the Bureau of Endangered Resources and others.

The goals of this project are to compile existing information on coastal wetlands for Lakes Superior and Michigan in Wisconsin, select ecologically significant primary coastal wetland sites, and identify existing data or inventory gaps. The project involved four main phases:

1. **Compile existing information for coastal wetlands.** A thorough literature search was conducted, focusing on information about wetland locations, rare plant and animal species, natural communities and other unique natural resources. Definitions for coastal wetlands were reviewed and addressed, and criteria were developed for the study area in the coastal zone. Wetland and endangered species data was collected. Several experts in the areas of resource management and wetlands were consulted.
2. **Identify ecologically significant primary coastal wetland sites.** Based on existing information, ecologically important areas which harbor unique, critical, and/or representative natural features were selected.
3. **Identify and document existing data gaps.** Gaps in existing data and information were identified, focusing on NHI-related data (rare plants and animals, natural communities and other unique features).
4. **Develop final report that serves as a compilation of wetland locations, their importance, and existing data gaps for Wisconsin's Great Lakes coastal wetlands.** The results presented in this report reflect this effort.

This report is structured in six main sections. The first part provides background information about wetlands, including an overview of wetland definitions. This is followed by an overview

of the methodology used in this study. Primary sites for Lake Michigan and Lake Superior are presented next, followed by a section on data and inventory gaps. Conclusions are found in the last section of this report, followed by the bibliography, glossary, and appendices.

BACKGROUND

Wetlands

Throughout history, wetlands have been viewed as having an ambiguous role on the landscape, their value difficult to quantify. According to Mitsch and Gosselink (1993), it is easier to see the value in a forest or a lake than a wetland. Forests provide timber, recreational areas, and habitat for many different types of game and non-game species. Lakes provide habitat for waterfowl and fish, a multitude of recreational benefits, and drinking water for many communities. Wetlands were typically viewed as worthless lands; they weren't suitable for farming, they were difficult to access, and they were breeding havens for disease-bearing insects like mosquitoes.

Ancient history has shown us evidence of civilizations that depended on wetlands for centuries, while other cultures placed less value on these resources, draining them completely or altering them significantly. In the United States, a prevalent attitude existed that wetlands had little or no value, since the benefits were not easily recognizable. The Swamp Lands Acts of 1849, 1850, and 1860 encouraged the draining and ditching of wetlands for conversion to agriculture or development. It is estimated that 53 percent of the original wetlands in the lower 48 states has been lost because of drainage and other human activities (Mitsch and Gosselink, 1993). However, recent history has seen a great change in the perception of the role of wetlands on the landscape. But what does a wetland do? Why is it important in our landscape?

Mitsch and Gosselink (1993) contend that wetlands have been recognized as one of the most important ecosystems on Earth. They are sometimes called the "kidneys of the landscape" because of their functions in hydrological and chemical cycles and because they function as the downstream receivers of wastes from both natural and human sources. They cleanse polluted waters, prevent floods, protect shorelines, and recharge groundwater aquifers. They have also been called "biological supermarkets" because of the rich biodiversity they support (both aquatic and terrestrial species), and for the role they play as carbon dioxide sinks and climate stabilizers on a global scale. Wetlands are often ecotones, that is, transition zones between uplands and deepwater aquatic systems. Today wetlands are protected by federal, state, and local laws. A brief overview of Wisconsin's wetland laws is found at the end of this section.

How is a wetland defined? What is the difference between an inland wetland and a coastal wetland? Most people probably find they can easily picture a wetland. One may think of a swamp with trees knee-deep in water, while another thinks of a shallow marsh surrounded by cattails. These are both examples of the quintessential wetland. However, sometimes a wetland is not so obvious. For example, coastal wetlands may or may not be present due to changes in water level fluctuations - either being completely submerged in some years, or exposed in others.

Some inland wetlands are dry most of the year, but in spring function as a wetland. Wetlands often support species adapted to living in either wet or dry conditions to those adapted to only a wet environment, making them difficult to use as wetland indicators. Wetlands vary widely in size, ranging from small prairie potholes of a few acres to large expanses of wetlands miles across.

Wetland Definitions

There are many different definitions for wetlands. Below is a brief overview of the most widely accepted definitions across political boundaries and between agencies.

According to Mitsch and Gosselink (1993), all wetland definitions include three main components:

1. Wetlands are distinguished by the presence of water, either at the surface or within the root zone.
2. Wetlands often have unique soil conditions that differ from adjacent uplands.
3. Wetlands support vegetation adapted to the wet conditions (*hydrophytes*) and conversely are characterized by an absence of flooding-intolerant vegetation.

The Wisconsin Department of Natural Resources has adopted a statutory definition for a wetland, which is "an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and which has soils indicative of wet conditions: [s. 23.32(1), Wis.Stats.]."

The Wisconsin Wetland Inventory (WWI) is a system developed by the Wisconsin DNR (with assistance from the U.S. Fish and Wildlife Service) authorized by the state legislature in 1978. It uses a special classification system for Wisconsin's wetlands and is based on aerial photography. The inventory is at the 1:24,000 scale and identifies wetlands as small as 2-5 acres.

These areas are included in the Wisconsin Wetlands Inventory (WWI):

1. All areas which support the aquatic plant communities as described in *A Manual of Aquatic Plants* (N.C. Fassett, 1940, University of Wisconsin Press.). All Areas which support the following wetland plant communities described in *The Vegetation of Wisconsin* (J.T. Curtis, 1959, University of Wisconsin Press.): wet forests, shrub-carrs, alder thickets, sedge meadows, aquatic communities, wet prairies, fens and open bogs. All areas which support the wetland plant communities listed in Wisconsin DNR's State Hydrophyte List.
2. Wetlands cultivated only during drought years and periods of low water table. These areas must have soils classified by the U.S.D.A. Soil Conservation Service as very poorly or poorly drained and support wetland vegetation during years of normal or high precipitation or periods of normal or high water table.
3. Wetlands where grazing, logging, or harvesting of marsh hay has removed most of the wetland vegetation. These areas must have shallow standing water or saturated

soil conditions for significant portions of years having normal precipitation and would be expected to revert to a wetland plant community if left undisturbed.

4. Wetlands which were drained or farmed in the past but have since been abandoned and have reverted to standing water or saturated soil conditions and the wetland plant communities listed in No. 1.
5. All natural or artificial water bodies which have a maximum depth of six feet or less (see exceptions in No. 5-6 next section).
6. All natural or artificial water bodies for which there is no depth information (see exceptions in No. 5-6 next section).
7. Areas of open water or wetland vegetation in sloughs, oxbows and the abandoned and secondary channels of rivers and streams.
8. Beaver ponds or man-made impoundments (six-feet deep or less) on rivers and streams where the main channel is no longer discernible.
9. All cranberry bogs.

The areas excluded by the Wisconsin Wetland Inventory are:

1. Areas of open water or submerged aquatic vegetation in lakes greater than six-feet deep.
2. Areas of flowing open water or submerged aquatic vegetation in the primary channels of rivers and streams.
3. Areas which were wetlands in their natural state but have since been drained or filled as of the date of the interpreted aerial photography.
4. Areas in the floodplain of lakes, rivers, and streams that do not meet the definition of a wetland in section 23.32(1) of the state statutes.
5. All sewage lagoons, manure storage pits, mine waste settling ponds and other man-made waste disposal pits including dredge spoil disposal areas which do not support wetland vegetation.
6. All ponds actively used for mining of gravel or other mineral resources that are unvegetated or support only surface algae.

The wetland acreages which meet the criteria for the WWI within the coastal zone are listed in Table 1 following.

Table 1. WETLAND ACREAGE PER COUNTY WITHIN THE COASTAL ZONE[1]. BASED ON ORIGINAL WISCONSIN WETLAND INVENTORY

County	Total Surface Area (Acres)	Acres of Wetland	% of County Mapped As Wetland	Wetlands as % of Statewide Total
Ashland	670,720	167,317	24.9	3.1
Bayfield	935,680	78,992	8.4	1.5
Brown	335,360	25,288	7.5	0.5
Door	314,880	52,559	16.7	1.0
Douglas	835,200	183,118	22.0	3.4
Iron	480,640	146,418	30.5	2.7
Kenosha	174,720	16,194	9.3	0.4
Kewaunee	219,520	31,933	14.5	0.6
Manitowoc	380,160	55,394	14.6	1.0
Marinette	892,800	227,708	25.5	4.3
Milwaukee	154,240	4,394	2.0	0.08
Oconto	641,280	160,263	25.0	3.0
Ozaukee	150,400	16,411	10.9	0.3
Racine	213,760	16,406	7.7	0.3
Sheboygan	329,600	39,902	12.1	0.7

Other definitions for wetlands vary by the agency that uses them and federal and state laws. A brief description of each of these can be found in the book "Wetlands" by Mitsch and Gosselink (see Bibliography). For descriptions of different types of wetlands, please refer to the Glossary.

Wisconsin's wetlands are legally protected through existing state statutes, and are administered by the DNR. DNR's principal authorities and responsibilities for wetlands protection include (adapted from Wisconsin Coastal Management Program, 1996):

1. Require permits for any alteration of or construction in a waterway or adjacent wetland below the Ordinary High Water Mark (OHWM) (Chapters 30 and 31).
2. Provide oversight over local zoning and permit decisions on shorelands
3. Review and certify federal CWA Section 404 wetland permits (individual and nationwide permits) for compliance with state water quality standards under CWA Section 401, using NR103.

[1] The Coastal Zone as defined by the Wisconsin Coastal Management Program, Department of Administration. This includes counties that border Lake Michigan and Lake Superior.

4. Provides nonregulatory technical assistance to property owners in promoting the use of wetlands on their property by wildlife and providing information on incentive programs like Stewardship Fund and federal acquisition and incentive programs.
5. Maintains and updates the WWI.

The Wisconsin State statutes that apply to wetland protection include:

1. Wisconsin Water Quality Wetland Standards (NR103)
2. Navigable Waters Protection (Chapters 30 and 31, Wisc. State Statutes)
3. Wisconsin Water Resources Development Act, Shoreland and Wetland Zoning (Ss. 59.971 and NR115 [counties]; 61.351, 62.231 Statutes and NR117 [villages and cities]).

There are other federal, local, and city regulatory and non-regulatory mechanisms to protect wetlands. For further information about wetland protection, please contact the Department of Natural Resources.

Coastal Wetlands

Wetlands found along the Great Lakes coasts include marshes, bogs, fens, sedge meadows, shrub swamps, hardwood swamps, coniferous swamps and others. Wetlands found only along the Great Lakes coasts include freshwater estuaries, interdunal wetlands, ridge and swale systems, and lakeplain prairies. While there is no universally accepted definition of a coastal wetland, there are some significant characteristics which distinguish them from their inland counterparts and from other wetlands found along the coast. These wetlands exist because of their historic and present-day interactions with the Great Lakes. They serve as spawning grounds for fish, stop-overs or staging grounds for migratory and breeding birds, and critical habitat for many rare plants and animals. Coastal wetlands harbor a diversity of species, from the globally rare Dwarf lake iris (*Iris lacustris*), to rare birds such as Caspian terns (*Sterna caspia*).

Of the many reports reviewed for this coastal wetland assessment, not one was completely consistent in defining a coastal wetland. Some reports outlined different types wetlands found along the coast, which are influenced by the Lakes in some capacity. Some of the most representative types that appeared in the literature include: interdunal wetland, coastal lagoon, freshwater estuary, lake dune (or barrier lagoon) wetlands, and ridge and swale wetlands. General definitions for these types can be found in the glossary.

The Department of Natural Resources adopted a statutory definition for a wetland, as described in the previous section. The Wisconsin Wetland Inventory does not specifically distinguish between "coastal" wetlands and "inland" wetlands, however, it does delineate all wetlands down to a 2- or 5-acre parcel throughout the coastal zone. The coastal zone as used for the purpose of this study is described below.

Coastal Ecological Landscapes of Wisconsin

The Department of Natural Resources has developed an ecological classification system, entitled the "Ecological Landscapes of Wisconsin" (**Map A**). Ecological landscapes are geographic areas of similar physical, chemical, and biological characteristics organized within a hierarchical framework. Each level of hierarchy shares important ecological attributes such as climate, geology, landform, hydrology, soils and vegetation. Terminology for ecological landscapes follows that developed by Bailey (1995), the National Hierarchical Framework of Ecological Units (NHFEU) (Avers et.al., 1994), and others. Related information on the ecological landscapes of Wisconsin and the western Great Lakes can be found in Albert (1995) and Hole and Germain (1994).

The three ecological landscapes that are found along Lakes Michigan and Superior include (**Map 1**):

1. **Superior Coastal Plain:** Lake Superior climate influence; rolling to flat topography with clay soils; primarily agriculture and mixed hardwood and spruce-fir forest, with high gradient streams.
2. **Northern Lake Michigan Coastal:** Lake Michigan climate influence; gently rolling to flat topography with clay and loam soils; dominated by agriculture in the south and mixed hardwood forest in the north.
3. **Southern Lake Michigan Coastal:** Lake Michigan climate influence; rolling topography with clay and silt loams soils; primarily urban and agriculture.

Study Area

The following criteria were used to determine the study area for this project. Please refer to **Map 1**.

1) Ecological Landscapes. Wetlands within the coastal ecological landscapes[2], including the Superior Coastal Plain, the Northern Lake Michigan Coastal, and the Southern Lake Michigan Coastal (described above). These are referred throughout this report as either “coastal zones” or “coastal ecological landscapes”.

2) Buffer area. Wetlands that are within a 6 mile buffer from the Lake Michigan or Lake Superior shoreline.

3) Size. Wetlands greater than 5 acres.

4) Hydrological Connection. Wetlands having a direct hydrological connection to and influenced by the Great Lakes.

[2] There were some areas within the three coastal ecological landscapes that were not evaluated, applicable to Lake Michigan only. Areas excluded are the portions of the coastal ecological landscapes for Calumet, Washington and Outagamie counties.

5) **Other significant wetland areas.** Wetlands outside the areas described in criteria #1 and #2 above, having critical or important interactions with the Lakes, and/or having rare or otherwise significant communities, endangered or threatened plants and animals, concentrations of nesting colonial birds, major migratory bird stop-overs, extensive fish spawning areas, or which have scientific or other values.

METHODOLOGY

This study was completed between July 1999 and March 2000. The methodology used for this report is consistent with the Natural Heritage Inventory (NHI) methods for collecting, processing, and managing data (detailed description in Appendix 2). There were three primary sources of coastal zone wetland information for Wisconsin that were used for this report. First, the literature search conducted identified existing information on wetlands in the coastal zone for the portions of Lake Michigan and Superior in Wisconsin. This information was gathered with an emphasis on rare flora and fauna, natural communities, and unique natural communities. The second source of information was the Wisconsin Wetland Inventory (WWI), which identifies wetland sites throughout the state down to 2- or 5-acres in size. Third, the Natural Heritage Inventory database was used to identify occurrences of rare plants, animals and communities. NHI staff members (consisting of an ecologist, zoologist and botanist) supplemented information and assisted in coordinating a list of sites.

Primary coastal wetland sites were selected and areas in need of inventory work were identified upon review and compilation of information from these three main sources. The scope of the project did not allow for field surveys, aerial photo interpretation or other means of assessing the current condition of the primary sites. Therefore, information gaps have been noted and inventory needs are identified later in the report.

Natural Heritage Inventory Overview

This coastal wetland evaluation and analysis was conducted by the Wisconsin Natural Heritage Inventory (NHI) Program, which is part of an international network of NHI programs. The defining characteristic of this network, and the feature that unites the programs, is the use of a standard methodology for collecting, processing, and managing data on the occurrences of biological diversity. This network of data centers was established, and is currently coordinated by the Association for Biodiversity Information and The Nature Conservancy, international non-profit organizations.

Natural Heritage Inventory programs focus on rare species, natural communities, and other rare elements of nature. These elements are tracked and data is collected. Those species tracked are

recorded on the NHI Working List, which changes over time as species' populations change (both up and down) and as our knowledge about their status and distribution increases.

Element occurrence information, or records of species or communities being tracked by the NHI program, is kept in the Bureau of Endangered Resources office in Madison. Inventory and site information are stored in manual files as well as in a computer system called the Biological Conservation Data System (BCD), a sophisticated relational database. This information is also spatially displayed in a Geographic Information System (GIS).

For this study, the BCD was a valuable source of information. Element occurrence data for rare plants, animals and natural communities supplemented data gathered on coastal wetland sites from existing reports. Lists of element occurrences relative to coastal wetland sites were developed, and helped determine sensitive coastal wetland areas. Lack of element occurrence data (or outdated records) also helped identify gaps in inventory throughout the coastal ecological landscapes and for particular sites.

Contributing Studies & Research

The most extensive effort of this project was to review existing reports and studies on coastal wetlands of Wisconsin. Nearly 40 reports were reviewed and are listed in the Bibliography. Six primary reports emerged as the best sources for providing information about and identifying coastal wetland locations. They identified specific locations along the coasts of the Great Lakes, including (brief or lengthy) site descriptions for each. This information was instrumental for comparison with NHI data and Wisconsin Wetland Inventory maps, and the subsequent identification of primary coastal wetland sites.

It is important to note that not all sites identified in each of these reports became a primary coastal wetland site. Most studies identified hundreds of sites covering a larger geographic area than the coastal zone (e.g. Southeastern Regional Planning Commission natural areas inventory). Some reports were restricted to the coastal zone but included both wetland and non-wetland sites. The process for narrowing down the list of sites is explained in the "Site Selection Process" section of the report.

The following is a summary of each of the reports reviewed, including the study's objective, brief methodology, and the number of sites extracted from each and used in the present study.

1) Fish and Wildlife Resources of the Great Lakes Coastal Wetlands within the United States. Volumes 1-6. U.S. Department of the Interior, Fish and Wildlife Service. Edited by Charles E. Herendorf, Suzanne M. Hartley and Mark D. Barnes. 1981.

The objective of the study was to identify and inventory coastal wetlands contiguous to the Lakes or partially or entirely within 1,000 feet of the U.S. shore of the Great Lakes and their connecting waters. Wetlands located entirely or partially within 1,000 feet of bays, harbors, estuaries, or coastal lakes and ponds having direct surface water connections to any of the Great Lakes were considered coastal wetlands. The report identified 1,370 coastal wetlands, comprising a total wetland area of 466 square miles.

Specifically, the four objectives of the report were to:
1) delineate and describe all wetland areas along the Great Lakes shorelines
2) inventory the fish and wildlife resources of these wetlands
3) describe the physiographic and cultural setting in which these wetlands are situated, and
4) determine the voids in knowledge pertaining to the fish and wildlife resources of the Great Lakes coastal wetlands.

Major sources of information for this report included a thorough literature review, journals and various technical and popular publications of state departments of natural resources, libraries, universities, federal, state, and local agencies and other agencies and private groups and individuals possessing knowledge of the Great Lakes coastal wetlands. The following information, where possible, was gathered for each site:
1) Physiographic setting: name, location, acreage, classification, topography, surficial geology, soils, hydrology, climate, and special features.
2) Biotic setting: vegetation, fish, invertebrates, reptiles and amphibians, avifauna, mammals, and endangered resources.
3) Cultural setting: demography, land use and ownership, recreation, mineral, energy, and forest resources, public utilities and facilities, pollution sources, and historical and archaeological features.

The Great Lakes were divided into 15 sections of shoreline that were separately inventoried and researched. Of these 15, only 3 sections were applicable to the Wisconsin shore of Lake Superior and Lake Michigan. These included Lake Sections numbers #9, #10, and #11. Lake Section #9 includes the stretch of the Lake Michigan just north of the Illinois-Wisconsin border to the Door County-Kewaunee County border. Lake Section #10 extends from the Door County-Kewaunee County border to the Brown County border. Lake Section #11 includes the Kewaunee County-Brown County border to the Wisconsin-Michigan border along the Menominee River. The sections from Lake Superior were not evaluated because a more recent coastal wetland evaluation occurred there (see description in #4 below).

Sites Extracted for Present Report.

A total of 13 sites from this report were used in the current study. Most of the 13 sites are primarily from Lake Michigan Section #11 in the northernmost part of Lake Michigan's coast, along the western shore of Green Bay. Very little literature, research, and site information was available for this particular part of the Lake Michigan shoreline.

Sites from Lake Section #10 (which includes the entire Door County) overlapped with a more recent report, entitled "Door Peninsula - Critical Habitat & Natural Areas Protection Plan", completed in 1999 (see #5 listed below). Because the Door report provided more current information about sensitive sites, the USFWS site descriptions were used as supplemental information.

Sites from Lake Section #8 were also not included because a thorough inventory of all natural areas sites, including all coastal wetland sites, was identified in the comprehensive "Southeastern Wisconsin Regional Planning Commission" report completed in 1997 (see #3 below).

2) Natural Area Inventory. Wisconsin's Great Lakes Coast - Revised 1980. Office of Coastal Management, Wisconsin Department of Administration and Scientific Areas Section, Wisconsin Department of Natural Resources. 1980.

This report was one of a series designed to inventory natural areas along Wisconsin coasts of Lake Michigan and Superior with the goal of locating remnant natural areas and other features. The Natural Area Inventory identified, delineated, and evaluated biotic communities and other features possessing a significant degree of naturalness. Identified sites included terrestrial and aquatic plant communities, recovery sites, sites containing significant geological or archaeological features or harboring threatened or endangered species of plants and/or animals. Natural areas were defined by the Scientific Areas Preservation Council as a tract of land or water so little modified by human activity or sufficiently recovered that it contains intact native plant and animal communities believed to be representative of the presettlement landscape.

The Natural Area Inventory encompassed a strip of land six miles inland from the entire shoreline of Lakes Michigan and Superior, and included the various islands off the Door Peninsula and the Apostle Islands of the Bayfield peninsula. In some instances, tracts beyond that 6-mile zone were included, particularly large tracts or what appeared to be high quality natural areas observed at the edge or beyond the 6-mile limit. This study was biased towards terrestrial plant communities. Site selection methods included the Scientific Areas Section file review, a thorough literature review, and by interviews from selected teachers, DNR field personnel, naturalists, and resource managers. Systematic examination of aerial photographs and the U.S. Geological Survey topographic maps located a bulk of the natural areas, and was followed up with field inspections of most of the sites. There were 169 sites identified in this report. Of these, 43 sites were ranked as high priority sites based on quality (diversity of plant and animal species, extent of human disturbance, size and educational value) and were further broken down into seven classifications.

Sites Extracted for Present Report.

A total of 18 sites were taken from this report, all along Lake Michigan's coastline. Sites identified along the Lake Superior coastal zone were more recently inventoried (1995-1996) by Natural Heritage Inventory staff for the Lake Superior Coastal Wetlands Evaluation (see #4 below).

3) A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin. Southeastern Wisconsin Regional Planning Commission. 1997.

This report is the product of an effort that began in 1987, when the Southeastern Wisconsin Regional Planning Commission (SEWRPC) was charged with preparing a report for its seven

constituent counties - Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha - for a regional natural areas and critical species habitat protection and management plan. The SEWRPC plan is the result of that 10 year effort, which included inventory work, consultations with local, state and federal agencies, and other individuals and organizations knowledgeable about the natural areas and critical species habitats of the region. The report identified all of the high-quality natural areas and critical species habitats remaining in the seven-county Region, and formulated recommendations for planning for the protection, wise use, and proper management of those areas and habitats.

SEWRPC thoroughly inventoried, evaluated, and researched multiple components related to land use planning in their respective region, including: demography, economic factors, historic land use, public utility base, air quality, park and other open spaces, physiography, geology, mineral and organic resources, soils, water resources, vegetation, fish and wildlife resources (including endangered and threatened species), and environmental corridors. Sites were evaluated using a natural areas assessment scheme, which included ecological components: natural area quality/human impact, size and buffer lands, species diversity, community significance, species significance, and mature community - each evaluated at a different scale (see p. 47 SEWRPC). Other factors addressed included some non-scientific criteria: amenity use and accessibility, availability and cost of purchase, degree of threat, educational use and some others. SEWRPC identified over 400 sites that were broken down into three categories: NA-1 (site of statewide or greater significance), NA-2 (site of countywide or regional significance), and NA-3 (site of local significance).

Sites Extracted for Present Report.

A total of 5 sites from the SEWRPC report were incorporated for the present study. There were more than 400 sites originally identified in the SEWRPC report, however, most of these sites were not within our study area (i.e. not a wetland, not located within one of the coastal ecological landscapes).

4) Wisconsin's Lake Superior Coastal Wetlands Evaluation. Wisconsin Department of Natural Resources, Bureau of Endangered Resources. Eric J. Epstein, Emmet J. Judziewicz, William A. Smith. 1997.

This report is the result of a two-year study to evaluate the coastal wetlands of Wisconsin's Lake Superior shoreline and Apostle Islands and to identify critical habitats. The primary objectives were to identify important wetland habitats that should be protected and/or restored, to identify areas suitable for restoration on previously converted or degraded wetlands and explore mitigation opportunities including restoration of functional values.

The report was designed as a prototype (demonstration project) on how to identify areas for protection and restoration, and develop a common environmental database and analytical tool to facilitate information exchange among the federal/state/local/tribal units working on Great Lakes protection. The geographic scope of the project was the Lake Superior drainage basin lying within the northwestern Wisconsin counties of Douglas, Bayfield, Ashland, and Iron. The

drainage basin of the study area was broken into five geographic areas, each a physiographic unit with distinctive physical and ecological attributes, conservation values, and challenges. The five units were consistent with the Ecoregional Subsections as described in the National Hierarchical Framework of Ecological Units (Avers 1995). In addition to inventories of coastal wetlands, field inventories were completed for the St. Louis River Estuary and uplands, and the Brule River State Forest.

The methods used to identify priority sites followed the methods as described in the "Natural Heritage Inventory Methods Overview" section (see Appendix 2). Field surveys were conducted on all priority sites. Data were collected, processed, entered, and updated in the Natural Heritage Inventory database and the report was developed. Wetland sites were prioritized based on size, diversity of communities, association with terrestrial features of interest, documented occurrences of rare plants and animals, and degree of past disturbance based on examination of files and air photos. Sites for which little or nothing was known were placed in a separate "gap" category, and were compared with better known areas by studying maps and air photos. "Inland" wetland sites were sometimes further prioritized by linkage to coastal wetlands by streams, and those evaluated as the most significant representatives of wetland types within the Ecoregional Subsections delineated for the basin.

Sites Extracted for Present Report.

All 28 sites identified from the Lake Superior Coastal Wetland Evaluation were included as primary sites in the present study. Some of these sites are located beyond the coastal ecological landscapes or 6-mile buffer, however, they were included because of their ecological significance within the Lake Superior Basin.

5) The Door County Land Use Forum, Inc. Door Peninsula, Wisconsin Critical Habitat and Natural Areas Land Protection Plan - Project Prospectus. Developed in cooperation with Wisconsin DNR, Bay Lake Regional Planning Commission, U.S. Fish and Wildlife Service, The Nature Conservancy, Door County Environmental Council, Door County Land Trust, Door County Planning Department, and the University of Wisconsin - Green Bay. Sturgeon Bay, WI. June 6, 1999.

The Door County Land Use Forum protection plan prospectus was established to seek and promote growth management practices that are sensitive to the integrity of the natural environment, rural character, and scenic beauty of Door County, in collaboration with several different federal, state, and local agencies. The report includes the preliminary mapping of 21 natural areas, with established site boundaries, threats identified, and habitat features listed in general terms. Land ownership and protection statuses were also identified. The overall objective of the Forum is to create processes whereby government agencies, town, city, and village governing bodies, environmental organizations, landowners, and citizens can team up as stewards and co-managers of the natural areas within their communities.

Sites Extracted for Present Report.

A total of 4 sites were extracted from this report, supplemented by site information identified in other reports or following field surveys by NHI staff.

6) The Coastal Wetlands of Manitowoc County: Inventory, Assessment, and Management Recommendations. Water Resources Management Program Graduate Students, University of Wisconsin - Madison. 1998.

This report presents the findings of eighteen UW-Madison graduate students participating in the 1998 Water Resources Management Workshop. Fifty-seven coastal wetlands in Manitowoc County were inventoried and evaluated for their functional values in eleven categories: natural hydrology, potential and actual stormwater attenuation, potential and actual water quality protection, shoreline protection, ground-water interaction, vegetation, wildlife habitat, human uses and public access. Key findings and management recommendations were presented. High priority sites were identified.

Sites Extracted for Present Report.

A total of 6 sites were extracted from this report and incorporated into the findings of this coastal wetland evaluation, all considered high priority sites according to the rating scheme used for the study. Most of these 6 sites represent combinations of several smaller sites.

Ongoing Natural Heritage Inventory Efforts

Several other on-going efforts were incorporated into the current coastal wetland study. First, the Natural Heritage Inventory (NHI) section of the Bureau of Endangered Resources (BER) recently completed biotic inventories on the Niagara Escarpment in the Door Peninsula area. Much of this linear geologic resource is located along the shores of Green Bay and directly impacts, or is impacted by, coastal wetlands. This inventory included work on coastal wetland areas. Supplemental site information from this inventory was used for some coastal wetland site descriptions for Door County found later in this report.

Second, BER has just completed a rare plant inventory of the Door County Islands (Judziewicz and Kopitzke, 1998). When applicable, inventory results from this study have been incorporated into the site descriptions found later in this report.

Geographic Information Systems (GIS) Coverages

Geographic Information Systems, or GIS, are used to spatially portray data onto maps at various scales and to analyze those data. GIS is most commonly used to create maps based on information in tables from a database. Several GIS maps (or coverages) were used as tools to further identify coastal wetland sites. The following coverages were used in this study:

Wisconsin Wetland Inventory (WWI). This is a digital data layer consisting of a series of polygon coverages and point coverages digitized from 1:24,000 scale maps. It contains attributes for various wetland classifications down to a 2-acre minimum. This GIS coverage was provided by DNR-Bureau of Water Resources.

Element Occurrences (EOs). These point and polygon (distribution range) coverages depict where endangered or threatened species or natural communities are found throughout the state of Wisconsin. The data source is the Natural Heritage Inventory BCD, DNR-Bureau of Endangered Resources.

Ecological Landscapes of Wisconsin. This coverage depicts the various ecological landscape boundaries within the state of Wisconsin, including the three used for this report: Superior Coastal Plain, Northern Lake Michigan Coastal, and Southern Lake Michigan Coastal. The original data source is the National Hierarchical Framework of Ecological Units, compiled at 1:1,000,000. This coverage was provided by the DNR-GEO Services.

Door Peninsula, Wisconsin Critical Habitat & Natural Areas Protection Plan. This coverage consists of polygons of the high priority project areas for Door County, and was developed with cooperation from The Nature Conservancy, DNR, Bay-Lake Regional Planning Commission, Door County Property Owners, Inc., and additional state and county agencies. This coverage was provided by the Bay-Lake Regional Planning Commission.

Manitowoc County Coastal Wetlands. This coverage was developed by Water Resources Management graduate students in 1998 as part of a Master's thesis about coastal wetlands of Manitowoc County. It consists of polygon coverages of coastal wetlands in Manitowoc County, based primarily on the Wisconsin Wetlands Inventory (WWI) from DNR. It was provided by Water Resource Management graduate students.

Other Coverages. These coverages from the DNR library were also used:

- Wisconsin Counties
- Geographic Management Units (GMU's) of Wisconsin
- Wisconsin Hydro 100 (depicts all rivers, streams, and lakes)
- Land Type Associations (depicts smaller-scale detail of specific land types throughout Wisconsin based on the National Hierarchy of Ecological Units)
- State Natural Areas of Wisconsin
- Wisconsin Watersheds
- Wisconsin Townships

Site Selection Process

In summary, there were three primary sources of coastal zone wetland information for Wisconsin that were used for this report. First, the literature search yielded over 40 reports concerning wetlands, six of which were used as primary sources of site information. They outlined specific site locations and classified, prioritized and/or ranked those sites by different methodologies.

There was a total of 74 coastal wetland sites identified through these reports (this number is slightly inflated as the same site was often identified in more than one report). Second, the Wisconsin Wetland Inventory (WWI) identifies wetland sites throughout the state down to 2- or 5-acres in size. Third, the Natural Heritage Inventory database was used to identify occurrences of rare plants, animals and communities. NHI staff members (consisting of an ecologist, zoologist and botanist) supplemented information and assisted in coordinating a list of sites.

Since the purpose of this study was to focus on "coastal" wetlands and current definitions are complex and inconsistent, information was gathered and then sorted logically in relation to the study area (see “Description of Study Area” section).

There were several hundred sites that emerged through various literature sources. Many of these sites were wetlands, while others were considered "significant" or "unique" areas within the coastal zone, as identified by their respective study. Site descriptions in some of the reports were vague, leaving it unclear whether or not the site was a wetland. The Wisconsin Wetland Inventory (WWI) GIS coverage was used to determine whether or not these questionable sites were wetlands. Topographic maps were also referenced. The site list was narrowed down into approximately 200 wetland sites, most in the coastal ecological landscapes.

Element occurrence data for rare plants, animals and natural communities supplemented other data gathered and were compared with site locations. The presence of element occurrences (or EO’s) within the sites indicated areas documented as most ecologically significant from a NHI standpoint.

One of the goals of this study was to identify existing data and inventory gaps. Sites that were identified through the literature but had few to no element occurrence records were not immediately excluded from the site pool. Rather, they were reviewed by NHI staff to determine whether or not there was a recent inventory on the site. Sites where there wasn’t a recent inventory were identified in this report as needing inventory. Examples include Renard Swamp in Door County and Whitney Slough in Brown County.

Through evaluating these sites, a list of coastal wetland sites was developed. This list was reviewed by NHI staff. Some slight modifications were made to the list based on recent site information obtained by NHI staff. Many of the smaller sites were combined to create larger site areas, particularly contiguous sites that were clearly ecologically connected to one other.

Through this process, a total of 64 ecologically significant sites, termed “Primary Coastal Wetland Sites”, emerged. These sites were delineated on a map (**see Map 2**) and are described below.

PRIMARY SITES

A total of 64 primary sites were selected within the coastal zone of Lakes Michigan and Superior **(Map 2.)**. Site boundaries are general and include some non-wetland areas. Each site description provides general site characteristics and location. Future needs and gaps in information about the site are identified in the site description. Larger inventory and data gaps are addressed at the end of the document.

Where applicable, a table of element occurrences (EOs) for each site is found after the site description. Element occurrences include rare animals and plants or natural communities that are currently being tracked by the Natural Heritage Inventory program. Some element occurrence tables also contain information about rare fish found within a range of a primary site[3]. **It is important to note that element occurrence tables were developed using data from the Biological Conservation Database (BCD). Site descriptions were primarily developed based on information from existing reports. Oftentimes site descriptions do not reflect element occurrence data.**

Each site is coded according to the coastal zone it falls within (LM = Lake Michigan, LS = Lake Superior), and given a unique number. A list of the sites by page number is provided below. The report source codes refer to the report from which the majority of site information was obtained. Each site may have more than one source code. The codes are:

#1 = U.S. Fish and Wildlife Service Report
#2 = Natural Area Inventory Report
#3 = Southeastern Regional Planning Commission Report
#4 = Wisconsin's Lake Superior Coastal Wetland Evaluation
#5 = Door County Critical Habitat and Natural Areas Land Protection Plan
#6 = Manitowoc County Coastal Wetlands
#7 = Other (NHI staff, The Nature Conservancy, Other agency, etc.)

Lake Michigan Primary Sites:

[3] Element occurrence data on fish applies to Lake Michigan proper and not necessarily the primary coastal wetland site described. The EO records available for fish that are tracked by the NHI program is incomplete.

Lake Superior Primary Sites:

Lake Michigan Primary Sites

General Description of Lake Michigan Coastal Zone.

The Lake Michigan shoreline varies significantly, from the gently sloping glacial till of Kenosha County in the south, to the rocky cliffs of the Door County Peninsula in the north. Along the north shoreline of Green Bay one will find low sand banks up to five feet high, with wetlands found along most of their reach (Herendorf et. al. 1981). The shoreline along the eastern side of Green Bay, including Door County Peninsula, consists of sand and gravel beaches backed by bluffs up to 100 feet high. The bluff material is composed of glacial till and lacustrine sediments. The Lake Michigan shore of Door County consists of a mixture of dolomite low rock cliffs, numerous narrow beaches, and shallow bays. Behind the upper reaches of many of the bays are low wetland areas. A red clay bluff ranging from 10 to 70 feet in height characterizes the Lake Michigan shore of southern Door County, Kewaunee County and northern Manitowoc County.

Narrow sand beaches and red clay bluffs extend from Two Rivers south to Sheboygan. Wetlands are scarce along this reach of the lake but a major dune complex is situated south of Sheboygan. The southern Wisconsin shore has areas of gently sloping, low sand banks fronted by wide beaches. Between Port Washington and Milwaukee glacial till bluffs reach 140 feet and decrease to 25 feet near Kenosha. The high bluffs normally have narrow beaches and few wetlands. South of Kenosha there is an extensive but degraded dune system, and the nationally significant Chiwaukee Prairie. The total acres of wetlands found within the coastal zone along the Lake Michigan shoreline are found in Table 2 below.

The Door Peninsula is one of the most sensitive areas along the Lake Michigan shoreline. The concentration of rare species and natural communities make it one of the highest conservation priorities in Wisconsin and the entire Great Lakes region. Many globally rare species are found there, and are there because of the unique past and present interactions of its geographical position, climate, geology and soils. The Door Peninsula extends into Lake Michigan and separates the lake from Green Bay. It forms the western edge of the Niagara Escarpment which arcs through upper Lake Michigan and over to the western edge of New York. The western shore of the peninsula and its rocky outcroppings reach heights of up to 150 feet above lake level. Moving eastward, the land gently slopes down towards the shore where sand dunes have been formed by wind and wave action over time. Many lakes on the eastern side of the Door Peninsula were once bays of post-glacial lakes, but are now separated from Lake Michigan by shoreline sand deposition. Characteristic beach ridge and swale topography is found in several places along the Lake Michigan coast of the Peninsula, which support many rare species. Between these areas one can find rocky headlands of thin soils over bedrock, supporting rare plants associated with these shallow rocky alkaline soils. The dolomite escarpments which form the shoreline of these headlands also support unique natural communities (The Nature Conservancy, Grimm et. al., 1994).

Much of the biological richness and natural beauty that has attracted people to the Peninsula has created a subsequent demand on the natural resources which warrants serious concern. Tourism

and second-home development present challenges to the community. Major threats to the coastal wetland sites on the Door Peninsula include wetland loss from filling for development, habitat fragmentation, alteration and a loss as forests are cleared for scenic viewing, septic fields, road work and utility maintenance, groundwater contamination from failing septic systems, leaking underground storage tanks, and surface water contamination from erosion in developing areas and agricultural runoff. Groundwater contamination is a particularly sensitive problem because of the shallow soils and fractured bedrock that characterize the peninsula. Contaminants are frequently not filtered out by the soil and bedrock before they reach groundwater aquifers (The Nature Conservancy, Grimm et. al., 1994).

Table 2. WETLAND ACREAGE PER COUNTY WITHIN LAKE MICHIGAN COASTAL ZONE[4]. BASED ON ORIGINAL WISCONSIN WETLAND INVENTORY

County	Total Surface Area (Acres)	Acres of Wetland	% of County Mapped As Wetland	Wetlands as % of Statewide Total
Brown	335,360	25,288	7.5	0.5
Door	314,880	52,559	16.7	1.0
Kenosha	174,720	16,194	9.3	0.4
Kewaunee	219,520	31,933	14.5	0.6
Manitowoc	380,160	55,394	14.6	1.0
Marinette	892,800	227,708	25.5	4.3
Milwaukee	154,240	4,394	2.0	0.08
Oconto	641,280	160,263	25.0	3.0
Ozaukee	150,400	16,411	10.9	0.3
Racine	213,760	16,406	7.7	0.3
Sheboygan	329,600	39,902	12.1	0.7

As shown on **Map 3**, there are 36 primary coastal wetland sites identified for the Lake Michigan coastal zones.

[4] The Coastal Zone as defined by the Wisconsin Coastal Management Program, Department of Administration. This includes counties that border Lake Michigan.

LM# 1 AHNAPEE RIVER WETLANDS

Report Source: #2
County: Kewaunee County

Site Description

The Ahnapee River Wetlands site is located in the northeastern part of Kewaunee County. The Ahnapee River is bordered by a narrow strip of forest, composed of white cedar, white spruce, tamarack and hardwoods. Almost all forest is second growth. There are patches of sedge meadow and marsh. This site provides an excellent buffer for the river as adjoining lands have been cleared for agriculture. A state trail goes through this site.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Ahnapee River Wetlands, Kewaunee County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Cardamine pratensis	Cuckoo-flower	1937	1
Northern Wet Forest	Northern Wet Forest	1978	2
Northern Sedge Meadow	Northern Sedge Meadow	1978	1

LM# 2 ANSUL PATTERNED DUNES

Report Source: #2
County: Marinette County

Site Description

Ansul Patterned Dunes is located in the eastern part of lower Marinette County. The dunes are stabilized with Hill's oak and jack pine forest (with white birch and red maple). Dry sandy ridges and ephemeral ponds and sloughs are found between the dunes. Wetland grasses, sedges and scattered shrubs occur in the open, ephemeral ponds, which show as patterned vegetation on aerial photos. Disturbance by off-road vehicles may be a problem, and residential development has encroached on the site's natural features.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. According to NHI staff, this site has been mostly destroyed (personal communication, December 1999). The element occurrence records are outdated.

Rare Elements of Ansul Patterned Dunes, Marinette County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Deschampsia flexuosa	Crinkled Hairgrass	1975	1
Lake Dune	Lake Dune	1976	1
Northern Dry Forest	Northern Dry Forest	1976	1

LM# 3 WASHINGTON ISLAND WETLANDS

(Coffee Swamp, Jackson Harbor Ridges, Big and Little Marsh)

Report Source: #2, #7 (NHI Staff)
County: Washington Island, Door County

Site Description

Washington Island is located directly north of the Door Peninsula mainland. There are three important coastal wetland areas on Washington Island, each described separately below.

Big and Little Marsh. This complex site is located midway up the eastern coast of Washington Island, and includes approximately 250 acres. Basically, it includes two components. There is a sandy barrier beach that has been mostly developed with an unpaved road and houses. It has at its south end a small (less than 5 acres) park (Percy Johnson County Park, formerly known as Eastside County Park). The park has a small but good quality remnant Great Lakes Beach and Lake Dune communities with several rare plant species.

The barrier beach cuts off a second, larger component of the site: An extensive undeveloped open wetland and wooded swamp (Big Marsh) located inland and west of the barrier beach. Immediately inland is a 38-acre Emergent Aquatic marsh on marl dominated by softstem bulrush. In some places there are patches of nearly bare marl with pavements of dolomite gravel and cobbles that are exposed at times of low water levels. Water depth ranges from two feet in the spring to dry by autumn, depending on the level of Lake Michigan, although the marsh is not directly connected to the Lake. Several rare plant species occur here.

Inland (west of) the marsh are two additional communities of note. Rare plant species are present in both. To the southwest is a 60-acre Northern Wet-Mesic Forest (white cedar swamp) that is probably the highest quality representative of this community type on Wisconsin's Lake Michigan islands. Northwest of the marsh is a 7-acre Boreal Rich Fen community dominated by wire-leaved sedges, sweet gale, shrubby cinquefoil, and swamp buckthorn (*Rhamnus alnifolius*).

Northeast of Big Marsh is Little Marsh, with lower quality communities, including Northern Hardwood Swamp (black ash dominant) and an ephemeral pond.

The landscape surrounding the Big-Little Marsh Area is mostly forested with second-growth hardwoods and conifers, and, farther away, abandoned agricultural fields. The potential for additional housing developments on adjacent uplands is a concern.

Except for Percy Johnson County Park, the entire site is divided among numerous private owners.

Coffee Swamp is an approximately 300-acre wetland complex located midway along the northern coast of Washington Island.

At the core of the complex and located about 0.5 miles south of Lake Michigan, is a small, very hard shallow seepage pond (Lake – Shallow, Hard, Seepage) with a substrate of pure marl. It nearly dries up in late summer and during years when Lake Michigan is low. Surrounding it but much more extensive to

the north is a 9-acre Boreal Rich Fen dominated by wire-leaved sedges, sweet gale, bogbean, bog goldenrod, and hoary willow. This fen has several rare plant species, but also the invading exotic plant glossy buckthorn (*Rhamnus frangula*) and the aggressive native giant reed (*Phragmites australis*).

Surrounding the fen, and on the south side of the pond, is a large (225 acre) Northern Wet-Mesic Forest (white cedar swamp) that has been severely impacted by deer browse. To the north of the cedar swamp there is a small (10 acres) but distinctive and high quality (Northern) Hardwood Swamp dominated by black ash. There are also small areas of Northern Sedge Meadow in various places in the complex.

The coastline of Lake Michigan is mostly an upland white cedar forest (with some balsam fir) on very thin soil over dolomite gravel and cobbles. Interspersed in this forest are a few old abandoned agricultural fields and an old channel that was blasted through the dolomite bedrock (probably about 1900) in an attempt to drain the swamp. One portion of the Lake Michigan shoreline has a unique "cobble glade" community type with a scattering of cedars among heaps and windows of large dolomite cobbles.

A 40-acre State Natural Area is at the core of Coffee Swamp. There are several private landowners to the south and west, and a very large landowner to the north and east along the Lake Michigan shoreline. Should this owner decide to sell, there will be very high development pressures on this shoreline.

Jackson Harbor Ridges is a State Natural Area located on the northeast side of Washington Island which contains an excellent assemblage of rare and uncommon vascular plants. The beach undulates with numerous areas of dry to wet sand and interdunal swales. These swales, including one large one near the base of the point, contain an unusual community that prefers wet calcareous soils. Characteristic plants here are Kalm's lobelia, shrubby cinquefoil, arctic primrose, low calamint, slender bog arrow-grass, bladderworts, and several sedges. The beach gradually grades into drier dunes which are stabilized with drought tolerant species such as bearberry, horizontal juniper, and sand coreopsis. Behind the dunes is a mixed conifer-hardwood forest of red and white pines, white cedar, balsam fir, and American beech. The point at the entrance to Jackson Harbor is a sand spit which attracts gulls, terns, shorebirds and waterfowl.

Rare Elements of Washington Island Wetlands, Door County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Boreal Forest	Boreal Forest	-	1
Boreal Rich Fen	Boreal Rich Fen	1998	2
Cakile edentula	American sea-rocket	1989	1
Calamagrostis stricta	Slim-stem small-reedgrass	1998	1
Calamintha arkansana	Low calamint	1970	1
Carex gynocrates	Northern bog sedge	1999	2
Carex livida var radicaulis	Livid sedge	1998	1
Cypripedium reginae	Showy lady's-slipper	1926	1
Deschampsia cespitosa	Tufted hairgrass	1998	1
Eleocharis quinqueflora	Few-flower Spikerush	1989	1
Elymus lanceolatus ssp psammophilus	Thickspike	1998	1
Emergent Aquatic	Emergent Aquatic	1998	1
Equisetum variegatum	Variegated horsetail	1999	1
Euphorbia polygonifolia	Seaside Spurge	1989	1
Gentianopsis procera	Lesser fringed gentian	1975	1
Great Lakes Beach	Great Lakes Beach	-	1
Iris lacustris	Dwarf lake iris	1998	2

Rare Elements of Washington Island Wetlands, Door County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Lake Dune	Lake Dune	-	1
Lake - shallow, hard, seepage	Lake - shallow, hard, seepage	1998	1
Malaxis brachypoda	White adder's-mouth	1998	1
Northern Hardwood Swamp	Northern Hardwood Swamp	1998	1
Northern Mesic Forest	Northern Mesic Forest	-	1
Northern Sedge Meadow	Northern Sedge Meadow	1998	1
Northern Wet-Mesic Forest	Northern Wet-Mesic Forest	1998	2
Primula mistassinica	Bird's-eye primrose	1970	1
Ribes hudsonianum	Northern black currant	1999	1
Scirpus cespitosus	Tufted club-rush	1998	1
Solidago ohioensis	Ohio goldenrod	1970	1
Solidago simplex var gillmanii	Sticky goldenrod	1998	1
Tofieldia glutinosa	Sticky false-asphodel	1998	1
Triglochin maritimum	Common bog arrow-grass	1998	1

LM# 4 BLACK ASH SWAMP AREA

Report Source: #2
County: Kewaunee County

Site Description

Black Ash Swamp is located in northern Kewaunee County and extends into southern Door County. It is a large inland lacustrine swamp composed of second growth timber (black ash is mentioned as dominant).

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Black Ash Swamp Area, Kewaunee County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Hardwood Swamp	Hardwood Swamp	1979	1

LM# 5 CHARLES POND

Report Source: #1, #2
County: Oconto County

Site Description

Charles Pond consists of a wetland complex located adjacent to the western shoreline of Green Bay. It was formed by a bay-mouth bar lake with a narrow outlet to Green Bay, surrounded by extensive shrub carr and shallow marsh. West of the pond was a hardwood forest. High water levels in the 1980's obliterated all of the marshland and a large portion of the hardwood forest while the remainder is affected by Green Bay seiches.

Fluctuations of several inches in the water level can drastically change the amount of wetland that is submerged. Water level fluctuations in this area may reduce wetland size and function, and influences the type of vegetation as well as wildlife habitat.

Substantial portions of the sandy beach are exposed during periods of low water levels. The surficial geology of Charles Pond and the surrounding area is characterized by glaciolacustrine deposits of sand, silt and clay. These lake sediments include associated deltas, sand dunes, and organic deposits.

Lower Green Bay is heavily polluted; low dissolved oxygen levels and nutrient enrichment are significant water quality problems. Chlorinated hydrocarbons and polychlorinated biphenyls are found throughout the Green Bay ecosystem, impacts on Charles Pond are unknown.

The DNR has designated this area as a State Natural Area. It is desirable habitat for waterfowl, gulls and terns, and shore birds. This site was historically known for its presence of the peregrine falcon (*Falco peregrinus*), the bald eagle (*Haliaeetus leucocephalus*), the osprey (*Pandion haliaetus*), and several other rare species of birds.

The Charles Pond area proper is under state protection and therefore is under minimal development pressures. The agricultural nature of the surrounding area suggests that the remainder of Charles Pond wetland, as well as the surrounding area, may be subject to low to moderate development pressures.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Charles Pond, Oconto County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Emergent Aquatic	Emergent Aquatic	-	1
Hardwood Swamp	Hardwood Swamp	1976	2
Northern Sedge Meadow	Northern Sedge Meadow	1976	2
Shrub-carr	Shrub-carr	1976	2

LM# 6 CLEVELAND HARDWOOD SWAMP

Report Source: #6
County: Manitowoc County

Site Description

Cleveland Hardwood Swamp is a depressional cedar swamp found in southern Manitowoc County. The swamp is just west of Lake Michigan but is separated from it by a country road. According to the classification of wetland functional values found in the Manitowoc report (Water Resources Management Graduate Students, 1998), this wetland was rated very high for floral diversity and wildlife habitat, as well as a high rating for human use. It was rated low for stormwater retention and water quality.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Cleveland Hardwood Swamp, Manitowoc County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Hardwood Swamp	Hardwood Swamp	1998	1

LM# 7 COUNTY LINE SWAMP

Report Source: #2
County: Marinette/Oconto Counties

Site Description

County Line Swamp is located on the border of southern Marinette County and northern Oconto County. It is a large lacustrine swamp (roughly 10,000 acres) of considerable diversity. Topography is a controlling factor, and there are hundreds of small "islands" of hardwoods in the swamp, presumably where sand is close to the surface. These sandy islands and some larger tracts are of white birch-aspen-oak-red maple of pole size; expanses are of alder-willow-dogwoods. Along the eastern edge are pole sized black ash and more mature soft maple-elm-ash swamp forest. The area is second growth and has suffered ditching, but its size makes it unlike any other site along the west shore of Green Bay.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are largely outdated. This site is a priority for comprehensive field inventory in the near future.

Rare Elements of County Line Swamp, Marinette/Oconto Counties

Scientific Name	Common Name	Last Observation Date	No. of EO's
Alder Thicket	Alder Thicket	1976	1
Eleocharis quinqueflora	Few-flower spikerush	1997	1
Emydoidea blandingii	Blanding's Turtle	1999	1
Hardwood Swamp	Hardwood Swamp	1976	1
Nycticorax nycticorax	Black-crowned night-heron	1977	1
Triglochin palustre	Slender bog arrow-grass	1997	1

LM# 8 DUVALL SWAMP

Report Source: #2
County: Kewaunee County

Site Description

Duvall Swamp is located in northwestern Kewaunee County approximately 1,500 acres in size. It is an extensive second-growth swamp, mostly of cedar, aspen, hemlock, red maple and tamarack forming the headwaters of the Red River. A small lake is surrounded by a cedar swamp that grades into a tamarack and shrub-carr zone, which in turn grades into an open boggy zone dominated by waterwillow (*Decodon verticillata*), sedges, and bog shrubs. The shrub-carr area is primarily bog birch with dogwood and alder, while the open area lies on a quaking sedge mat. The area was logged at one time but has never been grazed.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated. This site is a high priority for comprehensive field inventory because of its size.

Rare Elements of Duvall Swamp, Kewaunee County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Northern Sedge Meadow	Northern Sedge Meadow	1978	1
Northern Wet-Mesic Forest	Northern Wet-Mesic Forest	1978	1
Shrub-carr	Shrub-carr	1978	1

LM# 9 FISCHER-CENTERVILLE CREEKS AREA

Report Source: #6
County: Manitowoc County

Site Description

The Fischer-Centerville Creeks Area is located on the southeastern coast of Manitowoc County. This site is a combination of several smaller sites ranked as high priority coastal wetland sites in the Manitowoc report (Water Resources Management Graduate Students, 1998). Most of the sites within this area are less than five acres separately, but as a complex form a significant coastal wetland site.

The sites have a mixture of vegetative communities. These include mixed hardwood, conifers, and shrubs to an unclassified mosaic. The Centerville Creek area was rated a medium value for flora diversity and natural hydrology, and stormwater retention and water quality were rated low. It was also rated medium for wildlife habitat and human use.

Through the classification system of the Manitowoc report, these wetland areas are considered "coastal canyons". Coastal canyons are described as small, canyon-like wetlands which occur along the major perennial streams in the area. These canyons are complex and contain different types of coastal wetlands including bluff face seeps and gullies. Coastal canyons occur primarily in the southern region due to the large difference between the elevation of the lake and the adjacent shore, which is over 60 feet in some areas. As the drainage network developed after the retreat from the Nipissing lake level, major downcutting created the high bluffs on stream edges. The canyons vary widely in topography, and some contain remnants of other coastal features such as interdunal and ridge and swale wetlands.

Fischer Creek Park was used as a focus of the Manitowoc study, and was rated a high priority in the report. It is located approximately one mile north of the village of Cleveland on the western coast of Lake Michigan, midway between the cities of Sheboygan and Manitowoc. The park includes 109 acres of land and 6,900 feet of Lake Michigan shoreline, and is one of the largest undeveloped properties on Manitowoc County's coast. The major landforms of the park result from bedrock geology, glacial history and lake level fluctuations occurring over the period since the retreat of the glaciers (at the end of the Pleistocene about 10,000 years ago). The creek and associated wetlands are a dynamic system over both short and long term scales. There are significant changes in the water levels and exposed stream banks, caused by the stream flow, "baseflow" between storms, and rates of groundwater discharge. Periodic pumping during active quarrying may also add additional baseflow to the creek. Water quality in the creek is affected by the quality of water contributing to the baseflow and streamflow surface runoff and shallow subsurface interflow as primary sources, respectively). A hydrography analysis showed that there is at least some filtering during large storm events which lead to surface or very shallow subsurface flow into the creek. This implies that any contaminants on the surface are transported directly into the creek and immediately effect water quality (contaminants such as road salts, petroleum products, sediments, pesticides, fertilizers, and manure).

Lake Michigan influences Fischer Creek at the outlet, and during high water periods, lake water can extend as far as one-quarter mile inland. One of the most significant influences of Lake Michigan is the seiche. As the lake level rises and falls due to the seiche, it continually changes the elevation at the creek outlet. When the outlet level rises, water flowing downstream backs up and low lying areas adjacent to the creek are inundated. This explains the presence of the sedge meadows and cattail marshes, communities that adapt to periodic inundation and changing water levels.

Four major wetland communities and three upland communities were identified in Fischer Creek Park. The upland communities include old field, successional forest, and mature upland forest. The four wetland communities identified are shrub swamps, wooded swamps, seeps, and sedge meadows. The sedge meadows are located adjacent to the creek and therefore strongly influenced by and adapted to the dynamic water levels and chemistry of the creek. The bluff seeps differ from the sedge meadows in that they are not dependent on the surface water but on local groundwater. These seeps, which are found on the steep bluffs adjacent to the lake and creek, are small systems that contain the most fragile and dynamic vegetation communities in Fischer Creek Park. The shrub swamps and wooded swamps both fall somewhere along this surface water-groundwater continuum. They experience seasonal surface water flooding followed by periods during which groundwater dominate the community's hydrology. The amount of groundwater present is a function of the position in the regional discharge area and local topography.

The diverse plant communities naturally foster a diversity of wildlife. More than 35 species of birds were identified within the park. The students identified recommendations for protection of the area for local planners. The protection of the undeveloped shoreline is critical, as is protection of local groundwater sources to maintain the seeps. This stretch of coastline is heavily developed (agricultural and residential) and patches of remnant native vegetation are generally small and isolated.

Future Needs and/or Gaps

An inventory of this area is needed, as it is unclear whether or not there are few rare elements present or if there is a lack of recent inventory.

Rare Elements of Fischer-Centerville Creeks Area, Kewaunee County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Coregonus hoyi	Bloater	1979	1

LM# 10 KEWAUNEE RIVER WETLAND COMPLEX

Report Source: #1, #2
County: Kewaunee County

Site Description

The Kewaunee River Wetland Complex is located in eastern Kewaunee County, and is one of the largest complexes along Lake Michigan at roughly 360 acres. The wetland occupies both sides of the Kewaunee River at the point where the river forms a large bend north of the city. The northern half of the wetland is open and marshy, while the southern half is wooded. The area surrounding has a gently rolling topography, but steep bluffs (60-80 feet high) define the boundaries of both the floodplain and the wetland. The Kewaunee River is considered to be fertile and generally turbid, which may reflect the water quality of the wetland area. A harbor is located at the mouth of the River.

Historically this area has been considered excellent wildlife habitat, particularly for songbirds, waterfowl, gulls, terns, shore birds, and pheasants. It supports a diversity of birdlife because of the varied habitat of river, mudflats, sedges, cattails, shrubs, and lowland and upland forest present in and around the wetland, and because of the proximity of the wetland to Lake Michigan. Historical records indicate the presence of some rare reptiles and amphibians.

The Kewaunee Nuclear Power Plant is located about 10 miles south of this area. The warm water discharged from the plant into Lake Michigan attracts fish, which in turn draw large numbers of gulls and terns to the area. During the fall and winter, many waterfowl are found in the open water areas near the plant. Ducks and loons winter in the Kewaunee Harbor adjacent to the wetland and may feed at the power plant site. This is a migration corridor for many raptors, including the peregrine falcon (*Falco peregrinus*) and the bald eagle (*Haliaeetus leucocephalus*), the red-shouldered hawk (*Buteo lineatus*), and the harrier (*Circus cyaneus*).

Future Needs and/or Gaps

An updated survey and more detailed site description are needed.

Rare Elements of Kewaunee River Wetland Complex, Kewaunee County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Aster furcatus	Forked aster	1990	1
Cakile edentula	American sea-rocket	1990	1
Calamagrostis strictaslim	Stem small-reedgrass	1990	1
Calamovilfa longifolia var magna	Sand reed-grass	1990	1
Emergent Aquatic	Emergent Aquatic	1999	1
Moxostoma valenciennesi	Greater redhorse	1983	1
Nycticorax nycticorax	Black-crowned night-heron	-	1

LM# 11 KOHLER ANDRAE AREA

(Kohler Park Pines, Kohler Park Dunes State Natural Area, Lake Michigan Pine Hardwoods Dune Forest)

Report Source: #2
County: Sheboygan County

Site Description

Kohler Andrae is located along the south-central coast of Sheboygan County. This site is a combination of several smaller, contiguous sites identified in the Natural Area Inventory report.

Kohler Park Dunes State Natural Area is situated approximately three miles south of Sheboygan. It harbors excellent examples of lake dunes, interdunal wetlands, and beach communities. Several rare species are present. It contains active and stabilized dunes, one mile of beach, and a small dry-mesic white pine forest. There are several interdunal wetlands (pannes) thickly vegetated with rushes and sedges. Some of the common plants that stabilize the dunes are sand reed, Canada wildrye, marram grass, northern wheat grass, common and trailing junipers, sand cherry, and willow species. In autumn the skies above the dunes are often frequented by migrating raptors, while the low shrubs and pannes are very attractive to passerines. Interdunal ponds contain standing water and add vegetational diversity. This site is threatened by spread of the invasive exotic purple loosestrife, and sometimes is subject to heavy visitor use.

Kohler Park Pines is a section of the shoreline and adjacent forest located on stabilized dunes between Lake Michigan on the east and the Black River on the west. The sand beach and narrow zone of dunes progresses inland to a mixed conifer-hardwood forest composed of white and red pine, sugar maple, beech, paper birch and red oak. Shrub and wooded wetlands occur near the river. Several critical plant species occur in the dune and beach sections.

Lake Michigan Pine Hardwoods Dune Forest is a linear forest zone along Lake Michigan and contiguous with the state park. It consists of tracts of many small ownerships with lakefront homes. White pine 12-20” is dominant with red oak, white birch, beech, sugar maple and others. Toward the Black River on the west are ash-white cedar swamps and alder thickets. There are some hemlocks in the area.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Kohler Andre Area, Sheboygan County

Scientific Name	Common Name	Last Observation Date	No. of EO’s
Alder Thicket	Alder Thicket	1976	1
Botrychium campestre	Prairie dunewort	1985	1

Rare Elements of Kohler Andre Area, Sheboygan County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Buteo lineatus	Red-shouldered hawk	1972	1
Cakile edentula	American sea-rocket	1986	3
Cirsium pitcheri	Dune thistle	1994	1
Elymus lanceolatus ssp psammophilus	Thickspike	1984	2
Equisetum variegatum	Variegated horsetail	1987	1
Euphorbia polygonifolia	Seaside spurge	1986	1
Floodplain Forest	Floodplain Forest	1976	1
Grammia phyllira	Phyllira Tiger Moth	1992	1
Great Lakes Beach	Great Lakes Beach	1976	1
Interdunal Wetland	Interdunal Wetland	1987	1
Lake Dune	Lake Dune	1986	1
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1976	1
Northern Mesic Forest	Northern Mesic Forest	1976	2
Northern Wet-Mesic Forest	Northern Wet-Mesic Forest	1976	1
Orobanche fasciculata	Clustered broomrape	1979	1
Solidago simplex var gillmanii	Sticky goldenrod	1978	1
Triglochin palustre	Slender bog arrow-grass	1987	1

LM# 12 LITTLE MANITOWOC RIVER

Report Source: #6
County: Manitowoc County

Site Description

This site consists of a combination of smaller areas identified in the Manitowoc report (Water Resources Management Graduate Students, 1998). It is located in eastern Manitowoc county a few miles south of the Point Beach Area site. It consists of a river and a riverine wetland system of approximately 50 acres. The vegetative communities include sedge meadow and a disturbed emergent open marsh. According to the Manitowoc rating system, the site rated low to medium on floral diversity, natural hydrology, storm water retention and water quality and has a high shoreline protection rating. The area rates low to medium for wildlife habitat and high for human use and public access. The site is subject to development threats.

Future Needs and/or Gaps

The element occurrence records are outdated.

Rare Elements of Little Manitowoc River, Manitowoc County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Cakile edentula	American sea-rocket	1977	1

LM# 13 LITTLE TAIL POINT

Report Source: #1, #2
County: Brown County

Site Description

Little Tail Point is a peninsula of 250 acres extending into the west side of lower Green Bay in Brown County. The wetlands on the point are adjacent to the Green Bay shoreline. One of the wetlands at this site occurs south of the area at which Little Tail Point joins the mainland. Vegetation is mostly emergent marsh with some shrub swamp. A second wetland lies directly on Little Tail Point, and is a low sand and gravel bar extending into Green Bay. It is forested with swamp hardwoods and shrubs.

Fluctuations in the water level of Green Bay caused by seiches considerably alter the size of the wetlands. Substantial portions of sandy beach are exposed during periods of low water levels. There are no streams or rivers flowing through Little Tail Point wetlands. Several inches change in the water level can drastically change the amount of wetland that is submerged, which in turn influences the type of vegetation and wildlife habitat. Seiche activity acts as a catalyst for nutrient exchange and sediments and pollutants between the wetland and Green Bay.

The area is desirable for songbirds, waterfowl, gulls and terns. There are several nesting sites for endangered and threatened birds. It is an important focal point for migrating waterfowl, shore birds, and raptors. The peregrine falcon (*Falco peregrinus*), the bald eagle (*Haliaeetus leucocephalus*), the osprey (*Pandion haliaetus*), are observed here annually along the west shore of Green Bay, especially in fall.

When the water levels in Green Bay fluctuate, the changes affect the Fox River and cause nutrient- and silt- laden water to inundate Long Tail Point wetlands.

Future Needs and/or Gaps

Research projects to quantify the effects of pollution on Green Bay wetlands and wildlife have been conducted over the past several years. The findings of these studies, however, have not been incorporated into this report. A further review of existing information on pollution in Green Bay is needed. The site description is outdated and the element occurrence records are incomplete.

Rare Elements of Little Tail Point, Brown County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Emergent Aquatic	Emergent Aquatic	-	2
Nycticorax nycticorax	Black-crowned night-heron	-	2
Sterna forsteri	Forster's tern	-	1

LM# 14 LONG TAIL POINT

Report Source: #1, #2
County: Brown County

Site Description

Long Tail Point is a narrow peninsula about 200 acres in size which extends into lower Green Bay from the west. The mouth of the Saumico River lies to the north of the wetlands, the mouth of Duck Creek lies approximately four miles to the south. All of the wetlands, consisting of emergent marsh, shrub swamp, and small patches of swamp hardwoods, are situated adjacent to the Green Bay shoreline. The wetlands are on and along a low sand spit extending 3.5 miles southeast into Green Bay, forming the peninsula. The peninsula becomes a series of small islands when there are high water levels.

Fluctuations in the water level and resulting changes in the Fox River cause nutrient and silt laden water (as well as sediments and pollution) to inundate the wetlands. Erosion of the soil from dredging activity and poor water quality in Green Bay has diminished vegetation, particularly a historical bed of wild celery which once grew there.

Historically this site has been very important habitat for shore birds, gulls and terns. This is an important migratory bird focal point and is heavily used by waterfowl and shorebirds, as well as raptors and passerines.

The double-crested cormorant (*Phalacrocorax auritus*) has nested on a small island two miles south of the wetland since 1974. The peregrine falcon (*Falco peregrinus*), the bald eagle (*Haliaeetus leorcocephalus*) and the osprey (*Pandion haliaetus*) are occasionally observed in the vicinity, especially during migration periods. In 1994, 139 Forster's tern nests were recorded, and in 1995, 20-25 terns were spotted. The majority of these terns probably migrated north. The same year, platforms were installed in April, and were found inactive when checked in July. In 1996, some of the platforms were used and 2 nests with 6 eggs were observed. In 1997, 65-70 pairs nested in wind-downed *Pragmites*. In late June of that year, only 33-34 nests were observed and only 20 offspring fledged. In 1998, 10 pairs nested on 21 May and 2 July on "small amounts of cattail", but by 1999, no nesting occurred.

Ownership by the state suggests that the wetlands will be subject to minimal development pressures in the future. The area has several recreational uses, such as hunting, fishing, trapping, boat use, snowmobiling and skiing. It is possibly threatened by recreational overuse.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed.

Rare Elements of Long Tail Point, Brown County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Sterna forsteri	Forster's tern	1997	1
Sterna hirundo	Common tern	1983	2

LM# 15 LOWER GREEN BAY

(Dead Horse Bay, Peats Lake & Duck Creek, Bay Port Industrial Tract, Cat Island Area)

Report Source: #1, #2
County: Brown County

Site Description

This site is made up of several smaller sites on the western shore of lower Green Bay, beginning just south of Long Tail Point until just east of Bay Port Industrial Tract in Brown County. This site is extremely important habitat for endangered or threatened avifauna, as well as reptiles and amphibians.

The series of wetlands along **Dead Horse Bay** are probably some of the most significant within the larger site area. According to the USFWS report (Herendorf et. al. 1981), some of the wetlands extend into Green Bay or portions of them consist of emergent vegetation growing in shallow water. Fluctuations in the level of Green Bay considerably alter the size and composition of the wetlands. Seiches in Green Bay cause irregular water level fluctuations, which can drastically change the amount of wetland that is submerged, influencing the type of vegetation and wildlife habitat.

Pollution in lower Green Bay is a water quality issue, and pollution affects wetlands adjacent to Green Bay, especially during periods of high water. Seiche activity in Peters Marsh (part of Dead Horse Bay) acts as a catalyst for nutrient exchange between the wetland and Green Bay. Water quality studies conducted there indicate that the wetland receives polluted water containing high levels of suspended solids and turbidity, and releases water which has less of these constituents. During the evening, Peters Marsh releases oxygen-depleted water. At the time of the USFWS publication, the need for a more extensive study on this function was needed.

Historically this site has provided important habitat for songbirds, waterfowl, shorebirds, raptors, gulls, and terns. Double-crested cormorants (*Phalacrocorax auritus*) have nested on a small island in the Bay since 1974.

The privately owned wetlands within this area were subject to relatively high development pressure for agricultural or residential uses. A dumping ground is located adjacent to two of the wetlands and a dredged channel of the Green Bay Harbor federal navigation project lies to the east of these wetlands. Access roads are located in close proximity and barrow pits to the west of one of the wetlands.

Peats Lake & Duck Creek (also called Atkinson Marsh Complex) is located near the southern end of Green Bay, west of the mouth of the Fox River and on either side of the mouth of Duck Creek. Peats Lake wetlands are within Green Bay and are characterized as emergent vegetation growing in shallow water. Peats Lake wetlands (as of 1981) appeared to be little altered; however, the marsh area (Atkinson Marsh) has been extensively diked and filled. A portion of the wetland has been used by the US Army Corps of Engineers as a disposal site for dredge spoils from Fox River channelization maintenance. Portions of this wetland are also used by the city of Green Bay as a land fill and incineration site.

Lake level fluctuations caused by seiches considerably alter the size of the wetlands. Duck Creek flows through the northern edge of the wetland. The water quality of this area has been seriously degraded by human activity. Dredge spoil from the harbor, sanitary landfill operations, and fly ash disposal have filled

over half of Atkinson Marsh and polluted the waters. The area has been littered severely. Dredge spoil is present.

The Fox River water fluctuations cause nutrient- and silt- laden water to inundate the marsh. Historically this was one of the finest and largest wetlands in the Midwest, and whooping cranes (*Grus americana*) were reported to breed here in the 19th century. However, due to increased urbanization, it is predicted that this area's avifauna productivity will continually decrease. Over 250 bird species have been recorded here. These areas receive heavy use during migration, as a resting and staging area. Changing vegetation in recent years has reduced the size of the flocks using the area. Many waterfowl use the marsh for feeding and nesting.

Historically, the following endangered birds have been found in or near the vicinity of this site: peregrine falcon (*Falco peregrinus*), bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), double-crested cormorant (*Phalacrocorax auritus*), piping plover (*Charadrius melodus*), Forster's tern (*Sterna forsteri*), common tern (*Sterna hirundo*), and harriers (*Circus syaneus*). In the 1980's, the north shore area was being planned for single-family, low density residential development. At that time there was also significant pressure to fill a portion of the wetland for use as an industrial park. The Fox River is heavily polluted and the pollution load carried by it may affect Green Bay for a distance of five or more miles north of the river mouth.

Bay Port Industrial Tract is an area roughly 200 acres in size on the western side of the Fox River. It is surrounded by industrial development yet, as of the publication of the USFWS report (Herendorf et. al. 1981) continued to provide nesting sites for Forster's terns and black terns.

Cat Island is located in Green Bay. It is an important focal point for colonial birds which use the island (and surrounding islands) for nesting and breeding. The double-crested cormorant is one example of the nesting water birds present.

In 1994, 2 adult Great Egrets (*Casmerodius albus)* were observed on the island but no eggs or young were found. The bird did not nest on the island in 1995, however they were still present in lower Green Bay throughout the summer; in1996, they were present, but exact numbers were not known. By 1997, 6 nests were observed (3 containing 3 young per nest, 3 containing 4 young per nest) in box elder. In July of that year, a total of 13 young were banded. In 1998, 8 nests were recorded (3 containing 3 young per nest, 3 containing 4 young per nest) in box elder; 24 young fledged. In 1999, 18-20 nests (18 in box elder, 2 on the ground) were reported.

The following observations of the Common tern were recorded: 114 pairs, no young (1991), colony abandoned in the spring (1993), 0 nests (1994, 1995). In 1996, 10-15 pairs nested on island, but by early June, only 3-4 Common terns were present and all nests were abandoned, having poor nesting success due to Great Horned Owl predation. One nest with eggs was documented in 1997, however an estimated 15-16 breeding pairs were present. Due to Great Horned Owl predation, by18 June 1997, total desertion had occurred. In 1998 and 1999, no terns nested in the area.

The numbers of nesting Forster's terns in the area has increased from 385 (1989), 729 (1990), to 786 (1991), however no chicks fledged due to hawk predation. In 1994, 1995, zero were observed. In 1996, 35-45 pairs were counted in one of the two subcolonies on the island. Ruddy Turnstones and Great Horned Owls predated upon the other colony. There are no records for the Forster's tern in 1998 and 1999.

Future Needs and/or Gaps

An updated site description is needed, as some parts of this site have been developed and other changes have occurred since the reports were published. The effects of the pollution from Green Bay on this site is an issue, and the scope of this study did not allow time for an evaluation of pollution in relation to these wetlands. An updated inventory of this site is needed. The element occurrence records are outdated.

Rare Elements of Lower Green Bay, Brown County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Clemmys insculpta	Wood turtle	1981	1
Emergent Aquatic	Emergent Aquatic	1976	3
Euphyes dion	Dion skipper	1984	1
Poanes massasoit	Mulberry wing	1984	1
Poanes viator	Broad-winged skipper	1984	1
Ranunculus cymbalaria	Seaside crowfoot	1992	1
Sterna caspia	Caspian tern	1997	1
Sterna forsteri	Forster's tern	1984	2
Sterna hirundo	Common tern	1997	1
Trisetum melicoides	Purple false oats	***1881***	1

LM# 16 LOWER PESHTIGO RIVER

(Peshtigo River Floodplain Forest, Peshtigo River Oaks, Peshtigo Harbor Meadow, Peshtigo Harbor Wildlife Area)

Report Source: #1, #2
County: Marinette County

Site Description

The Lower Peshtigo River site contains a very large wetland (roughly 2,600 acres) adjacent to Green Bay approximately three miles southeast of the city of Peshtigo. There are some smaller areas included which fall within the greater site boundary (listed above). This site features abandoned oxbow lakes and a series of channels within the river delta which offer excellent waterfowl habitat. The wetland consists of emergent marsh, sedge meadow, shrub-carr, and floodplain forest. This system is periodically altered by fluctuations in lake levels. The Peshtigo River flows through the wetland. The last two miles of the river, which contain the wetland, consist of a delta complex at the river mouth. This delta complex includes old river channels and cutoff areas, some of which are now lagoons. Dyers Slough, located in the central portion of the wetland, forms a complex of lagoons as it empties into Green Bay.

Historically much of the wetland was inundated, including large tracts of sedge, shrub carr and upland trees. Extremely dense colonies of coontail (*Ceratophyllum demersum*) and pondweeds (*Potamogeton spp.*) were present. Some important reptiles and amphibians were also historically found at this site, including the wood turtle (*Clemmys insculpta*) and Blanding's turtle (*Emydoidea blandingi*).

According to the USFWS report (Herendorf et. al. 1981), the Peshtigo River is either polluted or adversely affected by pollution from upstream discharges of sludge deposits, filamentous slimes, and algae growths which limit dissolved oxygen levels. The effects from this pollution on the wetland are unknown. Seiches cause irregular water level fluctuations, which are large enough to have an impact on the wetland. This activity influences the extent and type of vegetation as well as wildlife habitat. The pollution from Green Bay may be reflected in the wetland, especially during high water periods.

This wetland is very desirable habitat for waterfowl, gulls and tern, and shorebirds – and is a very important staging, nesting and migratory stopover site. Several colonial nesting birds occupy the mouth of Peshtigo River, such as green herons (*Butorides striatus*) and the black tern (*Chlidonias nigra*). This site is important to migrating and nesting songbirds, especially the sedge meadow and floodplain forest. The bald eagle (*Haliaeetus leueocephalus*), peregrine falcon (*Falco peregrinus*), and osprey (*Pandion haliaetus*) occur here during migration, and eagles next in the site. Forster's and common terns (*Sterna forsteri, S. hirundo*) nest in this wetland. The red-shouldered hawk (*Buteo lineatus*) is a summer resident here. The habitat is also desirable for furbearers and trapping is an important recreational activity in the wetlands. The wood turtle (*Clemmys insculpta*) is present, but rare along the lower section of the Peshtigo River.

Ownership is mixed state and private; private ownership is primarily concentrated around the periphery of the wetland. Development pressure is low to medium. However, the area receives a multiplicity of recreation uses, such as hunting, fishing and trapping, and in summer some boating use. Logging has occurred periodically in the floodplain forests bordering the river above the marsh and meadow complex.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. Most of the element occurrence records are outdated.

Rare Elements of Lower Peshtigo River, Marinette County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Anguilla rostrata	American eel	1974	1
Buteo lineatus	Red-shouldered hawk	1987	1
Cakile edentula	American sea-rocket	1982	2
Chlidonias niger	Black tern	1988	1
Coturnicops noveboracensis	Yellow rail	1985	1
Deschampsia flexuosa	Crinkled hairgrass	1975	2
Eleocharis quinqueflora	Few-flower spikerush	1937	1
Equisetum variegatum	Variegated horsetail	1999	1
Floodplain Forest	Floodplain Forest	1987	1
Haliaeetus leucocephalus	Bald Eagle	1990	1
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1987	4
Pandion haliaetus	Osprey	1990	2
Rana catesbeiana	Bullfrog	1985	1
Sterna forsteri	Forster's tern	1976	1
Sterna hirundo	Common tern	1988	1
Viburnum cassinoides	Northern wild-raisin	1976	1

LM# 17 MUD CREEK WETLAND

Report Source: #1
County: Oconto County

Site Description

Mud Creek Wetland is located approximately 200 feet from the western shore of Green Bay and is roughly 30 acres in size. Fluctuations in water level caused by seiches have an impact on Mud Creek Wetland – fluctuations can determine whether or not the wetland is either submerged or exposed. This influences the type of vegetation found there as well as extent of wildlife habitat.

The wetland has been historically classified as desirable for songbirds, ruffed grouse (*Bonasa umbellus*), waterfowl, gulls, terns, and shorebirds. The area surrounding Mud Creek Wetland historically had moderate numbers of passerine birds during spring migration, including warblers, sparrows, viroes, thrushes, flycatchers, and finches. Autumn migration is more diffuse and is frequently augmented by many raptors, including the peregrine falcon (*Falco peregrinus*), bald eagle (*Haliaeetus leucocephalus*) and the osprey (*Pandion haliaetus*).

The rural nature of the area suggests that the wetland is subject to low development pressures.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Mud Creek Wetland, Oconto County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Euphyes dion	Dion skipper	1981	1
Lepomis megalotis	Longear sunfish	1975	1
Lythrurus umbratilis	Redfin shiner	1975	1
Myotis septentrionalis	Northern myotis	1980	2
Poanes massasoit	Mulberry wing	1981	1

LM# 18 NORTHEAST COAST DOOR COUNTY AREA

(North Bay, Ephraim Swamp, Bailey's Harbor Swamp, Moonlight Bay, Kangaroo Lake, Toft Point, Mud Lake Wildlife Area, The Ridges Santuary, Thorp Pond)

Report Source: #1, #2, #5, #7 (The Nature Conservancy, State Natural Areas files)
County: Door County

Site Description

This site encompasses on the northeastern coast of Door County. There are several important coastal wetland sites located within this larger site boundary, described below.

Moonlight Bay Bedrock Beach State Natural Area is located north of Bailey's Harbor. The primary feature of this site is the dolomite bedrock beach, which is periodically covered and exposed, depending on Lake Michigan water levels. When exposed, the beach is colonized by many plants indicative of these calcareous and dynamic shorelines including such rare species as small fringed gentian, tufted hair grass and several sedges. Ancient shorelines are present as ledges in the forested portions of the site. The forest is typical of northeastern Door County with white cedar, white spruce, paper birch, white pine, hemlock and balsam fir. Common understory plants are thimbleberry and mountain maple. The groundlayer is sparse, with mosses and lichens predominating.

Mud Lake State Natural Area is a shallow, hard drainage lake surrounded by an extensive shrub and timber swamp. The bottom is predominantly marl, although dolomite bedrock is found in some areas. There are many old snags present. Water levels fluctuate with seasonal precipitation. Aquatic plants are most diverse in the outlet stream and include bur-reed, coontail, pondweeds and wild rice. In the lake are softstem bulrush, yellow water lily, giant reed, and cattail. The plants under the old snags are sweet gale, dogwood, and willows. Reibolts Creek, which runs from Mud Lake to Lake Michigan, has been stocked with trout and supports a trout spawning run. Waterfowl use is occasionally heavy. Nesting has been confirmed for pied-billed grebe, American bittern, common golden eye, mallard, pintail, blue-winged teal, wood duck, and Virginia rail. This site has 2 populations of the federally-endangered Hine's emerald dragonfly.

Toft Point State Natural Area is located east of Bailey's Harbor. It contains several plant communities within a relatively short distance. The vegetation of the eastern shoreline, influenced by the cooling effects of Lake Michigan, consists of a narrow strip of relict boreal forest dominated by balsam fir and white spruce. The remainder of this peninsula is wooded with a mesic forest of sugar maple, yellow birch, hemlock, and scattered white pine. To the north, along Moonlight Bay, is an extensive sedge meadow that grades into shrub-carr and wet-mesic forest as one goes westward. The wet-mesic forest is dominated by white cedar with occasional paper birch and black ash. The site, along with the adjacent Ridges Sanctuary, contains many area-sensitive bird species including seventeen species of nesting warblers.

The Ridges Sanctuary State Natural Area is located just north of Bailey's Harbor. It encompasses a variety of unusual habitats, resulting in one of the greatest concentrations of rare plants in the Midwest. It consists of a series of Lake Michigan beach ridges forested with black spruce, white spruce, balsam fir, and white pine, with wet swales between the ridges. Swamp conifers occupy some of the swales; others are filled with marsh and bog flora. Portions of the ridges are open, wet and calcareous and support an outstanding assemblage of rare and endangered plants. Parts of the forest can be classified as boreal, far

disjunct from the northwestern Wisconsin boreal forest near Lake Superior. The climate is heavily influenced by Lake Michigan. Cooler springs and summers, warmer falls and winters, and reduced evaporation rates have allowed northern species to thrive. This site has the largest known population anywhere of the federally-endangered Hine's emerald dragonfly.

Baileys Harbor Swamp and Ephraim Swamp merge to form a wetland corridor which almost completely bisects the upper Door Peninsula. The southern portions of the wetlands lies adjacent to Baileys Harbor; this area consists of parallel, abandoned beach ridges and swales of former Lake Michigan levels. Some of these swales are wet and open, while others are forested with swamp conifers. This site is threatened by development and fragmentation.

The **North Bay** site covers approximately 4,700 acres and about 8,500 feet of frontage along North Bay, and represents a significant stretch of undeveloped Lake Michigan shoreline. This site contains several high quality wetland communities associated with the Lake Michigan shoreline. These include emergent aquatic communities; a northern sedge meadow, and a large calcareous fen community inland from the sedge meadow. Further inland the site contains extensive tracts of northern wet to mesic forest, which intergrades with a forest community with boreal components. Many shallow, cold hard water springs and spring runs also originate within the boundaries of the project site. The major spring fed stream, Three Springs (or Nick's) Creek drains through the center of the project emptying into Lake Michigan through a large emergent marsh to the north end of the bay. This marsh is dominated by soft and hard stemmed bulrush, cattail and bluejoint grass. The North Bay area contains a significant breeding population of the federally-endangered Hine's emerald dragonfly (*Somatochlora hineana*), as well as other rare dragonflies. Other rare animals include the dorcas copper butterfly (*Lycaena dorcas*) and the osprey (*Pandion haliaetus*). Important plant species identified from the site include the federally threatened dwarf lake iris (*Iris lacustris*), showy lady's slipper orchid (*Cypripedium reginae*), white bog orchis (*Platanthera dilitata*), and slender bog arrow grass (*Triglochin palustre*). North Bay is also an important spawning site for many fish. Possible threats include ATV use, introduction or spread of invasive species, and development.

Thorp Pond and part of Kangaroo Lake are two ecologically important areas not within the primary coastal wetland site boundary (proper), but adjacent to it.

Kangaroo Lake (including Meridian County Park on its south end) and Peil Creek. Kangaroo Lake is an embayment by sand deposition and dune formation caused by receding lake levels and regional post-glacial land rebound, and is a shallow, marl bottom basin with a high pH and calcium bicarbonate rich water. Set within a matrix of agricultural, residential, and forest land, it has significant natural communities and rare species associated with both its north and south ends. At the north end are wetlands, including a Northern Sedge Meadow or open herb/shrub wetland that includes a mix of plant species characteristic of fens, sedge meadows, marshes, and shrub-carrs. Calciphilic plants including shrubby cinquefoil, hoary and bog willow, twig-rush and wire-leaved sedges are present and may be locally dominant, as may be giant reed. The meadow is bordered by a conifer swamp of white cedar and tamarack towards the uplands. The northernmost basin of the lake is shallow and filled with emergent and floating-leaved macrophytes (Emergent Aquatic community) including hard-stemmed bulrush, wild rice, and bullhead lily. In addition, several rare invertebrates occur in this wetland and have been documented in Piel Creek. Just west of the north end of the lake are dolomite outcrops with rare land snails.

On the south end of Kangaroo Lake is a complex of old beach ridges and dunes, now wooded with a 140-acre Northern Mesic Forest with old-growth characteristics although there has been some select cutting. Dominant trees are hemlock, sugar maple, and yellow birch; also present are beech, red maple, white cedar and a few super-canopy white pines. There is a dense shrub layer of Canada yew that exceeds 50% in parts of the stand. Mountain maple may also be common, but there are only a few species such as

clubmosses, wood ferns, and Canada mayflower in the herb layer. This mesic forest type – on a stabilized lake sand dune – is quite rare in Wisconsin.

Bald eagles, osprey, and Caspian terns often feed on the lake, and historically black terns have nested in the marshes of the lake. The marshes of the north end are also important breeding and migration staging sites for diving and puddle ducks and shorebirds. There is significant threat from the construction of single family units on the developable forest and lakeshore lands within the project site. Residential unit construction with associated road and utility construction is the major cause of habitat loss, habitat fragmentation and possible alteration to the hydrology. Inappropriate logging and recreational vehicle use are moderate threats.

Thorp Pond is a 312-acre, privately-owned complex of wetland communities in the interior of the Door Peninsula, set in a matrix of agriculture, residential, and recreational land, on thin soils over dolomite bedrock. At the center of the complex is a small seepage pond only a few acres in size. It has a narrow ring of tall shrubs, coarse sedges, and white cedar saplings. This is surrounded, particularly on the north side, by a small (7-acre) but exceptionally floristically significant Boreal Rich Fen of tussock sedges separated by muck pockets with pitcher plant, bladderworts, and buckbean. There are five species of rare plants present here.

Surrounding the pond and fen is a 248-acre Northern Wet-Mesic Forest dominated by medium-sized white cedar, tamarack, black spruce, and black ash – all but the tamarack are reproducing. The understory includes native swamp buckthorn, red-osier dogwood, an herbs such as goldthread and lady's-slippers. The site has a history of logging and perhaps grazing, but interior has recovered well.

Associated with the wet-mesic forest is a 57-acre Hardwood Swamp dominated by green ash and red (or hybrid red x silver) maple; the best patches have trees 9-15"in diameter. Characteristic understory herbs here include marsh, cinnamon, and royal ferns, and water-parsnip. A rare bird was present in 1994-1995.

Rare Elements of Northeast Coast Door County Area, Door County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Aeshna clepsydra	Mottled darter	1991	1
Adlumia fungosa	Climbing fumitory	1973	1
Amerorchis rotundifolia	Round-leaved orchis	1985	1
Asplenium trichomanes	Maidenhair spleenwort	1977	1
Astragalus neglectus	Cooper's milkvetch	1999	1
Boreal Forest	Boreal Forest	1989	6
Botaurus lentiginosus	American bittern	1998	1
Botrychium lunaria	Moonwort Grape-fern	1997	2
Botrychium spathulatum	Spoon-leaf moonwort	1982	1
Cakile edentula	American sea-rocket	1982	1
Calamagrostis stricta	Slim-stem small-reedgrass	1961	2
Calamintha arkansana	Low calamint	1982	6
Calypso bulbosa	Fairy slipper	1973	1
Cardamine pratensis	Cuckooflower	1998	3
Carex capillaris	Hair-like sedge	1965	2
Carex concinna	Beautiful sedge	1987	2
Carex crawei	Crawe sedge	1973	1
Carex garberi	Elk sedge	1961	3
Carex gynocrates	Northern bog sedge	1957	1

Rare Elements of Northeast Coast Door County Area, Door County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Carex livida var radicaulis	Livid sedge	1995	1
Carex vaginata	Sheathed sedge	1981	1
Catinella exile	Pleistocene catinella	1995	1
Chromagrion conditum	Aurora damselfly	1991	1
Cordulegaster obliqua	Arrowhead spiketail	1990	1
Cypripedium arietinum	Ram's-head lady's-slipper	1992	1
Cypripedium parviflorum	Small yellow lady's-slipper	1999	2
Cypripedium reginae	Showy Lady's-slipper	1998	1
Deschampsia cespitosa	Tufted hairgrass	1950	2
Drosera linearis	Slenderleaf sundew	1995	1
Eleocharis quinqueflora	Few-flower spikerush	1965	1
Emergent Aquatic	Emergent Aquatic	1994	1
Epiaeschna heros	Swamp darner	1993	2
Epilobium palustre	Marsh willow-herb	1983	1
Equisetum palustre	Marsh horsetail	1983	1
Equisetum variegatum	Variegated horsetail	1994	2
Euphorbia polygonifolia	Seaside spurge	1934	1
Euphyes bimacula	Two-spotted skipper	1982	1
Euphyes dion	Dion skipper	1990	1
Festuca occidentalis	Western fescue	1977	2
Fundulus diphanus	Banded killifish	1965	1
Gentianopsis procera	Lesser fringed gentian	1994	5
Geocaulon lividum	Northern comandra	1954	1
Glyphyalinia wheatleyi	Bright glyph	1995	1
Great Lakes Alkaline Rockshore	Great Lakes Alkaline Rockshore	1992	6
Gymnocarpium robertianum	Limestone oak fern	1940	1
Hendersonia occulta	Cherrystone drop	1995	1
Iris lacustris	Dwarf lake iris	1998	15
Ischnura hastata	Citrine forktail	1991	1
Lake-shallow, hard, drainage	Lake-shallow, hard, drainage	1985	1
Lestes eurinus	Amber-winged spreadwing	1992	1
Malaxis brachypoda	White adder's-mouth	1986	2
Northern Mesic Forest	Northern Mesic Fores	1998	1
Northern Sedge Meadow	Northern Sedge Meadow	1998	5
Northern Wet Forest	Northern Wet Forest	1976	1
Northern Wet-Mesic Forest	Northern Wet-Mesic Forest	1976	5
Open Bog	Open Bog	1976	1
Ophioglossum vulgatum	Adder's-tongue	1950	1
Orobanche uniflora	One-flowered broomrape	1954	1
Paravitrea multidentata	Dentate Supercoil	1997	2
Parnassia parviflora	Small-flower grass-of-parnassus	1995	3
Platanthera dilatata	Leafy white orchis	1998	1
Platanthera hookeri	Hooker orchis	1983	1
Platanthera orbiculata	Large roundleaf orchid	1983	1
Primula mistassinica	Bird's-eye primrose	1994	4
Pterospora andromedea	Giant pinedrops	1968	2
Ribes hudsonianum	Northern black currant	1983	1
Scirpus cespitosus	Tufted club-rush	1995	1
Scirpus cespitosus var callosus	Tussock bulrush	1997	2

Rare Elements of Northeast Coast Door County Area, Door County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Selaginella selaginoides	Low spike-moss	1994	1
Solidago ohioensis	Ohio goldenrod	1994	1
Solidago simplex var gillmanii	Sticky goldenrod	1988	1
Somatochlora elongata	Ski-tailed emerald	1990	1
Somatochlora franklini	Delicate emerald	1991	1
Somatochlora hineana	Hine's emerald dragonfly	1996	10
Springs and spring runs, hard	Springs and spring runs, hard	1976	1
Striatura ferrea	Black striate	1997	1
Triglochin maritimum	Common bog arrow-grass	1998	1
Triglochin palustre	Slender bog arrow-grass	1998	2
Trisetum melicoides	Purple false oats	1997	1
Vertigo elatior	Tapered vertigo	1995	1
Vertigo hubrichti	Midwest Pleistocene vertigo	1997	3
Vertigo iowaensis	Iowa Pleistocene vertigo	1997	1
Viola rostrata	Long-spurred violet	1975	1
Vitrina limpida	Transparent vitrine snail	1995	1

LM# 19 OCONTO MARSH

Report Source: #1
County: Oconto County

Site Description

Oconto Marsh is a large wetland on the western shoreline of Green Bay. The Oconto River flows through it, and the southern portion of the wetland surrounds the river mouth. Oconto Marsh lies adjacent to Green Bay and much of the wetland is influenced by Lake Michigan water levels. Most of the wetland is emergent marsh, especially around the delta. The wetland features low beach ridges and swales. Abandoned oxbows and meanders of the Oconto River lie within the wetland near the river's delta. Fluctuations in water levels caused by seiches are large enough to have an impact on the vegetation and wildlife habitat of Oconto Marsh. Water quality may be adversely impacted by pollution from Green Bay.

According to the USFWS report (Herendorf et. al. 1981), endangered reptiles and amphibians are present on the marsh, as are several endangered birds. The marsh is an important breeding area for marsh birds and focal point for migrating waterfowl and shore birds. It is the largest wetland remaining on lower Green Bay and is important to many species that have been forced to abandon traditional habitat in the southern part of the bay because of high water levels, filling, and pollutants. In 1996, 162 Forester's Tern nests were washed out; the adults migrated to Pensaukee Dredge Spoil Island. The next year (1997) 35-45 pairs nested in cattail stands, but by early June only 3 nests were found. In 1998, 50-60 nested in cattail stands however none were observed in 1999.

Discharge into the Oconto River may adversely affect the marsh. Development pressure on the Oconto Marsh vary greatly within the wetland. There are several private inholdings. Much of the Oconto Marsh is within the Green Bay Shores Wildlife Area and receives a multiplicity of recreational uses.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated, and the data for avifauna, reptiles, and amphibians needs to be incorporated into the Biological Conservation Database (BCD).

Rare Elements of Oconto Marsh, Oconto County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Coturnicops noveboracensis	Yellow rail	1990	1
Emergent aquatic	Emergent aquatic	1981	1
Nycticorax nycticorax	Black-crowned night-heron	1977	1
Rana catesbeiana	Bullfrog	1995	1
Sterna caspia	Caspian tern	1985	1
Sterna forsteri	Forster's Tern	1997	2
Sterna hirundo	Common tern	1985	1

LM# 20 PENSAUKEE RIVER WETLAND COMPLEX

Report Source: #1, #2
County: Oconto County

Site Description

The Pensaukee River Wetland Complex is located near the mouth of the Pensaukee River on Green Bay shore of Oconto County and is approximately 500 acres in size. The wetlands are adjacent to the Lake Michigan shoreline. Water level fluctuations caused by seiches considerably alter the size of the wetlands in the area. Runoff in the Pensaukee River drainage basin is heavy and may cause significant amounts of suspended solids to enter the River, the effect on the wetland is unknown.

The area is desirable to songbirds, gulls and terns, and shorebirds. The Pensaukee Wildlife Area lies within the boundary. This wetland complex also provides excellent habitat for mammals. Historical records indicate the presence of endangered or threatened reptiles and amphibians. The peregrine falcon (*Falco peregrius*), bald eagle (*Haliaeetus leucocephalus*), and the osprey (*Pandion haliaetus*), have been observed here during migration, and the bald eagle and osprey historically nested here but no longer do. The Common Tern, once abundant in this locality, clearly suffered from high water levels and predation; 136 breeding pairs lost half of the 96 nests that a storm washed out in 1994. Thirty four chicks were banded that year and 45 more observed in August, for an estimated total of 70-75 fledged chicks that year (1994). In 1996, 108 nests were observed to suffer from the high water as well as mink predation: no young fledged that year, even with a peak nesting pair number recorded at 162. By 1997, only 75 pairs (70 nests with eggs, 5 nest scrapes) were found and 16 young fledged. It was estimated that by this year, approximately 65% of tern habitat was lost due to erosion. The next year (1998) 26 nests in the sand were found and only 2-3 young fledged, and by 1999 the 12 nests in the sand were entirely predated by mammals. One hundred and fifty Forster's Tern also attempted to nest in the area in 1996, however predation by mink and high water levels prevented any young to be hatched. There are no further records of the Forster's Tern in this area after 1996.

The southern portion of the Pensaukee River wetland is under state ownership, the remainder is under private ownership. These privately owned areas are subject to low to moderate development pressures. There is significant recreational uses of the wetland, such as hunting, fishing and trapping. In summer there is some boating and in winter snowmobiling and cross-country skiing.

Historically a fish reduction plant which produced excess process liquid wastes and sanitary sewage were dumped into a shallow holding pond near or located on the Pensaukee River Wetlands. It is not known if this plant is still in operation, and it's impact on the wetland.

In 1998 a study of wetlands used by spawning northern pike (*Esox lucius L.)* was completed by the Department of Natural Resources for the Pensaukee River Watershed, which is part of this site. This site is an important northern pike spawning grounds, and pike will travel several kilometers upstream to spawn. Reproduction in wetlands along the Pensaukee River is a likely principle source of recruitment for fish populations in Green Bay (Schuette and Rost, 1998).

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Pensaukee River Wetland Complex, Marinette County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Calephelis muticum	Swamp metalmark	1978	1
Clemmys insculpta	Wood turtle	1995	1
Lepomis megalotis	Longear sunfish	1975	1
Medeola virginiana	Indian cucumber-root	1978	2
Moxostoma valenciennesi	Greater redhorse	1976	1
Nycticorax nycticorax	Black-crowned night-heron	1977	1
Ophioglossum vulgatum	Adder's-tongue	1956	1
Platanthera flava var herbiola	Pale green orchid	1981	1
Poanes massasoit	Mulberry wing	1993	1
Poanes viator	Broad-winged skipper	1993	1
Podiceps grisegena	Red-necked grebe	1993	1
Sterna caspia	Caspian tern	1985	1
Sterna hirundo	Common tern	1985	1
Viburnum cassinoides	Northern wild-raisen	1969	1

LM# 21 POINT BEACH AREA

(Wilderness Ridge, Twin River Marsh, Woodland Dunes, Wet-Mesic Woods, Point Beach Ridges, Northern Molash Swamp, East Twin River, West Twin River)

Report Source: #2, #6
County: Manitowoc County

Site Description

There are several smaller sites located within the site boundary of Point Beach Area. Altogether these sites form a very important coastal wetland complex in Manitowoc County, with significant portions under state ownership.

Wilderness Ridge State Natural Area is located within Point Beach State Forest. It is a T-shaped area located on the north-south ridges of sand formed underwater during the later post-glacial states of Lake Nipissing. A fairly rapid fall in lake level permitted the ridges to exist without going through the leveling erosional processes. Similar ridges are still being formed offshore in Lake Michigan's breaker zone. The north-south transect (66 feet wide) follows a ridge wooded with red and white pines, hemlock, sugar maple, red maple, and yellow birch. Common groundlayer species along the ridge include bluebead lily, wintergreen, starflower, Canada mayflower, goldthread, and trailing arbutus. The east-west transect (66 feet wide) crosses the ridge-swale topography. Four of the swales are sedge meadows, filled with more than 28 species of sedges and many species of grasses. The swale edges have a narrow, nearly impenetrable zone of shrubs.

Point Beach Ridges State Natural Area is located north of the city of Two Rivers within Point Beach State Forest. It contains an excellent example of lake dunes and ridge and swale topography and vegetation which parallel the Lake Michigan shoreline. Except for a strip of dunes and beach along the lake, the area is forested with a variety of conifers and hardwoods. A range of successional stages is exhibited, varying from shifting sand to open swales and wooded ridges. The 11th swale from Lake Michigan is lightly forested with black ash and tamarack, and the 9th ridge has white pine, hemlock, white cedar, and yellow birch. Ridges 8 to 5 have more red maple and white birch. The transition to a sandier, drier, and sunnier environment continues to the east. Ridge 2 is stabilized by junipers, bearberry, and a host of sand plants. Ridge 1 and the sand beach east of it are vegetated with the unique and specialized flora of coastal beaches, undisturbed examples of which are rare.

Twin River Marsh is one of the larger river marshes (roughly 80 acres) along Lake Michigan. The area is dominated by sedges and cattails with some shrub-carr. Some infringements by the city and local farmers are taking place (dumping, filling, and drainage). This marsh is an excellent stopover for many species of birds. Timber on the north edge has been completely cut producing birch and shrub-carr. Some areas are being grazed. This site is privately owned.

Woodland Dunes is a forested tract containing ridges and former glacial lakes levels, lying 10-20 feet above Lake Michigan's present level. The ridges are wooded with scattered hemlock and pine with aspen. Small elm, cedar, and brush are present in lowlands. This is an important stopping place for a variety of migratory birds. Several maintained trails and boardwalks provide access to a variety of habitat variations and facilitate local educational use and nature implementation. It is approximately 700 acres in size.

The **Wet Mesic Woods (Forest)** was cut long ago, and there is infringement by housing. It does retain characteristics of a hemlock-yellow birch forest. The floor of the woods contains cradle knolls and many small ephemeral ponds. It is approximately 100 acres in size.

The following sites are also found within the larger site boundary of the Point Beach Area. They were identified exclusively in the Manitowoc report. They include:

Northern Molash Swamp is located north of the Point Beach area and is a barrier/lagoon system. The vegetation types in this wetland include unclassified mosaic, mixed hardwoods/conifer/shrub canyon, slope cedar swamp, sedge meadow, and depressional cedar swamp. According to the Manitowoc report's classification system, the wetland rated high in stormwater retention and medium to high in water quality. It also rated medium to high in floral diversity, human use, and wildlife habitat.

West Twin River is located south of the Point Beach State Forest. The wetland borders a river with vegetation communities including sedge meadow and slope cedar swamp. It has a high rating for wildlife habitat and medium to high rating for human use. It has mostly high water quality ratings and a high natural hydrology. It rated medium for floral diversity.

East Twin River is also located southwest of Point Beach State Forest. It is a riverine system bordered by communities of sedge meadow and slope cedar swamp. It has a high rating for natural hydrology, medium floral diversity and stormwater retention, and high wildlife habitat. It has a medium rating for human use.

Future Needs and/or Gaps

The element occurrence records are generally outdated.

Rare Elements of Point Beach Area, Manitowoc County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Arethusa bulbosa	Swamp-pink	-	1
Buteo lineatus	Red-shouldered hawk	1977	2
Cakile edentula	American sea-rocket	1990	3
Calamagrostis stricta	Slim-stem small-reedgrass	1959	1
Calamovilfa longifolia var magna	Sand reed-grass	1979	4
Cardamine pratensis	Cuckooflower	1978	1
Charadrium melodus	Piping Plover	1975	1
Cirsium pitcheri	Dune thistle	1994	1
Cypridedium reginae	Showy lady's-slipper	1885	1
Elymus lanceolatus spp psammophilus	Thickspike	1996	2
Emergent aquatic	Emergent aquatic	1976	1
Euphorbia polygonifolia	Seaside spurge	1994	3
Forested ridge and swale	Forested ridge and swale	1994	1
Great Lakes Beach	Great Lakes Beach	1987	1
Lake Dune	Lake Dune	1987	1
Malaxis brachypoda	White adder's-mouth	-	1
Medeola virginiana	Indian cucumber-root	1960	1

Rare Elements of Point Beach Area, Manitowoc County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Moxostoma valenciennesi	Greater redhorse	1989	3
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1976	1
Northern Mesic Forest	Northern Mesic Forest	1976	2
Nycticorax nycticorax	Black-crowned night heron	-	1
Orobanche fasciculata	Clustered broomrape	1979	2
Ranunculus cymbalaria	Seaside crowfoot	-	1
Salix cordata	Sand dune willow	1994	2
Tofieldia glutinosa	Sticky false-asphodel	1911	1
Triglochin maritimum	Common bog arrow-grass	1978	1
Triglochin palustre	Slender bog arrow-grass	1977	1
Tyto alba	Barn owl	1975	1

LM# 22 POINT CREEK

Report Source: #6
County: Manitowoc County

Site Description

This wetland was identified as a high priority site for Manitowoc County (Water Resources Management Graduate Students, 1998). It includes several smaller patches, roughly encompassing 20 acres. These sites are described as "coastal canyons". Coastal canyons are described as small, canyon-like wetlands which occur along the major perennial streams in the area. These canyons are complex and contain bluff face seeps and gullies. Coastal canyons occur primarily along the southern shore of Lake Michigan due to the large difference between the elevation of the lake and the adjacent shore, which is over 60 feet in some areas. As the drainage network developed after the retreat from the Nipissing lake level, major downcutting created the high bluffs on stream edges. The canyons vary widely in topography, and some contain remnants of other coastal features such as interdunal and ridge and swale wetlands. Other vegetation communities include mixed hardwoods/conifer/shrub canyon, and unclassified mosaic.

Point Creek was rated medium to high for floral diversity and natural hydrology, mostly low for water quality and stormwater retention. The wetlands received a high rating for groundwater interaction and medium to high for wildlife habitat. Human use was rated mostly medium.

Rare Elements of Point Creek, Manitowoc County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Cakile edentula	American sea-rocket	1987	1
Calamovilfa longifolia var magna	Sand reed-grass	1987	1
Hendersonia occulta	Cherrystone drop	1997	1
Sorex hoyi	Pigmy shrew	1987	1
Vertigo elatior	Tapered vertigo	1997	1

LM# 23 POINT AU SABLE

Report Source: #1
County: Brown County

Site Description

Point au Sable is located on the western shoreline of the Door Peninsula and is 112 acres in size. The wetland is inside a hook-shaped peninsula. The primary wetland community is an emergent marsh comprised mostly of cattails and giant reed. It has been considerably altered by fluctuations in the Green Bay water levels. A stream flows through the wetland, and there are many areas of open water. Extent of marsh vegetation varies with water level changes. These water level fluctuations are an integral part of the wetland ecology of Green Bay.

Lower Green Bay has a history of being heavily polluted. The extent to which this affects Point au Sable is unknown. The area has historically supported a rich diversity of bird life, such as black terns (*Chlidonias nigra*) and Forster's terns (*Sterna forsteri*), and the piping plover (*Charadrius melodus*). Waterfowl still heavily uses this wetland area for nesting and as a migration stopover.

Dumping of industrial and other wastes formerly occurred offshore.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are fairly outdated.

Rare Elements of Point au Sable, Brown County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Cakile edentula	American sea-rocket	1988	1
Emergent Aquatic	Emergent Aquatic	1999	1
Migratory Bird Concentration Site	Migratory Bird Concentration Site	1988	1
Moxostoma valenciennesi	Greater redhorse	1976	1

LM# 24 RED BANKS GLADES

Report Source: #7 (Niagara Escarpment Inventory)
County: Brown County

Site Description

Red Banks Glades is located in northeast Brown County. It is approximately 400 acres in size and represents an unusual and unique association of communities in Wisconsin. In fact, it is Wisconsin's only example of an alvar community and owes its origins to Great Lakes processes. The glades are about 2½ miles in length by a quarter to three-quarters of a mile in width. The site is perched on top of the Niagara Escarpment on exposed dolomite, or on very thin soil over dolomite. The glades are inundated with water at some points in the year and at other times are prone to drought, and harbor unique species only associated with this community type. It is privately owned with much disturbance and fragmentation, although it is rather intact and of high quality. It is separated from adjacent communities by several roads, Highway 57, a powerline ROW, two tracks, residences and businesses.

The dominant community is a closed canopy dry forest of bur oak, shagbark, red cedar, and aspen with small scattered openings with prairie-savanna species. These openings, roadsides, powerline ROW, and to a certain extent the abandoned agricultural lands, support a prairie-savanna community with big bluestem, little bluestem, Indiangrass, bluegrass, Dyer's weed, stiff goldenrod, heath aster, sky blue aster, smooth brome, Richardson sedge, craw sedge, and yellowish gentian. Shrubs which occur in both closed canopy and open areas include gray dogwood, common buckthorn, exotic honeysuckle, New Jersey tea, common juniper, snowberry, and perfumed cherry. An interesting form of this community occupies abandoned pasture and consists of an open savanna of scattered red cedars with bluegrass, a smattering of prairie species, and some herbaceous exotics. At least three rare plants occur here, including the yellowish gentian (*Gentiana flavida*), craw sedge (*Carex crawei*), and Richardson sedge (*Carex richardsonii*).

Cedar, hackberry, red elderberry, and oak occur in the forest surrounding these rock formations. The escarpments are multi-level and the uppermost near the parking areas are primarily nonvegetated except for occasional ferns including walking fern. These rocks likely endure climbers regularly. The trails were well worn between the cliffs. There is high to medium insect diversity, and good diversity across taxa such as Pseudoscorpions, jumping bristletails, both millipedes and centipedes and cave crickets. There is less diversity among surface/duff dwellers (beetle families). Redback salamanders are found here. The alien orchid species *Epipactis helleborine* was observed to be common at this site.

This site faces considerable development pressures, most notably the proposed reconstruction of Highway 57 through the site.

Rare Elements of Red Banks Glades, Brown County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Adlumia fungosa	Climbing fumitory	1994	3
Aeshna verticalis	Green-striped darner	1999	1
Alvar	Alvar	1996	3
Cardamine pratensis	Cuckooflower	1982	1
Carex crawei	Crawe sedge	1999	3

Rare Elements of Red Banks Glades, Brown County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Carex formosa	Handsome sedge	1994	3
Carex richardsonii	Richardson sedge	1993	3
Catinella gelida	A land snail	1995	1
Cypripedium parviflorum	Small yellow lady's-slipper	1993	5
Erynnis martialis	Mottled dusky wing	1985	3
Euphyes dion	Dion skipper	1984	1
Forested Ridge and Swale	Forested Ridge and Swale	1996	1
Gentiana alba	Yellow gentian	1999	4
Glyphyalinia rhoadsi	Sculpted glyph	1995	1
Guppya sterkii	Brilliant granule	1995	1
Gymnocarpium robertianum	Limestone oak fern	1993	1
Hendersonia occulta	Cherrystone drop	1997	5
Iris lacustris	Dwarf lake iris	1993	5
Lepomis megalotis	Longear sunfish	1973	1
Moist cliff	Moist cliff	1982	1
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1982	1
Northern Mesic Forest	Northern Mesic Forest	1982	1
Paravitrea multidentata	Dentate supercoil	1997	3
Poanes massasoit	Mulberry Wing	1984	1
Poanes viator	Broad-winged skipper	1984	1
Southern Mesic Forest	Southern Mesic Forest	1996	1
Strobilops affinis	Eightfold pinecone	1995	2
Succinea "bakeri"	A land snail	1996	3
Vertigo elatior	Tapered vertigo	1995	1
Vertigo hubrichti	Midwest Pleistocene vertigo	1996	5
Vertigo iowaensis	Iowa Pleistocene vertigo	1997	3

LM# 25 RENARD SWAMP AREA

Report Source: #5
County: Door County

Site Description

Renard Swamp Area is located on the southwestern side of Door County, adjacent to Lake Michigan. This site contains a significant southern hardwood swamp, with beach ridges (wet-mesic). Yew is present on the ridges just north of Shoemacher Point. There is a high diversity of species, however, there are significant impacts from agriculture on Renard Creek.

Future Needs and/or Gaps

There is relatively little information available about this site. There are no element occurrence records to date. However, some elements may be discovered during inventory work on the Niagara Escarpment. This site is threatened by development and inventory work should be a priority.

LM# 26 SEAGULL BAR

Report Source: #1, #2, #7 (State Natural Area files)
County: Marinette County

Site Description

Seagull Bar is a sand spit and marsh of 120 acres on the margin of Green Bay off Marinette County. The spit shelters a lagoon and a large area of shallow water with emergent vegetation. The eastern edge of Seagull Bar is a system of sand ridges and low dunes resulting from wave action and sand deposition. The rich dune flora includes marram grass, Canada rye, beach pea, and several rush species in wetter areas. The remainder of the area consists of mud flats and emergent marsh. Acreage of the emergent beds is always changing due to the bay's water level fluctuations. During some spring and fall migrations, shorebirds by the thousands congregate here. The lagoon area in particular is attractive to waterfowl. Small passerines are "trapped" occasionally by unfavorable weather conditions and then are seen in large numbers searching the flotsam. This site is threatened by recreational overuse and the spread of invasive species.

Rare Elements of Seagull Bar, Marinette County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Cakile edentula	American sea-rocket	1999	3
Chlidonias niger	Black tern	1978	2
Emergent aquatic	Emergent aquatic	1990	3
Great Lakes Beach	Great Lakes Beach	1990	1

LM# 27 SENSIBA WILDLIFE AREA

Report Source: #2
County: Brown County

Site Description

Sensiba Wildlife Area is located on the western coast of lower Green Bay in northern Brown County, directly north of Long Tail Point. It is 240 acres in size and currently under state ownership. Although ditched and diked, this area has historically provided significant nesting area for black terns, little gulls, Forster's terns, and waterfowl. More recent colonial bird studies indicate that the Forster's Tern has scarcely bred in the area: 2-3 pairs nested (1995), no nesting observed (1996), 2-3 pairs nested (1997), and none reported (1998 and 1999).

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. The element occurrence records are outdated.

Rare Elements of Sensiba Wildlife Area, Brown County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Botrychium oneidense	Blunt-lobed grape-fern	1980	1
Dryopteris filix-mas	Male fern	1977	1
Medeola virginiana	Indian cucumber root	1978	1
Nycticorax nycticorax	Black-crowned night-heron	-	1
Platanthera flava var herbiola	Pale green orchid	1883	1
Sterna forsteri	Forster's tern	1985	2

LM# 28 SHIVERING SANDS AREA

(Whitefish Dunes, Kellner's Fen, Shivering Sands, Cave Point County Park)

Report Source: #5, #7 (NHI Staff, The Nature Conservancy)
County: Door County

Site Description

The Shivering Sands Area is located along the eastern coast of Door County. It is a complex and important arrangement of wetland ecosystems. This site is composed of several smaller areas, each described below.

Whitefish Dunes is a State Natural Area located within Whitefish Dunes State Park in Door County. The primary communities on this state natural area are Great Lakes beach and dunes, both stabilized and active; northern mesic forest of sugar maple, American beech, and hemlock on dunes, northern wet-mesic forest of white cedar, balsam fir, and hemlock; and a small lake with associated sedge meadow and frontage on Clark Lake, a baymouth bar lake. The site contains all stages of succession from open beach through mature northern mesic forest. The beach and dune complex contains a rich flora with many species a particularly adapted to this habitat and restricted to Great Lakes coastal areas that are relatively undisturbed. An excellent ground cover of Canada yew is found on the back side and top of the dunes. Common nesting birds include red-eyed vireo, veery, black-throated green and Canada warblers, American redstart, and eastern wood pewee. The endangered Lake Huron locust is found at this site.

The **Shivering Sands** wetlands complex occurs in a botanically unique ecoregion along the northern coast of Lake Michigan. It is an exceptional site both in regards to its physical extent and natural community diversity. It is approximately 6,100 acres in size. The wetland complex includes three undeveloped lakes and associated wetlands. There is a conifer forest growing on thin humic soils over a dolomite limestone base and lowland conifer forest and wetlands on saturated peat soils, mixed with sand dune formations throughout the site. The vegetation is affected by the thermal balance of Lake Michigan, which has fostered a high degree of floristic diversity. The proximity to Lake Michigan prevents sharp changes in temperature, the lake sufficiently retards growth of vegetation to prevent damage by late, killing frost. Similarly, in the fall the warm air from the lake keeps the leaves on the trees for a long period of time, allowing the trees to store surplus food for spring.

The large central white cedar swamp surrounding the three undeveloped lakes forms a core rich in rare plant diversity. Here orchids such as showy lady-slippers (*Cypripedium reginae*) and the rare adder's mouth (*Malaxis momophyllos var. Brachyopoda*) flower amidst the mosses and downed trees. The open fen communities found on the lake edges harbor such rare species as tussock bulrush (*Scirpus cespitosus*) and coast sedge (*Carex exilis*). Dwarf Lake iris (*Iris lacustris*) blooms in the dolomite based upland conifer forest east of the central cedar swamp. An impressive suite of mammals including fisher, otter, black bear, snowshoe hare, porcupine, and mink have been recorded at the site. The site is also home to many breeding birds – all three accipiters (Cooper's hawk, goshawk, and sharp-shinned hawk) have been found here during their breeding season, black terns as well as sandhill cranes are regular breeders on Dune's Lake, and the ridge and swale forest is home to large numbers of Canada warblers and northern water thrushes, among others. A total of 110 species of birds have been recorded on breeding bird surveys from the site.

This site is under significant residential development pressure and threatened by subsequent fragmentation. Other site threats include detrimental logging practices, construction of roads and other corridors, agricultural land conversion, and quarry operations. More minor threats include agricultural practices and recreational overuse.

Kellner's Fen is a complex of fen and open water approximately 60-80 acres in size. The area includes a large fen, a transition zone of wet shrubs and small trees, coniferous swamps and mixed hardwood-conifer swamps. The area south and east of the fen includes forested ridge and swale topography. The matrix vegetation in the fen is composed largely of sedges and one of special concern in Wisconsin. This site is threatened by a serious infestation of the exotic shrub glossy buckthorn. Much of this site is unsuitable for development, but development of the adjacent uplands could alter the hydrology which could have serious negative consequences for the wetlands.

Rare Elements of Shivering Sands Area, Door County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Acris crepitans blanchardi	Blanchard's cricket frog	1983	2
Alder thicket	Alder thicket	1999	2
Arethusa bulbosa	Swamp-pink	1996	1
Boreal Rich Fen	Boreal Rich Fen	1999	1
Botrychium lunaria	Moonwort grape-fern	1985	1
Cakile edentula	American sea-rocket	1979	3
Calamovilfa longifolia var magna	Sand reed-grass	1982	2
Carex crawei	Crawe sedge	1916	1
Carex exilis	Coast sedge	1998	2
Carex gynocrates	Northern bog sedge	1979	1
Cirsium pitcheri	Dune thistle	1999	5
Cypripedium parviflorum	Small yellow lady's-slipper	1933	1
Cypripedium reginae	Showy lady's-slipper	1996	3
Deschampsia flexuosa	Crinkled hairgrass	1929	1
Elymus lanceolatus ssp psammophilus	Thickspike	1982	2
Emergent aquatic	Emergent aquatic	1976	2
Euphorbia polygonifolia	Seaside spurge	1994	2
Forested Ridge and Swale	Forested Ridge and Swale	1997	1
Grammia oithona	Oithona tiger moth	1991	2
Grammia phyllira	Phyllira tiger moth	1991	1
Great Lakes Beach	Great Lakes Beach	1999	1
Gymnocarpium robertianum	Limestone oak fern	1979	1
Hendersonia occulta	Cherrystone drop	1994	1
Iris lacustris	Dwarf lake iris	1979	2
Lake Dune	Lake Dune	1999	1
Lake—shallow, hard, drainage	Lake—shallow, hard, drainage	1986	2
Lake—shallow, very hard, drainage (marl)	Lake—shallow, very hard, drainage (marl)	1988	1
Malaxis brachypoda	White adder's-mouth	1973	1
Malaxis brachypoda	White adder's-mouth	1974	1
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1976	1
Northern Mesic Forest	Northern Mesic Forest	1999	3
Northern Sedge Meadow	Northern Sedge Meadow	1999	2
Northern Wet-Mesic Forest	Northern Wet-Mesic Forest	1999	4
Paravitrea multidentata	Dentate supercoil	1995	2

Rare Elements of Shivering Sands Area, Door County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Platanthera dilatata	Leafy white orchis	1979	1
Platanthera hookeri	Hooker orchis	1916	1
Platanthera orbiculata	Large roundleaf orchid	1979	1
Scirpus cespitosus var callosus	Tussock bulrush	1998	1
Solidago simplex var gillmanii	Sticky goldenrod	1988	4
Somatochlora hineana	Hine's emerald dragonfly	1997	1
Striatura ferrea	Black striate	1995	1
Triglochin maritimum	Common bog arrow-grass	1998	2
Triglochin palustre	Slender bog arrow-grass	1998	1
Trimerotropis huroniana	Lake Huron locust	1988	1
Vertigo hubrichti	Midwest Pleistocene vertigo	1997	2

LM# 29 SILVER-CALVIN CREEKS

Report Source: #6
County: Manitowoc County

Site Description

The Silver-Calvin Creeks site is located on the eastern coast of Manitowoc County. It is a combination of four smaller sites identified in the Manitowoc report (Water Resources Management Graduate Students, 1998). The site area is under a mixed public and private ownership and altogether is approximately 90 acres. The wetlands are considered "coastal canyons", which are described as small, canyon-like wetlands which occur along the major perennial streams in the area. These canyons are complex and contain different types of coastal wetlands including bluff face seeps and gullies. Coastal canyons occur primarily in the southern area along the Lake Michigan shoreline due to the large difference between the elevation of the lake and the adjacent shore, which is over 60 feet in some areas. As the drainage network developed after the retreat from the Nipissing lake level, major downcutting created the high bluffs on stream edges. The canyons vary widely in topography, and some contain remnants of other coastal features such as interdunal and ridge and swale wetlands.

The vegetation in these wetlands is disturbed open canopy. According to the rating system used in the Manitowoc report, this site rates medium in natural hydrology and water quality, and low in stormwater retention. It was considered to have medium quality wildlife habitat and floral diversity.

Rare Elements of Silver-Calvin Creeks, Manitowoc County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Cakile edentula	American sea-rocket	1990	1
Calamovilfa longifolia var magna	Sand reed-grass	1990	1
Euphorbia polygonifolia	Seaside spurge	1990	1
Moxostoma valenciennesi	Greater redhorse	1989	2

LM# 30 UPPER DOOR COUNTY AREA

(Mink River, Newport Conifer Hardwoods SNA in Newport State Park, Europe Lake)

Report Source: #5, #7 (The Nature Conservancy)
County: Door County

Site Description

The Upper Door County Area site is located on the northernmost tip of Door County. The area it encompasses is made up of several smaller sites, listed below.

The **Mink River Estuary** is owned by The Nature Conservancy and is located in northeastern Door County. The river originates in alkaline, spring fed headwaters and ends at its mouth into Lake Michigan. In between is a dynamic estuarine system formed by the mixing and flushing of the waters of Lake Michigan and the Mink River. This estuary is an important fish spawning and bird migration area. During high water seiches the estuarine marshes are flooded; however, during low water the marshes are dry and many spring channels are evident. Bulrush is the most common species in the deeper marshes, but wild rice, narrow leafed cattail, and burreed dominate certain areas. Shallower areas contain sedge meadow, with blue joint grass and reed grass. Surrounding the marsh is a narrow band of shrubs—willows, red osier dogwood, and alder. White cedar dominates the conifer swamp surrounding the Mink River. Also included within the project are small areas of second growth northern hardwoods and a stretch of beach along Rowley's Bay. The landscape of the Mink River hosts a variety of rare species.

The **Newport Conifer Hardwoods** (Newport Beach State Park) features a northern hardwood forest composed of white birch, sugar maple, beech, and ash. A 3-to-8-foot-high ledge of dolomite blocks traverses the site approximately northeast to southwest. This ledge is the former shoreline sculptured during the Lake Nipissing stage of Lake Michigan. Above the ledge, hardwoods are on a jumbled boulder substrate; south and east, they stabilized low dunes where large colonies of clubmoss can be observed. Other cover types include hemlock-hardwood, fir-spruce with white cedar, lowland brush, and swamp hardwoods. About ¼ mile of frontage on Lake Michigan is included. The large areas of different habitats within the wooded portion of the park give the area a wilderness aspect. The shoreline is characterized in low water years by extensive horizontal beds of exposed dolomites. Many rare species occur here, including a population of the Lake Huron locust.

Europe Lake is located on the eastern side of northern Door County. It was a bay of Lake Michigan at one time, but the action of waves and currents has formed a bar of gravel and sand across the mouth of the embayment, forming the lake. There is a forest of virgin red and white pine and old-growth beech-sugar maple mesic forest between Europe Lake and Lake Michigan. Swampy pockets of boreal forest occur east of Europe Lake, and this habitat supports many rare plants. A portion of the site is now within Newport Beach State Park.

Rare Elements of Upper Door County Area, Door County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Adlumia fungosa	Climbing fumitory	1978	2
Alder Thicket	Alder Thicket	1976	2
Asplenium trichomanes	Maidenhair spleenwort	1978	2
Boreal forest	Boreal forest	1976	1
Botrychium minganense	Mingan's moonwort	1998	1
Cakile edentula	American sea-rocket	1978	1
Calamagrostis stricta	Slim-stem small-reedgrass	1977	1
Calamintha arkansana	Low calamint	1978	2
Calamovilfa longifolia var magna	Sand reed-grass	1978	1
Carex garberi	Elk sedge	1978	1
Carex crawei	Crawe sedge	1978	1
Coturnicops noveboracensis	Yellow rail	1989	1
Cypripedium arietinum	Ram's-head lady's-slipper	1987	1
Cypripedium reginae	Showy lady's-slipper	1993	1
Deschampsia cespitosa	Tufted hairgrass	1940	1
Deschampsia flexuosa	Crinkled hairgrass	1978	1
Elymus lanceolatus ssp psammophilus	Thickspike	1978	1
Emergent aquatic	Emergent aquatic	1976	1
Equisetum variegatum	Variegated horsetail	1978	1
Festuca occidentalis	Western fescue	1979	3
Gentianopsis procera	Lesser fringed gentian	1978	1
Great Lakes Alkaline Lakeshore	Great Lakes Alkaline Lakeshore	1998	2
Great Lakes Beach	Great Lakes Beach	1987	3
Hendersonia occulta	Cherrystone drop	1996	1
Iris lacustris	Dwarf lake iris	1999	3
Lake Dune	Lake Dune	-	1
Malaxis brachypoda	White adder's-mouth	1929	2
Northern Dry-Mesic Forest	Northern Dry-Mesic Forest	1999	2
Northern Mesic Forest	Northern Mesic Forest	1998	3
Northern Sedge Meadow	Northern Sedge Meadow	1976	1
Northern Wet Forest	Northern Wet Forest	1976	1
Northern Wet-Mesic Forest	Northern Wet-Mesic Forest	1976	1
Orobanche uniflora	One-flowered broomrape	1978	1
Osmorhiza chilensis	Chilean sweet cicely	1999	1
Paravitrea multidentata	Dentate supercoil	1997	3
Parnassia parviflora	Small-flower grass-of-parnassus	1913	1
Plantanthera orbiculata	Large roundleaf orchid	1978	2
Primula mistassinica	Bird's-eye primrose	1989	1
Pterospora andromedea	Giant pinedrops	1999	1
Solidago simplex var gillmanii	Sticky goldenrod	1979	2
Somatochlora hineana	Hine's emerald dragonfly	1987	1
Springs and spring runs, hard	Springs and spring runs, hard	1976	1
Striatura ferrea	Black striate	1997	2
Tanacetum huronense	Lake Huron tansy	1979	1
Vertigo hubrichti	Midwest Pleistocene vertigo	1997	3
Vertigo iowaensis	Iowa Pleistocene vertigo	1997	2
Viola rostrata	Long-spur violet	1977	3

LM# 31 WHITNEY SLOUGH

Report Source: #1
County: Brown County

Site Description

Whitney Slough is approximately 450 acres in size and is located 250 feet from the southern shoreline of lower Green Bay in Brown County. It is east of the mouth of the Fox River and adjacent to the city of Green Bay and is bounded on the south and east by steep slopes. It is likely that the wetland was at one time contiguous with the waters of Green Bay, but a highway and residential development now separate the wetland from the bay. It has been substantially modified by urban development and road construction. Portions have been used as municipal and industrial landfill sites, and several dikes are present.

The Green Bay Wildlife Sanctuary lagoons are located in the western part of Whitney Slough. These lagoons are a series of ponds and connecting channels which have been excavated to serve as a wildlife refuge. The water source is surface drainage. The water levels of the wetland are impacted by a pump-supported drainage system. High water levels have historically reduced the quality of the wetlands. There is little seiche movement above Whitney Slough in the Bay Beach area because of shoals between Point au Sable and Grassy Island. Lower Green Bay is heavily polluted; however, the extent and effect of these pollutants on Whitney Slough is unknown.

The environmental quality of this wetland is likely detrimentally effected by residential and commercial development, roads, dikes and drainage ditches found in the wetland. Portions of the wetland have been used as landfill sites. A dumping ground lies several miles offshore of the wetland within Green Bay. The northwestern portion of the wetland includes Bay Beach Park and Green Bay Wildlife Sanctuary, no other major areas of the wetland are publicly owned. At the time of publication of the USFWS report (Herendorf et. al. 1981), two highways were proposed to intersect in the approximate center of the wetland. Development pressures on the eastern portion of the wetland are imminent and severe.

Pollution from various sources (roads, agriculture, and construction) contribute to the degradation of this wetland.

Future Needs and/or Gaps

An updated survey and more detailed site description are needed. There are no element occurrence records for this site, however, avifauna data does exist, but has not yet been compiled into a database. This site should be inventoried and avifauna data should be added.

LM# 32 CHIWAUKEE-ILLINOIS BEACH SHORELINE

Report Source: #3
County: Kenosha County

Site Description

The Chiwaukee-Illinois Beach Shoreline is located in the southeastern part of Kenosha County. It consists of several contiguous parcels of land, including Carol Beach Low Prairie and Panne State Natural Area, Barnes Creek Dunes and Panne, Tobin Road Prairie, and Chiwaukee Prairie State Natural Area. It is an extremely rich complex of wet prairie and calcareous fen on gentle ridge and swale topography created when the level of glacial Lake Michigan was lowered in stages. The resulting different micro-environments help support great species diversity. Over 400 plant species have been documented here, some of which are very rare in the State.

This site is the most intact coastal wetland in southeastern Wisconsin. It is currently threatened by development, altered hydrology (wetland filling), and shrub and several non-native plant invasions. This site adjoins Illinois Beach State Park, which also contains exceptional ecological features. This site has been a long time protection priority for the State of Wisconsin and The Nature Conservancy.

Future Needs and/or Gaps

The existing element occurrence data is outdated. Possible threats to this site include invasion by exotic species and alteration of wetland hydrology. An inventory should be conducted as soon as possible so elements can be identified and protection mechanisms can be addressed.

Rare Elements of Chiwaukee-Illinois Beach Shoreline, Kenosha County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Acris crepitans blanchardi	Cricket frog	-	1
Aflexia rubranura	Red-tailed prairie leafhopper	1993	1
Agalinis gattingeri	Roundstem foxglove	1985	1
Agalinis skinneriana	Pale false foxglove	1996	3
Asclepias sullivantii	Prairie milkweed	1981	1
Cacalia tuberosa	Prairie indian plantain	1991	3
Cakile edentula	American sea-rocket	1992	3
Calamintha arkansana	Low calamint	1974	3
Calamovilfa longifolia var magna	Sand reed-grass	1992	1
Calcareous fen	Calcareous fen	1992	1
Carex crawei	Crawe sedge	1966	1
Carex richardonii	Richardson sedge	1966	1
Cypripedium parviflorum	Small yellow lady's-slipper	1993	1
Dry-Mesic Prairie	Dry-Mesic Prairie	1976	1
Eleocharis compressa	Flat-stemmed spike-rush	1966	1
Emydoidea Blandingii	Blanding's turtle	1997	1
Etheostoma microperca	Least darter	1906	1
Euphorbia polygonifolia	Seaside spurge	1991	1
Euphyes bimacula	Two-spotted skipper	1992	1
Euphyes dion	Dion skipper	1989	1

Rare Elements of Chiwaukee-Illinois Beach Shoreline, Kenosha County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Fimbristylis puberula	Hairy fimbristylis	1986	2
Gentianopsis procera	Lesser fringed gentian	1991	4
Liatris spicata	Marsh blazing star	1982	5
Great Lakes Beach	Great Lakes Beach	1976	1
Lake Dune	Lake Dune	1991	1
Liatris spicata	Marsh blazing star	1992	6
Lycaeides melissa samuelis	Karner blue butterfly	1993	1
Orobanche uniflora	One-flowered broomrape	1992	1
Papaipema beeriana	Liatris borer moth	1992	1
Papaipema silphii	Silphium borer moth	1994	1
Penstemon pallidus	Pale beardtongue	1962	1
Phlox glaberrima ssp interior	Smooth phlox	1996	11
Platanthera leucopea	Prairie white-fringed orchid	1996	5
Poanes massasoit	Mulberry wing	1993	1
Poanes viator	Broad-winged skipper	1989	1
Polygala incarnata	Pink milkwort	-	1
Scleria triglomerata	Whip nutrush	1966	1
Scleria verticillata	Low nutrush	1961	1
Solidago ohioensis	Ohio goldenrod	1991	6
Southern Sedge Meadow	Southern Sedge Meadow	1976	1
Thalictrum revolutum	Waxleaf meadowrue	1992	1
Tofieldia glutinosa	Sticky false-asphodel	1995	3
Triglochin maritimum	Common bog arrow-grass	1986	1
Wet prairie	Wet prairie	1976	1
Wet-Mesic Prairie	Wet-Mesic Prairie	1992	6

LM# 33 KENOSHA SAND DUNES AND LOW PRAIRIE

Report Source: #3
County: Kenosha County

Site Description

This site is located on the southeast coastline of Kenosha County, north of Chiwaukee Prairie. It is one half-mile of Lake Michigan frontage containing well-developed dunes and dune succession patterns (fore dunes to swale to wet prairie). The dunes are disturbed by off-road vehicle use, and the shore has been riprapped. An ancient hardwood forest lies beneath the dunes. This is one of the few dune systems in Southeastern Wisconsin, and several uncommon species are present, including sea rocket (*Cakile edentula*), seaside spurge (*Euphorbia polygonifolia*), smooth phlox (*Phlox glaberrima*), and marsh blazing-star (*Liatris spicata*). This site is threatened by disruption of the shoreline processes and by urban encroachment, as well as by the spread of invasive species.

Rare Elements of Kenosha Sand Dunes and Low Prairie, Kenosha County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Cakile edentula	American sea-rocket	1991	1
Euphorbia polygonifolia	Seaside spurge	1991	1
Gentianopsis procera	Lesser fringed gentian	1991	1
Great Lakes Beach	Great Lakes Beach	1976	1
Lake Dune	Lake Dune	1991	1
Liatris spicata	Marsh blazing star	1991	1
Phlox glaberrima ssp interior	Smooth phlox	1991	1
Solidago ohioensis	Ohio goldenrod	1991	1
Wet-Mesic Prairie	Wet-Mesic Prairie	1991	1

LM# 34 ROOT RIVER RIVERINE FOREST

Report Source: #3
County: Milwaukee County

The Root River Riverine Forest is located in southern Milwaukee County, almost to the Racine County border. It is a wet-mesic to mesic hardwood forest bordering a gravel-bottom stream that is a tributary of the Root River. It contains a rich, diverse flora, including several rare species. The riverine forest is a significant portion of the regionally significant Root River corridor.

Rare Elements of Root River Riverine Forest, Milwaukee County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EO's**
Carex formosa	Handsome sedge	1980	1
Etheostoma microperca	Least darter	1924	1
Floodplain forest	Floodplain forest	1991	3
Lythrurus umbratilis	Redfin shiner	1924	1
Plantago cordata	Heart-leaved plantain	1994	1
Southern Mesic Forest	Southern Mesic Forest	1991	2
Stream—slow, hard, warm	Stream—slow, hard, warm	1985	1
Trillium recurvatum	Reflexed trillium	1991	3
Viburnum prunifolium	Smooth black-haw	1991	2

LM# 35 WARNIMONT PARK FENS

Report Source: #3
County: Milwaukee County

Warnimont Park Fens is located on the south-central coastline of Lake Michigan in Milwaukee County. It consists of semi-open clay bluffs with spring seepage along Lake Michigan which supports calcareous seepages containing an unusual flora. Some regionally uncommon plants are found here, and include purple false oats (*Trisetum melicoides*), Ohio goldenrod (*Solidago ohioensis*), and sticky false-asphodel (*Tofieldia glutinosa*), a State-threatened species. This site is threatened by the spread of invasive plants, bluff erosion, and altered hydrology.

Rare Elements of Warnimont Park Fens, Milwaukee County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Calcareous fen	Calcareous fen	1991	1
Cypripedium reginae	Showy lady's-slipper	1939	1
Equisetum variegatum	Variegated horsetail	1995	2
Gentianopsis procera	Lesser fringed gentian	1991	1
Procambarus gracilis	Prairie crayfish	1982	1
Solidago caesia	Bluestem goldenrod	1996	1
Solidago ohioensis	Ohio goldenrod	1991	1
Springs and spring runs, hard	Springs and spring runs, hard	1985	1
Thamnophis butleri	Butler's garter snake	1987	1
Tofieldia glutinosa	Sticky false-asphodel	1995	1
Triglochin palustre	Slender bog arrow-grass	1981	1
Tristetum melicoides	Purple false oats	1939	1

LM# 36 HARRINGTON BEACH LACUSTRINE FOREST

Report Source: #3
County: Ozaukee County

Harrington Beach Lacustrine Forest is located on the northeastern shoreline of Lake Michigan in Ozaukee County. It is a moderate- to good-quality mature second-growth northern wet-mesic forest, located just west of the shoreline beach ridge. Dominant trees include green and black ashes, basswood, and white cedar. This is a regionally rare community type, and the site is heavily used by migratory birds.

Rare Elements of Harrington Beach Lacustrine Forest, Ozaukee County

Scientific Name	Common Name	Last Observation Date	No. of EO's
Bartramia longicauda	Upland sandpiper	1991	1
Cakile edentula	American sea-rocket	1956	1
Elymus lanceolatus ssp psammophilus	Thickspike	1979	1
Hardwood swamp	Hardwood swamp	1991	1
Hendersonia occulta	Cherrystone drop	1998	1
Northern Wet-Mesic Forest	Northern Wet-Mesic Forest	1976	1
Tyto alba	Barn owl	1980	2
Vallonia excentrica	Oval vallonia	1996	1

Lake Superior Primary Sites

There are 28 primary wetland sites in the Lake Superior basin (**Map 4**), as identified in the Wisconsin Coastal Wetland Evaluation (Epstein et. al. 1997). There are few modifications to the original site descriptions. Each description includes natural community, plant, and animal components as well as a table of rare element occurrences when appropriate. The report source code is the same for each site (#4). Gaps in information about each primary site are not applicable as all of the sites were recently inventoried and site information/descriptions are current. However, general gaps in Lake Superior coastal zone are addressed in the next section of this report.

General Description of Lake Superior Coastal Zone.

The Wisconsin mainland shoreline of Lake Superior has widely differing physical features, including the excellent sand beach at Kakagon Slough in Ashland County, the steep, erodible clay bluffs along the Douglas County shore and the low sand bluffs and spits at Port Wing, Cornucopia and Sand Bay in Bayfield County (Herendorf et. al. 1981). Bluffless slough reaches along Chequamegon Point, at the top of Chequamegon Bay, and scattered along the eastern shore of Bayfield County are characterized by significant wetlands. The Apostle Islands, a group of 22 islands containing 175 miles of shoreline, have sandstone bluffs, sand and gravel beaches and wetland shores. The bluffs along the Wisconsin shore range up to 100 feet along the clay banks in Douglas County. A list of wetland acres for Lake Superior's coastal zone is below (Table 3).

Table 3. WETLAND ACREAGE PER COUNTY WITHIN LAKE SUPERIOR COASTAL ZONE[5]. BASED ON ORIGINAL WISCONSIN WETLAND INVENTORY

County	Total Surface Area (Acres)	Acres of Wetland	% of County Mapped As Wetland	Wetlands as % of Statewide Total
Ashland	670,720	167,317	24.9	3.1
Bayfield	935,680	78,992	8.4	1.5
Douglas	835,200	183,118	22.0	3.4
Iron	480,640	146,418	30.5	2.7

[5] The Coastal Zone as defined by the Wisconsin Coastal Management Program, Department of Administration. This includes counties that border Lake Superior.

LS# 1 BLACK LAKE BOG

Report Source: #4
County: Douglas County

Site Description

Black Lake Bog is a vast acid peatland in the headwaters of the Black River. Several thousand acres of open bog, muskeg, and black spruce swamp surround a large shallow lake that drains northward via the Black River, which eventually joins the Nemadji River south of the City of Superior.

Sphagnum mosses, ericaceous shrubs, and sedges blanket the level surface of the site. Representative vascular plants include leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), bog rosemary (*Andromeda glaucophylla*), small cranberry (*Vaccinium oxycoccos*), round-leaved sundew (*Drosera rotundifolia*), and the sedges *Carex oligosperma, C. pauciflora, C. paupercula*, and *Eriophorum spissum*. Stunted black spruce (*Picea mariana*), often associated with tamarack (*Larix laricina*), are scattered throughout the bog. In areas where the spruces form closed stands, Labrador tea (*Ledum groenlandicum*) and the sedge *Carex trisperma* are frequently members of the understory. Small upland "islands" occur in a few places within the bog, supporting mature stands of red pine (*Pinus resinosa*).

Among the animals, only birds have received even cursory attention. A number of habitat specialists occur here, among them the palm warbler and Lincoln's sparrow. The LeConte's sparrow has been noted in open areas with high sedge cover. Other characteristic birds of the site include common yellowthroat, song sparrow, white-throated sparrow, Nashville warbler, sedge wren, and purple finch. The yellow-bellied flycatcher and yellow-rumped warbler occur where the cover of spruce trees is high. Mammals observed on or adjacent to the site in recent years include the timber wolf and moose.

Black Lake Bog occupies portions of both Minnesota and Wisconsin. Ownership is primarily public, with Douglas County and the state of Minnesota the major landowners. The site is managed by cooperative agreement as an interstate natural area.

Rare Elements of Black Lake Bog, Douglas County.

Scientific Name	Common Name	Last Observation Date	No. of EOs
Ammodramus leconteii	LeConte's sparrow	1996	1
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1

LS# 2 BELDEN SWAMP

Report Source: #4
County: Douglas County

Site Description

This large, undisturbed acid peatland straddles the drainage divide between the St. Croix River and Lake Superior. The Spruce River originates here, draining southwestward to join the Tamarack River and then the St. Croix River. Several small streams drain northward from Belden Swamp, eventually reaching the Black River.

The peatlands are composed of open bog, muskeg, black spruce swamp, and poor fen communities. A thick carpet of *Sphagnum* mosses covers the surface of most of this wetland. Ericaceous shrubs, sedges, and stunted swamp conifers are the most prominent vascular plants. Important species include leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), bog rosemary (*Andromeda glaucophylla*), small cranberry (*Vaccinium oxycoccos*), black spruce (*Picea mariana*), tamarack (*Larix laricina),* and the sedges *Carex lasiocarpa, C. limosa, C. oligosperma, C. paupercula, Eriophorum angustifolium, E. spissum,* and *E. virginicum*. Possibly reflecting subsurface drainage patterns, the vegetation is not uniformly structured throughout the site. Open, sedge-dominated swales alternate with muskeg stands in which scattered, stunted spruces are prominent.

In a few areas, the coniferous trees are dense, and species such as Labrador tea (*Ledum groenlandicum*) and the sedge *Carex trisperma* are abundant in the understory. A wet, tall shrub zone of alder (*Alnus incana*) and willows (*Salix* spp.) is found at the upland-wetland interface. In the eastern portion of this wetland interior to the tall shrub community is an extensive stand of bog birch (*Betula pumila*) and beaked sedge (*Carex rostrata*). Birds of the open sedge swales include sedge wren, savanna sparrow, LeConte's sparrow, and northern harrier. In areas of stunted conifers, palm warbler, Lincoln's sparrow, white-throated sparrow, and Nashville warbler are common. More closed coniferous forest supports yellow-bellied flycatcher, yellow-rumped warbler, and sharp-shinned hawk.

Belden Swamp is owned by Douglas County. The site contains extensive, undisturbed examples of representative acid peatland communities and biota and merits serious consideration for special management designation.

Rare Elements of Belden Swamp, Douglas County.

Scientific Name	Common Name	Last Observation Date	No. of Eos
Ammodramus leconteii	LeConte's sparrow	1996	1
Boloria freija	Freija fritillary	1996	2
Boloria frigga	Frigga fritillary	1996	1
Boloria titania	Purple lesser fritillary	1995	1
Boloria eunomia	Bog fritillary	1996	2
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1
Lycaena epixanthe	Bog copper	1996	1

Rare Elements of Belden Swamp, Douglas County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Oeneis jutta ascerta	Jutta arctic	1996	1

LS# 3 MUD LAKE BOG / ERICSON CREEK

Report Source: #4
County: Douglas County

Site Description

This site encompasses a diverse assemblage of wetland and terrestrial features, including extensive open and forested acid peatlands, seepage lake, stream, mesic hardwood forest, and dry-mesic pine forest. Ericson Creek is part of the Amnicon River system, while the peatlands to the west of Mud Lake drain to the Black River. County Trunk Highway A runs north-south between Ericson Creek and Mud Lake (only the wetlands west of Mud Lake are represented in Figure 55).

The peatland communities include open bog, muskeg, and black spruce swamp. Thick carpets of *Sphagnum* mosses support ericaceous shrubs, sedges, and swamp conifers. Characteristic species are leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), bog rosemary (*Andromeda glaucophylla*), small cranberry (*Vaccinium oxycoccos*), black spruce (*Picea mariana*), tamarack (*Larix laricina*), and the sedges *Carex oligosperma, C. pauciflora, C. paupercula, Eriophorum angustifolium, E. spissum,* and *E. virginicum*. *Carex trisperma* and Labrador tea (*Ledum groenlandicum*) are important where cover of the conifers is relatively high.

Noteworthy peatland birds include Lincoln's sparrow, palm warbler, gray jay, Nashville warbler, white-throated sparrow, and red crossbill. Near Ericson Creek, the wetlands are bordered by or surround scattered stands of mature trees including mesic maple-basswood forest and dry-mesic red pine-white pine forest. Patches of white spruce (*Picea glauca*) and balsam fir (*Abies balsamea*) lend a boreal flavor to the complex.

Significant portions of this site are owned by Douglas County and should be considered for special recognition in the Douglas County Forest Plan. Currently, Douglas County, DNR and BER are working on special protection needs for this site.

Rare Elements of Mud Lake Bog/Ericson Creek, Douglas County

Scientific Name	Common Name	Last Observation Date	No. of EOs
Boloria freija	Freija fritillary	1996	3
Boloria titania	Purple lesser fritillary	1996	3
Boloria eunomia	Bog fritillary	1996	3
Erebia discoidalis	Red-disked alpine	1996	1
Haliaeetus leucocephalus	Bald eagle	1992	1
Lycaena epixanthe	Bog copper	1996	1
Oeneis jutta ascerta	Jutta arctic	1996	5
Perisoreus canadensis	Gray jay	1996	1
Somatochlora forcipata	Forcipate emerald	1998	1

LS# 4 NEMADJI RIVER BOTTOMS

Report Source: #4
County: Douglas County

Site Description

This portion of the deeply incised Nemadji River valley is mostly forested but also contains abandoned oxbows with emergent marsh and shrub swamp. The level landscape away from the river is a mixture of small farms, woodlots, and residential areas.

This forest type is rare, and possibly unique to the Lake Superior Clay Plain subsection. Terraces inside the sharp meanders of the river are situated 3-5 meters above normal flow stages. The canopy is dominated by black ash (*Fraxinus nigra*), and includes green ash (*F. pennsylvanica*), basswood (*Tilia americana*), red maple (*Acer rubrum*), silver maple (*A. saccharinum*), balsam poplar (*Populus balsamifera*), and bur oak (*Quercus macrocarpa*). Scattered conifers are also members of the canopy, though their cover is highest on the steep slopes bordering the river and terraces. Included among these are white spruce (*Picea glauca*), white cedar (*Thuja occidentalis*), white pine (*Pinus strobus*), and balsam fir (*Abies balsamea*). The herb layer is exceptionally rich, and while no rare species have been documented here to date, the flora is diverse and contains many plants more typical of maple-basswood forests far to the south. Spring ephemerals and their associates are especially well-represented, including false rue anemone (*Isopyrum biternatum*), wild leek (*Allium tricoccum*), Virginia waterleaf (*Hydrophyllum virginiana*), toothwort (*Dentaria laciniata),* spring beauty (*Claytonia virginica*), wild ginger (*Asarum canadense*), yellow trout lily (*Erythronium americanum*), Dutchman's breeches (*Dicentra cucullaria*), bloodroot (*Sanguinaria canadense*), and blue cohosh (*Caulophyllum thalictroides*).

Animals were not formally surveyed at this site, but among the common resident birds found in similar habitats upstream are veery, mourning warbler, red-eyed vireo, ovenbird, and broad-winged hawk. Four adult wood turtles (Wisconsin Threatened) were noted at the site in May of 1994.

Though not a virgin stand, many large trees remain and there has been little recent disturbance. Douglas County is the principal landowner, and is partially protecting the site via a special use designation. This site, and a similar stand several miles upstream, have many properties which are unique at least at the regional level. Protection efforts should be strongly encouraged throughout the Nemadji corridor, including the steep, fragile clay slopes where protection or restoration of long-lived coniferous trees is highly desirable. Slumping banks are common on the outside of stream meanders and the Nemadji River contributes a great deal of sediment to Allouez and Superior bays. The slopes bordering this river were badly damaged during past logging events. Present cover is mostly trembling aspen (*Populus tremuloides*).

Rare Elements of Nemadji River Bottoms, Douglas County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Clemmys insculpta	Wood turtle	1994	1

LS# 5 POKEGAMA-CARNEGIE WETLANDS

Report Source: #4
County: Douglas County

Site Description

The extensive, poorly drained, red clay flats in the headwaters of the Pokegama and Little Pokegama rivers support a large wetland mosaic of shrub swamp, sedge meadow, emergent marsh, and small ponds. Tiny, upland "islets" of white spruce (*Picea glauca*), white pine (*Pinus strobus*), red pine (*Pinus resinosa*), balsam poplar (*Populus balsamifera*), and trembling aspen (*Populus tremuloides*) punctuate the flats. The shrub wetlands are composed mostly of speckled alder (*Alnus incana*) and willows (*Salix petiolaris, S. discolor, S. pyrifolia*, others). The more open wet meadows are dominated by sedges (*Carex lacustris, C. stricta*) and bluejoint grass (*Calamagrostis canadensis*). Widely scattered small pools support a variety of emergent and submergent aquatic macrophytes.

Of special significance are the many populations of rare plants occurring in the site's wetlands. Many of the rarities are represented by large and/or multiple populations. It is important to recognize that some of these species are not widespread in the Lake Superior region, but are concentrated in the vicinity of the City of Superior. Amphibians and birds found here include: wood frog, spring peeper, green frog, leopard frog, eastern gray tree frog, American toad, yellow warbler, golden-winged warbler, gray catbird, alder flycatcher, white-throated sparrow, swamp sparrow, song sparrow, sora, Virginia rail, common snipe, woodcock, sharp-shinned hawk, northern goshawk, and common raven.

Appropriate management and protection of this site is critically important. Study of the site's hydrology is needed, as several right-of-ways cross the wetland and may be having impacts which are not clearly understood. Several of these right-of-ways are currently managed via brush-cutting, which appears to be an effective and appropriate means of maintaining conditions to the liking of at least some of the rare plants. Examination of the original land survey notes, as well as historical and current aerial photographs, would be helpful in understanding changes in land use and vegetation composition and structure, which could have management implications. Invasive exotic species are not a problem at present, but should be looked for periodically. At least one of the corridors crossing this wetland carries petroleum. A spill could have a devastating impact on the biota.

The vegetation of the Pokegama-Carnegie Wetlands resembles that occurring at several other sites, all in the vicinity of the City of Superior. Pokegama-Carnegie, however, is the largest site, has the greatest floristic diversity, supports some of the largest populations of rare species, and may be less likely in the short-term to suffer destruction or fragmentation owing to expanded development, disrupted hydrology, or incursions of aggressive species.

Rare Elements of Pokegama-Carnegie Wetlands, Douglas County.

Scientific Name	Common Name	Last Observation Date	No. of EOs
Eleocharis nitida	Slender spike-rush	1995	3
Juncus vaseyi	Vasey's rush	1995	3
Parnassia palustris	Marsh grass-of-Parnassus	1995	1

Rare Elements of Pokegama-Carnegie Wetlands, Douglas County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EOs**
Petasites sagittatus	Arrow-leaved sweet-coltsfoot	1995	3
Ranunculus gmelinii var hookeri	Small yellow water crowfoot	1995	3
Ranunculus cymbalaria	Seaside crowfoot	1996	1
Sparganium glomeratum	Northern bur-reed	1995	2
Viola novae-angliae	New England violet	1995	1

LS# 6 RED RIVER BREAKS / ST. LOUIS RIVER MARSHES

Report Source: #4
County: Douglas County

Site Description

Red River Breaks. This rough, deeply dissected, red clay landscape drained by the Red River and its tributaries borders the St. Louis River above the City of Superior. Much of the site is forested, with pole-size trembling aspen (*Populus tremuloides*) the dominant tree. The canopy is rather sparse, with a dense understory of speckled alder (*Alnus incana*) prominent in many stands. Conifers, which were formerly dominant in this area, presently occur as scattered individuals or in small stands, with white spruce (*Picea glauca*), white pine (*Pinus strobus*), and white cedar (*Thuja occidentalis*) the most important species. In poorly drained "flats" on the level ridges between ravines there are patches of black ash-dominated hardwood swamp and thickets of speckled alder and other tall wetland shrubs. Areas of standing water are infrequent, but where present support small emergent marshes and broad-leaved sedge meadows. A few patches of well-drained mesic hardwood forest occur on the ridges, with sugar maple (*Acer saccharum*) and yellow birch (*Betula alleghaniensis*), but these are not extensive and, in general, the "northern hardwoods" community is rare on the site.

The lower slopes of the steep-sided ravines are often springy, sometimes supporting remnant stands of white cedar (*Thuja occidentalis*) and unusual herbs. Several springs were flowing with brightly colored orange water, the result of the presence of iron bacteria. Another spring was noted in which the deposition of "tufa" (calcium carbonate) was occurring. Some of the small terraces a few meters above the streams in the ravine bottoms contain mature stands of large white spruce (*Picea glauca*), black ash (*Fraxinus nigra*), and balsam poplar (*Populus balsamifera*).

Several of the small feeder creeks entering the site from the vicinity of Minnesota's Jay Cooke State Park to the west were running clear, even after heavy rains. Bottom materials included sand, gravel, and boulders. Small fish and a number of invertebrates were noted in these upper stretches. Closer to the St. Louis River, the water is more turbid, carrying a heavier load of fine sediments. Along the St. Louis River there are stands of emergent macrophytes, shrub swamp, and small patches of black ash swamp.

At least 10 species of rare plants have been documented on the site. No rare animals have been observed to date, but the area supports a representative diversity of the region's birds, including large populations of many neotropical migrants. Further inventory is desirable, especially for breeding birds and aquatic macroinvertebrates. Access to the interior is slow going and difficult.

The site's forests, soils, and waters were seriously damaged during past catastrophic logging episodes. Many of the fragile seeps along the lower valley walls are slumping badly, leading to excessive sedimentation in the lower drainages. Conifers are generally not reproducing well, due to loss of seed source, unstable and possibly waterlogged substrates, overbrowsing by white-tailed deer, and possible past damage to soil structure. Thickets of tall shrubs and dense stands of bluejoint grass (*Calamagrostis canadensis*) may be inhibiting the establishment of seedlings of some species. Recovery is proceeding, but very slowly.

Recommendations include the development of a management plan focused on maintaining the site's extensive forests and unroaded condition, as well as protection of the rare plant populations occurring

there. In the short term, any active forest management should focus on stabilization of eroding areas and reestablishment of the diverse coniferous forests native to the site and no longer common in the region. Added study is needed on the regeneration problems currently exhibited by cedar, fir, and pine. Actions on these problems should first be implemented only on the periphery of the site.

St. Louis River Marshes. Upper portions of the St. Louis River Estuary from Fond du Lac downstream to Oliver feature extensive emergent marshes. These are typically located inside the main channel's meanders, but also occur in protected, shallow bays along the upland shore. Important emergent aquatics include arrowheads (*Sagittaria latifolia, S. rigida*), bulrushes (*Scirpus americanus, S. validus*), bur-reed (*Sparganium eurycarpum*), lake sedge (*Carex lacustris*), and cattail (*Typha* spp.). Wild rice (*Zizania aquatica*) and sweet flag (*Acorus calamus*) are locally common. Deeper waters of the marsh complexes support submergent and floating-leaved macrophytes such as coontail (*Ceratophyllum demersum*), waterweed (*Elodea canadensis*), yellow water lily (*Nuphar variegatum*), wild celery (*Vallisneria americana*), and pondweeds (*Potamogeton* spp.).

The patches of marsh associated with the main channel are often bordered by a natural levee adjoining the flowing river. Where well-developed, the levees are vegetated with tall wetland shrubs and lowland hardwoods, especially speckled alder (*Alnus incana*), red-osier dogwood (*Cornus stolonifera*), meadowsweet (*Spiraea alba*), willows (*Salix* spp.), ashes (F*raxinus nigra* and *F. pennsylvanica*), and box elder (*Acer negundo*).

Animals have not yet been surveyed in detail but use by waterfowl was heavy in early fall. Foraging birds noted during the nesting season included bald eagle, osprey, common tern, merlin, and belted kingfisher. Among the common avian residents were red-winged blackbird, common yellow-throat, swamp sparrow, song sparrow, yellow warbler, and sora.

The Wisconsin shoreline is almost entirely undeveloped, and includes a large block of rough, forested, roadless terrain (see "Red River Breaks" for additional information). A large area was purchased by the State of Wisconsin in the mid-1990's. Termed the St. Louis River Streambank Protection Area, the project acquisition goal is 5,000 acres. Shoreline protection, water quality improvement projects, and exotic species monitoring and control are important management considerations for this site. Other significant wetlands are within the St. Louis River Estuary, to the north, below the Village of Oliver (see "Oliver Marsh" and "Superior Municipal Forest"). The Minnesota side of the St. Louis River also harbors valuable wetlands, including remnant patches of wire-leaved sedge fen at the Oliver Bridge and downstream at Grassy Point.

The Red River Breaks/St. Louis River Marshes site was considered a priority owing to its large size, recent state aquisition, and significance to water quality in the St. Louis River Estuary. Also, a big information gap existed which needed to be filled in order to clarify the biological significance of the area for local and regional planning purposes.

Rare Elements of Red River Breaks/St. Louis River Marshes, Douglas County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Cypripedium parviflorum	Small yellow lady's-slipper	1996	1
Cypripedium reginae	Showy lady's-slipper	1996	1
Equisetum variegatum	Variegated horsetail	1996	2

Rare Elements of Red River Breaks/St. Louis River Marshes, Douglas County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Equisetum palustre	Marsh horsetail	1996	2
Haliaeetus leucocephalus	Bald eagle	1992	1
Juncus vaseyi	Vasey rush	1996	1
Petasites sagittatus	Arrow-leaved sweet-coltsfoot	1996	1
Ranunculus gmelinii var hookeri	Small yellow water crowfoot	1996	1
Ribes hudsonianum	Northern black currant	1996	1
Salix planifolia	Tea-leaved willow	1996	1
Sparganium glomeratum	Northern bur-reed	1996	1

LS# 7 OLIVER MARSH

Report Source: #4
County: Douglas County

Site Description

This large marsh occupies a part of the St. Louis River Estuary between the Village of Oliver and the City of Superior Municipal Forest. A narrow natural levee has developed on the outside bend of a channel meander, and is partially vegetated with shrubs and small lowland hardwoods. This separates the northern portion of the marsh from the main channel. The emergent beds are generally composed of tall, narrow-leaved plants, especially bulrushes (*Scirpus americanus, S. fluviatilis, S. validus*), bur-reeds (*Sparganium chlorocarpum, S. eurycarpum*), lake sedge (*Carex lacustris*), cattails (*Typha* spp.), sweetflag (*Acorus calamus*), and arrowheads (*Sagittaria latifolia, S. rigida*). Pockets of wild rice (*Zizania aquatica*) occur in several protected bays fed by tiny streams draining the uplands to the east. A deep central lagoon between the natural levee and the emergent beds adjacent to the upland shore harbors significant stands of floating-leaved and submergent macrophytes such as waterweed (*Elodea canadensis*), wild celery (*Vallisneria americana*), yellow water lily (*Nuphar variegatum*), and pondweeds (*Potamogeton* spp.).

Animal life has not been studied in detail, but surveys are planned for the near future. Waterfowl, rails, double-crested cormorants, common terns, northern harrier, merlin, and bald eagles were noted during our August 1996 vegetation survey.

Most of the Wisconsin shoreline is undeveloped, and forested with paper birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). Remnant stands of conifers, mostly spruce and pine, are scattered along the clay bluffs. Where homes and docks have been constructed, as is the case near the Village of Oliver, erosion is often noticeable. Small patches of purple loosestrife (*Lythrum salicaria*) are often associated with the natural levees, or disturbed shoreline areas. Slumps occur on many of the clay bluffs exposed to the direct action of water and ice, especially when unprotected by stands of aquatic vegetation. The Minnesota side of the river has more residential and industrial development but also has extensive marshes.

LS# 8 SUPERIOR MUNICIPAL FOREST

Report Source: #4
County: Douglas County

Site Description

The 4,000-acre City of Superior Municipal Forest contains a wealth of natural features unusual in the context of an urban-industrial center. Among the most significant of these are stands of mature coniferous forest, extensive emergent marsh, and wet clay flats supporting a mixture of shrub swamp and wet meadow. The site borders the St. Louis River Estuary, which dissects the uplands into a series of narrow, steep-sided ridges.

The coniferous forests are composed primarily of species often associated with the boreal regions. Canopy dominants include white spruce (*Picea glauca*), white pine (*Pinus strobus*), balsam fir (*Abies balsamea*), balsam poplar (*Populus balsamifera*), and paper birch (*Betula papyrifera*). In some stands, red pine (*Pinus resinosa*), black ash (*Fraxinus nigra*), or white cedar (*Thuja occidentalis*) are important. Stands still showing the influence of past logging followed by fire are generally composed of trembling aspen (*Populus tremuloides*) and paper birch (*Betula papyrifera*). The moist understories are also reminiscent of a boreal flora, and include uncommon species such as lungwort (*Mertensia paniculata*) and rabbit-berry (*Shepherdia canadensis*).

Resident birds include many species associated with mature conifers, such as blackburnian, black-throated green, pine, yellow-rumped, parula, and Cape May warblers. Winter wren, mourning warbler, veery, and hermit thrush inhabit the forest understory.

Throughout the Lake Superior Clay Plain Ecoregional Subsection, this forest type has been greatly fragmented and often replaced by monotypic stands of aspen (*Populus* spp.). Thus the stands within this site have at least a regional conservation significance. They could also provide a template for restoration actions considered elsewhere.

An extensive emergent marsh borders both sides of the Pokegama River (which is really an arm of the St. Louis River Estuary). Marsh composition is very similar to that of the stands found along the lower stretches of the St. Louis. Dominants include bur-reed (*Sparganium eurycarpum*), bulrushes (*Scirpus americanus, S. validus*), arrowheads (*Sagittaria latifolia, S. rigidus*), and cattail (*Typha* spp.). Deeper waters support submergent and floating-leaved species, such as coontail (*Ceratophyllum demersum*), bladderwort (*Utricularia macrorhiza*), and many pondweeds (*Potamogeton* spp.). Among the resident birds are Virginia rail, sora, and marsh wren. Northern harrier, common tern, and bald eagle were noted foraging in the marsh on several occasions.

The invasive exotic purple loosestrife (*Lythrum salicaria*) is uncommon but unfortunately widespread in the marsh. Efforts to control it should begin as soon as possible. A heavy infestation occurs just to the east of the city forest in ditched wetlands bordering railroad tracks and State Trunk Highway 105 on the west side of the Village of South Superior. As these ditches drain into ravines which eventually reach the Pokegama River, it is possible that this roadside population is a source of propagules which eventually are washed into the marsh. Eradication of this potential source population is recommended.

The shrub swamp and meadow complex provides habitat for several rare plants, including clustered bur-reed (*Sparganium glomeratum*), small yellow water crowfoot (*Ranunculus gmelinii*), and sweet coltsfoot

(*Petasites sagittatus*). Dominant plants include speckled alder (*Alnus incana*), willows (*Salix* spp.), lake sedge (*Carex lacustris*), and bluejoint grass (*Calamagrostis canadensis*). Birds such as alder flycatcher, yellow warbler, sedge wren, and white-throated sparrow are common in these communities. This wetland is the southwesternmost portion of a formerly much larger and contiguous wetland which has been partially destroyed and greatly disrupted by growth of the City of Superior. Additional surveys are desirable in the Municipal Forest's shrub swamp and meadow habitats.

A significant portion of this site was designated as a State Natural Area in 1996. This designation encompassed much of the mature forest and marsh, and also included a part of the wet clay flats in which rare plants occur.

Rare Elements of Superior Municipal Forest, Douglas County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Carduelis pinus	Pine siskin	1994	1
Juncus vaseyi	Vasey rush	1995	1
Petasites sagittatus	Arrow-leaved sweet-coltsfoot	1995	1
Ranunculus gmelinii var hookeri	Small yellow water crowfoot	1996	2
Sparganium glomeratum	Northern bur-reed	1995	1

LS# 9 SUPERIOR AIRPORT / HILL AVENUE WETLANDS / SOUTH SUPERIOR TRIANGLE

Report Source: #4
County: Douglas County

Site Description

These three sites, now separated by roads, railroad tracks, and other urban developments, are the largest remnants of a formerly contiguous wetland within the City of Superior. The wetlands are mosaics of shrub swamp and open meadow, with a few small patches of emergent marsh. Trembling aspen (*Populus tremuloides*) often occupies drier portions of the sites. Despite the severe disturbances which have altered the composition, structure, function, size, and configuration of these wetlands, they harbor significant populations of rare plants.

Dominant shrubs are speckled alder (*Alnus incana*) and willows (*Salix discolor, S. petiolaris, S. pyrifolia*, several others). Open meadows are typically dominated by broad-leaved sedges, most commonly lake sedge (*Carex lacustris*). Characteristic associates are flat-topped white aster (*Aster umbellatus*), joe-pye weed (*Eupatorium maculatum*), late goldenrod (*Solidago gigantea*), bedstraw bellflower (*Campanula aparinoides*), and marsh fern (*Thelypteris palustris*). Rare species occurring here include neat spikerush (*Eleocharis nitida*), clustered bur-reed (*Sparganium glomeratum*), small yellow water crowfoot (*Ranunculus gmelinii*), sweet coltsfoot (*Petasites sagittatus*), Vasey's rush (*Juncus vaseyi*), and New England violet (*Viola novae-angliae*).

Among the resident birds are swamp sparrow, song sparrow, common yellowthroat, yellow warbler, gray catbird, alder flycatcher, and sedge wren.

Because of habitat fragmentation and isolation, and disrupted hydrology, these sites are highly vulnerable to damage even in the absence of future developments. The City of Superior has developed a Rare Plant Conservation Plan in association with the expansion of its airport. As part of the Plan, the City relocated many of the rare plant populations occurring at the new runway site. In addition, the Plan calls for the City to manage the wetlands to benefit rare plant species at the airport site that will not be impacted by the new runway, as well as lands it will be acquiring soon along Hill Avenue. This could include techniques such as brushing, prescribed burning, and scarification to create and perpetuate the microhabitats used by many of these rare species. In an effort to better understand which translocation and management techniques are most effective for these rare species, the City will monitor rare species populations at the airport for ten years.

The City of Superior also recently received approval from the U.S. Army Corps of Engineers for it's Special Area Management Plan (SAMP). The goal of SAMP is to encourage residential, commercial, and industrial development in areas of the City that are most logical from a land-use planning perspective while minimizing environmental impacts. In developing the list of potential development sites in the SAMP, the City removed a site initially recommended for development along Hill Avenue due to the presence of rare plants. To ensure that important populations of rare species and high-quality natural communities are protected, the City will also contact BER for guidance on rare species inventories each time a site identified in the SAMP is proposed for development.

Rare Elements of Superior Airport, Douglas County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Eleocharis nitida	Slender spike-rush	1995	2
Juncus vaseyi	Vasey rush	1995	1
Petasites sagittatus	Arrow-leaved sweet-coltsfoot	1994	1
Ranunculus gmelinii var hookeri	Small yellow water crowfoot	1994	2
Ranunculus cymbalaria	Seaside crowfoot	1994	1
Sparganium glomeratum	Northern bur-reed	1995	2
Viola novae-angliae	New England violet	1995	1

Rare Elements of Hill Avenue Wetlands, Douglas County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EOs**
Eleocharis nitida	Slender spike-rush	1995	1
Juncus vaseyi	Vasey rush	1995	1
Petasites sagittatus	Arrow-leaved sweet-coltsfoot	1995	1
Viola novae-angliae	New England violet	1995	1

Rare Elements of South Superior Triangle, Douglas County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Eleocharis nitida	Slender spike-rush	1995	1
Juncus vaseyi	Vasey rush	1995	1
Petasites sagittatus	Arrow-leaved sweet-coltsfoot	1995	1
Ranunculus gmelinii var hookeri	Small yellow water crowfoot	1995	1
Viola novae-angliae	New England violet	1995	1

LS# 10 LOWER NEMADJI RIVER MARSHES

Report Source: #4
County: Douglas County

Site Description

The lower stretches of the Nemadji River flow in a narrow valley through a heavily industrialized and urbanized portion of the City of Superior before emptying into Allouez Bay. A series of emergent marshes occurs along the inside of the well-developed meanders characteristic of this river. These are separated from the main channel by natural levees, which support a mixture of tall wetland shrubs and small lowland hardwoods. They also tend to be quite weedy. The steep clay bluffs confining the valley are generally undeveloped, sometimes forested, and provide a measure of buffering between the river system and the urban areas.

Important marsh plants include bur-reed (*Sparganium eurycarpum*), arrowheads (*Sagittaria latifolia, S. rigida*), soft-stemmed bulrush (*Scirpus validus*), broad-leaved cattail (*Typha latifolia*), lake sedge (*Carex lacustris*), marsh cinquefoil (*Potentilla palustris*), water horsetail (*Equisetum fluviatile*), and water parsnip (*Sium suave*). Locally deep, slowly flowing sloughs support stands of wild rice (*Zizania aquatica*) and beds of pondweeds (*Potamogeton* spp.). Drier portions of the wetlands contain patches of sedge meadow dominated by tussock sedge (*Carex stricta*) and bluejoint grass (*Calamagrostis canadensis*). Animals were not formally surveyed here but we recorded incidental observations during the breeding season of American bittern, wood duck, blue-winged teal, mallard, hooded merganser, and sedge wren.

Though the lower Nemadji system has suffered many abuses, it has retained many significant natural features and should be a prime candidate for remedial attention. The marshes are representatively diverse, dominated by native species, appear reasonably functional, and support uncommon birds. Exotic plants are still quite localized, associated mostly with the disturbed levees and formerly dredged areas near U.S. Highway 2. It would be worthwhile to expand biological surveys to allow a more complete evaluation of at least the vegetation and the resident birdlife. Future surveys should include additional wetlands upstream.

LS# 11 WISCONSIN POINT – ALLOUEZ BAY MARSHES

Report Source: #4
County: Douglas County

Site Description

Wisconsin Point. Wisconsin Point is the eastern portion of a long coastal barrier spit separating the waters of Lake Superior from Allouez Bay. Major site features include several miles of open sand beach and dunes, small interdunal wetlands, and a xeric forest of white (*Pinus strobus*) and red pines (*P. resinosa*). The point and adjacent Allouez Bay receive heavy visitation by migrating birds in the spring. Developments include roads, vehicle turnouts, a Coast Guard station, and breakwater.

The open dunes are dominated by marram grass (*Ammophila breviligulata*) and beach pea (*Lathyrus japonicus*). Other characteristic plants are evening primrose (*Oenothera biennis*), sand cherry (*Prunus pumila*), Canada wild-rye (*Elymus canadensis*), common milkweed (*Asclepias syriaca*), jointweed (*Polygonella articulata*), rock cress (*Arabis lyrata*), and scouring rushes (*Equisetum* spp.). Stabilized dunes are colonized by shrubs such as common juniper (*Juniperus communis*) and false heather (*Hudsonia tomentosa*), and sapling trees. Disturbed areas are very weedy, with many exotic species present, and often support extensive beds of poison ivy (*Rhus radicans*). The exposed outer beaches are unvegetated.

A small, open, interdunal swale near the western tip of the point supports a community dominated by low graminoid plants, especially sedges (*Carex viridula, C. lasiocarpa*), rushes (*Juncus balticus*), and scouring rushes (*Equisetum* spp.). Other noteworthy species include red-stemmed gentian (*Gentiana rubricaulis)*, nodding ladies'-tresses (*Spiranthes cernua*), and a large population of the rare marsh grass-of-Parnassus (*Parnassia palustris*). The swale is surrounded by dense thickets of tall shrubs, mostly speckled alder (*Alnus incana*), willows (*Salix* spp.), and red-osier dogwood (*Cornus stolonifera*). These shrubs are encroaching on the openings and should be monitored and controlled if necessary. The shrubs do provide a measure of security for this fragile site by screening it from most passersby. During 1996 this swale was very wet, with standing water reaching a depth of over 30 cm in July and August.

Many of these same species occur in a small opening east of the Coast Guard station on the bay side of the point. This area was apparently cleared of vegetation and then fenced in the hope that it would provide nesting habitat for the critically endangered piping plover. The center of this sand area was excavated to a depth slightly below the water table, providing suitable conditions for colonization by some of the interdunal swale plants. Of additional interest are other rarities, including little grape fern (*Botrychium simplex*), marsh horsetail (*Equisetum palustre*), and a possible first Wisconsin record for juniper clubmoss (*Lycopodium sabinaefolium*). Identification of the latter by specialists is pending.

The mature xeric forest covering the western half of the point is composed of white and red pines (*Pinus resinosa*), with a dense shrub layer of beaked hazelnut (*Corylus cornuta*). There may be a long-term concern for this forest as the pines cannot reproduce under the dense shade of the shrubs and hardwood saplings. Natural disturbances (such as fire) that formerly occurred here and ultimately benefitted shade intolerant species may no longer be acceptable. Pine plantations adjoin the natural forest and it would be desirable to eventually phase these out, restoring open dune vegetation or pine forest, whichever is most appropriate.

Resident birds include pine, black-throated green, and yellow-rumped warblers, ovenbird, red-breasted nuthatch, hermit thrush, and, possibly, merlin. This site will require both vigilance and active management to maintain and protect the many valuable natural features present.

Allouez Bay. Allouez Bay is situated between the City of Superior's east-side neighborhood of Allouez and Wisconsin Point. The eastern end of the bay is shallow and contains a large marsh, with patches of sedge meadow and a drowned tamarack swamp present near the base of Wisconsin Point. Several small streams, including Bear Creek and Bluff Creek, empty into the bay. A portion of the wetland at the head of the bay, but now cut off by the access road to Wisconsin Point, was filled in the past.

The marsh is dominated by tall graminoids, such as bur-reeds (*Sparganium eurycarpum*), bulrushes (*Scirpus validus, S. americanus*), spikerush (*Eleocharis smallii*), sedges (*Carex lacustris, C. aquatilis*), and cattails (*Typha* spp.). Broad-leaved arrowhead (*Sagittaria latifolia*) is also among the dominants. Other characteristic plant species include water horsetail (*Equisetum fluviatile*), water parsnip (*Sium suave*), and water hemlock (*Cicuta* spp.). Deep areas within and on the margins of the emergent marsh support floating-leaved and submergent aquatic macrophytes, especially coontail (*Ceratophyllum demersum*), pondweeds (*Potamogeton* spp.), common bladderwort (*Utricularia macrorhiza*), and yellow water lily (*Nuphar variegatum*). The uncommon small-leaved yellow water lily (*Nuphar microphyllum*) occurs in the deepest waters of the bay capable of supporting rooted aquatic vegetation. The portions of the wetland nearest the shore are dominated by sedges (especially *Carex lacustris, C. stricta, C. lasiocarpa*). Tamarack (*Larix laricina*) snags are scattered throughout parts of this area.

It is possible that this wetland formerly contained extensive mats of wire-leaved sedges, but that eutrophication and other disturbances led to changed conditions which aided the spread and eventual dominance of the coarser, more tolerant emergents. Nevertheless, this wetland retains high wildlife values. In the early spring, substantial numbers of waterbirds of many kinds congregate here. This site may be especially significant in years when the break-up of ice on Lake Superior is late (as it was in 1996), and little open water is available elsewhere. The marsh also supports many nesting birds, including uncommon species like American bittern, least bittern, and northern harrier. The DNR has been supporting a tern nesting habitat restoration project at Wisconsin Point-Allouez Bay and common terns, sometimes several score, were observed foraging on the bay in 1995-96.

Rare Elements of Wisconsin Point-Allouez Bay Marshes, Douglas County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Circus cyaneus	Northern harrier	1996	1
Deschampsia flexuosa	Crinkled hairgrass	1995	1
Equisetum palustre	Marsh horsetail	1996	1
Equisetum variegatum	Variegated horsetail	1995	1
Falco columbarius	Merlin	1994	1
Incisalia polia	Hoary elfin	1989	1
Ixobrychus exilis	Least bittern	1996	1
Lycopodium selago	Fir clubmoss	1985	1
Lycopodium sabinaefolium	Savin-leaved club moss	1996	1
Ophioglossum vulgatum var pseudopodum	Adder's-tongue	1995	1
Parnassia palustris	Marsh grass-of-Parnassus	1996	1

Rare Elements of Wisconsin Point-Allouez Bay Marshes, Douglas County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Ribes oxyacanthoides	Canada gooseberry	1995	1
Spermophilus franklinii	Franklin's ground squirrel	1996	1
Sterna hirundo	Common tern	1996	1
Sympetrum danae	Black meadowhawk	1989	1
Thalictrum venulosum	Veined meadowrue	1990	1

LS# 12 DIVIDE SWAMP

Report Source: #4
County: Douglas County

Site Description

This complex of lowland forests, shrub swamp, and springs is the headwaters region of both the St. Croix and Brule rivers. The diverse lowland forests include stands of tamarack (*Larix laricina*), white cedar (*Thuja occidentalis*), black spruce (*Picea mariana*), and black ash (*Fraxinus nigra*). The sandy, rolling uplands are intensively managed for trembling aspen (*Populus tremuloides*) and pine (*Pinus* spp.). Much of the latter is grown in plantations. County Trunk Highway P crosses the site from north to south.

The mature tamarack swamp is even-aged and has few canopy associates. The understory features a well-developed layer of tall shrubs, especially speckled alder (*Alnus incana*). Saplings are mostly black ash (*Fraxinus nigra*), with occasional balsam fir (*Abies balsamea*). Representative herbs include the sedges *Carex disperma, C. leptalea,* and *C. vaginata*, manna grass (*Glyceria striata*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), marsh marigold (*Caltha palustris*), and the violets *Viola cucullata* and *V. pallens*. *Sphagnum* and other mosses are significant in parts of this community. Small pools are frequent where there is a hummock-hollow microtopography. Several rare plants occur here.

The white cedar-dominated (*Thuja occidentalis*) forest is quite extensive. Though evidence of past logging was noted, the canopy has closed and recent disturbance is mostly due to heavy browse by white-tailed deer. Trees are mostly in the 9"-15" d.b.h. size class but larger individuals are occasionally encountered. Generally drier than the tamarack swamp, understory plants include goldthread (*Coptis trifolia*), bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*), sedges and mosses. Where black spruce (*Picea mariana*) becomes dominant, the understory often includes many ericaceous shrubs, such as Labrador tea (*Ledum groenlandicum*), blueberries (*Vaccinium angustifolium, V. myrtilloides*), leatherleaf (*Chamaedaphne calyculata*) and creeping snowberry (*Gaultheria hispidula*). The moss layer is well-developed and includes a number of *Sphagnum* spp.

Several small rectangular clearcuts occurred in the 1970s just east of County Trunk Highway P, close to the Brule River. Each of these was given a different post-cutting treatment to study regeneration of white cedar (*Thuja occidentalis*). None of the treatments appeared successful, but it would be worthwhile to examine this problem in considerably more detail, as cedar reproduction is as poor throughout the Lake Superior drainage basin as it is elsewhere in Wisconsin. The cedar forests of the Brule River are major repositories of biodiversity and their loss would be of great significance.

Black ash (*Fraxinus nigra*) is the primary canopy component of the site's hardwood swamps. Tree size, canopy closure, and shrub/sapling density are all variable. Common understory plants are speckled alder (*Alnus incana*), manna grass (*Glyceria striata*), marsh marigold (*Caltha palustris*), bluejoint grass (*Calamagrostis canadensis*), sensitive fern (*Onoclea sensibilis*), crested shield fern (*Dryopteris cristata*) and sedges (*Carex* spp.).

Divide Swamp is within the Brule River State Forest and its ecological attributes should be thoroughly evaluated prior to committing to any management decisions. As a new master plan for the Brule River State Forest is scheduled to be developed in the near future, that would be an appropriate time to consider the site's values.

Rare Elements of Divide Swamp, Douglas County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Aeshna tuberculifera	Black-tipped darner	1996	1
Caenis youngi	A caenid mayfly	1996	1
Callitriche hermaphroditica	Autumnal water-starwort	1996	1
Callitriche heterophylla	Large water-starwort	1996	1
Carex tenuiflora	Sparse-flowered sedge	1996	2
Carex vaginata	Sheathed sedge	1996	1
Cypripedium parviflorum	Small yellow lady's-slipper	1996	1
Epilobium palustre	Marsh willow-herb	1996	2
Hydroporus pseudovilis	A predaceous diving beetle	1996	1
Lycopodium selago	Fir clubmoss	1996	1
Pandion haliaetus	Osprey	1996	1
Ribes hudsonianum	Northern black currant	1996	2

LS# 13 BRULE SPILLWAY

Report Source: #4
County: Douglas County

Site Description

This six-mile stretch of the Brule River features an extensive conifer swamp, shrub swamp, sedge meadow, and numerous springs and spring runs. The site also contains several stands of old-growth white (*Pinus strobus*) and red pine (*P. resinosa*), an extremely rare successional stage of this formerly widespread community.

The conifer swamp is dominated by white cedar (*Thuja occidentalis*), with balsam fir (*Abies balsamea*), tamarack (*Larix laricina*), black spruce (*Picea mariana*), and black ash (*Fraxinus nigra*) the major associates. Some stands are in or are approaching old-growth condition. The sapling layer is composed mostly of fir, with black ash (*Fraxinus nigra*) locally common. Cedar seedlings are common but saplings are very rare. Important shrubs include mountain maple (*Acer spicatum*), speckled alder (*Alnus incana*), and alder-leaved buckthorn (*Rhamnus alnifolia*). A few small patches of Canada yew (*Taxus canadensis*) are present. The vascular flora is quite rich. Among the common herbs and low shrubs are goldthread (*Coptis trifolia*), twinflower (*Linnaea borealis*), Labrador tea (*Ledum groenlandicum*), bunchberry (*Cornus canadensis*), and many sedges and orchids. Rich lichen and bryophtye flora also occur here.

Many species of rare plants are found here, including lapland buttercup (*Ranunculus lapponicus*), fairy slipper (*Calypso bulbosa*), northern black currant (*Ribes hudsonianum*), small yellow lady's-slipper (*Cypripedium parviflorum*), and sheathed sedge (*Carex vaginata*).

Rare Elements of Brule Spillway, Douglas County.

Scientific Name	Common Name	Last Observation Date	No. of Eos
Accipiter gentilis	Northern goshawk	1996	1
Ammodramus leconteii	LeConte's sparrow	1996	1
Callitriche hermaphroditica	Autumnal water-starwort	1996	1
Calypso bulbosa	Fairy slipper	1996	4
Cartelist pinus	Pine siskin	1996	1
Carex vaginata	Sheathed sedge	1996	7
Coccothraustes vespertinus	Evening grosbeak	1997	1
Cypripedium parviflorum	Small yellow lady's-slipper	1996	7
Dendroica tigrina	Cape may warbler	1996	3
Empidonax flaviventris	Yellow-bellied flycatcher	1996	2
Epilobium palustre	Marsh willow-herb	1996	7
Haliaeetus leucocephalus	Bald eagle	1995	2
Oeneis jutta ascerta	Jutta arctic	1996	1
Perisoreus canadensis	Gray jay	1997	1
Picoides arcticus	Black-backed woodpecker	1996	1

Rare Elements of Brule Spillway, Douglas County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Ranunculus lapponicus	Lapland buttercup	1996	2
Ribes hudsonianum	Northern black currant	1996	6
Somatochlora elongata	Ski-tailed emerald	1996	1

LS# 14 BIBON SWAMP

Report Source: #4
County: Douglas County

Site Description

Bibon Swamp is a vast wetland of over 10,000 acres within the drainage of the White River. The western portion of the site is a mosaic of several extensive wetland communities of generally good quality: a rich wet-mesic conifer swamp dominated by white cedar (*Thuja occidentalis*); a much more acid peaty swamp of black spruce (*Picea mariana*) and tamarack (*Larix laricina*); a hardwood swamp of black ash (*Fraxinus nigra*); and large stands of tall shrubs, especially speckled alder (*Alnus incana*) and willows (*Salix* spp.). Other communities of significance though of lesser areal extent are: northern sedge meadow composed of *Carex* spp. and bluejoint grass (*Calamagrostis canadensis*); and patches or strips of riparian hardwoods composed of American elm (*Ulmus americana*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), and box elder (*Acer negundo*) along the White River.

The white cedar swamp canopy is made up of mostly medium-size trees (9-15" d.b.h. size class). Trunk corings revealed that at least parts of this stand are in excess of 150 years old. Saplings are mostly of black ash (*Fraxinus nigra*) and balsam fir (*Abies balsamea*), with cedar reproduction limited to small seedlings. A tall shrub layer of moderate density is composed of mountain maple (*Acer spicatum*), alder buckthorn (*Rhamnus alnifolia*), and speckled alder (*Alnus incana*). Representative herbs and low shrubs include bunchberry (*Cornus canadensis*), twinflower (*Linnaea borealis*), small bishop's cap (*Mitella nuda*), and dwarf raspberry (*Rubus pubescens*). A number of orchid taxa are scattered through portions of this forest. Mosses of several genera form a surface cover which is broken by pools of muck and occasional spring runs. Overall, groundlayer species richness is high. Resident birds include Nashville, parula and Canada warblers, northern waterthrush, and winter wren. Deer remains were noted in the interior of the stand, victims of the harsh winter of 1995-96. This community is located south of the White River near the western edge of the site.

Bordering the cedar swamp on the extreme western edge of the site is a wet forest of mature black ash (*Fraxinus nigra*). In portions of this forested wetland the trees grow on low hummocks, which are separated by pools of soupy muck. The ash is represented in all vegetative strata. Characteristic groundlayer species are speckled alder (*Alnus incana*), fowl manna grass (*Glyceria striata*), sensitive fern (*Onoclea sensibilis*), orange touch-me-not (*Impatiens biflora*), lake sedge (*Carex lacustris*), and wood nettle (*Laportea canadensis*). Poison ivy (*Rhus radicans*) is abundant (maddeningly so!) in some areas. Red-eyed vireo, black-and-white warbler, Nashville warbler, and veery are common in this forest.

North of the river conditions are very different and there is a large complex of acid peatland communities including open bog, muskeg, and black spruce swamp. The more open areas are characterized by scattered, stunted black spruce (*Picea mariana*) with some tamarack (*Larix laricina*). Deep sphagnum hummocks form a continuous ground cover, upon which ericaceous shrubs grow including leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), bog rosemary (*Andromeda glaucophylla*), and small cranberry (*Vaccinium oxycoccos*). Common herbs include the sedges *Carex oligosperma, C. pauciflora*, and *C. paupercula*, and *Eriophorum spissum*. Where the canopy of spruce is more closed, Labrador tea (*Ledum groenlandicum*), three-leaved false Solomon's seal (*Smilacina trifolia*), and three-seeded sedge (*Carex trisperma*) are common understory members.

From the air it was apparent that the depth of the sphagnum peat has formed a dome, somewhat isolating the peatland vegetation from the influence of mineral rich groundwater or runoff from the uplands. A ring of large tamarack (*Larix laricina*) encircles the bog, and beyond that is a minerotrophic shrub swamp of alder (*Alnus* spp.) and willow (*Salix* spp.). Among the resident birds of these coniferous peatlands are palm warbler, Lincoln's sparrow, white-throated sparrow, yellow-bellied flycatcher, sharp-shinned hawk, and boreal chickadee.

The shrub swamps are vast, densely structured, and very difficult to cross. In some places, especially to the east, they may be a result of the combined impacts of disrupted hydrology, past logging, fire suppression, and natural succession. Stumps and remnants of open sedge meadows give evidence of historical changes in the vegetation. Dominant or characteristic species include slender willow (*Salix gracilis*), red-osier dogwood (*Cornus stolonifera*), speckled alder (*Alnus incana*), meadowsweet (*Spiraea alba*), rough bedstraw (*Galium asprellum*), and many sedges (*Carex* spp.). Representative species of the open meadows are lake sedge, tussock sedge (*Carex stricta*), bluejoint grass (*Calamagrostis canadensis*), spotted joe-pye-weed (*Eupatorium maculatum*), flat-topped aster (*Aster umbellatus*), marsh marigold (*Caltha palustris*), marsh bellflower (*Campanula aparinoides*), and fringed brome (*Bromus ciliatus*). Occasional tamarack (*Larix laricina*), balsam poplar (*Populus balsamifera*), and trembling aspen (*P. tremuloides*) rise above the shrub canopy.

Birds present in the shrub and meadow stands are common yellowthroat, yellow warbler, gray catbird, alder flycatcher, mourning warbler, golden-winged warbler, sedge wren, common snipe, woodcock, ruffed grouse, and black-billed cuckoo.

This site has considerable intrinsic value owing to its size, roadlessness, and the quality of some of its communities. It also supports at least seven rare plant and animal species. Formerly disturbed areas are recovering in some places, but seem to be in a holding pattern in others. Agricultural lands adjacent to the wetlands could pose runoff problems. White cedar (*Thuja occidentalis*) is not successfully reproducing due to heavy browse pressure. A threat to this site includes the presence of glossy buckthorn. This site also supports a valuable sport fishery, and is fed by small streams and springs coming from the south and west. Bibon Swamp is a vital connecting link between the extensive forests to the south and the Bad River corridor downstream. Maintenance of high water quality and streamside vegetation, especially along the White River, is critical throughout the watershed.

Rare Elements of Bibon Swamp, Bayfield County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Clemmys insculpta	Wood turtle	1986	2
Cypripedium reginae	Showy lady's-slipper	1996	1
Empidonax flaviventris	Yellow-bellied flycatcher	1996	2
Equisetum palustre	Marsh horsetail	1970	1
Parus hudsonicus	Boreal chickadee	1996	1
Petasites sagittatus	Arrow-leaved sweet-coltsfoot	1996	2
Viola novae-angliae	New England violet	1995	1

LS# 15 PORT WING

Report Source: #4
County: Bayfield County

Site Description

This large complex of wetlands, forested sand ridges, beach and open dune, occurs at the mouth of the Flag River adjacent to the Village of Port Wing. A large slough, Bibon Lake, is situated within the southwestern portion of the site. Significant communities include coastal fen, coastal bog, lake dune, tamarack swamp, and several stands of dry pine forest with a strong boreal flavor. Overall quality of the natural communities is good to excellent. At least twelve species of rare plants and animals have been documented here including the state's only known population of fly honeysuckle (*Lonicera involucrata*).

The fen community consists of a floating mat of sedges, dominated by woolly sedge (*Carex lasiocarpa*). Important associates are twig rush (*Cladium mariscoides*), sweet gale (*Myrica gale*), and buckbean (*Menyanthes trifoliata*). The coastal bog fringes the margins of the uplands, with a mat of *Sphagnum* mosses, ericaceous shrubs, and sedges. It contains a number of species not typically found in truly ombrotrophic bogs, such as buckbean, mud sedge (*Carex limosa*), white and sooty beak-rushes (*Rhynchospora alba, R. fusca*), livid sedge (*Carex livida*), and speckled alder (*Alnus incana*). Small tamarack (*Larix laricina*) are scattered unevenly through this community. The tamarack swamp consists of three stands, each with an even-aged canopy of mature tamarack, a dense tall shrub layer of speckled alder, and a diverse low shrub/herb/bryophyte flora. The sandspits and ridges are forested with a mixture of red pine (*Pinus resinosa*), white pine (*P. strobus*), black spruce (*Picea mariana*), and balsam fir (*Abies balsamea*). The stands east of the Flag River are in or approaching old-growth condition. Along the Lake Superior shore, dune and beach communities occur.

Partially protected via a State Natural Area designation, management and protection of the site's natural features will present many challenges. Potential problems include: spread of the aggressive giant reed grass (*Phragmites australis*) which is well-established in the open peatlands around Bibon Lake; the spread of narrow-leaved cattail (*Typha angustifolia*) diminished water quality due to discharge of effluent from the village sewage ponds into Bibon Lake; encroachment of developments into sensitive areas; disruption of coastal processes including longshore sediment transport by the jetties at the mouth of the river; and successional changes to the fire-dependent pine (*Pinus* spp.) forests. A more comprehensive management and monitoring plan is needed, with participation from appropriate agency personnel, local governments, conservation organizations, and private citizens.

Rare Elements of Port Wing, Bayfield County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Aeshna eremita	Lake darner	1989	1
Arethusa bulbosa	Swamp-pink	1995	1
Botaurus lentiginosus	American bittern	1996	1
Carex tenuiflora	Sparse-flowered sedge	1995	1
Carex livida var radicaulis	Livid sedge	1995	1

Rare Elements of Port Wing, Bayfield County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Empidonax flaviventris	Yellow-bellied flycatcher	1996	2
Lonicera involucrata	Fly honeysuckle	1995	1
Lycaena epixanthe	Bog copper	1996	2
Platanthera dilatata	Leafy white orchis	1995	1
Rhynchospora fusca	Brown beak-rush	1995	2
Sympetrum danae	Black meadowhawk	1989	1
Triglochin maritimum	Common bog arrow-grass	1995	1

LS# 16 LOST CREEK

Report Source: #4
County: Bayfield County

Site Description

This estuarine complex is located at the drowned mouths of three small creeks, just south of Lake Superior. A forested coastal barrier spit separates the site from the lake. Sandstone headlands flank the sandspit and estuary to the east and west. The major communities within the site are coastal fen, coastal bog, and shrub swamp. The lagoon at the junction of the creeks contains significant stands of emergent, submergent, and floating-leaved aquatic macrophytes. A mature dry forest of pine and spruce occurs on the sandspit, upon which a number of cabins and an access road have been built. The eastern end of the complex is forested with a shrubby second-growth stand of white cedar (*Thuja occidentalis*) and black ash (*Fraxinus nigra*). Resident birds include merlin, sedge wren, and yellow-bellied flycatcher.

The fen community is well-developed on the west and north sides of the lagoon. The mat is composed of woolly sedge (*Carex lasiocarpa*), livid sedge (*C. livida*), buckbean (*Menyanthes trifoliata*), sweet gale (*Myrica gale*), and cotton grass (*Scirpus hudsonianus*). Boggier areas with more firmly grounded moss peat are composed of *Sphagnum* spp., ericaceous shrubs, and sedges. Community boundaries are quite indistinct between these types at this site. The emergent marsh is composed of lake sedge (*Carex lacustris*), water arum (*Calla palustris*), marsh cinquefoil (*Potentilla palustris*), and broad-leaved cattail (*Typha latifolia*). Characteristic submergent and floating-leaved species are a floating-leaved bur-reed (*Sparganium fluctuans*), water-milfoils (*Myriophyllum* spp., including *M. verticillatum*), yellow water lily (*Nuphar variegatum*), common bladderwort (*Utricularia macrorhiza*), water-marigold (*Megalodonta beckii*), and pondweeds (*Potamogeton* spp.).

Though not a large site, at least fourteen rare species of plants, birds, and butterflies were documented here over the course of the project. Among the rarities is one of only two established populations in Wisconsin of the regionally rare lake cress (*Armoracia lacustris*). A portion of this site is designated as a State Natural Area, but increasing developments on the sandspit adjacent to the wetlands could threaten water quality and make the area unsuitable for sensitive species. Increased powerboat traffic in the lagoon could damage the aquatic beds and lead to the inadvertent introduction of invasive species. Promoting awareness of this site's values with local residents should be a priority for those with stewardship responsibilities.

Rare Elements of Lost Creek, Bayfield County.

Scientific Name	Common Name	Last Observation Date	No. of Eos
Arethusa bulbosa	Swamp-pink	1995	1
Armoracia lacustris	Lake cress	1996	1
Boloria eunomia	Bog fritillary	1996	1
Carex tenuiflora	Sparse-flowered sedge	1995	1
Carex livida var radicaulis	Livid sedge	1995	1
Coccothraustes vespertinus	Evening grosbeak	1996	1

Rare Elements of Lost Creek, Bayfield County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1
Falco columbarius	Merlin	1996	1
Incisalia polia	Hoary elfin	1989	1
Lycaena epixanthe	Bog copper	1996	2
Platanthera hookeri	Hooker orchis	1991	1
Platanthera dilatata	Leafy white orchis	1995	1
Rhynchospora fusca	Brown beak-rush	1995	1
Triglochin maritimum	Common bog arrow-grass	1995	1

LS# 17 SAND BAY

Report Source: #4
County: Bayfield County

Site Description

The drowned mouth of the Sand River is bordered by a complex of wetlands separated from Lake Superior by a forested sandspit. The lower portions of the stream are bordered by northern sedge meadow and alder thicket. West of the lagoon at the stream's outlet are several spring runs. East of the lagoon is a peatland with coastal fen, coastal bog, and tamarack swamp. Ownership is mostly by the National Park Service. The Red Cliff Band of Lake Superior Chippewa hold title to the forested spit west of the river mouth. Rocky headlands with significant outcroppings of sandstone cliffs occur on either side of Sand Bay. Most of the watershed is forested and undeveloped.

Most of the open peatland is a coastal bog composed of *Sphagnum* mosses, ericaceous shrubs, sedges, and insectivorous plants. Common vascular species include leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), woolly sedge (*Carex lasiocarpa*), pitcher plant (*Sarracenia purpurea*), mud sedge (*Carex limosa*), white beak-rush (*Rhynchospora alba*), small cranberry (*Vaccinium oxycoccos*), and scattered sapling-size tamarack (*Larix laricina*). A very wet mat within the sphagnum community between the sandspit and tamarack swamp is composed mostly of woolly sedge, with very low moss cover. Associates of this coastal fen include livid sedge (*Carex livida*), sooty beak-rush (*Rhynchospora fusca*), intermediate sundew (*Drosera intermedia*), water horsetail (*Equisetum fluviatile*), bog arrow-grass (*Triglochin maritimum*), and intermediate bladderwort (*Utricularia intermedia*). Buckbean (*Menyanthes trifoliata*) and sweet gale (*Myrica gale*) are common throughout both open peatland communities. The tamarack swamp is composed of small trees over a dense layer of speckled alder (*Alnus incana*). Leatherleaf, lake sedge (*Carex lacustris*), water horsetail, dwarf raspberry (*Rubus pubescens*), and marsh cinquefoil (*Potentilla palustris*) are common understory species.

Rare Elements of Sand Bay, Bayfield County.

Scientific Name	Common Name	Last Observation Date	No. of Eos
Arethusa bulbosa	Swamp-pink	1995	2
Boloria eunomia	Bog fritillary	1996	1
Callitriche hermaphroditica	Autumnal water-starwort	1988	1
Carex livida var radicaulis	Livid sedge	1995	1
Carex tenuiflora	Sparse-flowered sedge	1995	1
Coccothraustes vespertinus	Evening grosbeak	1996	1
Deschampsia flexuosa	Crinkled hairgrass	1990	1
Eleocharis robbinsii	Robbins spikerush	1988	1
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1
Epilobium palustre	Marsh willow-herb	1988	1
Epilobium strictum	Downy willow-herb	1988	1
Listera convallarioides	Broad-leaved twayblade	1992	1
Lycaena epixanthe	Bog copper	1996	1

Rare Elements of Sand Bay, Bayfield County.			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Oporornis agilis	Connecticut warbler	1996	1
Perisoreus canadensis	Gray jay	1996	1
Platanthera orbiculata	Large roundleaf orchid	1992	1
Rhynchospora fusca	Brown beak-rush	1995	1
Vermivora peregrina	Tennessee warbler	1996	1

LS# 18 RED CLIFF RESERVATION

Report Source: #4
County: Bayfield County

Site Description

The Reservation of the Red Cliff Band of Lake Superior Chippewa occupies the northeastern margin of the Bayfield Peninsula. Surveys were not initiated until July 1996 when a number of sites within the Reservation boundary were inventoried for natural communities and rare flora. Currently, we are in the process of developing a data sharing agreement with the Red Cliff Band of Lake Superior Chippewa. Until this agreement is in place, we will not be computerizing data or identifying locations for natural communities or rare species populations found on the Reservation.

Among the outstanding features within the Reservation boundary, several are especially important. These include two undisturbed wetland complexes containing coastal fen, coastal bog, northern sedge meadow, lagoon, and dry pine forest. Each of these sites harbors a diverse flora with significant populations of rare plants. Though we were unable to survey animals formally, we did obtain incidental records of rare birds and butterflies while conducting vegetation work at these sites. Future faunal surveys are a priority.

Wave-sprayed sandstone cliffs and ledges are prominent and characteristic features of the northern Bayfield Peninsula. Some of the most extensive and ecologically significant outcroppings occur within the Reservation. These sites are inhabited by a number of rare plants, most of which are habitat specialists and do not grow in other habitats.

Also of regional significance are the mature stands of hemlock-hardwoods. Most stands of this regionally widespread forest type have been severely altered owing to repeated episodes of intensive logging. Many stands have entirely lost their complement of native conifers, as well as their structural diversity. A number of uncommon and/or geographically restricted plants, several of them of Special Concern in Wisconsin, occur primarily in these mature stands, especially when they are associated with deep ravines. The Red Cliff Reservation and Apostle Islands National Lakeshore presently maintain the majority of the older hemlock-hardwoods forest remaining in the region. It is worth noting that such stands near Lake Superior typically include species absent from this forest type in other regions, such as white spruce (*Picea glauca*), white cedar (*Thuja occidentalis*), white pine (*Pinus strobus*), showy mountain ash (*Sorbus decora*), and thimbleberry (*Rubus parviflorus*). Future analysis may indicate that the Lake Superior hemlock-hardwoods warrant recognition as distinct natural communities, or at the least, as important regional variants.

The Sand River supports regionally significant diversity among its aquatic macroinvertebrates. This should be an important management consideration across administrative boundaries, as few of the area's streams are confined to a single-owner watershed.

LS# 19 SULTZ SWAMP

Report Source: #4
County: Bayfield County

Site Description

This acid peatland occupies a depression high on the Bayfield Peninsula approximately six miles inland from the Lake Superior coast. Although there are other, similar wetlands in this part of the basin, Sultz Swamp is the largest and embedded within vast stretches of county-owned forest. The major features of this insular peatland include a mature forest of black spruce (*Picea mariana*), an extensive muskeg/open bog, and large populations of several rare species. Disturbances to the interior of the site have been minimal, with the exception of a maintained power line corridor which crosses the area east-west. White cedar (*Thuja occidentalis*) logs were removed from the minerotrophic margins of the wetland in the distant past.

Underneath its closed canopy, the spruce forest is very open and park-like. Characteristic understory plants are Labrador tea (*Ledum groenlandicum*), three-leaved false Solomon's-seal (*Smilacina trifolia*), creeping snowberry (*Gaultheria hispidula*), moccasin flower (*Cypripedium acaule*), blueberries (*Vaccinium angustifolium, V. myrtilloides*), and the sedges *Carex paupercula* and *C. trisperma*. A level carpet of *Sphagnum* mosses covers the surface. Canopy gaps are filled with thickets of young black spruce or tamarack (*Larix laricina*).

Where peat has accumulated and forms a deep, hummocky layer of sphagnum, the spruce and tamarack become scattered and often stunted. The understory is dominated by ericaceous shrubs such as leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), bog rosemary (*Andromeda glaucophylla*), and small cranberry (*Vaccinium oxycoccos*). Dense patches of blueberries also occur, perhaps evidence of past fire. The presence of gnarly jack pine (*Pinus banksiana*) among the stunted spruces also hints at a fire history. Common sedges of the open bog and muskeg include the cotton grasses *Eriophorum spissum* and *E. virginicum*, plus *Carex oligosperma* and *C. pauciflora*. Of special interest is a large population of the Wisconsin Threatened Michaux's sedge (*Carex michauxiana*).

Among the resident birds are solitary vireo, yellow-bellied flycatcher, ruby-crowned kinglet, Lincoln's sparrow, and palm warbler. Large numbers of white-winged crossbills were noted in July 1996, but breeding was not confirmed. A rare butterfly, the Dorcas copper (*Lycaena dorcas*), was collected here in 1996.

The site is county-owned and merits serious consideration for special management designation in the county forest plan. Managers should work with the utility responsible for maintaining the power line corridor to ensure that introduction of invasive species is avoided and that no harmful chemicals are used in keeping the corridor open.

Rare Elements of Sultz Swamp, Bayfield County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Arethusa bulbosa	Swamp-pink	1996	1
Carex michauxiana	Michaux sedge	1996	1

Rare Elements of Sultz Swamp, Bayfield County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1
Lycaena dorcas	Dorcas copper	1996	1

LS# 20 BAYVIEW BEACH – SIOUX RIVER SLOUGH

Report Source: #4
County: Bayfield County

Site Description

The wetland complex at the Sioux River mouth includes emergent marsh and alder thicket communities. North of the river mouth is a narrow, mile-long peaty swale between two parallel sandspits. Major swale communities are an acid, weakly minerotrophic coastal bog and a wet coastal fen. The beach ridges are forested with white (*Pinus strobus*) and red pines (*P. resinosa*), balsam fir (*Abies balsamea*), and paper birch (*Betula papyrifera*). Many rare plants and animals occur at the site. Use by migratory birds can be significant, especially in the spring. A large cliff swallow colony with approximately 100 active nests is present under the State Trunk Highway 13 bridge across the Sioux River.

The coastal bog is composed of *Sphagnum* mosses, ericaceous shrubs, and sedges, with scattered small tamarack (*Larix laricina*), plus species such as speckled alder (*Alnus incana*), royal fern (*Osmunda regalis*), and bog willow (*Salix pedicellaris*). Wetter portions of the swale, support a mat of woolly sedge (*Carex lasiocarpa*) with buckbean (*Menyanthes trifoliata*), sweet gale (*Myrica gale*) and water horsetail (*Equisetum fluviatile*). The emergent marsh at the Sioux River mouth consists of bur-reed (*Sparganium eurycarpum*), soft-stemmed bulrush (S*cirpus validus*), cattails (*Typha* spp.), lake sedge (*Carex lacustris*), and water arum (*Calla Palustris*).

Threats include the spread of giant reed grass (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*), disruption of hydrology and water chemistry, overuse by recreationalists, and maintenance activities on State Trunk Highway 13. Recommendations include development of a management and protection plan with the township, DNR Bureaus of Fish Management and Endangered Resources, and Wisconsin Department of Transportation. The plan should provide for periodic monitoring of water quality, and both rare and invasive plant species. Currently monitoring is being conducted of phragmites and narrow-leaved cattail (*Typha angustifolia*) by Northland College.

Rare species of Bayview Beach-Sioux River Slough, Bayfield County

Scientific Name	Common Name	Las Observation Date	No. of Eos
Arethusa bulbosa	Swamp-pink	1995	1
Boloria eunomia	Bog fritillary	1996	1
Callitriche hermaphroditica	Autumnal water-starwort	1981	1
Carex tenuiflora	Sparse-flowered sedge	1995	1
Carex livida var radicaulis	Livid sedge	1995	1
Epilobium palustre	Marsh willow-herb	1988	1
Epilobium strictum	Downy willow-herb	1988	1
Falco columbarius	Merlin	1990	1
Listera auriculata	Auricled twayblade	1996	1
Lycaena epixanthe	Bog copper	1996	1
Oporornis agilis	Connecticut warbler	1996	1
Platanthera orbiculata	Large roundleaf orchid	1996	1

Rare species of Bayview Beach-Sioux River Slough, Bayfield County			
Scientific Name	**Common Name**	**Las Observation Date**	**No. of Eos**
Triglochin maritimum	Common bog arrow-grass	1995	1

LS# 21 FISH CREEK SLOUGHS

Report Source: #4
County: Bayfield and Ashland Counties

Site Description

The drowned mouth of Fish Creek and its associated wetlands occupy the head of Chequamegon Bay. Located on the outskirts of the City of Ashland and crossed by busy U.S. Highway 2, this site has been subjected to many disturbances in the past and remains vulnerable to further deterioration unless efforts to address problems are maintained. The primary wetland communities are emergent marsh, shrub swamp, and hardwood swamp. The open waters of the "sloughs" also constitute an important feature. This wetland is particularly dynamic, owing to the funnel shape of Chequamegon Bay, and the seiche activity which causes frequent and sometimes substantial short-term water level changes.

The emergent marsh occupies several hundred acres close to the creek mouth. Dominants include bur-reed (*Sparganium eurycarpum*), soft-stemmed bulrush (*Scirpus validus*), arrowheads (*Sagittaria latifolia, S. rigida*), lake sedge (*Carex lacustris*), and cattails (*Typha* spp.). *Carex aquatilis* is locally abundant. Beds of submergent and floating-leaved aquatic macrophytes occur in the open waters of the sloughs and intermingle with the emergents where conditions are suitable. Widespread members of this group are coontail (*Ceratophyllum demersum*), waterweed (*Elodea canadensis*), yellow water lily (*Nuphar variegatum*), and Richardson's pondweed (*Potamogeton richardsonii*). Forked duckweed (*Lemna trisulca*) is abundant in backwaters protected from currents. The exotic and aggressive purple loosestrife (*Lythrum salicaria*) is still widespread but its presence appears considerably diminished following several years of control efforts.

The marsh grades into a shrub swamp of speckled alder (*Alnus incana*) and willows (*Salix* spp.) to the south. The shrub swamp gives way to an extensive forest of swamp hardwoods composed of black ash (*Fraxinus nigra*), green ash (*F. pennsylvanica*), and box elder (*Acer negundo*).

In the shallow waters of the bay, just north of the mouth of Fish Creek, flats of sand and mud are exposed when the water level is low. These areas are used heavily by waterfowl, gulls, terns, and shorebirds as loafing or feeding sites. Several uncommon birds have been documented during the breeding season in the marsh and sloughs, including American bittern and red-breasted merganser. A colony of cliff swallows occurs underneath the U.S. Highway 2 bridge. The site hosts large numbers of waterbirds in the spring, especially noticeable when the bay waters are still locked in ice. Ducks, geese, swans, gulls, grebes, terns, and herons are among the groups finding suitable resting and feeding areas here when such amenities are scarce in the region.

Efforts to maintain the functional values of this site should be continued. Fish Creek Sloughs continue to have high importance as wildlife and fish habitat. Purple loosestrife (*Lythrum salicaria*) control is critical here, as bay currents and several wildlife species could serve as agents of seed dispersal, affecting other valuable wetlands in the bay ecosystem.

Rare Elements of Fish Creek Sloughs, Bayfield and Ashland Counties			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Botaurus lentiginosus	American bittern	1996	1
Callitriche hermaphroditica	Autumnal water-starwort	1995	1
Dendroica tigrina	Cape May warbler	1996	1
Epilobium palustre	Marsh willow-herb	1989	1
Mergus serrator	Red-breasted merganser	1996	1
Migratory bird concentration site	Migratory bird concentration site	1996	1

LS# 22 LONG ISLAND – CHEQUAMEGON POINT

Report Source: #4
County: Ashland County

Site Description

Western Lake Superior's most extensive and least disturbed coastal barrier spit separates the waters of Chequamegon Bay from Lake Superior. The natural dynamics of erosion and deposition are expressed in changed size and shape of the spit over time. An especially vivid example of this occurred following a severe November storm in the late 1970s when Long Island and Chequamegon Point were joined. Important communities at the site include beach and lake dune, xeric forest, interdunal wetland, open bog, shrub swamp, and wet sand flats. The few developments, all on Long Island, include an automated lighthouse, an abandoned Coast Guard station and dock, and a small cabin maintained by the National Park Service.

The beach and dune system is best developed where active deposition of sand is occurring. Owing to wind, wave, and ice exposure the beaches are unvegetated. The dune vegetation is composed mostly of marram grass (*Ammophila breviligulata*) and beach-pea (*Lathyrus japonicus*). False heather (*Hudsonia tomentosa*), bearberry (*Arctostaphylos uva-ursi*), and sand cherry (*Prunus pumila*) are among the other members of the dune community. This site was the last breeding place in Wisconsin for the piping plover. In 1998, 2 color-banded breeding adults were observed on Long Island. After a predator-proof structure was installed around the scrape, incubation immediately began, hatching three out of four of the eggs. All three chicks were banded. In 1999, 3 pairs of piping plovers were observed, only one pair succesfully. The successful pair was the same pair from 1998 and produced a clutch size of four, however only two of the young survived due to mammalian predation. The island continues to attract large numbers of gulls, terns, and sometimes shorebirds and raptors. Rare dune insects, absent from other dune systems on western Lake Superior, occur here.

Most of Long Island is forested with mature stands of jack pine (*Pinus banksiana*), Hill's oak (*Quercus ellipsoidalis*), red pine (*Pinus resinosa*), and white pine (*P. strobus*). Common understory plants include Canada mayflower (*Maianthemum canadense*), blueberry (*Vaccinium angustifolium*), wintergreen (*Gaultheria procumbens*), and bracken fern (*Pteridium aquilinum*). Resident birds include bald eagle, merlin, yellow-rumped, pine, and Nashville warblers, and red-breasted nuthatch. During the spring, large numbers of passerines and raptors can migrate through this area.

While wetlands cover only a very small percentage of the site, the interdunal ponds located near the western end of Long Island are a very rare community statewide and also provide habitat for several rare plants. The bogs of the ridge and swale system on the Chequamegon Bay side of the island generally contain a subset of the common bog ericads and sedges.

The wet sand flats occur at the former gap between the point and the island, along the bay. The flora is an interesting mix of plants from many communities but also contains several that are rare or absent elsewhere in the region such as green twayblade (*Liparis loeselii*) and nodding ladies' tresses (*Spiranthes cernua*). Other characteristic species are shore rush (*Juncus balticus*) and the sedge, *Carex viridula*. Unfortunately, the aggressive exotic purple loosestrife (*Lythrum salicaria*) is well established on the sand flats.

This site comprises the most intact coastal barrier spit system on western Lake Superior. Included are excellent examples of both rare and widespread natural communities. A number of rare species are resident here, some of them specialized to dune environments. The site is used heavily by migratory birds. Of great added significance is the role this coastal barrier spit plays in protecting the vast wetlands of the Bad and Kakagon river systems just to the south. It will be essential for the owners and stewards of these properties to continue working together to address management issues and needs.

Pressures to develop amenities and facilitate access will continue, particularly on Long Island. That portion of the site for which the National Park Service is responsible could benefit from special designation and recognition in the property management plan.

Rare Elements of Long Island-Chequamegon Point, Ashland County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Carex lenticularis	Shore sedge	1996	3
Cicindela hirticollis rhodensis	Beach-dune tiger beetle	1996	2
Deschampsia cespitosa	Tufted hairgrass	1975	1
Equisetum variegatum	Variegated horsetail	1992	2
Melanoplus flavidus	Blue-legged grasshopper	1996	1
Migratory bird concentration site	Migratory bird concentration site	1996	2

LS# 23 BIG BAY

Report Source: #4
County: Ashland County

Site Description

This large embayment on the eastern coast of Madeline Island contains a coastal barrier spit, beach and dunes, xeric pine forest, lagoon, and a diverse array of peatlands. The lagoon is bordered by coastal fen, coastal bog, shrub swamp, and tamarack swamp. An abandoned sandspit now three-quarters of a mile inland from Lake Superior separates a much more acid complex of peatland types, including open bog, muskeg, and black spruce swamp, from the more minerotrophic types to the east.

The floating mat around the lagoon is composed of woolly sedge (*Carex lasiocarpa*), coast sedge (*C. exilis*--one of only four known stations statewide), twig rush (*Cladium mariscoides*), sweet gale (*Myrica gale*), and buckbean (*Menyanthes trifoliata*). Away from the lagoon the more firmly grounded mat consists of *Sphagnum* mosses, ericaceous shrubs, and a different complement of sedges. Important species include leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), bog laurel (*Kalmia polifolia*), small cranberry (*Vaccinium oxycoccos*), scheuchzeria (*Scheuchzeria palustris*), pitcher plant (*Sarracenia purpurea*), white beak-rush (*Rhynchospora alba*), sweet gale, and woolly sedge. Small tamarack (*Larix laricina*) are present, and closer to the interior spit they form a nearly closed forest of 4"-11" d.b.h. trees. Characteristic understory plants of this conifer swamp include speckled alder (*Alnus incana*), Labrador tea (*Ledum groenlandicum*), crested shield fern (*Dryopteris cristata*), lake sedge (*Carex lacustris*), beaked sedge (*C. rostrata*), few-seeded sedge (*C. oligosperma*), three-seeded sedge (*C. trisperma*), cinnamon fern (*Osmunda cinnamomea*), and small black spruce (*Picea mariana*).

To the west of the interior spit, which supports a boreal conifer-hardwood forest, is an oddly patterned acid peatland. The interior is quite open, with deep, hummocky *Sphagnum* mosses, ericads, and a depauperate flora representative of a truly ombrotrophic community. Among the few herbs present are the sedges *Carex oligosperma, C. pauciflora, C. paupercula*, the cespitose cotton-grass *Eriophorum spissum*, and round-leaved sundew (*Drosera rotundifolia*). Stunted black spruce (*Picea mariana*) are abundant. To the east of the more open muskeg, there is a closed stand of mature black spruce. Prevalent understory species include Labrador tea (*Ledum groenlandicum*), three-seeded sedge (*Carex trisperma*), three-leaved false Solomon's seal (*Smilacina trifolia*), and creeping snowberry (*Gaultheria hispidula*). The sphagnum carpet is nearly level, and except where blowdowns have occurred, this stand was easy to traverse. Deep accumulations of sphagnum peat have apparently raised the surface of this bog enough to isolate it from the influence of the more alkaline, mineral rich waters of either Lake Superior, the substrate underlying the peatland, or runoff from the uplands. Large tamarack (*Larix laricina*) ring the bog and spruce swamp, and a wet zone of alder (*Alnus* spp.), black ash (*Fraxinus nigra*), and lake sedge (*Carex lacustris*) occurs at the upland margins. This may be the only coastal wetland where the fens adjoin a true ombrotrophic bog.

The coastal spit is mostly forested, with all three pine species native to Wisconsin present. Wintergreen (*Gaultheria procumbens*), cow-wheat (*Melampyrum lineare*), blueberries (*Vaccinium angustifolium, V. myrtilloides*), and bracken fern (*Pteridium aquilinum*) comprise the understory. A narrow but extensive strip of unvegetated beach, and a dune with marram grass (*Ammophila breviligulata*) and beach-pea (*Lathyrus japonicus*) borders the shoreline.

Breeding bird surveys conducted in the open wetlands during June yielded records for merlin, American bittern, northern harrier, and LeConte's sparrow. The conifer swamp and muskeg supported, among many others, palm warbler, Lincoln's sparrow, red crossbill, and yellow-bellied flycatcher.

This site is rich in rare and uncommon species and contains excellent examples of many natural communities. As it is within Big Bay State Park and also a designated State Natural Area, the major tasks are to ensure that inappropriate use does not occur and to monitor periodically for invasive species. Most of the watershed is forested but there are also scattered small farms and residences. Working with local landowners to maintain forest block size and dispersal corridors, and prevent damage from runoff would be worthwhile.

Rare Elements of Big Bay, Ashland County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Ammodramus leconteii	LeConte's sparrow	1996	1
Botaurus lentiginosus	American bittern	1996	1
Carex michauxiana	Michaux sedge	1995	2
Carex pallescens var neogaea	Pale sedge	1992	1
Carex tenuiflora	Sparse-flowered sedge	1974	1
Carex livida var radicaulis	Livid sedge	1995	1
Deschampsia flexuosa	Crinkled hairgrass	1971	1
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1
Falco columbarius	Merlin	1996	1
Lycaena epixanthe	Bog copper	1996	1
Mergus merganser	Common merganser	1996	1
Rhynchospora fusca	Brown beak-rush	1974	1
Triglochin maritimum	Common bog arrow-grass	1995	1
Trisetum spicatum	Narrow false oats	1973	1

LS# 24 STOCKTON ISLAND TOMBOLO

Report Source: #4
County: Ashland County

Site Description

The tombolo is an exceptionally diverse and complex association of rare landforms and natural communities on the southeast end of 10,000 acre Stockton Island. Two sandspits have connected Presque Isle Point, historically an islet, with the main body of the island. The spits enclose a large wetland and lagoon which are traversed by a series of narrow, parallel, sand ridges. The swales between the ridges support a variety of wetlands including submergent aquatic, emergent aquatic, coastal fen, coastal bog, alder thicket, and tamarack swamp.

Communities associated with the sandspits are beach, lake dune, Great Lakes barrens, dry boreal forest, northern dry-mesic forest, and interdunal wetland. Several small streams drain the island's interior and reach Lake Superior via an outlet through the eastern sandspit into Julian Bay.

The fen mat is composed of woolly sedge (*Carex lasiocarpa*), the very rare coast sedge (*C. exilis*), twig rush (*Cladium mariscoides*), beak-rushes (*Rhynchospora alba, R. fusca*), sweet gale (*Myrica gale*), and buckbean (*Menyanthes trifoliata*). A boggier mat of *Sphagnum* mosses, ericaceous shrubs, sedges, and scattered small tamarack (*Larix laricina*) occurs in the drier swales and along the upland margins of the wetland. An interdunal pond supports an unusual flora that includes shore rush (*Juncus balticus*), Robbins spikerush (*Eleocharis robbinsii*), twig rush, and the carnivorous bladderworts *Utricularia cornuta* and *U. resupinata*. A large, isolated portion of the wetland in the northwestern sector of the tombolo is quite acid, dominated by ericaceous shrubs, especially leatherleaf (*Chamaedaphne calyculata*), few-seeded sedge (*Carex oligosperma*) and beaked sedge (*C. rostrata*). Speckled alder (*Alnus incana*) is locally common here.

Terrestrial communities in close association with the wetlands include extensive unvegetated sand beach, and a lake dune system of marram grass (*Ammophila breviligulata*) and beach pea (*Lathyrus japonicus*). The southeastern corner of the tombolo supports a small but excellent example of the very rare Great Lakes barrens community. Open-grown red pine (*Pinus resinosa*) and white pine (*P. strobus*) are interspersed among patches of open heath, of blueberry (*Vaccinium angustifolium*), bearberry (*Arctostaphylos uva-ursi*), false heather (*Hudsonia tomentosa*), grasses and lichens. Large colonies of moccasin flower (*Cypripedium acaule*) grow under the pines. The forked sandspit bordering Presque Isle Bay on the west side of the tombolo is forested with mature pines. The canopy on the eastern fork is dominated by red pine (*Pinus resinosa*), with a subcanopy of black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*). Common groundlayer species are bracken fern (*Pteridium aquilinum*), trailing arbutus (*Epigaea repens*), wintergreen (*Gaultheria procumbens*), cow-wheat (*Melampyrum lineare*), blueberries (*Vaccinium angustifolium, V. myrtilloides*), and huckleberry (*Gaylussacia baccata*). Mosses and lichens form a significant groundcover, and several lichen species are abundant on the lower branches of the conifers. The other part of this spit supports a mixed mature forest of white (*Pinus strobus*) and red pines (*P. resinosa*), with less of the spruce-moss-lichen component that gave the boreal feel to the other stand.

Presque Isle Point is vegetated with a mature, mesic hemlock-hardwood forest, also with a distinct boreal flavor. The shoreline of the point is rocky, with frequent sandstone ledges and low cliffs. The main body of the island is forested but much of it is still recovering from past catastrophic logging. The eastern coast is also rocky, with long expanses of substantial sandstone cliffs.

A very high concentration of rare species has been documented here, mostly plants and birds. Apart from the many rare species, the diversity, extent, and quality of the natural communities are reflected in the very high overall species diversity at this site.

The National Park Service maintains a dock, several buildings, and a small campground on the southwestern edge of the tombolo. Other than a few foot trails, these are the only developments at the site. The only problems to watch for at this time would be overuse by visitors and the appearance of invasive species. Stockton Island Tombolo is a designated State Natural Area within the Apostle Islands National Lakeshore.

Rare Elements of Stockton Island Tombolo, Ashland County.

Scientific Name	Common Name	Last Observation Date	No. of EOs
Arethusa bulbosa	Swamp-pink	1992	1
Bucephala clangula	Common goldeneye	1990	1
Carex exilis	Coast sedge	1992	1
Carex michauxiana	Michaux sedge	1995	1
Carex lenticularis	Shore sedge	1995	5
Catharus ustulatus	Swainson's thrush	1990	1
Circus cyaneus	Northern harrier	1990	1
Dendroica fusca	Blackburnian warbler	1990	1
Dendroica tigrina	Cape May warbler	1990	1
Deschampsia cespitosa	Tufted hairgrass	1996	1
Deschampsia flexuosa	Crinkled hairgrass	1991	1
Eleocharis robbinsii	Robbins spikerush	1992	1
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1
Falco columbarius	Merlin	1992	1
Hemidactylium scutatum	Four-toed salamander	1976	2
Mergus serrator	Red-breasted merganser	1996	1
Mergus merganser	Common merganser	1990	1
Platanthera orbiculata	Large roundleaf orchid	1993	1
Primula mistassinica	Bird's-eye primrose	1996	1
Rhynchospora fusca	Brown beak-rush	1992	1
Trisetum spicatum	Narrow false oats	1996	1
Utricularia resupinata	Northeastern bladderwort	1995	1

LS# 25 OUTER ISLAND SANDSPIT AND LAGOON

Report Source: #4
County: Ashland County

Site Description

The attenuated southern tip of the remote, 8,000 acre Outer Island, part of the Apostle Islands National Lakeshore, forms a long sandspit which encloses a large lagoon and wetland. The spit features extensive unvegetated beach, lake dunes, and a xeric pine forest. The open peatlands surrounding the lagoon are sedge-dominated to the south, more boggy to the north. Thickets of tall shrubs, and small, scattered stands of conifers add structural diversity to the site's wetlands.

The sedge-dominated mat around the southern end of the lagoon is composed primarily of woolly sedge (*Carex lasiocarpa*), twig rush (*Cladium mariscoides*), beak-rushes (*Rhynchospora alba, R. fusca*), buckbean (*Menyanthes trifoliata*), and sweet gale (*Myrica gale*). To the north, the mat is boggier, becoming *Sphagnum*-dominated, with ericaceous shrubs such as leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), and small cranberry (*Vaccinium oxycoccos*); as well as few-seeded sedge (*Carex oligosperma*), scheuchzeria (*Scheuchzeria palustris*), and pitcher plant (*Sarracenia purpurea*).

Of the terrestrial communities, the dunes are vegetated with marram grass (*Ammophila brevilgulata*), beach-pea (*Lathyrus japonicus*), and sand cherry (*Prunus pumila*). The second-growth, maturing xeric forest has a canopy of red pine (*Pinus resinosa*), white pine (*P. strobus*), and paper birch (*Betula papyrifera*). Jack pine (*P. banksiana*) occurs in a few locations but is uncommon. Balsam fir (*Abies balsamea*) is present in gaps and scattered throughout the forest understory. The groundlayer includes bracken fern (*Pteridium aquilinum*), bunchberry (*Cornus canadensis*), cow-wheat (*Melampyrum lineare*), wintergreen (*Gaultheria procumbens*), blueberry (*Vaccinium angustifolium*), and clubmosses (*Lycopodium* spp.).

At least five rare plants species have been documented at this site. Three rare birds have been observed during the breeding season. The site hosts notable concentrations of migratory birds in the fall, especially among the passerines and raptors. Loons, grebes, and cormorants congregate in the waters off of the spit, and there are frequent visits from southbound shorebirds. Gulls and terns commonly "loaf" on the tip of the spit. Outer Island has been designated as a State Natural Area. There are no immediate threats to this site, but it should be monitored periodically for invasive species, changes in abundance of rare species, and human use (currently light).

Rare Elements of Outer Island Sandspit and Lagoon, Ashland County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Arethusa bulbosa	Swamp-pink	1990	1
Carex lenticularis	Shore sedge	1995	2
Catharus ustulatus	Swainson's thrush	1996	1
Eleocharis robbinsii	Robbins spikerush	1995	1
Falco columbarius	Merlin	1993	2

Rare Elements of Outer Island Sandspit and Lagoon, Ashland County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Mergus serrator	Red-breasted merganser	1996	1
Migratory bird concentration site	Migratory bird concentration site	1996	1
Rhynchospora fusca	Brown beak-rush	1992	1
Utricularia resupinata	Northeastern bladderwort	1995	1

LS# 26 KAKAGON SLOUGHS / BAD RIVER RESERVATION

Report Source: #4
County: Ashland County

Site Description

The Reservation of the Bad River Band of Lake Superior Chippewa encompasses the lower portions of the Bad River drainage in northeastern Ashland and extreme northwestern Iron counties. Surveys conducted in 1996 focused on the vast wetland ecosystems of the lower Bad and Kakagon (a separate but ecologically linked system just west of the Bad River) rivers, and the corridor of the Bad River south of U.S. Highway 2. Major wetland communities of the lower Bad and Kakagon rivers include emergent marsh, coastal fen, coastal bog, tamarack swamp, and shrub swamp. A number of coastal lakes (lagoons) support beds of submergent and floating-leaved aquatic plants and provide critical habitat for many aquatic animals. These communities are the most extensive and among the least disturbed of their respective types in the project area, and certainly rank among the most significant in the Great lakes.

As the wetlands of the Bad and Kakagon systems are partially separated from and protected by terrestrial features, these deserve mention as well. A coastal barrier spit (see "Long Island-Chequamegon Point") borders the Bad and Kakagon wetlands on the north. This spit contains extensive beach and dune communities, and in several locations, dry forest of pine and oak. Oak Point, north of the Kakagon River mouth, consists of nearly-parallel sand ridges radiating from a common base on its eastern end. These ridges support significant stands of dry forest, with pine and oak dominant. The area has experienced a decline in the number of Black Tern in the past few years, declining from a population of 16 (1989) to 2 (1994) to 0 in 1999.

South of U.S. Highway 2, the course of the Bad River is confined within steep clay banks. Between the sharp meanders is a series of terraces occupied primarily by mesic hardwood forests of sugar maple (*Acer saccharum*) and basswood (*Tilia americana*). The groundflora of these terraces is exceptionally rich and includes many plants which are rare or absent elsewhere in northern Wisconsin. Rare animals also occur here. This is a unique ecosystem within both the project area and northern Wisconsin. Only the much more disturbed lower Nemadji River corridor of northwestern Douglas County has similar characteristics, but there the dominant trees are black ash (*Fraxinus nigra*) and white spruce (*Picea glauca*). A data sharing agreement with the Bad River Band of Lake Superior Chippewa is in development. Until this agreement is in place, we will not be computerizing data or identifying locations for natural communities or rare species populations found on the Reservation.

Associated with the mesic bottoms of the meander "tongues" are stands of floodplain forest, black ash swamp, shrub swamp, hemlock-hardwood forest, and oxbow lakes. The red clay and sand bluffs flanking the Bad River and its tributaries also support significant communities, including boreal conifer-hardwoods, dry pine forest, hemlock-white cedar forest, and spring seeps. A large complex of tamarack swamp, white cedar swamp, black ash swamp, and fen occurs where the river exits the deep clay "canyons" to spread out over the plain to the north.

Due to the scale of the natural features of the site and the complex ownership patterns within and beyond the Reservation boundaries, partnerships among tribal, public, and private entities will be essential in addressing important conservation issues of the Bad River Watershed such as invasive species, eutrophication, and sedimentation. Planning should be done on a watershed basis wherever possible.

LS# 27 CAROLINE LAKE WETLANDS

Report Source: #4
County: Ashland and Iron Counties

Site Description

This site lies near the southern edge of the Lake Superior Basin, in the Winegar Moraines subsection. The location of the site is strategic, as it occupies the headwaters region of the Bad River. Major features include a large undeveloped lake and several hundred acres of undisturbed wetlands. Most surrounding land is forested with second-growth northern hardwoods, though some stands have retained a significant component of conifers. Human population density is low, but development is increasing rapidly, especially around other lakes in the area. Caroline Lake covers 129 acres, has a maximum depth of 8 ft, and has soft, slightly acid water. Bottom materials include muck, sand, and gravel. It is fed by several small streams which originate in the extensive peatlands to the east. The outlet is the Bad River. Based on these physical and chemical attributes we have classified it as a soft, shallow, drainage lake, a relatively rare type in Wisconsin.

A narrow zone of emergent aquatic macrophytes 1-15 m wide borders much of the shoreline. Dominant species are water horsetail (*Equisetum fluviatile*), hard-stemmed bulrush (*Scirpus acutus*), and Small's spike rush (*Eleocharis smallii*). Shallow portions of the lake basin support dense beds of submerged and floating-leaved aquatic vegetation, such as water shield (*Brasenia schreberi*), coontail (*Ceratophyllum demersum*), yellow water lily (*Nuphar variegatum*), and pondweeds (*Potamogeton* spp.). Small stands of tamarack swamp, sedge meadow, and shrub swamp adjoin the lake.

The acid peatlands to the east consist of extensive muskeg/open bog, with small pools bordered by a poor fen (sphagnum lawn) community. The muskeg is characterized by scattered, stunted black spruce (*Picea mariana*) and tamarack (*Larix laricina*); ericaceous shrubs such as leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), and small cranberry (*Vaccinium oxycoccos*); and sedges, especially *Carex oligosperma, C. pauciflora, C. paupercula,* and *Eriophorum spissum*. Deep accumulations of sphagnum peat create a pronounced hummock-hollow microtopography across the surface. In some areas the trees are larger and denser, creating a near-forest condition. Labrador tea (*Ledum groenlandicum*) and three-seeded sedge (*Carex trisperma*) are abundant in the understory of such stands. Around the margins of the small pools within the peatland interior, the flora differs markedly. Here the sphagnum mat is level and quaking. The common sedges are white beak-rush (*Rhynchospora alba*) and mud sedge (*Carex limosa*); and scheuchzeria (*Scheuchzeria palustris*) and grass pink orchid (*Calopogon tuberosus*) are more abundant.

Animals noted on or near the lake during the summer of 1996 include bald eagle, osprey (fishing), broad-winged hawk, common loon (pair on lake), blue-winged teal, and hooded merganser. Freshwater sponges were common on submerged woody debris near the shore. A diverse complement of boreal lepidoptera and birds resides here. Lincoln's sparrow, palm warbler, magnolia warbler, olive-sided flycatcher, and yellow-bellied flycatcher are representative avifauna. Caroline Lake and Wetlands has high intrinsic values but is also worthy of protection for its important role in the Bad River Watershed. Protection work will have to proceed quickly as the rate of lake development has accelerated in recent years.

Rare Elements of Caroline Lake Wetlands, Iron County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of EOs**
Boloria freija	Freija fritillary	1996	1
Empidonax flaviventris	Yellow-bellied flycatcher	1996	1
Lycaena dorcas	Dorcas copper	1996	1
Oeneis jutta ascerta	Jutta arctic	1996	1
Perisoreus canadensis	Gray jay	1996	1

LS# 28 BARK BAY

Report Source: #4
County: Bayfield County

Site Description

This large complex of coastal barrier spit, lagoon, springs, and wetlands occupies an embayment between two rocky headlands. The wetlands are extensive and include two major types; coastal fen and coastal bog. The fen dominants are woolly sedge (*Carex lasiocarpa*), twig rush (*Cladium mariscoides*), sweet gale (*Myrica gale*), water horsetail (*Equisetum fluviatile*) and buckbean (*Menyanthes trifoliata*). The coastal bog is composed of a mat of *Sphagnum* mosses, ericaceous shrubs, sedges, and scattered small tamarack (*Larix laricina*). Both communities are floristically diverse, in excellent condition, and support many rare species. Among the latter are plants, birds, and butterflies. A large lagoon occupies the center of the site and supports submergent and floating-leaved aquatic macrophytes. A forested interior spit parallel to the coastal barrier spit breaks the wetlands into two major sections. Communities are similar on both sides of the interior spit but the interior wetlands lack a central lagoon. Other significant features include a narrow strip of dry pine forest on the coastal spit, springs associated with the mouth of the Bark River on the eastern edge of the site, and small stands of tamarack and tall shrubs.

Birds present during the breeding season included bald eagle, merlin, northern harrier, yellow rail, sandhill crane, Brewer's blackbird, and American bittern. Substantial numbers of migrating shorebirds were noted after late June through August in both 1995 and 1996.

This site is a protection priority as its wetlands are extensive, in excellent condition, and support many rare, uncommon, and representative species. The unnamed inlet stream on the west side of the site is bordered by several large clones of the invasive giant reed grass (*Phragmites australis*). This species should be monitored, and controlled if necessary. A portion of the site is designated as a State Natural Area but the boundary is not adequate to prevent negative impacts associated with increased development in the area. A broader view of the local watershed and the land uses therein is desirable to assess and better anticipate/address threats and protection needs.

Rare Elements of Bark Bay, Bayfield County

Scientific Name	Common Name	Last Observation Date	No. of Eos
Arethusa bulbosa	Swamp-pink	1995	1
Boloria eunomia	Bog fritillary	1996	1
Botaurus lentiginosus	American bittern	1996	1
Callitriche hermaphroditica	Autumnal water-starwort	1995	1
Carex livida var radicaulis	Livid sedge	1995	1
Carex michauxiana	Michaux sedge	1995	1
Carex tenuiflora	Sparse-flowered sedge	1995	1
Coturnicops noveboracensis	Yellow rail	1996	1
Deschampsia flexuosa	Crinkled hairgrass	1995	1
Epilobium strictum	Downy willow-herb	1988	1
Lycaena epixanthe	Bog copper	1996	1

Rare Elements of Bark Bay, Bayfield County			
Scientific Name	**Common Name**	**Last Observation Date**	**No. of Eos**
Myriophyllum farwellii	Farwell's water-milfoil	1974	1
Phyciodes batesii	Tawny crescent spot	1991	1
Platanthera orbiculata	Large roundleaf orchid	1996	1
Rhynchospora fusca	Brown beak-rush	1995	1

GAPS AND FUTURE NEEDS: DATA AND INVENTORY

This report represents a first step in gathering information about the ecologically significant sites in the Lake Michigan and Lake Superior coastal zones. The scope of the project did not allow for field surveys, aerial photo interpretation or other means of assessing the current condition of the primary sites. Therefore, information gaps have been noted and inventory needs identified in the preceding site descriptions and below.

General Gaps and Future Needs

Throughout the course of this project, several general gaps and future needs became apparent regarding to coastal wetland information for Wisconsin, applicable to both of the Lake Michigan and Lake Superior coastal zones. These are:

1 - Classification of Coastal Wetlands. Although several studies have been conducted on "coastal wetlands", there is no statutory or otherwise universal definition of a coastal wetland. Upon reviewing the literature and various studies that were used to develop this report, it became apparent that the various systems used to classify wetlands need to be reconciled. The preceding site descriptions come from various sources, and definitions used within those descriptions may be inconsistent with one another. It would be very beneficial to crosswalk site descriptions for all sites into a consistent classification system. The National Vegetation Classification currently under development by the National Office of The Nature Conservancy will improve this situation in the future, depending on how widely it is adopted. Natural community descriptions currently used by the Wisconsin Natural Heritage Inventory are found in Appendix 1.

2 - Site Maps and Photos. The scope of this project did not allow for the completion of detailed site maps nor site photos for the primary coastal wetland sites.

3 - Further Prioritization of Sites. A significant gap is the lack of current site information available for some of the coastal areas. Once that situation is rectified (either through inventory or other efforts), it would be valuable to further prioritize the 64 primary coastal wetland sites.

4 – Biological Conservation Database (BCD) Update. Many of the existing reports reviewed for this project contain information on rare species locations that is not currently found in NHI's BCD. The BCD should be expanded to include this information.

5 - Review of pollution studies. Several research projects have been conducted over the past several years to quantify the effects of pollution on Green Bay wetlands and wildlife. The findings of most of these studies, however, have not been incorporated into this report. A further review of existing information on pollution in Green Bay is needed.

6 - Data on Fish. Information on fish should be collected and incorporated into the BCD.

Gaps, Future Needs, and Suggestions: Lake Michigan

Several major gaps emerged throughout the course of this project applicable specifically to Lake Michigan. They are listed below.

1 - Outdated Site Descriptions. There is a lack of current information for some of the sites, especially those sites on the western shore of Green Bay, and the Lake Michigan coast south of Door County and north of Ozaukee County. Much of the available site information was developed in 1980 or 1981, and could be significantly outdated. Site descriptions from the various reports were often very brief and did not provide detailed site information. The scope of this project did not allow for extensive field inspections for each of the coastal wetland sites, and this precludes the filling of obvious gaps. Part of this effort should involve obtaining as much site information as possible from other sources (aerial photos, maps, etc.).

2 - Outdated or Missing Element Occurrence Data. Often the information about rare elements found in the site descriptions did not dovetail with the list of element occurrences from the NHI database, particularly for birds. Since element occurrence information from NHI's BCD and information from past coastal wetland studies did not "match", it is suggested that field inventory should be conducted on all, or a sub-set, of the primary coastal wetland sites.

3 - Inventory of Other Coastal Areas. After determining locations of primary coastal wetland sites, it became apparent there may be other coastal areas not identified which are important sites. It is unclear whether or not these areas actually have rare elements or if there is a lack of inventory data and information to be able to make those conclusions. For example, along the western shore of Green Bay there are wetlands between the primary coastal wetland sites for which there is very little existing information (and few element occurrence records). These areas should be briefly visited to determine whether or not they are significant coastal wetland areas.

4 - Bird Information. Accessible data on birds proved to be a enormous gap. To date no comprehensive database for migratory, colonial, and breeding birds has been developed. This needs to be addressed to supplement information on coastal wetland sites. Wisconsin's Breeding Bird Atlas could be used as a guide to identify priority sites for inventory. Individual site files can be reviewed by contacting the Department of Natural Resources, the National Park Service, and other sources. Some web-sites also exist which provide information on bird conservation initiatives. These references can be found in Appendix 3.

5 - Dams. The impacts of dams on streams entering the Great Lakes, and subsequently on coastal wetlands, is relatively unknown and was not addressed in this report. A study of these impacts should be developed.

6 – Significant Sites Outside Coastal Zone. Wetland sites outside the Lake Michigan coastal zone were not evaluated as part of this study. It is likely that sites exist outside this zone which impact coastal waters and wetlands. A study of these areas would be useful in an overall assessment of Wisconsin's wetlands, as well as furthering the knowledge of wetlands functions in relation to the Great Lakes.

Gaps, Future Needs, and Suggestions: Lake Superior

All of the primary coastal wetland sites in Lake Superior were identified through the inventory and assessment conducted by NHI staff. A detailed description of this evaluation can be found in the "Contributing Studies and Research" section of this report.

Considering the recent completion of the report and inventory, there are relatively few known gaps in this coastal zone. Unlike the primary sites of Lake Michigan, information on birds was incorporated into the findings of this report.

However, Lake Superior has some very rare recently found species that will need to be inventoried (personal communication, NHI staff ecologist). Data on the Apostle Islands is less thorough than information available for mainland sites. Efforts should be made to inventory the Islands not inventoried through this evaluation.

CONCLUSIONS

This report represents the first step of a larger project envisioned by the NHI section of the Bureau of Endangered Resources (BER). Using the compiled information on the primary sites of Lakes Michigan and Superior, BER ultimately envisions public documents that will provide comprehensive information about the most ecologically significant sites within the coastal zone. However, to achieve this goal, the information gaps discussed above need to be addressed.

Potential work elements for additional phases to this project could include:

1 - Field inventory on selected sites in greatest need of surveying (as identified throughout the report). These areas should include sites along the western shore of Green Bay, and the area between Door County and Ozaukee County.

2 - Limited surveys of remaining primary sites to determine current status. This may involve field visits and/or current aerial photo interpretation as needed.

3 - Compilation of bird data.

4 - The development of public documents which will identify and describe the most ecologically significant sites in the coastal zone.

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GLOSSARY OF TERMS

This glossary is intended to provide definitions for several words found throughout the text and in the site descriptions. Please note the definitions for wetlands are generalized based on definitions found in wetland publications used for this report. The natural community definitions used to describe and classify some Lake Michigan primary sites and all of the Lake Superior primary sites can be found in ***Appendix 1****.*

Definitions.

Bog**.** A peat-accumulating wetland that has no significant water inflows or outflows and supports acidophilic mosses, particularly sphagnum.

Bottomland. Lowlands along streams and rivers, usually on alluvial floodplains that are periodically flooded.

Element Occurrence (or EO). A record or series of records of rare, threatened, and special concern plant and animal species and natural communities being tracked by the Natural Heritage Inventory program.

Fen**.** A peat-accumulating wetland that receives some drainage from surrounding mineral soil and usually supports marshlike vegetation.

Freshwater (Coastal) Estuary. Rivers that form drowned valleys where Great Lakes and river waters mix. These provide valuable habitat for spawning fish, nesting and migrating birds, and many rare or specialized plants.

GIS (Geographic Information System). A system of computer hardware, software, procedures, standards, geographical data, and personnel for the capture, storage, maintenance, manipulation, analysis and display of all forms of geographically referenced (spatial) information. A GIS can be thought of as having three essential components: a graphical (or pictoral) interface, a database, and a capacity to perform spatial analysis (i.e. how many lakes are in a particular county and what proportion of land do they cover) from that database in a graphical way.

Interdunal Wetland. A type of coastal wetland that occurs between dunes adjacent to the Great Lake coasts (and follow no specific pattern). They generally occur where the water table is close to or exposed at the surface, and are formed by wind, wave, and storm action.

Lake Dune System or Barrier Lagoon Wetlands. Wetlands or lagoons which were once part of the Great Lakes but are now separated from the lake by an unbroken natural barrier sand dune or ridge. They generally have very little flow.

Marsh. A frequently or continually inundated wetland characterized by emergent herbaceous vegetation adapted to saturated soil conditions.

Muskeg. Large expanses of peatlands or bogs.

Natural Heritage Inventory (or NHI). A program was established by the Wisconsin Legislature in 1985 and is maintained by the Wisconsin DNR's Bureau of Endangered Resources. The NHI program is responsible for maintaining data on the locations and status of rare species, natural communities, and natural features in Wisconsin.

Peatland. Any wetland that accumulates partially decayed plant matter.

Pothole. Shallow, marshlike pond

Red Clay Complex Wetlands. Occur mainly on old lake plains adjoining Lake Superior and are composed of a mixture of wet and dry red clay soils.

Reedswamp. Marsh dominated by *Phragmites* (common reed)

Ridge and Swale Wetland. A type of formation composed of sandy ridges running parallel to the shore and low areas between them (swales). Ridge and swale formations were created by the receding coastline of post-glacial lake levels. The swales can hold moisture and create a unique habitat for wetland vegetation.

Seiches. This is a natural process generated when wind blows in a constant direction and piles water up on the downwind shore. When the wind drops, the water is released from the force and flows back to the opposite shore. When a seiche moves towards the western shore of Lake Michigan, it acts as a dams, slowing the discharge of rivers and creeks into the lake or even forcing water to reverse course and move upstream (adopted from Manitowoc report, 1998).

Slough. A swamp or shallow lake system.

Swamp. Wetland dominated by trees or shrubs.

Vernal pond. Shallow, intermittently flooded wet meadow, generally dry for most of the summer and fall.

Wave-splashed Cliff/Rock Ledge. Wet rock crevices along the Great Lakes which support rare plants.

Wet Meadow. Grassland with waterlogged soil near the surface but without standing water for most of the year.

Wet Prairie. Similar to a marsh but with water levels usually intermediate between a marsh and a wet meadow.