



U.S. Fish & Wildlife Service

Gravel Island, Green Bay, Harbor Island, Huron, and Michigan Islands

National Wildlife Refuges

Comprehensive Conservation Plan

U.S. Department of the Interior
Fish and Wildlife Service
Region 3 (Midwest Region); Bloomington, MN

Cover Photograph: U.S. Fish and Wildlife Service



The mission of the U.S. Fish & Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

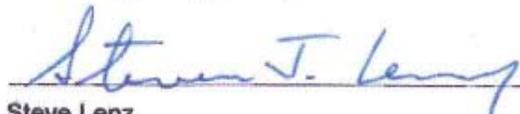
Comprehensive Conservation Plans provide long-term guidance for management decisions; set forth goals, objectives and strategies needed to accomplish refuge purposes; and, identify the Fish and Wildlife Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Gravel Island, Green Bay, Harbor Island, Huron and Michigan Islands

National Wildlife Refuges

Comprehensive Conservation Plan Approval

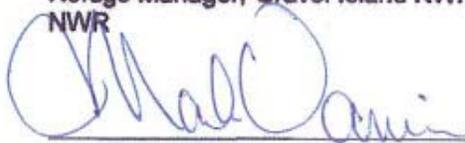
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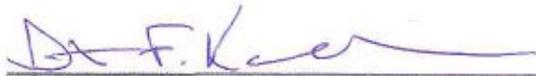
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Gravel Island, Green Bay, Harbor Island, Huron, and Michigan Islands

National Wildlife Refuges

Comprehensive Conservation Plan and Land Protection Plan

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Chapter 1: Introduction and Background

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[The U.S. Fish and Wildlife Service](#)
[The National Wildlife Refuge System](#)
[Refuge Purpose](#)
[Refuge Vision](#)
[Purpose and Need for Plan](#)
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Throughout this document, five national wildlife refuges (NWRs, refuges) are discussed individually—such as the Gravel Island NWR or the Green Bay NWR. This document also discusses all five NWRs collectively as one entity and when doing so, refers to the group as the “Great Lakes islands refuges” or “Great Lakes islands NWRs.”

Introduction

The Great Lakes of North America contain one-fifth of the world's fresh surface water or 95 percent of water in the United States. Only the polar ice caps and Lake Baikal in Siberia contain more fresh water. The surfaces of these water bodies encompass more than 94,000 square miles, and the coastline stretches along 10,900 miles. The Great Lakes shoreline is equal to almost 44 percent of the circumference of the earth. These figures are impressive and well known to many who live in the surrounding states and provinces. Of lesser renown are the 35,000 islands that dot the lakes and serve as a terrestrial base or “hubs” for aquatic ecosystems of the Great Lakes.

For many, the thought of islands can evoke a sense of mystery, isolation, history, and wildness, or they can provide dreams of an exotic, private hideaway from a fast-paced world. Islands are a place of sanctuary and protection from the harsh elements of the open water. Islands also serve as a refuge for rare plants and animals, protected by miles of water from predators, diseases, and urban development. That is why both people and wildlife are attracted to these island havens.



View from Plum Island Lighthouse, Green Bay NWR

The Great Lakes islands have unique landforms, plants and animal assemblages, and cultural history. They are living laboratories of natural selection. The Great Lakes islands contain globally-rare conservation targets, such as alvar plant communities—found only in Scandinavia and the Great Lakes ecosystem—and they provide breeding habitat for endangered species, such as the Great Lakes Piping Plover and the Lake Erie water snake. Many Great Lakes islands offer important breeding and stopover

sites for migratory birds, and they provide climatic buffers and other special protection for fish nurseries.

The Great Lakes islands we will examine in this Comprehensive Conservation Plan (CCP) are part of the National Wildlife Refuge System (NWRS, Refuge System) in Lake Huron, Lake Michigan, and Lake Superior. The CCP will include Gravel Island, Green Bay, Harbor Island, Huron, and Michigan Islands NWRs (figures 1-1 through 1-3, table 1-1).

The CCP will set wildlife, habitat, and public use priorities and guide management decisions on these refuges for the next 15 years. All aspects of the island refuges will be addressed by the CCP, including important fish and wildlife habitats, public use, and current management activities. By law, six wildlife-dependent recreational uses receive a priority on national wildlife refuges: fishing, hunting, wildlife observation and photography, and environmental education and interpretation.

Table 1-1: Great Lakes Islands

State/Lake	Refuge Name	Responsible Office	Island Name	Acreage
Wisconsin/Lake Michigan	Green Bay NWR	Horicon NWR	Hog Island	2
Wisconsin/Lake Michigan	Green Bay NWR	Horicon NWR	Plum Island	325
Wisconsin/Lake Michigan	Green Bay NWR	Horicon NWR	Pilot Island	3
	Green Bay NWR (3 islands) Total Acreage			330
Wisconsin/Lake Michigan	Gravel Island NWR	Horicon NWR	Gravel Island	1.2
Wisconsin/Lake Michigan	Gravel Island NWR	Horicon NWR	Spider Island	17.7
	Gravel Island (2 islands) Total Acreage			18.9
Michigan/Lake Superior	Huron NWR	Seney NWR	Lighthouse Island (aka West Huron Island)	44.1
Michigan/Lake Superior	Huron NWR	Seney NWR	Unnamed Island near Lighthouse Island	0.4
Michigan/Lake Superior	Huron NWR	Seney NWR	Cattle Island	8.5
Michigan/Lake Superior	Huron NWR	Seney NWR	McIntyre Island	81
Michigan/Lake Superior	Huron NWR	Seney NWR	Gull Island	8.9
Michigan/Lake Superior	Huron NWR	Seney NWR	Unnamed Island near Gull Island	0.9
Michigan/Lake Superior	Huron NWR	Seney NWR	Unnamed Island near Gull Island	2.3
Michigan/Lake Superior	Huron NWR	Seney NWR	Unnamed Island near Gull Island	0.9
	Huron NWR (8 islands) Total Acreage			147.07
Michigan/Lake Huron	Harbor Island NWR (1 island)	Seney NWR	Harbor Island	695
Michigan/Lake Huron	Michigan Islands NWR	Shiawassee NWR	Thunder Bay Island	195.09
Michigan/Lake Huron	Michigan Islands NWR	Shiawassee NWR	Sugar Island	144
Michigan/Lake Huron	Michigan Islands NWR	Shiawassee NWR	Scarecrow Island	4.31
Michigan/Lake Huron	Michigan Islands NWR	Shiawassee NWR	Scarecrow Island	1
Michigan/Lake Huron	Michigan Islands NWR	Shiawassee NWR	Big Charity Island	250.8
Michigan/Lake Huron	Michigan Islands NWR	Shiawassee NWR	Little Charity Island	16.99
Michigan/Lake Michigan	Michigan Islands NWR	Seney NWR	Gull Island	243.32
Michigan/Lake Michigan	Michigan Islands NWR	Seney NWR	Pismire Island	2
Michigan/Lake Michigan	Michigan Islands NWR	Seney NWR	Hat Island	16.07
Michigan/Lake Michigan	Michigan Islands NWR	Seney NWR	Shoe Island	1.32
	Michigan Islands (9 islands) Total Acreage			874.9

The U.S. Fish and Wildlife Service

The Great Lakes islands refuges are administered by the U.S. Fish and Wildlife Service (FWS, Service). The Service is the primary federal agency responsible for conserving, protecting, and enhancing the Nation's fish and wildlife populations and their habitats. It oversees the enforcement of federal wildlife laws, management and protection of migratory bird populations, restoration of nationally significant fisheries, administration of the Endangered Species Act, and the restoration of wildlife habitat such as wetlands. The Service also manages the National Wildlife Refuge System.

The National Wildlife Refuge System

Refuge lands are part of the National Wildlife Refuge System, which was founded in 1903 when President Theodore Roosevelt designated Pelican Island in Florida as a sanctuary for Brown Pelicans. Today, the Refuge System is a network of 556 refuges and 38 wetland management districts covering more than 150 million acres of public lands and waters. Most of these lands (82 percent) are in Alaska, with approximately 16 million acres located in the lower 48 states and several island territories.

The Refuge System is the world's largest collection of lands specifically managed for fish and wildlife. Overall, it provides habitat for more than 5,000 species of birds, mammals, fish, amphibians, reptiles, and insects. As a result of international treaties for migratory bird conservation and other legislation, such as the Migratory Bird Conservation Act of 1929, many refuges have been established to protect migratory waterfowl and their migratory flyways.

Refuges also play a crucial role in preserving endangered and threatened species. Refuges also provide unique recreational and educational opportunities for people. When human activities are compatible with wildlife and habitat conservation, they are places where people can enjoy wildlife-dependent recreation such as hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Many refuges have visitor centers, wildlife trails, automobile tours, and environmental education programs. Nationwide, approximately 30 million people visited national wildlife refuges in 2004.

The National Wildlife Refuge System Improvement Act of 1997 established several important mandates aimed at making the management of national wildlife refuges more cohesive. The preparation of CCPs is one of those mandates. The legislation directs the Secretary of the Interior to ensure that the mission of the Refuge System and purposes of the individual refuges are carried out. It also requires the Secretary to maintain the biological integrity, diversity, and environmental health of the Refuge System.

The goals of the Refuge System are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Figure 1-1: Michigan Islands National Wildlife Refuge

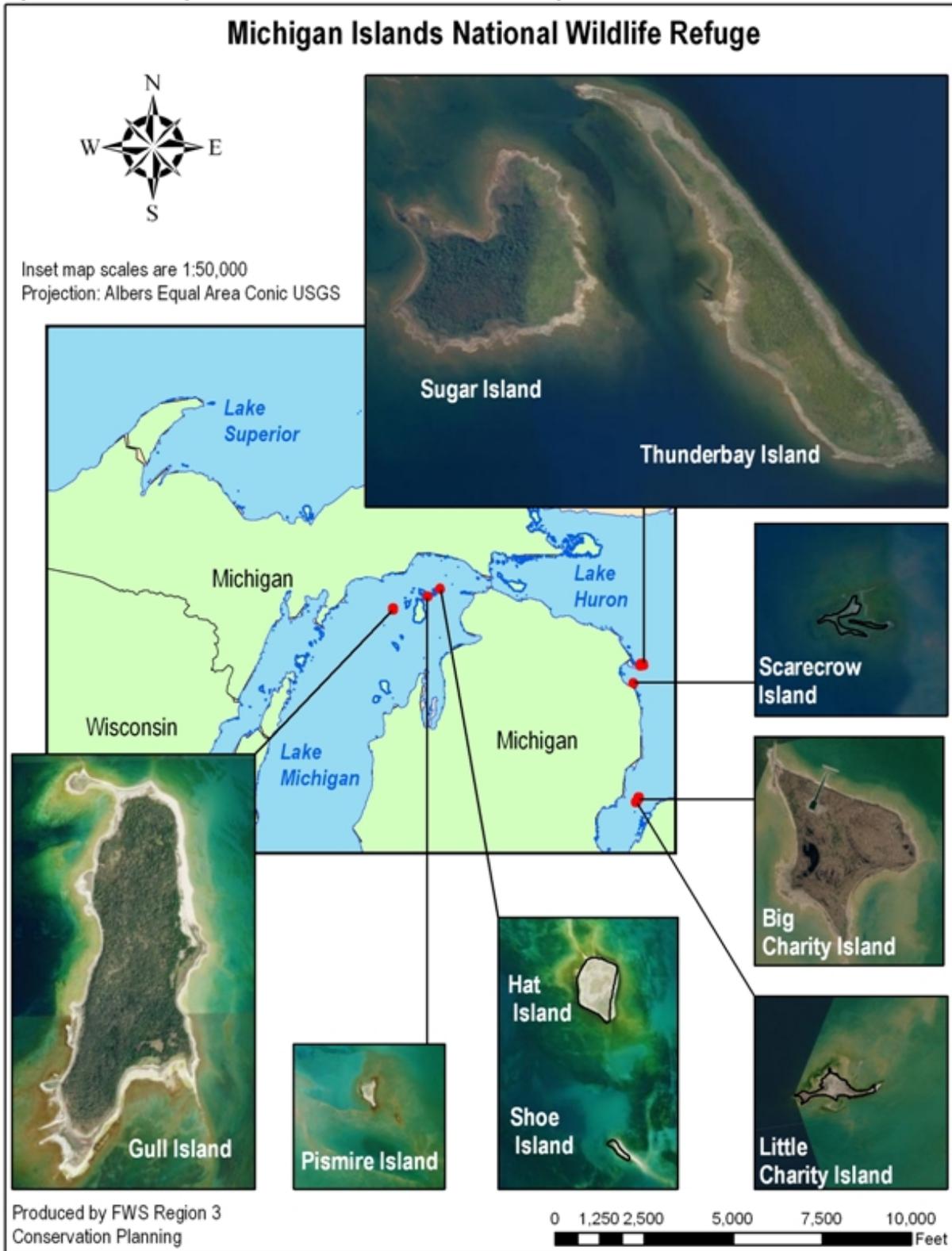


Figure 1-2: Green Bay National Wildlife Refuge

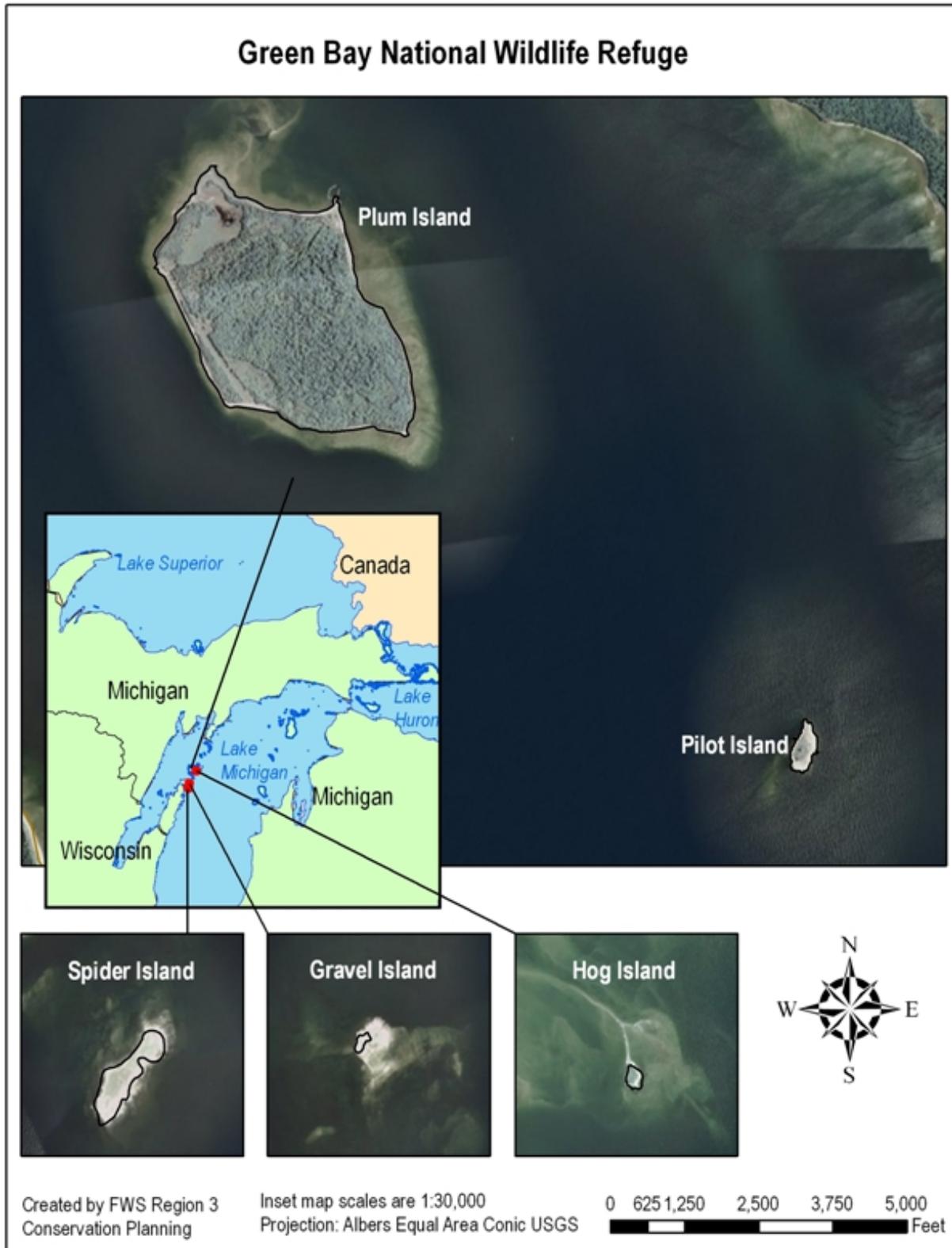
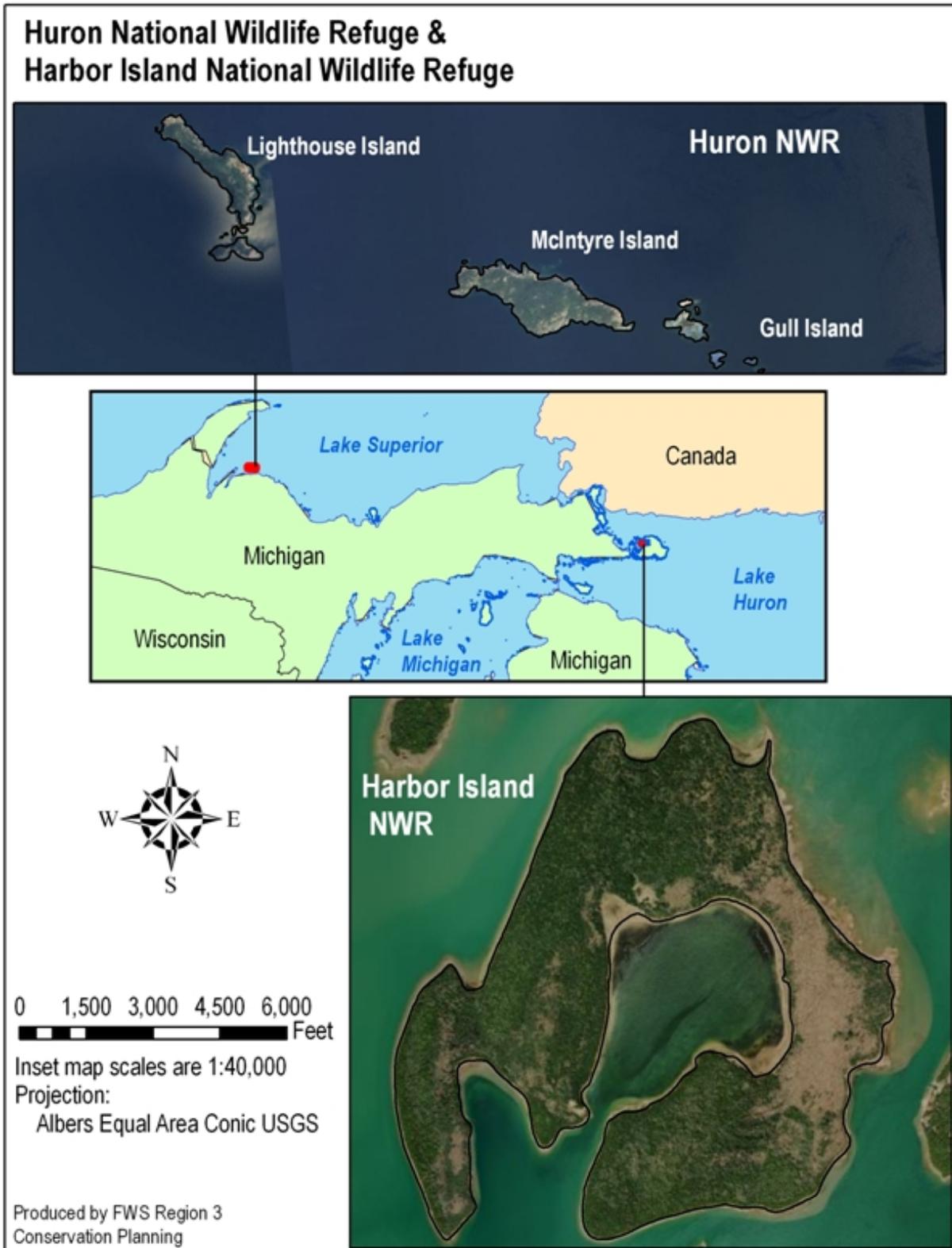


Figure1-3: Huron and Harbor Island National Wildlife Refuges



Refuge Purpose

Gravel Island NWR was established by Executive Order 1678, dated January 9, 1913 . . .

“ . . . as a preserve and breeding ground for native birds.”

Public Law 91-504, October 23, 1970 designated the Gravel Island NWR as a Wilderness Area.

Green Bay NWR was established by Executive Order 1487, February 21, 1912 . . .

“ . . . as a preserve and breeding ground for native birds.”

Public Law 91-504, October 23, 1970 designated the Green Bay NWR as a Wilderness Area.

Green Bay NWR, Plum and Pilot Islands Additions were established by Public Land Order 7681, dated October 17, 2007 . . .

“ . . . to protect native and migratory bird habitat and endangered species habitat within the Great Lakes Basin ecosystem.”

Harbor Island NWR was purchased in 1983 under authority of the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j) . . .

“ . . . (for the) conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act)

Huron NWR was established by Executive Order dated October 10, 1905 . . .

" . . . as a Refuge and breeding ground for migratory birds and other wildlife . . . " 16 U.S.C. 71 5d (Migratory Bird Conservation Act)

“ . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act).

Public Law 91-504, October 23, 1970 designated the Huron NWR as a Wilderness Area.

Michigan Islands NWR was established by Executive Order 265 in 1943. . .

" . . . as a refuge and breeding ground for migratory birds and other wildlife . . . "

" . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. n 715d (Migratory Bird Conservation Act) and

" . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . " 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act)

Public Law 91-504, October 23, 1970 established Shoe, Pismire, and Scarecrow Islands as designated Wilderness Areas.

Refuge Vision

The planning team considered the past vision statements and emerging issues and drafted the following combined vision statement of the desired future state for all of the Great Lakes islands refuges:

“Management of Great Lakes islands refuges will reflect the mission of the National Wildlife Refuge System by conserving in perpetuity a rich mosaic of island habitats and, enabling nesting and migrating birds, and other wildlife of conservation concern in the Great Lakes, to thrive here. With the help of our conservation partners, we will apply sound, scientific principles based on research and studies and adaptive management strategies to sustain the long-term health and integrity of Great Lakes habitats; expand community outreach and environmental education and interpretation programs; and, stimulate visitors to embrace stewardship of natural resources.”

Purpose and Need for Plan

This CCP articulates the management direction for the five Great Lakes islands refuges for the next 15 years. Through the development of goals, objectives, and strategies, this CCP describes how each refuge also contributes to the overall mission of the Refuge System. Several legislative mandates within the National Wildlife Refuge System Improvement Act of 1997 have guided the development of this plan. These mandates include:

- Wildlife has first priority in the management of refuges.
- Wildlife-dependent recreation activities, namely hunting, fishing, wildlife observation and photography, and environmental education and interpretation are priority public uses of refuges. We will facilitate these activities when they do not interfere with our ability to fulfill the refuge’s purpose or the mission of the refuge system.
- Other uses of the refuges will only be allowed when determined appropriate and compatible with refuge purposes and mission of the refuge system.

The plan will guide the management of the Great Lakes islands refuges by:

- Providing a clear statement of direction for the future management of each refuge.
- Making a strong connection between refuge activities and conservation activities that occur in the surrounding area.
- Providing refuge neighbors, users, and the general public with an understanding of the Service’s land acquisition and management actions on and around the refuge.
- Ensuring the refuge actions and programs are consistent with the mandates of the Refuge System.
- Ensuring that refuge management considers federal, state, and county plans.
- Establishing long-term continuity in refuge management.

- Providing a basis for the development of budget requests on the refuge's operational, maintenance, and capital improvement needs.

History of Refuge Establishment

Gravel Island NWR

Gravel (4 acres) and Spider (23 acres) Islands comprise the Gravel Island NWR. These islands are located in Lake Michigan, approximately 1 mile east of the northern tip of the Door County Peninsula, Wisconsin. The islands were set aside by Executive Order 1678 in 1913 as a preserve and breeding ground for native birds.

Green Bay NWR

Green Bay NWR consists of Hog Island (2 acres), Plum Island (325 acres), and Pilot Island (3.7 acres). The islands are located in Lake Michigan, near Washington Island, off the tip of Wisconsin's Door Peninsula. Hog Island was set aside by Executive Order 1487 in 1912 as a preserve and breeding ground for native birds. Plum and Pilot Islands were transferred from the U.S. Coast Guard (USCG) to the Service in 2007.

Harbor Island NWR

Harbor Island (695 acres) is located one mile north of Drummond Island, MI and 3.5 miles south of the United States–Canadian (Ontario) border in Potagannissing Bay on Lake Huron. Harbor Island was purchased from The Nature Conservancy (TNC) in December 1983 as part of the Unique Ecosystem program.

Huron NWR

Huron NWR in Lake Superior was established in 1905 by executive order of President Theodore Roosevelt and is the oldest refuge in the Great Lakes and in the Midwest Region (Region 3).

Michigan Islands NWR

Shoe and Pismire Islands in Lake Michigan and Scarecrow Island in Lake Huron were acquired in 1943 and were the first islands that established the Michigan Islands NWR. Thunder Bay Island in Lake Huron was added in 1965 by a USCG /Service agreement.

The USCG ceded Lake Michigan's Gull Island to the Service in 1969. A sixth island was added to the refuge in 1995, when TNC transferred Hat Island in Lake Michigan to the Service. Big and Little Charity Islands in Lake Huron's Saginaw Bay were added to the refuge in 1999.

In 2000, Scarecrow and Thunder Bay Islands were designated part of the Thunder Bay National Marine Sanctuary and Underwater Preserve. The designation gives federal protection to more than 100 well-preserved shipwrecks that litter the bottom of Thunder Bay, located near Alpena, MI. Once part of a major shipping channel, this 448-square-mile sanctuary is the first national marine sanctuary in fresh water and is located in an area that was known as "Shipwreck Alley" in the 1800s.

Sugar Island, near Thunder Bay Island, was purchased by the Service in 2011.

See Chapter 3, The Environment, for more details on individual island history, natural features and current management.

Legal Context

In addition to the authorizing legislation for establishing each NWR that comprises Great Lakes NWR and the National Wildlife Refuge System Improvement Act of 1997, several federal laws, executive orders, and regulations govern administration of Refuge System lands. Appendix F contains a partial list of the legal mandates that guided the preparation of this plan and those that pertain to refuge management.

Chapter 2: The Planning Process

In this chapter:

[Internal Agency Scoping](#)

[Public Comments on Draft CCP](#)

[Summary of Issues, Concerns and Opportunities](#)

[Preparation, Publishing, Finalization and Implementation of the CCP](#)

Throughout this document, five national wildlife refuges (NWRs, refuges) are discussed individually—such as the Gravel Island NWR or the Green Bay NWR. This document also discusses all five NWRs collectively as one entity and when doing so, refers to the group as the “Great Lakes islands refuges” or “Great Lakes islands NWRs.”

The Great Lakes islands refuges Comprehensive Conservation Plan (CCP) has been written with input and assistance from citizens, non-governmental organizations (NGOs), and staff from state and local agencies. The participation of these stakeholders is vital, and all of their ideas have been valuable in determining the future direction of the refuges.

Internal Agency Scoping

The CCP planning process began in February 2009 with a kickoff teleconference between staff at the Seney, Shiawassee and Horicon refuges as well as staff and regional planners from the U.S. Fish and Wildlife Service’s (FWS, Service) office in the Twin Cities area. The participants in this “internal scoping” exercise reviewed vision statements and goals, existing baseline resource data, planning documents, and other information. In addition, the group identified a preliminary list of issues, concerns, and opportunities facing islands that would need to be addressed in the CCP.

A list of required CCP elements such as maps, photos, and GIS data layers was also developed at this meeting and during subsequent e-mail and telephone communications. Concurrently, the group studied federal and state mandates plus applicable local ordinances, regulations, and plans for their relevance to this planning effort. Finally, the group agreed to a process and sequence for obtaining public input and a tentative schedule for completion of the CCP. A Public Involvement Plan was drafted and distributed to participants soon after the meeting.

Open House Events

Public input was encouraged and obtained using several methods, including open houses, written comments during a public scoping period, and personal contacts.

Initial public scoping for the CCP began during the summer of 2009 with a series of eight open house events held in communities near the island refuges. Turnout ranged from very light (Huron NWR and Michigan Islands NWR) to more than 50 attending (Washington Island and Green Bay NWR). Comment forms were available at the events and were made available at the managing refuge headquarters and visitor centers during the following weeks.

Those interested in making written comments had until August 15, 2009 to submit them. Comments could be sent by U.S. mail, e-mail, or via the Service’s planning website on the

Internet. Eighty-five comment forms and other written comments were received during the scoping process.

The following is a list of dates and locations where open house events were held.

Lake Michigan

Gravel Island NWR and Green Bay NWR (Gravel, Hog, Pilot, Plum and Spider Islands)

Wednesday, June 17, 2009, 5–8 p.m.
Washington Island Community Center Gymnasium
910 Main Road; Washington Island, WI

Thursday, June 18, 2009, 5–8 p.m.
Sturgeon Bay Library
107 South 4th Avenue; Sturgeon Bay, WI

Lake Huron

Michigan Islands NWR (Big and Little Charity, Scarecrow, Thunder Bay Islands)

Tuesday, July 7, 2009, 4–8 p.m.
Great Lakes Maritime Heritage Center
500 W. Fletcher Street; Alpena, MI

Wednesday, July 8, 2009, 4–8 p.m.
Au Gres Community Library
230 Mackinaw Street; Au Gres, MI

Thursday, July 9, 2009, 4-8 p.m.
Sleeper State Park
6573 State Park Road; Caseville, MI

Lake Huron, Lake Michigan, Lake Superior

Harbor Island NWR, Huron NWR, and portions of Michigan Islands NWR (Hat, Shoe, Pismire, Gull Islands)

Monday, July 20, 2009, 5–8 p.m.
L'Anse Public Library
201 N 4th St, L'Anse, MI

Wednesday, July 22, 2009, 4:30–7:30 p.m.
Peaine Township Hall
Beaver Island, MI

Thursday, July 23, 2009, 5-8 p.m.
Drummond Island Town Hall
Drummond Island, MI

Total open house attendance: 115

Summary of Issues, Concerns and Opportunities

The following list of significant issues was generated by internal scoping, the public open house events, e-mails, and letters. Each issue will be described in more detail in the following chapters of this plan.

Major issues identified by the public:

Double-crested Cormorant Management: Strong feelings among some for increased control measures in Green Bay and Beaver Island chain.

Access: Plum and Pilot Islands were added to the Green Bay NWR in 2007. Many people are requesting access to Plum Island for kayak and motor boat landings and hiking on trails. A group of people requested advertising Harbor Island as part of a kayak trail and establishing boat landings and hiking trails. Other commenters had an opposing view to retain the status quo at Harbor Island.

Island Acquisition: Several comments were received about adding specific islands in private ownership to the Refuge System. What criteria should be used for adding islands to the existing refuge system?

Cultural Resources: Will cultural resource sites, especially the lighthouses, receive adequate care, restoration, and protection into the future?

Visitor Services: Should additional wildlife-dependent recreation opportunities be made available, or are the existing opportunities for hunting, fishing, wildlife observation and photography, and environmental education and interpretation adequate?

Public Comments on Draft CCP

The Draft CCP, Land Protection Plan (LPP) and Environmental Assessment (EA) were officially released for public review on August 23, 2012; the 31-day comment period ended on September 24, 2012. Planning information was sent to individuals and organizations for review and announced through local media outlets, resulting in 24 comment submissions. During the comment period two open house events were held to receive public comments on the Draft CCP. The open houses were held on September 10th, 2012, from 5–8 p.m. at the Washington Island Community Center; Rutledge Room; 910 Main Road; Washington Island, WI; and September 12th, 2012, from 4–7 p.m. at the Bear Track Inn Restaurant and Motel; 33655 Townline Road; Drummond Island, MI.

Forty-four individuals attended these open house events. Because few changes to the preferred alternative were recommended during the public review period, only minor changes were made to the drafts in preparing the final CCP/EA document.

All respondents that expressed an opinion endorsed the selection of Alternative C and the general approach of the proposed future management of the Great Lakes islands refuges. We were able to incorporate nearly all of the specific changes suggested in the written comments. Consequently, we did not produce a formal Response to Comments Appendix for this CCP.

Preparation, Publishing, Finalization, and Implementation of the CCP

The Gravel Island, Green Bay, Harbor Island, Huron, and Michigan Islands CCP and EA were prepared by a team of staff from the Seney, Shiawassee, and Horicon Refuges and the Service's regional office. The CCP/EA was published in two phases and in accordance with the National Environmental Policy Act (NEPA). The EA (Appendix A) presents a range of alternatives for future management and identifies the preferred alternative, which is also the CCP.

Verbal and written comments received by the Service were incorporated into this document. This document is the basis for guiding management on the refuges over a 15-year period. It will guide the development of more detailed step-down management plans for specific resource areas; it will underpin the annual budgeting process through Service-wide allocation databases. Most importantly, it lays out the general approach to managing habitat, wildlife, and people on the Great Lakes islands refuges that will direct day-to-day decision-making and actions.

Chapter 3: The Environment

In this chapter:

[Introduction](#)
[Climate](#)
[Island Types, Geology and Soils](#)
[Archeological and Cultural Values](#)
[Social and Economic Context](#)
[Environmental Contaminants](#)
[Natural Resources](#)
[Associated Plans and Initiatives](#)
[Habitat Management](#)
[Visitor Services](#)
[Archaeological and Cultural Resources Management](#)
[Law Enforcement](#)

Throughout this document, five national wildlife refuges (NWRs, refuges) are discussed individually—such as the Gravel Island NWR or the Green Bay NWR. This document also discusses all five NWRs collectively as one entity and when doing so, refers to the group as the “Great Lakes islands refuges” or “Great Lakes islands NWRs.”

Introduction

General Island Geological and Ecological Background

Michigan and Wisconsin are fortunate to have many islands that form a “waterscape” unlike any found elsewhere in the world. Of the three Upper Great Lakes (Huron, Michigan, and Superior), there exists approximately 200 islands within the confines of the states in Lake Huron, 76 in Lake Michigan, and 175 in Lake Superior (not counting 86 in the St. Mary’s River) (Soule, 1993).

The glacial history of island chains differs across the Upper Great Lakes. Glacial till overlying limestone bedrock forms the bulk of the Beaver Island group in northern Lake Michigan, although Pismire Island (part of Michigan Islands NWR) is an example of a sand and gravel bar island. Conversely, most islands in Lake Superior are formed of igneous and metamorphic bedrock, with the Huron Islands (of Huron NWR) being the result of granite upthrusts (Soule, 1993).

Post-glacial history of these islands also varies. National Wildlife Refuge System (NWRS, Refuge System) records indicate that many of the islands of Michigan Islands NWR were either impacted by human habitation (Gull Island) or by other uses (e.g., Hat Island was used as bombing range prior to refuge establishment) (Gates, 1950). Likewise, Huron NWR and Harbor Island NWR have had a history of human disturbance and manipulations (e.g., buildings are or were on both these refuges).

Many ecological disturbances maintain the character of islands in the Upper Great Lakes, including fire, wind, insects and disease, hydrology, and the effects to vegetation by large flocks of nesting colonial waterbirds or the population cycling of herbivorous mammals such as snowshoe hares. Subsequent colonization of islands after major disturbances and successional

change over time (including colonization by flora and fauna) spurred the *Theory of Island Biogeography* by MacArthur and Wilson (1967). Because of geographic isolation and the resulting impact this isolation has had on colonization by species and human use, many of the islands in the Upper Great Lakes have unique plant and animal communities. Not surprisingly, numerous studies have occurred on these islands to describe flora, fauna, and ecological patterns and processes (see Soule, 1993 for a detailed list of references). And to this day, the study and conservation of islands have multiple values for science and society as a whole. Islands of the Upper Great Lakes are, and have always been, dynamic ecosystems unto themselves.

Gravel Island NWR

Gravel (4 acres) and Spider (23 acres) Islands comprise the Gravel Island NWR. These islands are located in Lake Michigan, approximately 1 mile east of the northern tip of the Door County Peninsula, Wisconsin. Both islands provide optimum conditions for nesting birds, including Herring Gulls, Caspian Terns, and Double-crested Cormorants. Gravel Island currently supports the largest colony of Caspian Terns in the Great Lakes Region.

Gravel Island NWR and Hog Island, one component of Green Bay NWR, comprise the Wisconsin Islands Wilderness Area, which, at 29 acres, is one of the smallest wilderness areas in the country. The refuge is managed by staff at Horicon NWR, in Mayville, WI. Public use is not allowed due to ground nesting by migratory birds and limited access.



Spider Island, Gravel Island NWR

Green Bay NWR

Green Bay NWR consists of Hog Island (2 acres), Plum Island (325 acres), and Pilot Island (3.7 acres). The islands are located in Lake Michigan, near Washington Island, off the tip of Wisconsin's Door Peninsula.



Pilot Island Lighthouse, Green Bay NWR

The refuge is managed by staff at Horicon NWR, in Mayville, WI. Hog Island supports a nesting colony of herring gulls and a few nesting Great Blue Herons and Red-breasted Mergansers. No development has occurred on Hog Island due to its small size, remoteness, and landing difficulties.

Portions of Plum and Pilot Islands were developed to serve as lighthouse facilities or lifesaving stations during the late 19th century. The lighthouse on Pilot Island was built in 1858 and is listed in the National Register of Historic Places. Plum Island is

home to the historically significant lifesaving station, keeper's quarters, and associated buildings. All are listed on the National Register of Historic Places.

Plum Island essentially functions as a small ecosystem and retains natural qualities absent on the nearby mainland. Habitats on Plum Island consist of cedar lowlands; maple, basswood, and hemlock uplands; and alkaline beach habitat. Today Pilot Island supports nesting colonies of Double-crested Cormorants, and Herring Gulls. Small numbers of Great Blue and Back-crowned Night-Herons also nest on Pilot Island.

All public use is prohibited on Hog and Pilot Islands due to ground nesting by migratory birds and the limited and treacherous access. Plum Island may offer public use opportunities in the future provided they are compatible with the refuge's purpose and mission.

Harbor Island NWR

The 695-acre Harbor Island NWR is located one mile north of Drummond Island, MI and 3.5 miles south of the United States–Canadian (Ontario) border in Potagannissing Bay on Lake Huron. Habitats on Harbor Island consist of balsam/cedar lowlands and oak, beech, and maple uplands. Soil consists of shallow organics or sands over dolomite rock. Resident wildlife species include red fox, Ruffed Grouse, snowshoe hare, White-throated Sparrows, Gray Jays, and Magnolia Warblers. Timber wolves from St. Joseph Island, Ontario may hunt on the island during winter months. Bald Eagles also use the island's large bay for fishing each spring and fall. For more information see the 1978 Harbor Island Report (also known as the *Harbor Island Ecological Inventory*). Access to the island is by private boat. Harbor Island NWR's sheltered bay is used by boaters for fishing and as an overnight anchorage. A sand beach is also used for swimming.

Huron NWR

Huron NWR is comprised of eight islands: West Huron (or Lighthouse) Island, Gull Island, McIntyre Island, Cattle Island, and four nameless, bare rock islands. Despite their small size, totaling only 147 acres, the remoteness and primitive quality of these islands have earned them the designation of a Wilderness Area.

The lighthouse on West Huron Island was built in 1868 and is listed in the National Register of Historic Places. The Huron Islands Lighthouse Preservation Association was formed to raise funds for its restoration.

Habitat of this unstaffed refuge varies from a sparse covering of red pines and white birch with ground-level vegetation to barren granite with scattered lichen growth. Resident wildlife species include Merlins, Bald Eagles and a large gull colony on Cattle and nearby Rock Islands.



West Huron (or Lighthouse) Island, Huron NWR

Access to the island is by private boat. The refuge is located three miles off the south shore of Lake Superior and 18 miles east of the Keweenaw Peninsula. Of the eight islands, only West Huron Island (Lighthouse Island) is open to the public, during daylight hours, for hiking and nature study.

All remaining islands are closed to the public, except by Special Use Permit to biologists, botanists, or other qualified persons in conjunction with approved studies. Exceptions are emergency landings by boats in distress. Camping is prohibited on all islands, except that biologists, botanists, and other qualified applicants may be permitted prescribed primitive-type camping only on West Huron Island (Lighthouse Island) by Special Use Permit, in conjunction with approved studies.

Michigan Islands NWR

Michigan Islands NWR is comprised of nine islands in Lakes Michigan and Huron. Thunder Bay, Sugar, and Scarecrow Islands in Thunder Bay (near Alpena, MI), and Big and Little Charity Islands in Saginaw Bay are managed by Shiawassee NWR in Saginaw, MI. Seney NWR has management responsibility for Gull, Pismire, Hat, and Shoe Islands, part of the Beaver Island Group in the northern portion of Lake Michigan. In 1970, Scarecrow, Pismire, and Shoe Islands were officially designated as Michigan Islands Wilderness Area. The portion of Michigan Islands NWR managed by Seney NWR totals 262 acres with Gull Island accounting for 230 of those acres.

Habitats vary considerably. Shoe Island has little to no groundcover and Gull Island has a grass- and forb-covered beach area above the high-water line, a shrub-covered sand dunes area, and balsam fir and white cedar in the interior. Soils consist of shallow organics or sands over cherty limestone and dolomite. At some point in their history, all nine islands have supported waterbird colonies, some of significant size and diversity.

Big Charity and Thunder Bay Islands have lighthouses and keeper's quarters.

Climate

Due to its inland location, northern latitude, and relatively high elevation, the Great Lakes islands refuges are characterized by a relative severe climate. Growing season ranges from 70 to 130 days, with spring freezes common. Extreme temperatures recorded range from -50 °F to over 105 °F. Snowfall is heavy, with up to 140 inches recorded annually in some localities. Average annual precipitation is relatively uniform across the area, between 28 inches and 32 inches (Albert, 1995).

Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors. The increase of carbon dioxide (CO²) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact that refuges can affect in a small way. The U.S. Department of Energy's "Carbon Sequestration

Research and Development” defines carbon sequestration as “. . . the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere.”

Vegetated land is important for carbon sequestration. Terrestrial biomes of all types—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and in acting as a biological “scrubber” of atmospheric CO². The Department of Energy report’s conclusions noted that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

Conserving natural habitat for wildlife is the heart of any long-range plan for national wildlife refuges. The actions proposed in this Comprehensive Conservation Plan (CCP) would conserve or restore land and habitat and would thus retain existing carbon sequestration. This in turn contributes positively to efforts to mitigate human-induced global climate change.

One U.S. Fish and Wildlife Service (FWS, Service) activity in particular—prescribed burning—releases CO² directly to the atmosphere from the biomass consumed during combustion. However, there is actually no net loss of carbon, since new vegetation quickly germinates and sprouts to replace the burned-up biomass and sequesters or assimilates an approximately equal amount of carbon as was lost to the air (Boutton et al., 2006). Overall, there should be little or no net change in the amount of carbon sequestered on the Great Lakes islands refuges from any of the proposed management alternatives.

Several impacts of climate change have been identified that may need to be considered and addressed in the future:

- Habitat available for coldwater fish such as trout and salmon in lakes could be reduced.
- Forests may change, with some species shifting their range northward or dying out and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat due to stronger and more frequent droughts.
- Changes in the timing of migration and nesting could put some birds out of sync with the life cycles of their prey species.
- Animal and insect species historically found farther south may colonize new areas to the north as winter climatic conditions moderate.

The managers and resource specialists responsible for the refuges need to be aware of current and future change due to global warming. When feasible, documenting long-term vegetation, species, and hydrologic changes should become a part of research and monitoring programs on the refuges. Adjustments in land management direction may be necessary over the course of time to adapt to a changing climate.

The following paragraphs are excerpts from the 2000 report, *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change*, produced by the National Assessment Synthesis Team, an advisory committee chartered under the Federal Advisory Committee Act to help the U.S. Global Change Research Program fulfill its mandate under the Global Change Research Act of 1990. These excerpts are from the section of the report focused upon the eight-state Midwest Region.

Observed Climate Trends

Over the 20th century, the northern portion of the Midwest, including the Upper Great Lakes, has warmed by almost 4 °F (2 °C), while the southern portion, along the Ohio River valley, has cooled by about 1 °F (0.5 °C). Annual precipitation has increased, with many of the changes quite substantial, including as much as 10- to 20-percent increases over the 20th century. Much of the precipitation has resulted from an increased rise in the number of days with heavy and very heavy precipitation events. There have been moderate to very large increases in the number of days with excessive moisture in the eastern portion of the basin.

Scenarios of Future Climate

During the 21st century, models project that temperatures will increase throughout the Midwest and at a greater rate than has been observed in the 20th century. Even over the northern portion of the region, where warming has been the largest, an accelerated warming trend is projected for the 21st century, with temperatures increasing by 5 to 10 °F (3 to 6 °C). The average minimum temperature is likely to increase as much as 1 to 2 °F (0.5 to 1 °C) more than the maximum temperature. Precipitation is likely to continue its upward trend, at a slightly accelerated rate; 10- to 30-percent increases are projected across much of the region. Despite the increases in precipitation, increases in temperature and other meteorological factors are likely to lead to a substantial increase in evaporation, causing a soil moisture deficit, reduction in lake and river levels, and more drought-like conditions in much of the region. In addition, increases in the proportion of precipitation coming from heavy and extreme precipitation are very likely.

Midwest Key Issues

1. Reduction in Lake and River Levels

Water levels, supply, quality, and water-based transportation and recreation are all climate-sensitive issues affecting the region. Despite the projected increase in precipitation, increased evaporation due to higher summer air temperatures is likely to lead to reduced levels in the Great Lakes. Of 12 models used to assess this question, 11 suggest significant decreases in lake levels while one suggests a small increase. The total range of the 12 models' projections is less than a 1-foot increase to more than a 5-foot decrease. A 5-foot (1.5-meter) reduction would lead to a 20- to 40-percent reduction in outflow to the St. Lawrence Seaway. Lower lake levels cause reduced hydropower generation downstream, with reductions of up to 15 percent by 2050. An increase in demand for water across the region at the same time as net flows decrease is of particular concern. There is a possibility of increased national and international tension related to increased pressure for water diversions from the Lakes as demands for water increase. For smaller lakes and rivers, reduced flows are likely to cause water quality issues to become more acute. In addition, the projected increase in very heavy precipitation events will likely lead to increased flash flooding and worsen agricultural and other non-point source pollution as more frequent heavy rains wash pollutants into rivers and lakes. Lower water levels are likely to make water-based transportation more difficult with increases in the costs of navigation of 5- to 40-percent. Some of this increase will likely be offset as reduced ice cover extends the navigation season. Shoreline damage due to high lake levels is likely to decrease 40- to 80-percent due to reduced water levels.

Adaptations

A reduction in lake and river levels would require adaptations such as re-engineering of ship docks and locks for transportation and recreation. If flows decrease while demand increases, international commissions focusing on Great Lakes water issues are likely to become even more important in the future. Improved forecasts and warnings of extreme precipitation events could help reduce some related impacts.

2. Agricultural Shifts

Agriculture is of vital importance to this region, the nation, and the world. It has exhibited a capacity to adapt to moderate differences in growing season climate, and it is likely that agriculture would be able to continue to adapt. With an increase in the length of the growing season, double cropping—the practice of planting a second crop after the first is harvested—is likely to become more prevalent. The CO₂ fertilization effect is likely to enhance plant growth and contribute to generally higher yields. The largest increases are projected to occur in the northern areas of the region, where crop yields are currently temperature-limited. However, yields are not likely to increase in all parts of the region. For example, in the southern portions of Indiana and Illinois, corn yields are likely to decline, with 10–20 percent decreases projected in some locations. Consumers are likely to pay lower prices due to generally increased yields, while most producers are likely to suffer reduced profits due to declining prices. Increased use of pesticides and herbicides are very likely to be required and to present new challenges.

Adaptations

Plant breeding programs can use skilled climate predictions to aid in breeding new varieties for the new growing conditions. Farmers can then choose varieties that are better attuned to the expected climate. It is likely that plant breeders will need to use all the tools of plant breeding, including genetic engineering, in adapting to climate change. Changing planting and harvest dates and planting densities, and using integrated pest management, conservation tillage, and new farm technologies are additional options. There is also the potential for shifting or expanding the area where certain crops are grown if climate conditions become more favorable. Weather conditions during the growing season are the primary factor in year-to-year differences in corn and soybean yields. Droughts and floods result in large yield reductions; severe droughts, like the drought of 1988, cause yield reductions of more than 30 percent. Reliable seasonal forecasts are likely to help farmers adjust their practices from year-to-year to respond to such events.

3. Changes in Semi-natural and Natural Ecosystems

The Upper Midwest has a unique combination of soil and climate that allows for abundant coniferous tree growth. Higher temperatures and increased evaporation will likely reduce boreal forest acreage and make current forestlands more susceptible to pests and diseases. It is likely that the southern transition zone of the boreal forest will be susceptible to expansion of temperate forests, which in turn will have to compete with other land use pressures. However, warmer weather (coupled with beneficial effects of increased CO₂), are likely to lead to an increase in tree growth rates on marginal forestlands that are currently temperature-limited. Most climate models indicate that higher air temperatures will cause greater evaporation and hence, reduced soil moisture, a situation conducive to forest fires. As the 21st century progresses, there will be an increased likelihood of greater environmental stress on both

deciduous and coniferous trees, making them susceptible to disease and pest infestation, likely resulting in increased tree mortality.

As water temperatures in lakes increase, major changes in freshwater ecosystems will very likely occur, such as a shift from coldwater fish species (e.g., trout) to warmer water species, (e.g., bass and catfish). Warmer water is also likely to create an environment more susceptible to invasions by non-native species. Runoff of excess nutrients (such as nitrogen and phosphorus from fertilizer) into lakes and rivers is likely to increase due to the increase in heavy precipitation events. This, coupled with warmer lake temperatures, is likely to stimulate the growth of algae, depleting the water of oxygen to the detriment of other living things. Declining lake levels are likely to cause large impacts to the current distribution of wetlands. There is some chance that some wetlands could gradually migrate, but in areas where their migration is limited by the topography, they would disappear. Changes in bird populations and other native wildlife have already been linked to increasing temperatures, and more changes are likely in the future. Wildlife populations are particularly susceptible to climate extremes due to the effects of drought on their food sources.

Climate Change and The Great Lakes

At various times throughout its history, the Great Lakes basin has been covered by thick glaciers and tropical forests, but these changes occurred before humans occupied the basin. Present-day concern about the atmosphere is premised on the belief that society at large—through its means of production and modes of daily activity, especially by ever-increasing carbon dioxide emissions—may be modifying the climate at a rate unprecedented in history.

The very prevalent “greenhouse effect” is actually a natural phenomenon. It is a process by which water vapor and carbon dioxide in the atmosphere absorb heat given off by the earth and radiate it back to the surface. Consequently the earth remains warm and habitable: 16 °C average world temperature rather than -18 °C without the greenhouse effect. However, humans have increased the carbon dioxide present in the atmosphere since the industrial revolution from 280 parts per million to the present 350 ppm, and some predict that the concentration will reach twice its pre-industrial levels by the middle of the next century.

Climatologists, using the General Circulation Model (GCM), have been able to determine the manner in which the increase of carbon dioxide emissions will affect the climate in the Great Lakes basin. Several of these models exist and show that at twice the carbon dioxide level, the climate of the basin will be warmer by 2–4 °C and slightly damper than at present. For example, Toronto's climate would resemble the present climate of southern Ohio. Warmer climates mean increased evaporation from the lake surfaces and evapotranspiration from the land surface of the basin. This in turn will augment the percentage of precipitation that is returned to the atmosphere. Studies have shown that the resulting net basin supply—the amount of water contributed by each lake basin to the overall hydrologic system—will be decreased by 23- to 50-percent. The resulting decreases in average lake levels will be from ½ to 2 meters, depending on the GCM used.

Large declines in lake levels would create large-scale economic concern for the commercial users of the water system. Shipping companies and hydroelectric power companies would suffer economic repercussions, and harbors and marinas would be adversely affected. While the precision of such projections remains uncertain, the possibility of their accuracy embraces important long-term implications for the Great Lakes.

The decline in lake levels and a warmer climate would also impact the islands in the Great Lakes. Vegetation would change on some islands as growing conditions evolve. Non-native species of plants and wildlife will pioneer onto some islands. Declining water levels will also expose more shoal habitat and beaches. In general, island sizes will increase, and some nearshore islands will become connected to the mainland. These connections to the mainland will speed the establishment of invasive plant species and provide corridors for predators to impact nesting waterbird colonies.

Island Types, Geology, and Soils

Island systems in the Great Lakes vary greatly in both diversity and complexity. While some island areas are characterized by several large islands with similar features, other areas contain hundreds of islands with variable shorelines and features but are highly integrated in ecological functions. Islands can be categorized by the following categories:

- **Resistant Rock** – Precambrian islands of basalt and granite dominate the northern shores of Lake Superior, Lake Huron, and the St. Lawrence River. Islands on the southern shore of Lake Superior are composed of Precambrian and Cambrian sandstones.
- **Non-resistant Rock** – Limestone and dolomite are represented on many islands in northern Lake Michigan, Lake Huron, Lake Erie, and Lake Ontario.
- **Unconsolidated Sediments** – Islands, such as Turkey Island in the Detroit River can include fine sediments and cobbles that can accumulate on reefs in Lake Superior. Deltaic islands are at the mouths of rivers, especially the St. Clair River.
- **Anthropogenic** – Islands that are not natural and are artificially created can also include key biodiversity significance for birds and fish. Types of artificial islands include breakwaters, breakwalls, and caution points.
- **Floating** – Floating islands can be characterized as marsh ‘mats’ that can occur in some wetlands.

Islands of the Great Lakes support globally rare ecosystems called alvars. Alvars are open areas of flat limestone or marble bedrock with little or no soil and a usually sparse covering of herbs and shrubs. Trees are either absent or sparse. The vegetation and animals of alvars are distinctive—only certain species can withstand the extreme environmental conditions. Alvars typically have poor drainage of rain and snow; so they are flooded in the spring and dry later in the summer. Alvars with exposed bedrock absorb heat from the sun and become extremely hot in the summer. A high proportion of the alvars that exist in the world is present only in the Great Lakes islands and coastal areas.

Archeological and Cultural Values

Gravel Island NWR (Horicon)

Established in 1913 and consisting of Gravel and Spider Islands, Gravel Island NWR has not been subjected to a comprehensive cultural resources field survey. There are no known cultural

sites on the islands, and because of their size and topography the likelihood of significant sites seems low.

Green Bay NWR (Horicon)

Green Bay NWR consists of three islands, Hog, Pilot, and Plum. No cultural resources survey has been conducted on Hog Island, and the likelihood of finding significant sites on the island seems low.

Pilot Island was acquired in 2007. It has a standing 1858 lighthouse/keeper's quarters and a circa 1900 fog signal building. Both were placed on the National Register of Historic Places (NRHP) under one nomination on November 21, 1983 (Reference # 83004279). The lighthouse/keeper's quarters is in fair to good shape but shows signs of increasing wear on the light-colored brick façade and in the wooden doors/windows. After some interior water damage, the roof was replaced in 2009. The U.S. Coast Guard (USCG) maintains the light. The fog signal building is in fair to poor shape due to the collapse of the roof, which threatens to severely damage the brick superstructure. Removing, and perhaps replacing, the collapsed roof and shoring up the walls should be a top cultural resources priority.

The remaining portion of Pilot Island has not been subjected to a cultural resources survey and other sites are possible on those areas with intact soil development. However, the island has become a busy nesting ground for cormorants and gulls, which has killed off most of the vegetation. There are three or more shipwrecks in one location in 20 to 50 feet of water just off Pilot Island to the northwest. It is very popular place for local divers. Placed on the NRHP on March 19, 1992 (Reference #92000103), the site is not currently on Service lands. However, it is possible that parts of the site may wash up on Pilot Island sometime in the future.

Plum Island was added to the Green Bay NWR along with Pilot Island in 2007. Plum Island was reserved from the public domain in 1848 for lighthouse purposes and contains a number of historic buildings and related structures as well as archaeological sites. The 1897 rear range light was placed on the NRHP on July 19, 1984 (Reference #84003659). Nine standing buildings/structures and one site, including the front range light (1964), the original keeper's dwelling (1897), a fog signal building (circa 1900), the USCG lifesaving station (1896), and a boathouse (circa 1930), as well as the pier and breakwater, a flagpole, an outbuilding, a radio tower, and the unimproved access road/path connecting the north and south side of the island were added to the NRHP as a district on June 24, 2010 (Reference #10000385). These NRHP sites on Plum Island are in fair to good condition. The NRHP sites on both Plum and Pilot Islands are undergoing stabilization and restoration work under a partnership agreement with the Friends of Plum and Pilot Islands (FOPPI).

Five additional archaeological sites are known on Plum Island. These include the undressed fieldstone foundation of the original 1848 Port des Morts Lighthouse, the Hanson Site (a Middle Archaic Period Old Copper Culture copper knife findspot), the Plum Island Light Site (a residential dump associated with the light keeper's dwelling), the North Shore Site (a lithic and historic artifact scatter), and the Station Dump Site (the location of a dump associated with the lifesaving station). Two historic Native American (possibly Potawatomi) sites are suspected to exist on Plum Island but have never been confirmed by field survey. These include a campsite and corn garden beds. It seems likely that there are additional archaeological sites yet to be found if a comprehensive field survey is conducted.

At least six shipwrecks have been recorded just off the shores of Plum Island. Items from some of these sites appear to have been washing up on the island. There is also evidence of paleontological fossils within the limestone bedrock of the island.

Harbor Island NWR (Seney)

Acquired in 1983 and consisting of only Harbor Island, past human influences to the vegetation of Harbor Island NWR are still found. According to records at Seney NWR, no cultural surveys have been conducted on the island. At acquisition, at least one 1950s or 1960s era house was removed from the island. Based on the size of the island, its location relative to other islands, the vegetation present and other indicators, prehistoric and historic sites are likely to be present.

Huron NWR (Seney)

Established in 1905, Huron NWR is the oldest refuge in the Midwest Region. The refuge encompasses eight islands including Lighthouse (West Huron), McIntyre (East Huron), Gull (Gull Rock), Cattle, and four small unnamed islands.

The most visible cultural resources on Huron NWR are the Huron Islands Lighthouse and Assistant Keeper's Quarters. The lighthouse, consisting of a keeper's residence and integrated light tower, was originally constructed in 1868 on Lighthouse Island as a navigational aid. It was fully automated in 1972 and was essentially abandoned along with the 1934 Assistant Keeper's Quarters and the other facilities.

Other facilities on the island include a brick privy (1898), an oil house (1896), a pre-1914 barn site, a fog signal building (1898), a 1961 barracks, pre-1966 landing, dock and boathouse on the northwest tip of the island; quarry, boat, and breakwater (1877 to 1892) on the southwest side of island, and a boathouse (1913), as well as a small support building and a new dock installed in 2009. Additional facilities on Lighthouse Island that were associated with lighthouse operations prior to automation include: a 1-mile long footpath—750 feet of which are cement walkway and stairs, a 300 foot tramway, and two footbridges.

Only the lighthouse itself was placed on the NRHP on September 2, 1975 (Reference #75000955). But, as of December 7, 2004, the other facilities associated with the lighthouse, except perhaps the barracks (less than 50 years old at the time of review), were considered to be eligible for listing on the NRHP by the Service. The preservation and maintenance of the NRHP site and associated structures are being addressed under a Memorandum of Understanding with the Huron Island Lighthouse Preservation Association, which is currently in place until July 26, 2019.

Lighthouse Island is the only island with visible buildings/structures. However, there is reported to be a small dilapidated cabin and associated brick pile somewhere on the western end of McIntyre Island. There are no known archeological sites on any of the islands, mainly because no formal surveys have been performed on the refuge. However, there is moderate potential for archeological site discovery on the two largest islands, Lighthouse and McIntyre, and low potential on Cattle and Gull Islands. The four unnamed islands are small rocky outcrops with essentially no potential for finding archaeological sites.

Michigan Islands NWR (Seney, Lake Michigan Islands; Shiawassee, Lake Huron Islands)

Established in 1947, the Michigan Islands NWR currently consists of four islands in Lake Michigan including Gull, Hat, Pismire, and Shoe and five islands in Lake Huron including Thunder Bay, Sugar, Scarecrow, Big Charity, and Little Charity. An overview study of archeological and cultural values on the islands in both Lakes Michigan and Huron (except Big Charity and Little Charity) was conducted by Commonwealth Cultural Resources Group, Inc. in 2000 (Robertson et al., 2000). The Commonwealth report was forwarded to the Michigan State Historic Preservation Officer in October 2000.

A summary of the findings for the Lake Michigan islands indicates that there are no previously recorded archeological sites on Hat, Shoe, or Pismire Islands. Gull Island, according to General Land Office survey notes, had a fishing village, four log shanties, and a few Native American wigwams on the east side of the island. There are no existing, previously recorded, historical above-ground resources on any of the four islands. Hat, Shoe, and Pismire Islands are rated as having a low potential for archeological sites due to their small size and limited elevation above the lake. Gull Island is rated as having a high potential for both prehistoric and historic archeological sites on habitable portions of the island.

Except for Scarecrow Island, the islands of Thunder Bay and Sugar within Thunder Bay of Lake Huron are known to contain standing structures and archaeological sites. Thunder Bay Island contains an 1832 standing lighthouse and associated buildings on the southern tip of the island. While on the NRHP (Reference #84001371), these structures are *not* on Service lands and are managed by the Thunder Bay Island Preservation Society. Also not on Service property is an extant USCG lifesaving station/boathouse in the shallows on the west side of the island.

However, there are five other known archaeological sites within Service lands on Thunder Bay Island. These include a portion of an archaeological complex associated with the 1832 lighthouse and its associated buildings, a 19th century lifesaving/fishing house complex, the 19th century Harwood's fish house, the 19th century Hood's fishing cooperage (not field confirmed however), a 20th century dump site. On Sugar Island, archaeologists have identified two archaeological sites including the 19th/20th century McDonald/Paxton's Fish House and an unnamed 19th century fish house complex. While Native American use of both islands is known historically, no sites associated with their use can be confirmed at this time. However, the probability of finding additional archaeological sites on these two islands remains high. Conversely, the probability of finding archaeological sites on Scarecrow Island is low.

Within Saginaw Bay of Lake Huron are the islands of Big Charity and Little Charity. The Service owns all of Little Charity but not all of Big Charity. No known sites are located on Little Charity Island and the probability of finding any sites seems low. Big Charity Island has a light tower with attached keeper's house on the northwest tip of the island. However, currently the house is in private hands, and the tower is owned by The Nature Conservancy (TNC). The Service has a three-acre easement with the conservancy, which excludes the tower (along with a 100-foot buffer). Therefore, to clarify, neither the house nor the tower are on Service property. Also, not on Service property is a long dock complex dredged into the island, which provides boat access for visitors. There are no known archaeological sites on the island. However, if a comprehensive field survey was conducted it seems likely that sites would be found.

Social and Economic Context

Currently the Great Lakes basin is home to more than one-tenth of the population of the United States and one-quarter of the population of Canada. Some of the world's largest concentrations of industrial capacity are located in the Great Lakes Region. Nearly 25 percent of the total Canadian agricultural production and 7 percent of the American production are located in the basin. The United States considers the Great Lakes a fourth seacoast, and the Great Lakes Region is a dominant factor in the Canadian industrial economy.

Agriculture

Early settlers were attracted to the Great Lakes Region because of its agricultural lands. Dairy and meat production for local consumption became the dominant agriculture. As time went by, the growing urban populations created a demand for specialty crops such as fruits, vegetables, and tobacco. Today, corn, soybeans, and hay are the primary crops in the Great Lakes Region. The northwestern region of Michigan's Lower Peninsula is known for its cherry production.

Commercial and Sport Fisheries

Sport and commercial harvest fisheries are important industries in the Great Lakes Region. Commercial fishing began in about 1820 and has increased ever since. About 65 million pounds of fish per year are harvested from the lakes, contributing more than \$1 billion to the Great Lakes economy. Primary commercial catches include whitefish, smelt, walleye, and perch, while sport anglers prefer salmon, steelhead, walleye, lake trout, perch and bass. The commercial fishery in the region has been declining, however, due to over-fishing, pollution, habitat destruction, and the introduction of invasive species.

Sport fishing is a significant tourist attraction, which helps to build the economy of the Great Lakes Region. Sport fishing contributes \$4 billion to the region's economy. Sport fishing has also been responsible for the unintended introduction of some invasive species. Exotic fish such as salmon were purposely introduced to help boost the sport fishing industry.

Shipping

The history of shipping practices in the Great Lakes begins in 1825, when the Erie Canal was used to carry settlers west and to carry freight east. The St. Lawrence Seaway was completed in 1959 and allowed ocean vessels access to the Great Lakes for shipping purposes. More than 200 million tons of cargo is shipped every year through the Great Lakes. The three main cargoes are iron ore, coal, and grain. Other modes of transportation such as trucking and railroads now compete with shipping in the Great Lakes, and thus shipping has not expanded much recently. Historically, shipping has been the vector for most of the invasive species in the Great Lakes.

Recreation and Tourism

The Great Lakes provide a popular tourist attraction. The region is home to many park systems, conservation and wilderness areas, and beaches. Fishing, diving, and boating are a few of the many recreational activities in the region. One-third of all registered boaters in the United States reside in the Great Lakes basin. Recreation and tourism serve as important economic

contributors to many parts of the Great Lakes Region. Boats, marinas, resorts, restaurants, and the production and sale of outdoor sports equipment all contribute to the region's economy.

Industry

Industrialization of the Great Lakes Region began in the early 20th century. There were many harmful environmental impacts of early industrialization, but many are being assessed and fixed today. Historically, the major industries in the Great Lakes Region have produced steel, paper, chemicals, automobiles, and other manufactured goods. Auto manufacturing and steel production continue to be the primary industries in the region.

Environmental Contaminants

More than 400 different man-made chemicals have been detected in Great Lakes biota. Research and monitoring have focused on heavy metals such as mercury, organochlorine pesticides such as dichlorodiphenyltrichloroethane (DDT), dieldrin, and mirex; and other chlorinated organics such as polychlorinated biphenyls (PCBs), hexachlorobenzene (HCB), dioxins, and furans. All of these contaminants have been detected in Herring Gull eggs and are routinely measured. Today, the Herring Gull continues to be recognized as one of the major indicator species for environmental contamination in the Great Lakes.

Levels of some contaminants in Herring Gull eggs have remained relatively stable throughout the 1990s, with no significant changes observed in levels of PCBs and DDE at some Great Lake colonies. A few significant decreases in levels of dieldrin and heptachlor epoxide have been noted during this period.

This relative "steady state" in contaminant levels indicates that these chemicals are still being released and/or recycled through the Great Lakes ecosystem by individuals, households, municipalities, industry, and/or agriculture. Atmospheric deposition, agricultural land runoff, the slow movement (leaching) of discarded stocks of pesticides and other chemicals from landfill sites and agricultural soils into the Great Lakes via groundwater, and the resuspension of contaminated lake/river sediments, continue to be major indirect sources of contamination. These indirect sources are difficult to control and contribute slow, but continual, contaminant inputs into the Great Lakes ecosystem. Atmospheric deposition has become an increasingly significant route of entry of contaminants into the Great Lakes ecosystem, especially in the Upper Great Lakes. On Lake Superior, for example, up to 90 percent of toxic contaminants entering this lake comes from the atmosphere in the form of precipitation.

While concentrations of some persistent toxic substances have been significantly reduced in the Great Lakes over the past 30 years, toxins such as polychlorinated biphenyls (PCBs) are still present above levels considered safe for humans and wildlife warranting fish consumption advisories in all five Great Lakes. In addition, chemicals of emerging concern, such as pharmaceuticals, are now being detected in the Great Lakes.

Natural Resources

Fish, Wildlife, and Plant Communities

Gravel Island NWR

Gravel Island

Gravel Island is a small, 4-acre flat-topped island with an elevation of approximately ten feet. Gravel Island has no permanent vegetation due to periodic over washing by waves and ice during high-water years. Jedziewicz (2001) reported no vascular plants present during his visit to the island in July 1999. However, low-water years allow several plants to pioneer on Gravel Island. In August 2004, refuge staff recorded 21 species, including American sea rocket (*Cakile edentula*), a state species of concern. Besides sea rocket, vegetative composition of Gravel Island is very similar to that of Spider Island.

Gravel Island is covered almost entirely by a matrix of Herring Gull and Ring-billed Gull nests except for the northeast portion of the island, where state endangered Caspian Terns nest. With 1,390 nests in 2012, this is the largest Caspian Tern colony in the Great Lakes Region. Common Terns and Great Black-backed Gulls have also been observed nesting in recent years. Like Spider Island, Gravel Island provides important habitat for migrating birds. The eastern shores of Gravel Island provide important shorebird habitat during low-water conditions.

Spider Island

Spider Island is a 23-acre island with an elevation of about 14 feet at the highest point. Spider Island was surveyed in 1905. At that time, the island was dominated by white cedar (*Thuja occidentalis*), tamarack (*Larix laricina*), and white birch (*Betula papyrifera*), with boreal forest and Great Lakes shoreline understory species such as blue flag iris (*Iris virginica*), wood lily (*Lilium philadelphicum*), and Indian paintbrush (*Castilleja coccinea*) (Jedziewicz, 2001). By 1966, nesting Ring-billed and Herring Gulls and Great Blue Herons had reduced the forest to only a few standing trees, abundant Canada yew (*Taxus canadensis*) with the shrubs, red-osier dogwood (*Cornus stolonifera*), red raspberry (*Rubus sp.*), and red elderberry (*Sambucus racemosa*). The activities of the nesting gulls, herons, and later Double-crested Cormorants reduced the white cedar, tamarack, and white birch overstory of the mid-1900s to a single snag in 2009.

Today, Spider Island is mostly a mixture of exotic herbs. A few sandbar willow (*Salix exigua*) and eastern cottonwood (*Populus deltoides*) saplings are pioneering in the low-lying area near the north end of the island. Common mallow (*Malva neglecta*), tumble mustard (*Sisymbrium altissimum*), and wormseed mustard (*Erysimum cheiranthoides*) are the dominant species on the Spider Island.

A large Double-crested Cormorant colony interspersed amongst a matrix of Herring Gull nests covers most of the island. Waterfowl use is limited since there is very sparse vegetation, but this vegetation does provide some cover for scattered nesting of species like Mallards, Black Ducks, and Canada Geese. Killdeer, Ring-billed Gulls, and the non-native Mute Swan have also been observed nesting on the island.

Spider Island provides valuable rest stops for migrating birds traveling across open water. Approximately 6 acres of fissured, depressed dolomite pavement support shallow pools, which warm and provide food for migrating shorebirds. Ruddy Turnstones, Piping Plovers, Dunlins, Semi-palmated Sandpipers, Least Sandpipers, Pectoral Sandpipers, and Sanderlings feed in these areas along the eastern shore of the island. Additionally, Hooded Mergansers, Blue-winged Teal, Common Mergansers, Mallards, and American Wigeon were observed feeding

and loafing on these shorelines during fall migration. Horned Larks, Savannah Sparrows, and American Pipits have also been observed resting on the island.

Green Bay NWR

Hog Island

Two-acre Hog Island rises approximately 20 feet above lake level. Remnant forest still exists on the flat top of the island; however, due to colonial bird activity many overstory trees are dead or stressed and the understory is dominated by invasive or weedy species. A few white birch (*Betula papyrifera*) and chokecherry (*Prunus virginiana*) are in the overstory. Red elderberry (*Sambucus racemosa*) forms a dominant and nearly impassable shrub layer, some Canada yew (*Taxus canadensis*) is still present. Intertwined among the elderberry or interspersed in open areas is a dense herbaceous mixture of weedy or exotic species; fringed bindweed (*Polygonum cilinode*) and American black currant (*Ribes americanum*) dominate.

Limestone ledges, which form broad steps around three-fourths of the island are barren. The remaining quarter of the shoreline has slopes that are covered with vegetation between the heavy woody cover and the bare wave-washed rocks of the lakeshore. A long gravel spit on the northwest corner of the island protrudes northwestward, branching out at the tip.

Hog Island supports a nesting colony of Herring Gulls, which nest around the perimeter of the island on the open areas. Great Blue Herons, Black-crowned Night-Herons, and Great Egrets nest in trees on the island interior, and Red-breasted Merganser nests can be found hidden in the limestone ledges. Sandbar willows (*Salix exigua*) on the gravel spit provide cover for nesting waterfowl like Mallards, Black Ducks, and Canada Geese. Recently, Double-crested Cormorants have attempted to nest on the island, and active control measures are taken to remove the birds and prevent change to woody vegetation.

Pilot Island

In 2007, 3.7-acre Pilot Island was added to the Green Bay NWR. This is the site of a formerly-occupied lighthouse (est.1851) and contains a variety of native and ornamental vegetation. Pilot Island was surveyed in the 1970s; at that time the vegetation was composed of red-osier dogwood (*Cornus stolonifera*), lilacs (*Syringa vulgaris*), Canada yew (*Taxus canadensis*), white cedar (*Thuja occidentalis*), willow (*Salix sp.*), white birch (*Betula papyrifera*), and poison ivy (*Toxicodendron radicans*) (Jedziewicz, 2001). By the 1980s, the activities of nesting gulls, herons, and later Double-crested Cormorants drastically changed the vegetative composition. Vegetation today consists of a shrub layer dominated by chokecherry (*Prunus virginiana*) and Red elderberry (*Sambucus racemosa*). Intertwined among the elderberry or interspersed in open areas is a dense herbaceous mixture of weedy or exotic species. Bittersweet nightshade (*Solanum dulcamara*), catnip (*Nepeta cataria*), and common mallow (*Malva neglecta*) are the most frequently occurring species on Pilot Island.

A large Double-crested Cormorant colony covers much of the island, nesting in the formerly forested area. Hundreds of Herring Gull nests are on the rocks and boulders of the shoreline and on the open area in the center of the island. The vegetation provides some cover for scattered nesting waterfowl species like Red-breasted Mergansers, Mallards, and Canada Geese.

Plum Island

Plum Island was added to the Green Bay NWR along with Pilot Island in 2007. Plum Island was reserved from the public domain in 1848 for lighthouse purposes and contains a number of historic buildings and related structures including the front and rear range lights, the original keeper's quarters, a fog signal building, the USCG station, and a substantial boathouse and dock.

The island is 325 acres, has an elevation of 620 feet, and is surrounded by rocky shoals. Plum Island was visited in 1974; at that time old-growth sugar maple and basswood forest existed in the interior with a dense Canada yew understory. In addition, no deer were reported (Huntoon, 1977). The forest has since been impacted by heavy selective logging in the 1980s and deer herbivory. The logging left the canopy open, and pioneering species such as red raspberry and invasive species have colonized these areas. The east and south coast bluffs are dominated by white cedar. A 15-acre sedge meadow and shallow emergent wetland are on the northeastern part of the island. The wetland is directly connected to the lake and experiences the same changes in water levels. The rising and falling of the water on a seasonal basis and over longer periods creates a dynamic system of change. In low-water years, a calcareous meadow dominated by brook lobelia (*Lobelia kalmia*), rushes (*Juncus spp.*) and St. Johnswort (*Hypericum L*) is exposed. The sedge meadow is dominated by bluejoint (*Calamagrostis canadensis*) and tussock sedge (*Carex stricta*). The federally threatened dwarf lake iris (*Iris lacustris*) is present along a strip of boreal forest along the northeast shoreline.

Migrating and Breeding Birds – Refuge staff has detected more than 70 species during the breeding season on Plum Island. The ubiquitous American Redstart has been observed more than twice as often as the next most common species (in order: House Wren, Indigo Bunting, Red-eyed Vireo, Red-winged Blackbird). Canada Geese, Wood Ducks, Mallards, Bald Eagles, American Woodcock, and Northern Flicker are among the Midwest Region (Region 3) conservation priorities that use Plum Island during the breeding season.

Plum Island also provides valuable rest stops for birds migrating across open water. In early May, densities approaching 60 birds/hectare (up to 17 species/hectare) have been recorded in some forest habitats. Seven species of Wood Warblers and up to 25 Yellow-rumped Warblers per tree, in some locales, have been observed.

Mammals – Refuge staff has conducted trapping efforts to obtain a baseline inventory of mammals. The only species captured was deer mice. White-tailed deer are present and are seen intermittently, and raccoon tracks have been observed on the island. It does not appear that insectivores, lagomorphs, small carnivores, or other rodents have been able to successfully colonize the island, although it should be large enough to support at least some of these species.

Reptiles and Amphibians – Coverboard and call surveys have been conducted on Plum Island to obtain a baseline inventory of reptiles and amphibians. Six species were observed during coverboard sampling: common garter snake, brown snake, western fox snake, northern ringneck snake, blue-spotted salamander, and central newt. A strong chorus of northern spring peepers along with several individual American toads and eastern gray tree frogs were recorded on the call surveys. Incidental to other work on Plum Island, staff observed several northern water snakes. American toads on Plum Island exhibit island gigantism phenomenon; they are much larger in comparison to their mainland relatives.

Fish – According to the *Atlas of the Spawning and Nursery Areas of the Great Lakes Fishes*, the shoals surrounding the refuge islands are historic spawning beds for lake trout and several other Great Lakes fish species. The island reefs and shorelines provide coastal habitat required by these species to complete their lifecycles. Carp spawn by the hundreds in the Plum Island harbor and can be seen in high-water years in the Plum Island wetland.

Harbor Island NWR

During past observations, 149 species of fauna (16 mammal species, 7 herptofaunal species, and 126 bird species) have been observed (see Appendix D). Fourteen Region 3 Birds of Concern Species have been observed on or near Harbor Island NWR:

American Bittern, Black-crowned Night-Herons, Trumpeter Swan, Canada Goose, American Black Duck, Lesser Scaup, Wood Duck, Mallard, Blue-winged Teal, Bald Eagle, Common Tern, Black Tern, Whip-poor-will, and Northern Flicker. Of special note is that in 1965–1978 Louis Benua visited Harbor Island and nearby islands and

noted a number of large predators, including the federally threatened Canada Lynx (*Lynx canadensis*). Although no records of black bear exist in refuge files, this species, too, is thought to use the island.



Harbor Island NWR

Wildlife harvest regulations for deer and bear on the refuge are the same as State of Michigan regulations, and management of the white-tailed deer populations is of primary concern. A 1978 pre-acquisition survey indicated a year-round deer population and island vegetation was showing the stress imposed by overabundant deer. Other mammals reported include snowshoe hare, beaver, little brown bat, red bat, woodland deer mouse, red-backed vole, and mink. Gray wolves (*Canis lupus*) from St. Joseph Island, Ontario hunt the island during the winter months. Several other species have been reported on Bald Island just east of Harbor Island and are expected to be visitors to the refuge.

During past observations, 127 species of flora have been observed (Appendix E). Four major vegetative associations are on the island. Areas containing northern white cedar and balsam fir predominate. The next most prevalent community is a mixed upland community containing red oak, sugar maple, trembling aspen, white ash, and paper birch. The red oak, in particular, is quite impressive, growing very well on the soils of the island. Marsh is around the interior bay and along the northeast side of the island. Some acreage of open field is just inland from the bay. The species composition is unknown but likely contains timothy, Canada bluegrass, and other species based on similar abandoned agricultural sites in the Upper Peninsula. Figure 3-1 shows the major vegetative associations and is adapted from the unpublished plant community survey by Selzer (2000).

Figure 3-1: Vegetative Associations, Harbor Island NWR (2009)



Huron NWR

In post-glacial times, the islands that now comprise Huron NWR have been modified by changes in water levels and isostatic rebound following glacial retreat. Thus, the islands, and their biota are relatively young, on the order of 8,000- to 15,000-years before present (Soule, 1993). Most wildlife use at Huron NWR involves migratory birds, especially forest-dependent species. However, a small mammal community is present. Past surveys (e.g., Corin, 1976) have documented 93 species of fauna (79 bird species, 8 mammal species, 6 herptofaunal species). Eight Region 3 Birds of Concern Species have been documented on the Huron Islands: Canada Goose, American Black Duck, Mallard, Bald Eagle, Peregrine Falcon, Northern Flicker, Canada Warbler, and Bobolink (which is likely a migrant).

Four islands of Huron NWR are vegetated; the remaining islands are barren outcrops of granite. Vegetation surveys have documented 157 species of flora. The vegetated islands are generally characterized by shallowly rooted trees and exposed granite. Vegetation is a boreal transition type made up of balsam fir, white pine, red pine, white spruce, red maple, bigtooth aspen, and paper birch. Much of the balsam fir is decadent and contributes to a significant fuel loading on Huron Island NWR. The understory contains cherry species, balsam fir regeneration, Canada yew, various woody shrubs, grasses, and forbs. There are a few areas on East Huron that contain small sphagnum bogs with an occasional black spruce. Only Huron, East Huron, Cattle, and Gull Rock Islands have substantial vegetation.

Michigan Islands NWR (Seney)

During past observations, 69 bird species and two mammal species (deer mouse, *Peromyscus maniculatus*; snowshoe hare, *Lepus americanus*) have been observed at Michigan Islands NWR. Of these 69 bird species, nine are Region 3 Birds of Concern Species: Common Loon, Caspian Tern, American Bittern, Black-crowned Night-Heron, Canada Goose, Lesser Scaup, Mallard, Bald Eagle, Northern Harrier, and American Woodcock.

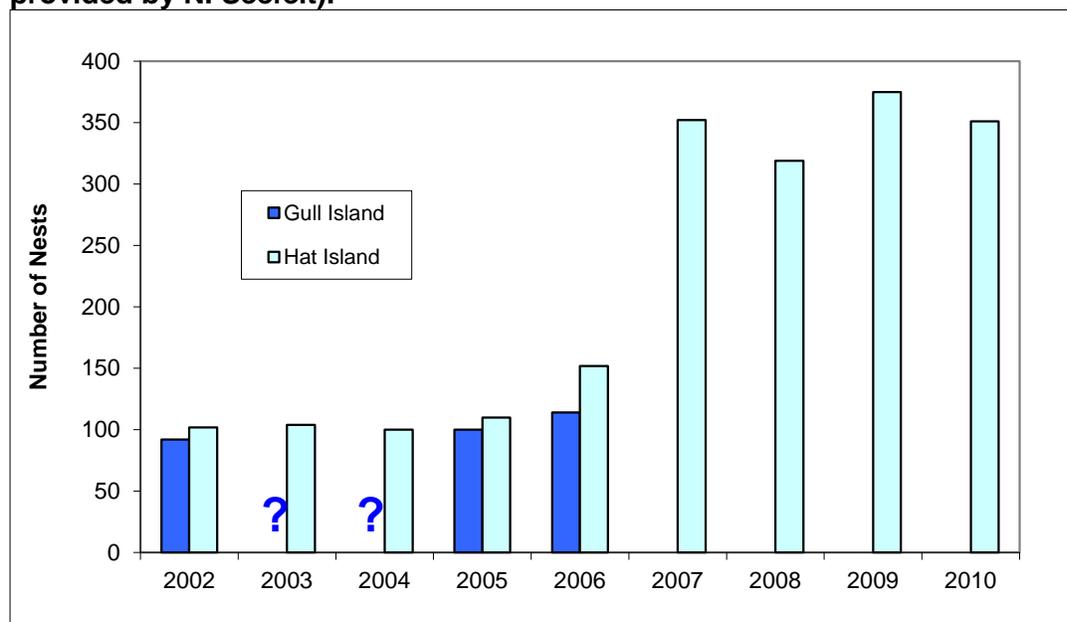
Each of the islands of Michigan Islands NWR support breeding colonial waterbirds. Herring Gulls nest on Shoe Island each year; intermittently, Ring-billed Gulls nest at this location. Pismire Island supports both species of gulls and Double-crested Cormorants. Gull and Hat Islands host the greatest numbers and diversity of species. Over the past ten years, these islands have supported both Ring-billed and Herring Gulls, Great Blue Herons, Black-crowned Night-Herons, Double-crested Cormorants, Common Terns, and Caspian Terns. Other avian species are breeding on these islands, including shorebirds (Spotted Sandpipers and Killdeer), waterfowl and a variety of landbirds. Due to its larger size and more diverse habitats, Gull Island supports a greater diversity of landbirds, including raptors and songbirds.

Michigan Islands NWR has exceptional value to colonial nesting waterbird conservation in the Great Lakes Region and specific islands have been proposed as an Important Bird Area by the National Audubon Society for species such as Black-crowned Night-Heron (Gull Island) and Caspian Tern (Hat Island). And not surprisingly, many past studies have been conducted on population biology and the natural history of species inhabiting these islands, such as Caspian Tern (Shugart et al., 1979; Cuthbert, 1985; Cuthbert, 1988; Wires and Cuthbert, 2000) and Double-crested Cormorant (Cuthbert, 2002; Seefelt and Gillingham, 2004, 2006a,b, 2008; Wires and Cuthbert, 2006).

According to Hatt et al. (1948) an ornithologist, Charles L. Cass, visited Shoe Island in July 1896 and found nesting Caspian Terns at this site. Caspian Terns have nested on Shoe Island

or nearby Hat Island since Cass' first report, often changing islands in response to fluctuating water levels. In the late 1980s, 437 nesting pairs were documented on Hat Island (Scharf and Shugart, 1998), and this site has been consistently used through the present. Hat Island is currently a productive colony and terns have been documented to fledge at this location most years since 2002 (figure 3-2). In addition, Gull Island has supported nesting Caspian Terns between 2002 and 2006; terns were not as successful breeding at this location. As an overview, between 1977 and 1997, Caspian Terns numbers increased in the Great Lakes (Cuthbert et al., 2003). However, more recent censuses indicate that the population in Lake Michigan is declining (Cuthbert and Wires 2008), thus exemplifying the importance of Hat Island. Caspian Terns are currently listed as threatened in Michigan.

Figure 3-2: The number of breeding Caspian Tern pairs on Gull and Hat Island (data provided by N. Seefelt).



Double-crested Cormorants were first recorded nesting on Gull, Hat and Pismire Islands in 1984, and these sites have been used consistently through the present (Ludwig, 1984; table 3-1). Hat Island has become the most important colony for this species in the archipelago, and overall population fluctuations are consistent with this site's breeding activity. The peak population in the archipelago was in 1997 (Cuthbert et al., 2003); however, the Michigan Islands NWR supported its largest number breeding cormorants in 2007, when no other archipelago sites were active. During this same year, population control measures, including both egg-oiling and shooting adults, began on refuge Islands and has continued to the present day. These activities have the potential to impact co-nesting species on these islands, as well.

Table 3-1: The number of Double-crested Cormorant pairs breeding on Gull, Hat and Pismire Islands, 1984–2010 (data provided by N. Seefelt)

	Gull	Hat	Pismire	Total
1984 ^a	139	54	57	250
1989 ^b	260	294	35	589
1997 ^c	1887	4617	383	6887
2000	1532	4917	987	7436
2001	2013	4511	1035	7559
2002	957	3659	615	5231
2003	435*	7341	1164	8940
2004	1274	3515	725	5514
2005	2332	5289	838	8459
2006	2464	5776	512	8752
2007	2821	7942	660	11423
2008	1817	6800	300	8917
2009	1319	5480	272	7071
2010	613	3721	157	4491

^a Nest count data from Ludwig (1984)
^b Nest count data from Scharf and Shugart (1998)
^c Nest count data from Cuthbert *et al.* (1997)
* Partial ground count completed by Seney NWR personnel

Black-crowned Night-Herons are a more elusive species to census. However, this species had been documented to nest in small numbers (6 to 7 pairs) on Hat Island between 2005 and 2008. In addition, these herons have nested among the tree-nesting cormorants on the southeast, south and western shore on Gull Island. At minimum, 20 to 24 pairs have consistently nested on Gull Island between 2005 and the present. Young have fledged from both islands.

Vegetation

During past observations, 47 species of flora have been documented, with most work done at Gull Island (B. Leuck, Centenary College of LA, ongoing studies) and Hat Island (Gates, 1950). Historically, Gull and Hat Islands (and to a lesser extent Pismire Island) were the only islands that supported significant vegetation. However, now (due to disturbance by Double-crested Cormorant) only Gull Island has any significant live woody vegetation. Species on this island

include: paper birch, red maple, sugar maple, northern white cedar, balsam fir, white spruce, and trembling aspen. The groundcover is dominated by Canada yew. Mountain ash, red osier dogwood, elderberry, willow, and juniper are also present. On Hat Island there is mostly brush with some grass. Forest vegetative cover is limited to mostly standing dead trees due to effects of some nesting waterbirds. Pismire Island is covered in brush, with scattered herbaceous vegetation. Shoe Island, at high-lake levels, is virtually submerged, and at low-lake levels appears as a gravel bar with a few clumps of grass and herbs.

Michigan Islands NWR (Shiawassee)

Big Charity

The Charity Islands are located near the mouth of Saginaw Bay, approximately 7 miles from the mainland. Big Charity is 250 acres in size and is heavily wooded, with an 11-acre lake in the center. Bald Eagles and neotropical songbirds nest on the island, and Pitcher's thistle (federal and state threatened) is on the island.

Little Charity

Little Charity Island is an undeveloped 5.4-acre island located approximately 2 miles from Big Charity. The island is wooded, and colonial waterbirds such as Double-crested Cormorants, egrets, herons, and gulls nest throughout the island.

Scarecrow Island

Scarecrow Island is a 9-acre island located in Lake Huron at the southern limit of Thunder Bay. This limestone bedrock island is covered with boulders and gravel, with a minimal soil layer supporting shrubs, scattered forbs, and a few snags, which are used by Double-crested Cormorants, Black-crowned Night-Herons, Common Terns, Caspian Terns, and Herring Gulls for nesting. Ring-billed Gulls, terns, shorebirds, and waterfowl also nest on Scarecrow Island.

Sugar Island

Sugar Island is 140 acres and is located east of Thunder Bay Island. The island was sold to TNC in 2009 and the Service recently acquired the island using Great Lakes Restoration Initiative funding. The island shoreline includes cobble beach, a limestone pavement alvar, scattered boulders, and freshwater, coastal wetlands. Alvars are naturally open landscapes formed of a thin layer of soil over limestone, and are found only in the Great Lakes Region, the Baltic, and in Northern Ireland. Sugar Island has a dense interior conifer forest. Tree species include black cherry, white cedar, balsam fir, tamarack, white pine, white spruce, balsam poplar, quaking aspen, and white birch. Songbirds, shorebirds, waterbirds, waterfowl, and raptors have been observed on the island.

Thunder Bay Island

The island supports a rare endemic Great Lakes alvar ecological community of national and global significance. Alvar ecosystems are grassland, savanna, and sparsely vegetated rock barrens that develop on flat limestone or dolomite bedrock where soils are very shallow. Plant communities include little bluestem alvar grassland, alvar pavement, and a limestone bedrock lakeshore. The thin layer of soil associated with alvar communities supports a dense interior

forest of American yew, white cedar, spruce, fir, and birch. The shoreline includes cobble beach and freshwater coastal wetlands. American Redstarts, Ring-billed Gulls, Herring Gulls, terns, and America Black Ducks nest on the island.

Associated Plans and Initiatives

Michigan's Wildlife Action Plan

In 2005, Michigan's Wildlife Action Plan (WAP) was completed to better manage wildlife species and their habitats of "greatest conservation need" in Michigan. The plan was developed with the support of funding from the State Wildlife Grant Program created by Congress in 2001. The goal of the plan is to provide a common strategic framework that enable Michigan's conservation partners to jointly implement a long-term holistic approach for the conservation of all wildlife species. Members of the partnership include the Michigan Department of Natural Resources (DNR), the U.S. Fish and Wildlife Service, The U.S. Forest Service, TNC, Michigan Natural Features Inventory, academics from several Michigan universities, as well as many other agencies and conservation organizations.

The action plan:

- provides an ecological, habitat-based framework to aid in the conservation and management of wildlife;
- identifies and recommends actions to improve habitat conditions and population status of species with the greatest conservation need, which are those species with small or declining populations or other characteristics that make them vulnerable;
- recommends actions that will help to keep common species common;
- identifies and prioritizes conservation actions, research and survey needs, and long-term monitoring needed to assess the success of conservation efforts;
- complements other conservation strategies, funding sources, planning initiatives, and legally mandated activities;
- incorporates public participation to provide an opportunity for all conservation partners and Michigan residents to influence the future of resource management;
- provides guidance for use of State Wildlife Grant funds; and
- provides a clear process for review and revision as necessary to address changing conditions and to integrate new information as it becomes available.

Migratory Bird Conservation Initiatives

Several migratory bird conservation plans have been published over the last decade that can be used to help guide management decisions for the refuges. Bird conservation planning efforts have evolved from a largely local, site-based orientation to a more regional, even inter-continental, landscape-oriented perspective. Several trans-national migratory bird conservation initiatives have emerged to help guide the planning and implementation process. The regional plans relevant to the Great Lakes islands refuges are:

- The Upper Mississippi River/Great Lakes Region Joint Venture Implementation Plan of the North American Waterfowl Management Plan;
- The Partners in Flight Boreal Hardwood Transition [land] Bird Conservation Plan;
- The Upper Mississippi River/Great Lakes Region Shorebird Conservation Strategy; and
- The Upper Mississippi River/Great Lakes Region Waterbird Conservation Strategy.

All four conservation plans will be integrated under the umbrella of the North American Bird Conservation Initiative. Each of the bird conservation initiatives has a process for designating priority species, modeled to a large extent on the Partners in Flight method of computing scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance, and population trend. These scores are often used by agencies to develop lists of priority bird species. The Service based its 2008 list of Birds of Conservation Concern primarily on the Partners in Flight, Landbird Conservation Plan, U.S. Shorebird Conservation Plan, and North American Waterbird Conservation Plan status assessment scores.

Habitat Management

Managing Invasive Plants

No inventories of invasive plants were conducted on the Great Lakes islands refuges. However, island ecosystems are extremely vulnerable to harm caused by natural or intentional introduction of non-native plants. It is likely, but not documented, that some of the wetland areas are infested with purple loosestrife (*Lythrum salicaria*) and that spotted knapweed (*Centaurea maculosa*) may be found locally in the open lands of the larger islands.

Conflict Species Management

Double-Crested Cormorants (DCCO)

DCCO status: The most recent Great Lakes Colonial Waterbird Census estimate (Cuthbert and Wires, 2011) for Cormorants during 2007–2009 was approximately 103,000 pairs in the Great Lakes. Of these, about 54,000 pairs were recorded in U.S. waters. Populations have increased significantly in the last 25 years, and growing concern about their impacts on natural resources, especially fish and vegetation, caused the Service to establish a Public Resource Depredation Order (PRDO) in 2003.

The PRDO authorizes 3 entities—the U.S. Department of Agriculture Wildlife Services (WS), state wildlife agencies, and tribes (acting on tribal lands)—to kill DCCOs, oil their eggs, and destroy their nests in 24 states when they significantly impact fish, vegetation, or other birds. Landowner permission is needed, and there are reporting requirements.

Under the PRDO, the Service has responsibilities to ensure that: 1) the other agencies comply with the provisions of the PRDO (especially relative to documenting impacts on natural resources), 2) the long-term sustainability of regional DCCO populations is not affected by management activities, and 3) DCCO management does not negatively impact other birds or federally listed species that co-occur with DCCOs. Depredation permits may be issued by the Service's Migratory Bird Program for DCCO management to alleviate conflicts related to

economic impacts to private property and to address human health and safety concerns. However, the PRDO is the primary regulatory tool that is relevant to DCCO management on refuge lands.

When DCCO management is proposed for national wildlife refuges, the Service also has to assess whether it's an appropriate use and then grant permission if other action agencies handle the management.

Environmental Assessments (EAs) were conducted where significant DCCO take has been proposed. In the Midwest Region, which includes Minnesota, Wisconsin, Michigan, and Ohio; WS is the lead agency on the EAs, and the Service and sometimes the DNRs and tribes are cooperating agencies. The EAs:

- Review DCCO population status.
- Establish the need for action by reviewing conflicts and evidence of DCCO impacts.
- Develop alternatives within the PRDO framework. All of the EAs have selected as their preferred alternative Integrated Wildlife Damage Management, which allows for a combination of non-lethal and lethal activities, including harassment, nest destruction, egg oiling, and shooting of adults, as appropriate.
- Establish state-level Interagency Cormorant Coordination Groups.

Cormorant Management in Michigan

Michigan DCCO numbers rose from about 4,100 pairs in 1980–1991 to 30,500 pairs in 1997–1999. The numbers declined slightly to 29,300 pairs in 2007–2009 (Cuthbert and Wires, 2011). As of the last decadal census, 39 DCCO colonies were active in the Michigan portions of Lakes Huron, Michigan, and Superior; and the St. Marys River.



Cormorant Nest, Hat Island, Michigan Islands NWR

A 2006 EA established an allowable take of up to 10,500 DCCOs annually in Michigan, which would be ~14 percent of the state's breeding population. In 2008, WS and four tribes in Michigan killed ~8,300 DCCOs and oiled eggs in ~16,000 nests, mostly to reduce documented or perceived impacts on fish populations. About two-thirds of the DCCO colonies in Michigan are subject to some sort of control activities. Michigan accounts for about 40 percent of the birds killed and 50 percent of the eggs oiled in the U.S. under the PRDO, so it's an important state for DCCO management.

Refuge islands where DCCO management has occurred or has been proposed include:

- Seney NWR, part of the Michigan Islands NWR (Beaver Archipelago, Lake Michigan):

- Gull Island: 2,821 nests in 2007; 449 nests in 2011; management is permitted on the entire island, a formally off-limits Caspian Tern colony site was abandoned after a storm.
- Pismire Island: 660 nests in 2007; 142 nests in 2011.
- Hat Island: 7,942 nests in 2007; 2,608 nests in 2011; access to the island for egg oiling or shooting birds is not allowed due to the presence of one of the largest Caspian Tern colonies in the northern Great Lakes. However, Wildlife Services does shoot birds on nearby open water. Hat Island has a large DCCO population.
- Shiawassee NWR, part of the Michigan Islands NWR (Lake Huron):
 - Scarecrow Island (Thunder Bay): Egg oiling and shooting are not allowed on this island, because the evidence does not warrant control, and there is concern about co-nester impacts. DCCOs abandoned Scarecrow Island in recent years. WS shoots DCCOs offshore in Thunder Bay (1,300 birds in 2008).

Cormorant Management in Wisconsin

DCCOs were state-listed as endangered in Wisconsin in 1972, primarily due to the use of DDT. Numbers increased to ~10,000 pairs by 1997 and are currently at ~15,000 pairs. Approximately 80 percent of the breeding birds in the state are in the Lower Green Bay and Door County areas.

The EA on DCCO management in Wisconsin was completed in 2009 and established an allowable take of up to 6,600 DCCOs annually in Wisconsin, which would be ~18 percent of the state's breeding population. In Green Bay, the goal is to ultimately reduce the breeding population from 13,000 to 6,000 pairs, mostly through egg oiling. The Service is not convinced that fish impacts can be strongly linked to DCCOs there, plus it has other objectives for the refuge islands.

In 2011, WS in Wisconsin killed 3,197 cormorants and oiled eggs in 8,588 nests, mostly to reduce documented or perceived impacts on fish populations.

Refuge islands where DCCO management has occurred or has been proposed include:

- Gravel Island NWR:
 - Spider Island: 4,055 nests in 2011. No management occurs on Spider Island. At the time the EA was written, refuge staff felt there was not sufficient justification for DCCO reduction at a refuge established specifically to protect breeding birds. Additionally, DCCO reduction would disrupt an on-going DCCO banding and observation study started in 1988. The study is aimed at improving DCCO demographic data. The wilderness designation also requires additional consideration with regards to cormorant reduction activities and the requirement to protect wilderness character.
- Green Bay NWR:
 - Pilot Island: 4,124 nest in 2011. This island is also off limits to management because, DCCO banding observation program has expanded there and the site serves as a "control" to better allow us to assess the effects of DCCO management.

- Hog Island: 464 nest in 2011. DCCOs have nested at Hog Island in small numbers in the past, until recent years when increasing numbers have attempted to nest on the island. To protect the remaining vegetation and habitat for co-nesting species refuge staff began destroying nests and eggs in 2007 (working as agents of the DNR). Nests are initiated late in the season, suggesting these birds are possibly pushed there by egg oiling activities at nearby sites. Refuge staff will continue to monitor and manage to reduce and prevent adverse impacts of DCCO on vegetation and co-nesting species by carefully managing colonization.
- Plum Island: Currently vegetated, and the refuge staff wants to prevent DCCOs from nesting on the island. None have initiated nesting there to date.

Visitor Services

The National Wildlife Refuge System Improvement Act of 1997 emphasizes wildlife management and that all prospective public uses on any given unit of the Refuge System must be compatible with the wildlife-related purposes before they can be allowed. The Improvement Act also identifies six priority uses of national wildlife refuges that in most cases a considered compatible uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Opportunities to participate in all of these wildlife-dependent activities exist on those islands open to the public.

Gravel Island and Green Bay NWRs

Gravel, Hog, Spider and Pilot Islands are all closed to public use to protect the nesting bird colonies and fragile habitats. Environmental education and interpretation activities may occur at a distance from the Islands (e.g., by boat around the perimeter of the Islands) or be offered offsite.

Plum Island is currently closed to general public access except for specific, seasonal uses under refuge permit. Since 1982, the USCG allowed deer hunting on the island. When the Service retained ownership, hunting was allowed to continue, but by permit only. About 76 people have hunted since 2007, harvesting 39 deer. It is critical to control the deer herd on the island in order to protect the forest diversity.

The Service is considering new wildlife-dependent activities for Plum Island. These proposed activities are discussed in detail in Chapter 4 of the CCP and in the Compatibility Determinations located in the Appendix B.

Harbor Island NWR

The main harbor on the island is well protected and provides abundant opportunities for boats to anchor or beach on shore. There is a sandy beach on the north end of the island that is used by swimmers during the summer months. During winter this area of the lake is normally frozen, and access to the island is only via snow machine. Currently the refuge is not staffed. Based upon current documentation, the Service estimates that the refuge will receive about 200 visitors per year. At this time there are no self-guided interpretive services on the island, just informational and regulatory signs.

Hunting is currently allowed for big game. The entire island is open to the hunting of white-tailed deer and black bear. These hunts are conducted in accordance with State of Michigan regulations.

Wild blueberries and morel mushrooms, when present, may be harvested throughout the spring, summer, and fall. Activity is normally concentrated during the few weeks that fruit is ripe. This activity most likely occurs on the refuge incidental to other activities.

Huron NWR

The Huron NWR, with the exception of the lighthouse and associated structures/features, is designated a Federal Wilderness Area. This designation was part of Public Law 91-504 passed October 23, 1970. Current regulations include the following:

- Only West Huron Island (Lighthouse Island) is open to the public—and only during daylight hours, for hiking and nature study.
- All remaining islands are closed to the public, except by Special Use Permit to biologists, botanists, or other qualified persons in conjunction with approved studies. Exceptions are emergency landings by boats in distress.
- Camping is prohibited on all islands, except that biologists, botanists, and other qualified applicants may be permitted prescribed primitive-type camping only on West Huron Island (Lighthouse Island) by Special Use Permit, in conjunction with approved studies.

Michigan Islands NWR (Seney)

Shoe, Pismire, Gull and Hat Islands are closed to the public to protect colonial nesting birds. Exceptions are emergency landings by boats in distress. Special Use Permits may be issued for approved purposes. Wildlife observation and photography are welcome offshore.

Michigan Islands NWR (Shiawassee)

Scarecrow, Thunder Bay, Sugar, Big Charity, and Little Charity Islands are currently closed to the public; no public uses have been permitted. There is little public demand to access Little Charity, Scarecrow, Thunder Bay, and Sugar Islands. Most of the demand is from local residents and vacationers that are curious to explore the island and its shores during the summer. Occasionally anglers beach on the shoreline and waterfowlers hunt from the islands.

All of these islands are surrounded by treacherous waters. These waters are shallow and littered with large boulders and shallow reefs. Consequently, the islands are only accessible to boaters that are very experienced with the underwater terrain and have small vessels. Navigating these waters is not safe for the inexperienced boater.

Archaeological and Cultural Resources Management

Cooperative maintenance and restoration of lighthouses and other maritime buildings is the only cultural resources management that occurs on the Great Lakes islands refuges. In general, cultural resources management in the Service is the responsibility of the Regional Director and is not delegated to field managers for the Section 106 process when historic properties could be

affected by Service actions, for issuing archeological permits, and for Indian tribal involvement. The Regional Historic Preservation Officer advises the Regional Director about procedures, compliance, and implementation of cultural resources laws. The field manager assists by informing the Regional Historic Preservation Officer about Service actions, by protecting archeological sites and historic properties, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

Law Enforcement

Staff of the Great Lakes islands refuges is dedicated to safeguarding the resources under their jurisdiction including natural resources, cultural resources, and facilities. Resource management includes both protective and preventive functions. Protection is safeguarding the visiting public, staff, facilities, and natural and cultural resources from criminal action, accidents, negligence, and acts of nature such as wildfires. Preventing incidents from occurring is the best form of protection and requires a known and visible law enforcement presence as well as other proactive steps to address potential threats and natural hazards.

Over the years, the most common violations on the Great Lakes islands refuges have been vandalism and trespass. Vandalism incidents have included damage to buildings, signs, and other structures.

Chapter 4: Future Management Direction; Tomorrow's Vision

In this chapter:

[Great Lakes Islands Refuges Vision, Goals, Objectives and Strategies](#)
[Vision Statement for the Great Lakes Islands Refuges](#)
[Goals for Great Lakes Islands Refuges](#)
[Objectives and Strategies for Great Lakes Islands Refuges](#)

Throughout this document, five national wildlife refuges (NWRs, refuges) are discussed individually—such as the Gravel Island NWR or the Green Bay NWR. This document also discusses all five NWRs collectively as one entity and when doing so, refers to the group as the “Great Lakes islands refuges” or “Great Lakes islands NWRs.”

Great Lakes Islands Refuges Vision, Goals, Objectives and Strategies

The planning team developed goals and objectives for three broad management alternatives that will apply to all of the Great Lakes islands refuges. These alternatives include:

- Alternative A: Current Direction to Maintain Natural Integrity
- Alternative B: Minimal Management to Preserve Wilderness Qualities
- Alternative C: Enhanced Management to Promote Natural Integrity and Public Stewardship

The Environmental Assessment (EA) (Appendix A) describes and evaluates each alternative. Alternative C is the preferred alternative, and it forms the basis for the Great Lakes islands refuges Comprehensive Conservation Plan (CCP). The goals, objectives, and strategies are presented on the following pages. The planning team established goals for major management areas, objectives for achieving those goals, and the specific strategies that will be employed by the refuges' staff. The goals are organized into the broad categories of ecosystem, wildlife, habitat, people, and cultural.

Vision Statement for Great Lakes Islands Refuges

Management of Great Lakes islands refuges will reflect the mission of the National Wildlife Refuge System (NWRS, Refuge System) by conserving in perpetuity a rich mosaic of island habitats and enabling nesting and migrating birds and other wildlife of conservation concern in the Great Lakes to thrive here. The refuge islands will serve as a resilient source of evolving habitats and ecosystem processes even as structure and composition are altered due to climate change. With the help of our conservation partners, we will apply sound, scientific principles based on research, studies, and adaptive management strategies to:

- sustain the long-term health and integrity of Great Lakes habitats;

- expand community outreach and environmental education and interpretation programs; and,
- motivate visitors to embrace stewardship of natural resources.

Goals for Great Lakes Islands Refuges

The following goals were developed after consideration of refuge purposes, the U.S. Fish and Wildlife Service (FWS, Service) and Refuge System missions, the refuge vision statement, and the mandates, plans, and conservation initiatives described above. They are intentionally broad, descriptive statements of purpose. The goals highlight elements of our vision statement that emphasize future refuge management.

Ecosystem Goal

Protect and maintain natural ecological communities to promote a healthy functioning ecosystem and identify future scenarios for Great Lakes islands ecosystems

Wildlife Goal

Protect, restore and maintain a natural diversity of fish and wildlife native to the Great Lakes, with an emphasis on Service Resource Conservation Priority Species.

Habitat Goal

Perpetuate the biological diversity and integrity of native plant communities to sustain high quality habitat for migratory birds, fish, and endangered species.

People Goal

Communicate and work in partnership with communities, governments, and appropriate organizations throughout the Great Lakes watershed to understand and appreciate the island ecosystems of the Great Lakes and further the mission of the Refuge System. Protect the cultural resources and cultural history of the refuges to assure historical preservation and connect refuge staff, visitors, and the community to the area's past.

Objectives and Strategies for Great Lakes Islands Refuges

The following management objectives and strategies are divided into two sections. The first section deals with issues and management approaches that are common to all refuge islands. The second section describes specific actions, or strategies, that will be applied to individual islands.

Objectives and Strategies Common to All Island Refuges

Ecosystem Goal

Ecosystem Objectives 1: Climate Change

Within five years of CCP approval, identify potential impacts of the projected climate changes on both abiotic and biotic components of the Great Lakes island ecosystem and communicate these issues to the public.

Discussion and Rationale

Managing at the proper scale is fundamental to the accomplishment of conservation objectives. Managing natural resources and landscapes is becoming increasingly complex. Land use changes and impacts such as drought, wildfire, contaminants, invasive species, disease, and a rapidly changing climate can threaten native species and their habitats. The impacts of climate change are already evident in warmer water, longer ice-free season, earlier spring runoff, changing water levels and resulting habitat alterations and impacts to water quality and ecological processes. Species range shift, species extinction, phenological changes, and community restructuring are the major climate change issues affecting the Great Lakes Region. Secretarial Order 3226 requires that climate change impacts be considered and analyzed when planning or decision making.



Restoration Supporters, Plum Island, Green Bay NWR (Photo by Tim Sweet)

Making people more aware of how the accelerating climate change is harming fish and wildlife and how it reduces the flow of societal goods and affects ecosystem services is a challenge for the Service, our state and tribal counterparts, and the conservation community at large. The same ecosystem functions that provide for sustainable fish and wildlife populations also provide communities with significant benefits, such as good water quality, flood and fire protection, and recreation. Meeting the challenge will require that the Service and its partners use every available communication tool to engage the public about the ecological, economic, social, and cultural costs exacted by climate change.

Strategies

1. Refuge staff, as appropriate, will work directly with the Upper Midwest and Great Lakes Landscape Conservation Cooperatives to implement resource assessments, climate model applications to appropriate scale, vulnerability assessments, inventory and monitoring protocols, and conservation plans and designs.
2. Participate in climate change discussions with our local, national, and international partners in the public and private sectors.
3. Actively seek knowledge from state, federal, tribal, and local government agencies; non-governmental organizations; business and industry already engaged in addressing climate change; and individual citizens.
4. Continue working and developing new collaborative island management efforts with other agencies, state and local governments, and non-governmental organizations to

increase our understanding of global climate change impacts and use our combined expertise and creativity to help wildlife resources adapt in a climate-changed world.

Ecosystem Objective 2: Island Acquisition

Through the life of the plan, protect highly threatened Great Lakes island habitat that is either underrepresented and unique; or critical for threatened and endangered species, focal colonial waterbird species, or birds of conservation concern for Region 3 of the Service.

Discussion and Rationale

It is important to consider the islands of the Great Lakes as a single, irreplaceable resource. The value of the whole collection of islands is much greater than the islands' individual resources. Great Lakes islands form a landscape unique in the world and support remarkable diversity. With their relative isolation, they offer opportunities to protect the unique biological legacy of Great Lake islands. Acquiring additional islands will add to local island biodiversity and protect important island habitat in the Great Lakes Basin.

Strategies

1. Implement the Land Protection Plan (Appendix C) by adding up to 14,133 acres of important island habitats.
2. Continue seeking out funding sources for acquisition and working with conservation partners to implement the plan in the Great Lakes Basin.
3. Develop partnerships for acquisition of lighthouses and associated structures so the Service does not have to take on restoration and/or preservation of these structures.
4. Update the priority islands periodically as wildlife, threats, and habitat conditions change over time.

Wildlife Goal

Wildlife Objective 1: Inventory and Monitoring

Within five years of CCP approval, implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of select resources including but not limited to Region 3 Conservation Priority Species, habitats, communities and ecosystems (e.g., Great Lake islands' habitat). Resources to be monitored are identified under the island's specific objectives or in forthcoming step-down plans. As the need arises, implement research to answer questions that have been raised regarding the management of resources and other issues.

Discussion and Rationale

These islands are valuable patches of habitat for a variety of migratory birds during both the migration and the breeding season. In particular, colonial waterbirds make use of them as loafing and breeding sites. The location of these islands, near forage fish habitat combined with their relatively undisturbed condition during spring and early summer, offer these species of migratory birds the necessary protected habitat. Habitat for colonial waterbirds has been under intense pressure on some refuge islands as shoreline development continues.

Strategies

1. Work with Region 3 Biological Monitoring Team (BMT) staff to develop a monitoring plan that will improve biological inventory and monitoring tools for the refuge islands, and set up a framework of adaptive management.
2. Conduct periodic reviews of the monitoring plan to assess trends of refuge resources, and determine if there are any priorities for research or monitoring.
3. If a research issue has been identified, initiate research at the station level. If the issue goes beyond the boundary of the refuge, take the lead role in contacting other federal, state, university, and other organizations; and develop a broader scale research project to address those issues.
4. Continue colonial waterbird nest counts, and assist Regional staff with census efforts to assess population abundance, distribution, and trends for species with conservation management or stewardship priority. Surveys will use aerial survey methodology when possible. The use of aerial photos decreases disturbance typically associated with ground counts.

Wildlife Objective 2: Applied Research

During the life of the CCP, promote applied research aimed at answering wildlife-, habitat-, community-, and ecosystem-based questions without compromising wildlife, visitor, and wilderness values.

Discussion and Rationale

The islands have served as research sites for the Service and colleagues for many years. These studies contribute valuable information about contaminants and their impacts to waterbirds and natural resources. Currently, research projects are being conducted at some islands that will assist in directing future planning and management for wildlife species, their habitats, and associated communities and ecosystems. These islands offer rare opportunities to study the changes that are occurring on the landscape with minimal human intrusion. There are very few such natural sites available to study and document long-term changes in the absence of human disturbance.

Strategies

1. Monitor and assess research annually including access for researchers and the location, duration, and impacts of research.
2. Continue and promote applied research, and initiate dialogue with federal and state agencies, universities, and other organizations to answer management questions.
3. Seek external research funding through partnerships with others outside of the Service, where and when possible.
4. Communicate research findings with the broader conservation community through peer-review and other publications, lectures, and other outreach activities.
5. Inform visitors of research findings and explain their importance for planning and management on refuge islands.

6. Prioritize research on priority species, habitats, communities, and ecosystems of conservation priority.
7. Develop a better understanding as to how refuge ecosystems function on a landscape and regional scale, including the effects of future climate change.

Wildlife Objective 3: Protect Waterbird Colonies

During the life of the CCP, limit disturbance to colonial waterbird colonies in order to maintain current nesting population levels of gull, tern, egret, and heron species.

Discussion and Rationale

Colonial waterbirds are extremely sensitive to human disturbance. Disturbance during the pre-nesting and nest-building phase can cause the birds to abandon the island for the current and future nesting seasons. During the incubation and chick-rearing phase, disturbance may cause loss of eggs and chicks. When incubating adults are induced to leave the nest, eggs and chicks are vulnerable to predation from gulls and other opportunistic predators (consuming eggs and chicks whole) and heat stress, which can kill eggs and chicks in a matter of minutes on a hot day.

Strategies

1. Improve and maintain boundary signs. Using buoy markers will alert boaters and kayakers and assure boaters maintain an appropriate distance to avoid disturbance to nesting birds.
2. Continue law enforcement patrols.
3. Monitor applied research activities to ensure activities are conducted with minimal disturbance to nesting birds.
4. Build support for protecting waterbird colonies through public outreach, education, and promoting waterbird conservation opportunities.

People Goal

People Objective 1: Community Outreach

Within five years of CCP approval, 50 percent of neighboring communities and businesses will express support for the refuge through active promotion of island habitat protection and refuge special events.

Discussion and Rationale

Outreach is a two-way communication between the Service and the public to establish and promote involvement and influence attitudes and actions—with the goal of improving joint stewardship of our natural resources. Outreach includes congressional relations, news media relations, community relations, and public informational activities such as speeches and open houses.

Island habitats can be fragile, and wildlife species can be sensitive to disturbance by humans. In light of this fact, refuge managers have to determine whether existing and future opportunities for wildlife observation and photography, hunting, fishing, environmental education and interpretation are appropriate and sustainable on specific islands.

Strategies

1. Maintain websites with current information about refuge management and events.
2. Work closely with Friends Groups (where applicable) to maintain and increase important connections with the local communities.
3. Develop outreach plans for important resource issues.
4. Increase community partnerships.
5. Establish dedicated staff for island refuges. In 2007, the region conducted a staffing model exercise, which indicated the need for up to three staff positions dedicated to the islands. This level of staffing probably can't be supported without a large increase in refuge budgets. However, a staff member at Seney and Horicon NWRs, with a significant portion of their work dedicated to the islands would greatly assist in implementing this plan. See Chapter 5 for more details.

People Objective 2: Cultural Resource Protection

Within five years of CCP approval, develop strategies to protect specific, known cultural and historic sites on the island refuges.

Discussion and Rationale

Several Great Lakes islands refuges contain unique, and often highly visible, historic sites. Refuge managers need to ensure these sites, especially the lighthouses, receive adequate care, restoration, and protection into the future.

Cultural resources are both physical manifestations and intangible values that connect us to our past, providing the means to study and reflect upon the events and processes that have shaped our nation, our communities and ourselves. Many of these resources are unique and

irreplaceable. Their true value rests in what they offer us in terms of scientific information, interpretive opportunities, and cultural identity. Cultural resources managed by the Service are important, because the study of managed cultural resources provides important information on changes to our environment and landscapes over thousands of years, and this contributes directly to the Service's primary mission of managing wildlife and natural landscapes.



Thunder Bay Lighthouse, Michigan Islands NWR

We take seriously our responsibility to consider the effects of our actions on archeological and historic resources. This dedication is underscored by our compliance with Section 106 of the National Historic Preservation Act before disturbing any ground. Compliance may require any or all of the following: review of State Historic Preservation Office records, consultation with Native American Tribal Historic Preservation offices, a literature survey, or field survey.

The National Historic Preservation Act considers deterioration of historic structures as an adverse effect upon them. All historic structures owned by the Service are managed by non-profit organizations through cooperative agreements. All of these structures were in various states of repair when acquired by the Service. Most of these structures have received repairs since acquisition, but all require further repairs to place them in stable condition. Establishment of a regular program of cyclical maintenance, involving items such as painting and roofing repairs, will also be essential to protect these historic structures.

In addition, we will continue our program to maintain historic lighthouses and/or associated structures to at least minimum national historic preservation standards. The Service is not directly responsible for maintaining any historic structures on the existing refuge islands. However, several lighthouses and related structures are maintained under cooperative agreements with private non-profit organizations.

As noted under Ecosystem Objective 2 (Island Acquisition), we will acquire additional refuge lands. However, we are not purposefully seeking to acquire any more historic structures except as necessary to protect refuge biological resources.

Strategies

1. Conduct site-specific surveys prior to ground-disturbing projects, and protect known archeological, cultural, and historic sites.
2. Within 10 years of CCP approval and with the assistance of the Regional Historic Preservation Officer (RHPO), develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.
3. Identify and nominate to the National Register of Historic Places all historic properties including those of religious and cultural significance to Indian tribes.
4. Inform the RHPO early in project planning to ensure compliance with Section 106 of National Historic Preservation Act.
5. Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings.
6. Inspect the condition of known cultural resources on the refuge, and report to the RHPO changes in the conditions.
7. Integrate historic preservation with planning and management of other resources and activities.

Objectives and Strategies Specific to Green Bay NWR (Plum and Pilot Islands)

Wildlife Goal

Wildlife Objective 1: Inventory and Monitoring

Within 5 years of CCP approval, implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of select resources, including but not limited to Region 3 Conservation Priority Species, habitats, communities, and ecosystems. Priority species that are currently found on Plum Island include (but are not limited to), the Bald Eagle, Black-billed Cuckoo, Red-headed Woodpecker, Northern Flicker, and Black-throated Blue Warbler. Valued resources also include the unique island community types found on Plum Island. Examples include the limestone pavement lakeshore communities and boreal habitat that supports the federally threatened dwarf lake iris that is endemic to the Great Lakes Region. As the need arises, implement research to answer questions that are raised regarding the management of these resources.

Discussion and Rationale

From a biodiversity perspective, Great Lakes islands are of particular importance and support relatively high numbers of endemic plant and animal species and distinct plant communities, and they serve as refugia to migrating and breeding birds. The islands are highly vulnerable and without a monitoring program; challenges such as over browsing by deer and invasive species threaten important island habitat.

Strategies

1. Work with Region 3 Biological Monitoring Team (BMT) staff to develop a monitoring plan that will improve biological inventory and monitoring tools for the refuge islands, and set up a framework of adaptive management. For example, implement a landbird inventory protocol to monitor spring and fall migratory birds use on Plum Island.
2. Continue colonial bird nest counts on Pilot Island and assist Regional staff with census efforts to assess population abundance, distribution, and trends for species with conservation management or stewardship priority.
3. Re-visit permanent vegetation plots set up on Plum Island to monitor habitat changes, and assess effectiveness of active management and/or restoration efforts.
4. Continue to develop collaborative efforts with other agencies, state, and local governments, and other organizations. Given the shortage of resources and the cost associated with islands work, these partnerships will be necessary to achieve adequate island management and monitoring goals.

Wildlife Objective 2: Deer Population

Annually, maintain the Plum Island deer population consistent with State Management Unit 81 at a density of 10–19 deer per square mile based on annual winter surveys. A more liberal bag limit on Plum Island may be necessary to achieve wildlife goals and enhance the restoration and protection of native vegetation.

Discussion and Rationale

Based on studies and long-term experience with deer herd management by Wisconsin Department of Natural Resources (DNR), this is the optimal population density or carrying capacity of white-tailed deer on island habitat in this region.

Historically, few if any deer were present on Plum Island. At present, the deer herd on Plum Island is over state population goals and estimated to be between 15 and 20 per square mile. An over-abundant deer population can alter the structure, composition, and diversity of the forest community. Sustained browsing pressure can limit regeneration of favored and susceptible woody plants and eliminate populations of herbaceous plants. The forest habitat on Plum Island is exhibiting signs of an overabundant deer population. This is evident by the browse line and the current structure and composition of the forest habitat.

Strategies

1. Annual deer hunts will be necessary to prevent an overabundance of deer on the island. Depending on the level of hunter interest and potential for crowding, the refuge may institute a permit system to assure a safe and quality hunter experience.
2. Annually, monitor for signs of habitat damage such as browse lines on the refuge that would indicate that carrying capacity has been surpassed. A deer exclosure could also be established to assist with these monitoring efforts.
3. Interact with hunters, and listen to feedback on ways to improve the hunt.
4. Due to the challenges for hunters to access Plum Island during state regulated deer hunting seasons, it may be necessary to reduce over-abundant deer populations by other means. Refuge staff may consider the use of sharpshooters to reduce deer populations and protect native vegetation if the hunting program is not successful at achieving wildlife management goals and objectives. Harvested deer would be donated to local food pantries.

Wildlife Objective 3: Conflict Species

Strategies in Addition to Those Common to all Island Refuges

1. Participate in the Interagency Cormorant Coordination Group to gather information, discuss, and coordinate annual cormorant census, management, and research efforts in Wisconsin.
2. Prevent Double-crested Cormorant colony expansion on Plum Island. No cormorants have been observed nesting on the island. If cormorants attempt to nest on Plum Island, refuge staff will use an integrated management approach, as described in *Environmental Assessment: Reducing Double-Crested Cormorant Damage in Wisconsin*, to prevent the establishment of a new colony.
3. Assess Double-crested Cormorant populations annually on Pilot Island. At the present time, there is insufficient justification for cormorant population reduction at Pilot Island. The island was acquired primarily to protect breeding bird habitat. Initiating control measures now would disrupt the ongoing island cormorant research projects. However, if future data warrants reduction of cormorant numbers for the protection of historic

property, fish populations, or co-nesting species, refuge management could implement/permit Double-crested Cormorant control activities, so long as the impacts do not exceed those analyzed in *Environmental Assessment: Reducing Double-Crested Cormorant Damage in Wisconsin*.

Habitat Goal

Habitat Objective 1: Northern Mesic Forest

Annually, maintain 227 acres on Plum Island for a diversity of successional stages, and (where and when possible) restore historic composition and structure for the diversity of species present, including Region 3 Conservation Priority Species Bald Eagle, Black-throated Blue Warbler, and Northern Flicker.

Discussion and Rationale

This habitat type contains a wide range of forest conditions, from those composed primarily of early successional species such as aspen and to forest dominated by sugar maple, basswood, and eastern hemlock. The interior of Plum Island is dominated by a sugar maple and basswood forest. Visits to the island in the 1970s documented an old-growth sugar maple and basswood forest with a dense Canada yew understory and no deer.

The forest has since been altered by heavy selective and/or clear-cut logging activities and browsing by over-abundant deer. Thus, the forest composition has shifted to more early successional species with a relatively uniform age structure. This is different than historical conditions, which contain greater species and structural diversity. Future management and restoration efforts should focus on promoting ecological integrity of the forest by promoting compositional and structural diversity and (in most instances) moving succession forward.

Strategies

1. Promote a forest dominated by late successional stages of mixed forest.
2. Use management techniques that mimic natural ecological disturbances (windthrow and native pathogens).
3. Use commercial and non-commercial mechanical treatments, where and when appropriate.
4. Ensure white-tailed deer populations do not negatively affect the habitat.
5. Manage invasive species aggressively.
6. Protect active Bald Eagle nests, and maintain high quality suitable habitat for nesting Bald Eagles on Plum Island.

Habitat Objective 2: Great Lakes Alkaline Rock Shore and Alvar

On Plum Island, annually protect and maintain 40 acres of coastal habitat for the diversity of species present including Regional Priority Species Sedge Wren and American Woodcock and the federally threatened dwarf lake iris.

Discussion and Rationale

Crevice, coastal, horizontal exposures of dolomite support a distinct plant community. They are influenced by wave action, ice push, and fluctuating levels of Lake Michigan. White cedar is the dominant shoreline tree, and common shrubs include red-osier dogwood and shrubby cinquefoil. Understory species include the federally threatened dwarf lake iris.

On the northwestern coast of Plum Island is a sheltered wetland with shallow water and an accumulation of calcareous mud, gravel, and cobble. The meadows are dominated by sedges and bulrush. Southwest of the wetland on Plum Island is a 16-acre sedge meadow. The meadow is dominated by bluejoint and tussock sedge. The water levels in this wetland area are dictated by the fluctuating water levels of Lake Michigan.

Strategies

1. Manage invasive species aggressively. Continue ongoing efforts to control invasive *Phragmites australis*.
2. Continue to map and monitor the population of dwarf lake iris to assure the necessary protection from potential threats, including management activities.

Habitat Objective 3: Open Land

On Plum Island, reduce open land habitat from 2007 levels (36 acres) by 21 acres, and manage the remaining 15 acres to protect historical U.S. Coast Guard (USCG) structures.

Discussion and Rationale

This habitat type consists primarily of anthropogenic habitats created prior to the acquisition of Plum Island in 2007. Open areas occur on the island in the southern range light area and near the USCG structures.

The areas near the USCG structure (approximately 10 acres) will be maintained as open areas, especially in the path of the range light, which will continue to function as an active aid to navigation. USCG Aids to Navigation will maintain the areas near the range lights. Note: After Service acquisition, the USCG crew cut down several large diameter cedar trees in the path of the range light. The downed cedar trees currently lie where they fell. To this date no efforts have been initiated by USCG staff to clean up/remove the downed trees.

Many non-native grass species, such as Kentucky bluegrass and several brome species, characterize these areas. Fields other than near the USCG structures should be allowed to succeed to forest habitat or be actively managed to do so.

Strategies

1. Maintain openness near historical USCG structures via mechanical methods (mowing).
2. Remove downed cedar trees (cut by USCG), and slash to reduce potentially hazardous fuel by mechanical means and/or prescribed fire operations (burn piles).
3. Elsewhere, restore fields to upland deciduous forest stands either passively or through natural secondary succession.

4. Manage invasive species aggressively (see below).

Habitat Objective 4: Invasive Species Management

By 2015, reduce the area infested with target invasive plant species on Plum Island (e.g., phragmites, spotted knapweed, and hound's tongue) by 50 percent from the documented 2011 level, and eliminate new infestations of these and other highly invasive species as they occur.

Discussion and Rationale

Islands are especially vulnerable to invasive species. Exotic plants have been identified on Plum Island, with a few being invasive, and more invasive species are expected to arrive in the area in the future. For example, garlic mustard is currently not found on Plum Island, but there is a high potential for it to spread to this island. This invasive herb has the potential to take over and destroy the native herbaceous understory of the mesic forest habitat on Plum Island. The plant is now dominant at Peninsula State Park, and visitors to Peninsula Park would likely be visitors to Plum Island, inadvertently transporting the seeds from this invasive plant.

Areas around the USCG structures, which were disturbed from the USCG's hazardous waste clean-up activities are of particular concern. These areas are dominated by invasive spotted knapweed. Invasive exotic species occur in the wetland and shorelines (phragmites), in the open areas (spotted knapweed), and to some extent in the forested areas (spotted knapweed and hound's tongue).

Management should strive to assess the threat these species have on native ecosystem/habitat structure and function, and for those species that constitute the greatest threats an active management and monitoring program should ensue.

Strategies

1. Prior to access on Plum and Pilot Islands, special attention should be focused on preventing the spread of invasive species. Steps such as placing signs to require and ensure shoes and all equipment are cleaned and free of seeds and soil will be implemented.
2. Document the locations and sizes of targeted populations. The access sites need urgent and frequent attention.
3. Use chemical, mechanical, prescribed, and natural fire (where appropriate) as means to manage infestations in cases where biological control techniques have not been developed.
4. Monitor the infestations and effectiveness of management measures.
5. When available, use biological control as a preferred strategy.

People Goal

People Objective 1: Public Access

Provide access opportunities for the public to enjoy high quality wildlife-dependent recreation on Plum Island while protecting the natural and cultural resources of the island.

Discussion and Rationale

Plum Island will be managed primarily for the conservation of fish, wildlife, and plants through careful planning and regulation. Plum Island provides the public with unique opportunities for recreation, education, and interpretation. Providing these opportunities: hunting, wildlife observation and photography, environmental education, and environmental interpretation is consistent with the refuges' purpose and the National Wildlife Refuge Improvement Act of 1997. Specific activities must be compatible with the purpose of the Green Bay NWR. The islands are remote but still within access to visitors. Plum Island is near Washington Island, a favorite Door County tourist destination, and is located six miles from the mainland.

Visitors to Plum Island will have the opportunity to observe and photograph wildlife from interpretive trails. People hiking along refuge trails will cause some disturbance to wildlife, such as resting birds that may flush and move to other areas and birds sitting on nests that may temporarily leave. Overall, if visitors remain on the trails, as proposed, disturbance is limited to a small portion of the entire island.

Prior to opening the island up to public access, it is critical to have the proper infrastructure (trails, regulatory signs, and sanitary facilities) in place to protect the sensitive nature of the islands. Extra precautions will be needed to protect the location of the federally threatened dwarf lake iris population and active Bald Eagle nests. For example, eagle nests that are located near trails will prompt trail closings until the young are fledged, which is typically after the July 4th holiday.

The existing dock at Plum Island is in acceptable condition for staff and volunteers. Recent efforts to improve the condition and safety of the dock were accomplished through cooperation between refuge staff and the Friends of Plum and Pilot Islands (FOPPI). A more formal assessment of the current condition and evaluation of safety concerns may be required prior to opening the island to public access.

Chapter 5 of this document lists a proposal to complete a Visitor Services Plan to evaluate interpretive opportunities and provide a necessary tool to guide the development of future visitor services on the island. This work could be completed through a contract with a local university. The study would provide staff with information on the impacts of activities and may lead to adjustments in specific strategies.

Strategies

1. Establish interpretive hiking trails on Plum Island to accommodate wildlife observation, photography, and cultural resource site interpretation annually from Memorial Day to Labor Day, during daylight hours only. The old patrol road that follows the perimeter of the island and the existing trail between the lifesaving station and lighthouse would make ideal trail locations. Both of the locations have already been disturbed by past USCG activities, eliminating the need to disturb pristine habitat. Actual trail location will be determined through a site analysis and more detailed Visitor Services Plan.
2. Install a restroom facility, requiring minimal maintenance, near the access point/dock area.
3. Develop and install regulatory signage.

4. Visitors will be allowed to access Plum Island via private watercraft including motorboats, sailboats, kayaks, and canoes. Due to the fragile nature of plant communities, docking boats at undesignated beach areas will not be permitted. Boats will be required to moor at designated areas at the dock. A launch/landing area designated for kayaks and canoes will also be designated near the dock. There will be no fees to access Plum Island.
5. Commercial, public, and private companies and organizations offering charter boat service to Plum Island and/or guided wildlife tours and activities, will be allowed authorized access under the terms of a Commercial Use Authorization or Special Use Permit pending the completion of a Visitor Services Plan. Activities may include the following: kayak tours, bird watching excursions, wildlife viewing or photography trips, nature programs, and environmental education field outings
6. Continue participating in conversations regarding the Lake Michigan Water Trail (LMWT), and support efforts to include Plum Island as a day-use only public access site (no camping). Wisconsin's LMWT will consist of a series of paddler access and camping sites and related user information along the 523-mile shoreline. Wisconsin's LMWT will provide access to both visitors and the nearly two million residents within a 30-minute drive of the shoreline as well as form a keystone in the water trail circumnavigating Lake Michigan. The trail will promote stewardship, wildlife appreciation, ecotourism, physical activity, and a sense of place.

People Objective 2: Environmental Education and Interpretation

Within five years of CCP approval, 50 percent of visitors will be able to explain a key environmental theme for the refuge. The themes may include island ecology, human impact on fragile ecosystems, wilderness status, value for migratory birds, and climate change impacts.

Discussion and Rationale

Environmental education is a process designed to teach citizens and visitors the history and importance of conservations and the biological and scientific knowledge of our Nation's natural resources. Through this process, we can help develop a citizenry that has the awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively towards the conservation of our Nation's environmental resources.

Environmental education includes both onsite and offsite programming and distance education via computer.

It also pertains to activities such as formal curriculums about the refuge environment, Junior Duck Stamp programs, and Scout badge projects. Interpretation is a communication process that forges emotional and intellectual connections between the audience and the resource.



Guided Bird Watchers, Plum Island, Greed Bay NWR (Photo by Tim Sweet)

A limited amount of onsite environmental education occurs now on Plum Island. The refuge currently does not have a staff person to promote and conduct environmental education and interpretation. Green Bay NWR is in the position to provide more environmental education than it does now to grade-level and college students in northeastern Wisconsin.

Refuge staff will strive to provide educational opportunities that highlight the objectives of this plan, so the public will understand future management activities and provide support. For example, a person who understands invasive species control on islands will be more likely to support refuge decisions.

Strategies

1. Support special events and programs on Plum Island that interpret the refuge, its habitat, wildlife, and wildlife management. Examples include, The Door County Bird Festival, Migratory Bird Day, National Public Lands Day, and National Trail Day
2. Develop and place interpretive signs for planned hiking trails on Plum Island. Interpretive signs could include information about other island refuges in the area that will remain closed to visitors: Pilot, Hog, Gravel, and Spider Islands; and cultural resource information, including archeological, lighthouse, and shipwreck information.
3. Develop and install a kiosk to place near the Plum Island access point/dock that will allow visitors to view refuge maps and regulations and help interpret habitat, wildlife, and wildlife management.
4. Hire a full-time Visitor Service Specialist (see Chapter 5).
5. Develop refuge brochures and bird lists.
6. Evaluate during the development of the Visitor Service Plan, the use of the former USCG buildings on Plum Island—such as the boathouse and/or lifesaving station—as a visitor contact station. Space could be provided for refuge staff and volunteers, interpretive exhibit, dioramas of local wildlife, an information desk, restrooms, multipurpose room, and a small interpretive bookstore. The partnership with FOPPI, other local conservation groups, and other local state and federal conservation agencies could allow this visitor contact station to serve as an information station for people interested in Great Lakes islands ecology.
7. Maintain websites with current information about refuge management and events.
8. Work with local teachers to develop grade-specific curricula that meet local, state, and national educational standards and that emphasize the importance of island habitat, ecosystem processes, and wildlife management.
9. If feasible, train volunteers to provide tours for onsite environmental education and cultural resource programs on Plum Island or offsite environmental education programs and lessons for classrooms.
10. Devise and encourage additional opportunities for research, such as wildlife surveys within the ability of high school science or biology classes.
11. Encourage partnerships with local schools, community groups, and surrounding agencies
12. Train educators to conduct their own programs via teacher workshops.

People Objective 3: Community Outreach

Within five years of CCP approval, increase awareness of refuge management and issues concerning management within surrounding areas by annually providing opportunities for at least 100 students to participate in programs, 10 teachers to participate in training programs, and 100 people to be members of a supporting volunteer Friends Group.

Discussion and Rationale

Outreach is a two-way communication between the Service and the public to establish and promote involvement and influence attitudes and actions—with the goal of improving joint stewardship of our natural resources. Outreach includes congressional relations, news media relations, community relations, and public informational activities such as speeches and open houses.

It is critical to the mission of the refuge that the neighbors and citizens of the surrounding landscape know about the refuge and support it as a valuable and contributing part of the community.

Strategies

1. Work closely with the FOPPI to foster understanding and mutual priorities.
2. Support an active volunteer program, and work with the FOPPI to recruit and train volunteers for assistance in refuge programs.
3. Offer training programs to teachers and local naturalist facilities that focus on the refuge's place in the ecological landscape, the importance of habitat management, and the objectives of this plan.
4. Increase community partnerships.
5. Participate in offsite community events.
6. Maintain websites with current information about refuge management and events.

People Objective 4: Protection of Cultural Resources

Within five years of CCP approval, initiate a Cultural Resources Management Plan that incorporates all existing surveys and investigations, identifies future needs, and guides permanent protection measures for historic structures on Plum and Pilot Islands.

Discussion and Rationale

Most buildings and structures on Plum and Pilot Islands are listed on the National Register of Historic Places. The Pilot Island lighthouse was added to the Register in 1983 and the entire Plum Island district, which includes all buildings and structures of substantial size and scale, was added to the Register in 2010. Additionally, numerous shipwrecks have occurred in the area, and the remains of some can be found off the coasts of Plum and Pilot Islands.

The structures on Plum and Pilot Islands were in various conditions when acquired by the Service. Refuge staff is committed to assuring the historical structures receive adequate care,

restoration, and protection into the future. Realizing that minimal funding will be available for these efforts, it is critical to establish and maintain existing partnerships and future partnership efforts.

FOPPI formed shortly after the acquisition of Plum and Pilot Islands. A Service Memorandum of Understanding was put in place to formalize the cooperation of the Service and the Friends. Together, the Service and Friends support the preservation, restoration, and maintenance of the lighthouses, accessory buildings, and other historic resources on Plum and Pilot Islands as well as conserve and protect wildlife resources, while providing opportunities for quality wildlife-dependent recreation on Plum Island. The Friends have been an invaluable asset, securing funding to complete stabilization plans for the building and implementing the most urgent repairs necessary to protect the historical structures on both Plum and Pilot Islands.

Strategies

1. Continue existing partnership with FOPPI. FOPPI will continue to work toward developing political and public support for maintenance of these historical structures and developing interpretation and educational programs related to the history of lighthouses and associated structures on Plum and Pilot Islands.
2. Continue to consult closely with the Wisconsin State Historical Society and FOPPI regarding repairs and annual and cyclical maintenance for the three National Register listed buildings on the refuges.
3. Complete an inventory of maintenance needs necessary to bring each building to national and state preservation standards; incorporate needs into a database system. Seek alternative funding sources and pursue additional partnerships to accomplish priority work.
4. Develop a step-down plan for surveying lands to identify archeological resources and for developing a preservation program. The intent of this statement is to meet the requirements of Section 14 of the Archaeological Resources Protection Act and Section 110(a)(2) of the National Historic Preservation Act.
5. Continue efforts with FOPPI to develop an oral cultural history to preserve the “community memories” and maritime history of Plum and Pilot Islands.
6. Explore the idea of utilizing the historical structures as historic/cultural museums if/when the structures are stabilized and restored to acceptable conditions.

People Objective 5: Cultural Resource Appreciation

Within five years of CCP approval, 50 percent of visitors to the islands will understand and appreciate the cultural history of the Green Bay NWR—especially the history of the lighthouses and USCG lifesaving station.

Discussion and Rationale

Our understanding of a national landscape is enhanced by knowing its human history as well as its natural history. People develop connections with the land based on the land itself, experiences they have on the land or at a memorable location, or even buildings on the land. Those connections motivate citizens to help preserve and protect what they care about. An

effective cultural resource appreciation program that increases understanding of history by visitors to Plum Island will increase their connection to the land.

Strategies

1. Incorporate cultural history messages into programs, tours, exhibits, and other media with an emphasis on use of the refuge landscape throughout time.
2. Incorporate cultural resource interpretation into trail development. Develop signs on interpretive trails that help tell the unique maritime history of the local area.
3. Continue FOPPI partnership efforts to provide information through outreach and education, which builds on a sense of connection to the land and guides people toward being better stewards of the cultural resources and land conservation in general.

Objectives and Strategies Specific to Harbor Island NWR

People Goal

People Objective 1: Community Outreach

Within five years of CCP approval, 50 percent of the neighboring communities and businesses will express support for the refuge through active promotion of island habitat protection and refuge special events.

Strategies in Addition to Those Common to all Island Refuges

1. Support newly-formed refuge Friends Groups. The new Harbor Island National Wildlife Preservation Society (HINWRPS) would establish a productive and cooperative relationship between the refuge and area residents.
2. Work with Friends Group to pursue additional sources of potential funding to support the refuge.
3. Estimate visitation numbers and develop a Visitor Use Plan. Harbor Island NWR is part of a large complex of islands that are close together. Several of the islands are privately-owned and include year round or seasonal residents. Drummond Island supports a large year round population. Harbor Island currently gets quite a bit of visitation.
4. Work with the HINWRPS to make Harbor Island more accessible to visitors. The mission of HINWRPS is " . . . to support and promote Harbor Island NWR and the NWRS in their efforts to conserve habitat and wildlife."
5. The HINWRPS has proposed to fund and maintain a trail loop on the island. A suitable location will be selected for a trail to interpret the island habitats and concentrate or keep most use away from nesting eagles and some historical sites on the refuge.
6. Place small signs at beach access points and along the route of the primitive trail loop. HINWRPS will provide and place benches along the route.

Objectives and Strategies Specific to Gravel Island NWR (and Spider and Hog Island of Green Bay NWR)

The planning team grouped these islands together for the purpose of defining objectives based on the islands having similar biological and physical diversity and geographic location.

Wildlife Goal

Wildlife Objective 1: Inventory and Monitoring

Within five years of CCP approval, implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of select biological resources including but not limited to Region 3 Conservation Priority Species, colonial waterbirds, habitats, communities, and ecosystems (e.g., Great Lake Island habitat). As the need arises, implement research to answer questions regarding the management of these resources.



Hog Island, Wisconsin Islands Wilderness Area, Green Bay NWR

Discussion and Rationale

These islands are invaluable patches of habitat for a variety of migratory birds both during the migration and during the breeding season. In particular, colonial waterbirds make use of the islands as loafing and breeding sites. The location of these islands, near forage fish habitat, combined with their relatively undisturbed condition during spring and early summer, offer these species of migratory birds the necessary protected habitat. Habitat for colonial waterbirds has been under intense pressure in Door County as shoreline development continues.

Strategies

1. Work with Region 3 Biological Monitoring Team (BMT) staff to develop a monitoring plan that will improve biological inventory and monitoring tools for the refuge islands, and set up a framework of adaptive management.
2. Conduct periodic reviews of the monitoring plan to assess trends of refuge resources and determine if there are any priorities for research or monitoring.
3. If a research issue has been identified, initiate research at the station level. If the issue goes beyond the boundary of the refuge, take a lead role in contacting other federal, state, university, and other organizations; and develop a broader scale research project to address those issues.
4. Continue colonial waterbird nest counts on the wilderness islands, and assist Regional staff with census efforts to assess population abundance, distribution, and trends for species with conservation management or stewardship priority. Surveys will utilize aerial survey methodology when possible. The use of aerial photos decreases disturbance typically associated with ground counts.

Wildlife Objective 2: Research

Promote applied research aimed at answering wildlife-, habitat-, community-, and ecosystem-based questions without compromising wildlife, visitor, and wilderness values.

Discussion and Rationale

The islands have served as research sites for the Service for more than 35 years. These studies contribute valuable information about contaminants and their impacts to waterbirds and natural resources. Currently, research projects are being conducted at the refuge that will assist in directing future planning and management for wildlife species, their habitats, and associated communities, and ecosystems. These islands offer rare opportunities to study the changes that are occurring on the landscape with minimal human intrusion. There are very few such natural sites available to study and document long-term changes in the absence of human disturbance.

Strategies

1. Monitor and assess research annually including access for researchers and the location, duration, and impacts of research.
2. Continue and promote applied research, and initiate dialogue with federal and state agencies, universities, and other organizations to answer management questions.
3. Seek external research funding through partnerships with others outside of the Service, where and when possible.
4. Communicate research findings with the broader conservation community through peer-review and other publications, lectures, and other outreach activities.
5. Inform visitors of research findings, and explain their importance for planning and management on refuge islands.
6. Prioritize research on species, habitats, communities, and ecosystems of conservation priority.
7. Develop a better understanding as to how refuge ecosystems function on a landscape and regional scale, including the effects of future climate change.

Wildlife Objective 3: Protect Waterbird Colonies

During the life of the CCP, limit disturbance to colonial nesting waterbird colonies to maintain the productivity of the Ring-billed Gull, Herring Gull, Black-crowned Night Heron, Common Tern, Caspian Tern, Great Blue Heron, and Great Egret.

Discussion and Rationale

Colonial nesting waterbirds are extremely sensitive to human disturbance. Disturbance during the pre-nesting and nest-building phase can cause the birds to abandon the island for the current and future nesting seasons. During the incubation and chick-rearing phase, disturbance may cause loss of eggs and chicks. When incubating adults are induced to leave the nest, eggs and chicks are vulnerable to predation from gulls and other opportunistic predators (consuming

eggs and chicks whole) and heat stress, which can kill eggs and chicks in a matter of minutes on a hot day.

Strategies

1. Improve and maintain boundary signs. Using buoy markers will alert boaters and kayakers and assure boaters maintain an appropriate distance to avoid disturbance to nesting birds.
2. Continue law enforcement patrols.
3. Monitor research activities to ensure activities are conducted with minimal disturbance to nesting birds.
4. Build support for protecting waterbird colonies through public outreach, education, and promoting waterbird conservation opportunities.

Habitat Goal

Habitat Objective 1: Waterbird Habitat

Maintain and provide nesting habitat favorable to colonial nesting waterbirds and other waterbirds (such as waterfowl), including Region 3 Conservation Priority Bird Species—Black crowned Night-Heron, Common Tern, and Double-crested Cormorant—without compromising the wilderness integrity.

Discussion and Rationale

Great Lakes islands provide essential habitat for colonial nesting waterbirds. These islands support nesting colonies of Ring-billed Gull, Herring Gull, Black-crowned Night Heron, Common Tern, Caspian Tern, Double-crested Cormorant, Great Blue Heron, and Great Egret. The islands offer protected habitat that has been eliminated from most other places in the immediate vicinity.

Strategies

1. Monitor the bird populations and nesting success annually during the nesting season (April–July).
2. Assess Double-crested Cormorant populations annually and protect remaining habitat for other tree and shrub-nesting waterbirds on Hog Island by implementing Double-crested Cormorant control methods when deemed biologically necessary and when staff availability and funding will allow and as described in *Environmental Assessment: Reducing Double-crested Cormorant Damage in Wisconsin*.

Habitat Objective 2: Exotic and Invasive Species Control

By 2020, inventory all refuge land for invasive species, target control efforts on species that threaten habitat, and eliminate new infestations of these and other highly invasive species as they occur.

Discussion and Rationale

The Mute Swan is a non-native species and its population continues to grow at a rapid rate near refuge islands. Mute Swans compete for resources with native waterfowl such as ducks, colonial waterbirds, Tundra Swans, and geese and will sometimes completely displace, or even kill, native waterfowl. Due to the tendency of Mute Swans to concentrate in large numbers at productive feeding areas, there is concern that they will deplete aquatic plants needed by native waterfowl. In flocks, Mute Swans can overgraze submerged vegetation to the point that the vegetation cannot fully recover. This causes a reduction in the quantity and quality of aquatic habitat that may affect the food web, impact resident and migratory waterfowl, and affect an area's biodiversity. Ground nesting waterfowl including Mallards, Red-breasted Mergansers, and Black Ducks use the dense brush areas on refuge islands for nesting. Additionally, migrating waterfowl feed in the shallow areas adjacent to refuge islands. Controlling Mute Swans will protect native waterfowl nesting habitat and protect aquatic habitat diversity for migrating waterfowl.

The colonial nesting bird population on Hog, Spider, and Gravel Islands dictate vegetative conditions on these islands. The arboreal vegetation has been destroyed by the urea of nesting colonial waterbirds, such as Herring Gulls and Double-crested Cormorants. The understory of these islands currently consists of native and exotic herbs such as catnip, nettles, motherwort, and thistles. These species do not pose a serious threat to the habitat. Efforts to control/eradicate invasive plant species in the presence of nesting colonial waterbirds would be difficult due to the rapidly changing conditions brought on by the nesting activities of thousands of nesting birds. However, it is still important to monitor and prevent new infestation of aggressive exotic invasive species that could pose a threat in the future.

Strategies

1. Continue partnership efforts to work with U.S. Department of Agriculture, Wildlife Services and Wisconsin DNR to control and reduce invasive Mute Swan populations near refuge islands.
2. Destroy nests and eggs of nesting Mute Swans during routine monitoring efforts.
3. Prior to accessing islands for monitoring or research activities take proper precautions to assure shoes and all equipment are clean and free of seeds or soil before boarding a boat.
4. Document the locations and sizes of targeted exotic invasive plant populations.
5. When available, use biological control methods as a preferred strategy.
6. Use chemical and mechanical methods and prescribed fire (when appropriate) as means to manage infestations in cases where biological control techniques have not been developed.
7. Monitor the infestations and effectiveness of management measures.

People Goal

People Objective 1: Protect Wilderness Character

Protect wilderness character by maintaining natural qualities of the island through limited human presence and disturbance

Discussion and Rationale

Green Bay NWR (Hog Island) and Gravel Island NWR (Spider and Gravel Islands) were designated as a Federal wilderness area in 1970 primarily because of the islands' importance as nesting grounds for colonial waterbirds. The islands are small and provide resting and feeding habitat for migratory birds. The islands are managed to minimize human disturbance to the nesting birds and will remain closed to the public. The isolated location of the refuge islands along with difficult and often hazardous access have dictated limited management potential. Limiting human presence, as in the past, will continue to preserve the wilderness character.

Strategies

1. Continue periodic law enforcement visits. Evidence of closure violations will increase frequency and timing of visits.
2. Update the 1981 Wilderness Management Plan.

People Objective 2: Environmental Education and Interpretation

Within five years of CCP approval, all off-refuge outreach contacts will understand, appreciate, and support the Gravel Island NWR, the wilderness status, and the need to preserve the islands for colonial nesting birds.

Discussion and Rationale

Environmental education is a process designed to teach citizens and visitors the history and importance of conservations and the biological and scientific knowledge of our Nation's natural resources. Through this process, we can help develop a citizenry that has the awareness, knowledge, attitudes, skills, motivation, and commitment to work cooperatively towards the conservation of our Nation's environmental resources. Environmental education includes both onsite and offsite programming and distance education via computer. It also pertains to activities such as formal curriculums about the refuge environment, Junior Duck Stamp programs, and Scout badge projects. Interpretation is a communication process that forges emotional and intellectual connections between the audience and the resource.

Because the islands are undisturbed, they provide unique opportunities to reach out to the public with an environmental message. There is a unique opportunity to educate visitors about islands with no human disturbance, in contrast to islands with a history of human occupation.

Strategies

1. Develop brochures and information sheets for distribution to off-refuge contacts.
2. Partner with FOPPI to develop displays at the newly established visitor center at Northport, near the Washington Island Ferry dock.
3. Develop informational signs and kiosks for use at area boat landings. These signs would also serve to inform boaters and kayakers and alert them to maintain an appropriate distance to avoid disturbance to colonial nesting waterbirds.

4. In all off-refuge presentations, include information about the Green Bay and Gravel Island NWRs, their wilderness status, and the need to prevent disturbance to breeding colonies.

People Objective 3: Community Outreach

Increase awareness of refuge by increasing community outreach efforts in the local community

Discussion and Rationale

Outreach is a two-way communication between the Service and the public to establish and promote involvement and influence attitudes and actions—with the goal of improving joint stewardship of our natural resources. Outreach includes congressional relations, news media relations, community relations, and public informational activities such as speeches and open houses.

It is critical to the mission of the refuge that the neighbors and citizens of the surrounding landscape know about the refuge and support it as a valuable and contributing part of the community.

Strategies

1. Participate in offsite community events.
2. Increase community partnerships and volunteer base.
3. Offer training programs for teachers and local naturalists on the refuge's place in the ecological landscape and the objectives in this plan.
4. Develop outreach plans for important issues, such as Double-crested Cormorant management and research programs.
5. Improve outreach to refuge neighbors.
6. Maintain websites with current information about refuge management and events.

Objectives and Strategies Specific to Huron NWR

People Goal

People Objective 1: Welcome and Orient Visitors

Within five years of CCP approval, staff will develop and employ an inventory technique to better understand Island visitation numbers.

Discussion and Rationale

In order to better understand the impact on island resources and the impact interpretation may have on those resources, baseline information on the number of visitors using the refuge is necessary.

Strategies

1. Working with staff from the Service's Fort Collins Inventory and Monitoring group and with the Regional Visitor Services Staff, develop an inventory technique and database to determine and record baseline visitation information for Huron NWR.

People Objective 2: Interpretation/Outreach

Within the life of this plan, interpretation and/or outreach about Huron NWR will have increased by 50 percent and 100 percent respectively compared to 2012 effort levels.

Discussion and Rationale

Interpretation is a process designed to help visitors form an emotional and intellectual connection between them and the natural resources. It also helps explain complex scientific processes and natural history in a way the layman may understand. Through this process we can help develop a citizenry that has the awareness, knowledge, attitude, skills, motivation, and commitment to work towards the conservation of our Nation's natural resources. Interpretation may include both onsite and offsite resources (i.e., signs, kiosk, website, presentations). Refuge staff will strive to provide interpretation opportunities that highlight the objectives of this plan, so the public will understand future management activities and support the efforts. Outreach is a two-way communication between the Service and the public to establish and promote involvement and influence attitudes and actions with the goal of improving joint stewardship of our natural resources. Outreach includes congressional relations, new media relations, community relations, and public informational activities such as presentations and open houses.

Strategies

1. Develop a visitor use plan.
2. Develop interpretive materials (signs, kiosks, articles, presentations, etc.) to educate the public about Huron NWR (wilderness, lighthouse history, flora, fauna, etc.).

People Objective 3: Cultural Resource Protection

Within the life of this plan, island cultural heritage holdings will be assessed and then maintained as determined necessary.

Discussion and Rationale

The Huron Island lighthouse on Lighthouse Island, part of Huron NWR, was listed on the National Register of Historic places in 1976. The other structures, including the lighthouse keeper's quarters, barracks, fog horn building, boathouse, and various other structures, are not listed on the Register. Structures on the island are in various conditions of repair. Refuge staff, in conjunction with the Huron Island Lighthouse Preservation Association (HILPA), is committed to assuring the historical structures receive adequate care.

Strategies

1. Ensure archaeological and cultural resources are identified, described, and taken into consideration prior to implementing undertakings.
2. Determine need and ultimate disposition of refuge buildings—there are eight buildings/structures on Huron Island associated with the old USCG station. The exterior of the lighthouse, a National Historic Landmark, has been rehabbed and maintained through the efforts of the HILPA. The remaining buildings are in various stages of decay.
3. Coordinate with HILPA to preserve and maintain structure and historical integrity of lighthouse and associated structures selected for preservation.
4. Ensure all doors and windows on the lighthouse building, fog horn building, and barracks are either locked or covered with plywood to protect the interior of the buildings from weather damage, to prevent vandalism, for safety concerns, and to keep the general public from entering.
5. Cover all openings in the lighthouse keeper's quarters by the end of fall 2013. Currently, the house is completely open (no windows or doors) to the elements and is slowly deteriorating.
6. Within one year of completion of this plan, cut down and remove all trees and shrubs growing against or over any of the buildings and structures to maintain the exterior condition of the buildings.
7. Establish efforts with HIPLA and others to develop an oral cultural history to preserve the "community memories" and maritime history of the Huron Islands.

Objectives and Strategies Specific to Michigan Islands NWR (Seney)

People Goal

People Objective 1: Community Outreach

Within five years of CCP approval, 50 percent of neighboring communities and businesses will express support for the refuge through active promotion of island habitat protection and refuge special events.

Strategy in Addition to Those Common to all Island Refuges

1. Reinvigorate cooperation with the USCG. Seney NWR has a long history of working with the USCG at Huron NWR and Hat and Gull Islands. The lighthouse at Huron NWR is still a functioning lighthouse, although automated. There are numerous opportunities with the USCG to strengthen and expand our cooperative relationship on all islands. See Chapter 5 for more details.

Wildlife Goal

Wildlife Objective 2: Applied Research

During the life of the CCP, promote applied research aimed at answering ecosystem-, wildlife-, habitat-, and community-based questions without compromising wildlife, visitor, and wilderness values.

Strategy in Addition to Those Common to all Island Refuges

1. Establish a formal Memorandum of Understanding with Central Michigan University (CMU). CMU runs a biological station on Beaver Island that is active during the summer months. The four Seney NWR-managed islands of the Michigan Islands NWR are all located fairly close to Beaver Island. A formal Memorandum of Understanding with CMU would promote biological and ecological studies and provide opportunities for students to learn about and conduct real science.

Objectives and Strategies Specific to Michigan Islands NWR (Shiawassee)

Ecosystem Goal

Ecosystem Objective 1: Preserve Great Lakes Alvar Communities on Thunder Bay and Sugar Islands

Throughout the life of the CCP, maintain and protect all alvar sites on Thunder Bay and Sugar Islands through proactive monitoring and aggressive control of non-indigenous invasive plants and animals.

Discussion and Rationale

The refuge has an opportunity to contribute to the conservation of this rare ecosystem, which supports several rare and declining species. One of the primary threats to alvar ecosystems is colonization and spread of nonindigenous invasive plants such as common buckthorn, common mullein, and St. Johnswort.

Strategies

1. Within five years of CCP completion, develop an Inventory and Monitoring Plan. Components of this plan would include surveys of flora and fauna with emphasis on characteristic and indicator alvar species, rare and declining species, and invasive species. It would also include mapping of boundaries of alvar sites and vegetative cover types, locations of resources of concern and invasive species within alvar sites, and the development of protocols to measure current and future alvar status and effectiveness of conservation strategies.
2. Within five years of CCP completion, develop a Habitat Management Plan. Components of this plan would include preservation of alvar sites and their component characteristic and indicator species, rare and declining species, and other resources of concern. Incorporate invasive species control as an important component of alvar conservation on the refuge.

Wildlife Goal

Wildlife Objective 1: Maintain and Provide Nesting Habitat

Throughout the life of the CCP, maintain and provide nesting habitat on Little Charity and Scarecrow Islands favorable to colonial nesting waterbirds, including Region 3 Conservation Priority Species: Black-crowned Night-Heron and Common Tern.

Discussion and Rationale

Little Charity and Scarecrow Islands provide important habitat to several species of nesting colonial waterbirds including Double-crested Cormorant, Great Blue Heron, Great Egret, Black-crowned Night-Heron, Ring-billed Gull, Herring Gull, Caspian Tern, and Common Tern. Black-crowned Night-Heron is an Upper Mississippi River/Great Lakes Region Joint Venture (UMR/GLRJV) Focal Species and a state listed species of special concern. Caspian Tern is a state listed threatened species. Common Tern is a UMR/GLRJV Focal Species, Service Region 3 Bird of Conservation Concern, and state listed threatened species. The Upper Mississippi River/Great Lakes Region Waterbird Conservation Strategy includes Little Charity and Scarecrow Islands on its list of the most important sites for breeding colonial waterbirds in the United States Great Lakes. The Waterbird Conservation Plan lists population inventory and monitoring, habitat protection and management, and management of human disturbance as priority conservation actions for waterbirds.

Strategies

1. Continue annual surveys of nesting colonial waterbird colonies at Little Charity and Scarecrow Islands. These surveys have been ongoing since 2002.
2. Within five years of CCP completion, develop an Inventory and Monitoring Plan. Components of the plan would include an assessment of nesting colonial waterbirds at Little Charity and Scarecrow Islands.
3. Within five years of CCP completion, develop a Habitat Management Plan. Components of the plan would include conservation of nesting waterbirds colonies at Little Charity and Scarecrow Islands through prevention of human disturbance, suppression of invasive non-indigenous species, and other practices.

Habitat Goal

Habitat Objective 1: Preserve Pitcher's Thistle

Preserve Pitcher's thistle on Big Charity Island and dwarf lake Iris on Thunder Bay and Sugar Islands.

Discussion and Rationale

Pitcher's thistle is a state and federally listed threatened species, which occurs on Big Charity Island. The refuge has opportunities to implement actions listed in the Pitcher's Thistle Recovery Plan and actions identified in the five-year review of the plan, toward delisting of this species. Dwarf lake iris is a state and federally listed threatened species, which occurs on Thunder Bay Island. This species may also occur on Sugar Island. A five-year review of the Dwarf Lake Iris Recovery Plan identifies specific recovery action and is located at <http://www.fws.gov/Midwest/Endangered>.

Strategies

1. Immediately employ practices to control of phragmites in and adjacent to Pitcher's thistle habitat.
2. Within five years of CCP completion, develop an Inventory and Monitoring Plan for Pitcher's thistle. Components of the plan would include an assessment of Pitcher's thistle population on Big Charity Island, surveys to more precisely determine thistle population, mapping of thistle sites and non-indigenous invasive species, and development of protocols to measure current and future Pitcher's thistle status and effectiveness of conservation strategies.
3. Within five years of CCP completion, develop a Habitat Management Plan. Components of this plan would include preservation of Pitcher's thistle and its habitat. Incorporate invasive species control as an important component of Pitcher's thistle conservation on the refuge.
4. Within five years of CCP completion, develop an Inventory and Monitoring Plan for dwarf lake iris. Components of this plan would include an assessment of dwarf lake iris population on Thunder Bay and Sugar Islands, surveys to more precisely determine iris population size, mapping of iris locations, and development of protocols to measure current and future dwarf lake iris status and effectiveness of conservation strategies.

Habitat Objective 2: Protect Sensitive Habitat by Reducing Invasive Plant Species

By 2020, protect sensitive colonial bird habitat by reducing the area infested with target invasive plant species on Scarecrow and Big Charity Islands (e.g., common buckthorn, phragmites, reed canarygrass) by 50 percent from the documented 2011 levels and eliminate new infestations of these and other highly invasive species as they occur.

Discussion and Rationale

Nonindigenous invasive species are a threat to specific resources of concern on several refuge islands. Alvar communities are being degraded by a suite of species such as common mullein, St. Johnswort, and Kentucky bluegrass. Phragmites threatens to overtake Pitcher's thistle habitat at Big Charity Island.

Further, invasive species are a threat to the overall habitat quality of the islands. Extensive common buckthorn control has been undertaken to preserve nesting waterbird colonies adjacent to Scarecrow Island. Phragmites and reed canarygrass are displacing native wetland plants and covering cobble beach along the shoreline at Big Charity Island to the detriment of migrant waterfowl and shorebirds. The Mute Swan population in Saginaw Bay is burgeoning. This species is aggressive toward native waterbirds and waterfowl, and their feeding habits can severely damage wetland plant communities. These impacts have contributed to the State of Michigan's program to substantially reduce its Mute Swan population.

Strategies

1. Within five years of CCP completion, develop an Inventory and Monitoring Plan. Components of the plan would include an assessment of nonindigenous invasive species on all refuge islands, protocols for the early detection of invasive species,

mapping of sites occupied by invasive species, and protocols to measure current and future invasives status and effectiveness of conservation strategies.

2. Within five years of CCP completion, develop a Habitat Management Plan. Components of the plan would include provisions to reduce adverse impacts of invasive species—in particular common buckthorn, Phragmites, reed canarygrass, and mute swan. The plan would also incorporate practices to eradicate incipient invasions discovered through early detection processes.

People Goal

People Objective 1: Environmental Education

Within three years visitors to Big Charity Island will recognize that the majority of the island is part of the National Wildlife Refuge System.

Discussion and Rationale

This will broaden knowledge and understanding of the refuge and help protect species and habitats on the island through development of an appreciation for these natural resources.

Strategies

1. Erect a one panel kiosk near the boat harbor where visitors to the private lighthouse will be able learn about the island's biological values and role in the Refuge System.
2. Within two years, visitor use will be investigated near the end of the summer tourist season by looking for areas of worn paths, trampled vegetation, etc. If use is negatively impacting the habitat, a visitor use plan will be developed to address the issue.

Chapter 5: Plan Implementation

In this chapter:

[New and Existing Projects](#)
[Current and Future Staffing Requirements](#)
[Step-Down Management Plans](#)
[Partnership Opportunities](#)
[Finding of No Significant Impact \(FONSI\)](#)

Throughout this document, five national wildlife refuges (NWRs, refuges) are discussed individually—such as the Gravel Island NWR or the Green Bay NWR. This document also discusses all five NWRs collectively as one entity and when doing so, refers to the group as the “Great Lakes islands refuges” or “Great Lakes islands NWRs.”

New and Existing Projects

The Gravel Island, Green Bay, Harbor Island, Huron, and Michigan Islands NWRs Comprehensive Conservation Plan (CCP) outlines an ambitious course of action for the future management of the Great Lakes islands refuges. All refuges that collectively make up the Great Lakes islands refuges will continually need appropriate operational and maintenance funding to implement the objectives in this plan.

The following provides a brief description of the highest priority refuge projects, as chosen by the refuge staff and listed in the Refuge Operating Needs System.

Great Lakes Islands Refuges Operating Needs Projects

Gravel Island and Green Bay NWRs

Enhance refuge management and administration via a Resource Specialist

Provide a Resource Specialist to conduct wildlife and habitat surveys, invasive species control, habitat management and restoration projects, and other needs such as updating and writing refuge plans. The refuge islands provide important habitat for migratory and breeding birds. The shoals and shallow waters of the islands provide spawning and nursery areas for many imperiled aquatic species of the Great Lakes. The unique coastal environment contains distinctive biota and the biological diversity is of global significance.

Estimated cost: \$130,000

Develop a Visitor Services Plan for the refuge islands

Plum Island provides the public with a unique opportunity for outreach and interpretation if suitable infrastructure can be developed and maintained. The plan is an essential tool that will guide the development of a sustainable and successful visitor service program including interpretive themes and signs. The plan will also provide an essential tool for refuge management, allow for improved stakeholder discussions, and provide for increased funding opportunities.

Estimated cost: \$20,000

Establish Plum Island interpretive trail and informational kiosks

This project will provide funding to design, construct, and maintain a self-guided interpretive trail on Plum Island. Kiosks, informational signs, and other items will be developed to provide information about Green Bay NWR, the National Wildlife Refuge System (NWRS, Refuge System), Great Lakes Basin ecology, and cultural history of Plum and Pilot Islands. There are two unmaintained trails on Plum Island that were historically used by the U.S. Coast Guard (USCG). The existing (but overgrown) perimeter trail will be cleared and developed into an interpretive trail. A section of the trail is currently home to the federally threatened dwarf lake iris. This section will need to be re-routed to assure necessary protection. The existing “cross-island” trail, which connects the lifesaving station on the north side of the island to the keeper’s quarters and rear range light on the south side of the island will need to be closed and/or re-routed to avoid disturbing an active Bald Eagle’s nest. The trails will allow for wildlife observation and environmental education opportunities on Plum Island.

Estimated cost: \$15,000

Use solar and/or wind power to generate power to existing and new infrastructures on Plum Island

New facilities for future visitor services including restroom facilities and a well for drinking water will be required. The existing Plum Island boathouse and lifesaving station could also be powered by solar/and or a residential-sized wind turbine. The island provides an ideal location for receiving and generating solar and wind power.

Estimated cost: \$300,000

Continue and increase efforts concerning invasive species control

For several years, money has been provided through the Natural Resource Damage Assessment fund for a temporary employee who has implemented invasive species control measures and habitat restoration projects. However, the funding is depleted, and new populations are detected annually. Monitoring and control efforts must continue to protect and restore important island habitat including a unique coastal wetland complex threatened by invasives. This project would purchase equipment and supplies for this long-term effort. An efficient boat, motor, and trailer will be purchased. This boat will be large enough to provide safety to staff and volunteers working in the Great Lakes environment and have the capability of hauling and unloading supplies. Control of these invasive weeds is important since they cause degradation of nesting habitat and a decrease in overall plant and animal diversity.

Estimated cost: \$200,000

Implement a Visitor Service Program on Plum Island

Hire a full-time Visitor Services Specialist with a major responsibility to cooperatively work with partners and volunteers to implement a Visitor Services Plan for Plum Island. Plum Island contains a number of historic buildings and related structures including the front and rear range

lights, the original keeper's quarters, a fog signal building, the USCG station and a substantial boathouse and dock. The rear range light, built in 1896, is still operational and listed on the National Register of Historic Places. There is also a concentration of shipwrecks, dating from the 1800s and early 1900s. A partnership between the US Fish and Wildlife Service (FWS, Service) and the Friends of Plum and Pilot Islands (FOPPI), currently helps support the preservation, restoration, and maintenance of the lighthouse and other historic structures while also protecting wildlife resources. Plum Island provides an excellent opportunity to integrate history and local community traditions and values into refuge interpretive and education programs.

The project will leverage the resources provided by this partnership to provide wildlife-dependent recreational opportunities on Plum Island. The full-time specialist would work with Friends Group to accomplish the following:

- Acquire grant money or other funding to implement the plan.
- Facilitate partnerships and increase efforts to aid in the management of cultural resources with federal and state agencies, the State Historic Preservation Office, professional archeologists, and the general public.
- Work with FOPPI to cooperatively preserve, restore, and maintain the lighthouse and other historic structures on Plum and Pilot Islands. The boathouse on Plum Island may be used as a visitor contact station and exhibit space to provide information about Green Bay NWR, the Refuge System, Great Lakes Basin ecology, and historic resources on Plum and Pilot Islands. Additionally, the USCG station may be used as a research station and bunkhouse for refuge staff, researchers, and volunteers.
- Coordinate more than 100 Friends Group members and volunteers who provide assistance to the refuge on many different projects in all program areas.
- Develop and implement quality opportunities for wildlife-dependent recreation on Plum Island to cultivate an understanding and appreciation of refuges' ecology and the human influence on the region's ecosystem
- Develop and implement interpretive programs (such as Refuge Week, International Migratory Bird Day, etc.) for area schools, local communities, and refuge visitors.

A full-time Visitor Services Specialist would allow us to better meet one of the highest priorities for the Service, which is "Connecting People with Nature: Ensuring the Future of Conservation."

Estimated cost: \$130,000

Improve visitor services by providing refuge brochures

Develop brochures for Green Bay NWR. Many people request information on specific items such as certain types of wildlife that use the refuge and the maritime history. Brochures will be needed to inform the visiting public about Plum Island. This project would provide funding to develop and print refuge brochures, bird lists, hunting brochures, maps, and maritime history for visitors and volunteers.

Estimated cost: \$7,000

Increase refuge awareness

Investigate the acquisition or lease of properties on the mainland and/or Washington Island to provide refuge informational kiosks and/or signs accessible to area visitors. Kiosks and/or signs will be located in proximity to major ferry and island-viewing tour boats and kayak access points. Door County is a major tourist destination during the summer. The majority of tourists and summer residents come from the metropolitan areas of Milwaukee, Chicago, Madison, and the Twin Cities or Minneapolis–St. Paul. Visitors come to visit the areas five state parks, explore the area lighthouses, and to recreate on Lake Michigan waters. Kiosks will provide an opportunity to better educate and inform the public about Gravel Island and Green Bay NWRs and the mission of the Refuge System and Service.

Estimated cost: \$5,000

Reestablish safe access to Plum Island

Repair and/or replace the Plum Island dock and breakwater to allow for safe access. The current stability of the structure is unknown; therefore, conducting an assessment is high priority because of the safety concern. A professional structural engineer will be hired to conduct an inspection and assessment of the Plum Island dock and breakwater and to prepare a report, which will include a summary of findings of existing conditions, options for repair/restoration, and a cost estimate for the repair options. The dock piers also support the boathouse; so, preserving the dock will also contribute to the stability and preservation of the historic boathouse. Refuge staff and volunteers use the Plum Island dock on a regular basis during the field season. Allowing the deterioration of the dock to continue will lead to increased costs for repair and eventually prevent staff, volunteers, and potential future visitors from accessing the island.

Estimated cost:\$500,000

Locate wilderness area boundaries

Investigate refuge and wilderness boundary designation to assure necessary protection of plant and wildlife communities, particularly the nesting colonies of waterbirds. The boundaries—as marked on the original Executive Order, which set aside the islands for preservation—are unclear. Fluctuating water levels complicate the issue. Restricting boating traffic during the crucial nesting period is important since disturbance can lead to unsuccessful nesting and cause colony abandonment. This project would allow for the installation of signs and/or buoys to protect nesting colonies, provide signs (regulatory and interpretive) at area public boat launching ramps, and print and distribute educational information through local marinas and other coastal businesses.

Estimated cost: \$10,000

Improve habitat for native fish in coastal waters

The shoals surrounding the refuge are historic spawning beds for lake trout, herring, and other Great Lakes species. The island reefs and shorelines provide coastal habitat required by these species to complete their lifecycles. Implementing an aquatic habitat assessment is necessary to determine if future restoration projects are needed to enhance vital spawning and nursery

habitat for native Lake Michigan fish species. These efforts will provide for the enhancement, abundance, and diversity of self-sustaining fish populations in the waters surrounding refuge lands.

Estimated cost: \$75,000

Harbor Island NWR

Explore establishing a refuge Friends Group

The refuge has received strong interest from portions of the Drummond Island community to increase tourism in that area of Lake Huron, which includes Harbor Island NWR. Formation of a Friends Group will establish a productive and cooperative relationship between the refuge and area residents to make sure the increased development does not negatively affect Harbor Island NWR. Working with the Friends Group will open up additional sources of potential funding to support the refuge.

Estimated cost: \$0 (included in current budget)

Determine accurate visitation numbers, and develop Visitor Use Plan

Harbor Island NWR is part of a large complex of islands that are close together. Several of the islands are privately owned and include year round or seasonal residents. Drummond Island supports a large year round population.



Harbor Island currently gets quite a bit of visitation. The refuge estimates the island currently receives several visitors, but this is only an estimate, and all indications show that use is increasing. Good hard data are needed to determine the actual number of visitors to Harbor Island. A Visitor Use Plan is necessary to determine the appropriate interpretive infrastructure needed, the appropriate level of recreational activities that the island can support, and to build the infrastructure to support that use.

Visitor Sign, Harbor Island NWR

Estimated cost: \$35,000

Huron NWR

Determine need and ultimate disposition of refuge buildings

There are eight buildings/structures on Huron Island associated with the old USCG station. The exterior of the lighthouse, a National Historic Landmark, has been rehabbed and maintained through the efforts of the Huron Island Lighthouse Preservation Association. The dock was completely renovated in 2008. The fog signal building on the north end of the island is brick construction; the exterior of the building is in good shape. The lighthouse keeper's quarters is

wood construction, The exterior of the building is still in fair-to-good shape, but all windows and doors are missing leaving the structure open to the weather. If significant work is not done in the near future the building will likely deteriorate to the point of not being worth saving. The other four buildings are showing significant wear or have issues:

- The boathouse, a concrete structure, is showing extensive cracking in the walls, roof and foundation. People have to walk by it to access the island.
- The barracks on the north end of the island is wood construction. The roof has a large hole, which has been patched with plywood, but the shingles are badly deteriorated. The siding is showing significant wear.
- The comfort station is deteriorating and has no windows or doors in place.
- The hazardous storage building is showing signs of wear.

There should be no question of keeping and maintaining the lighthouse and the dock, but retaining the other six buildings should be open for discussion. If any buildings are razed, it needs to be determined whether to leave the materials on the island or transport off island for disposal. In addition to the buildings, there are remnants of the old USCG station—such as a large tank, old metal poles, old cable, etc.—that need to be removed and disposed of.

Estimated cost: \$150,000 (disposed cost)

Determine accurate visitation numbers, and develop Visitor Use Plan

Currently, the Service estimates that West Huron (or Lighthouse) Island—the only island of the eight refuge islands that is open to the public—receives one hundred visitors per year. This estimate is likely low. Good hard data are needed to determine the number of visitors to Huron NWR. We presume that a majority of the visitors are visiting the island because of the lighthouse and the old USCG station. We need to determine if this is correct or not. A Visitor Use Plan is necessary to determine the appropriate interpretive infrastructure needed, the appropriate level of visitation that the island can support, and to build the infrastructure to support that use.



West Huron (or Lighthouse) Island, Huron NWR

Estimated cost: \$35,000

Harbor Island NWR/Huron NWR/Michigan Islands NWR

Establish dedicated staff for island refuges

In 2007, the Midwest Region conducted a staffing model exercise, which indicated the need for three staff positions dedicated to the islands. This level of staffing probably can't be supported without a large increase in refuge budgets. However, a staff member at both Seney and Shiawassee NWRs, with a significant portion of their work dedicated to the islands, would greatly assist in implementing this plan. A key responsibility would be the managerial functions such as developing partnerships, handling Special Use Permit requests, managing real property, insuring appropriate regulatory signage, and gathering and analyzing essential data for making sound management decisions. Another responsibility would be collecting essential flora and fauna data and conducting analysis to enable sound management decisions. Support is also needed for conducting environmental education activities in area schools, developing interpretive materials, identifying possibilities for public use/recreational infrastructure, leading tours, and conducting programs.

Estimated cost: \$120,000

Strengthen and expand cooperation with the USCG

Seney NWR has a long history of working with the USCG at Huron NWR and at Hat and Gull Islands at Michigan Islands NWR. It is very likely cooperation will continue, given the activities that have or will take place on the islands. The lighthouse at Huron NWR is still a functioning lighthouse. Although, the lighthouse is automated, the USCG maintains a battery bank charged by solar panels to keep the light operating. The USCG visits the island at least quarterly to check on the light. Other activities that have taken place or are opportunities for future cooperation include the following:

- The Service worked with the USCG to remove barrels from Hat Island.
- The USCG has a navigation aid on the north end of Gull Island, which will likely require inspection.
- Seney NWR annually cooperates with the USCG station at St. Ignace managing a Common Tern colony.

There are many opportunities with the USCG to strengthen and expand our cooperative relationship.

Estimated cost: \$0 (included in current budget)

Michigan Islands NWR (Seney)

Establish formal Memorandum of Understanding with Central Michigan University (CMU)

Establish a formal Memorandum of Understanding with CMU to promote biological and ecological studies on and around the refuge islands. Information collected from the studies would help the refuge staff more effectively manage the islands and their resources and would provide opportunities for students to learn about and conduct real science. CMU runs a biological station on Beaver Island that is active during the summer months, and some Seney NWR staff hold adjunct appointments at CMU. The four Seney NWR-managed islands of the Michigan Islands NWR are all located fairly close to Beaver Island. Three of the four islands are normally an easy boat ride from Beaver Island. The Michigan islands are located approximately

three hours from the Seney NWR office. Access to the islands can be weather-dependent and includes one-to-two hours of traversing open water. Explore opportunities with CMU, such as:

- positioning refuge personnel at the Beaver Island station for short or extended periods;
- storing a refuge boat and/or vehicle at the station over the winter; and
- dock the boat during the summer.

These and other opportunities to leverage support and resources with CMU should provide us better access to the islands help us more effectively manage the refuge.

Estimated cost: \$5,000/year

Control nonindigenous invasive plants

Introduced invasive plants such as common reed, purple loosestrife, and reed canarygrass are a significant threat to the islands' natural resources. These aggressive plants push out native species and degrade the quality of habitat for wildlife. Moreover, these aggressive species threaten populations of the federally listed (threatened) Pitcher's thistle and (threatened) dwarf lake iris. This project is necessary to reduce or eliminate these invasives on islands where they presently occur and prevent their colonization elsewhere.

Estimated Cost: \$50,000

Improve habitat for migratory bird species by controlling invasive Mute Swans

The Mute Swan population is growing rapidly near the islands. This non-native species competes aggressively for resources with native waterfowl and colonial waterbirds. In fact, these birds will sometimes completely displace, or even kill, native waterbirds. Further, Mute Swans concentrate in large numbers at productive feeding areas and overgraze submerged vegetation to the point that it cannot fully recover. This causes a reduction in the quality of wetland and aquatic habitat for waterbirds, fish, and other wildlife.

Estimated Cost: \$20,000

Current and Future Staffing Requirements

None of the Great Lakes islands refuges have a permanent staff. The staff at Horicon, at Seney, and at Shiawassee NWRs oversee the islands and provide services on an as-needed basis. These duties include, but are not limited to, partnership coordination, Special Use Permit administration, and onsite law enforcement. Full-time oversight may be required at some units in the future if new islands are acquired or special programs are expanded. Strategies presented in chapter 4 envision a total of three positions dedicated to island refuge management: one Visitor Services Specialist and one Resource Specialist at Green Bay NWR; and one half-time Manager at Seney and Shiawassee each.

Step-Down Management Plans

Step-down management plans describe specific actions that support the accomplishment of refuge objectives. The refuges that are collectively known as the Great Lakes islands refuges do not require many step-down plans due to relatively small size of properties and the lack of staff and funding. The objectives and strategies outlined in this CCP will provide adequate detail for most of the programs at these refuges. However, strategies presented in chapter 4 call for a Visitor Services Plan for Green Bay NWR, Huron NWR, and Harbor Island NWR and a Habitat Management Plan for Michigan Islands NWR. In addition, a Biological Inventory and Monitoring Plan will be completed for each island refuge.

Partnership Opportunities

Partnerships have become an essential element for the successful accomplishment of Gravel Island and Green Bay NWRs' goals, objectives, and strategies. The objectives outlined in this CCP need the support and the partnerships of federal, state, and local agencies; non-governmental organizations, and individual citizens. This broad-based approach to managing fish and wildlife resources extends beyond social and political boundaries and requires a foundation of support from many. Gravel Island and Green Bay NWRs will continue to seek creative partnership opportunities to achieve its vision for the future.

The Friends of Plum and Pilot Island works to support the goals of the preservation, restoration, and maintenance of the lighthouses, accessory buildings, and other historic resources on Plum and Pilot Islands and to conserve and protect wildlife resources. This partnership enables refuge staff to improve on protection of historic properties and foster a visitor program through partnerships. Plum Island provides an excellent opportunity to integrate history and local community traditions and values into refuge interpretive and education programs.

Other particularly notable partners of the refuges include refuge volunteers and the Wisconsin and Michigan Departments of Natural Resources.

Wilderness Review

As part of the CCP process, the Service reviewed islands within the legislative boundaries of each refuge for wilderness suitability. No additional lands were found suitable for designation as wilderness as defined in the Wilderness Act of 1964. The islands not designated as wilderness do not contain 5,000 contiguous, roadless acres. Most islands acquired subsequent to the original Wilderness Act have been substantially affected by humans, particularly through lighthouse infrastructure.

Potential impacts to wilderness resources from offsite activities such as tour boat operations, commercial and recreational fishing, and recreational boating and other current levels of activity and facility developments diminish wilderness character of most islands.

Monitoring and Evaluation

The direction set forth in this CCP and specifically identified strategies and projects will be monitored throughout the life of this plan. On a periodic basis, the regional office will assemble a station review team whose purpose will be to visit the island refuges and evaluate current

activities in light of this plan. The team will review all aspects of management including direction, accomplishments, and funding. The goals and objectives presented in this CCP will provide the baseline from which each field station will be evaluated.

Plan Review and Revision

The CCP for the Great Lakes islands refuges is meant to provide guidance to refuge managers and staff over the next 15 years. However, the CCP is also a dynamic and flexible document and several of the strategies contained in this plan are subject to such things as drought, floods, windstorms, and other uncontrollable events. Likewise, many of the strategies are dependent upon Service funding for staff and projects. Because of all these factors, the recommendations in the CCP will be reviewed periodically and, if necessary, revised to meet new circumstances.

Finding of No Significant Impact (FONSI)

Finding of No Significant Impact

Environmental Assessment and Comprehensive Conservation Plan for Gravel Island, Green Bay, Harbor Island, Huron and Michigan Islands NWR, States of Michigan and Wisconsin

An Environmental Assessment (EA) has been prepared to identify management strategies to meet the conservation goals of Gravel Island, Green Bay, Harbor Island, Huron and Michigan Islands NWRs. The EA examined the environmental consequences that each management alternative could have on the quality of the physical, biological, and human environment, as required by the National Environmental Policy Act of 1969 (NEPA). The EA evaluated three alternatives for the future management of these Great Lakes Islands Refuges.

The alternative selected for implementation on the refuge is Alternative C: Enhanced Management to Promote Natural Integrity and Public Stewardship. The preferred alternative would provide for the growth of the island refuges and more opportunities for compatible recreational use.

Up to 14,133 acres of new island habitats would be pursued under this alternative. Protection measures will include transfers from other government agencies, donations, and fee simple and conservation easement purchase from federal and private funding sources. Site-specific actions would be taken to control overpopulations of colonial nesting waterbirds, particularly Double-crested Cormorants, when compatible with approved joint agency plans and only if desirable co-nesting waterbirds are not negatively impacted. Efforts would be made to prevent the introduction of invasive or noxious plant and animal species.

Islands within Congressionally-designated Wilderness will be managed according to the wilderness policy of the Service. Efforts would be made to prevent the introduction of invasive or noxious plant and animal species. Cultural resources related to maritime navigation will be inventoried, restored, and protected in cooperation with non-profit organizations and state historic preservation offices.

In general, visitors will be encouraged to minimize their impact on these fragile island habitats. However, new visitor facilities and seasonal programs will be considered on some islands. New facilities may include marked trails and designated boat landings. Environmental interpretation will focus on the uniqueness of Great Lakes island ecosystems and cultural resources.

For reasons presented above and below, and based on an evaluation of the information contained in the Environmental Assessment, we have determined that the action of adopting Alternative C: Enhanced Management to Promote Natural Integrity and Public Stewardship, as the management alternatives for these refuges is not a major federal action which would significantly affect the quality of the human environment, within the meaning of Section 102 (2)(c) of the National Environmental Policy Act of 1969.

Additional Reasons:

1. Future management actions will have a neutral or positive impact on the local economy.
2. This action will not have an adverse impact on threatened or endangered species.

Supporting References:

Environmental Assessment
Land Protection Plan
Comprehensive Conservation Plan

ACTING 
Regional Director

1/30/13
Date

Appendix A: Environmental Assessment

ENVIRONMENTAL ASSESSMENT FOR IMPLEMENTATION OF COMPREHENSIVE CONSERVATION PLAN FOR GREAT LAKES ISLAND NATIONAL WILDLIFE REFUGES (GRAVEL ISLAND, GREEN BAY, HARBOR ISLAND, HURON, AND MICHIGAN ISLANDS)

In this appendix:

- [Chapter 1: Purpose and Need](#)
- [Chapter 2: Description of the Alternatives](#)
- [Chapter 3: Affected Environment](#)
- [Chapter 4: Environmental Consequences](#)
- [Chapter 5: List of Preparers](#)
- [Chapter 6: Consultation and Coordination with Stakeholders](#)

Abstract: The U.S. Fish and Wildlife Service (FWS, Service) is proposing to implement a Comprehensive Conservation Plan (CCP) for five Great Lakes island refuges located in Lake Huron, Lake Michigan, and Lake Superior. This Environmental Assessment (EA) considers the biological, environmental, and socioeconomic effects that implementing the CCP (which is the preferred alternative in this assessment), or an alternative, would have on the issues and concerns identified during the planning process. The purpose of the proposed action is to establish the management direction for the refuge for the next 15 years. The management action will be achieved by implementing a detailed set of goals, objectives, and strategies described in the CCP.

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Mark Vaniman, Refuge Manager Harbor Island, Huron, Michigan Islands NWRs 1674 Refuge Entrance Road Seney, MI 49883 Office Phone: (906) 586-9851 Ext. 11	Gary Muehlenhardt U.S. Fish and Wildlife Service NWRs/Conservation Planning 5600 American Boulevard West Suite 990 Bloomington, MN 55437-1458 Office Phone: (612) 713-5477

Throughout this document, five national wildlife refuges (NWRs, refuges) are discussed individually—such as the Gravel Island NWR or the Green Bay NWR. This document also discusses all five NWRs collectively as one entity and when doing so, refers to the group as the “Great Lakes islands refuges” or “Great Lakes islands NWRs.”

Chapter 1: Purpose and Need

1.1 Background

The purpose of the proposed action is to specify a 15-year management direction for islands in the Great Lakes that are managed as part of the National Wildlife Refuge System (NWRS, Refuge System). This management direction will be described in detail through a set of goals, objectives, and strategies in a CCP.

The islands in Michigan waters consist of three refuges that are managed by two Service field stations:

1.1.1 Shiawassee NWR

Michigan Islands NWR consisting, in part, of four islands in Lake Huron (Big Charity, Little Charity, Scarecrow, and Thunder Bay) are managed by the staff at Shiawassee NWR located in Saginaw, MI.

1.1.2 Seney NWR

Three island refuges in Lake Huron, Lake Michigan and Lake Superior are managed by the staff at Seney NWR located on the Upper Peninsula of Michigan. These island refuges are Harbor Island NWR (Lake Huron), Huron NWR (Lake Superior), and additional portions of Michigan Islands NWR (Hat, Shoe, Pismire, and Gull Islands in Lake Michigan).

The island refuges in Wisconsin waters are Gravel Island NWR and Green Bay NWR. The refuges consist of five islands in Lake Michigan off the tip of the Door County Peninsula (Gravel, Hog, Pilot, Plum and Spider Islands). These refuges are managed by the staff at Horicon NWR located in Mayville, WI.

We prepared this EA using guidelines established under the National Environmental Policy Act (NEPA) of 1969. NEPA requires us to examine the effects of proposed actions on the natural and human environment. In the following sections we describe three alternatives for future management of refuge islands, the environmental consequences of each alternative, and our preferred management direction. We have selected our preferred alternative based on environmental consequences and the ability to achieve the purpose of each refuge.

1.2 Purpose and Need for Action

The purpose of the proposed action is to specify management directions for all Great Lakes island refuges over the coming 15 years. These management directions will be described in detail through a distinct set of goals, objectives, and strategies in a CCP.

The action is needed because adequate, long-term management direction does not currently exist for these islands. Management is now guided by various general policies and short-term plans. The action is also needed to address current management issues and to satisfy the legislative mandates of the National Wildlife Refuge System Improvement Act of 1997, which requires the preparation of a CCP for all national wildlife refuge system lands in the United States.

This EA will present three management alternatives for the future of the Great Lakes islands refuges. The preferred alternative will be selected based on its ability to meet identified goals. These goals may also be considered as the primary need for action. Common goals for the refuges were developed by the planning team and encompass all aspects of management, including wildlife management, habitat management, and public use. Each of the management alternatives described in this EA will be able to at least minimally achieve these goals.

1.3 Great Lakes Islands Refuges Goals

1.3.1 Ecosystem Goal

Protect and maintain natural ecological communities to promote a healthy functioning ecosystem and identify future scenarios for Great Lakes islands ecosystems

1.3.2 Wildlife Goal

Protect, restore and maintain a natural diversity of fish and wildlife native to the Great Lakes, with an emphasis on Service Resource Conservation Priority Species.

1.3.3 Habitat Goal

Perpetuate the biological diversity and integrity of native plant communities to sustain high quality habitat for migratory birds, fish, and endangered species.

1.3.4 People Goal

Communicate and work in partnership with communities, governments, and appropriate organizations throughout the Great Lakes watershed to understand and appreciate the island ecosystems of the Great Lakes and further the mission of the Refuge System. Protect the cultural resources and cultural history of the refuges to assure historical preservation and connect refuge staff, visitors, and the community to the area's past.

1.4 Vision Statement

Management of Great Lakes islands refuges will reflect the mission of the National Wildlife Refuge System by conserving in perpetuity a rich mosaic of island habitats and, enabling nesting and migrating birds, and other wildlife of conservation concern in the Great Lakes, to thrive here. With the help of our conservation partners, we will apply sound, scientific principles and adaptive management strategies to sustain the long-term health and integrity of Great Lakes habitats; expand community outreach and environmental education and interpretation programs; and, stimulate visitors to embrace stewardship of natural resources.

1.5 Decision Framework

The Regional Director for the Midwest Region (Region 3 of the Service) will need to make two decisions based on this EA: 1) select an alternative future management, and 2) determine if the selected alternative is a major federal action significantly affecting the quality of the human environment, thus requiring preparation of an Environmental Impact Statement. The planning team has recommended Alternative C (Enhanced Management to Promote Natural Integrity and

Public Stewardship) to the Regional Director. The CCP was developed for implementation based on this recommendation.

1.6 Authority, Legal Compliance, and Compatibility

The Refuge System includes federal lands managed primarily to provide habitat for a diversity of fish, wildlife, and plant species. National wildlife refuges are established under many different authorities and funding sources for a variety of purposes. The purposes of the individual island refuges were derived primarily from the laws and executive orders that established them. Appendix C of the CCP contain a list of the key laws, orders, and regulations that provide a framework for the proposed action.

1.7 Scoping of the Issues

The CCP planning process began in February 2009 and included internal discussions and a series of public open houses held in communities near the island refuges. See Chapter 2 in the CCP for details of the issue scoping process.

1.7.1 Great Lakes Islands Refuges Issues, Concerns, and Opportunities

The following list of issue topics was generated by internal refuge scoping, the public open house sessions, and program reviews.

Double-crested Cormorant Management: Strong feelings among some for population reduction measures in Green Bay and the Beaver Island chain.

Access: Plum and Pilot Islands were added to the Green Bay NWR in 2007. Many people are requesting access to Plum Island for kayak and motor boat landings and hiking on trails. Some people requested advertising Harbor Island as part of a kayak trail and establishing boat docks and hiking trails, while others had an opposing view to retain the status quo.

Island Acquisition: Several comments were received about adding specific islands in private ownership to the refuge system. What criteria should be used for adding islands to the existing refuge system?

Cultural Resources: Will cultural resource sites, especially the lighthouses, receive adequate care, restoration and protection into the future?

Visitor Services: Should additional wildlife-dependent recreation opportunities be made available, or are the existing opportunities for wildlife observation and photography, hunting, and environmental education and interpretation adequate?

Chapter 2: Description of the Alternatives

2.1 Formulation of Alternatives

Based on the issues, concerns, and opportunities we heard during the scoping process, the planning team developed three alternative management scenarios that could be used for the Great Lakes islands refuges. These alternatives and the consequences of adopting each are presented in the EA. The alternatives were formulated under the assumption that staffing and budgets would remain constant or grow slowly throughout the life of the plan.

The alternative descriptions presented below provide a general overview of management direction. However, many details of management remain on an island-specific basis and will be described in Chapter 4: Environmental Consequences. For example, seasonal access restrictions and wildlife population control measures will vary from island to island based on specific resource concerns.

The three management alternatives were developed to address most of the issues, concerns, and opportunities identified during the CCP planning process. Specific impacts of implementing each alternative will be examined in five broad issue categories:

Island Acquisition: Should new islands be added to the existing refuge system?

Migratory Birds: What role do the islands that support colonies of nesting waterbirds play in the surrounding ecosystem? Are the colonies adequately protected from invasive species and human influences?

Cultural Resources: Will cultural resource sites, especially the lighthouses, receive adequate care, restoration, and protection into the future?

Access: Should the refuges provide more or fewer public access opportunities?

Visitor Services: Should additional wildlife-dependent recreation opportunities be made available, or are the existing opportunities for wildlife observation and photography, hunting, and environmental education and interpretation adequate?

2.2 Management Alternatives

2.2.1 Alternative A: Current Direction to Maintain Natural Integrity (No Action)

The current management direction of all Great Lakes islands NWRs would be maintained under this alternative. For NEPA purposes, this is referred to as the “No Action” alternative, a misnomer as some changes will occur over the next 15 years.

New islands will be added as opportunities and funding arises up to a total of 5,000 acres. Protection measures will primarily include transfers from other government agencies and fee purchase from federal appropriations. Site-specific actions would be taken to manage overpopulations of colonial nesting waterbirds, particularly Double-crested Cormorants, when compatible with approved joint agency plans and only if desirable co-nesting waterbirds are not negatively impacted. Efforts would be made to prevent the introduction of invasive or noxious plant and animal species.

Islands within Congressionally-designated Wilderness will be managed according to the wilderness policy of the Service. Refuge management activities will meet the “minimum requirement” for administering the area as wilderness as necessary to accomplish the purposes of the refuge. Cultural resources related to maritime navigation will be inventoried, restored, and protected in cooperation with non-profit organizations and state historic preservation offices.

Visitor facilities such as boat landings, signs, and trails will be very limited or not supplied on some islands. Environmental interpretation will focus on the uniqueness of Great Lakes island ecosystems and cultural resources.

2.2.2 Alternative B: Minimal Management to Preserve Wilderness Qualities

Alternative B would focus management actions to retain the wilderness character of each island to the extent practical. Public access and visitor services would be kept to a minimal level in order to reduce visual and habitat impacts.

New islands will be added as opportunities and funding arises, up to a total of 14,500 acres. Protection measures will primarily include transfers from other government agencies and fee purchase from federal appropriations. Site-specific actions would be taken to manage overpopulations of colonial nesting waterbirds, particularly Double-crested Cormorants, when compatible with approved joint agency plans and only if desirable co-nesting waterbirds are not negatively impacted. Efforts would be made to prevent the introduction of invasive or noxious plant and animal species.

Some islands will remain closed to entry except by special use permit. Islands within Congressionally-designated Wilderness will be managed according to the wilderness policy of the Service. Refuge management activities will meet the “minimum requirement” for administering the area as wilderness and necessary to accomplish the purposes of the refuge. Cultural resources related to maritime navigation will be inventoried, restored, and protected in cooperation with non-profit organizations and state historic preservation offices.

In general, visitors will be encouraged to minimize their impact on these fragile island habitats. Boat landing facilities will be very limited or not supplied on some islands. Environmental interpretation will focus on the wilderness qualities of Great Lakes islands.

2.2.3 Alternative C: Enhanced Management to Promote Natural Integrity and Public Stewardship (Preferred Alternative)

Alternative C would provide for the growth of the island refuges and more opportunities for compatible recreational use.

Up to 14,133 acres of new island habitats would be pursued under this alternative. Protection measures will include transfers from other government agencies, donations, and fee simple and conservation easement purchase from federal and private funding sources. Site-specific actions would be taken to control overpopulations of colonial nesting waterbirds, particularly Double-crested Cormorants, when compatible with approved joint agency plans and only if desirable co-nesting waterbirds are not negatively impacted. Efforts would be made to prevent the introduction of invasive or noxious plant and animal species.

Islands within Congressionally-designated Wilderness will be managed according to the wilderness policy of the Service. Efforts would be made to prevent the introduction of invasive or noxious plant and animal species. Cultural resources related to maritime navigation will be inventoried, restored, and protected in cooperation with non-profit organizations and state historic preservation offices.

In general, visitors will be encouraged to minimize their impact on these fragile island habitats. However, new visitor facilities and seasonal programs will be considered on some islands. New facilities may include marked trails and designated boat landings. Environmental interpretation will focus on the uniqueness of Great Lakes island ecosystems and cultural resources.

Chapter 3: Affected Environment

This chapter includes a brief overview of the affected environments of the Great Lakes islands refuges. More details are contained in Chapter 3 of the CCP itself.

3.1 Introduction

3.1.1 General Island Geological and Ecological Background

Michigan and Wisconsin are fortunate to have many islands that form a “waterscape” unlike any found elsewhere in the world. Of the three Upper Great Lakes (Huron, Michigan, and Superior), there exists approximately 200 islands within the confines of the states in Lake Huron, 76 in Lake Michigan, and 175 in Lake Superior (not counting 86 in the St. Mary’s River) (Soule, 1993).

The glacial history of island chains differs across the Upper Great Lakes. Glacial till overlying limestone bedrock forms the bulk of the Beaver Island group in northern Lake Michigan, although Pismire Island (part of Michigan Islands NWR) is an example of a sand and gravel bar island. Conversely, most islands in Lake Superior are formed of igneous and metamorphic bedrock, with the Huron Islands (of Huron NWR) being the result of granite upthrusts (Soule, 1993).

Post-glacial history of these islands also varies. National Wildlife Refuge System (NWRS, Refuge System) records indicate that many of the islands of Michigan Islands NWR were either impacted by human habitation (Gull Island) or by other uses (e.g., Hat Island was used as bombing range prior to refuge establishment) (Gates, 1950). Likewise, Huron NWR and Harbor Island NWR have had a history of human disturbance and manipulations (e.g., buildings are or were on both these refuges).

3.2 Archeological and Cultural Values

Several of the lighthouses and associated buildings on the islands (West Huron, Plum and Pilot Islands) have been placed on the National Register of Historic Places. No other historic or prehistoric sites have been identified as eligible for the National Register. See Chapter 3 of the CCP for more details.

3.3 Social and Economic Context

Now the Great Lakes basin is home to more than one-tenth of the population of the United States and one-quarter of the population of Canada. Some of the world’s largest concentrations of industrial capacity are located in the Great Lakes Region. Nearly 25 percent of the total Canadian agricultural production and 7 percent of the American production are located in the basin. The United States considers the Great Lakes a fourth seacoast, and the Great Lakes Region is a dominant factor in the Canadian industrial economy.

3.4 Natural Resources

Habitats, wildlife species, and endangered species of each individual island refuge are described in Chapter 3 of the CCP. Also, lists of species for specific islands can be found in Appendix D.

3.5 Visitor Services

The National Wildlife Refuge System Improvement Act of 1997 emphasizes wildlife management and that all prospective public uses on any given unit of the Refuge System must be compatible with the wildlife-related purposes before they can be allowed. The Improvement Act also identifies six priority uses of national wildlife refuges that in most cases are considered compatible uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Opportunities to participate in all of these wildlife-dependent activities exist on the island refuges.

Chapter 4: Environmental Consequences

4.1 Effects Common to All Alternatives

Specific environmental and social impacts of implementing each alternative are compared in table A-1 within the broad categories of wildlife, habitat, and people. However, several potential effects will be very similar under each alternative and are summarized below:

4.1.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Clinton on February 11, 1994. Its purpose was to focus the attention of federal agencies on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

None of the management alternatives for the five refuges described in this EA would disproportionately place any adverse environmental, economic, social, or health impacts on minority and low-income populations. The percentage of minorities in Door County, Wisconsin and the Upper Peninsula of Michigan is lower than in Michigan and Wisconsin (and much lower than the United States). Average incomes and poverty rates within the counties are comparable to other rural counties in the state. Public use activities that would be offered under each of the alternatives would be available to any visitor regardless of race, ethnicity, or income level.

4.1.2 Climate Change Impacts

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change impacts as part of long range planning endeavors. The increase of carbon dioxide (CO²) within the earth’s atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact that refuges can affect in a small way. The U.S. Department of Energy’s “Carbon Sequestration Research and Development” defines carbon sequestration as “. . . the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere.”

See Chapter 3 of the CCP for more detail on potential climate change impacts in the Great Lakes Region.

4.1.3 Cultural Resources

The Service is responsible for managing archeological and historic sites found on national wildlife refuges. Known cultural resources occur on several islands, and there may be undiscovered cultural resources awaiting discovery. Under each of the alternatives evaluated in

this EA, refuge management would ensure compliance with relevant federal laws and regulations, particularly Section 106 of the National Historic Preservation Act. Prior to all habitat and facility projects, appropriate efforts will be made to identify cultural resources within the area of potential impact by contacting the Regional Historic Preservation Officer.

4.1.4 Fire Management

Many of the islands are small and sparsely vegetated with little or no history of wildfires. However, on islands containing forests, brush or dense grasslands the use of prescribed fire may be beneficial to habitat or the protection of historic structures. In the future, management ignited wildland fire maybe used to reduce hazardous fuel loads, control invasive vegetation, and mimic natural disturbance patterns to enhance and maintain wildlife habitat.

4.1.5 Other Common Effects

None of the alternatives would have more than negligible—or at most minor—effects on soils, topography, noise levels, land use patterns in and around the refuge, transportation and traffic, waste management, human health and safety, or visual resources.

4.2 Cumulative Environmental Impacts Analysis

“Cumulative environmental impacts” refer to effects that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Land parcels under the jurisdiction of the Great Lakes islands refuges are relatively small and scattered over many counties. No cumulative impacts have been identified for actions suggested in this EA.

Table A-1: Comparison of Environmental Consequences by Management Alternative

Issues	Alternative A: Current Direction to Maintain Natural Integrity (No Action)	Alternative B: Minimal Management to Preserve Wilderness Qualities	Alternative C: Enhanced Management to Promote Natural Integrity and Public Stewardship (Preferred)
Goal 1: Ecosystem – Protect and maintain natural ecological communities to promote a healthy functioning ecosystem and identify future scenarios for Great Lakes islands ecosystems			
<i>Island Acquisition</i>	Conserve up to 150 acres of island habitat through full purchase, easements or transfer.	Conserve up to 5,000 acres of island habitat through full purchase, easements or transfer.	Conserve up to 14,133 acres of island habitat through full purchase, easements or transfer.
<i>Climate Change</i>	See Common to All Alternatives	Same as A.	Same as A.
Goal 2: Wildlife – Protect, restore and maintain a natural diversity of fish and wildlife native to the Great Lakes, with an emphasis on Service Resource Conservation Priority Species.			
<i>Migratory Bird Populations</i>	Natural fluctuation of colonial waterbird nesting populations. Opportunistic use by migrating songbirds.	Same as A.	Increase in nesting waterbird populations due to active protection measures and control of non-target species.
<i>Over-abundant Wildlife Species</i>	Decrease in Double-crested Cormorant populations on most islands with colonies. Stable to decrease in white-tailed deer numbers, where present.	Stable to slight increase in Double-crested Cormorant populations on most islands with colonies. Stable to increase in white-tailed deer numbers, where present.	Decrease in Double-crested Cormorant populations on most islands with colonies. Stable to decrease in white-tailed deer numbers, where present.
<i>Exotic and Invasive Species Control</i>	Reduce non-native Mute Swan populations through active control measures (Green Bay NWR only).	Increase monitoring of invasive plants and control infestations.	Same as A & B.
Goal 3: Habitat – Perpetuate the biological diversity and integrity of native plant communities to sustain high quality habitat for migratory birds, fish, and endangered species.			
<i>Rare Habitats</i>	Stable. Protect Great Lakes Alvar communities (~100 acres) on islands containing this globally-rare habitat.	Same as A.	Increase in protected Great Lakes alvar communities on islands containing this globally-rare habitat. Increase will occur through island acquisition.
Goal 4: People – Communicate and work in partnership with communities, governments, and appropriate organizations throughout the Great Lakes watershed to understand and appreciate the island ecosystems of the Great Lakes and further the mission of the Refuge System.			
<i>Public Access</i>	Stable to slight increase due to new access opportunities on Plum and Harbor Islands.	Stable. Public access will be kept to a minimum to enhance wilderness appreciation.	Same as A plus new access options at Harbor Island NWR and islands acquired in the future.
<i>Environmental Education and Outreach</i>	Slight increase due to new opportunities on Plum and Harbor Islands.	Same as A.	Same as A plus new opportunities at Huron NWR and islands acquired in the future.
Goal 5: Cultural Resources – Protect the cultural resources and cultural history of the refuges to assure historical preservation and connect refuge staff, visitors, and the community to the area's past.			
<i>Protection of Cultural Resources</i>	Slight increase due to historic building restoration efforts at Huron NWR and Plum and Pilot Islands.	Stable to slight increase due to historic building restoration efforts at Huron NWR and Plum and Pilot Islands.	Same as A with new protection or restoration efforts on islands acquired in the future.

Chapter 5: List of Preparers

5.1 Refuge Staff

Michigan Islands NWR (Shiawassee NWR)
Steve Kahl, Refuge Manager

Gravel Island NWR and Green Bay NWR
Patti Meyers, Former Refuge Manager
Sadie O'Dell, Wildlife Biologist

Michigan Islands NWR (Seney NWR), Harbor Island NWR, and Huron NWR
Mark Vaniman, Refuge Manager
Greg Corace, Forester
Greg McClellan, Assistant Refuge Manager

5.2 Regional Office Staff

Gary Muehlenhardt, Wildlife Biologist/Refuge Planner, Region 3, USFWS
Gabriel DeAlessio, Biologist-GIS, Region 3, USFWS
James Myster, Regional Historic Preservation Officer, Region 3, USFWS
Mark Hogeboom, Writer/Editor, Region 3, USFWS

Chapter 6: Consultation and Coordination with Stakeholders

The refuge and regional planning staffs have conducted extensive consultation and coordination over three years with stakeholders in developing the CCP and EA for the Great Lakes islands refuges. In the course of scoping and other meetings, the Service consulted with more than 200 individuals representing Michigan and Wisconsin DNRs, conservation organizations, neighboring communities, and other stakeholders. See Chapter 2 of the CCP for a more detailed description of the process.

Appendix B: Appropriate Use and Compatibility Determinations

In this appendix:

[Appropriate Use Determinations](#)
[Compatibility Determinations](#)

Throughout this document, five national wildlife refuges are discussed individually—such as the Gravel Island NWR or the Green Bay NWR. This document also discusses all five NWRs collectively as one entity and when doing so, refers to the group as the “Great Lakes islands refuges” or “Great Lakes islands NWRs.”

Further, several appropriate use and compatibility determination documents in this appendix may include any of the following references, spelled out or abbreviated:

- U.S. Fish and Wildlife Service (FWS, Service)
- National Wildlife Refuge System (NWRS, System)
- National Wildlife Refuge (NWR, Refuge)
- Comprehensive Conservation Plan (CCP)
- Environmental Assessment (EA)
- Department of Natural Resources (DNR)
- U.S. Coast Guard (USCG)

This appendix provides the following Appropriate Use Determinations and Compatibility Determinations listed for each national wildlife refuge.

Appropriate Use Determinations

Gravel and Green Bay NWRs

- [Special Events \(non-refuge sponsored\)](#)
- [Research](#)
- [Commercially Guided Wildlife and Wildland Tours and Activities](#)

Harbor Island NWR

- [Mushroom and Berry Picking](#)

Michigan Islands NWR

- [Research \(includes Huron NWR and Harbor Island NWR\)](#)

Compatibility Determinations

Gravel and Green Bay NWRs

- [Hunting](#)
- [Environmental Education and Interpretation](#)
- [Wildlife Observation and Photography \(including means of access\)](#)
- [Special Events \(non-refuge sponsored\)](#)
- [Research](#)
- [Commercially Guided Wildlife and Wildland Tours and Activities](#)

Harbor Island NWR

- [Environmental Education and Interpretation](#)
- [Wildlife Observation and Photography \(including means of access\)](#)
- [Hunting](#)
- [Mushroom and Berry Picking](#)

Huron NWR

- [Wildlife Observation and Photography \(including means of access\)](#)
- [Environmental Education and Interpretation](#)

Michigan Islands NWR

- [Priority Wildlife-dependent Recreational Uses \(Hunting, Fishing, Wildlife Observation and Photography, Environmental Education and Interpretation\) on Scarecrow, Thunder Bay, Sugar, Big Charity and Little Charity Islands](#)
- [Research \(includes Huron NWR and Harbor Island NWR\)](#)

Appropriate Use Determinations

The Service's Appropriate Use policy describes the initial decision process a Refuge Manager follows when first considering whether or not to allow a proposed use on a refuge. The Refuge Manager must first find a use to be appropriate before undertaking a compatibility review of the use and outlining the stipulations of the use.

This policy clarifies and expands on the compatibility policy (Service Manual, 603 FW 2.10 D (1)), which describes when Refuge Managers should deny a proposed use without determining compatibility. If we find a proposed use is not appropriate, we will not allow the use and will not prepare a compatibility determination. By screening out proposed uses not appropriate to the refuge, the Refuge Manager avoids unnecessary compatibility reviews. By following the process for finding the appropriateness of a use, we strengthen and fulfill the Refuge System mission. Although a refuge use may be both appropriate and compatible, the Refuge Manager retains the authority to not allow the use or modify the use.

Background for this policy as it applies to the Great Lakes islands refuges is in the following statutory authorities:

- *National Wildlife Refuge System Administration Act of 1966* (Administration Act), as amended by the *National Wildlife Refuge System Improvement Act of 1997* (16 U.S.C. 668dd-668ee) (Improvement Act). This law provides the authority for establishing policies and regulations governing refuge uses, including the authority to prohibit certain harmful activities. The Administration Act does not authorize any particular use, but rather authorizes the Secretary of the Interior to allow uses only when they are compatible. The Improvement Act provides the Refuge System mission and includes specific directives and a clear hierarchy of public uses on the Refuge System.
- *Refuge Recreation Act of 1962*, (16 U.S.C. 460k). This law authorizes the Secretary of the Interior to allow public recreation in areas of the Refuge System when the use is an "appropriate incidental or secondary use."

This policy does NOT apply to:

- Situations where reserved rights or legal mandates provide we must allow certain uses.
- Refuge management activities. Refuge management activities conducted by the Refuge System or a Refuge System-authorized agent are designed to conserve fish, wildlife, and plants and their habitats. These activities are used to fulfill a refuge purpose(s) or the Refuge System mission, and are based on sound professional judgment.

Uses that have been administratively determined to be appropriate are:

- Six wildlife-dependent recreational uses. As defined by the Improvement Act, the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are determined to be appropriate. However, the Refuge Manager must still determine if these uses are compatible.
- Take of fish and wildlife under state regulations. States have regulations concerning take of wildlife that includes hunting, fishing, and trapping. We consider take of wildlife under

such regulations appropriate. However, the Refuge Manager must determine if the activity is compatible before allowing it on a refuge.

Refuge uses must meet at least one of the following four conditions to be deemed appropriate:

- It is a wildlife-dependent recreational use of a refuge as identified in the Improvement Act.
- It contributes to fulfilling the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after the Improvement Act was signed into law.
- The use involves the take of fish and wildlife under state regulations.
- The Refuge Manager has evaluated the use following the guidelines in this policy and found that it is appropriate. The criteria used by the manager to evaluate appropriateness are on each of the appropriate use forms included in this appendix. Also included under this condition are 'specialized uses,' or uses that require specific authorization from the Refuge System, often in the form of a Special Use Permit, letter of authorization, or other permit document. These uses do not include uses already granted by a prior existing right. We make appropriateness findings for specialized uses on a case-by-case basis.

Gravel and Green Bay NWRs

Finding of Appropriateness of a Refuge Use

Refuge Name: Gravel and Green Bay National Wildlife Refuges

Use: Special Events (non-refuge sponsored)

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	X	
Is the use consistent with applicable executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with state fish and wildlife agencies.

Yes ___ No ___

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate _____ Appropriate X

Refuge Manager: /Steve Lenz/ Date: 7/20/2012

Justification: Disturbance to wildlife and habitat will be minimal since this use will occur on existing trails, be periodic, and relatively short duration. Wildlife disturbed will be displaced during the event, but should return to the areas affected quickly. Adjacent habitat is abundant for wildlife to use when disturbed. Stipulations in place will minimize disturbance, ensure control of the events, and contribute to the mission of the Refuge System by requiring an interpretive or environmental education component. This use will also expose large numbers of people to the refuge and help them gain a better understanding and appreciation of the refuge. These events are also consistent with the agency commitment to protecting and managing cultural resources in a spirit of stewardship for future generations to understand and enjoy. The number of events, and their size and scope, remains under the control of the Refuge Manager through the requirement of a Special Use Permit.

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence.

If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Green Bay and Gravel Island National Wildlife Refuges

Use: Research

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (Federal, State, tribal, and local)?	X	
Is the use consistent with applicable executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with state fish and wildlife agencies.

Yes ___ No ___

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ___ Appropriate X

Refuge Manager: /Steve Lenz/ Date: 7/20/2012

Justification: This use is appropriate provided that specific stipulations are implemented. Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities

occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence.

If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Finding of Appropriateness of a Refuge Use

Refuge Name: Gravel and Green Bay National Wildlife Refuges

Use: Commercially Guided Wildlife and Wildland Tours and Activities

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	X	
Is the use consistent with applicable executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with state fish and wildlife agencies.
 Yes ___ No ___

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate _____ Appropriate X

Refuge Manager: /Steve Lenz/ Date: 7/20/2012

Justification: In accordance with the missions of the National Wildlife Refuge System, Green Bay NWR, and the 1997 Improvement Act, this use has been determined appropriate provided specific stipulations are implemented. This use will promote public awareness and stewardship

of the refuges' natural and cultural resources. It does not materially interfere with or detract from the Service's ability to meet the mission of the Refuge System.

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence.

If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Harbor Island NWR

Finding of Appropriateness of a Refuge Use

Refuge Name: Harbor Island National Wildlife Refuge

Use: Mushroom and Berry Picking

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	X	
Is the use consistent with applicable executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with state fish and wildlife agencies.

Yes ___ No ___

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate _____ Appropriate X

Refuge Manager: /Mark Vaniman/ Date: 7/20/2012

Justification: This use has little impact to wildlife or habitat since it is recreational in nature and few people participate. A very small percentage of available fruit is harvested so no appreciable effect on wildlife mast is anticipated. This activity provides hours of enjoyable recreation and promotes a positive image of the refuge.

If found to be Not Appropriate, the Refuge Supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found Not Appropriate outside the CCP process, the Refuge Supervisor must sign concurrence.

If found to be Appropriate, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

Date: _____

A compatibility determination is required before the use may be allowed.

Michigan Islands NWR

Finding of Appropriateness of a Refuge Use

Refuge Name: Michigan Islands, Harbor Island, and Huron National Wildlife Refuges

Use: Research

This exhibit is not required for wildlife-dependent recreational uses, forms of take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision Criteria:	YES	NO
Do we have jurisdiction over the use?	X	
Does the use comply with applicable laws and regulations (federal, state, tribal, and local)?	X	
Is the use consistent with applicable executive orders and Department and Service policies?	X	
Is the use consistent with public safety?	X	
Is the use consistent with goals and objectives in an approved management plan or other document?	X	
Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	X	
Is the use manageable within available budget and staff?	X	
Will this be manageable in the future within existing resources?	X	
Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	X	
Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see section 1.6D. for description), compatible, wildlife-dependent recreation into the future?	X	

Where we do not have jurisdiction over the use ("no" to (a)), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above, we will generally not allow the use.

If indicated, the Refuge Manager has consulted with state fish and wildlife agencies.

Yes ___ No ___

When the Refuge Manager finds the use appropriate based on sound professional judgment, the Refuge Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate _____ Appropriate X

Refuge Manager: /Steve Kahl/ Date: 7/20/2012

Compatibility Determinations

Gravel and Green Bay NWRs

Compatibility Determination

Use: Hunting

Refuge Name: Green Bay National Wildlife Refuge, Door County

Green Bay NWR: Plum Island (325 acres)

Establishing and Acquisition Authorities:

Plum Island was transferred from the U.S. Bureau of Land Management to the U.S. Fish and Wildlife Service on October 17, 2007 under the authority of the Federal Land Management and Policy Act of 1976, 43 U.S.C. 1714 (2000).

Refuge Purpose:

Plum Island: “. . . to protect native and migratory bird habitat and endangered species habitat within the Great Lakes Basin ecosystem.” Public Land Order 7681, dated October 17, 2007.

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and water for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resource habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is hunting of deer on Plum Island as an activity conducted by the general public under regulation authority of the National Wildlife Refuge System Improvement Act and the National Wildlife Refuge System. Since 1982, the U.S. Coast Guard (USCG) allowed deer hunting on the island. When the U.S. Fish and Wildlife Service retained ownership, hunting was allowed to continue, but by permit only. About 76 people have hunted since 2007, harvesting 39 deer. It is critical to control the deer herd on the island in order to protect the forest diversity. Upon completion of a Refuge Hunt Plan, the refuge proposes to continue offering hunting opportunities for deer, either continuing by a permit system or open to the general public.

Where is the use conducted? Currently, the entire 325 acres of Plum Island is open for deer hunting by permit.

How is the use conducted? Hunting will be conducted under state- and refuge-specific federal regulations. Hunting activities are intended to meet the National Wildlife Refuge System Improvement Act and some of the refuge objectives and management goals without adversely affecting the primary objectives and mission of the refuge.

Completing this activity under a hunting plan allows the refuge to accomplish its management goals and provide needed safety levels for citizens of the area without adversely affecting refuge habitats and wildlife populations.

When would the use be conducted? The hunting seasons will follow state seasons. Generally, the deer season begins in mid-September with archery, followed by gun hunting and then another late archery hunt. All deer hunting ends around the first week of January.

Details about when, where, and how the hunts are conducted will be defined in the hunt management plan. All hunting activities will follow applicable state laws, except where the refuge administers further restrictions to ensure a quality hunt and visitor and staff safety. Hunting activities can only occur in designated areas listed in the hunt management plan.

Why is this use being proposed? Hunting is one of the priority uses outlined by Congress in the National Wildlife Refuge System Improvement Act of 1997. The Service supports and encourages priority uses on national wildlife refuge lands where appropriate and compatible. Hunting is used in some instances to manage wildlife populations and can provide pertinent biological information to state wildlife agencies. Hunting is also a traditional form of wildlife oriented recreation that can be accommodated on many national wildlife refuge lands. In Door County, many private islands and state areas offer similar hunting opportunities.

Availability of Resources:

Approximately \$5,000 of staff time will be required to administer and manage these activities. Time will be spent on managing the permit system for this hunt, issuing news releases, and conducting law enforcement. Some of the costs could be offset by the Recreational Fee Program if a permit program was established for Plum Island. Law enforcement staff from the Wisconsin Department of Natural Resources from Door County will provide limited monitoring.

Anticipated Impacts of Use:

Hunting is consistent with the purposes of the refuge when carried out within established regulations and is a priority uses identified in the Refuge Improvement Act. Island visitation is expected to be minimal (and will be limited if a permit system is established) and anticipated uses and impacts should also be minimal since all access will be outside of the bird nesting season. The hunters will cause some disturbance to other wildlife, but the disturbance is minor and short-term.

Illegal use of permanent or overnight tree stands could be an impact if trees are damaged or if staff has to spend time removing stands. Litter may also be a problem, especially when spent shotgun shells are left on the island. Impact to the vegetation is minimal and temporary.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public review.

Determination (check one below):

Use is Not Compatible

Compatibility Determination

Use: Environmental Education and Interpretation

Refuge Name: Gravel Island and Green Bay National Wildlife Refuges, Door County

Gravel Island NWR: Gravel Island (10 acres) and Spider Island (25 acres)

Green Bay NWR: Hog Island (2 acres), Plum Island (325 acres), and Pilot Island (3.7 acres)

Establishing and Acquisition Authorities:

Gravel, Spider, and Hog Islands were established by Executive Order No. 1678 of January 9, 1913, and Executive Order No. 1487 of February 21, 1912, respectively. Public Law 91-504, October 23, 1970 designated the existing Green Bay and Gravel Island NWRs as a Wilderness Area.

Plum and Pilot Islands were transferred from the U.S. Bureau of Land Management to the U.S. Fish and Wildlife Service on October 17, 2007 under the authority of the Federal Land Management and Policy Act of 1976, 43 U.S.C. 1714 (2000).

Refuge Purpose:

Gravel Island NWR: “. . . as a preserve and breeding ground for native birds.” Executive Order 1678, dated January 9, 1913.

Green Bay NWR: Hog Island: “. . . as a preserve and breeding ground for native birds.” Executive Order 1487, dated February 21, 1912.

Plum and Pilot Islands: “. . . to protect native and migratory bird habitat and endangered species habitat within the Great Lakes Basin ecosystem.” Public Land Order 7681, dated October 17, 2007.

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and water for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resource habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Environmental education consists of public outreach and onsite activities conducted by refuge staff, volunteers, teachers, and university professors. Environmental education may include staff led overnight activities with youth groups (e.g., Girl Scouts and Youth Conservation Corp.). Interpretation occurs in less formal activities with refuge staff and volunteers or through exhibits, signs, and brochures.

Where is the use conducted? On Plum Island, the activities may include traditional environmental education activities (teacher-led or staff-led onsite field trips, teacher and student workshops), offsite programs in classrooms, nature study, and interpretation of the wildlife

resources and a possible support facility such as interpretive trails and a visitor contact station. Access to Plum Island is by private or commercial tour boat.

Gravel, Spider, Hog, and Pilot Islands will remain closed to public entry to ensure necessary protection of nesting birds. Environmental education and interpretation activities will occur at a distance from the Islands (e.g., by boat around the perimeter of the Islands) or be offered offsite.

How is the use conducted? All environmental education and interpretation activities will be conducted with the refuge's primary goals, objectives, and habitat management requirements as the guiding principles. Activities done under these restrictions allow the refuge to accomplish its management goals and provide for the safety of visitors. All programs will include a description of the U.S. Fish and Wildlife Service and the Refuge System. All of the programs will address a number of wildlife conservation issues such as management, watershed, habitat, wildlife, endangered species, invasive species, etc.

Why is this use being proposed? Permitting this activity would be consistent with the National Wildlife Refuge System Improvement Act, and help accomplish refuge goals and promote understanding, appreciation, and support for its mission.

Plum Island contains a number of historic buildings and related structures including the front and rear range lights, the original keeper's quarters, a fog signal building, the USCG station and a substantial boathouse and dock. The rear range light, built in 1896, is still operational and listed on the National Register of Historic Places. The remaining Plum Island District (buildings, structures, and cross island trail) was recently added to the National Register of Historic Places. There is also a concentration of shipwrecks, dating from the 1800s and early 1900s. A partnership between the Service and the Friends of Plum and Pilot Islands, currently helps support the preservation, restoration, and maintenance of the lighthouse and other historic structures, while also protecting wildlife resources. Plum Island provides an excellent opportunity to integrate history and local community traditions and values into refuge interpretive and education programs.

Availability of Resources:

A full-time Visitor Services Specialist will be required to fully implement this activity to better meet one of the highest priorities for the U.S. Fish and Wildlife Service, which is "Connecting People with Nature: Ensuring the Future of Conservation." Their major responsibility would be to cooperatively work with partners and volunteers to implement a Visitor Services Plan for Plum Island. Costs for the 1 FTE and associated materials would be \$170,000. Most of this cost would be up front as the program is initially set up. After environmental education and interpretive activities are in place, maintenance and improvement of refuge interpretive signs, trails, etc. will be periodically monitored. Trained volunteers will also provide a valuable service in these programs.

Anticipated Impacts of Use:

Environmental education and interpretation are not expected to have measurable environmental impacts on the refuge, its habitats, or wildlife species. Disturbance to wildlife is limited to occasional incidents like flushing wildlife. Restrictions on locations, time of year, and number of users in the environmental education and interpretation programs will be placed to assure minimal disturbance to wildlife, especially nesting birds.

There are two unmaintained “trails” on Plum Island that were historically used by the USCG. Plans are to clear the existing (but overgrown) perimeter trail and develop it into an interpretive trail. A section of the trail is currently home to the federally threatened dwarf lake iris. This section will be re-routed to assure necessary protection. The existing “cross-island” trail, which connects the lifesaving station on the north side of the island to the keeper’s quarters and rear range light on the south side of the island will be closed and/or re-routed to avoid disturbing an active Bald Eagles nest.

The activities will follow all applicable laws, regulations and policies including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Green Bay and Gravel Island NWRs goals and objectives. These activities comply with the purpose of the refuge and the National Wildlife Refuge System mission. Operating these activities does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge.

Environmental education and interpretation are priority public uses listed in the National Wildlife Refuge System Improvement Act. By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

- Use is Not Compatible
- Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and refuge goals and objectives, environmental education and interpretation will only occur under the following stipulation:

Environmental education and interpretation will only occur in developed areas designated by the CCP or a step-down plan or under the guidance of a refuge staff member, volunteer, or trained teacher to assure minimal disturbance to wildlife, minimal vegetation damage, and minimal user conflict between other public uses.

Justification:

The refuge uses partnerships and environmental education to motivate citizens of all ages to action and understanding in protecting a healthy ecosystem. Partnerships and environmental education are tools used to build a land ethic and lessen vandalism, littering, and poaching.

The minor impacts to vegetation and wildlife, which may occur are a worthwhile tradeoff for informing visitors about island wildlife and providing an opportunity for active land stewardship.

Refuge Manager: _____/Steven J. Lenz/_____ Date: 10/9/2012

Regional Chief: _____/Tom Worthington (Acting)/_____ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2027

Compatibility Determination

Use: Wildlife Observation and Photography (including means of access)

Refuge Name: Gravel Island and Green Bay National Wildlife Refuges, Door County

Gravel Island NWR: Gravel Island (10 acres) and Spider Island (25 acres)

Green Bay NWR: Hog Island (2 acres), Plum Island (325 acres), and Pilot Island (3.7 acres)

Establishing and Acquisition Authorities:

Gravel, Spider, and Hog Islands were established by Executive Order No. 1678 of January 9, 1913, and Executive Order No. 1487 of February 21, 1912, respectively. Public Law 91-504, October 23, 1970 designated the existing Green Bay and Gravel Island NWR as a Wilderness Area.

Plum and Pilot Islands were transferred from the U.S. Bureau of Land Management to the U.S. Fish and Wildlife Service on October 17, 2007 under the authority of the Federal Land Management and Policy Act of 1976, 43 U.S.C. 1714 (2000).

Refuge Purpose:

Gravel Island NWR: “. . . as a preserve and breeding ground for native birds.” Executive Order 1678, dated January 9, 1913.

Green Bay NWR: Hog Island: “. . . as a preserve and breeding ground for native birds.” Executive Order 1487, dated February 21, 1912.

Plum and Pilot Islands: “. . . to protect native and migratory bird habitat and endangered species habitat within the Great Lakes Basin ecosystem.” Public Land Order 7681, dated October 17, 2007.

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and water for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resource habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Conduct and allow access for priority public uses (wildlife observation and, photography) as provided for under the National Wildlife Refuge System Improvement Act of 1997. Provide public access on Plum Island to observe and/or photograph wildlife and refuge habitats by means of hiking.

The current dock on Plum Island will provide access to the visiting public, however; opportunities will be limited due to the current condition of the dock. A kayak access point will be established to facilitate wildlife observation and photography. On the other islands, (Gravel, Spider, Pilot, and Hog), which are closed to public entry, these uses will occur at a distance from the Islands (e.g., by boat around the perimeter of the Islands).

Where is the use conducted? There are two unmaintained “trails” on Plum Island that were historically used by the USCG. The existing (but overgrown) perimeter trail will be cleared and developed into an interpretive trail. A section of the trail is currently home to the federally threatened dwarf lake iris. This section will need to be re-routed to assure necessary protection. The existing “cross-island” trail, which connects the lifesaving station on the north side of the island to the keeper’s quarters and rear range light on the south side of the island will need to be closed and/or re-routed to avoid disturbing an active Bald Eagles nest. The trails will allow for wildlife observation and environmental education opportunities on Plum Island.

The boathouse on Plum Island may be used as a visitor contact station and exhibit space to provide information about Green Bay and Gravel Island NWRs, the National Wildlife Refuge System, Great Lakes Basin ecology, and historical resources on Plum and Pilot Islands. Additionally, the USCG station may be used as a research station and bunkhouse for refuge staff, researchers, and volunteers.

How is the use conducted? All wildlife observation and photography activities will be conducted with the refuge's primary objectives, habitat management requirements, and goals as the guiding principles. Activities done under these restrictions will allow the refuge to accomplish its management goals and provide for the safety of visitors.

Why is this use being proposed? Wildlife observation and photography are priority public uses on National Wildlife Refuge System Lands as identified in the National Wildlife Refuge System Improvement Act of 1997. Entry on all or portions of individual areas may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife populations, or public safety.

Availability of Resources:

A full-time Visitor Services Specialist will be required to fully implement this activity to better meet one of the highest priorities for the U.S. Fish and Wildlife Service, which is “Connecting People with Nature: Ensuring the Future of Conservation.” Their major responsibility would be to cooperatively work with partners and volunteers to implement a Visitor Services Plan for Plum Island. Costs for the 1 FTE and associated materials would be \$170,000. Most of this cost would be up front as the program is initially set up. After wildlife observation and photography activities are in place, maintenance and improvement of refuge interpretive signs, trails, etc. will be periodically monitored. Trained volunteers will also provide a valuable service in these programs.

Anticipated Impacts of Use:

Wildlife observation and photography are not expected to have measurable environmental impacts on the refuge, its habitats, or wildlife species. Disturbance to wildlife is limited to occasional incidents like flushing wildlife. Restrictions on locations and time of year will be placed to assure minimal disturbance to wildlife, especially nesting birds.

The activities will follow all applicable laws, regulations, and policies including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Green Bay and Gravel Island NWRs goals and objectives. These activities comply with the purpose of the refuge and the National Wildlife Refuge System mission. Operating these activities does not alter the

Regional Chief: _____/Tom Worthington (Acting)/_____ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2027

Compatibility Determination

Use: Special Events (non-refuge sponsored)

Refuge Name: Green Bay National Wildlife Refuge, Door County

Green Bay NWR: Plum Island (325 acres), and Pilot Island (3.7 acres)

Establishing and Acquisition Authorities:

Plum and Pilot Islands were transferred from the U.S. Bureau of Land Management to the U.S. Fish and Wildlife Service on October 17, 2007 under the authority of the Federal Land Management and Policy Act of 1976, 43 U.S.C. 1714 (2000).

Refuge Purpose:

Green Bay NWR: Plum and Pilot Islands: “. . . to protect native and migratory bird habitat and endangered species habitat within the Great Lakes Basin ecosystem.” Public Land Order 7681, dated October 17, 2007.

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and water for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resource habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

This use is for special events sponsored by charitable and other non-profit clubs or groups such as Friends of Plum and Pilot Islands. These events may include a guided hike or a lighthouse tour on Plum Island. Events may be held one to six times annually and occur at different times throughout the year. Events may have up to 100 participants, although generally less than 50. Participants will use the established boat dock and trails.

Pilot Island may be open for special events (e.g., lighthouse tours) pending dock repairs. These events will occur after the nesting season to assure necessary protection of breeding birds and to avoid disruption to ongoing research activities currently being conducted on the Island.

Availability of Resources:

These events generally involve staff time for meeting with sponsors, explaining refuge regulations, issuing a Special Use Permit, and providing some level of oversight during portions of the event. Existing staff are adequate to administer this use depending on number of requests received and the size and scope of the event. Since special events on Plum Island are held based on existing dock and trails, facilities are deemed adequate. However, future events may require additional dock and trail improvements prior to issuing Special Use Permits. The existing dock on Pilot Island is currently unsuitable for public access due to safety concerns. Sponsors are required to furnish any additional facilities needed, such as portable toilets.

Anticipated Impacts of Use:

The short-term impact associated with these events is human disturbance to wildlife occupying habitat on the Islands. Most events will occur on established trails or areas that already support a moderate level of human activity. Wildlife that occupy habitat in these areas are accustomed to a higher degree of human disturbance. Any alteration of behavior or bird flight would be temporary and localized with wildlife quickly resuming normal activities.

There will be some short-term impact to other visitors engaged in wildlife-dependent recreation during the event. Visitors not engaged in the event, will be permitted to continue their activity. With an increase of public use during events, an increase of litter is expected. Event coordinators will be required to clean the area when the event is complete. Clean-up events actually reduce litter and debris and thus have a positive impact on the visual character of the refuge.

Other than the potential for some increase in future visitation to the refuge, no long-term impacts associated with these events are anticipated.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

1. Events must include an educational message that helps further the understanding of the purposes of the refuge and the mission of the Refuge System.
2. Event sponsors will furnish complete information on event description, date, time, preferred location, number of participants, and logistics for health and safety, so that the manager can make a determination of best area and timing of events when issuing a Special Use Permit. Management reserves the right to deny any proposal that will cause an undue demand on staff or resources, is not related to a charitable or non-profit organization, or does not promote the goals of the campaign designed to get Americans outdoors and active on their public lands.
3. Events will be scheduled only at appropriate times of the year to avoid significant wildlife and visitor disturbance. Events will be scheduled on a first-come, first-served basis, with no more than one event in the same area and time. All activities will be limited to the designated routes on established trails.
4. All activities associated with the event will be approved by refuge staff in advance of the event and will be located to avoid any sensitive sites (e.g., areas with high densities of foraging shorebirds, areas where waterbirds, waterfowl, raptors, or passerines are nesting, etc.) and to minimize disturbance to wildlife foraging/perching/loafing in adjacent wetlands and woodlands.

5. Event sponsors will be required to set up and remove all materials necessary for the event. This requirement applies to any tables, chairs, displays, signs, traffic aids, litter receptacles, portable toilets, etc. needed.

Justification:

Disturbance to wildlife and habitat will be minimal since this use will occur on existing trails, be periodic, and relatively short duration. Wildlife disturbed will be displaced during the event, but should return to the areas affected quickly. Adjacent habitat is abundant for wildlife to use when disturbed. Stipulations in place will minimize disturbance, ensure control of the events, and contribute to the mission of the Refuge System by requiring an interpretive or environmental education component. This use will also expose large numbers of people to the refuge and help them gain a better understanding and appreciation of the refuge. These events are also consistent with the agency commitment to protecting and managing cultural resources in a spirit of stewardship for future generations to understand and enjoy. The number of events, and their size and scope, remains under the control of the Refuge Manager through the requirement of a Special Use Permit.

Refuge Manager: _____/Steven J. Lenz/_____ Date: 10/9/2012

Regional Chief: _____/Tom Worthington (Acting)/_____ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2027

Compatibility Determination

Use: Research

Refuge Name: Gravel Island and Green Bay National Wildlife Refuges, Door County

Gravel Island NWR: Gravel Island (10 acres) and Spider Island (25 acres)

Green Bay NWR: Hog Island (2 acres), Plum Island (325 acres), and Pilot Island (3.7 acres)

Establishing and Acquisition Authorities:

Gravel, Spider, and Hog Islands were established by Executive Order No. 1678 of January 9, 1913, and Executive Order No. 1487 of February 21, 1912, respectively. Public Law 91-504, October 23, 1970 designated the existing Green Bay and Gravel Island NWR as a Wilderness Area.

Plum and Pilot Islands were transferred from the U.S. Bureau of Land Management to the U.S. Fish and Wildlife Service on October 17, 2007 under the authority of the Federal Land Management and Policy Act of 1976, 43 U.S.C. 1714 (2000).

Refuge Purpose:

Gravel Island NWR: “. . . as a preserve and breeding ground for native birds.” Executive Order 1678, dated January 9, 1913.

Green Bay NWR: Hog Island: “. . . as a preserve and breeding ground for native birds.” Executive Order 1487, dated February 21, 1912.

Plum and Pilot Islands: “. . . to protect native and migratory bird habitat and endangered species habitat within the Great Lakes Basin ecosystem.” Public Land Order 7681, dated October 17, 2007.

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and water for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resource habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is research projects conducted by universities and other academic institutions, government agencies such as the Wisconsin Department of Natural Resources and U.S. Geological Survey (USGS), and private conservation organizations. Research projects will contribute to a better understanding of refuge wildlife and habitat resources, provide information to improve adaptive management decisions, and increase life history information on species of concern.

Written research proposals will be required for review and approval before access will be allowed. If approved, access to the islands will be limited to the least invasive means required to accomplish the activities. Research will be carried out by professors, students, contractors,

refuge staff, and volunteers. Research results will be used to assist refuge staff in making wise management decisions and to support adaptive management processes.

Several studies involving Double-crested Cormorants, Red-breasted Mergansers, and Black-crowned Night-Herons have used Gravel Island and Green Bay NWRs as study sites. Activities have included sampling eggs, embryos, adults, and juveniles for various toxicants, counting nests, sampling blood for genetic purposes, and banding.

The most recent study was initiated in 2001. Through banding and re-sighting efforts, researchers are trying to better understand the population of Double-crested Cormorants and its growth. The mark/recapture study is being conducted as a joint project with U.S. Department of Agriculture Wildlife Service's researchers in order to obtain these critical data in this last remaining unmanaged segment of the population. The study continued through 2010.

Islands are valuable sites for biological research providing opportunities to study populations, island biogeography, predator-prey relations, and competition. Research opportunities may increase if the lifesaving station on Plum Island is renovated as a research facility/dormitory for island researchers.

Where is the use conducted? The use could occur on any or all of the refuge islands and often on other islands not owned by U.S. Fish and Wildlife Service.

How is the use conducted? Research may be conducted by foot, boat, canoe, kayak, and aerial methods. Marking of nests and individual animals may be required. The least invasive means required to accomplish objectives will be used. Housing is available offsite for use by researchers (RV trailer at local campground) but may include use of a dormitory directly on Plum Island in the future.

When would the use be conducted? Research projects may be conducted year round but usually occur from April–November.

Why is this use being proposed? Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Availability of Resources:

Some research and monitoring is funded by grants, other government agencies, and universities; or conducted by students and volunteers. Refuge staff involvement includes reviewing research proposals, supervising or monitoring research activities, reviewing reports, providing some equipment and vehicles, and occasionally participating in field work.

Staff time for development and/or review of research proposals/reports, administration of Special Use Permits, supervision of students and volunteers, maintenance of vehicles, specialized equipment, and housing is already available and committed.

Anticipated Impacts of the Use:

Research projects will be evaluated to determine whether the project is aligned with information needs of the island refuges and surrounding landscape. Only projects that benefit resource management will be approved to receive a permit or cooperative agreement.

Disturbance or removal of plants and wildlife would be a temporary impact. Re-population of the removed individuals would be expected to occur over time.

Some temporary dispersal of animals around or off the islands may occur from field activities.

Permit/Cooperative Agreements will be developed to eliminate or minimize impacts to other uses and management activities. Information collected from research project will assist the refuge manager in fine tuning management activities to maximize productivity of islands.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public review.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Green Bay and Gravel Island NWR's goals and objectives the activity can only occur under the following stipulations:

1. Researchers will submit a study proposal and designate specific area(s) on the islands where the activity is to occur.
2. Each project will be evaluated on its merits. All proposals will be reviewed for their potential benefits to future island management activities and potential impact(s) to current activities. Permits/Cooperative Agreements will only be issued to those projects that contribute to inventory, monitoring, management impacts, life history needs on species of concern, and information needs of the islands.
3. Coordination will be maintained with the Regional Refuge Wildlife Biologist.
4. A report must be submitted at the end of each field season and at the conclusion of the study.
5. Annually all ongoing activities and operations will be reviewed to ensure compliance with all applicable laws, regulations, and policies.

Justification:

This use has been determined compatible provided the above stipulations are implemented. Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities

occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Refuge Manager: _____/Steven J. Lenz/_____ Date: 10/9/2012

Regional Chief: _____/Tom Worthington (Acting)/_____ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2022

Compatibility Determination

Uses: Commercially Guided Wildlife and Wildland Tours and Activities

Refuge Name: Green Bay National Wildlife Refuge, Door County

Green Bay NWR: Plum Island (325 acres)

Establishing and Acquisition Authorities:

Plum Island was transferred from the U.S. Bureau of Land Management to the U.S. Fish and Wildlife Service on October 17, 2007 under the authority of the Federal Land Management and Policy Act of 1976, 43 U.S.C. 1714 (2000).

Refuge Purpose:

Plum Island: “. . . to protect native and migratory bird habitat and endangered species habitat within the Great Lakes Basin ecosystem.” Public Land Order 7681, dated October 17, 2007.

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and water for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resource habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

This use involves environmental education activities, tours, and programs that are offered to the public for a fee and are conducted on refuge property. Activities provide recreational and educational opportunities for the paying public who desire a successful, quality experience but who may lack the necessary equipment, skills, or knowledge to observe wildlife or otherwise experience the diverse habitats of the refuge. The refuge refers to these uses as commercially guided wildlife and wildlands tours and activities, which may include the following: kayak tours, bird watching excursions, wildlife viewing or photography trips, lighthouse tours, nature programs, and environmental education field outings. This determination is not addressing any new use; the activities listed above are permitted activities compatible with the refuge mission. Rather, this review looks at the compatibility of an economic use of the refuge, how it will impact the resource, and how it will be administered consistently in conjunction with other permitted uses. The commercial uses are covered generally in this determination, with the intent that the accompanying Special Use Permit will include more specific stipulations, conditions, and requirements.

Guiding operations will generally be allowed on established trails Memorial Day to Labor Day, daylight hours only. Access will be handled on a case-by-case basis within areas that are designated closed or restricted or areas within the vicinity of sensitive bird areas such as nesting sites. Administration of commercially guided wildlife/wildland activities will be conducted in accordance with commercial guide use stipulations (see attached). These conditions were developed to ensure consistency throughout the refuge; provide a safe, quality experience, protect resources, and to ensure compliance with pertinent Refuge System regulations and policies. The special use stipulations will address the number of permits to be issued, guide qualifications, permit cost, and selection methods. Commercial Guide Use conditions will take

into account the distribution of guides and public opportunity and address sensitive wildlife areas or other considerations.

Availability of Resources:

This program will increase overall costs of refuge operations, including but not limited to, development and review of policy and procedure, yearly administration of permits (inquiries, screening and selecting applicants, issuing permits), and enforcement of permit conditions. The size and scope of the guiding program, and the number of permits that will be available, will have to be limited and be in balance with staff availability. In the long-term, a comprehensive guiding program, when combined with other new initiatives requiring permits, may require additional administrative and/or other personnel time. Existing facilities (boat docks, trails, sanitary facilities, etc.) and other infrastructure are currently insufficient to accommodate this use.

Anticipated Impacts of the Use:

Disturbance of wildlife is the primary concern regarding this use. Increased use could cause disturbance to waterfowl, nesting passerines, Bald Eagles, and other wildlife. While field trip routes and observation sites are located in areas open to the general public, disturbance caused by group tours could be more intense, because the number of people may be greater than normally occurs during general public activities. This disturbance may displace individual animals to adjacent areas of the refuge. However, the level of disturbance, through control of areas used and seasons of use, should limit the disturbance during critical feeding, resting, and breeding periods and not measurably affect overall refuge populations.

There is also a concern for habitat degradation through the potential for increased potential for invasive species introductions. Limits placed on the number and size of tours as well as launch locations will be established and/or adjusted in response to evidence of habitat degradation.

Guided tour activities may also conflict with other refuge users. For example, commercial tours will most likely use the same areas as the independent wildlife viewer, kayakers, and boaters during open seasons. Unregulated or inadequately regulated commercial guiding operations may adversely affect the safety of refuge users, the quality of their experience, and the equity of opportunity. Stipulations proposed were developed to mitigate these concerns by coordinating schedules and implementing volume and space restraints for commercial operators. Guide operations may increase use of some refuge facilities, such as boat docks, but, if regulated, this increase would not be significant compared to overall use.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

Commercially Guided Wildlife and Wildlands Tours and Activities Special Use Permit Stipulations on Green Bay National Wildlife Refuge.

Commercial activities refer to activities that provide educational and recreational opportunities for the paying public who desire a successful, quality experience but who may lack the necessary equipment, skills, or knowledge to observe wildlife or otherwise experience the diverse habitats of the refuge. Commercially guided wildlife and wildlands tours and activities may include the following: kayak tours, bird watching excursions, wildlife viewing or photography trips, nature programs, lighthouse tours, and environmental education field outings.

The Refuge Manager will designate “Commercial Wildlife Observation Guide Use Areas” within the refuge. In most cases this will include the dock and trails within the refuge except those areas that are closed or subject to seasonal closures because of hunting and sensitive bird areas such as rookeries and bald eagle nests. The Refuge Manager may as necessary establish a maximum number of guides that will be allowed to operate within the refuge. The number of tours may also be limited as necessary to reduce unforeseen conflict between user groups or disturbance to wildlife and habitats.

Qualified individuals may apply to use the refuge. If the maximum number of guides exceeds the recommended allowance for the area, guides will be selected by random drawing for a Special Use Permit valid for up to one year.

Administrative and permit fee will be \$200, non-refundable. These fees will be established as the initial program fees until the number of participants and earned revenues can be determined.

Administration of these activities will be conducted in accordance with the following stipulations, which were developed to ensure consistency throughout the refuge: provide a safe, quality experience; protect resources; and to ensure compliance with pertinent Refuge System regulations and policies.

1. Permittee(s), designated representatives, and associates will comply with all the refuge regulations and conditions of the Special Use Permit as provided by the refuge manager.
2. Instructors and guides will provide proof of insurance as established by the refuge including minimum coverage for general liability and comprehensive for all operations; and possess a current CPR and First Aid training certificate issued by a recognized national organization.
3. The permittee will be liable for all personal injuries, loss of life, and damage and/or loss to personal and public property, which are incurred by or caused by employees or clients during tours or activities on the refuge.
4. The permittee will be responsible for all infractions of refuge special regulations and Code of Federal Regulations Title 50 Subparts C, pertaining to National Wildlife Refuges.
5. The refuge reserves the right to change fees, regulations and/or restrictions or terminate the permit during the effective period following consultation with the permittee.
6. The permittee will disclose, during all trips, tours, activities that this area is part of the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service at Green Bay NWR.
7. Refuge staff has the right to accompany any tour, program, or activity, with proper notice, as a non-paying observer.

8. Permittees may be assisted by any number of individuals. Assistants must be named/authorized on the permit issued and possess the applicable state licenses and/or registration to perform the duties conducted.
9. The permittee will provide the refuge with a proposed schedule, including times, dates and locations, of all programs/tours/activities at least 30 days prior to conducting those activities on the refuge.
10. The permittee is responsible for accurate record keeping and will provide the issuing refuge office an annual summary of activity by January 15 of each year; the following information will be included:
 - a. Fee schedule for the year (charge per individual)
 - b. Number of guided tours/activities/programs conducted on the refuge
 - c. Number of individuals that participated in tours/activities/programs
 - d. Date of each trip
 - e. Location of each trip, or general area of activity
 - f. Individual names and description of duties for all additional staff who assisted with a trip on the refuge.
11. All vessels used in guide operations shall be marked with a guide identifier as required by the refuge. All boats are to be equipped and operated in accordance with Wisconsin and USCG boating regulations, including possessing a current Wisconsin registration.
12. The Special Use Permit and the privileges granted herein may be revoked by the issuing refuge office at any time for failure to comply with the permit conditions or other federal or state law.

Justification:

In accordance with the missions of the National Wildlife Refuge System, Green Bay NWR and the 1997 Refuge Improvement Act, this use has been determined compatible provided the above stipulations are implemented. This use will promote public awareness and stewardship of the refuges' natural and cultural resources. It does not materially interfere with or detract from the Service's ability to meet the mission of the National Wildlife Refuge System because:

1. Existing federal and state agency oversight and regulation of affected species and habitat is sufficient to ensure healthy populations. Disturbance to fish and wildlife will be local, short-term, and not adversely impact overall populations.
2. There are adequate state and federal enforcement officials to enforce state and federal regulations.
3. Restricting the number of guides and managing how and where guided activities are conducted will reduce adverse habitat effects, conflicts between competing guide services, and conflicts between guided operations and other refuge users.
4. Designated areas of operation (Guide Use Areas), operating requirements, and other regulation of guided activities will minimize conflicts with other refuge users.
5. Administrative and Special Use Permit fees will help off-set costs to administer and provide oversight to this use.

Harbor Island NWR

Compatibility Determination

Use: Environmental Education and Interpretation

Refuge Name: Harbor Island National Wildlife Refuge

Establishing and Acquisition Authorities:

Harbor Island was purchased from The Nature Conservancy in December 1983 as part of the Unique Ecosystem Program and waterfowl production area under authority of the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j).

Refuge Purpose:

“ . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act).

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Environmental education would consist of public outreach and onsite activities conducted by refuge staff, volunteers, teachers, and university professors. Interpretation occurs in less formal activities with refuge staff and volunteers or through exhibits, signs, and brochures.

Where is the use conducted? Environmental education and interpretation activities may occur throughout the refuge, but are most likely to occur on or around the main harbor, which is well protected and provides abundant opportunities for boats to anchor or nose into shore. The refuge is located in Potagannissing Bay in Lake Huron, approximately 3 miles off Drummond Island and approximately 10 miles, via boat, from the Detour Village boat ramp. During the winter this area of the lake is normally frozen, and access to the island would only be via snow machine. Currently the refuge is not staffed. We estimate the refuge receives a about 200 visitors per year, although we don't have good documentation. As mentioned above, the refuge contains a very protected harbor with good anchoring that is utilized for the primary purpose of getting out of the weather or anchoring for the night. Environmental education and interpretation may occur on the refuge or offsite. Currently, there are no self-guided interpretive services on the island, just informational and regulatory signs. Onsite guided services may be provided although extensive logistical coordination would have to occur and would be dependent on weather and lake conditions. Local school districts are located approximately two–three hours away by vehicle. Programs would be given at schools upon request. Programs would be given upon request onsite at the refuge, although extensive logistical coordination would have to

occur and would be dependent on weather and the lake condition. Offsite activities consist of teacher workshops, participation in special events, and the sharing of wildlife education trunks.

When is the use conducted? Interpretation occurs throughout the year, whenever a visitor reads a sign, brochure, or the refuge website. Environmental education activities would primarily occur during the school year but can occur at any time. Most activities occur during daylight hours.

How is the use conducted? All environmental education and interpretation activities are conducted with the refuge's primary goals, objectives, and habitat management requirements as the guiding principles. Activities done under these restrictions allow the refuge to accomplish its management goals and provide for the safety of visitors. All programs include a description of the U.S. Fish and Wildlife Service and the Refuge System. All of the programs address at least one of a number of wildlife conservation issues such as management, watershed, habitat, wildlife, endangered species, invasive species, etc.

Why is the use being proposed? Permitting this activity is consistent with the National Wildlife Refuge System Improvement Act (1997), helps accomplish refuge goals and objectives, and promotes understanding, appreciation and support for our mission.

Availability of Resources:

Harbor Island National Wildlife Refuge is managed out of the Seney National Wildlife Refuge office along with two other remote island refuge units: the remote Kirtland's Warbler Wildlife Management Area and a remote subunit, Whitefish Point. Currently, we have one full-time Visitor Service Manager and a career seasonal Park Ranger to lead the interpretive and environmental education program. With current staff, opportunities exist to improve the interpretive program at Harbor Island NWR with development of interpretive signs and kiosks to be located on the refuge. Also with current staff, limited environmental educational activities could be conducted at local school districts. An additional public use staff dedicated to our three remote island refuges would be needed in order to begin to provide a more adequate environmental education program at local school districts plus education efforts on the island and refuge led interpretive activities on the Island. Approximately \$100,000 would be needed to begin to adequately administer this program.

Trained volunteers and interns provide an integral part of the Seney National Wildlife Refuge's environmental education and interpretation program. All the interns and most of the volunteers are based in the Seney NWR area. Additional local volunteers may be available with the formation of a Harbor Island Friends Group, currently being considered by local entities.

Every effort is made to meet each request for environmental education and interpretive programs. However, staff, funding, and the location of the refuge have curtailed programs. Due to logistical challenges, the Environmental Education and Interpretive (staff led) programs actually occurring on the island will always be very limited. Based on a review of the current Complex budget, there is sufficient funding to administer this program at its limited current level and ensure compatibility with the purpose for which Harbor Island National Wildlife Refuge was established.

Anticipated Impacts of the Use:

Environmental education and interpretation are not expected to have measurable environmental impacts on the refuge, its habitats, or wildlife species. Disturbance to wildlife is limited to

occasional incidents such as flushing wildlife. Restrictions on locations for environmental education and interpretation and the numbers of users will assure minimal disturbance to wildlife and other public use activities.

The activities follow all applicable laws, regulations, and policies including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Harbor Island NWR goals and objectives. These activities comply with the purpose of the refuge and the National Wildlife Refuge System mission. Operating these activities does not alter the refuge's ability to meet habitat goals, and it helps support several of the primary objectives of the refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Harbor Island National Wildlife Refuge goals and objectives, environmental education and interpretation can only occur under the following stipulation:

Environmental education and interpretation activities will occur only when and where they pose little or no threat to wildlife. The impacts of any activity that occurs will be evaluated for its impacts on wildlife. All activities will occur under the guidance of a refuge staff member, volunteer or trained teacher to assure minimal disturbance to wildlife, minimal vegetation damage, and minimal user conflict between other public uses.

Justification:

Environmental education and interpretation are priority public uses for the National Wildlife Refuge System as outlined in the National Wildlife Refuge System Improvement Act of 1997. By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife and their habitats, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System.

Refuge Manager: /Mark Vaniman/ Date: 10/9/2012

Regional Chief: /Tom Worthington (Acting)/ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2027

Compatibility Determination

Use: Wildlife Observation and Photography (including means of access)

Refuge Name: Harbor Island National Wildlife Refuge

Establishing and Acquisition Authorities:

Harbor Island was purchased from The Nature Conservancy in December 1983 as part of the Unique Ecosystem Program and waterfowl production area under authority of the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j).

Refuge Purpose:

"(for the) . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . ." 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act).

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? General public access to observe and/or photograph wildlife and refuge habitats including the means of access such as boat and then hiking, skiing, or snowshoeing on the island. Under the National Wildlife Refuge Improvement Act of 1997, wildlife observation and photography are priority public uses.

Where is the use conducted? These activities could take place anywhere on the refuge but most often occur along the two main harbors at the southern end of the island or anywhere along the perimeter. Currently, the refuge does not contain any type of designated trail.

When is the use conducted? The easiest/safest access to the refuge is via a boat, which normally can occur from March–November. If ice has formed on the lake, access to the island could occur via snow machine. Most wildlife observation and photography are most likely to occur from May–September; however, they could occur at any time of the year, but only during daylight hours.

How is the use conducted? All wildlife observation and photography activities will be conducted with the refuge's goals, objectives, and management plans as the guiding principles. Activities pursued under these restrictions allow the refuge to accomplish its goals and objectives and provide for the safety of visitors. Entry on all or portions of individual areas may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife or public safety.

Why is the use being proposed? Wildlife observation and photography are priority public uses on National Wildlife Refuge System lands as identified in the National Wildlife Refuge

Improvement Act of 1997. Allowing access to the refuge for wildlife observation and photography is consistent with goals of the refuge and the National Wildlife Refuge System.

Availability of Resources:

Approximately \$2,000 is required to maintain refuge signs and to cover logistics to annually get to the island. Currently, with the assistance of the volunteers and the Seney Natural History Association, there is enough staffing and funding available to administer these activities.

Anticipated Impacts of the Use:

Wildlife observation and photography can cause minor disturbance to wildlife especially during nesting seasons. In areas where people travel off trails, the impact on wildlife is normally minimal and temporary. The more significant impact can be the vegetation, but even this is dispersed and infrequent.

Wildlife observation and photography are priority public uses listed in the National Wildlife Refuge System Improvement Act. By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife and their habitats, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and beyond. Increased public stewardship will support and complement Service actions in achieving refuge purposes and the mission of the National Wildlife Refuge System.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

- Use is Not Compatible
- Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Harbor Island NWR goals and objectives, wildlife observation and photography can only occur under the following stipulation:

1. The refuge is closed from sunset until sunrise,
2. All motorized vehicles are prohibited.

Justification:

This use has been determined compatible provided the above stipulations are implemented. It promotes public stewardship of natural resources and helps the refuge meet its goals and objectives. It does not materially interfere with or detract from the Service's ability to meet the mission of the National Wildlife Refuge System.

The activities follow all applicable laws, regulations, and policies, including: Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Refuge goals and objectives. These activities are compliant with the purpose of the refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge.

Refuge Manager: /Mark Vaniman/ Date: 10/9/2012

Regional Chief: /Tom Worthington (Acting)/ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2027

Compatibility Determination

Use: Hunting

Refuge Name: Harbor Island National Wildlife Refuge

Establishing and Acquisition Authorities:

Harbor Island was purchased from The Nature Conservancy in December 1983 as part of the Unique Ecosystem Program and waterfowl production area under authority of the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j).

Refuge Purpose:

“ . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act).

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is the hunting of game as an activity conducted by the general public under regulation authority of the National Wildlife Refuge System Improvement Act (1997) and the National Wildlife Refuge System. Hunting is currently allowed for big game. These hunts are conducted in accordance with State of Michigan regulations.

Where is the use conducted? The entire island is open to the hunting of white-tailed deer and black bear under state regulations.

When is the use conducted? Hunting is allowed during state seasons, generally from early September through the end of December each year.

How is the use conducted? Hunting is conducted under State of Michigan and refuge-specific regulations.

Why is the use being proposed? Hunting is identified as a priority public use in the National Wildlife Refuge System Improvement Act of 1997 and has traditionally occurred on Harbor Island without adverse impacts to the purpose for which the refuge was established. The hunt program is administered in accordance with sound wildlife management principles and the utmost concern for public safety.

Availability of Resources:

Based on a review of the refuge budget and current staffing levels, resources are adequate to administer this program to ensure compatibility with the purpose for which the refuge was established.

Anticipated Impacts of the Use:

The activity follows all applicable laws, regulations, and policies including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Harbor Island NWR goals and objectives. These activities comply with the purpose of the refuge and the National Wildlife Refuge System Mission. Operating these activities does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Harbor Island NWR goals and objectives, hunting can only occur under the following stipulations:

1. State and/or tribal hunting regulations apply to all hunting on Harbor Island.
2. Refuge-specific regulations apply as follows:
 - o baiting or the use of bait is prohibited
 - o the use of dogs to hunt black bear is prohibited
 - o no motorized vehicles are permitted on the island
 - o no camping or open fires
3. All hunting activities will be reviewed annually to ensure compliance with all applicable laws, regulations, and policies.

Justification:

This use has been determined compatible provided the above stipulations are implemented. This use is being permitted as it is a priority public use and will not detract from the primary purposes of the refuge. This use will meet the mission of the National Wildlife Refuge System by providing renewable resources for the benefit of the American public while conserving fish, wildlife, and plant resources on these lands.

Compatibility Determination

Use: Mushroom and Berry Picking

Refuge Name: Harbor Island National Wildlife Refuge

Establishing and Acquisition Authorities:

Harbor Island was purchased from The Nature Conservancy in December 1983 as part of the Unique Ecosystem Program and waterfowl production area under authority of the Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j).

Refuge Purpose:

“ . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . ” 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act).

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Non-commercial harvest of berries and mushrooms for human consumption, primarily blueberries and morel mushrooms.

Where is the use conducted? These activities may occur throughout the entire 694 acres of the Harbor Island NWR.

When is the use conducted? Mushroom and berry picking can occur throughout the spring, summer, and fall. Activity is normally concentrated during the few weeks that fruit is ripe. This activity most likely occurs on the refuge incidental to other activities.

How is the use conducted? This is an activity that is often done in conjunction with other activities that are wildlife-dependent, such as wildlife observation and photography. Visitors typically walk the upland portions of the refuge and harvest opportunistically. All harvesting is done by hand.

Why is the use being proposed? Permitting this activity is consistent with the National Wildlife Refuge System Improvement Act, helps accomplish refuge goals, and promotes understanding, appreciation and support for its mission. Wild food gathering is a traditional family activity allowing visitors to collect wholesome, natural foods while enjoying the refuge.

Availability of Resources:

Harbor Island NWR is managed out of the Seney NWR office along with two other remote island refuge units: the remote Kirtland's Warbler Wildlife Management Area and a remote subunit,

Huron NWR

Compatibility Determination

Use: Wildlife Observation and Photography (including means of access)

Refuge Name: Huron National Wildlife Refuge

Establishing and Acquisition Authorities:

Huron Islands Reservation was originally established by Executive Order dated October 10, 1905. Executive Order 7795, dated January 12, 1938 revoked the executive order from 1905 and established Huron Migratory Bird Refuge.

Refuge Purpose:

" . . . as a refuge and breeding ground for migratory birds and other wildlife . . . " 16 U.S.C. 71 5d (Migratory Bird Conservation Act).

" . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . . " 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act).

Designated wilderness in 1970 to " . . . *secure for the American people of present and future generations the benefits of an enduring resource of wilderness*" Public Law 91-504, October 23, 1970 (Huron NWR, Scarecrow, Pismire, and Shoe Islands).

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? General public access to observe and/or photograph wildlife and refuge habitats including the means of access such as boat or snow machine and then hiking or snowshoeing on the refuge. Under the National Wildlife Refuge Improvement Act, of 1997, wildlife observation and photography are priority public uses.

Where is the use conducted? Huron National Wildlife Refuge is comprised of eight islands. West Huron, or Lighthouse Island, is the only island in the archipelago open to the public and has a dock available for visitor use. On West Huron Island, there is an established trail leading from the boat dock up to the lighthouse area. Another trail leads north from the lighthouse area to the north end of the island where an old fog horn building is located. People can readily branch out from the trail and explore other parts of the island.

When is the use conducted? The easiest/safest access to the refuge is via a boat, which normally can occur from March–November. If ice has formed on the lake, access to the island could occur via snow machine. Wildlife observation and photography are most likely to occur

from May–September; however, these activities may occur at any time of the year, but are only permitted during daylight hours.

How is the use conducted? All wildlife observation and photography activities will be conducted with the refuge's goals, objectives, and management plans as the guiding principles. Activities pursued under these restrictions allow the refuge to accomplish its objectives and provide for the safety of visitors. Entry on all or portions of individual areas may be temporarily suspended due to unusual or critical conditions affecting land, water, vegetation, wildlife or public safety.

Why is the use being proposed? Wildlife observation and photography are priority public uses on National Wildlife Refuge System Lands as identified in the National Wildlife Refuge Improvement Act of 1997. Allowing access to the refuge for wildlife observation and photography is consistent with goals of the refuge and the National Wildlife Refuge System.

Availability of Resources:

Approximately \$2,000 is required to maintain refuge signs and to cover logistics to annually get to the island. Currently, with the assistance of the volunteers and the Seney Natural History Association, there is enough staffing and funding available to administer these activities.

Anticipated Impacts of the Use:

Wildlife observation and photography can cause minor disturbance to wildlife especially during nesting seasons. In areas where people travel off trails, the impact on wildlife is normally minimal and temporary. Vegetation may be impacted due to foot travel but affects should be minimal due to limited visitation.

Wildlife observation and photography are priority public uses listed in the National Wildlife Refuge System Improvement Act. By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and beyond. Increased public stewardship will support and complement Service actions in achieving refuge purposes and the mission of the Refuge System.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Huron National Wildlife Refuge goals and objectives, wildlife observation and photography can only occur under the following stipulation:

1. The refuge is closed from sunset until sunrise,

Justification:

This use has been determined compatible provided the above stipulations are implemented. It promotes public stewardship of natural resources and helps the refuge meet its goals and objectives. It does not materially interfere with or detract from the Service's ability to meet the mission of the National Wildlife Refuge System.

The activities follow all applicable laws, regulations, and policies, including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and refuge goals and objectives. These activities are compliant with the purpose of the refuge and the National Wildlife Refuge System Mission. Operating this activity does not alter the refuge's ability to meet habitat goals and it helps support several of the primary objectives of the refuge.

Refuge Manager: /Mark Vaniman/ Date: 10/9/2012

Regional Chief: /Tom Worthington (Acting)/ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2027

Compatibility Determination

Use: Environmental Education and Interpretation

Refuge Name: Huron National Wildlife Refuge

Establishing and Acquisition Authorities:

Migratory Bird Conservation Act 16 U.S.C & 7 15d

Refuge Purpose:

Huron Island Bird Reservation was established in 1905 " . . . as a refuge and breeding ground for migratory birds and other wildlife . . ."

Executive Order 7795, dated January 12, 1938 revoked the executive order from 1905 and established Huron Migratory Bird Refuge.

" . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 71 5d (Migratory Bird Conservation Act).

" . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . ." 16 U.S.C. n 668dd(a)(2) (National Wildlife Refuge System Administration Act).

Designated wilderness in 1970 to " . . . secure for the American people of present and future generations the benefits of an enduring resource of wilderness" Public Law 91-504, October 23, 1970 (Huron NWR, Scarecrow, Pismire, and Shoe Islands).

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? Environmental education would consist of public outreach and onsite activities conducted by refuge staff, volunteers, teachers, and university professors. Interpretation occurs in less formal activities with refuge staff and volunteers or through exhibits, signs, and brochures.

Where is the use conducted? Environmental education and interpretation activities may occur throughout the refuge, but are most likely to occur on West Huron (Lighthouse) Island. West Huron Island features buildings from an old USCG station and has a dock, which provides easy access to the Island. The other seven islands in the refuge are not open to the public except by Special Use Permit. The refuge is located three miles off the south shore of Lake Superior and is inaccessible during the winter. Programs would be given upon request onsite although extensive logistical coordination would have to occur and would be dependent on weather and the lake condition.

When is the use conducted? Interpretation occurs throughout the year, whenever a visitor reads a sign, brochure, or the refuge website. Environmental education activities are concentrated in the summer months but can occur at any time. Most activities occur during daylight hours.

How is the use conducted? All environmental education and interpretation activities are conducted with the refuge's primary goals, objectives, and habitat management requirements as the guiding principles. Activities done under these restrictions allow the refuge to accomplish its management goals and provide for the safety of visitors. All programs include a description of the U.S. Fish and Wildlife Service and the Refuge System. All of the programs address at least one of a number of wildlife conservation issues such as management, watershed, habitat, wildlife, endangered species, invasive species, etc.

Why is the use being proposed? Permitting this activity is consistent with the National Wildlife Refuge System Improvement Act, helps accomplish refuge goals, and promotes understanding, appreciation and support for its mission.

Availability of Resources:

Huron NWR is managed out of the Seney NWR office along with two other remote island refuge units: the remote Kirtland's Warbler Wildlife Management Area and a remote subunit, Whitefish Point. Currently, we have one full-time Visitor Service Manager and a career seasonal Park Ranger to lead the interpretive and environmental education program. With current staff, opportunities exist to improve the interpretive program at Huron NWR with development of interpretive signs and kiosks to be located on the refuge. Approximately \$100,000 would be needed to begin to adequately administer this program.

Trained volunteers and interns provide an integral part of the refuge's environmental education and interpretation program. All the interns and most of the volunteers are based in the Seney NWR area. The refuge does have a Friend's Group, Huron Island Lighthouse Preservation Association based out of L'Anse, which could be a local base for volunteers to help with environmental education and/or interpretive activities.

Every effort is made to meet each request for environmental education and interpretive programs. However, staff, funding, and the location of the refuge have curtailed programs. Due to logistical challenges, the Environmental Education and Interpretive (staff led) programs actually occurring on the island will always be very limited. Based on a review of the current Complex budget, there is sufficient funding to administer this program at its limited current level and ensure compatibility with the purpose for which Huron National Wildlife Refuge was established.

Anticipated Impacts of the Use:

Environmental education and interpretation are not expected to have measurable environmental impacts on the refuge, its habitats, or wildlife species. Disturbance to wildlife is limited to occasional incidents such as flushing wildlife. Restrictions on locations for environmental education and interpretation and the numbers of users will assure minimal disturbance to wildlife and other public use activities.

The activities follow all applicable laws, regulations, and policies including Migratory Bird Conservation Act, Title 50 Code of Federal Regulations, National Wildlife Refuge System Manual, National Wildlife Refuge System goals and objectives, and Huron NWR goals and

objectives. These activities comply with the purpose of the refuge and the National Wildlife Refuge System mission. Operating these activities does not alter the refuge's ability to meet habitat goals, and it helps support several of the primary objectives of the refuge.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and Huron NWR goals and objectives, environmental education and interpretation can only occur under the following stipulation:

Environmental education and interpretation activities will occur only when and where they pose little or no threat to wildlife. The impacts of any activity that occurs outside of designated public use areas will be evaluated for its impacts on wildlife. All activities will occur under the guidance of a refuge staff member, volunteer, or trained teacher to assure minimal disturbance to wildlife, minimal vegetation damage, and minimal user conflict between other public uses.

Justification:

Environmental education and interpretation are priority public uses for the National Wildlife Refuge System as outlined in the National Wildlife Refuge System Improvement Act of 1997. By facilitating these uses on the refuge, we will increase visitors' knowledge and appreciation of fish and wildlife, which will lead to increased public stewardship of fish and wildlife and their habitats on the refuge and in general. Increased public stewardship will support and complement the Service's actions in achieving the refuge's purposes and the mission of the National Wildlife Refuge System.

Refuge Manager: /Mark Vaniman/ Date: 10/9/2012

Regional Chief: /Tom Worthington (Acting)/ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2027

Michigan Islands NWR

Compatibility Determination

Uses: Priority Wildlife-dependent Recreational Uses (Hunting, Fishing, Wildlife Observation and Photography, Environmental Education and Interpretation) on Scarecrow, Thunder Bay, Sugar, Big Charity and Little Charity Islands

Refuge Name: Michigan Islands National Wildlife Refuge

Establishing and Acquisition Authorities:

Michigan Islands NWR was established by Executive Order in 1943. Scarecrow Island was one of the first islands acquired. Thunder Bay Island in was added in 1965 by a USCG/Fish and Wildlife Service agreement. The USCG ceded Lake Michigan's Gull Island to the Service in 1969. Big and Little Charity Islands in Lake Huron's Saginaw Bay were added to Michigan Islands NWR in 1999 via Natural Resource Damage Assessment. Sugar Island in Thunder Bay was added to the refuge in 2010 in partnership with The Nature Conservancy.

Refuge Purpose:

The primary purpose of Michigan Islands NWR is to serve “. . . as a refuge and breeding ground for migratory birds and other wildlife.” Scarecrow and Little Charity Islands provide habitat for colonial nesting birds, including Herrings and Ring-billed Gulls, Double-crested Cormorants, Great Blue Herons, Black-crowned Night-Herons, Great Egrets, and Common and Caspian Terns. Thunder Bay Island historically harbored large colonies of waterbirds, which, hopefully, will return. All of these islands provide valuable stopover habitat for migrant waterfowl, shorebirds, and songbirds.

Scarecrow Island was designated as wilderness under Public Law 91-504, October 23, 1970. This island is one of three within the Michigan Island Wilderness, which is part of the National Wilderness Preservation System.

In 2000, Scarecrow and Thunder Bay Islands were designated a part of the Thunder Bay National Marine Sanctuary and Underwater Preserve. The designation gives federal protection to more than 100 well-preserved shipwrecks that litter the bottom of Thunder Bay, located near Alpena, MI. Once part of a major shipping channel, this 448 square-mile sanctuary is the first national marine sanctuary in fresh water and is located in an area that was known as “Shipwreck Alley” in the 1800s.

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Uses:

Hunting, fishing, wildlife observation and photography, environmental education and interpretation are priority wildlife-dependent recreational uses, as defined by the National Wildlife Refuge System Administration Act of 1966 (as amended by the National Wildlife Refuge System Improvement Act of 1997). However, Scarecrow, Thunder Bay, Sugar, Big Charity, and Little Charity Islands are currently closed to the public and none of these uses have been permitted.

There is little public demand to access Little Charity, Scarecrow, Thunder Bay, and Sugar Islands. Most of the demand is from local residents and vacationers that are curious to explore the island and its shores during the summer. Occasionally anglers beach on the shoreline, and waterfowlers hunt from the islands.

All of these islands are surrounded by treacherous waters. These waters are shallow and littered with large boulders and shallow reefs. Consequently, the islands are only accessible to boaters that are very experienced with the underwater terrain and have small vessels. Navigating these waters is not safe for the inexperienced boater.

Thunder Bay Island is currently owned by the USCG. The Service manages most of the island as part of Michigan Islands NWR under permits and agreements. The USCG does not allow public access to the island.

Most of the demand for island access occurs at Big Charity Island. A private enterprise owns the former lighthouse keeper's quarters and gives tours to several thousand people annually. These visitors must travel through Service lands as part of the tour. However, the enterprise owns an ingress and egress right-of-way through these lands, which tour members use.

Availability of Resources:

Significant additional resources would be needed to manage a public use program and facilitate these uses on the islands. Currently, these islands are unfunded, unstaffed, and managed as a satellite refuge via Shiawassee NWR in Saginaw, MI. Investment of several hundred thousand dollars would be necessary to provide safe mooring, restroom facilities, signage, and information materials. A similar investment would be required in visitor services, management, and law enforcement staffing.

Anticipated Impacts of the Uses:

Impacts resulting from these uses could be significant. Scarecrow and Little Charity Islands harbor large colonies of nesting waterbirds. Bald Eagles nest at Big Charity and Sugar Islands. All of these birds are very sensitive to disturbance during the nesting season and are known to abandon nest sites because of human interference. These islands are currently closed to the public to prevent this disturbance.

Public Review and Comment:

This compatibility determination was included in the refuge's Draft Environmental Assessment and Comprehensive Conservation Plan. The public had an opportunity to review and comment on the Draft Comprehensive Conservation Plan and this compatibility determination during a 90 day comment period that extended from October 17, 2005 to January 17, 2006.

Determination (check one below):

Compatibility Determination

Use: Research

Refuge Name: Huron National Wildlife Refuge, Harbor Island National Wildlife Refuge, Michigan Islands National Wildlife Refuge

Establishing and Acquisition Authorities:

Varied. Migratory Bird conservation Act 16 U.S.C & 715d.

Refuge Purpose:

". . . as a refuge and breeding ground for migratory birds and other wildlife . . ." Executive Order 7795, dated January 12, 1938 revoked the executive order from 1905 and established Huron Migratory Bird Refuge.

" . . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. 71 5d (Migratory Bird Conservation Act).

"(for the) . . . conservation, management, and restoration of the fish, wildlife, and plant resources and their habitats for the benefit of present and future generations of Americans . . ." 16 U.S.C. n 668dd (a) (2) (National Wildlife Refuge System Administration Act).

Designated wilderness in 1970 to ". . . secure for the American people of present and future generations the benefits of an enduring resource of wilderness" Public Law 91-504, October 23, 1970 (Huron NWR, Scarecrow, Pismire, and Shoe Islands).

National Wildlife Refuge System Mission:

The mission is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use:

What is the use? The use is research projects conducted by universities and other academic institutions; government agencies such as the Michigan Department of Natural Resources and the U.S. Geological Survey; and private conservation organizations. Research projects will focus on better understanding of refuge wildlife and habitat resources, provide information to improve adaptive management decisions, and increase life history information on species of concern.

A refuge research application accompanied by a written project proposal is required for review and approval before access will be allowed. If approved, access to refuge lands and waters will be limited to the least invasive means required to accomplish the activities. Research will be carried out by professors, students, contractors, and refuge staff and volunteers. Researchers will be required to notify the refuge manager or his/her designee of entry and exit times when conducting research, provide written reports, and make data available to the refuge staff.

Where is the use conducted? On lands within the Huron NWR, Harbor Island NWR, and Michigan Islands NWR.

When is the use conducted? Research may occur at all times of the year, day or night. However, most research activity occurs during the summer months and daylight hours.

How is the use conducted? All research activities will be conducted with the primary goals, objectives and habitat management requirements of the refuge as the guiding principles. Every effort will be made to minimize the impacts of research activities on wildlife and their habitats and avoid conflicts with public use and management activities. A Special Use Permit will be issued for each research project that specifies what, when, where, and how research may be conducted on the refuge.

Why is the use being proposed? Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Availability of Resources:

Approximately \$100,000 to administer the research program within the Seney National Wildlife Refuge Complex. Much of the research is funded by grants, other government agencies, and universities; or conducted by students and volunteers. Refuge staff involvement includes reviewing research proposals, supervising or monitoring research activities, reviewing reports, providing some equipment and vehicles, and occasionally participating in field work. Based on a review of the current refuge budget, there is enough funding to ensure administration of this program if compatible with the purposes for which the refuges were established.

Anticipated Impacts of the Use:

Disturbance to wildlife and vegetation by researchers could occur through vegetation sampling, capture and handling of wildlife, observation activities, banding, and accessing the study area. It is possible that that direct or indirect mortality could result as a byproduct of research activities. However, the overall impact of allowing well-designed and properly reviewed research to be conducted by non-service personnel is likely to have very little impact on refuge wildlife populations. If the research project is conducted with professionalism and integrity, potential adverse impacts are likely to be outweighed by the knowledge gained about an entire species, habitat, or public use.

Public Review and Comment:

This compatibility determination was part of the Draft Comprehensive Conservation Plan and Environmental Assessment, which was announced in the *Federal Register* and available for public comment for 30 days.

Determination (check one below):

Use is Not Compatible

Use is Compatible with the Following Stipulations

Stipulations Necessary to Ensure Compatibility:

To ensure compatibility with National Wildlife Refuge System and island refuge goals and objectives, research can only occur under the following stipulations:

Each research proposal is evaluated to insure the latest techniques are used, and preference is given to projects that focus on better understanding of refuge wildlife and habitat resources, provide information to improve adaptive management decisions, and increase life history information on species of concern.

Researchers must follow their study proposal and comply with the provisions of their Special Use Permit.

Coordination will be maintained with the applied sciences staff.

Researchers must notify the refuge of all ingress and egress to study sites.

A report must be submitted at the end of each field season and at the conclusion of the study.

Researchers must make any data collected under the Special Use Permit available for refuge use.

Refuge research activities are evaluated annually to ensure that their collective impacts do not compromise the goals or objectives of the island refuges named herein.

Justification:

This use has been determined compatible provided the above stipulations are implemented. Research and monitoring information is critical to making sound biological decisions in the restoration and management of ecosystems/landscapes for fish and wildlife communities occurring on national wildlife refuges. It is needed to measure the successes and failures of management efforts. This is an important use with long-term benefits that ensures we have the best information possible upon which to base management decisions.

Refuge Manager: /Mark Vaniman/ Date: 10/9/2012

Regional Chief: /Tom Worthington (Acting)/ Date: 12/10/2012

Mandatory 10-or 15-year Re-evaluations Date: 2022

Appendix C: Land Protection Plan

Land Protection Plan for the Expansion of Green Bay and Michigan Islands National Wildlife Refuges (NWR, Refuge)

In this appendix:

[Introduction](#)
[Proposed Action and Objective](#)
[Project Description](#)
[Joint Detailed Planning](#)
[Description of Habitat](#)
[Major Wildlife Values](#)
[Threat to and Status of Resources to be Protected](#)
[Protection Alternatives](#)
[Acquisition Alternatives](#)
[Coordination](#)
[Sociocultural Impacts](#)
[Strategic Habitat Conservation](#)
[Literature Cited](#)

Green Bay NWR: Door County, Wisconsin and Delta County, Michigan

Michigan Islands NWR: United States Portions of Lakes Superior, Huron, and Michigan

Key Points

- Protection of additional **Great Lakes island habitat** critical for **rare and declining species** as well as other unique, **underrepresented habitats**
- Preservation of stopover sites along key **bird migration corridors**
- **Highly vulnerable** to climate change, colonization by invasive species, and development
- **Acquisition priority based** on criteria from the **Conserving the Future** vision document
- Acquisition by a **combination of fee title and less-than-fee title** is preferred
- Diverse ownership patterns encourage potential **partnering** with other conservation agencies



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240



In Reply Refer To:
FWS/ANRS/052804

JAN 15 2013

Memorandum

To: Regional Director, Region 3

From: Director

Subject: Approval to Proceed with Publication and Distribution of the Final Planning Documents for the Expansion of the Green Bay National Wildlife Refuge in Wisconsin, and Michigan Islands National Wildlife Refuge in Michigan

I approve your request dated September 28, 2012, to expand both the Green Bay NWR by 4,133 acres and also the Michigan Islands NWR by 10,000.

This request is based on the preferred alternative (Alternative C) in the Comprehensive Conservation Plan covering Green NWR, Michigan Islands NWR, Gravel Island NWR, Harbor Island NWR, and Huron NWR, collectively referred to as the Great Lakes Islands NWR, which was initiated in February, 2009. Public participation was solicited during the planning process. Federal, State, and local governments, as well as private organizations and citizens have provided input.

The Decision Package you submitted for my review included an Environmental Assessment, Land Protection Plan, and other related documents indicative of detailed planning. These documents comply with the requirements of the Director's land acquisition planning procedures memo dated August 11, 2000.

The lands targeted for protection will assist the refuge in addressing three priority conservation objectives: recovering listed threatened and endangered species, conserving migratory birds in decline, and protecting highly threatened island habitat that is underrepresented and unique.

Attachments

Introduction

With over 32,000 islands, the North American Great Lakes contain the largest collection of freshwater islands in the world. Extremely variable in nature, from size to complexity, these islands contain amazing biodiversity. However, many of them with the highest biodiversity are also under the greatest threat from human activity. Therefore, in 1996, a Preliminary Project Proposal (PPP) was approved to begin detailed planning for the addition of up to 4,133 acres in the Grand Traverse archipelago and an unknown amount in the upper end of Green Bay to Green Bay NWR (figure C-1). Likewise, in 2010 a PPP was approved to begin detailed planning to consider expansion of Michigan Islands NWR by approximately 10,000 acres within Lake Michigan and the United States' portions of Lakes Superior and Huron (figure C-1). This Land Protection Plan (LPP) is a portion of the detailed planning initiated by the approval of both PPPs.

In 2009, an Environmental Assessment (EA) and Draft Comprehensive Conservation Plan (CCP) were initiated for both these refuges as well as other refuges in the Great Lakes (i.e., Gravel Island, Huron, and Harbor Island NWRs). Expansions of these two refuges are part of the preferred alternative in the CCP. The purpose of this LPP is to provide information to the public in a clear and concise format outlining resource protection needs, the implementation schedule and priorities, and the dimensions of Service preservation proposals.

The following factors, consistent with U.S. Fish and Wildlife Service (FWS, Service) policy, generally guide land acquisition:

- The Service establishes new national wildlife refuges and expands existing refuge boundaries in order to fulfill the mission and goals of the National Wildlife Refuge System (NWRS, Refuge System) and the purpose(s) of individual refuges within the Refuge System.
- The Service acquires land only when other means of achieving program goals and objectives, such as zoning or regulation, are not appropriate, available, effective, or consistent with Service purpose and direction.
- The Service acquires land and water interests including, but not limited to, fee title, easements, leases, and other interests. Donations of desired lands or interests are encouraged.
- The Service respects the rights and interests of private landowners. Service policy has been and continues to be that land is purchased from willing sellers. As a result, the lands within a given project boundary that are of greatest interest to the Service because of their biological importance are not necessarily the first made available by willing sellers. In some cases lands within a project boundary may never become available for purchase.
- Law requires the Service to offer fair market value when acquiring lands. The Service must offer to buy the whole property when acquisition of only a portion of the property would leave the owner with an uneconomic remnant. The Service strives to minimize or eliminate any adverse impact on the landowner due to the acquisition process.

Proposed Action and Objective

The proposed action is to permanently protect additional (strategically prioritized) island habitat (approximately 14,133 acres) in the Great Lakes by expanding Green Bay and Michigan Islands NWRs. As more thoroughly explained below, many of the Great Lakes islands:

- Harbor significant biodiversity;
- Support endangered, threatened, and candidate species;
- Serve as important breeding and staging areas for colonial nesting waterbirds;
- Provide re-fueling stopover sites for migrating birds; and
- Contain relict, unusual, and high quality plant and wildlife communities.

Many of the qualities that make Great Lakes islands unique also make them vulnerable to a variety of threats, with climate change, invasive species, and residential development topping the list. The acquisition priority of each island is based on criteria set forth by the Conserving the Future vision Strategic Growth implementation team. The guiding document for this team is *Conserving the Future: Wildlife Refuges and the Next Generation* (FWS, 2011). This document states, “The **future growth of the Refuge System** will be guided by the following priorities: habitats to fulfill the goals and objectives identified in **threatened and endangered species recovery** or habitat conservation plans; habitats to fulfill the goals and objectives identified in **national bird . . . management plans; habitats** that are **unique, rare, declining or under-represented** in existing protection efforts; climate refugia . . . ; and modifications to existing refuge boundaries to adapt to climate change . . . ”

The objective then, of this proposal, is:

To protect highly threatened Great Lakes islands’ habitat that is either underrepresented and unique; or critical for threatened and endangered species, focal colonial nesting waterbird species, or birds of conservation concern for Region 3 of the U.S. Fish and Wildlife Service.

Project Description

Location and Size

Green Bay National Wildlife Refuge

Green Bay NWR (330.7 acres) currently consists of Hog Island (2 acres), Plum Island (325 acres), and Pilot Island (3.7 acres) (see map in CCP). The islands are located in Lake Michigan near Washington Island, off the tip of Wisconsin’s Door County Peninsula. Hog Island was set aside by Executive Order in 1913 as a preserve and breeding ground for native birds. Plum and Pilot Islands were transferred from the U.S. Coast Guard (USCG) to the Service in 2007. The islands were acquired to protect native bird habitat and endangered species habitat in the Great Lakes Basin Ecosystem. In 1970, Hog Island and Gravel Island NWR were designated as the Wisconsin Islands Wilderness. The refuge is managed by staff at Horicon NWR in Mayville, WI.

Hog Island supports a nesting colony of Herring Gulls and a few nesting Great Blue Herons and Red-breasted Mergansers. No development has occurred on Hog Island due to its small size, remoteness, and landing difficulties.

Portions of Plum and Pilot Islands were developed to serve as lighthouse facilities or lifesaving stations during the late 19th century. Plum Island essentially functions as a small ecosystem and retains natural qualities absent on the nearby mainland. Today Pilot Island supports nesting

colonies of Double-crested Cormorants and Herring Gulls. A handful of Great Blue Herons and Black-crowned Night-Herons also nest on Pilot Island.

All public use is prohibited on Hog and Pilot Islands due to ground nesting by migratory birds and the limited and treacherous access. Plum Island may offer public use opportunities in the future provided they are compatible with the refuge's purpose and mission.

Michigan Islands National Wildlife Refuge

Michigan Islands NWR (744 acres) is comprised of nine islands in Lakes Michigan and Huron (see map in CCP). Thunder Bay (122 acres), Scarecrow (9 acres) and Sugar (144 acres) Islands in Thunder Bay (near Alpena, MI), and Charity (214 acres) and Little Charity (11 acres) islands in Saginaw Bay are managed by Shiawassee NWR in Saginaw, MI. Seney NWR has management responsibility for Gull (230 acres), Pismire (2 acres), Hat (11 acres), and Shoe (0.5 acres) Islands, part of the Beaver Island Group in the northern portion of Lake Michigan.

Shoe and Pismire Islands in Lake Michigan and Scarecrow Island in Lake Huron were the first acquired. Thunder Bay Island in Lake Huron was added in 1965 by a USCG/ Service agreement. The USCG ceded Lake Michigan's Gull Island to the Service in 1969. In 1970, Scarecrow, Pismire, and Shoe Islands were officially designated as Michigan Islands Wilderness Area. A sixth island was added to the refuge in 1995, when The Nature Conservancy (TNC) transferred Hat Island in Lake Michigan to the Service. Charity and Little Charity Islands in Lake Huron's Saginaw Bay were added to the refuge in 1999. The most recent addition to Michigan Island NWR was Sugar Island in December of 2010.

In 2000, Scarecrow and Thunder Bay Islands were designated part of the Thunder Bay National Marine Sanctuary and Underwater Preserve. The designation gives federal protection to over 100 well-preserved shipwrecks that litter the bottom of Thunder Bay, located near Alpena, MI. Once part of a major shipping channel, this 448-square-mile sanctuary is the first national marine sanctuary in fresh water and is located in an area that was known as "Shipwreck Alley" in the 1800s. Big Charity and Thunder Bay Islands have lighthouses and keeper's quarters.

The islands are used for nesting by American Redstarts, Herring and Ring-billed Gulls, Double-crested Cormorants, Great Blue Herons, Black-crowned Night-Herons, and Common and Caspian Terns. Thunder Bay Island is a rare, distinctive, alvar ecological community with a little bluestem alvar grassland, alvar pavement, and a limestone bedrock lakeshore. The refuge is closed to the public.

Joint Detailed Planning

This LPP is a joint detailed effort for both of the aforementioned PPPs. The approved study areas from both PPPs were initially reduced by eliminating the western portion of Lake Superior and Lake St. Clair between Lakes Huron and Erie (figure C-1, Initial Focus Area). This was primarily due to the large amount of public land, state parks, national parks, etc. and heavy development on much of the remaining private land already existing in these areas. Then, a GIS analysis, based on data representing three priorities set forth by the Conserving the Future vision Strategic Growth implementation team, was used to prioritize islands for future protection. The three priorities include:

- Presence of federal threatened, endangered, and candidate species;

- Presence of birds in decline; and
- Presence of underrepresented unique habitat types.

In particular for this project, the “birds in decline” included three Upper Mississippi River/Great Lakes Region Joint Venture (UMR/GLRJV) focal colonial nesting waterbird species (i.e., Common Tern, Black Tern, and Black-crowned Night-Heron) and Forester’s Tern (per communication with a Region 3 migratory bird biologist) as well as 20 other species (table C-1) on the 2008 Region 3 Birds of Conservation Concern (BCC) List for Bird Conservation Regions (BCR) 12 and 23 (FWS, 2008). The BCC species use islands for stop-over sites to rest and refuel during migration as well as for breeding.

Also, in particular for this project, the “underrepresented unique habitat types” is based on the presence of key ecological systems (which includes rare plant communities and globally rare communities) from the *Islands of Life: A Biodiversity and Conservation Atlas of the Great Lakes Islands* study published by TNC of Canada in 2010 (Henson et al., 2010).

All islands (68) known to have threatened, endangered, and candidate species or colonial nesting waterbirds present were considered a priority, except seven of the largest and most developed (i.e., Sugar – 31,574 acres, Bois Blanc – 23,660 acres, Washington – 14,362 acres, Drummond – 83,258 acres, Beaver – 36,787 acres, Neebish – 13,768 acres, North Manitou – 14,415 acres) and one that is known to contain environmental contaminants (Shelter Island). While these islands contain priority species and critical habitat for the endangered Hine’s emerald dragonfly (Washington and Bois Blanc), their highly developed nature more easily lends itself to handling any potential acquisition on a case-by-case basis. Three other islands (in addition to the 60 islands mentioned above) also contain critical habitat for the Hine’s emerald dragonfly and, therefore, were considered a priority as well. These 63 priority islands were then ranked based on the sum of normalized scores for the presence of those species as well as the 20 BCC and “underrepresented unique habitat types.” So, the higher the final score, the more rare and declining species and habitat types the island contains (figures C-2 through C-6 and tables C-2 and C-3).

In the event that two or more priority islands become available for protection at the same time, threat potential could be used to prioritize them. Based on extrapolation from a crude analysis of existing “highly developed” islands, larger islands and those within five miles of the mainland appear to be more threatened by future development. Therefore, size and proximity to the mainland should be considered when poised with the option to buy two or more different priority islands at the same time with limited funding. “Highly developed” islands considered in the crude analysis mentioned above were determined by threat scores obtained from the *Islands of Life* study and are primarily based on housing density but also include roads, cropland, quarries, and mines.

The priority island analysis described above is essentially a model, which is based on three criteria that are part of the future vision of the Refuge System. The data used in the model may change over time, with more complete or more accurate information as it becomes available—for example, if a new island is found to have an endangered species. However, the model and the criteria it’s based on should not change until the vision of the Refuge System changes. Therefore, the 63 islands in figures C-2 through C-6 and tables C-2 and C-3 are the highest priority for growing the Refuge System today. In ten years with new data, assuming the Refuge System visions holds constant, the model may deliver a list of slightly different islands, perhaps

more or fewer that are of high priority. The list of high priority islands to acquire may change over time, therefore, allowing this proposal to be adaptable.

Description of Habitat

The priority islands contain a variety of habitat types. Table C-5 shows the major and generally more common habitats found on some of the islands. Rare habitats including rare plant communities and globally rare communities, represented here by “key ecological systems,” occur on nearly 75 percent of the priority islands as well. The “key ecological systems” include the following:

- True alvar (grassland, savanna, and sparsely vegetated rock barrens that develop on flat limestone where soils are very shallow);
- Other alvars (including anthropogenic);
- Wetlands (swamp, marsh, bog, fen, muskeg);
- Grass and meadow;
- Prairie and savanna;
- Limestone plain forest complexes (this forest is likely to have more rare species and community types);
- All top scoring terrestrial blueprint systems (TNC, U.S. Great Lakes terrestrial portfolio); and
- All top scoring aquatic blueprint systems (TNC, U.S. Great Lakes aquatic portfolio).

Alvars thrive where environmental extremes (e.g., seasonal hot, cold, drought, and flood) create naturally open landscapes, and therefore contain their own distinctive ecology. They support a unique set of plants—uncommon wildflowers, mosses and lichens, many kinds of grasses and sedges, and even some stunted trees. Animals common to alvars include birds, land snails, leafhoppers, and other invertebrates.

Limestone plain forest complexes include coniferous, deciduous, and mixed forests. They can be dominated by species like white cedar, white spruce, aspen, and white birch. They often include a complex patchwork of wetlands and naturally open areas of thin soil over limestone or bedrock, which hosts a distinctive vegetation community, including a considerable number of rare plants.

Major Wildlife Values

The priority islands also contain a variety of wildlife that colonizes islands through a variety of means. Species such as reptiles and amphibians can float on debris; birds such as gulls can carry seeds on their feet and feathers; migratory birds use islands as stop-over sites, and some stay to breed; mammals such as black bears, coyotes and wolves can swim or walk on ice to reach islands. Other species arrive through deliberate or accidental anthropogenic introductions. Twenty-three of the priority islands also contain threatened, endangered, and candidate species including the following:

- Piping Plover (endangered)
- Pitcher's thistle (threatened)
- Houghton's goldenrod (threatened)
- Dwarf lake iris (threatened)
- Eastern massasauga rattlesnake (candidate species)

Piping Plover (*Charadrius melodus*) pairs have been documented nesting for one or more years on eight (six priority) islands since the mid-1980s. Historically they bred extensively on the coastal sand and gravel beaches and fore-dunes of Great Lakes islands. However, the number of nesting pairs declined drastically in the 1940s and 1950s with increased shoreline development. Threats include predation, degradation of habitat (primarily from shoreline development), and human disturbance. Emerging potential threats include disease, wind turbine generators, and climate change.

Pitcher's thistle (*Cirsium pitcheri*) is found only in the Great Lakes Region and occurs in dune grasslands. The eleven (eight priority) islands on which it occurs contain some of the largest populations of this species. Bees and butterflies are important pollinators of Pitcher's thistle, and its seeds are dispersed by wind and water. Pitcher's thistle is adapted to a changing environment; however, intensive foot and vehicular traffic can increase erosion, destroy vegetation, and introduce competitive non-native species.

Houghton's goldenrod (*Solidago houghtonii*) was first discovered in Mackinac County, Michigan and grows nowhere else in the world outside the Great Lakes. It occurs on eight (six priority) islands and is typically found on moist sandy beaches and shallow depressions between low sand ridges along the shoreline (interdunal wetlands). Fluctuating water levels of the Great Lakes play a role in maintaining this unique goldenrod. During high water years, colonies of Houghton's goldenrod may be submerged. When water levels recede some plants survive the inundation, and new seedlings establish on the moist sand.

Dwarf lake iris (*Iris lacustris*) grows on alvar barrens only around the Great Lakes. The lakeshore habitat of dwarf lake iris has been greatly reduced by shoreline development, and it now resides only on 16 (12 priority) islands. Residential and vacation homes as well as associated road-widening, chemical spraying and salting, and off-road vehicle use have caused disturbance and destruction of habitat.

Eastern massasauga rattlesnake (*Sistrurus catenatus*) occurs on three (two priority) islands with wetlands or shrub swamps with adjacent natural habitat in the uplands, including drier open shrub forest, open fields, grassy meadows, etc. This snake is a federal candidate species for which the Service has sufficient information on its biological status and threats to propose them as endangered or threatened. Candidate species receive no legal protection; however, conservation is encouraged since they may warrant future protection under the Endangered Species Act. Primary threats to the snake include human harassment and loss of wetland habitat.

Three islands contain critical habitat (habitat believed to be essential to the species' conservation) for the Hine's emerald dragonfly (*Somatochlora hineana*). The Hine's emerald dragonfly is among the most endangered dragonflies in the United States and is restricted to wetland habitats characterized by thin soils over dolomite bedrock with marshes, seeps, and

sedge meadows. Fragmentation and destruction of suitable habitat are believed to be the main reasons for this species' endangered status and continue to be the primary threats to its recovery.

Migration Corridors

Several of the priority islands also occur within Important Bird Areas (IBAs). The American Bird Conservancy's IBA program is a global effort to identify and protect areas that are exceptionally important, even essential, for bird conservation (figure C-1). The program not only recognizes the sites as important, but mobilizes resources needed to protect them.

The large shallow Saginaw Bay of Lake Huron is one IBA that is used by an array of waterbird species as a migratory stopover site, wintering ground, and breeding ground. Large migratory congregations of Tundra Swans, American Black Ducks, Mallards, Redheads, Common Goldeneyes, Mergansers, and Scaup have all been recorded in this area. Several important waterbird breeding colonies also exist within this IBA, including Common Tern, Caspian Tern, Ring-billed Gull, Great Egret, and Black-crowned Night-Heron. This area also supports the lower peninsula's largest spring raptor migration, with at least 18 species of hawks, eagles, vultures, and falcons concentrated in areas from Caseville, MI to Huron City, MI, up to two miles inland and occasionally over water. This IBA sits within an area of one of the state's largest wind power resources and is being targeted for several wind farms. At least one project is already completed (Harvest Wind Farm).

The area from Sturgeon Bay, between St. Ignace, MI and Mackinaw City, MI, over to Saint Martin Bay (including Bois Blanc Island) is a key migration corridor. Since migratory birds (especially raptors) avoid crossing large bodies of water during migration, this area is an important migration route. Raptors (especially Bald Eagles) and songbirds "island hop" along this route and, therefore, concentrate in and around peninsulas. Two other key migration corridors encompassing priority islands for acquisition include the following:

- The area from Grand Traverse Bay north toward Naubinway, MI, including North and South Manitou Islands, North and South Fox Islands and Beaver Island; and
- The chain of islands from the Door County Peninsula in Wisconsin to the Delta County Peninsula in Michigan (Big Bay de Noc), including Washington Island.

Potential Population Benefit Examples

Due to the large number of bird species occurring in the Great Lakes and Big Rivers Region (Region 3, also known as the Midwest Region) of the Service and the limited resources available for conservation, the UMR/GLRJV selected several "JV focal species" for breeding habitat planning and population monitoring. The use of focal species is a conservation shortcut, reducing the number of models required for developing habitat objectives for a full suite of species. In effect, JV focal species were selected to represent cover types used by multiple species within that bird group. Monitoring results (i.e., population change) based on focal species are assumed to reflect the suite of species they represent. The following three species are provided as possible examples of how the proposed expansion could benefit such colonial nesting waterbird populations. The habitat objectives for protection, breeding territory size, and habitat requirements (area, type, etc.) are all from the UMR/GLRJV Waterbird Conservation Strategy completed in 2007.

Black Terns have been recorded nesting in three wetlands adjacent to priority islands. Their habitat needs include marshes with extensive stands of emergent vegetation and large areas of open water. The minimum habitat area required per colony is 50 acres with an average of 40 birds per colony. The estimated area of quality habitat needed to accommodate current breeding populations is 23,350 acres. Acquiring the colony nest sites on those three islands would maintain and protect existing habitat for approximately 120 Black Terns (60 breeding pairs).

Black-crowned Night-Herons have used 15 of the 63 priority islands and prefer large marshes with a mix of open water, herbaceous vegetation, and nearby woody cover. The minimum habitat area required per colony is nearly 500 acres with an average of 220 birds per colony. The estimated area of quality habitat needed to accommodate current breeding populations is 29,160 acres. Acquiring the colony nest sites on those 15 islands would maintain and protect existing habitat for approximately 3,300 Black-crowned Night-Herons (1,650 breeding pairs).

Common Terns have used 16 of the 63 priority islands and primarily need large lakes often with marsh habitat and abundant small forage fish available from the surface. They prefer island or peninsula nest sites with sand, gravel, shell, or cobble substrates and scattered vegetation. A typical colony is 100 breeding pairs (200 birds) on a 400 square meter site (0.1 acres). The estimated area of quality habitat needed to accommodate current breeding populations is 38 islands and associated territories. Acquiring the colony nest sites on those 16 islands would maintain and protect existing habitat for approximately 3,200 Common Terns (1,600 breeding pairs).

Threat to and Status of Resources to be Protected

Size, isolation, physical location, parent material, wave action exposure, fluctuating water levels, climate, and age all contribute to the biodiversity and distinctiveness of the islands in the Great Lakes. In particular, climate (where some islands experience warmer winters, later springs, and cooler summers) and location (such as separation from the mainland) allow some of the islands to act as refugia with extremely diverse biota, often genetically and ecologically divergent from mainland populations (Vigmostad et al., 2007). Not surprisingly then, some islands contain threatened, endangered, and candidate species and some provide the most significant nesting and dry-land roosting habitat for colonial nesting waterbirds (Wires et al., 2010).

Some of the characteristics that make these islands so diverse and distinct also make them the most vulnerable. In particular, the relatively small size and isolation of islands makes them subject to quick change by both natural and anthropogenic forces. Fluctuating water levels, increases in deer density and colonization, and abandonment by colonial nesting waterbirds have all triggered fast ecological change on islands in the past (Vigmostad et al., 2007).

This combination of unique diversity and vulnerability subject these islands to several significant threats. Climate change, colonization by invasive species, and development (mostly residential) top the list (Wires et al., 2010). Some examples include the following:

- Islands that are distant from the mainland generally experience less predation, less competition, and are less disturbed by humans; however, they are often more vulnerable to storm-driven waves and climate-induced water level change.

- Islands that are isolated often contain unique floral communities; however, colonization by invasive species, particularly plants, quickly changes their structure, composition, and character.
- Larger islands (and sometimes closer to the mainland) often contain habitat for rare or declining species, however, those qualities also promote development and colonization by humans.

Climate change will likely add another layer of stress to the Great Lakes and, therefore, the islands within them, as they are particularly susceptible to the effects of rapid global warming (Wires et al., 2010). Water temperatures are expected to rise—with an expected average air temperature increase of 2–4 °C—reducing seasonal mixing and biomass productivity (i.e., reduced aquatic organisms that form the base of the food chain), and decreasing water quality characterized by increased algal blooms (Wires et al., 2010). Precipitation is expected to increase 25 percent by the end of the 21st century; however, lake water levels are predicted to fall (by the year 2100) due to the increased temperatures and related evaporation. This could create new mainland connections and, therefore, increase predation, competition, and disturbance. While some level of adaptation is expected for some species, certain barriers and invasive species will likely limit that adaptation. Losses then, in local biodiversity, are likely to accelerate towards the end of the 21st century (Wires et al., 2010).

Other lingering threats, including wind turbine generators, increased recreation (especially foot and vehicular traffic), and disease will also add to the vulnerability of these island systems.

Protection Alternatives

Alternative 1 – No Action

The No-Action Alternative includes no expansion or additional acquisition by Green Bay or Michigan Islands NWRs. The existing islands within these two refuges would remain in the Refuge System, and management of them would continue as currently planned. This alternative is not preferred, because it does not increase protection of high priority habitat that will help the Service achieve the following important priorities:

- Threatened and endangered species recovery plan goals;
- Joint Venture waterbird population objectives; and
- A trend reversal for other “birds in decline.”

While this alternative would be the least expensive approach, it does not meet the objective of this proposal.

Alternative 2 – Acquisition and/or Management by Others (State, County, Non-Governmental Organizations, etc.)

In Alternative 2, Green Bay and Michigan Islands NWRs would be expanded based on the priority list generated above; however, acquisition and/or management of that expansion would be undertaken by a partner agency and not by the Service. This alternative is not preferred, because other partner agencies are unlikely to have sufficient funds for acquisition or adequate

staff for management. The Service is the principal federal agency responsible for administering the Endangered Species Act and managing and conserving migratory birds in the United States. Therefore, threatened and endangered species as well as migratory birds are essential Service priorities. Partner agencies have their own unique missions, responsibilities, and priorities that differ from those of the Service. Conservation of the priority islands, then, may not be their first interest. This alternative would:

- Have minimal or no cost to the Service;
- Meet the objective of this proposal; however, it would
- Not be a reasonable option since partner agencies have not expressed interest in such acquisition and/or management.

Alternative 3 – Acquisition by Fee Title (Service)

In Alternative 3, Green Bay and Michigan Islands NWRs would be expanded based on the priority list generated above through outright purchase of the islands at fair market value. That is, the Service would own all or portions of the islands acquired as part of the expansion. This alternative is not preferred, because some existing island owners may not be willing to sell their property to the Service. They may, however, be willing to sell and give up certain property rights to protect rare species and habitats. This alternative excludes the use of easements in which the Service would purchase development and other rights but not the actual property to protect rare species and their habitats. While this alternative would meet the objective of this proposal, it:

- Is likely the most costly option since all properties would be acquired outright (including all rights);
- May prove ineffective as many landowners may not be willing to sell their properties; and
- Is unnecessary as the Service can use less-than-fee title acquisition to conserve at least some rare species and their habitats.

Alternative 4 – Acquisition by Less-Than-Fee Title (Service)

In Alternative 4, Green Bay and Michigan Islands NWRs would be expanded based on the priority list generated above through purchase of certain rights to the island properties but not the actual properties. That is, the Service would not own any of the islands (or portions of them) acquired for the expansion. This alternative is not preferred, because some species (i.e., colonial nesting waterbirds, Piping Plovers, eastern massasauga rattlesnakes) require habitat free from human disturbance. This alternative is also limiting, because some island property owners may not be interested in selling only certain property rights to the Service. They may only be interested in selling their properties outright. This alternative, then, eliminates the use of fee title purchase as a conservation tool, in which the Service actually owns the property. This alternative:

- Is likely to be less costly than Alternative 3, since only certain rights are purchased and not the entire property;

- May prove ineffective, since some landowners may be unwilling to sell only certain rights to their property; and
- Would not effectively meet the objective of this proposal by eliminating human disturbance to colonial nesting waterbirds, other species, and unique habitats.

Alternative 5 – Acquisition by a Combination of Fee Title and Less-Than-Fee Title (Service) as well as Acquisition and for Management by Others (State, County, Non-Governmental Organization, etc.) (Preferred Alternative)

This alternative is essentially a combination of Alternatives 3 and 4 above. In this alternative, Green Bay and Michigan Islands NWRs would be expanded based on the priority list generated above through a combination of outright purchase of islands and through the purchase of certain rights to the island properties via conservation easements. In addition, other governmental and non-governmental partners would be encouraged to pursue similar conservation measures. **This alternative is preferred, because:**

- It is the most cost-effective approach to meeting the objective of this proposal; and
- Is also very adaptable, allowing for a variety of means to conserve island property, therefore allowing more options to work with island property owners.

Fee title acquisition would be preferred for acquiring all islands where colonial nesting waterbirds, Piping Plovers, and eastern massasauga rattlesnakes occur. Since human disturbance is a major threat to these species, fee title acquisition of a property that can be closed to public use, at least partially or seasonally, would provide the best protection. Less-than-fee title acquisition is preferred for all other island properties (tables C-2 and C-3). Important rights for the Service to consider when acquiring priority island property with the less-than-fee title option include: development (all types including roads), off-road vehicle use, party hunting, and use of herbicide or other appropriate tools to manage invasive species. Allowing or disallowing these activities is important to protecting the sensitive resources around which this proposal is built.

Acquisition Alternatives

Purchase

There are two different types of “purchase” that can be used to protect habitat. *Fee* purchase involves buying—as the availability of funding allows—a parcel of land outright from a willing seller in fee title, which involves all rights and complete ownership. *Easement* purchase refers to the purchase of limited rights (i.e., less-than-fee title) from an interested landowner. The landowner retains ownership of the land but sells certain rights identified and agreed upon by both parties. The objectives and conditions of proposed conservation easements recognize lands for their importance to wildlife habitat or outdoor recreational activities.

Funding to buy land comes primarily from the Land and Water Conservation Fund (LWCF), which derives from certain user fees, the proceeds from the disposal of surplus federal property, the federal tax on motor boat fuels, and oil and gas lease revenues. About 90 percent of that

fund now derives from Outer Continental Shelf oil and gas leases. The federal government receives about 40 percent of that fund to acquire and develop nationally significant conservation lands. Other sources of funding to purchase land include the Migratory Bird Conservation Fund, which derives from Federal Duck Stamp revenue, Environmental Protection Agency grants (albeit rare), and other funds geared for a specific use—of which one of the islands may fit. These funds, but primarily LWCF, will be used to acquire either full or partial interest in the priority islands listed above as opportunities in both land and funding arise.

Donation

Generally, donations in the approved area as fee title or conservation easement are encouraged and welcomed as long as management concerns, such as contaminants, are not a major issue. Presently, there are no known opportunities to accept donations.

Exchange

The Service has the authority to exchange land in Service ownership for other land that has greater habitat/wildlife value. Inherent in this concept is the requirement to get dollar-for-dollar value with, occasionally, an equalization payment. Exchanges are attractive, because they usually do not increase federal land holdings or require purchase funds; however, they also may be very labor and time intensive to complete. Presently, there are no known opportunities for exchange.

Transfer

Transfer of military, USCG, and other lands declared excess to the Service is also acceptable. Poverty Island (one of the 63 priority islands) is currently in the process of being transferred to General Services Administration from the Bureau of Land Management and the USCG with plans for eventual transfer to the Service.

Coordination

Coordination efforts for the proposed expansion have been somewhat limited given the scattered nature of the islands of concern and the vastness of the Great Lakes. However, the diverse ownership pattern on many of the islands lends itself to many potential partners once the expansion is approved. For example, many of the islands contain at least some state property, which opens the doors to coordinating with Wisconsin and Michigan state conservation agencies. The Bureau of Land Management, U. S. Coast Guard, and other agencies divest properties from time to time making them ideal for coordination, as has been the case in the past.

The Service coordinated with several agencies to gather data as input for the model used to prioritize islands for acquisition. TNC has been involved with island transfers and other island acquisitions in the past. Data from TNC's *Islands of Life* study was used as a basis for the model providing digitized islands as well as many attributes associated with them. The University of Minnesota contributed to the analysis for this proposal through the data collected from colonial nesting waterbird surveys. The UMR/GLRJV provided guidance for this proposal regarding focal colonial nesting waterbirds. Also, threatened and endangered species

information was provided through the Natural Heritage Inventory data from Wisconsin and Michigan.

And finally, there are several “islands” FWS Friends Groups who have rallied behind expansion of these two refuges and support the criteria used to prioritize islands for acquisition.

Sociocultural Impacts

There are no anticipated negative sociocultural impacts associated with this proposal; however, there may be some positive impacts. Acquisition of the priority islands by the Service may prevent them from being developed. This may result in a slight improvement to public health (water quality) and safety (fewer roads, airports, congestion, etc.). Acquisition of the priority islands may also allow for some public use that currently does not exist due to private ownership. This may result in a slight increase in recreational opportunities for the general public. Public use opportunities will, however, be very situational given the sensitivity of the species and habitats on the islands that are being acquired. Furthermore, if any of the islands acquired contain cultural resources or heritage assets including archaeological sites, buildings and structures, landscapes, objects, and historic documents, they will be protected in perpetuity along with the rare species and habitats of concern.

Strategic Habitat Conservation

This proposal has been developed with a Strategic Habitat Conservation framework:

Biological Planning

Federal trust and other species and habitats of interest have been identified as well as population objectives for some focal species earlier in this document, including: Piping Plover, Hine’s emerald dragonfly (critical habitat), Pitcher’s thistle, Houghton’s goldenrod, dwarf lake iris, eastern massasauga rattlesnake, Common Tern, Forester’s Tern, Black-crowned Night-Heron, Black Tern, alvars, wetlands, and limestone plain forest complexes.

Conservation Design

Islands within the approved study areas from the two PPPs were prioritized by determining species and habitats of interest. These species and habitats of interest formed the three criteria that were used to drive a model. This model, which included a ranking of islands considered a priority, produced an organized list of priority islands for future acquisition.

Conservation Delivery

This planning process was used to determine the best approach (e.g., fee title, easement, partnership, etc.) to protect and restore essential habitat for the species of interest as well as other underrepresented and unique habitats through the possible expansion of two refuges.

Assumption-driven Research and Outcome-based Monitoring

If this proposal is approved and the two refuges are expanded, management activities (or lack thereof in the case of disturbance being a big threat to colonial nesting waterbirds, etc.) and

their effect on the species and habitats of interest will be evaluated, so the assumptions made from the previous planning can be adapted and refined as necessary. “Lessons learned” will be shared and utilized for improvement of future management decisions.

Literature Cited

Henson, B. L., D. T. Kraus, M. J. McMurtry and D. N. Ewert. 2010. *Islands of Life: A Biodiversity and Conservation Atlas of the Great Lakes Islands*. Nature Conservancy of Canada. 154 pp.

U.S. Fish and Wildlife Service. 2008. *Birds of Conservation Concern 2008*. United States.

U. S. Fish and Wildlife Service. 2011. *Conserving the Future: Wildlife Refuges and the Next Generation*. United States.

Vigmostad, K. E., F. Cuthbert, D. Ewert, D. Kraus, M. Seymour, and L. Wires. 2007. *Great Lakes Islands: Biodiversity Elements and Threats. A Final Report to the Great Lakes National Program Office of the Environmental Protection Agency*. 70 pp.

Wires, L. R., S. J. Lewis, G. J. Soulliere, S. W. Matteson, D. V. “Chip” Weseloh, R. P. Russell, and F. J. Cuthbert. 2010. *Upper Mississippi River/Great Lakes Region Waterbird Conservation Strategy. A plan associated with the Waterbird Conservation for the Americas Initiative. Final Report submitted to the U. S. Fish and Wildlife Service, Fort Snelling, MN.*

More detailed information on the sources for data used in this document and the spatial analysis completed can be found in the project file.

Figure C-1: Great Lakes Islands Expansion Approved Study Area



Figure C-2: Priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges, Saginaw Bay Area

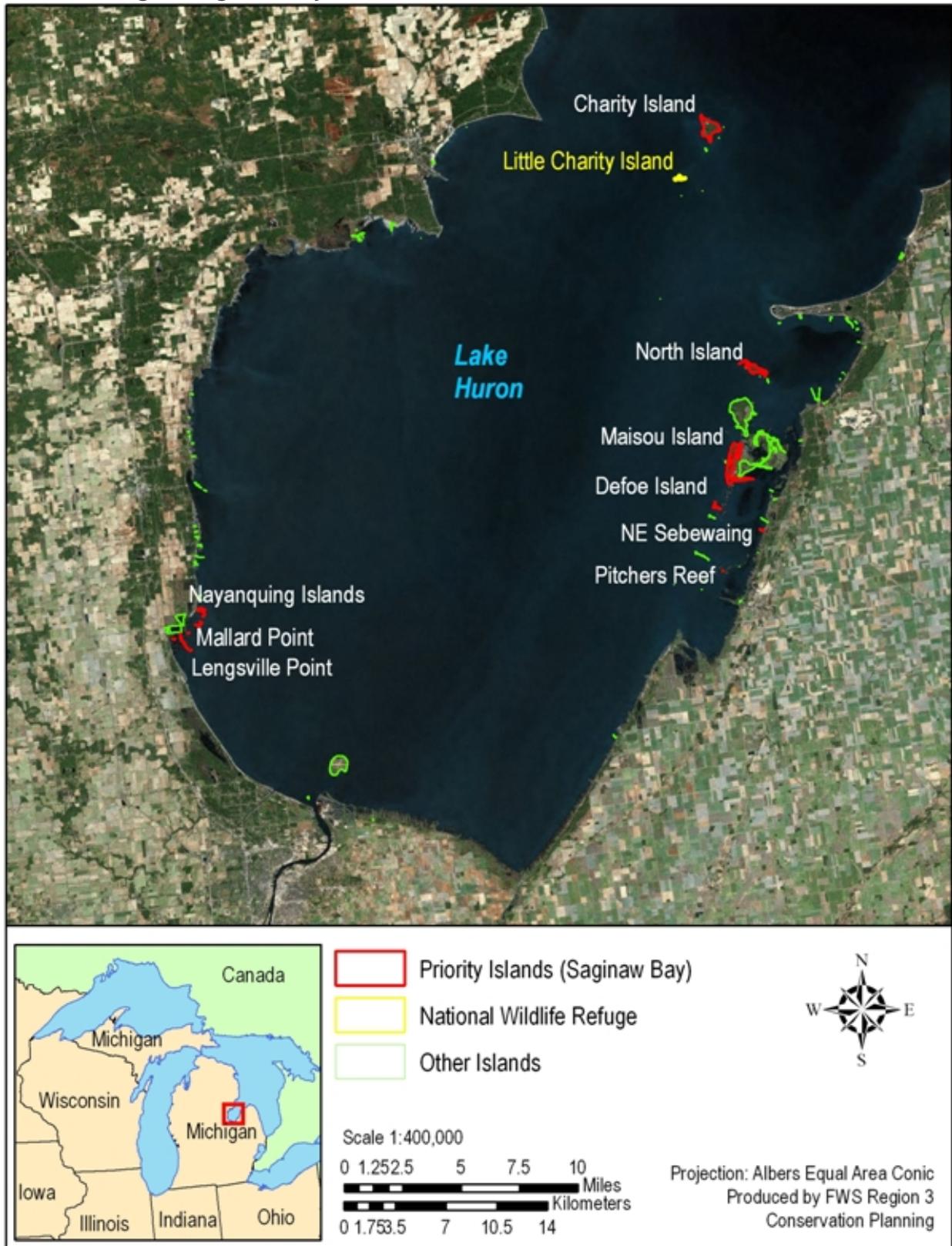


Figure C-3: Priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges, Thunder Bay Area

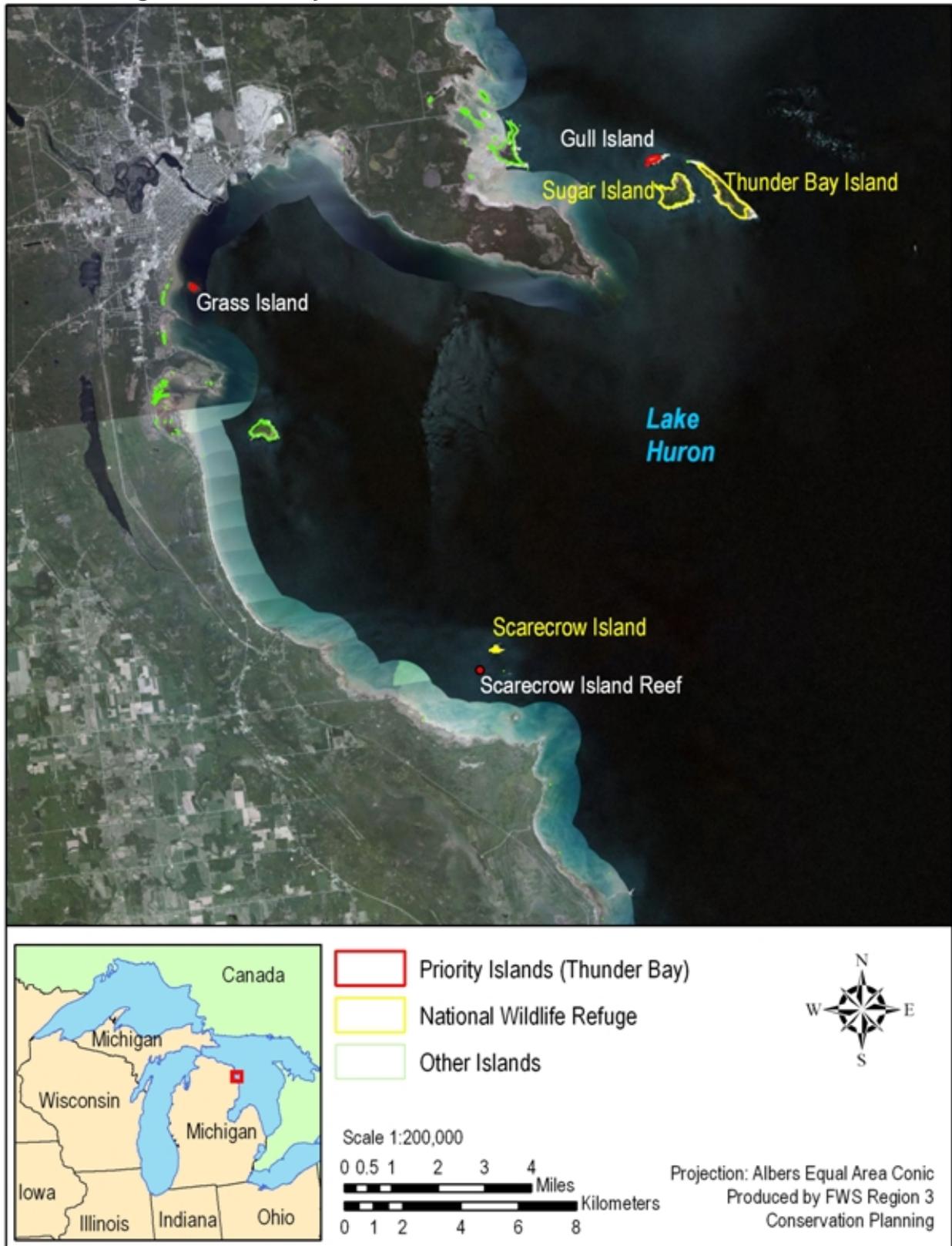


Figure C-4: Priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges, Green Bay Area

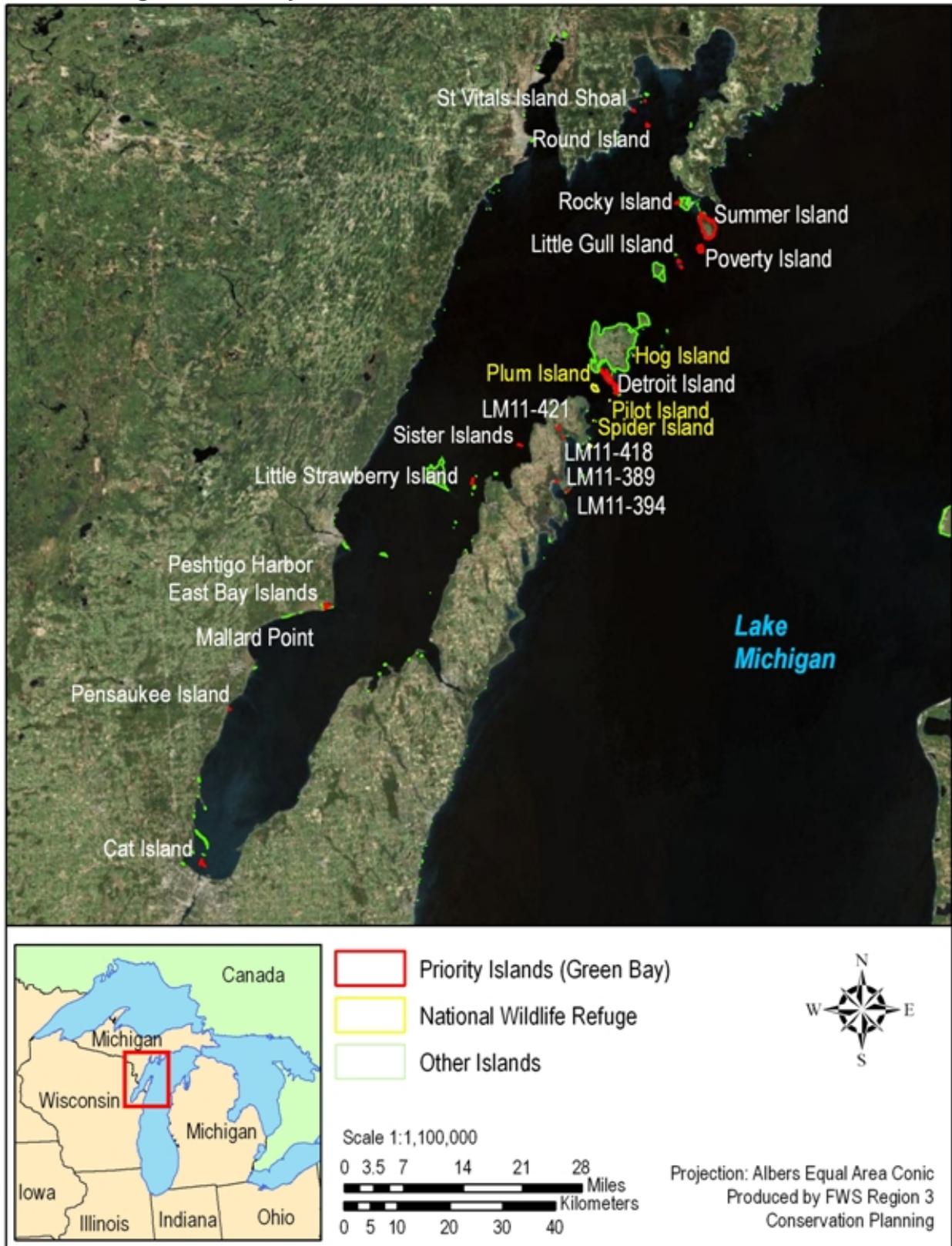


Figure C-5: Priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges, Northern Lake Huron Area

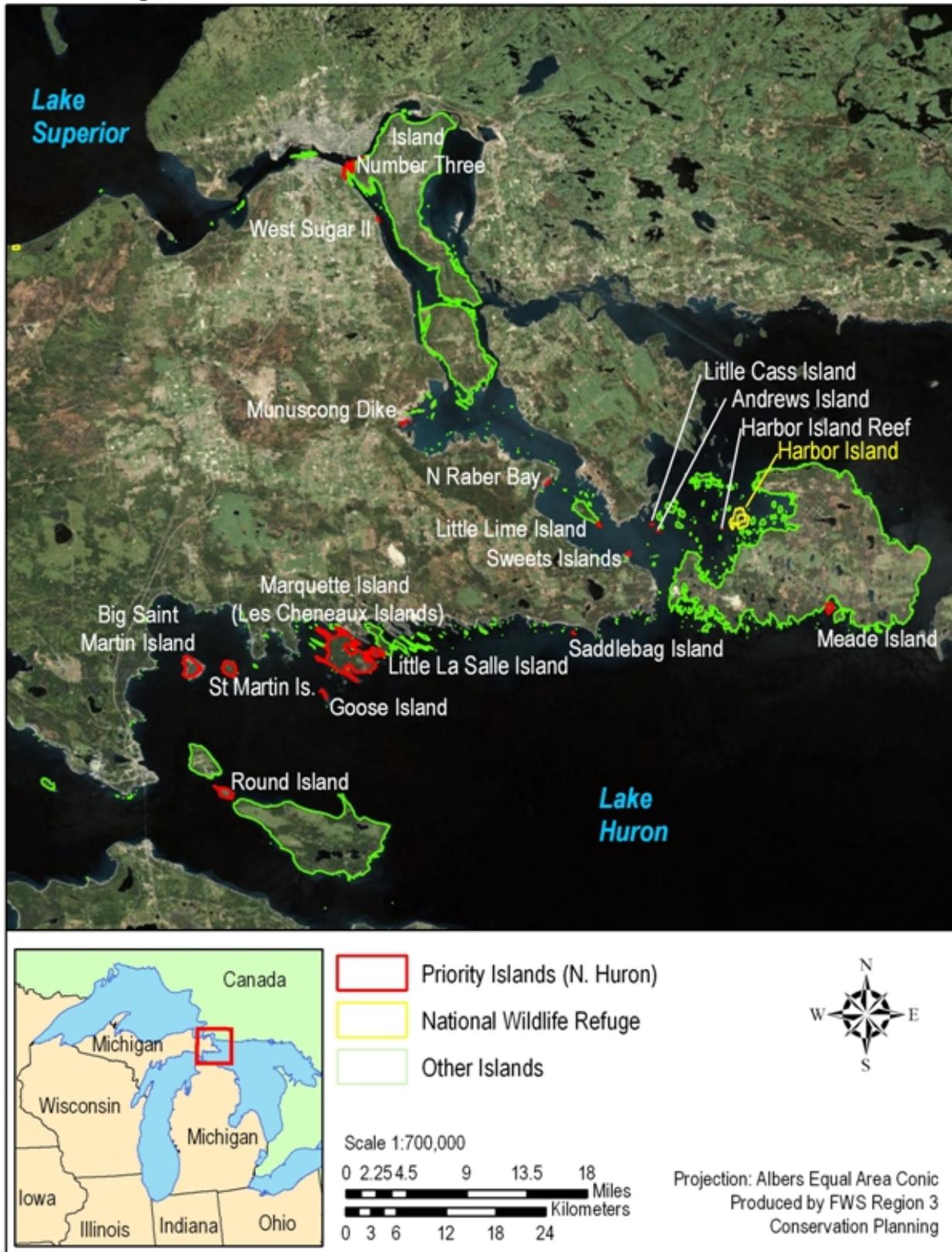


Figure C-6: Priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges, Northern Lake Michigan Area

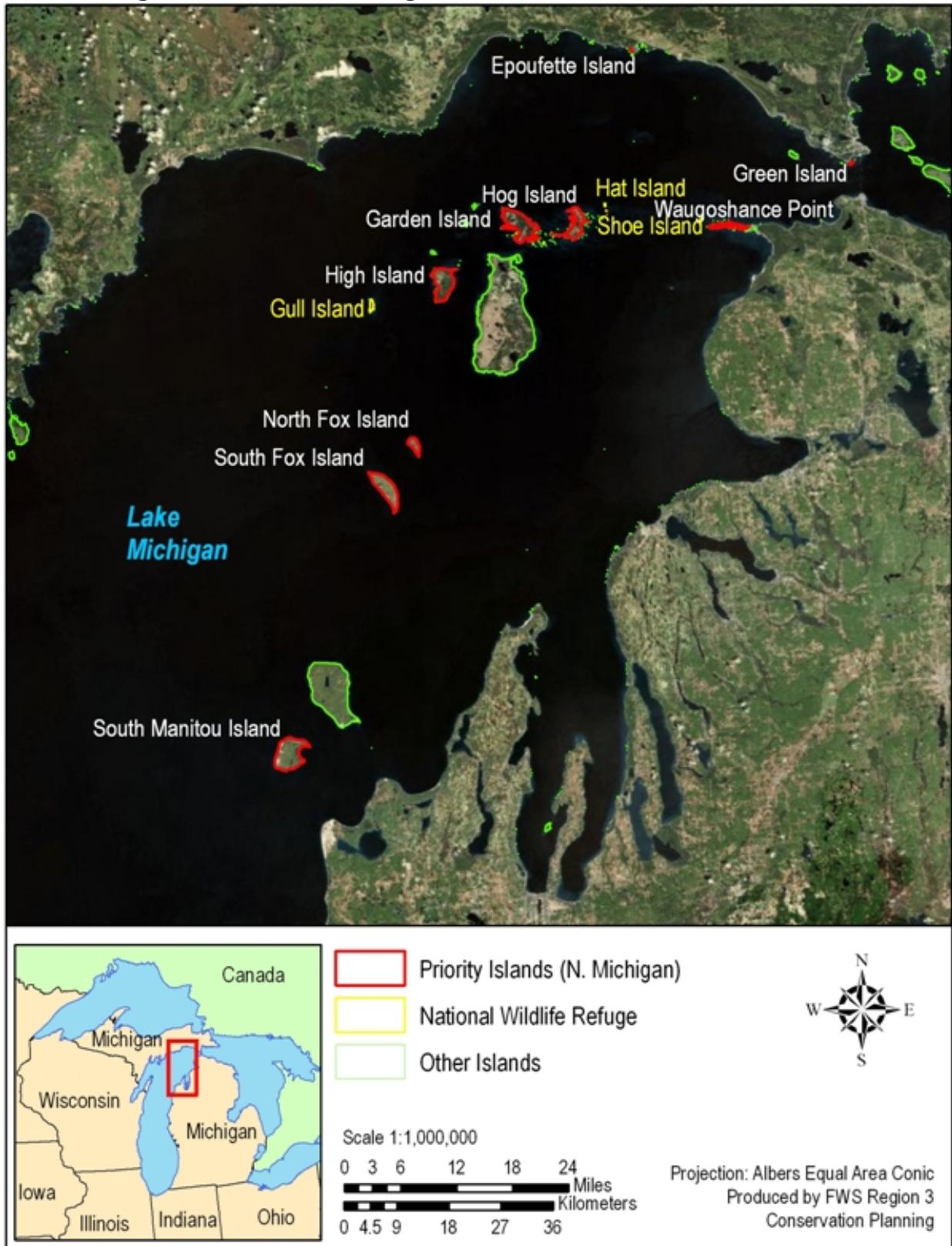


Table C-1: Birds of Conservation Concern (BCC) for Region 3 of the U.S. Fish and Wildlife Service that occur within Bird Conservation Regions (BCR) 12 and 23 and the project area

American Ornithologists Union Code	Common Name	Scientific Name	Primary Habitat
HOGR	Horned Grebe	<i>Podiceps auritus</i>	Wetland
AMBI	American Bittern	<i>Botaurus lentiginosus</i>	Wetland
BAEA	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Lake
YERA	Yellow Rail	<i>Coturnicops noveboracensis</i>	Wetland
SOSA	Solitary Sandpiper	<i>Tringa solitaria</i>	Wetland
UPSA	Upland Sandpiper	<i>Bartramia longicauda</i>	Grassland
WHIM	Whimbrel	<i>Numenius phaeopus</i>	Wetland
REKN	Red Knot (<i>rufa</i>)	<i>Calidris canutus rufa</i>	Wetland
BBSA	Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	Grassland
SBDO	Short-billed Dowitcher	<i>Limnodromus griseus</i>	Wetland
BBCU	Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Shrub-Forest
SEOW	Short-eared Owl	<i>Asio flammeus</i>	Grassland
WPWI	Whip-poor-will	<i>Caprimulgus vociferus</i>	Shrub-Forest
OSFL	Olive-sided Flycatcher	<i>Contopus cooperi</i>	Wetland-Coniferous Forest
WOTH	Wood Thrush	<i>Hylocichla mustelina</i>	Deciduous Forest
GWWA	Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Shrub-Wetland
CAWA	Canada Warbler	<i>Wilsonia canadensis</i>	Mixed Forest
NSTS	Nelson's Sparrow	<i>Ammodramus nelsoni</i>	Wetland-Grassland
SMLO	Smith's Longspur	<i>Calcarius pictus</i>	Grassland
RUBL	Rusty Blackbird	<i>Euphagus carolinus</i>	Wetland-Forest

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Table C-2: Summary of the proposed action: Attributes used to determine and rank sixty-three priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges

TNC Complex Number	TNC Complex Name	Houghton's Goldenrod	Dwarf Lake Iris	Pitcher's Thistle	Hine's Emerald Dragonfly	Hine's Emerald Dragonfly Critical Habitat	Piping Plover	Eastern Massasauga Rattlesnake	Key Ecological Systems (#)	Colonial Nesting Waterbird (AOU code)	Birds of Conservation Concern (AOU code)	Priority Rank
LM11-394		no	no	no	no	yes	no	no	2			1.4
LM11-418		no	no	no	no	yes	no	no	2			1.4
LM11-421		no	no	no	no	yes	no	no	2			1.4
LH5-1333	Charity Island	no	no	yes	no	no	no	yes	1	COTE	BAEA	1.4
LM12-1435	Hog Island	yes	yes	yes	no	no	no	no	2		BAEA	1.3
LH10-1323	Big Saint Martin Island	yes	yes	no	no	no	no	no	3		BAEA	1.3
LH10-1324	Saint Martin Island	yes	yes	no	no	no	no	no	3		BAEA	1.3
LM12-1436	Garden Island	yes	no	yes	no	no	no	no	3		BAEA	1.3
LH5-1337	Maisou Island	no	no	no	no	no	no	no	2	COTE	BAEA	1.2
LM9-274	Cat Island	no	no	no	no	no	no	no	1	COTE, BCNH		1.2
LM9-344	Peshtigo Harbor E. Bay	no	no	no	no	no	no	no	3	COTE		1.1
LM12-1438	Waugoshance Island	no	no	no	no	no	yes	no	2	COTE		1.1
LM13-1272	South Manitou Island	no	no	yes	no	no	no	no	2		BAEA	0.9
LM12-1443	High Island	no	no	yes	no	no	yes	no	1		BAEA	0.9
LM13-1270	South Fox Island	no	no	yes	no	no	yes	no	1		BAEA	0.9
LH10-719	Goose Island	no	no	no	no	no	no	no	2	BCNH		0.9
LH5-127	Lengsville Point	no	no	no	no	no	no	no	2	FOTE		0.9
LH5-128	Mallard Point	no	no	no	no	no	no	no	2	FOTE		0.9
LH5-129	Cattails E. of Pitchers Reef	no	no	no	no	no	no	no	2	FOTE		0.9
LH5-133	Nayanquing Offshore	no	no	no	no	no	no	no	2	FOTE		0.9
LH5-136	Northeast	no	no	no	no	no	no	no	2	FOTE		0.9

TNC Complex Number	TNC Complex Name	Houghton's Goldenrod	Dwarf Lake Iris	Pitcher's Thistle	Hine's Emerald Dragonfly	Hine's Emerald Dragonfly Critical Habitat	Piping Plover	Eastern Massasauga Rattlesnake	Key Ecological Systems (#)	Colonial Nesting Waterbird (AOU code)	Birds of Conservation Concern (AOU code)	Priority Rank
	Sebewaing											
LH5-142	Defoe Island	no	no	no	no	no	no	no	2	FOTE		0.9
LH9-773	Saddlebag Island	no	no	no	no	no	no	no	2	BCNH		0.9
LM12-942	Epoufette Island	no	no	no	no	no	no	no	2	BCNH		0.9
LS5-1014	North Raber Bay	no	no	no	no	no	no	no	2	BLTE		0.9
LS5-1076	West Sugar II	no	no	no	no	no	no	no	2	COTE		0.9
LS5-1090	Island Number Three	no	no	no	no	no	no	no	2	COTE		0.9
LS5-964	Little Lime Island	no	no	no	no	no	no	no	2	COTE		0.9
LS6-1037	North of Munuscong River	no	no	no	no	no	no	no	2	BLTE		0.9
LS6-1038	Munuscong Dike	no	no	no	no	no	no	no	2	BLTE		0.9
LS6-917	Sweets Islands	no	no	no	no	no	no	no	2	COTE		0.9
LH5-1334	North Island	no	no	no	no	no	no	yes	3			0.8
LM12-1437	Temperance Island	no	no	no	no	no	yes	no	3			0.8
LM10-606	Round Island	no	no	no	no	no	no	no	0	BCNH	BAEA	0.8
LH10-1322	Little La Salle Island	no	yes	yes	no	no	no	no	2			0.8
LH10-824	Pleasant Point	yes	yes	no	no	no	no	no	2			0.8
LM11-1461	Detroit Island	no	yes	no	no	no	no	no	1		BAEA	0.7
LM13-1269	North Fox Island	no	no	yes	no	no	no	no	1		BAEA	0.7
LM10-400	Little Strawberry Island	no	no	no	no	no	no	no	1	BCNH		0.7
LM10-416	Sister Islands	no	no	no	no	no	no	no	1	BCNH		0.7
LM9-308	Pensaukee Island	no	no	no	no	no	no	no	1	COTE		0.7
LH10-1439	Waugoshance Point	no	no	no	no	no	yes	no	2			0.6

TNC Complex Number	TNC Complex Name	Houghton's Goldenrod	Dwarf Lake Iris	Pitcher's Thistle	Hine's Emerald Dragonfly	Hine's Emerald Dragonfly Critical Habitat	Piping Plover	Eastern Massasauga Rattlesnake	Key Ecological Systems (#)	Colonial Nesting Waterbird (AOU code)	Birds of Conservation Concern (AOU code)	Priority Rank
LM11-1445	Summer Island	no	yes	no	no	no	no	no	2			0.6
LM11-389		no	yes	no	no	no	no	no	2			0.6
LM12-609		no	no	no	no	no	yes	no	2			0.6
GB6-939	Harbor Island Reef	no	no	no	no	no	no	no	0	COTE		0.5
GB6-944	Andrews Island	no	no	no	no	no	no	no	0	COTE		0.5
GB6-954	Little Cass Island	no	no	no	no	no	no	no	0	COTE		0.5
LH10-692	Green Island	no	no	no	no	no	no	no	0	BCNH		0.5
LH5-202	Charity Island	no	no	no	no	no	no	no	0	BCNH		0.5
LH6-326	Scarecrow Island	no	no	no	no	no	no	no	0	COTE		0.5
LH7-351	Grass Island	no	no	no	no	no	no	no	0	BCNH		0.5
LH7-358	Gull Island	no	no	no	no	no	no	no	0	BCNH		0.5
LM10-537	Rocky Island	no	no	no	no	no	no	no	0	BCNH		0.5
LM10-652	Shoal South of Martin Bay	no	no	no	no	no	no	no	0	COTE		0.5
LM10-673	St Vitals Island Shoal	no	no	no	no	no	no	no	0	COTE		0.5
LM11-501	Little Gull Island	no	no	no	no	no	no	no	0	BCNH		0.5
LM11-504	Gull Island	no	no	no	no	no	no	no	0	BCNH		0.5
LM12-675	Shoe Island	no	no	no	no	no	no	no	0	BCNH		0.5
LH8-1326	Round Island	no	yes	no	no	no	no	no	1			0.4
LM11-1446	Poverty Island	no	yes	no	no	no	no	no	1			0.4
LH9-1309	Meade Island	no	yes	no	no	no	no	no	0			0.2

Table C-3: Summary of the proposed action: Other attributes of sixty-three priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Type of Protection	Type of Acquisition	NWR to Expand
LH10-1316	Marquette Island	4,420	0.0	1	0	74	26	no	65	28	Less-Than-Fee Title	any	Michigan Islands
LM11-394		1	0.0	0	0	100	0	no	1	1	Less-Than-Fee Title	any	Green Bay
LM11-418		1	0.0	0	0	100	0	no	0	1	Less-Than-Fee Title	any	Green Bay
LM11-421		2	0.0	1	0	100	0	no	2	0	Less-Than-Fee Title	any	Green Bay
LH5-1333	Charity Island	267	0.0	0	77	11	11	yes	16	0	Fee Title	any	Michigan Islands
LM12-1435	Hog Island	2,272	0.0	0	100	0	0	no	36	1	Less-Than-Fee Title	any	Michigan Islands
LH10-1323	Big Saint Martin Island	822	0.0	2	0	100	0	no	34	33	Less-Than-Fee Title	any	Michigan Islands
LH10-1324	Saint Martin Island	505	0.0	0	0	100	0	no	31	36	Less-Than-Fee Title	any	Michigan Islands
LM12-1436	Garden Island	4,580	0.0	1	98	2	0	no	75	1	Less-Than-Fee Title	any	Michigan Islands
LH5-1337	Maisou Island	298	0.0	1	99	1	0	no	12	12	Fee Title	any	Michigan Islands
LM9-274	Cat Island	11	0.0	0	0	100	0	no	1	62	Fee Title	any	Green Bay
LM9-344	Peshtigo Harbor E. Bay	30	0.0	0	0	100	0	no	0	3	Fee Title	any	Green Bay
LM12-1438	Waugoshance Island	226	0.0	0	99	1	0	no	11	11	Fee Title	any	Michigan Islands
LM13-1272	South Manitou Island	5,308	0.4	15	68	32	0	yes	425	41	Less-Than-Fee Title	any	Michigan Islands
LM12-1443	High Island	3,587	0.0	1	100	0	0	no	238	7	Fee Title	any	Michigan Islands
LM13-1270	South Fox Island	3,434	0.0	0	35	65	0	yes	351	34	Fee Title	any	Michigan Islands
LH10-719	Goose Island	20	0.0	0	0	100	0	no	14	3	Fee Title	any	Michigan Islands
LH5-127	Lengsville Point	8	0.0	0	0	100	0	no	2	50	Fee Title	any	Michigan Islands
LH5-128	Mallard Point	1	0.0	0	0	100	0	no	2	50	Fee Title	any	Michigan Islands
LH5-129	Cattails E. of Pitchers	0	0.0	0	0	100	0	no	0	7	Fee Title	any	Michigan Islands

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Type of Protection	Type of Acquisition	NWR to Expand
	Reef												
LH5-133	Nayanquing Offshore	7	0.0	0	0	100	0	no	1	55	Fee Title	any	Michigan Islands
LH5-136	Northeast Sebewaing	1	0.0	0	0	100	0	no	0	3	Fee Title	any	Michigan Islands
LH5-142	Defoe Island	11	0.0	0	96	4	0	no	6	41	Fee Title	any	Michigan Islands
LH9-773	Saddlebag Island	5	0.0	0	84	16	0	no	0	57	Fee Title	any	Michigan Islands
LM12-942	Epoufette Island	4	0.0	0	0	100	0	no	7	3	Fee Title	any	Michigan Islands
LS5-1014	North Raber Bay	1	0.0	0	19	81	0	no	0	3	Fee Title	any	Michigan Islands
LS5-1076	West Sugar II	5	0.0	0	0	100	0	no	4	11	Fee Title	any	Michigan Islands
LS5-1090	Island Number Three	60	0.0	1	0	99	1	no	17	1	Fee Title	any	Michigan Islands
LS5-964	Little Lime Island	15	0.0	0	99	1	0	no	11	28	Fee Title	any	Michigan Islands
LS6-1037	North of Munuscong River	0	0.0	0	0	100	0	no	0	36	Fee Title	any	Michigan Islands
LS6-1038	Munuscong Dike	8	0.0	0	88	12	0	no	0	5	Fee Title	any	Michigan Islands
LS6-917	Sweets Islands	3	0.0	0	0	100	0	no	2	35	Fee Title	any	Michigan Islands
LH5-1334	North Island	129	0.0	1	0	100	0	no	16	8	Fee Title	any	Michigan Islands
LM12-1437	Temperance Island	221	0.0	0	98	2	0	no	11	13	Fee Title	any	Michigan Islands
LM10-606	Round Island	34	0.0	0	0	100	0	no	9	14	Fee Title	any	Green Bay
LH10-1322	Little La Salle Island	273	0.0	1	0	61	39	no	21	28	Less-Than-Fee Title	any	Michigan Islands
LH10-824	Pleasant Point	1	0.0	2	0	100	0	no	1	35	Less-Than-Fee Title	any	Michigan Islands
LM11-1461	Detroit Island	639	0.3	17	0	100	0	no	82	27	Less-Than-Fee Title	any	Green Bay
LM13-1269	North Fox Island	832	0.0	0	100	0	0	no	168	35	Less-Than-Fee Title	any	Michigan Islands
LM10-400	Little Strawberry Island	15	0.0	0	0	100	0	no	12	3	Fee Title	any	Green Bay

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Type of Protection	Type of Acquisition	NWR to Expand
LM10-416	Sister Islands	6	0.0	0	0	100	0	no	2	55	Fee Title	any	Green Bay
LM9-308	Pensaukee Island	4	0.0	0	0	100	0	no	0	1	Fee Title	any	Green Bay
LH10-1439	Waugoshance Point	240	0.0	0	99	1	0	no	4	14	Fee Title	any	Michigan Islands
LM11-1445	Summer Island	2,205	0.0	0	58	42	0	no	119	16	Less-Than-Fee Title	any	Green Bay
LM11-389		0	0.0	0	0	100	0	no	0	53	Less-Than-Fee Title	any	Green Bay
LM12-609		15	0.0	0	98	2	0	no	3	18	Fee Title	any	Michigan Islands
GB6-939	Harbor Island Reef	0	0.0	0	0	100	0	no	0	19	Fee Title	any	Michigan Islands
GB6-944	Andrews Island	0	0.0	0	0	100	0	no	1	10	Fee Title	any	Michigan Islands
GB6-954	Little Cass Island	1	0.0	0	0	100	0	no	2	11	Fee Title	any	Michigan Islands
LH10-692	Green Island	12	0.0	0	0	100	0	no	10	4	Fee Title	any	Michigan Islands
LH5-202	Charity Island	17	0.0	0	98	2	0	no	16	38	Fee Title	any	Michigan Islands
LH6-326	Scarecrow Island	0	0.0	0	0	100	0	no	0	9	Fee Title	any	Michigan Islands
LH7-351	Grass Island	5	0.0	0	0	100	0	no	1	11	Fee Title	any	Michigan Islands
LH7-358	Gull Island	15	0.0	0	0	100	0	no	10	23	Fee Title	any	Michigan Islands
LM10-537	Rocky Island	26	0.0	0	0	4	96	no	11	33	Fee Title	any	Green Bay
LM10-652	Shoal South of Martin Bay	0	0.0	0	0	100	0	no	0	30	Fee Title	any	Green Bay
LM10-673	St Vitals Island Shoal	0	0.0	0	0	100	0	no	0	30	Fee Title	any	Green Bay
LM11-501	Little Gull Island	10	0.0	0	0	100	0	no	13	8	Fee Title	any	Green Bay
LM11-504	Gull Island	20	0.0	0	0	100	0	no	12	10	Fee Title	any	Green Bay
LM12-675	Shoe Island	1	0.0	0	81	19	0	no	4	8	Fee Title	any	Michigan Islands
LH8-1326	Round Island	376	0.0	0	99	1	0	no	110	33	Less-Than-Fee Title	any	Michigan Islands
LM11-1446	Poverty Island	224	0.0	0	0	100	0	yes	53	35	Less-Than-Fee Title	any	Green Bay

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Type of Protection	Type of Acquisition	NWR to Expand
LH9-1309	Meade Island	162	0.0	2	0	100	0	no	24	8	Less-Than-Fee Title	any	Michigan Islands

Table C-4: Number of islands, acres, and privately owned acres for all Great Lakes islands (within the United States) within the Initial Focus Area^ as well as the priority islands

	Number of Islands	Acres	Privately Owned (Acres)
All Islands (Within the United States) in Initial Focus Area^	1,093	282,820	93,502
Priority Islands	63	31,426	11,264

^See figure C-1.

Table C-5: Major (and generally common) habitat types found on some of the priority islands for the expansion of Green Bay and Michigan Islands National Wildlife Refuges

General Island Areas	Major Habitat Types										
	Temperate Broadleaf Forest	Broadleaf Deciduous Forest	Woody Wetlands	Coniferous Forest	Beaches	Shrub / Scrub	Grasslands	Sand Plain Mixed Forests	Limestone Plain Coniferous Forests	Emergent Herbaceous Wetlands	Rock
Green Bay area (Peshtigo Harbor East Bay Islands)	X		X		X	X					
Mackinac and Eastern Door County area (Garden, Hog, High, Waugoshance and Rock Islands)	X		X		X		X				
Manitou and Fox Islands area (South Manitou, North Fox and South Fox Islands)		X			X						
Lake Huron northern coast area (Saint Martin, Marquette, and Waugoshance Point Islands)			X					X	X		
Saginaw Bay area (Charity, North and Maisou Islands)		X	X				X			X	X
Lake Huron northwest coast area (Round Island)		X	X	X							

Attachment 1: Attributes for the seven largest and more highly developed islands as well as Shelter Island (environmental contaminant site) that are not considered a priority but would have acquisition considered on a case by case basis (see figure C-1).

TNC Complex Number	TNC Complex Name	Houghton's Goldenrod	Dwarf Lake Iris	Pitcher's Thistle	Hine's Emerald Dragonfly	Hine's Emerald Dragonfly Critical Habitat	Piping Plover	Eastern Massasauga Rattlesnake	Key Ecological Systems (#)	Colonial Nesting Waterbird (AOU code)	Birds of Conservation Concern (AOU code)
LS5-1410	Sugar Island	no	no	no	no	no	no	no	2	COTE	BAEA
LM13-1271	North Manitou Island	no	no	yes	no	no	yes	no	2		BAEA
LS5-1416	Neebish Island	no	no	no	no	no	no	no	3	COTE, BLTE	BAEA
LM12-1442	Beaver Island	yes	yes	yes	no	no	yes	no	2		AMBI, BAEA
LH8-1327	Bois Blanc Island	yes	yes	yes	yes	yes	no	yes	2		AMB, IBAEA
LM10-1459	Washington Island	no	yes	no	yes	yes	no	no	3		UPSA
GB6-1305	Drummond Island	no	yes	no	no	no	no	no	3	BLTE	AMBI, BAEA, YERA
LH5-1341	Shelter Island	no	no	no	no	no	no	no	0	COTE, BCNH	

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR
LS5-1410	Sugar Island	31,574	1.9	572	0	90	10	no	322	25
LM13-1271	North Manitou Island	14,415	0.0	1	100	0	0	no	409	38
LS5-1416	Neebish Island	13,768	0.6	142	0	100	0	no	127	21
LM12-1442	Beaver Island	36,787	4.7	686	34	66	0	yes	215	3
LH8-1327	Bois Blanc Island	23,660	1.8	355	30	69	1	yes	112	34
LM10-1459	Washington Island	14,362	1.9	491	0	100	0	yes	175	27
GB6-1305	Drummond Island	83,258	2.2	730	55	44	2	no	184	1
LH5-1341	Shelter Island	292	0.0	0	0	100	0	no	29	18

Attachment 2: Attributes for all other islands within the Initial focus Area (see figure C-1).

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Key Ecological Systems (#)	Birds of Conservation Concern (AOU code)
LH9-885	Adelaide Island	6	0.0	0	0	100	0	No	6	20	0	
LS5-1067	Advance Island	2	0.0	0	0	100	0	No	1	19	2	
LM10-399	Adventure Island	34	0.0	0	0	100	0	No	5	10	1	
LS11-1141	Agate Point	6	0.0	0	0	100	0	No	0	7	1	
GB6-950	Andrews Island	14	0.0	0	0	100	0	No	3	1	0	
GB6-1428	Ashman Island	62	0.0	0	0	100	0	No	7	2	1	
LH6-214	Au Gres Coastal Marsh	2	0.0	0	0	100	0	No	1	14	0	
LS9-1384	Au Train Island	102	0.0	0	0	100	0	No	33	36	0	BAEA
GB6-952	Bacon Island	4	0.0	0	0	100	0	No	4	4	1	
LH4-223	Bald Eagle Point	5	0.0	0	0	100	0	No	2	1	0	
GB6-1429	Bald Island	75	0.0	0	0	100	0	No	22	0	0	
LM9-725	Bass Islands	24	0.0	0	0	100	0	No	0	40	2	
LS5-1004	Bass Reef Island	1	0.0	0	0	100	0	No	1	17	2	
LM2-312	Basset Island	1	0.0	0	0	100	0	No	0	4	2	
GB6-940	Bay Island	3	0.0	0	0	100	0	No	1	3	0	
LS7-1077	Bay Mills Point	1	0.0	0	0	100	0	No	0	52	0	
LH10-834	Bear Island	1	0.0	0	0	100	0	No	0	13	2	
LM13-491	Beaver Archipelago	0	0.0	0	0	100	0	No	0	22	0	
LM13-492	Beaver Archipelago	0	0.0	0	0	100	0	No	0	16	1	
LM13-485	Beaver Archipelago	0	0.0	0	0	100	0	No	0	48	0	
LM13-481	Beaver Archipelago	0	0.0	0	0	100	0	No	0	52	1	
LH10-1315	Beaver Tail Point	42	0.0	3	0	100	0	No	3	20	2	
LS6-829	Bellevue Island	74	0.0	0	0	63	37	No	10	10	0	
LM2-376	Bellow Island	5	0.0	2	0	6	94	No	4	2	0	
LM10-464	Big Susie Island	17	0.2	3	0	100	0	No	1	16	1	
GB6-1431	Big Trout Island	96	0.0	0	0	100	0	No	19	4	1	
LH10-844	Birch Island	14	0.0	0	0	100	0	No	4	38	2	
LH10-1321	Boot Island	138	0.0	2	0	48	52	No	9	24	2	
LH9-794	Bootjack Island	8	0.0	0	0	100	0	No	3	28	2	
GB6-1432	Boulanger Island	48	0.0	0	0	100	0	No	16	0	0	
GB6-927	Bow Island	7	0.0	0	0	100	0	No	4	0	1	
LH10-880	Burnham Island	1	0.0	0	0	100	0	No	0	27	2	
LH4-237	Burnt Cabin Point	17	0.0	0	0	100	0	No	4	47	0	
GB6-1418	Burnt Island	433	0.0	0	0	100	0	No	17	3	2	BAEA
LH10-860	Bush Bay Island	0	0.0	0	0	100	0	No	0	19	2	
LM9-699	Butlers Island	8	0.0	0	0	100	0	No	0	65	0	
GB6-983	Butterfield Island	35	0.0	0	0	100	0	No	7	30	0	BAEA
GB6-1427	Cass Island	87	0.0	0	0	100	0	No	3	5	1	
GB6-1420	Cedar Island	69	0.0	0	0	100	0	No	7	1	1	BAEA

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Key Ecological Systems (#)	Birds of Conservation Concern (AOU code)
LM10-1455	Chambers Island	2,820	0.7	55	0	100	0	Yes	18	29	3	BAEA
GB6-993	Cherry Island	2	0.0	0	0	100	0	No	3	1	1	
LH10-1318	Coryell Island	100	0.0	3	0	100	0	No	8	25	2	
LH9-875	Cove Island	2	0.0	0	0	100	0	No	0	14	0	
LH10-836	Cove Island	1	0.0	0	0	100	0	No	0	15	2	
LS6-817	Crab Island	5	0.0	0	0	100	0	No	0	58	0	
LH7-1329	Crooked Island	126	0.0	0	0	100	0	No	4	4	2	
LH10-820	Crow Island	3	0.0	0	0	100	0	No	3	19	2	
LS6-855	Small island in Whitney Bay	0	0.2	0	0	100	0	No	0	56	0	
LS6-866	Duck Island	21	0.5	6	0	100	0	No	7	25	1	
LH10-814	Eagle Island	5	0.0	0	0	100	0	No	0	32	2	
LS5-999	Edward Island	2	0.0	0	0	100	0	No	3	31	2	
LM12-923	Epoufette Island	6	0.0	0	0	100	0	No	2	17	0	
LH9-1313	Espanore Island	131	0.0	0	0	100	0	No	7	7	1	BAEA
GB6-884	Fairbank Island	2	0.0	0	0	100	0	No	1	3	0	
LM11-483	Fish Island	2	0.0	0	0	100	0	No	1	32	0	
LM1-427	Fisherman Island	11	0.0	0	58	42	0	No	3	9	1	
LM11-479	Fisherman Shoal	1	0.0	0	0	100	0	No	1	39	0	
LH4-229	Flat Rock Point	0	0.0	0	0	100	0	No	0	49	0	
LS6-865	Frying Pan Island	4	0.0	0	0	100	0	No	1	55	2	
LS6-1311	Garden Island	42	0.0	0	0	100	0	No	10	15	0	
LS9-1392	Garlic Island	6	0.0	0	0	100	0	No	0	27	0	
LS5-1078	Gem Island	2	0.0	0	0	100	0	No	0	19	2	
LH10-870	Goat Island	3	0.0	2	0	100	0	No	0	8	2	
LH10-1320	Government Island	224	0.0	0	0	100	0	No	11	26	2	
LS9-1382	Grand Island	13,563	0.4	12	100	0	0	Yes	120	19	3	BAEA
LS9-1386	Granite Island	5	0.0	0	0	100	0	No	0	27	0	
GB6-1430	Grape Island	83	0.0	0	0	100	0	No	13	1	1	
LH9-741	Gravel Island	23	0.0	0	0	100	0	No	4	9	1	BAEA
LM11-424	Gravel Island	1	0.0	0	0	100	0	No	0	50	2	
LM12-969	Gravel Island	1	0.0	0	0	100	0	No	0	2	0	
LM11-507	Gravelly Island	4	0.0	0	0	100	0	No	2	12	0	
LH10-779	Gravelly Island	8	0.0	0	0	100	0	No	4	18	2	
LM10-1454	Green Island	55	0.0	2	0	100	0	Yes	7	14	1	
LM13-1268	Gull Island	247	0.0	0	98	2	0	No	8	0	0	BAEA
GB6-924	Gull Island	18	0.0	0	0	100	0	No	7	1	0	
LH8-572	Gull Island	8	0.0	3	0	100	0	No	0	24	0	
LH5-109	Gull Island	3	0.0	0	0	100	0	No	0	12	2	

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LS6-1023	Gull Island	0	0.0	0	0	100	0	No	0	20	2	
LS10-1128	Gull Rock	0	0.0	0	0	100	0	Yes	1	30	0	
GB6-1000	Harris Island	23	0.0	0	0	100	0	No	5	3	0	
LS5-989	Hart Island	19	0.0	0	99	1	0	No	3	32	2	
LM12-684	Hat Island	15	0.0	0	93	7	0	No	2	24	0	
LM10-382	Hat Island	5	0.0	0	0	100	0	No	1	3	1	
LH10-873	Haven Island	1	0.0	0	0	100	0	No	0	24	2	
LH5-1335	Heisterman Island	570	0.0	0	99	1	0	No	5	10	4	BAEA
LS5-1057	Hen and Chicken Islands	32	0.0	0	0	100	0	No	0	31	2	
LM11-473	Hog Island	2	0.0	0	0	100	0	No	3	40	1	
LH10-838	Holsinger Island	0	0.0	0	0	100	0	No	1	16	2	
LM10-404	Horseshoe Island	30	0.0	0	0	100	0	No	9	3	1	
GB6-921	Howard Island	1	0.0	0	0	100	0	No	1	1	0	
LS10-1114	Huron NWR - Gull Island and Others	14	0.0	0	90	10	0	No	13	46	0	BAEA
LS10-1110	Huron NWR - Island off McIntyre Island	0	0.0	0	34	66	0	No	1	47	0	
LS10-1109	Huron NWR - Island off Lighthouse Island	0	0.0	0	0	100	0	No	0	47	0	
LS10-1108	Huron NWR - Islands next to Lighthouse Islands	10	0.0	0	72	28	0	No	25	1	0	BAEA
LS10-1113	Huron NWR - Lighthouse Island	44	0.0	1	86	14	0	Yes	44	43	0	
LS10-1112	Huron NWR - McIntyre Island	81	0.0	0	93	7	0	No	51	46	0	
LH10-816	Huron Point	2	0.0	0	0	100	0	No	0	3	2	
LS7-1088	Iroquois Island	6	0.0	0	0	100	0	No	2	6	0	
LS5-1086	Island Number Four	8	0.0	1	0	100	0	No	3	27	2	
LS5-1413	Island Number One (East)	69	0.0	1	0	100	0	No	4	37	2	
LS5-1415	Island Number One (West)	53	0.0	0	0	100	0	No	3	37	2	
LS5-1414	Island Number Two	60	0.0	0	0	100	0	No	4	37	2	
GB6-949	James Island	30	0.0	0	0	100	0	No	7	2	1	
GB6-951	Jim Island	1	0.0	0	0	100	0	No	1	1	0	
LS6-858	Jones Island	0	0.0	0	0	100	0	No	1	55	0	
LH10-1314	La Salle Island	1,037	0.0	1	0	100	0	No	23	27	2	
LS9-1390	Larus Island	2	0.0	0	0	100	0	No	11	58	0	
LH10-876	Avery Point Island	1	0.0	0	0	100	0	No	1	27	2	
LH10-868	Horse Rock Point	0	0.0	0	0	100	0	No	0	24	2	

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	Island											
LH10-770	Island south of Bosely Channel	1	0.0	0	0	100	0	No	0	2	2	
LH10-864	Island off of White Loon Island	0	0.0	0	0	100	0	No	2	19	2	
LS5-1421	Lime Island	908	0.0	1	99	1	0	No	33	10	2	BAEA
LH5-209	Little Charity Island	3	0.0	0	0	100	0	No	1	33	0	
LM12-959	Little Hog Island	3	0.0	0	0	100	0	No	2	25	0	
LM12-653	Little Island	14	0.0	0	99	1	0	No	3	6	0	
LH10-832	Little Island	3	0.0	0	0	100	0	No	2	37	2	
LS9-1391	Little Presque Isle	10	0.0	0	67	33	0	No	0	37	0	
LH10-749	Little Saint Martin Island	3	0.0	0	0	100	0	No	0	27	2	
LM10-1444	Little Summer Island	590	0.0	0	17	83	0	No	16	18	2	BAEA
GB6-938	Little Trout Island	8	0.0	0	0	100	0	No	4	8	0	
LH5-139	Lone Tree Island	5	0.0	0	94	6	0	No	2	46	2	
LH9-1310	Long Island	43	0.0	0	0	100	0	No	10	6	0	
GB6-977	Long Island	18	0.0	0	0	100	0	No	9	30	1	
LH10-1319	Long Island	70	0.0	3	0	100	0	No	4	32	2	
LM9-1451	Long Tail Point	79	0.0	0	0	100	0	Yes	0	65	1	BAEA
LS5-1001	Love Island	10	0.0	0	91	9	0	No	3	16	2	BAEA
LH10-1325	Mackinac Island	2,366	11.4	335	96	4	0	No	99	31	1	
GB6-1423	Macomb Island	232	0.0	0	0	100	0	No	25	4	1	
LH5-146	Maisou Island	1	0.0	0	67	33	0	No	2	2	2	
LS20-1267	Manitou Island	1,033	0.0	3	30	61	9	No	7	35	1	BAEA
GB6-1426	Maple Island	124	0.0	0	0	100	0	No	17	3	1	
LM2-1449	Marion Island	199	0.0	0	0	100	0	No	47	32	2	BAEA
LM9-379	Mekaunee Shoal	22	0.2	0	0	100	0	No	0	17	1	
LH5-1336	Middle Grounds Island - North	154	0.0	1	97	3	0	No	2	11	2	
LH5-1338	Middle Grounds Island - South	167	0.0	0	99	1	0	No	2	12	2	
LH7-1328	Middle Island	280	0.0	1	12	88	0	Yes	5	11	1	BAEA
LS9-1987	Middle Island	12	0.0	0	0	100	0	No	19	25	0	
LS6-1047	Moon Island	53	0.0	0	0	100	0	No	0	38	2	
LH10-882	Mortsen Point and Mill Pond Peninsula	2	0.0	0	0	100	0	No	2	27	2	
LS6-1044	Munuscong Island	26	0.0	0	0	100	0	No	0	36	2	
LS7-1087	Naomikong Island	0	0.0	0	0	100	0	No	1	54	0	
LM12-966	Naubinway Island	1	0.0	0	0	100	0	No	0	8	0	

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Key Ecological Systems (#)	Birds of Conservation Concern (AOU code)
LH5-1339	Nayanquing Point	68	0.0	3	100	0	0	No	1	48	2	
GB6-1003	Norris Island	6	0.0	0	0	100	0	No	4	8	0	
LH4-224	Orion Rock	1	0.0	0	0	100	0	No	0	2	0	
LH4-213	Oscube Point	3	0.0	0	0	100	0	No	0	54	0	
LS9-1385	Partridge Island	93	0.0	0	0	100	0	No	67	38	0	BAEA
GB6-1422	Peck Island	54	0.0	0	0	100	0	No	13	2	0	BAEA
LH10-767	Penny Island	2	0.0	0	0	100	0	No	0	2	2	
LS10-1107	Pequaming Point	1	0.0	2	0	100	0	No	1	30	0	
LM9-1452	Peshtigo Harbor Peninsula	113	0.0	2	94	6	0	No	1	31	2	
LH9-808	Peters Island	6	0.0	0	0	100	0	No	1	19	2	
GB6-886	Picnic Island	7	0.0	0	0	100	0	No	4	3	0	
LS9-1393	Picnic Rocks	2	0.0	0	0	100	0	No	10	9	0	
LS6-1028	Pilot Island	1	0.0	0	0	100	0	No	0	60	2	
LS6-1027	Pine Island	4	0.0	1	0	100	0	No	3	7	2	
LS6-893	Pipe Island	15	0.0	0	0	100	0	No	5	24	2	
LS6-903	Pipe Island Twins	1	0.0	0	0	100	0	No	2	53	2	
LM10-403	Pirate Island	0	0.0	0	0	100	0	No	0	3	1	
LM12-626	Pismire Island	2	0.0	2	89	11	0	No	0	3	0	
LH5-134	Pitchers Reef	9	0.0	1	0	100	0	No	2	46	2	
LS11-1137	Porters Island	19	0.0	0	66	34	0	No	0	24	1	
LS9-1388	Presque Isle Point Rocks	2	0.0	0	0	100	0	No	0	14	0	
GB6-979	Propeller Island	1	0.0	0	0	100	0	No	1	2	0	
LM10-322	Quarry Point	7	0.0	0	0	100	0	No	1	12	1	
LM10-314	Rileys Point	22	0.0	3	0	100	0	No	5	27	1	
LM11-1463	Rock Island	975	0.0	2	97	3	0	Yes	65	26	2	BAEA
LS5-1071	Rock Island	2	0.0	2	0	100	0	No	2	18	2	
LH10-874	Roger Island	1	0.0	0	0	100	0	No	5	25	2	
GB6-932	Rogg Island	67	0.0	0	0	100	0	No	7	0	1	
LH7-372	Round Island	24	0.0	0	0	100	0	No	3	4	2	
LS5-1009	Round Island	9	0.0	0	0	100	0	Yes	10	40	2	
LS5-1081	Round Island	8	0.0	0	0	100	0	No	8	12	0	
LH10-828	Rover Island	18	0.0	0	0	100	0	No	3	30	2	
GB6-1424	Rultand Island	72	0.0	0	0	100	0	No	23	2	1	
LH10-1433	Saint Helena Island	288	0.0	0	0	5	95	Yes	7	0	0	BAEA
LH10-871	Saint Ledger Island	13	0.0	3	0	100	0	No	3	10	2	
LM10-1448	Saint Martin Island - Northwest	1,358	0.0	0	0	100	0	Yes	53	10	1	BAEA
LM10-681	Saint Vital Island	23	0.0	0	96	4	0	No	3	4	0	

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GB6-907	Sam Island	2	0.0	0	0	100	0	No	3	1	0	
LM9-602	Sand Island	30	0.0	3	0	100	0	Yes	1	21	0	
GB6-913	Seastone Point	2	0.0	3	0	100	0	No	3	3	1	
LS11-1125	Sevenmile Point	0	0.0	0	0	100	0	No	0	18	0	
LH1-1312	Shelter Island	67	0.0	0	0	100	0	No	3	12	0	
LH9-775	Silver Island	9	0.0	0	0	100	0	No	3	3	0	
LM10-318	Snake Island	23	0.0	0	0	100	0	No	1	46	2	
LM10-590	Snake Island	9	0.0	0	0	100	0	No	0	30	0	
LM10-466	Snake Island	1	0.0	0	0	100	0	No	0	2	1	
LM11-410	Spider Island	18	0.0	0	0	100	0	No	4	52	2	
LM12-1434	Squaw Island	75	0.0	0	0	100	0	Yes	7	8	1	
GB6-925	Squaw Island	1	0.0	0	0	100	0	No	1	3	0	
GB6-962	Staltonstall Island	22	0.0	0	0	100	0	No	5	2	1	
GB6-965	Standerson Island	24	0.0	0	0	100	0	No	2	2	0	
LS6-1033	Steamboat Island	1	0.0	0	0	100	0	No	0	59	2	
LH7-353	Stony Point	4	0.0	0	0	100	0	No	0	0	1	
LS6-830	Strawberry Island	5	0.0	0	0	100	0	No	1	58	2	
LH10-1317	Strong's Island	100	0.0	3	0	100	0	No	7	24	2	
LH7-1331	Sugar Island	192	0.0	0	0	100	0	No	6	0	1	BAEA
LH7-1332	Sulphur Island	82	0.0	2	0	100	0	No	3	6	0	BAEA
LS6-847	Surgeon Island	2	0.0	0	0	100	0	No	3	10	0	
GB6-914	Surveyors Island	10	0.0	0	0	100	0	No	9	0	0	
LS7-1096	Tahquamenon Island	2	0.0	2	0	100	0	No	1	54	0	
LS10-1381	Traverse Island	91	0.0	0	0	100	0	No	15	36	0	BAEA
LM12-1441	Trout Island	85	0.0	0	0	100	0	No	4	8	0	
LS5-1019	Twin Island	2	0.0	2	0	100	0	No	0	19	2	
GB6-984	Twin Sister Island	3	0.0	0	0	100	0	No	1	3	0	
LS5-1040	Two Tree Island	1	0.0	0	0	100	0	No	0	15	2	
LH10-747	Voight Bay Islands	2	0.0	0	0	100	0	No	0	20	2	
LM12-1440	Whisky Island	90	0.0	0	0	100	0	No	6	8	1	BAEA
LH10-862	White Loon Island	0	0.0	0	0	100	0	No	1	19	2	
LS9-1091	Williams Island	32	0.0	0	0	100	0	No	6	14	0	BAEA
GB6-891	Willoughby Island	3	0.0	0	0	100	0	No	1	2	0	
GB6-1419	Wilson Island	163	0.0	0	0	100	0	No	10	2	1	
LS9-1383	Wood Island	196	0.0	0	0	100	0	No	21	14	0	BAEA
GB6-919	Wreck Island	1	0.0	0	0	100	0	No	2	1	0	
GB6-883	Young Island	2	0.0	0	0	100	0	No	1	6	0	
LM9-341		2	0.0	0	0	100	0	No	0	17	1	YERA

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LH5-1340		108	0.0	1	100	0	0	No	3	21	2	
LS5-1411		81	0.0	1	0	100	0	No	11	33	0	
LM9-1450		70	0.0	0	0	100	0	No	3	65	2	
LS5-1093		47	0.0	2	0	100	0	No	10	24	0	
LM9-294		41	0.0	1	95	5	0	No	1	25	0	
LS5-1083		38	0.0	0	0	100	0	No	0	21	0	
LH9-784		34	0.0	2	0	100	0	No	7	31	0	
LS6-1045		29	0.0	0	0	100	0	No	0	38	2	
LM9-278		28	0.0	0	0	100	0	No	0	34	1	
LM9-273		27	0.0	0	0	100	0	No	0	14	1	
LS5-1059		25	0.0	0	0	100	0	No	0	38	2	
LS5-1085		25	0.0	1	0	100	0	No	3	25	2	
LS5-1098		19	0.0	0	0	100	0	No	0	26	2	
LH4-236		16	0.0	1	0	100	0	No	4	47	0	
LM10-320		15	1.5	9	0	100	0	No	2	25	1	
LH7-346		14	0.0	0	0	100	0	No	0	2	1	
LM9-328		14	0.0	0	0	100	0	No	2	7	0	
LS5-1062		13	0.0	0	0	100	0	No	0	17	2	
LS5-1051		12	0.0	0	0	100	0	No	0	39	2	
LH5-198		12	0.0	0	35	65	0	No	1	16	2	
LH10-856		12	0.0	0	0	14	86	No	3	8	2	
LH5-171		11	0.0	1	0	100	0	No	2	25	2	
LS6-1048		11	0.0	0	0	100	0	No	0	39	2	
LM9-339		10	0.0	0	0	100	0	No	1	15	1	
LH10-787		10	0.0	1	0	100	0	No	0	16	2	
LM9-282		10	0.0	0	0	100	0	No	0	8	1	
LH5-149		10	0.0	0	94	6	0	No	2	19	2	
LM9-563		10	0.0	0	57	43	0	No	1	68	3	
LH10-869		9	0.0	0	0	100	0	No	3	7	2	
LH5-147		8	0.0	0	0	100	0	No	1	33	2	
LM11-364		8	0.0	0	0	100	0	No	1	2	2	
LM9-285		8	0.0	0	0	100	0	No	0	25	1	
LH4-156		8	0.0	0	0	100	0	Yes	1	23	0	
LH10-901		8	0.0	0	50	50	0	No	0	8	2	
LM10-474		7	0.4	1	0	100	0	No	1	15	1	
LH4-168		7	0.2	0	0	100	0	No	0	60	0	
LS11-1138		6	0.0	0	0	100	0	No	10	16	1	
LS6-1041		6	0.0	0	0	100	0	No	0	58	2	
LH4-228		6	0.0	0	0	100	0	No	0	2	0	
LH1-720		6	0.0	0	0	100	0	No	1	0	0	
LH5-152		5	0.0	1	0	100	0	No	1	2	2	
LH5-153		5	0.0	0	0	100	0	No	2	3	2	
LH10-598		5	0.0	0	16	84	0	No	0	3	3	

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LH4-234		5	0.0	0	0	100	0	No	4	8	0	
GB6-998		5	0.0	0	0	100	0	No	1	21	1	
LH10-588		5	0.0	0	0	100	0	No	0	1	2	
LS5-1058		4	0.0	0	0	100	0	No	0	36	2	
LH9-735		4	0.0	0	0	100	0	No	0	6	0	
LH7-348		4	0.0	0	0	100	0	No	0	2	1	
LM12-948		4	0.0	0	0	100	0	No	2	36	1	
LH10-709		4	0.0	0	0	100	0	No	0	25	2	
LM12-630		4	0.0	1	0	100	0	No	0	1	0	
LH5-200		4	0.0	0	0	100	0	No	3	15	0	
LH5-175		4	0.0	0	0	100	0	No	2	24	2	
LH5-182		4	0.0	0	0	100	0	No	1	35	1	
LS5-1094		4	0.0	2	0	100	0	No	0	0	2	
LH4-231		4	0.0	0	0	100	0	No	1	49	0	
LH5-143		4	0.0	0	0	100	0	No	2	12	2	
LM11-433		4	0.0	0	0	100	0	No	1	43	1	
LS10-1104		4	0.0	0	0	100	0	No	0	11	1	
LM12-718		3	0.0	0	0	100	0	No	0	3	0	
LS5-1065		3	0.0	1	0	100	0	No	3	17	2	
LH9-758		3	0.0	0	0	100	0	No	0	36	0	
GB6-992		3	0.0	0	0	100	0	No	1	23	1	
LS5-1054		3	0.0	0	0	100	0	No	0	26	2	
LH4-113		3	0.0	0	0	100	0	No	1	7	0	
LS5-1053		3	0.0	0	0	100	0	No	0	31	2	
LM9-722		3	0.0	0	0	100	0	No	3	60	2	
LH5-137		3	0.0	0	0	100	0	No	2	46	2	
LM9-672		3	0.0	0	0	100	0	No	0	65	0	
LH4-174		3	0.0	0	0	100	0	No	0	60	0	
LH10-843		3	0.0	0	0	100	0	No	3	32	2	
LH4-203		3	0.0	0	0	100	0	No	0	1	0	
LS5-1079		2	0.0	2	0	100	0	No	0	20	2	
LM12-723		2	0.0	0	0	100	0	No	0	23	0	
LM11-381		2	0.0	0	0	100	0	No	0	55	2	
LH7-373		2	0.0	0	0	100	0	No	0	5	3	
LS11-1136		2	0.0	0	0	100	0	No	0	16	0	
LS5-1011		2	0.0	0	94	6	0	No	0	18	2	
LS6-1043		2	0.0	0	99	1	0	No	0	31	2	
LH5-158		2	0.0	0	0	100	0	No	2	23	2	
LM9-275		2	0.0	0	0	100	0	No	0	2	1	
LH10-712		2	0.0	0	0	100	0	No	0	5	2	
GB6-970		2	0.0	0	0	100	0	No	1	2	0	
LM9-277		2	0.0	0	0	100	0	No	0	2	1	

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LS11-1142		2	0.0	0	0	100	0	No	0	18	1	
LH5-161		2	0.0	0	0	100	0	No	0	20	2	
LH4-232		2	0.0	0	0	100	0	No	0	10	0	
LH10-822		2	0.0	0	0	100	0	No	0	3	2	
LH5-112		2	0.0	0	0	100	0	No	0	47	2	
LH5-118		2	0.2	0	0	100	0	No	0	14	2	
LM11-414		2	0.0	0	0	100	0	No	0	51	2	
LH5-151		2	0.0	0	81	19	0	No	0	30	2	
LM12-945		2	0.0	0	0	100	0	No	0	52	2	
LH10-693		2	0.0	0	0	100	0	No	0	2	1	
LS6-912		2	0.0	0	0	100	0	No	1	52	2	
LS5-1097		2	0.0	0	0	100	0	No	0	27	2	
LH8-460		1	0.0	0	0	100	0	No	0	29	0	
LS5-1082		1	0.0	0	0	100	0	No	0	20	0	
LH9-793		1	0.0	0	91	9	0	No	0	14	2	
LH7-360		1	0.0	0	0	100	0	No	0	5	1	
LS10-1105		1	0.0	1	0	100	0	No	0	7	1	
LS6-819		1	0.0	0	0	100	0	No	1	57	2	
LH9-748		1	0.0	0	0	100	0	No	1	11	1	
LH5-144		1	0.0	0	0	100	0	No	2	46	2	
LM9-287		1	0.0	0	0	100	0	No	0	8	1	
LH5-170		1	0.0	0	0	100	0	No	1	32	2	
LH7-342		1	0.0	0	0	100	0	No	1	10	1	
LM12-585		1	0.0	0	0	100	0	No	0	26	0	
LM10-456		1	0.0	3	0	100	0	No	1	11	1	
LS11-1134		1	0.0	0	0	100	0	No	0	15	0	
LH5-150		1	0.0	0	88	12	0	No	2	30	2	
GB6-1008		1	0.0	0	0	100	0	No	1	2	0	
LH9-755		1	0.0	0	0	100	0	No	0	24	0	
LH9-840		1	0.0	0	0	100	0	No	0	54	0	
LM10-705		1	0.0	0	0	100	0	No	1	32	0	
LM12-647		1	0.0	0	96	4	0	No	0	1	0	
LH10-888		1	0.0	0	0	100	0	No	1	7	3	
LS6-906		1	0.0	0	0	100	0	No	1	24	2	
LH4-131		1	0.0	0	0	100	0	No	1	38	0	
LH4-218		1	0.0	0	0	100	0	No	0	17	0	
LS5-1073		1	0.0	0	0	100	0	No	0	19	2	
LM11-506		1	0.0	0	0	100	0	No	0	12	0	
LH5-140		1	0.0	0	0	100	0	No	2	46	2	
LM2-319		1	0.0	0	4	96	0	No	0	1	2	
LS5-1063		1	0.0	1	0	100	0	No	3	17	2	

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LH7-366		1	0.0	0	0	100	0	No	0	4	1	
LM13-560		1	0.0	0	0	100	0	No	0	10	0	
LH5-148		1	0.0	0	81	19	0	No	2	3	2	
LM1-405		1	0.0	0	0	100	0	No	1	7	0	
LM1-406		1	0.0	0	0	100	0	No	0	35	0	
LM10-363		1	0.0	0	0	100	0	No	0	31	1	
LH5-172		1	0.0	0	0	100	0	No	2	33	2	
LM9-688		1	0.0	0	0	100	0	No	0	18	0	
LH4-201		1	0.0	0	0	100	0	No	0	1	0	
LH5-135		1	0.0	0	0	100	0	No	0	33	2	
LM12-522		1	0.0	0	95	5	0	No	0	1	0	
LH5-173		1	0.0	0	0	100	0	No	2	31	2	
LH5-154		1	0.0	0	0	100	0	No	1	24	2	
LH5-159		1	0.0	0	0	100	0	No	0	26	2	
LH7-383		1	0.0	0	0	100	0	No	0	6	0	
LM11-511		1	0.0	0	0	100	0	No	0	5	1	
GB6-972		1	0.0	0	76	24	0	No	1	28	1	
LS5-1070		1	0.0	0	0	100	0	No	0	18	2	
LM10-541		1	0.0	0	0	100	0	No	0	3	0	
LS5-1095		1	0.0	3	0	100	0	No	0	2	2	
LS11-1143		1	0.0	0	0	100	0	No	0	13	0	
LS11-1135		1	0.0	0	0	100	0	No	0	18	0	
LS5-1072		1	0.0	0	0	100	0	No	0	19	2	
LH10-867		1	0.0	0	0	100	0	No	2	21	2	
LM9-290		1	0.0	0	0	100	0	No	0	8	0	
LH5-104		1	0.0	0	0	100	0	No	2	14	2	
LH4-123		1	0.0	0	0	100	0	No	1	37	0	
LS6-1020		1	0.0	0	0	100	0	No	0	4	2	
LS5-1069		1	0.0	0	0	100	0	No	0	18	2	
LS5-1017		1	0.0	0	0	100	0	No	0	19	2	
LM11-594		1	0.0	0	0	100	0	No	1	6	0	
LS5-1060		1	0.0	0	0	100	0	No	0	17	2	
LM10-370		1	0.0	0	0	100	0	No	0	12	1	
LM9-340		1	0.0	0	0	100	0	No	0	16	1	
LS11-1133		0	0.0	0	0	100	0	No	0	18	0	
LS5-1089		0	0.0	0	0	100	0	No	0	2	0	
LH5-165		0	0.0	0	0	100	0	No	2	22	2	
LH4-177		0	0.0	0	0	100	0	No	0	25	0	
LM12-941		0	0.0	0	0	100	0	No	0	10	0	
LH4-233		0	0.0	0	0	100	0	No	4	9	0	
LH9-771		0	0.0	0	0	100	0	No	1	2	0	

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LS5-1056		0	0.0	0	0	100	0	No	0	17	2	
LH4-183		0	0.0	0	0	100	0	No	0	36	0	
LH9-756		0	0.0	0	0	100	0	No	1	24	0	
LH7-338		0	0.0	0	0	100	0	No	1	3	0	
LS6-1046		0	0.0	0	70	30	0	No	0	33	2	
LS11-1146		0	0.0	0	0	100	0	No	0	17	0	
LS5-1015		0	0.0	0	0	100	0	No	0	18	2	
LM10-324		0	0.0	0	0	100	0	No	0	33	1	
GB6-994		0	0.0	0	0	100	0	No	1	29	1	
LH8-591		0	0.0	0	0	100	0	No	0	25	0	
LM10-310		0	0.0	0	0	100	0	No	0	5	1	
GB6-929		0	0.0	0	0	100	0	No	0	0	1	
LM9-711		0	0.0	0	0	100	0	No	0	15	0	
LS11-1140		0	0.0	0	0	100	0	No	0	17	1	
LH4-187		0	0.0	0	0	100	0	No	0	17	0	
LH5-157		0	0.0	0	0	100	0	No	2	20	2	
GB6-971		0	0.0	0	0	100	0	No	1	1	0	
LM11-411		0	0.0	0	0	100	0	No	0	51	2	
LH7-357		0	0.0	0	0	100	0	No	0	4	0	
LS5-1092		0	0.0	3	0	100	0	No	0	1	2	
LS5-1055		0	0.0	0	0	100	0	No	0	17	2	
LM9-279		0	0.0	0	0	100	0	No	0	37	1	
LS10-1106		0	0.0	1	0	100	0	No	0	29	1	
LS6-1021		0	0.0	0	0	100	0	No	0	2	2	
LS5-1084		0	0.0	0	0	100	0	No	2	20	2	
LH4-181		0	0.0	0	0	100	0	No	0	21	0	
LS5-1049		0	0.0	0	0	100	0	No	0	18	2	
LS5-1061		0	0.0	0	0	100	0	No	0	17	2	
LH7-345		0	0.0	0	0	100	0	No	0	4	0	
LS11-1132		0	0.0	0	0	100	0	No	0	18	1	
LH7-365		0	0.0	0	0	100	0	No	0	5	1	
LH7-402		0	0.0	0	0	100	0	No	0	5	0	
LS5-1052		0	0.0	0	0	100	0	No	0	18	3	
LS11-1147		0	0.0	0	0	100	0	No	0	17	1	
LM11-455		0	0.0	2	0	100	0	No	0	43	1	
LH10-825		0	0.0	2	0	100	0	No	0	14	2	
LH10-908		0	0.0	0	0	100	0	No	0	7	2	
LH4-185		0	0.0	0	0	100	0	No	0	14	0	
LH8-446		0	0.0	0	0	100	0	No	0	31	0	

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LH5-163		0	0.0	0	0	100	0	No	2	19	2	
LM10-582		0	0.0	0	0	100	0	No	0	24	1	
LH9-781		0	0.0	0	0	100	0	No	0	22	2	
LS5-1074		0	0.0	0	0	100	0	No	0	38	2	
LH4-217		0	0.0	0	0	100	0	Yes	2	14	0	
LM12-659		0	0.0	0	94	6	0	No	0	35	0	
LM10-391		0	0.0	0	0	100	0	No	0	3	1	
LH10-877		0	0.0	0	0	100	0	No	0	26	2	
LS5-1080		0	0.0	0	0	100	0	No	0	20	2	
LH5-164		0	0.0	0	0	100	0	No	0	28	2	
LS5-1064		0	0.0	0	0	100	0	No	0	17	2	
LH5-155		0	0.0	0	0	100	0	No	1	37	2	
LM11-509		0	0.0	0	0	100	0	No	0	1	0	
LH4-141		0	0.0	0	0	100	0	No	0	34	0	
LS11-1144		0	0.0	0	0	100	0	No	0	16	0	
LS5-1075		0	0.0	2	0	100	0	No	0	21	2	
LM7-64		0	0.0	0	0	100	0	No	0	0	0	
GB6-1002		0	0.0	0	0	100	0	No	0	8	1	
GB6-987		0	0.0	0	0	100	0	No	0	1	0	
LH5-132		0	0.0	0	0	100	0	No	0	32	2	
LH7-367		0	0.0	0	0	100	0	No	0	8	0	
LS11-1139		0	0.0	0	0	100	0	No	0	18	1	
LM9-283		0	0.0	0	0	100	0	No	0	7	1	
LS5-1066		0	0.0	0	0	100	0	No	2	18	2	
LM11-428		0	0.0	0	0	100	0	No	0	48	2	
LS9-1389		0	0.0	0	0	100	0	No	0	20	0	
LS10-1111		0	0.0	0	0	100	0	No	0	31	0	
LH8-465		0	0.0	0	0	100	0	No	0	30	1	
LH4-190		0	0.0	0	0	100	0	No	0	52	0	
LS5-1068		0	0.0	0	0	100	0	No	0	18	2	
LH6-321		0	0.0	0	0	100	0	No	0	6	1	
LH4-191		0	0.0	0	0	100	0	No	0	50	0	
LM11-450		0	0.0	0	0	100	0	No	0	32	1	
LM12-624		0	0.0	0	0	100	0	No	0	11	0	
LM12-564		0	0.0	0	0	100	0	No	0	4	0	
LM12-656		0	0.0	0	0	100	0	No	0	6	0	
LM12-573		0	0.0	0	0	100	0	No	0	7	0	
LM12-567		0	0.0	0	0	100	0	No	0	13	1	
LM12-674		0	0.0	0	0	100	0	No	0	31	1	
LM12-635		0	0.0	0	0	100	0	No	0	2	0	
LM12-596		0	0.0	0	0	100	0	No	0	28	2	

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LM12-570		0	0.0	0	0	100	0	No	0	1	0	
LM10-528		0	0.0	0	0	100	0	No	0	7	0	
LM11-526		0	0.0	0	0	100	0	No	0	18	0	
LM2-327		0	0.0	0	0	100	0	No	0	17	2	
LM11-269		0	0.0	0	0	100	0	No	0	6	0	
LS5-1022		0	0.0	0	0	100	0	No	0	7	2	
LM12-973		0	0.0	0	0	100	0	No	0	35	0	
LM12-934		0	0.0	0	0	100	0	No	0	34	0	
LM12-918		0	0.0	0	0	100	0	No	0	32	0	
LM12-831		0	0.0	0	0	100	0	No	0	2	0	
LM11-697		0	0.0	0	0	100	0	No	0	8	0	
LM12-682		0	0.0	0	0	100	0	No	0	18	0	
LM12-645		0	0.0	0	0	100	0	No	0	3	1	
LM12-639		0	0.0	0	0	100	0	No	0	3	0	
LM12-610		0	0.0	0	0	100	0	No	0	0	2	
LM11-605		0	0.0	0	0	100	0	No	0	32	0	
LM12-583		0	0.0	0	0	100	0	No	0	4	0	
LM12-581		0	0.0	0	0	100	0	No	0	3	0	
LM12-578		0	0.0	0	0	100	0	No	0	3	0	
LM12-576		0	0.0	0	0	100	0	No	0	3	0	
LM12-558		0	0.0	0	0	100	0	No	0	12	0	
LM10-531		0	0.0	0	0	100	0	No	0	7	0	
LM11-525		0	0.0	0	0	100	0	No	0	29	0	
LM11-523		0	0.0	0	0	100	0	No	0	22	0	
LM11-521		0	0.0	0	0	100	0	No	0	24	0	
LM1-497		0	0.0	0	0	100	0	No	0	7	0	
LM11-490		0	0.0	0	0	100	0	No	0	18	1	
LM11-486		0	0.0	0	0	100	0	No	0	0	1	
LM1-469		0	0.0	0	0	100	0	No	0	3	0	
LM11-458		0	0.0	2	0	100	0	No	0	19	1	
LM11-452		0	0.0	2	0	100	0	No	0	11	1	
LM11-451		0	0.0	0	0	100	0	No	0	5	1	
LM1-432		0	0.0	0	0	100	0	No	0	15	0	
LM11-440		0	0.0	0	0	100	0	No	0	11	1	
LM1-407		0	0.0	0	0	100	0	No	0	26	0	
LM11-408		0	0.0	0	0	100	0	No	0	16	2	
LM2-334		0	0.0	0	0	100	0	No	0	32	2	
LS20-1120		0	0.0	0	0	100	0	No	0	11	0	
LS20-1119		0	0.0	0	0	100	0	No	0	24	0	
LS5-1042		0	0.0	0	0	100	0	No	0	29	2	
LS6-1039		0	0.0	0	0	100	0	No	0	21	2	
LS5-1036		0	0.0	0	0	100	0	No	0	11	2	

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LS6-1035		0	0.0	0	0	100	0	No	0	58	2	
LS5-1032		0	0.0	0	0	100	0	No	0	17	2	
LS5-1034		0	0.0	0	0	100	0	No	0	10	2	
LS6-1031		0	0.0	0	0	100	0	No	0	47	2	
LS6-1024		0	0.0	0	0	100	0	No	0	19	2	
LS6-1030		0	0.0	0	0	100	0	No	0	88	2	
LS6-1029		0	0.0	0	0	100	0	No	0	16	2	
LS5-1025		0	0.0	0	0	100	0	No	0	6	2	
LS5-1026		0	0.0	0	0	100	0	No	0	10	2	
LS5-1018		0	0.0	0	0	100	0	No	0	7	2	
LS5-1016		0	0.0	0	0	100	0	No	0	8	2	
LS5-1013		0	0.0	0	0	100	0	No	0	6	2	
GB6-1010		0	0.0	0	0	100	0	No	0	35	0	
LS5-1012		0	0.0	0	0	100	0	No	0	10	2	
GB6-1007		0	0.0	0	0	100	0	No	0	6	0	
LS5-1005		0	0.0	0	0	100	0	No	0	16	2	
LM12-991		0	0.0	0	0	100	0	No	0	14	0	
LM12-988		0	0.0	0	0	100	0	No	0	11	0	
GB6-1006		0	0.0	0	0	100	0	No	0	34	0	
LS5-997		0	0.0	0	0	100	0	No	0	12	2	
GB6-995		0	0.0	0	0	100	0	No	0	0	1	
LM12-990		0	0.0	0	0	100	0	No	0	11	0	
LM12-982		0	0.0	0	0	100	0	No	0	35	0	
LM12-985		0	0.0	0	0	100	0	No	0	11	0	
LM12-978		0	0.0	0	0	100	0	No	0	35	0	
GB6-996		0	0.0	0	0	100	0	No	0	11	1	
LM12-981		0	0.0	0	0	100	0	No	0	35	0	
LM12-975		0	0.0	0	0	100	0	No	0	35	0	
GB6-974		0	0.0	0	0	100	0	No	0	23	0	
GB6-986		0	0.0	0	0	100	0	No	0	37	0	
LM12-980		0	0.0	0	0	100	0	No	0	35	0	
LS5-976		0	0.0	0	0	100	0	No	0	10	2	
LM12-968		0	0.0	0	0	100	0	No	0	35	0	
LM12-961		0	0.0	0	0	100	0	No	0	35	0	
LM12-967		0	0.0	0	0	100	0	No	0	35	0	
GB6-963		0	0.0	0	0	100	0	No	0	36	0	
GB6-957		0	0.0	0	0	100	0	No	0	41	0	
GB6-960		0	0.0	0	0	100	0	No	0	39	0	
GB6-958		0	0.0	0	0	100	0	No	0	39	0	
GB6-956		0	0.0	0	0	100	0	No	0	38	0	
GB6-953		0	0.0	0	0	100	0	No	0	42	0	
GB6-955		0	0.0	0	0	100	0	No	0	39	0	
GB6-947		0	0.0	0	0	100	0	No	0	37	1	
LM12-946		0	0.0	0	0	100	0	No	0	35	0	

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LM12-943		0	0.0	0	0	100	0	No	0	36	1	
LM12-933		0	0.0	0	0	100	0	No	0	67	0	
LM12-936		0	0.0	0	0	100	0	No	0	36	1	
LS6-926		0	0.0	0	0	100	0	No	0	0	2	
LM12-922		0	0.0	0	0	100	0	No	0	38	0	
GB6-931		0	0.0	3	0	100	0	No	0	34	0	
LH10-915		0	0.0	0	0	100	0	No	0	31	2	
LH10-928		0	0.0	0	0	100	0	No	0	31	2	
LM12-935		0	0.0	0	0	100	0	No	0	35	0	
GB6-930		0	0.0	0	0	100	0	No	0	34	0	
GB6-909		0	0.0	0	0	100	0	No	0	28	0	
GB6-937		0	0.0	0	0	100	0	No	0	38	0	
LH10-920		0	0.0	0	0	100	0	No	0	31	2	
GB6-910		0	0.0	0	0	100	0	No	0	25	0	
LS6-905		0	0.0	0	0	100	0	No	0	0	2	
LM12-902		0	0.0	0	0	100	0	No	0	26	0	
GB6-911		0	0.0	0	0	100	0	No	0	29	0	
LM12-898		0	0.0	0	0	100	0	No	0	26	0	
GB6-916		0	0.0	0	0	100	0	No	0	27	0	
LH10-900		0	0.0	0	0	100	0	No	0	32	2	
GB6-904		0	0.0	0	0	100	0	No	0	23	0	
LH10-896		0	0.0	0	0	100	0	No	0	31	2	
LH10-897		0	0.0	0	0	100	0	No	0	32	2	
GB6-890		0	0.0	0	0	100	0	No	0	3	0	
LM12-895		0	0.0	0	0	100	0	No	0	0	0	
LH10-899		0	0.0	0	0	100	0	No	0	32	2	
LM12-894		0	0.0	0	0	100	0	No	0	3	0	
GB6-889		0	0.0	0	0	100	0	No	0	21	0	
GB6-892		0	0.0	0	0	100	0	No	0	1	0	
LH10-881		0	0.0	0	0	100	0	No	0	32	2	
GB6-887		0	0.0	0	0	100	0	No	0	19	0	
LH9-878		0	0.0	0	0	100	0	No	0	25	0	
LH10-879		0	0.0	0	0	100	0	No	0	31	2	
LH10-863		0	0.0	0	0	100	0	No	0	34	1	
LH9-872		0	0.0	0	0	100	0	No	0	25	0	
LH10-854		0	0.0	0	0	100	0	No	0	34	2	
LH10-852		0	0.0	0	0	100	0	No	0	36	2	
LH10-851		0	0.0	0	0	100	0	No	0	36	2	
LH10-846		0	0.0	0	0	100	0	No	0	37	2	
LM12-861		0	0.0	0	0	100	0	No	0	25	0	
LM12-853		0	0.0	0	0	100	0	No	0	25	0	
LM12-841		0	0.0	0	0	100	0	No	0	24	0	
LS6-857		0	0.0	0	0	100	0	No	0	0	2	
LH10-845		0	0.0	0	0	100	0	No	0	19	0	

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LH10-818		0	0.0	0	0	100	0	No	0	15	1	
LM12-800		0	0.0	0	0	100	0	No	0	22	0	
LM12-835		0	0.0	0	0	100	0	No	0	21	0	
LM12-850		0	0.0	0	0	100	0	No	0	24	0	
LH10-842		0	0.0	0	0	100	0	No	0	4	2	
LM12-803		0	0.0	0	0	100	0	No	0	19	0	
LH10-839		0	0.0	0	0	100	0	No	0	3	2	
LH10-815		0	0.0	0	0	100	0	No	0	9	2	
LH10-796		0	0.0	0	0	100	0	No	0	7	1	
LH10-786		0	0.0	0	0	100	0	No	0	3	1	
LH10-848		0	0.0	0	0	100	0	No	0	18	2	
LH10-837		0	0.0	0	0	100	0	No	0	4	2	
LM12-809		0	0.0	0	0	100	0	No	0	3	0	
LH10-807		0	0.0	0	0	100	0	No	0	7	2	
LH10-821		0	0.0	0	0	100	0	No	0	10	0	
LM12-826		0	0.0	0	0	100	0	No	0	20	0	
LH10-849		0	0.0	0	0	100	0	No	0	36	2	
LM12-811		0	0.0	0	0	100	0	No	0	20	0	
LH10-813		0	0.0	0	0	100	0	No	0	2	2	
LH10-802		0	0.0	0	0	100	0	No	0	12	2	
LH10-812		0	0.0	0	0	100	0	No	0	7	2	
LM12-823		0	0.0	0	0	100	0	No	0	3	0	
LM12-795		0	0.0	0	0	100	0	No	0	31	0	
LH10-833		0	0.0	0	0	100	0	No	0	4	2	
LH10-810		0	0.0	0	0	100	0	No	0	14	2	
LH10-792		0	0.0	0	0	100	0	No	0	9	2	
LH10-788		0	0.0	0	0	100	0	No	0	13	2	
LH10-805		0	0.0	0	0	100	0	No	0	10	2	
LH10-827		0	0.0	0	0	100	0	No	0	6	2	
LH10-798		0	0.0	0	0	100	0	No	0	8	1	
LM11-780		0	0.0	0	0	100	0	No	0	38	0	
LM12-801		0	0.0	0	0	100	0	No	0	20	0	
LH9-804		0	0.0	0	0	100	0	No	0	19	2	
LM12-790		0	0.0	0	0	100	0	No	0	47	0	
LH9-774		0	0.0	0	0	100	0	No	0	20	2	
LH9-785		0	0.0	0	0	100	0	No	0	20	2	
LS6-806		0	0.0	0	0	100	0	No	0	20	2	
LH9-782		0	0.0	0	0	100	0	No	0	14	0	
LM12-797		0	0.0	0	0	100	0	No	0	31	0	
LM12-799		0	0.0	0	0	100	0	No	0	31	0	
LM12-783		0	0.0	0	0	100	0	No	0	61	0	
LH10-789		0	0.0	0	0	100	0	No	0	7	2	
LH10-777		0	0.0	0	0	100	0	No	0	18	2	
LM11-776		0	0.0	0	0	100	0	No	0	36	0	

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LH10-764		0	0.0	0	0	100	0	No	0	1	2	
LH10-762		0	0.0	0	0	100	0	No	0	9	2	
LH9-778		0	0.0	0	0	100	0	No	0	19	0	
LH10-763		0	0.0	0	0	100	0	No	0	11	2	
LH10-761		0	0.0	0	0	100	0	No	0	10	2	
LH9-772		0	0.0	0	0	100	0	No	0	19	2	
LH10-760		0	0.0	0	0	100	0	No	0	0	2	
LM12-791		0	0.0	0	0	100	0	No	0	31	0	
LH10-743		0	0.0	0	0	100	0	No	0	13	2	
LH10-765		0	0.0	0	0	100	0	No	0	1	2	
LM12-769		0	0.0	0	0	100	0	No	0	62	0	
LM12-768		0	0.0	0	0	100	0	No	0	63	0	
LH10-759		0	0.0	0	0	100	0	No	0	0	2	
LH9-739		0	0.0	0	0	100	0	No	0	15	0	
LH9-746		0	0.0	0	0	100	0	No	0	3	2	
LH9-754		0	0.0	0	0	100	0	No	0	19	2	
LH9-744		0	0.0	0	0	100	0	No	0	17	0	
LH10-740		0	0.0	0	0	100	0	No	0	8	2	
LH9-753		0	0.0	0	0	100	0	No	0	19	0	
LH9-757		0	0.0	0	0	100	0	No	0	19	0	
LH9-752		0	0.0	0	0	100	0	No	0	19	0	
LH10-736		0	0.0	0	0	100	0	No	0	13	2	
LH9-766		0	0.0	0	0	100	0	No	0	20	0	
LH9-726		0	0.0	0	0	100	0	No	0	22	0	
LH10-750		0	0.0	0	0	100	0	No	0	0	2	
LH10-738		0	0.0	0	0	100	0	No	0	8	2	
LH10-729		0	0.0	0	0	100	0	No	0	7	2	
LH9-745		0	0.0	0	0	100	0	No	0	2	0	
LH9-737		0	0.0	0	0	100	0	No	0	18	0	
LH9-742		0	0.0	0	0	100	0	No	0	14	0	
LH9-734		0	0.0	0	0	100	0	No	0	39	0	
LH9-730		0	0.0	0	0	100	0	No	0	21	0	
LH9-733		0	0.0	0	0	100	0	No	0	24	0	
LH9-732		0	0.0	0	0	100	0	No	0	54	0	
LH9-731		0	0.0	0	0	100	0	No	0	20	0	
LH9-728		0	0.0	0	0	100	0	No	0	21	0	
LH9-727		0	0.0	0	0	100	0	No	0	21	0	
LH9-724		0	0.0	0	0	100	0	No	0	25	0	
LH9-721		0	0.0	0	0	100	0	No	0	25	0	
LH10-707		0	0.0	0	0	100	0	No	0	7	2	
LH10-714		0	0.0	0	0	100	0	No	0	7	0	
LH10-708		0	0.0	0	0	100	0	No	0	8	0	
LH1-716		0	0.0	0	0	100	0	No	0	8	0	
LH9-717		0	0.0	0	0	100	0	No	0	25	0	

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LH10-710		0	0.0	0	0	100	0	No	0	8	0	
LH1-715		0	0.0	0	0	100	0	No	0	11	0	
LH10-702		0	0.0	0	0	100	0	No	0	8	0	
LM12-706		0	0.0	0	0	100	0	No	0	64	0	
LH10-703		0	0.0	0	0	100	0	No	0	8	0	
LH9-713		0	0.0	0	0	100	0	No	0	27	0	
LH10-704		0	0.0	0	0	100	0	No	0	8	2	
LH10-701		0	0.0	0	0	100	0	No	0	8	0	
LM11-700		0	0.0	0	0	100	0	No	0	36	0	
LM12-694		0	0.0	0	0	100	0	No	0	67	0	
LM11-698		0	0.0	0	0	100	0	No	0	37	0	
LM12-691		0	0.0	0	0	100	0	No	0	66	0	
LH10-695		0	0.0	0	0	100	0	No	0	8	0	
LM12-690		0	0.0	0	0	100	0	No	0	22	0	
LM11-696		0	0.0	0	0	100	0	No	0	32	0	
LH10-689		0	0.0	0	0	100	0	No	0	8	0	
LM12-686		0	0.0	0	0	100	0	No	0	17	0	
LM12-687		0	0.0	0	0	100	0	No	0	29	0	
LM12-685		0	0.0	0	0	100	0	No	0	17	0	
LM12-683		0	0.0	0	0	100	0	No	0	17	0	
LM12-679		0	0.0	0	0	100	0	No	0	58	0	
LM12-676		0	0.0	0	0	100	0	No	0	0	1	
LM12-680		0	0.0	0	0	100	0	No	0	0	0	
LM12-677		0	0.0	0	0	100	0	No	0	58	0	
LM12-667		0	0.0	0	0	100	0	No	0	28	0	
LM12-668		0	0.0	0	0	100	0	No	0	29	0	
LM12-664		0	0.0	0	0	100	0	No	0	27	0	
LM12-661		0	0.0	0	0	100	0	No	0	52	0	
LM12-670		0	0.0	0	0	100	0	No	0	30	0	
LM12-663		0	0.0	0	0	100	0	No	0	53	0	
LM12-671		0	0.0	0	0	100	0	No	0	28	0	
LM11-669		0	0.0	0	0	100	0	No	0	38	0	
LM12-658		0	0.0	0	0	100	0	No	0	36	0	
LM12-666		0	0.0	0	0	100	0	No	0	5	0	
LM12-660		0	0.0	0	0	100	0	No	0	34	0	
LM10-678		0	0.0	0	0	100	0	No	0	3	0	
LM12-648		0	0.0	0	0	100	0	No	0	4	0	
LM12-662		0	0.0	0	0	100	0	No	0	51	0	
LM12-657		0	0.0	0	0	100	0	No	0	36	0	
LM12-644		0	0.0	0	0	100	0	No	0	1	0	
LM12-654		0	0.0	0	0	100	0	No	0	37	0	
LM11-655		0	0.0	0	0	100	0	No	0	14	0	
LM10-665		0	0.0	0	0	100	0	No	0	5	0	
LM12-651		0	0.0	0	0	100	0	No	0	40	0	

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LM12-650		0	0.0	0	0	100	0	No	0	1	0	
LM12-642		0	0.0	0	0	100	0	No	0	1	0	
LM12-649		0	0.0	0	0	100	0	No	0	2	0	
LM12-640		0	0.0	0	0	100	0	No	0	2	1	
LM12-641		0	0.0	0	0	100	0	No	0	1	0	
LM12-643		0	0.0	0	0	100	0	No	0	3	0	
LM12-646		0	0.0	0	0	100	0	No	0	3	0	
LM12-634		0	0.0	0	0	100	0	No	0	1	0	
LM12-636		0	0.0	0	0	100	0	No	0	2	0	
LM12-638		0	0.0	0	0	100	0	No	0	1	0	
LM12-633		0	0.0	0	0	100	0	No	0	1	0	
LM12-631		0	0.0	0	0	100	0	No	0	1	0	
LM12-637		0	0.0	0	0	100	0	No	0	1	0	
LM12-632		0	0.0	0	0	100	0	No	0	2	0	
LM12-617		0	0.0	0	0	100	0	No	0	19	2	
LM12-629		0	0.0	0	0	100	0	No	0	2	1	
LM12-625		0	0.0	0	0	100	0	No	0	3	0	
LM12-619		0	0.0	0	0	100	0	No	0	0	0	
LM12-622		0	0.0	0	0	100	0	No	0	0	2	
LM12-627		0	0.0	0	0	100	0	No	0	1	0	
LM12-620		0	0.0	0	0	100	0	No	0	28	2	
LM12-612		0	0.0	0	0	100	0	No	0	6	2	
LM12-628		0	0.0	0	0	100	0	No	0	4	2	
LH10-599		0	0.0	0	0	100	0	No	0	8	2	
LM12-621		0	0.0	0	0	100	0	No	0	28	0	
LM12-623		0	0.0	0	0	100	0	No	0	2	2	
LM12-613		0	0.0	0	0	100	0	No	0	6	0	
LH10-600		0	0.0	0	0	100	0	No	0	9	2	
LH10-603		0	0.0	0	0	100	0	No	0	1	2	
LH8-616		0	0.0	0	0	100	0	No	0	23	0	
LM12-614		0	0.0	0	0	100	0	No	0	19	2	
LM12-618		0	0.0	0	0	100	0	No	0	9	0	
LM12-604		0	0.0	0	0	100	0	No	0	27	0	
LM12-608		0	0.0	0	0	100	0	No	0	4	0	
LM12-597		0	0.0	0	0	100	0	No	0	28	2	
LM11-611		0	0.0	0	0	100	0	No	0	37	0	
LM11-615		0	0.0	0	0	100	0	No	0	33	0	
LM12-593		0	0.0	0	0	100	0	No	0	23	0	
LM12-586		0	0.0	0	0	100	0	No	0	20	0	
LM12-595		0	0.0	0	0	100	0	No	0	21	2	
LM11-607		0	0.0	0	0	100	0	No	0	37	0	
LH10-589		0	0.0	0	0	100	0	No	0	9	2	
LM12-584		0	0.0	0	0	100	0	No	0	0	0	
LM11-592		0	0.0	0	0	100	0	No	0	32	0	

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LH8-580		0	0.0	0	0	100	0	No	0	31	0	
LM11-601		0	0.0	0	0	100	0	No	0	33	0	
LM10-587		0	0.0	0	0	100	0	No	0	5	1	
LM10-579		0	0.0	0	0	100	0	No	0	9	1	
LM12-574		0	0.0	0	0	100	0	No	0	6	0	
LH8-575		0	0.0	0	0	100	0	No	0	31	0	
LM10-577		0	0.0	0	0	100	0	No	0	6	1	
LM12-568		0	0.0	0	0	100	0	No	0	1	0	
LM12-571		0	0.0	0	0	100	0	No	0	3	0	
LM12-565		0	0.0	0	0	100	0	No	0	13	0	
LM11-569		0	0.0	0	0	100	0	No	0	33	0	
LM11-566		0	0.0	0	0	100	0	No	0	34	0	
LM12-562		0	0.0	0	0	100	0	No	0	3	0	
LM13-561		0	0.0	0	0	100	0	No	0	12	0	
LH8-559		0	0.0	0	0	100	0	No	0	31	0	
LH8-556		0	0.0	0	0	100	0	No	0	31	0	
LM11-557		0	0.0	0	0	100	0	No	0	27	0	
LM12-549		0	0.0	0	0	100	0	No	0	6	0	
LM11-555		0	0.0	0	0	100	0	No	0	32	0	
LM11-554		0	0.0	0	0	100	0	No	0	27	0	
LM12-547		0	0.0	0	0	100	0	No	0	13	0	
LM9-553		0	0.0	0	0	100	0	No	0	9	0	
LM9-551		0	0.0	0	0	100	0	No	0	9	0	
LM11-546		0	0.0	0	0	100	0	No	0	37	0	
LM11-548		0	0.0	0	0	100	0	No	0	24	0	
LM9-552		0	0.0	0	0	100	0	No	0	8	0	
LH8-545		0	0.0	0	0	100	0	No	0	31	0	
LH8-544		0	0.0	0	0	100	0	No	0	31	0	
LM9-550		0	0.0	0	0	100	0	No	0	24	0	
LM9-543		0	0.0	0	0	100	0	No	0	24	0	
LM12-540		0	0.0	0	0	100	0	No	0	14	0	
LM12-538		0	0.0	0	0	100	0	No	0	1	0	
LM9-542		0	0.0	0	0	100	0	No	0	21	0	
LM12-530		0	0.0	0	0	100	0	No	0	14	0	
LM10-539		0	0.0	0	0	100	0	No	0	9	0	
LM11-536		0	0.0	0	0	100	0	No	0	34	0	
LM10-533		0	0.0	0	0	100	0	No	0	7	0	
LM10-535		0	0.0	0	0	100	0	No	0	7	0	
LM10-534		0	0.0	0	0	100	0	No	0	6	0	
LM10-527		0	0.0	0	0	100	0	No	0	7	0	
LM10-532		0	0.0	0	0	100	0	No	0	7	0	
LM10-529		0	0.0	0	0	100	0	No	0	7	0	
LM12-524		0	0.0	0	0	100	0	No	0	1	0	
LM12-520		0	0.0	0	0	100	0	No	0	3	0	

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LM13-518		0	0.0	0	0	100	0	No	0	13	1	
LM12-517		0	0.0	0	0	100	0	No	0	0	0	
LM11-519		0	0.0	0	0	100	0	No	0	32	0	
LM12-516		0	0.0	0	0	100	0	No	0	2	0	
LM12-515		0	0.0	0	0	100	0	No	0	2	0	
LH8-514		0	0.0	0	0	100	0	No	0	31	0	
LH8-513		0	0.0	0	0	100	0	No	0	29	0	
LM1-508		0	0.0	0	0	100	0	No	0	7	0	
LM1-510		0	0.0	0	0	100	0	No	0	8	0	
LM9-512		0	0.0	0	0	100	0	No	0	22	0	
LM1-505		0	0.0	0	0	100	0	No	0	7	0	
LM1-503		0	0.0	0	0	100	0	No	0	8	0	
LM1-502		0	0.0	0	0	100	0	No	0	6	0	
LM1-499		0	0.0	0	0	100	0	No	0	7	0	
LM1-496		0	0.0	0	0	100	0	No	0	7	0	
LM9-500		0	0.0	0	0	100	0	No	0	20	0	
LM1-494		0	0.0	0	0	100	0	No	0	8	0	
LM9-498		0	0.0	0	0	100	0	No	0	20	0	
LM1-493		0	0.0	0	0	100	0	No	0	9	0	
LM9-495		0	0.0	0	0	100	0	No	0	20	0	
LH8-487		0	0.0	0	0	100	0	No	0	31	0	
LM11-489		0	0.0	0	0	100	0	No	0	18	1	
LH8-484		0	0.0	0	0	100	0	No	0	30	0	
LM9-488		0	0.0	0	0	100	0	No	0	16	0	
LM11-482		0	0.0	0	0	100	0	No	0	28	1	
LM1-471		0	0.0	0	0	100	0	No	0	10	0	
LH8-477		0	0.0	0	0	100	0	No	0	30	0	
LM1-470		0	0.0	0	0	100	0	No	0	14	0	
LM11-480		0	0.0	0	0	100	0	No	0	38	1	
LH8-478		0	0.0	0	0	100	0	No	0	31	0	
LM1-468		0	0.0	0	0	100	0	No	0	9	0	
LM1-463		0	0.0	0	0	100	0	No	0	10	0	
LM1-462		0	0.0	0	0	100	0	No	0	10	0	
LM1-467		0	0.0	0	0	100	0	No	0	3	0	
LM1-461		0	0.0	0	0	100	0	No	0	11	0	
LM11-475		0	0.0	0	0	100	0	No	0	26	1	
LM11-476		0	0.1	3	0	100	0	No	0	22	1	
LM11-472		0	0.0	0	0	100	0	No	0	23	1	
LM1-457		0	0.0	0	0	100	0	No	0	11	0	
LM1-449		0	0.0	0	0	100	0	No	0	12	0	
LM1-454		0	0.0	0	0	100	0	No	0	12	0	
LM1-442		0	0.0	0	0	100	0	No	0	3	0	
LM1-443		0	0.0	0	0	100	0	No	0	13	0	
LM1-444		0	0.0	0	0	100	0	No	0	12	0	

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LM11-453		0	0.0	0	0	100	0	No	0	17	1	
LM9-459		0	0.0	0	0	100	0	No	0	19	0	
LM11-448		0	0.0	0	0	100	0	No	0	2	1	
LM11-447		0	0.0	0	0	100	0	No	0	4	1	
LM11-445		0	0.0	0	0	100	0	No	0	4	1	
LM1-438		0	0.0	0	0	100	0	No	0	15	0	
LM1-436		0	0.0	0	0	100	0	No	0	24	0	
LM1-435		0	0.0	0	0	100	0	No	0	15	0	
LM11-441		0	0.0	0	0	100	0	No	0	13	1	
LM11-439		0	0.0	0	0	100	0	No	0	19	1	
LH8-437		0	0.0	0	0	100	0	No	0	31	0	
LM11-434		0	0.0	0	0	100	0	No	0	20	1	
LM1-429		0	0.0	0	0	100	0	No	0	31	0	
LH8-431		0	0.0	0	0	100	0	No	0	31	0	
LM1-425		0	0.0	0	0	100	0	No	0	28	0	
LM1-426		0	0.0	0	0	100	0	No	0	30	0	
LM2-423		0	0.0	0	0	100	0	No	0	33	0	
LM2-417		0	0.0	0	0	100	0	No	0	31	0	
LM11-422		0	0.0	0	0	100	0	No	0	16	2	
LM2-420		0	0.0	0	0	100	0	No	0	37	0	
LM2-415		0	0.0	0	0	100	0	No	0	18	0	
LM2-412		0	0.0	0	0	100	0	No	0	19	0	
LM11-419		0	0.0	0	0	100	0	No	0	32	2	
LM10-413		0	0.0	0	0	100	0	No	0	7	0	
LM11-409		0	0.0	0	0	100	0	No	0	31	2	
LH7-401		0	0.0	0	0	100	0	No	0	29	0	
LM1-395		0	0.0	0	0	100	0	No	0	26	0	
LM11-393		0	0.0	0	0	100	0	No	0	16	2	
LM11-398		0	0.0	0	0	100	0	No	0	34	2	
LH7-396		0	0.0	0	0	100	0	No	0	28	0	
LM11-397		0	0.0	0	0	100	0	No	0	17	2	
LM9-392		0	0.0	0	0	100	0	No	0	23	0	
LM11-388		0	0.0	0	0	100	0	No	0	37	2	
LH7-385		0	0.0	0	0	100	0	No	0	29	0	
LM2-384		0	0.0	0	0	100	0	No	0	19	2	
LM9-387		0	0.0	0	0	100	0	No	0	23	0	
LM9-390		0	0.0	0	0	100	0	No	0	23	0	
LM9-386		0	0.0	0	0	100	0	No	0	22	0	
LH7-378		0	0.0	0	0	100	0	No	0	21	2	
LM2-377		0	0.0	0	0	100	0	No	0	19	2	
LM2-375		0	0.0	0	0	100	0	No	0	16	2	
LM2-371		0	0.0	0	0	100	0	No	0	18	2	
LM10-380		0	0.0	0	0	100	0	No	0	9	1	
LH7-374		0	0.0	0	0	100	0	No	0	21	2	

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Key Ecological Systems (#)	Birds of Conservation Concern (AOU code)
LM2-369		0	0.0	0	0	100	0	No	0	18	2	
LM2-361		0	0.0	0	0	100	0	No	0	35	2	
LH7-368		0	0.0	0	0	100	0	No	0	33	1	
LH7-359		0	0.0	0	0	100	0	No	0	21	1	
LH7-355		0	0.0	0	0	100	0	No	0	28	0	
LH7-356		0	0.0	0	0	100	0	No	0	28	1	
LM10-362		0	0.0	3	0	100	0	No	0	4	1	
LH7-354		0	0.0	0	0	100	0	No	0	27	1	
LH7-350		0	0.0	0	0	100	0	No	0	26	0	
LM11-352		0	0.0	0	0	100	0	No	0	20	2	
LH7-349		0	0.0	0	0	100	0	No	0	26	0	
LM13-347		0	0.0	0	0	100	0	No	0	0	0	
LM10-343		0	0.0	0	0	100	0	No	0	8	0	
LH7-336		0	0.0	0	0	100	0	No	0	3	0	
LH7-337		0	0.0	0	0	100	0	No	0	14	0	
LM2-335		0	0.0	0	0	100	0	No	0	35	2	
LM2-333		0	0.0	0	0	100	0	No	0	34	2	
LM2-332		0	0.0	0	0	100	0	No	0	33	2	
LM2-331		0	0.0	0	0	100	0	No	0	32	2	
LM2-330		0	0.0	0	0	100	0	No	0	29	2	
LM2-329		0	0.0	0	0	100	0	No	0	31	2	
LM2-323		0	0.0	0	0	100	0	No	0	16	2	
LH6-325		0	0.0	0	0	100	0	No	0	17	0	
LM2-317		0	0.0	0	0	100	0	No	0	14	2	
LH6-316		0	0.0	0	0	100	0	No	0	16	0	
LM2-315		0	0.0	0	0	100	0	No	0	13	2	
LM2-311		0	0.0	0	0	100	0	No	0	13	2	
LH6-313		0	0.0	0	0	100	0	No	0	15	0	
LM2-305		0	0.0	0	0	100	0	No	0	13	2	
LH6-306		0	0.0	0	0	100	0	No	0	16	0	
LH6-309		0	0.0	0	0	100	0	No	0	14	0	
LM2-302		0	0.0	0	0	100	0	No	0	12	2	
LH6-303		0	0.0	0	0	100	0	No	0	13	0	
LM11-307		0	0.0	0	0	100	0	No	0	33	1	
LM11-304		0	0.0	0	0	100	0	No	0	34	1	
LH6-301		0	0.0	0	0	100	0	No	0	12	0	
LH6-300		0	0.0	0	0	100	0	No	0	12	0	
LH6-298		0	0.0	0	0	100	0	No	0	11	0	
LH6-297		0	0.0	0	0	100	0	No	0	3	0	
LM11-299		0	0.0	0	0	100	0	No	0	17	1	
LH6-296		0	0.0	0	0	100	0	No	0	2	0	
LH6-295		0	0.0	0	0	100	0	No	0	2	0	
LM3-292		0	0.0	0	0	100	0	No	0	38	0	
LM3-291		0	0.0	0	0	100	0	No	0	38	1	

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Key Ecological Systems (#)	Birds of Conservation Concern (AOU code)
LM11-293		0	0.0	0	0	100	0	No	0	21	1	
LH6-288		0	0.0	0	0	100	0	No	0	7	0	
LM11-289		0	0.0	0	0	100	0	No	0	37	0	
LM11-286		0	0.0	0	0	100	0	No	0	27	0	
LM10-284		0	0.0	0	0	100	0	No	0	7	1	
LM11-280		0	0.0	0	0	100	0	No	0	26	0	
LM11-276		0	0.0	0	0	100	0	No	0	28	0	
LM11-271		0	0.0	0	0	100	0	No	0	36	0	
LM11-272		0	0.0	0	0	100	0	No	0	28	0	
LM11-270		0	0.0	0	0	100	0	No	0	32	0	
LM11-268		0	0.0	0	0	100	0	No	0	36	0	
LM11-266		0	0.0	0	0	100	0	No	0	22	0	
LM11-267		0	0.0	0	0	100	0	No	0	31	0	
LM11-265		0	0.0	0	0	100	0	No	0	29	0	
LH4-238		0	0.0	0	0	100	0	No	0	9	0	
LH6-226		0	0.0	0	0	100	0	No	0	3	0	
LH4-230		0	0.0	0	0	100	0	No	0	12	0	
LH4-227		0	0.0	0	0	100	0	No	0	1	0	
LH4-225		0	0.0	0	0	100	0	No	0	19	0	
LH5-215		0	0.0	0	0	100	0	No	0	2	0	
LH4-222		0	0.0	0	0	100	0	No	0	19	0	
LH4-220		0	0.0	0	0	100	0	No	0	25	0	
LH5-210		0	0.0	0	0	100	0	No	0	1	0	
LH4-221		0	0.0	0	0	100	0	No	0	19	0	
LH4-216		0	0.0	0	0	100	0	No	0	32	0	
LH4-219		0	0.0	0	0	100	0	No	0	23	0	
LH4-208		0	0.0	0	0	100	0	No	0	0	0	
LH4-205		0	0.0	0	0	100	0	No	0	21	0	
LH4-204		0	0.0	0	0	100	0	No	0	17	0	
LM8-207		0	0.0	0	0	100	0	No	0	38	0	
LH5-197		0	0.0	0	0	100	0	No	0	3	0	
LH5-193		0	0.0	0	0	100	0	No	0	3	2	
LH5-195		0	0.0	0	0	100	0	No	0	1	0	
LH5-192		0	0.0	0	0	100	0	No	0	23	0	
LH5-199		0	0.0	0	0	100	0	No	0	2	1	
LH5-194		0	0.0	0	0	100	0	No	0	9	1	
LH4-196		0	0.0	0	0	100	0	No	0	21	0	
LH4-189		0	0.0	0	0	100	0	No	0	20	0	
LH4-188		0	0.0	0	0	100	0	No	0	34	0	
LH4-186		0	0.0	0	0	100	0	No	0	34	0	
LH4-184		0	0.0	0	0	100	0	No	0	34	0	
LH5-179		0	0.0	0	0	100	0	No	0	11	0	
LH4-180		0	0.0	0	0	100	0	No	0	30	0	
LH4-178		0	0.0	0	0	100	0	No	0	36	0	

TNC Complex Number	TNC Complex Name	Acres	Houses per Acre (year 2000)	TNC Threat Score	Gov't Owned (%)	Private Owned (%)	NGO Owned (%)	Lighthouse	Elevation, from water surface (m)	Miles to Closest NWR	Key Ecological Systems (#)	Birds of Conservation Concern (AOU code)
LH4-176		0	0.0	0	0	100	0	No	0	35	0	
LH4-169		0	0.0	0	0	100	0	No	0	35	0	
LH5-162		0	0.0	0	0	100	0	No	0	9	2	
LH4-167		0	0.0	0	0	100	0	No	0	36	0	
LH4-166		0	0.0	0	0	100	0	No	0	36	0	
LH5-160		0	0.0	0	0	100	0	No	0	9	2	
LH4-138		0	0.0	0	0	100	0	No	0	36	0	
LM11-281		0	0.0	0	0	100	0	No	0	33	0	
LH5-130		0	0.0	0	0	100	0	No	0	24	2	
LH5-126		0	0.0	0	0	100	0	No	0	9	2	
LH5-125		0	0.0	0	0	100	0	No	0	11	2	
LH5-122		0	0.0	0	0	100	0	No	0	24	2	
LH4-124		0	0.0	0	0	100	0	No	0	36	0	
LH4-121		0	0.0	0	0	100	0	No	0	36	0	
LH4-120		0	0.0	0	0	100	0	No	0	37	0	
LH4-119		0	0.0	0	0	100	0	No	0	37	0	
LH4-116		0	0.0	0	0	100	0	No	0	38	0	
LH4-117		0	0.0	0	0	100	0	No	0	37	0	
LH4-114		0	0.0	0	0	100	0	No	0	39	0	
LH4-115		0	0.0	0	0	100	0	No	0	38	0	
LH4-110		0	0.0	0	0	100	0	No	0	39	0	
LH4-111		0	0.0	0	0	100	0	No	0	39	0	
LH4-108		0	0.0	0	0	100	0	No	0	40	0	
LH4-106		0	0.0	0	0	100	0	No	0	44	0	
LH4-105		0	0.0	0	0	100	0	No	0	44	0	
LH4-103		0	0.0	0	0	100	0	No	0	45	0	
LH4-98		0	0.0	0	0	100	0	No	0	3	0	
LH4-97		0	0.0	0	0	100	0	No	0	14	0	
LH4-94		0	0.0	0	0	100	0	No	0	13	0	
LH4-93		0	0.0	0	0	100	0	No	0	11	0	
LM7-80		0	0.0	0	0	100	0	No	0	36	0	

Appendix D: Species Lists

In this appendix:

Great Lakes Fish Species
 Gravel Island NWR
 Gravel Island and Green Bay NWRs
 Harbor Island NWR
 Huron NWR
 Michigan Islands NWR

(National Wildlife Refuge = NWR, Refuge)

Great Lakes Fish Species

Common Name	Scientific Name	Present/Absent			Regional/State Status
		Lake Michigan	Lake Huron	Lake Superior	
					R3-Conservation Priority in Region 3 E- Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern
Acipenseridae					
Lake sturgeon	<i>Acipenser fulvescens</i>	x	x	x	R3 (rare/declining, recreational/economic value, tribal trust), SSC (WI), ST (MI)
Amiidae					
Bowfin	<i>Amia calva</i>	x	x		
Catostomidae					
White sucker	<i>Catostomus commersoni</i>	x	x	x	
Longnose sucker	<i>Catostomus catostomus</i>	x	x	x	
Centrarchidae					
Rockbass	<i>Ambloplites rupestris</i>	x	x	x	
Smallmouth bass	<i>Micropterus dolomieu</i>	x	x	x	
Pumpkinseed	<i>Lepomis gibbosus</i>	x	x	x	
Clupeidae					
Gizzard shad #	<i>Dorosoma cepedianum</i>	x	x	x	
Alewife #	<i>Alosa pseudoharengus</i>	x	x		
Cyprinidae					
Carp #	<i>Cyprinus Carpio</i>	x	x	x	
Esocidae					
Northern pike	<i>Esox Lucieus</i>	x	x	x	
Muskellunge	<i>Esox masquinongy</i>	x	x	x	
Gadidae					
Burbot	<i>Lota lota</i>	x	x	x	
Gobiidae					
Round goby #	<i>Neogobius melanostomus</i>	x	x	x	R3 (nuisance)
Moronidae					
White bass	<i>Morone chrysops</i>	x	x		
Osmeridae					
Rainbow smelt #	<i>Osmerus mordax</i>	x	x	x	
Percichthyidae					
White perch #	<i>Morone americana</i>	x	x	x	

Common Name	Scientific Name	Present/Absent			Regional/State Status
Percidae					
Yellow perch	<i>Perca flavescens</i>	x	x	x	R3 (rare/declining, recreational/economic value)
Walleye	<i>Stizostedion vitreum</i>	x	x	x	R3 (recreational/economic value, tribal trust)
Eurasian ruffe #	<i>Gymnocephalus cernuus</i>		x	x	R3 (nuisance)
Petromyzontidae					
Sea lamprey #	<i>Petromyzon marinus</i>	x	x	x	R3 (nuisance)
Salmonidae					
Brook trout	<i>Salvelinus fontinalis</i>	x	x	x	R3 (rare/declining, recreational/economic value, tribal trust)
Brown trout #	<i>Salmo trutta</i>	x	x	x	
Lake trout	<i>Salvelinus namaycush</i>	x	x	x	R3 (rare/declining, recreational/economic value, tribal trust)
Rainbow trout #	<i>Oncorhynchus mykiss</i>	x	x	x	
Lake whitefish	<i>Coregonus clupeaformis</i>	x	x	x	R3 (Recreational/economic value, tribal trust)
Round whitefish	<i>Prosopium cylindraceum</i>	x	x	x	
Lake herring	<i>Coregonus artedii</i>	x	x	x	ST (MI)
Shortjaw cisco	<i>Coregonus zenithicus</i>	x	x	x	R3 (rare/declining), SSC (WI), ST (MI)
Kiyi	<i>Coregonus kiyi</i>	x		x	R3 (rare/declining), SSC(WI,MI)
Chinook salmon #	<i>Oncorhynchus tshawytscha</i>	x	x	x	R3 (recreational/economic value)
Coho salmon #	<i>Oncorhynchus kisutch</i>	x	x	x	R3 (recreational/economic value)
Pink salmon #	<i>Oncorhynchus gorbuscha</i>			x	
Bloater	<i>Coregonus hoyi</i>	x	x	x	
Sciaenidae					
Freshwater drum	<i>Aplodinotus grunniens</i>	x	x	x	

Denotes introduced species

Note: Not every species found in the lakes is included

Gravel Island NWR

Bird Species

Species	Scientific Name	Habitat	Spring	Summer	Fall
Loons					
Common Loon	(<i>Gavia immer</i>)	OW	(u)	o	(u)
Grebes					
Pied-billed Grebe	(<i>Podilymbus podiceps</i>)	OW	(u)	o	(u)
Pelicans					
American White Pelican	(<i>Pelecanus erythrorhynchos</i>)	OW/RS	(u)	o	(u)
Cormorants					
Double-crested Cormorant *	(<i>Phalacrocorax auritus</i>)	OW/RS/MF	a	a	a
Hérons and Bitterns					
Great Blue Heron*	(<i>Ardea herodias</i>)	RS/MF	c	c	c
Black-crowned Night-Heron*	(<i>Nycticorax nycticorax</i>)	RS/MF	u	u	u
Great Egret*	(<i>Ardea alba</i>)	RS/MF	u	u	u
Swans, Geese, and Ducks					
Canada Goose*	(<i>Branta canadensis</i>)	OW/RS	a	c	a
Tundra Swan	(<i>Cygnus columbianus</i>)	OW	u		u
Mute Swan*	(<i>Cygnus olor</i>)	OW/RS	c	c	c
Gadwall	(<i>Anas strepera</i>)	OW	(u)		(u)
American Wigeon	(<i>Anas americana</i>)	OW	(u)		(u)
American Black Duck*	(<i>Anas rubripes</i>)	OW/RS	u	u	u
Mallard Duck*	(<i>Anas platyrhynchos</i>)	OW/RS	c	c	c
Blue-winged Teal	(<i>Anas discors</i>)	OW	(u)		(u)
Northern Pintail	(<i>Anas acuta</i>)	OW	u		u
Green-winged Teal	(<i>Anas crecca</i>)	OW	(u)		(u)
Redhead	(<i>Aythya americana</i>)	OW	(u)		(u)
Greater Scaup	(<i>Aythya marila</i>)	OW	(u)		(u)
Lesser Scaup	(<i>Aythya affinis</i>)	OW	(u)		(u)
Bufflehead	(<i>Bucephala albeola</i>)	OW	(u)	(u)	(u)
Common Goldeneye	(<i>Bucephala clangula</i>)	OW	c	c	c
Long-tailed Duck	(<i>Clangula hyemalis</i>)	OW	(c)		(c)
Hooded Merganser	(<i>Lophodytes cucullatus</i>)	OW	(u)		(u)
Common Merganser	(<i>Mergus merganser</i>)	OW	(u)	(u)	o
Red-breasted Merganser*	(<i>Mergus serrator</i>)	OW/RS	c	c	c
Hawks and Eagles					
Bald Eagle	(<i>Haliaeetus leucocephalus</i>)	OW/RS/MF	u	u	u
Sharp-shinned Hawk	(<i>Accipiter striatus</i>)	FE	u	u	u
Red-shouldered Hawk	(<i>Buteo lineatus</i>)	MF	r	r	r
Red-tailed Hawk	(<i>Buteo jamaicensis</i>)	FE/GF/MF	c	c	c
Broad-winged Hawk	(<i>Buteo platypterus</i>)		(a)	u	(a)
Falcons					
Peregrine Falcon	(<i>Falco peregrinus</i>)		r	r	r
Merlin	(<i>Falco columbarius</i>)	MF	r		
Rails and Coots					
American Coot	(<i>Fulica americana</i>)	OW	(u)		(u)
Shorebirds					
Black-bellied Plover	(<i>Pluvialis squatarola</i>)	RS	(u)		(r)
Piping Plover	(<i>Charadrius melodus</i>)	RS/SB	(u)		(r)
Semipalmated Plover	(<i>Charadrius semipalmatus</i>)	SB	(u)		(r)
Killdeer*	(<i>Charadrius vociferus</i>)	RS	c	c	c
Greater Yellowlegs	(<i>Tringa melanoleuca</i>)	RS	(u)	(u)	(u)
Lesser Yellowlegs	(<i>Tringa flavipes</i>)	RS	(u)	(u)	(u)
Whimbrel	(<i>Numenius phaeopus</i>)	SB		(r)	
Upland Sandpiper	(<i>Bartramia longicauda</i>)	GM		(r)	
Least Sandpiper	(<i>Calidris minutilla</i>)	SB	(u)		(r)
Pectoral Sandpiper	(<i>Calidris acuminata</i>)	RS	(u)		(r)
Dunlin	(<i>Calidris alpina</i>)	SB	(u)	(u)	(u)
Red Knot	(<i>Calidris canutus</i>)	RS/SB	(r)		
Sanderling	(<i>Calidris alba</i>)	SB	(u)	(u)	(u)
Ruddy Turnstone	(<i>Arenaria interpres</i>)	RS	(u)		
Gulls and Terns					

Species	Scientific Name	Habitat	Spring	Summer	Fall
Bonaparte's Gull	<i>(Larus philadelphia)</i>	SB/RS	(c)		(u)
Ring-billed Gull*	<i>(Larus delawarensis)</i>	SB/RS	c	c	c
Herring Gull*	<i>(Larus argentatus)</i>	RS/SB	a	a	c
Great Black-backed Gull*	<i>(Larus marinus)</i>	RS	o	o	
Common Tern	<i>(Sterna hirundo)</i>	OW/RS	(u)	u	(u)
Caspian Tern*	<i>(Sterna caspia)</i>	OW/RS	c	c	(u)
Kingfishers					
Belted Kingfisher	<i>(Ceryle alcyon)</i>	RS/FE	c	c	c
Jays, Magpies, and Crows					
American Crow	<i>(Corvus brachyrhynchos)</i>	MF	a	a	a
Common Raven	<i>(Corvus corax)</i>	MF	c	c	c
Larks					
Horned Lark	<i>(Eremophila alpestris)</i>	GM	u		
Swallows					
Cliff Swallow	<i>(Petrochelidon pyrrhonota)</i>	SB/RS	c	c	c
Wagtails and Pipits					
Water Pipit	<i>(Anthus spinoletta)</i>	RS			(r)
Sparrows					
Savannah Sparrow	<i>(Passerculus sandwichensis)</i>	GM	c	c	u
Blackbirds					
Red-winged Blackbird*	<i>(Agelaius phoeniceus)</i>	GM/W	c	c	c
Common Grackle	<i>(Quiscalus quiscula)</i>	FE	c	c	c

* Denotes species nesting on the refuge

Abundance Code	Decode
a	abundant
c	common
o	occasional
r	rare
u	uncommon
()	during migration
Habitat Code	Decode
MF	Mixed Coniferous/Hardwood Forest
FE	Forest Edge
W	Wetlands/Ephemeral Ponds
GM	Grassy Meadow
SB	Sandy Beach/Dunes
RS	Rocky Shoreline
OW	Open Water/Off-shore Islands

Season	Dates
Spring	April-mid-June
Summer	mid-June- August
Fall	September-November
Winter	December-March

Gravel Island and Green Bay NWRs

Wildlife Species of Management Concern to Gravel Island and Green Bay NWRs

Species	Scientific Name	Refuge Status	Regional/State Status
			R3-Conservation Priority in Region 3 E- Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern
Mammals			
White-tailed deer	<i>Odocoileus virginianus</i>	Recreation/Economic/Abundant	
Birds			
Common Loon	<i>Gavia immer</i>	Uncommon	R3
American White Pelican	<i>Pelecanus erythrorhynchos</i>	Uncommon	SSC
Double-crested Cormorant	<i>Phalacrocorax auratus</i>	Abundant	R3 (nuisance)
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	Uncommon	R3, SSC
Great Egret	<i>Ardea alba</i>	Uncommon	ST
Canada Goose	<i>Branta canadensis</i>	Recreational/Economic/Common	R3
Wood Duck	<i>Aix sponsa</i>	Recreational/Economic/Uncommon	R3
Mallard	<i>Anas platyrhynchos</i>	Recreational/Economic/Common	R3
American Black Duck	<i>Anas rubripes</i>	Recreational/Economic/Uncommon	R3, SSC
Blue-winged Teal	<i>Anas discors</i>	Recreational/Economic/Uncommon	R3
Northern Pintail	<i>Anas acuta</i>	Recreational/Economic/Uncommon	R3, SSC
Redhead	<i>Aythya americana</i>	Recreational/Economic/Uncommon	SSC
Lesser Scaup	<i>Aythya affinis</i>	Recreational/Economic/Uncommon	R3
Common Goldeneye	<i>Bucephala clangula</i>	Recreational/Economic/Common	SSC
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Common	R3, SSC
Red-shouldered Hawk	<i>Buteo lineatus</i>	Rare	R3, ST
Peregrine Falcon	<i>Falco peregrinus</i>	Rare	R3, SE
Piping Plover	<i>Charadrius melodus</i>	Rare	E, R3, SE
Greater Yellowlegs	<i>Tringa melanoleuca</i>	Uncommon	R3
Whimbrel	<i>Numenius phaeopus</i>	Rare	R3, SSC
Upland Sandpiper	<i>Bartramia longicauda</i>	Rare	R3, SSC
American Woodcock	<i>Scolopax minor</i>	Recreational/Economic/Common	R3
Short-billed Dowitcher	<i>Limnodromus griseus</i>	Uncommon	R3
Bonaparte's Gull	<i>Larus philadelphia</i>	Common	SSC
Great Black-backed Gull	<i>Larus marinus</i>	Rare	SSC
Common Tern	<i>Sterna hirundo</i>	Rare	R3, SE
Caspian Tern	<i>Sterna caspia</i>	Common	SE
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Uncommon	R3
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Uncommon	SSC
Northern Flicker	<i>Colaptes auratus</i>	Common	R3
Sedge Wren	<i>Cistothorus platensis</i>	Uncommon	R3
Swainson's Thrush	<i>Catharus ustulatus</i>	Uncommon	SSC
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Uncommon	R3
Cape May Warbler	<i>Dendroica tigrina</i>	Uncommon	SSC
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	Uncommon	R3, SSC
Reptiles			
Northern ringneck snake	<i>Diadophis puntatus edwarsi</i>	Uncommon	SSC
Plants			
Dwarf lake iris	<i>Iris lacustris</i>	Uncommon	T, R3, ST
Dune goldenrod	<i>Solidago simplex var. gillmanii</i>	Uncommon	ST
Climbing fumitory	<i>Adlumia fungosa</i>	Uncommon	SSC
One-flowered cancer root	<i>Orobancha uniflora</i>	Uncommon	SSC
White camas	<i>Zigadenus elegans var. glaucus</i>	Uncommon	SSC

Canada yew	<i>Taxus canadensis</i>	Uncommon	SSC
Tufted hairgrass	<i>Deschampsia cespitosa</i>	Uncommon	SSC
Variegated horsetail	<i>Equisetum variegatum</i>	Uncommon	SSC
American sea rocket	<i>Cakile lacustris</i>	Uncommon	SSC

Vegetation by Island

Gravel Island NWR

Gravel Island Vegetation

Scientific Name	Genus	Species	Common Name	Family
<i>Malva neglecta</i>	Malva	neglecta	common mallow	Malvaceae
<i>Polygonum lapathifolium</i>	Polygonum	lapathifolium	nodding smartweed, curly-top knotweed, pale smartweed	Polygonaceae
<i>Potentilla norvegica</i>	Potentilla	norvegica	rough cinquefoil	Rosaceae
<i>Solanum dulcamara</i>	Solanum	dulcamara	bittersweet nightshade	Solanaceae
<i>Argentina anserina</i>	Argentina	anserina	silverweed	Rosaceae
<i>Erysimum cheiranthoides</i>	Erysimum	cheiranthoides	wormseed-mustard	Brassicaceae
<i>Sedum acre</i>	Sedum	acre	golden carpet, gold moss stonecrop	Crassulaceae
<i>Amaranthus sp.</i>	Amaranthus	sp.	amaranth	Amaranthaceae
<i>Cirsium vulgare</i>	Cirsium	vulgare	bull thistle	Asteraceae
<i>Populus deltoides</i>	Populus	deltoides	eastern cottonwood	Salicaceae
<i>Solidago canadensis</i>	Solidago	canadensis	Canada goldenrod	Asteraceae
<i>Achillea millefolium</i>	Achillea	millefolium	yarrow	Asteraceae
<i>Euthamia graminifolia</i>	Euthamia	graminifolia	flat-topped goldenrod	Asteraceae
<i>Cakile lacustris</i>	Cakile	lacustris	sea-rocket	Brassicaceae
<i>Eupatorium perfoliatum</i>	Eupatorium	perfoliatum	boneset	Asteraceae
<i>Lycopus americanus</i>	Lycopus	americanus	common water-horehound	Lamiaceae
<i>Portulaca oleracea</i>	Portulaca	oleracea	purslane	Portulacaceae
<i>Polygonum persicaria</i>	Polygonum	persicaria	lady's thumb	Polygonaceae
<i>Salix exigua</i>	Salix	exigua	sandbar willow	Salicaceae
<i>Senecio vulgaris</i>	Senecio	vulgaris	common groundsel	Asteraceae

Spider Island Vegetation

Scientific Name	Genus	Species	Common Name	Family
<i>Malva neglecta</i>	Malva	neglecta	common mallow	Malvaceae
<i>Nepeta cataria</i>	Nepeta	cataria	catnip	Lamiaceae
<i>Polygonum lapathifolium</i>	Polygonum	lapathifolium	nodding smartweed, curly-top knotweed, pale smartweed	Polygonaceae
<i>Potentilla norvegica</i>	Potentilla	norvegica	rough cinquefoil	Rosaceae
<i>Solanum dulcamara</i>	Solanum	dulcamara	bittersweet nightshade	Solanaceae
<i>Urtica dioica</i>	Urtica	dioica	stinging nettle	Urticaceae
<i>Argentina anserina</i>	Argentina	anserina	silverweed	Rosaceae
<i>Erysimum cheiranthoides</i>	Erysimum	cheiranthoides	wormseed-mustard	Brassicaceae
<i>Sedum acre</i>	Sedum	acre	golden carpet, gold moss stonecrop	Crassulaceae
<i>Veronica anallis-aquatica</i>	Veronica	anallis-aquatica	water speedwell	Scrophulariaceae
<i>Silene vulgaris</i>	Silene	vulgaris	bladder campion	Caryophyllaceae
<i>Amaranthus sp.</i>	Amaranthus	sp.	amaranth	Amaranthaceae
<i>Aster sp.</i>	Aster	sp.	aster	Asteraceae
<i>Conyza canadensis</i>	Conyza	canadensis	horseweed	Asteraceae
<i>Polygonum sp.</i>	Polygonum	sp.	polygonum	Polygonaceae
<i>Sisymbrium altissimum</i>	Sisymbrium	altissimum	tumble mustard	Brassicaceae

Green Bay NWR

Hog Island Vegetation

Scientific Name	Genus	Species	Common Name	Family
<i>Betula papyrifera</i>	Betula	papyrifera	white birch, paper birch	Betulaceae
<i>Cirsium vulgare</i>	Cirsium	vulgare	bull thistle	Asteraceae
<i>Cornus stolonifera</i>	Cornus	stolonifera	red-osier dogwood	Cornaceae
<i>Malva neglecta</i>	Malva	neglecta	common mallow	Malvaceae
<i>Nepeta cataria</i>	Nepeta	cataria	catnip	Lamiaceae
<i>Polygonum lapathifolium</i>	Polygonum	lapathifolium	nodding smartweed, curly-top knotweed, pale smartweed	Polygonaceae
<i>Potentilla norvegica</i>	Potentilla	norvegica	rough cinquefoil	Rosaceae
<i>Prunus virginiana</i>	Prunus	virginiana	chokecherry	Rosaceae
<i>Sambucus racemosa</i>	Sambucus	racemosa	red-berried elder	Caprifoliaceae
<i>Solanum dulcamara</i>	Solanum	dulcamara	bittersweet nightshade	Solanaceae
<i>Urtica dioica</i>	Urtica	dioica	stinging nettle	Urticaceae
<i>Epilobium ciliatum</i>	Epilobium	ciliatum	willow-herb	Onagraceae
<i>Impatiens capensis</i>	Impatiens	capensis	touch-me-not, jewelweed	Balsaminaceae
<i>Populus deltoides</i>	Populus	deltoides	eastern cottonwood	Salicaceae
<i>Rubus sp.</i>	Rubus	sp.	red raspberry	Rosaceae
<i>Argentina anserina</i>	Argentina	anserina	silverweed	Rosaceae
<i>Aster pilosus</i>	Aster	pilosus	Pringle's frost aster	Asteraceae
<i>Geranium robertianum</i>	Geranium	robertianum	herb-robert	Geraniaceae
<i>Melilotus alba</i>	Melilotus	alba	white sweet-clover	Leguminosae
<i>Populus tremuloides</i>	Populus	tremuloides	quaking aspen	Salicaceae
<i>Silene latifolia</i>	Silene	latifolia	white campion, evening lychnis	Caryophyllaceae
<i>Solidago canadensis</i>	Solidago	canadensis	Canada goldenrod	Asteraceae
<i>Abies balsamea</i>	Abies	balsamea	balsam fir	Pinaceae
<i>Achillea millefolium</i>	Achillea	millefolium	yarrow	Asteraceae
<i>Artemisia sp.</i>	Artemisia	sp.	wormwood	Asteraceae
<i>Aster puniceus</i>	Aster	puniceus	purple-stemmed aster	Asteraceae
<i>Berteroa incana</i>	Berteroa	incana	hoary-alyssum	Brassicaceae
<i>Campanula rotundifolia</i>	Campanula	rotundifolia	harebell	Campanulaceae
<i>Celastrus scandens</i>	Celastrus	scandens	American bittersweet	Celastraceae
<i>Cirsium arvense</i>	Cirsium	arvense	Canada thistle	Asteraceae
<i>Elymus canadensis</i>	Elymus	canadensis	Canada wildrye	Poaceae
<i>Erysimum cheiranthoides</i>	Erysimum	cheiranthoides	wormseed-mustard	Brassicaceae
<i>Erigeron sp.</i>	Erigeron	sp.	fleabane	Asteraceae
<i>Euthamia graminifolia</i>	Euthamia	graminifolia	flat-topped goldenrod	Asteraceae
<i>Leonurus cardiaca</i>	Leonurus	cardiaca	motherwort	Lamiaceae
<i>Leucanthemum vulgare</i>	Leucanthemum	vulgare	ox-eye daisy	Asteraceae
<i>Lythrum salicaria</i>	Lythrum	salicaria	purple loosestrife	Lythrumaceae
<i>Matricaria discoidea</i>	Matricaria	discoidea	pineapple-weed	Asteraceae
<i>Polygonum cilinode</i>	Polygonum	cilinode	fringed bindweed	Polygonaceae
<i>Ribes americanum</i>	Ribes	americanum	American black currant	Grossulariaceae
<i>Salix bebbiana</i>	Salix	bebbiana	beaked willow	Salicaceae
<i>Salix lucida</i>	Salix	lucida	shining willow	Salicaceae
<i>Sedum acre</i>	Sedum	acre	golden carpet, gold moss stonecrop	Crassulaceae
<i>Taxus canadensis</i>	Taxus	canadensis	Canada yew	Taxaceae
<i>Veronica anallis-aquatica</i>	Veronica	anallis-aquatica	water speedwell	Scrophulariaceae

Pilot Island Vegetation

Scientific Name	Genus	Species	Common Name	Family
<i>Betula papyrifera</i>	Betula	papyrifera	white birch, paper birch	Betulaceae
<i>Cirsium vulgare</i>	Cirsium	vulgare	bull thistle	Asteraceae
<i>Cornus stolonifera</i>	Cornus	stolonifera	red-osier dogwood	Cornaceae
<i>Hemerocallis fulva</i>	Hemerocallis	fulva	day-lily	Liliaceae
<i>Heracleum maximum</i>	Heracleum	maximum	cow parsnip	Apiaceae
<i>Malva neglecta</i>	Malva	neglecta	common mallow	Malvaceae
<i>Nepeta cataria</i>	Nepeta	cataria	catnip	Lamiaceae
<i>Physocarpus opulifolius</i>	Physocarpus	opulifolius	Ninebark	Rosaceae
<i>Polygonum lapathifolium</i>	Polygonum	lapathifolium	nodding smartweed, curly-top knotweed, pale smartweed	Polygonaceae
<i>Potentilla norvegica</i>	Potentilla	norvegica	rough cinquefoil	Rosaceae
<i>Prunus virginiana</i>	Prunus	virginiana	chokecherry	Rosaceae
<i>Saponaria officinalis</i>	Saponaria	officinalis	soapwort, bouncing-bet	Caryophyllaceae
<i>Sambucus racemosa</i>	Sambucus	racemosa	red-berried elder	Caprifoliaceae
<i>Solanum dulcamara</i>	Solanum	dulcamara	bittersweet nightshade	Solanaceae
<i>Syringa vulgaris</i>	Syringa	vulgaris	lilac	Oleaceae
<i>Urtica dioica</i>	Urtica	dioica	stinging nettle	Urticaceae
<i>Verbascum thapsus</i>	Verbascum	thapsus	common mullein	Scrophulariaceae
<i>Convolvulus sp. (vine)</i>	Convolvulus	sp. (vine)	bindweed	Convolvulaceae
<i>Cynoglossum officinale</i>	Cynoglossum	officinale	hound's tongue	Boraginaceae
<i>Epilobium ciliatum</i>	Epilobium	ciliatum	willow-herb	Onagraceae
<i>Fraxinus pennsylvanica</i>	Fraxinus	pennsylvanica	green ash	Oleaceae
<i>Geum sp.</i>	Geum	sp.	Geum	Rosaceae
<i>Impatiens capensis</i>	Impatiens	capensis	touch-me-not, jewelweed	Balsaminaceae
<i>Lysimachia ciliata</i>	Lysimachia	ciliata	fringed loosestrife	Primulaceae
<i>Oenothera biennis</i>	Oenothera	biennis	common evening-primrose	Onagraceae
<i>Populus deltoides</i>	Populus	deltoides	eastern cottonwood	Salicaceae
<i>Rubus sp.</i>	Rubus	sp.	red raspberry	Rosaceae
<i>Silene vulgaris</i>	Silene	vulgaris	bladder campion	Caryophyllaceae
<i>Smilacina stellata</i>	Smilacina	stellata	starry false Solomon's-seal	Liliaceae
<i>Thuja occidentalis</i>	Thuja	occidentalis	northern white cedar	Cupressaceae

Plum Island Vegetation

Scientific Name	Genus	Species	Common Name	Family
<i>Abies balsamea</i>	Abies	balsamea	balsam fir	Pinaceae
<i>Acer negundo</i>	Acer	negundo	box-elder	Aceraceae
<i>Acer saccharum</i>	Acer	saccharum	sugar maple	Aceraceae
<i>Acer spicatum</i>	Acer	spicatum	mountain maple	Aceraceae
<i>Achillea millefolium</i>	Achillea	millefolium	yarrow	Asteraceae
<i>Acinos arvensis</i>	Acinos	arvensis	basil-thyme	Lamiaceae
<i>Actaea rubra</i>	Actaea	rubra	red baneberry	Ranunculaceae
<i>Actea pachypoda</i>	Actea	pachypoda	white baneberry	Ranunculaceae
<i>Adlumia fungosa</i>	Adlumia	fungosa	Allegheny vine	Fumariaceae
<i>Agalinis purpurea</i>	Agalinis	purpurea	purple false foxglove	Scrophulariaceae
<i>Agrimonia gryposepala</i>	Agrimonia	gryposepala	common agrimony	Rosaceae
<i>Agrostis hyemalis</i>	Agrostis	hyemalis	tickle grass	Poaceae
<i>Agrostis stolonifera</i>	Agrostis	stolonifera	creeping bent grass	Poaceae
<i>Allium tricoccum</i>	Allium	tricoccum	wild leek	Liliaceae
<i>Alnus incana</i>	Alnus	incana	speckled alder	Betulaceae
<i>Amaranthus powellii</i>	Amaranthus	powellii	tall amaranth	Amaranthaceae
<i>Amelanchier sanguinea</i>	Amelanchier	sanguinea	round-leaved juneberry	Rosaceae
<i>Anaphalis margaritacea</i>	Anaphalis	margaritacea	pearly everlasting	Compositae
<i>Anemone acutiloba</i>	Anemone	acutiloba	sharp-lobed hepatica	Ranunculaceae
<i>Anemone americana</i>	Anemone	americana	round-lobed hepatica	Ranunculaceae
<i>Anemone canadensis</i>	Anemone	canadensis	Canada anemone	Ranunculaceae
<i>Anemone virginiana</i>	Anemone	virginiana	tall thimbleweed	Ranunculaceae
<i>Antennaria howellii</i>	Antennaria	howellii	Howell's pussy-toes	Compositae
<i>Apocynum androsaemifolium</i>	Apocynum	androsaemifolium	spreading dogbane	Apocynaceae
<i>Aquilegia canadensis</i>	Aquilegia	canadensis	columbine	Ranunculaceae
<i>Arabis divaricarpa</i>	Arabis	divaricarpa	spreading-pod rock-cress	Cruciferae
<i>Arabis hirsuta</i>	Arabis	hirsuta	hairy rock-cress	Cruciferae
<i>Arabis lyrata</i>	Arabis	lyrata	lyre-leaved rock-cress	Cruciferae
<i>Aralia nudicaulis</i>	Aralia	nudicaulis	wild sarsaparilla	Araliaceae
<i>Aralia racemosa</i>	Aralia	racemosa	spikenard	Araliaceae
<i>Arctium minus</i>	Arctium	minus	common burdock	Asteraceae
<i>Arctostaphylos uva-ursi</i>	Arctostaphylos	uva-ursi	bearberry	Ericaceae
<i>Arenaria serpyllifolia</i>	Arenaria	serpyllifolia	thyme-leaved sandwort	Caryophyllaceae
<i>Argentina anserina</i>	Argentina	anserina	silverweed	Rosaceae
<i>Arisaema triphyllum</i>	Arisaema	triphyllum	jack-in-the-pulpit	Araceae
<i>Artemisia biennis</i>	Artemisia	biennis	biennial wormwood	Compositae
<i>Asclepias syriaca</i>	Asclepias	syriaca	common milkweed	Asclepiadaceae
<i>Asparagus officinalis</i>	Asparagus	officinalis	asparagus	Liliaceae
<i>Aster ciliolatus</i>	Aster	ciliolatus	Lindley's aster	Compositae
<i>Aster macrophyllus</i>	Aster	macrophyllus	big-leaved aster	Compositae
<i>Aster pilosus</i>	Aster	pilosus	Pringle's frost aster	Asteraceae
<i>Athyrium filix-femina</i>	Athyrium	filix-femina	lady fern	Dryopteraceae
<i>Barbarea vulgaris</i>	Barbarea	vulgaris	garden yellow-rocket	Cruciferae
<i>Berberis thunbergii</i>	Berberis	thunbergii	Japanese barberry	Berberidaceae
<i>Berteroa incana</i>	Berteroa	incana	hoary-alyssum	Brassicaceae
<i>Betula papyrifera</i>	Betula	papyrifera	white birch, paper birch	Betulaceae
<i>Bidens cernua</i>	Bidens	cernua	nodding beggar-ticks	Compositae
<i>Botrychium virginianum</i>	Botrychium	virginianum	rattlesnake fern	Ophioglossaceae
<i>Cakile lacustris</i>	Cakile	lacustris	sea rocket	Brassicaceae
<i>Calamagrostis canadensis</i>	Calamagrostis	canadensis	bluejoint grass	Poaceae
<i>Caltha palustris</i>	Caltha	palustris	marsh marigold	Ranunculaceae
<i>Calystegia sepium</i>	Calystegia	sepium	hedge bindweed	Convolvulaceae
<i>Campanula aparinoides</i>	Campanula	aparinoides	marsh bellflower	Campanulaceae
<i>Campanula rotundifolia</i>	Campanula	rotundifolia	harebell	Campanulaceae
<i>Capsella bursa-pastoris</i>	Capsella	bursa-pastoris	shepherd's-purse	Cruciferae
<i>Cardamine concatenata</i>	Cardamine	concatenata	broad-leaved toothwort	Cruciferae
<i>Cardamine diphylla</i>	Cardamine	diphylla	board-leaved toothwort	
<i>Carex aquatilis</i>	Carex	aquatilis	water sedge	Cyperaceae
<i>Carex arctata</i>	Carex	arctata	drooping woodland sedge	Cyperaceae
<i>Carex deweyana</i>	Carex	deweyana	Dewey's sedge	Cyperaceae

Scientific Name	Genus	Species	Common Name	Family
<i>Carex eburnea</i>	Carex	eburnea	bristle-leaf sedge	Cyperaceae
<i>Carex flava</i>	Carex	flava	yellow sedge	Cyperaceae
<i>Carex hystericina</i>	Carex	hystericina	bottlebrush sedge	Cyperaceae
<i>Carex laxiflora</i>	Carex	laxiflora	broad loose-flowered sedge	Cyperaceae
<i>Carex peckii</i>	Carex	peckii	Peck's sedge	Cyperaceae
<i>Carex pedunculata</i>	Carex	pedunculata	long-stalked sedge	Cyperaceae
<i>Carex pensylvanica</i>	Carex	pensylvanica	Penn sedge	Cyperaceae
<i>Carex radiata</i>	Carex	radiata	eastern star sedge	Cyperaceae
<i>Carex rosea</i>	Carex	rosea	rosy sedge	Cyperaceae
<i>Carex sartwellii</i>	Carex	sartwellii	Sartwell's sedge	Cyperaceae
<i>Carex viridula</i>	Carex	viridula	little green sedge	Cyperaceae
<i>Castilleja coccinea</i>	Castilleja	coccinea	indian paintbrush	Scrophulariaceae
<i>Caulophyllum thalictroides</i>	Caulophyllum	thalictroides	blue cohosh	Berberidaceae
<i>Celastrus scandens</i>	Celastrus	scandens	American bitter-sweet	Celastraceae
<i>Centaurea biebersteinii</i>	Centaurea	biebersteinii	spotted knapweed	Compositae
<i>Cerastium fontanum</i>	Cerastium	fontanum	mouse-ear chickweed	Caryophyllaceae
<i>Cerastium nutans</i>	Cerastium	nutans	nodding chickweed	Caryophyllaceae
<i>Chenopodium capitatum</i>	Chenopodium	capitatum	strawberry-blite	Chenopodiaceae
<i>Cichorium intybus</i>	Cichorium	intybus	chickory	Compositae
<i>Cicuta bulbifera</i>	Cicuta	bulbifera	bulblet water-hemlock	Umbelliferae
<i>Circa alpina</i>	Circaea	alpina	dwarf enchanters nightshade	Onagraceae
<i>Circaea lutetiana</i>	Circaea	lutetiana	common enchanter's-nightshade	Onagraceae
<i>Cirsium arvense</i>	Cirsium	arvense	Canada thistle	Asteraceae
<i>Cirsium palustre</i>	Cirsium	palustre	European swamp thistle	Compositae
<i>Cirsium vulgare</i>	Cirsium	vulgare	bull thistle	Asteraceae
<i>Claytonia caroliniana</i>	Claytonia	caroliniana	Carolina spring-beauty	Portulacaceae
<i>Clinopodium vulgare</i>	Clinopodium	vulgare	wild-basil	Lamiaceae
<i>Clintonia borealis</i>	Clintonia	borealis	bluebead	Liliaceae
<i>Comandra umbellata</i>	Comandra	umbellata	bastard-toadflax	Santalaceae
<i>Comarum palustre</i>	Comarum	palustre	marsh cinquefoil	Rosaceae
<i>Convallaria majalis</i>	Convallaria	majalis	European lily-of-the-valley	Liliaceae
<i>Convolvulus sp.</i>	Convolvulus		bindweed	Convolvulaceae
<i>Conyza canadensis</i>	Conyza	canadensis	horseweed	Asteraceae
<i>Cornus rugosa</i>	Cornus	rugosa	round-leaved dogwood	Cornaceae
<i>Cornus stolonifera</i>	Cornus	stolonifera	red-osier dogwood	Cornaceae
<i>Corydalis aurea</i>	Corydalis	aurea	golden corydalis	Fumariaceae
<i>Crepis tectorum</i>	Crepis	tectorum	hawk's-beard	Compositae
<i>Cynoglossum officinale</i>	Cynoglossum	officinale	hound's tongue	Boraginaceae
<i>Cypripedium pubescens</i>	Cypripedium	pubescens	large yellow lady's-slipper	Orchidaceae
<i>Cystopteris tenius</i>	Cystopteris	tenius	Mackay's brittle fern	Polypodiaceae
<i>Dactylis glomerata</i>	Dactylis	glomerata	orchard grass	Poaceae
<i>Daucus carota</i>	Daucus	carota	Queen Anne's-lace	Umbelliferae
<i>Deschampsia cespitosa</i>	Deschampsia	cespitosa	tufted hairgrass	Poaceae
<i>Diervilla lonicera</i>	Diervilla	lonicera	bush-honeysuckle	Caprifoliaceae
<i>Dryopteris intermedia</i>	Dryopteris	intermedia	intermediate wood fern	Polypodiaceae
<i>Dryopteris marginalis</i>	Dryopteris	marginalis	marginal wood fern	Polypodiaceae
<i>Eleocharis elliptica</i>	Eleocharis	elliptica	elliptic spikerush	Cyperaceae
<i>Eleocharis palustris</i>	Eleocharis	palustris	common spikerush	Cyperaceae
<i>Elymus canadensis</i>	Elymus	canadensis	Canada wildrye	Poaceae
<i>Elymus trachycaulus</i>	Elymus	trachycaulus	slender wheatgrass	Poaceae
<i>Elytrigia repens</i>	Elytrigia	repens	quackgrass	Poaceae
<i>Epilobium ciliatum</i>	Epilobium	ciliatum	willow-herb	Onagraceae
<i>Epipactis helleborine</i>	Epipactis	helleborine	helleborine orchid	Orchidaceae
<i>Equisetum arvense</i>	Equisetum	arvense	field horsetail	Equisetaceae
<i>Equisetum variegatum</i>	Equisetum	variegatum	variegated scouring rush	Equisetaceae
<i>Erigeron philadelphicus</i>	Erigeron	philadelphicus	common fleabane	Compositae
<i>Erigeron strigosus</i>	Erigeron	strigosus	daisy fleabane	Compositae
<i>Erucastrum gallicum</i>	Erucastrum	gallicum	dog mustard	Cruciferae
<i>Erysimum cheiranthoides</i>	Erysimum	cheiranthoides	wormseed-mustard	Brassicaceae
<i>Erythronium americanum</i>	Erythronium	americanum	yellow trout-lily	Liliaceae
<i>Eupatorium perfoliatum</i>	Eupatorium	perfoliatum	boneset	Asteraceae

Scientific Name	Genus	Species	Common Name	Family
<i>Euthamia graminifolia</i>	Euthamia	graminifolia	flat-topped goldenrod	Asteraceae
<i>Festuca occidentalis</i>	Festuca	occidentalis	Western fescue	Poaceae
<i>Festuca pratensis</i>	Festuca	pratensis	rye grass	Poaceae
<i>Festuca subverticillata</i>	Festuca	subverticillata	nodding fescue	Poaceae
<i>Festuca trachyphylla</i>	Festuca	trachyphylla	sheep fescue	Poaceae
<i>Fragaria vesca</i>	Fragaria	vesca	woodland strawberry	Rosaceae
<i>Fragaria virginiana</i>	Fragaria	virginiana	wild strawberry	Rosaceae
<i>Fraxinus pennsylvanica</i>	Fraxinus	pennsylvanica	green ash	Oleaceae
<i>Galium aparine</i>	Galium	aparine	cleavers	Rubiaceae
<i>Galium triflorum</i>	Galium	triflorum	sweet-scented bedstraw	Rubiaceae
<i>Gentianopsis crinita</i>	Gentianopsis	crinita	fringed gentian	Gentianaceae
<i>Geranium robertianum</i>	Geranium	robertianum	herb-robert	Geraniaceae
<i>Geum aleppicum</i>	Geum	aleppicum	yellow avens	Rosaceae
<i>Geum canadense</i>	Geum	canadense	white avens	Rosaceae
<i>Gymnocarpium dryopteris</i>	Gymnocarpium	dryopteris	common oak fern	Polypodiaceae
<i>Halenia deflexa</i>	Halenia	deflexa	spurred-gentian	Gentianaceae
<i>Hemerocallis fulva</i>	Hemerocallis	fulva	day-lily	Liliaceae
<i>Heracleum maximum</i>	Heracleum	maximum	cow parsnip	Apiaceae
<i>Hesperis matronalis</i>	Hesperis	matronalis	dame's rocket	Cruciferae
<i>Hieracium aurantiacum</i>	Hieracium	aurantiacum	orange hawkweed	Compositae
<i>Hieracium kalmii</i>	Hieracium	kalmii	Canada hawkweed	Compositae
<i>Hieracium piloselloides</i>	Hieracium	piloselloides	kin-devil	Compositae
<i>Hypericum kalmianum</i>	Hypericum	kalmianum	Kalm's St. Johnswort	Hypericaceae
<i>Hypericum majus</i>	Hypericum	majus	small St. Johnswort	Hypericaceae
<i>Hypericum perforatum</i>	Hypericum	perforatum	common St. Johnswort	Hypericaceae
<i>Impatiens capensis</i>	Impatiens	capensis	touch-me-not, jewelweed	Balsaminaceae
<i>Iris lacustris</i>	Iris	lacustris	dwarf lake iris	Iridaceae
<i>Iris versicolor</i>	Iris	versicolor	northern blue flag	Iridaceae
<i>Juncus articus</i>	Juncus	articus	Baltic rush	Juncaceae
<i>Juniperus communis</i>	Juniperus	communis	common juniper	Cupressaceae
<i>Lactuca canadensis</i>	Lactuca	canadensis	Canada lettuce	Compositae
<i>Larix laricina</i>	Larix	laricina	tamarack	Pinaceae
<i>Lathyrus japonicus</i>	Lathyrus	japonicus	beach pea	Leguminosae
<i>Lathyrus palustris</i>	Lathyrus	palustris	marsh pea	Leguminosae
<i>Leonurus cardiaca</i>	Leonurus	cardiaca	motherwort	Lamiaceae
<i>Leucanthemum vulgare</i>	Leucanthemum	vulgare	ox-eye daisy	Asteraceae
<i>Lilium philadelphicum</i>	Lilium	philadelphicum	wood lily	Liliaceae
<i>Linaria vulgaris</i>	Linaria	vulgaris	butter-and-eggs	Scrophulariaceae
<i>Linnaea borealis</i>	Linnaea	borealis	twinflower	Caprifoliaceae
<i>Lobelia kalmii</i>	Lobelia	kalmii	brook lobelia	Lobeliaceae
<i>Lonicera canadensis</i>	Lonicera	canadensis	Canada honeysuckle	Caprifoliaceae
<i>Lonicera dioica</i>	Lonicera	dioica	red honeysuckle	Caprifoliaceae
<i>Lonicera hirsuta</i>	Lonicera	hirsuta	hairy honeysuckle	Caprifoliaceae
<i>Lonicera xbella</i>	Lonicera	xbella	Bell's honeysuckle	Caprifoliaceae
<i>Lycopus americanus</i>	Lycopus	americanus	common water-horehound	Lamiaceae
<i>Lysimachia quadriflora</i>	Lysimachia	quadriflora	narrow-leaved loosestrife	Primulaceae
<i>Lysimachia thyrsoflora</i>	Lysimachia	thyrsoflora	tufted loosestrife	Primulaceae
<i>Maianthemum canadense</i>	Maianthemum	canadense	Canada mayflower	Liliaceae
<i>Malus pumila</i>	Malus	pumila	apple	Rosaceae
<i>Medicago lupulina</i>	Medicago	lupulina	black medick	Leguminosae
<i>Melampyrum lineare</i>	Melampyrum	lineare	cow-wheat	Scrophulariaceae
<i>Melilotus alba</i>	Melilotus	alba	white sweet-clover	Leguminosae
<i>Milium effusum</i>	Milium	effusum	wood millet	Poaceae
<i>Myosotis scirpioides</i>	Myosotis	scirpioides	common forget-me-not	Boraginaceae
<i>Nepeta cataria</i>	Nepeta	cataria	catnip	Lamiaceae
<i>Nuphar variegatum</i>	Nuphar	variegatum	bullhead pondlily	Nymphaeaceae
<i>Oenothera oakesiana</i>	Oenothera	oakesiana	Oakes' evening-primrose	Onagraceae
<i>Orobanche uniflora</i>	Orobanche	uniflora	one-flowered cancer-root	Orobanchaceae
<i>Osmorhiza claytonii</i>	Osmorhiza	claytonii	hairy sweet cicely	Apiaceae
<i>Osmorhiza longistylis</i>	Osmorhiza	longistylis	long-styled sweet cicely	Umbelliferae
<i>Ostrya virginiana</i>	Ostrya	virginiana	hop-hornbeam	Betulaceae
<i>Panicum acuminatum</i>	Panicum	acuminatum	Western panic grass	Poaceae
<i>Panicum capillare</i>	Panicum	capillare	witch grass	Poaceae

Scientific Name	Genus	Species	Common Name	Family
<i>Phalaris arundinacea</i>	Phalaris	arundinacea	reed canarygrass	Poaceae
<i>Phleum pratense</i>	Phleum	pratense	Timothy	Poaceae
<i>Physocarpus opulifolius</i>	Physocarpus	opulifolius	Ninebark	Rosaceae
<i>Picea glauca</i>	Picea	glauca	white spruce	Pinaceae
<i>Pinus strobus</i>	Pinus	strobus	white pine	Pinaceae
<i>Poa pratensis</i>	Poa	pratensis	Kentucky bluegrass	Poaceae
<i>Poa annua</i>	Poa	annua	annual bluegrass	Poaceae
<i>Poa compressa</i>	Poa	compressa	Canada bluegrass	Poaceae
<i>Poa palustris</i>	Poa	palustris	fowl meadow grass	Poaceae
<i>Polygala paucifolia</i>	Polygala	paucifolia	fringed polygala	Polygalaceae
<i>Polygonatum pubescens</i>	Polygonatum	pubescens	downy Solomon's-seal	Liliaceae
<i>Polygonum amphibium</i>	Polygonum	amphibium	water smartweed	Polygonaceae
<i>Polygonum cilinode</i>	Polygonum	cilinode	fringed bindweed	Polygonaceae
<i>Polygonum erectum</i>	Polygonum	erectum	erect knotweed	Polygonaceae
<i>Polygonum lapathifolium</i>	Polygonum	lapathifolium	nodding smartweed, curly-top knotweed, pale smartweed	Polygonaceae
<i>Populus balsamifera</i>	Populus	balsamifera	balsam poplar	Salicaceae
<i>Populus deltoides</i>	Populus	deltoides	eastern cottonwood	Salicaceae
<i>Populus tremuloides</i>	Populus	tremuloides	quaking aspen	Salicaceae
<i>Portulaca oleracea</i>	Portulaca	oleracea	purslane	Portulacaceae
<i>Potentilla norvegica</i>	Potentilla	norvegica	rough cinquefoil	Rosaceae
<i>Potentilla recta</i>	Potentilla	recta	rough-fruited cinquefoil	Rosaceae
<i>Prunus pensylvanica</i>	Prunus	pensylvanica	fire cherry	Rosaceae
<i>Prunus pumila</i>	Prunus	pumila	sand cherry	Rosaceae
<i>Prunus virginiana</i>	Prunus	virginiana	chokecherry	Rosaceae
<i>Pyrola asarifolia</i>	Pyrola	asarifolia	pink shinleaf	Pyrolaceae
<i>Pyrola chlorantha</i>	Pyrola	chlorantha	greenish shinleaf	Pyrolaceae
<i>Quercus rubra</i>	Quercus	rubra	red oak	Fagaceae
<i>Ranunculus abortivus</i>	Ranunculus	abortivus	small-flowered buttercup	Ranunculaceae
<i>Ranunculus acris</i>	Ranunculus	acris	common buttercup	Ranunculaceae
<i>Ranunculus recurvatus</i>	Ranunculus	recurvatus	hooked buttercup	Ranunculaceae
<i>Rhamnus frangula</i>	Rhamnus	frangula	glossy buckthorn	Rhamnaceae
<i>Rorippa palustris</i>	Rorippa	palustris	yellow-cress	Cruciferae
<i>Rosa blanda</i>	Rosa	blanda	smooth rose	Rosaceae
<i>Rosa eglanteria</i>	Rosa	eglanteria	eglantine	Rosaceae
<i>Rubus idaeus</i>	Rubus	idaeus	red raspberry	Rosaceae
<i>Rudbeckia hirta</i>	Rudbeckia	hirta	black-eyed susan	Compositae
<i>Rumex acetosella</i>	Rumex	acetosella	sheep sorrel	Polygonaceae
<i>Rumex crispus</i>	Rumex	crispus	curly dock	Polygonaceae
<i>Rumex orbiculatus</i>	Rumex	orbiculatus	great water dock	Polygonaceae
<i>Salix amygdaloides</i>	Salix	amygdaloides	peach-leaved willow	Salicaceae
<i>Salix bebbiana</i>	Salix	bebbiana	beaked willow	Salicaceae
<i>Salix discolor</i>	Salix	discolor	pussy willow	Salicaceae
<i>Salix exigua</i>	Salix	exigua	sandbar willow	Salicaceae
<i>Salix lucida</i>	Salix	lucida	shining willow	Salicaceae
<i>Sambucus racemosa</i>	Sambucus	racemosa	red-berried elder	Caprifoliaceae
<i>Saponaria officinalis</i>	Saponaria	officinalis	soapwort, bouncing-bet	Caryophyllaceae
<i>Schoenoplectus pungens</i>	Schoenoplectus	pungens	three-square bulrush	Cyperaceae
<i>Schoenoplectus tabernaemontanus</i>	Schoenoplectus	tabernaemontanus	great bulrush	Cyperaceae
<i>Scutellaria galericulata</i>	Scutellaria	galericulata	common skullcap	Lamiaceae
<i>Sedum acre</i>	Sedum	acre	golden carpet, gold moss stonecrop	Crassulaceae
<i>Senecio vulgaris</i>	Senecio	vulgaris	common groundsel	Asteraceae
<i>Shepherdia canadensis</i>	Shepherdia	canadensis	russet buffaloberry	Elaeagnaceae
<i>Silene antirrhina</i>	Silene	antirrhina	sleepy catchfly	Caryophyllaceae
<i>Silene latifolia</i>	Silene	latifolia	white campion, evening lychnis	Caryophyllaceae
<i>Silene vulgaris</i>	Silene	vulgaris	bladder campion	Caryophyllaceae
<i>Sisymbrium altissimum</i>	Sisymbrium	altissimum	tumble mustard	Brassicaceae
<i>Sisyrinchium montanum</i>	Sisyrinchium	montanum	mountain blue-eyed-grass	Iridaceae
<i>Smilacina racemosa</i>	Smilacina	racemosa	common false Solomon's-seal	Liliaceae
<i>Smilacina stellata</i>	Smilacina	stellata	starry false Solomon's-seal	Liliaceae
<i>Solanum dulcamara</i>	Solanum	dulcamara	bittersweet nightshade	Solanaceae
<i>Solidago canadensis</i>	Solidago	canadensis	Canada goldenrod	Asteraceae

Scientific Name	Genus	Species	Common Name	Family
<i>Solidago flexicaulis</i>	Solidago	flexicaulis	zigzag goldenrod	Compositae
<i>Solidago hispida</i>	Solidago	hispida	hairy goldenrod	Compositae
<i>Solidago simplex</i>	Solidago	simplex	dune goldenrod	Compositae
<i>Sorbus decora</i>	Sorbus	decora	showy mountain-ash	Rosaceae
<i>Sphenopholis intermedia</i>	Sphenopholis	intermedia	slender wedgrass	Poaceae
<i>Stachys palustris</i>	Stachys	palustris	marsh hedge-nettle	Lamiaceae
<i>Stellaria media</i>	Stellaria	media	common chickweed	Caryophyllaceae
<i>Streptopus roseus</i>	Streptopus	roseus	rosy twisted-stalk	Liliaceae
<i>Symphoricarpos albus</i>	Symphoricarpos	albus	snowberry	Caprifoliaceae
<i>Syringa vulgaris</i>	Syringa	vulgaris	lilac	Oleaceae
<i>Tanacetum vulgare</i>	Tanacetum	vulgare	common tansy	Compositae
<i>Taraxacum officinale</i>	Taraxacum	officinale	dandelion	Asteraceae
<i>Taxus canadensis</i>	Taxus	canadensis	Canada yew	Taxaceae
<i>Thalictrum dioicum</i>	Thalictrum	dioicum	early meadow-rue	Ranunculaceae
<i>Thlaspi arvense</i>	Thlaspi	arvense	pennycress	Cruciferae
<i>Thuja occidentalis</i>	Thuja	occidentalis	northern white cedar	Cupressaceae
<i>Tilia americana</i>	Tilia	americana	basswood	Tiliaceae
<i>Toxicodendron rydbergii</i>	Toxicodendron	rydbergii	poison ivy	Anacardiaceae
<i>Tragopogon dubius</i>	Tragopogon	dubius	common goat's-beard	Compositae
<i>Trientalis borealis</i>	Trientalis	borealis	starflower	Primulaceae
<i>Trifolium hybridum</i>	Trifolium	hybridum	Alsike clover	Leguminosae
<i>Trifolium pratense</i>	Trifolium	pratense	red clover	Leguminosae
<i>Trifolium repens</i>	Trifolium	repens	white clover	Leguminosae
<i>Trillium grandiflorum</i>	Trillium	grandiflorum	great white trillium	Liliaceae
<i>Tsuga canadensis</i>	Tsuga	canadensis	eastern hemlock	Pinaceae
<i>Urtica dioica</i>	Urtica	dioica	stinging nettle	Urticaceae
<i>Valeriana officinalis</i>	Valeriana	officinalis	garden valerian	Valerianaceae
<i>Verbascum thapsus</i>	Verbascum	thapsus	common mullein	Scrophulariaceae
<i>Veronica anallis-aquatica</i>	Veronica	anallis-aquatica	water speedwell	Scrophulariaceae
<i>Veronica arvensis</i>	Veronica	arvensis	corn speedwell	Scrophulariaceae
<i>Veronica officinalis</i>	Veronica	officinalis	common speedwell	Scrophulariaceae
<i>Vicia americana</i>	Vicia	americana	American vetch	Leguminosae
<i>Vicia villosa</i>	Vicia	villosa	hairy vetch	Leguminosae
<i>Viola adunca</i>	Viola	adunca	hook-spur violet	Violaceae
<i>Viola canadensis</i>	Viola	canadensis	Canada violet	Violaceae
<i>Viola labradorica</i>	Viola	labradorica	alpine violet	Violaceae
<i>Viola pubescens</i>	Viola	pubescens	yellow violet	Violaceae
<i>Zigadenus elegans</i>	Zigadenus	elegans	white camass	Liliaceae

Bird Species

Species	Scientific Name	Habitat	Spring	Summer	Fall
Loons					
Common Loon	(<i>Gavia immer</i>)	OW	(u)	o	(u)
Grebes					
Pied-billed Grebe	(<i>Podilymbus podiceps</i>)	OW	(u)	o	(u)
Pelicans					
American White Pelican	(<i>Pelecanus erythrorhynchos</i>)	OW/RS	(u)	o	(u)
Cormorants					
Double-crested Cormorant *	(<i>Phalacrocorax auritus</i>)	OW/RS/MF	a	a	a
Hérons and Bitterns					
Great Blue Heron*	(<i>Ardea herodias</i>)	RS/MF	c	c	c
Black-crowned Night-Heron*	(<i>Nycticorax nycticorax</i>)	RS/MF	u	u	u
Great Egret*	(<i>Ardea alba</i>)	RS/MF	u	u	u
Vultures					
Turkey Vulture	(<i>Cathartes aura</i>)	FE	(c)	c	u
Swans, Geese and Ducks					
Canada Goose*	(<i>Branta canadensis</i>)	OW/RS	a	c	a
Tundra Swan	(<i>Cygnus columbianus</i>)	OW	u		u
Mute Swan*	(<i>Cygnus olor</i>)	OW/RS	c	c	c
Gadwall	(<i>Anas strepera</i>)	OW	(u)		(u)
American Wigeon	(<i>Anas americana</i>)	OW	(u)		(u)
American Black Duck*	(<i>Anas rubripes</i>)	OW/RS	u	u	u
Mallard Duck*	(<i>Anas platyrhynchos</i>)	OW/RS	c	c	c
Blue-winged Teal	(<i>Anas discors</i>)	OW	(u)		(u)
Northern Pintail	(<i>Anas acuta</i>)	OW	u		u
Green-winged Teal	(<i>Anas crecca</i>)	OW	(u)		(u)
Redhead	(<i>Aythya americana</i>)	OW	(u)		(u)
Greater Scaup	(<i>Aythya marila</i>)	OW	(u)		(u)
Lesser Scaup	(<i>Aythya affinis</i>)	OW	(u)		(u)
Bufflehead	(<i>Bucephala albeola</i>)	OW	(u)	(u)	(u)
Common Goldeneye	(<i>Bucephala clangula</i>)	OW	c	c	c
Long-tailed Duck	(<i>Clangula hyemalis</i>)	OW	(c)		(c)
Hooded Merganser	(<i>Lophodytes cucullatus</i>)	OW	(u)		(u)
Common Merganser	(<i>Mergus merganser</i>)	OW	(u)	(u)	o
Red-breasted Merganser*	(<i>Mergus serrator</i>)	OW/RS	c	c	c
Hawks and Eagles					
Bald Eagle*	(<i>Haliaeetus leucocephalus</i>)	OW/RS/MF	u	u	u
Sharp-shinned Hawk	(<i>Accipiter striatus</i>)	FE	u	u	u
Red-shouldered Hawk	(<i>Buteo lineatus</i>)	MF	r	r	r
Red-tailed Hawk	(<i>Buteo jamaicensis</i>)	FE/GF/MF	c	c	c
Broad-winged Hawk	(<i>Buteo platypterus</i>)		(a)	u	(a)
Falcons					
Peregrine Falcon	(<i>Falco peregrinus</i>)		r	r	r
Merlin	(<i>Falco columbarius</i>)	MF	r		
Rails and Coots					
Sora*	(<i>Porzana carolina</i>)	W	u	u	u
American Coot	(<i>Fulica americana</i>)	OW	(u)		(u)
Cranes					
Sandhill Crane	(<i>Grus canadensis</i>)	GM	u	u	u
Shorebirds					
Semipalmated Plover	(<i>Charadrius semipalmatus</i>)	SB	(u)		(r)
Killdeer*	(<i>Charadrius vociferus</i>)	RS	c	c	c
Greater Yellowlegs	(<i>Tringa melanoleuca</i>)	RS	(u)	(u)	(u)
Lesser Yellowlegs	(<i>Tringa flavipes</i>)	RS	(u)	(u)	(u)
Whimbrel	(<i>Numenius phaeopus</i>)	SB		(r)	
Spotted Sandpiper	(<i>Actitis macularia</i>)	RS/SB	(c)	u	(u)
Dunlin	(<i>Calidris alpina</i>)	SB	(u)	(u)	(u)
American Woodcock*	(<i>Scolopax minor</i>)	MF/FE	c	u	
Short-billed Dowitcher	(<i>Limnodromus griseus</i>)				
Gulls and Terns					
Bonaparte's Gull	(<i>Larus philadelphia</i>)	SB/RS	(c)		(u)
Ring-billed Gull*	(<i>Larus delawarensis</i>)	SB/RS	c	c	c
Herring Gull*	(<i>Larus argentatus</i>)	RS/SB	a	a	c

Species	Scientific Name	Habitat	Spring	Summer	Fall
Great Black-backed Gull*	<i>(Larus marinus)</i>	RS	o	o	
Common Tern	<i>(Sterna hirundo)</i>	OW/RS	(u)	u	(u)
Caspian Tern	<i>(Sterna caspia)</i>	OW/RS	c	c	(u)
Doves					
Mourning Dove	<i>(Zenaida macroura)</i>	GM/FE	c	c	c
Cuckoos and Roadrunners					
Black-billed Cuckoo*	<i>(Coccyzus erythrophthalmus)</i>	FE	u	u	
Yellow-billed Cuckoo*	<i>(Coccyzus americanus)</i>	FE	u	u	
Owls					
Great Horned Owl*	<i>(Bubo virginianus)</i>	FE	c	c	c
Nighthawks and Nightjars					
Common Nighthawk*	<i>(Chordeiles minor)</i>	GM	(c)	(c)	
Swifts					
Chimney Swift*	<i>(Chaetura pelagica)</i>	GM	(u)	(u)	
Hummingbirds					
Ruby-throated Hummingbird*	<i>(Archilochus colubris)</i>	FE	(c)	c	(c)
Kingfishers					
Belted Kingfisher*	<i>(Ceryle alcyon)</i>	RS/FE	c	c	c
Woodpeckers					
Red-headed Woodpecker	<i>(Melanerpes erythrocephalus)</i>	MF	u	u	u
Pileated Woodpecker	<i>(Dryocopus pileatus)</i>	MF	c	c	c
Red-bellied Woodpecker	<i>(Melanerpes carolinus)</i>	MF	c	c	c
Yellow-bellied Sapsucker	<i>(Sphyrapicus varius)</i>	FE/MF	(c)	u	u
Hairy Woodpecker*	<i>(Picoides villosus)</i>	MF	a	a	a
Downy Woodpecker*	<i>(Picoides pubescens)</i>	MF	a	a	a
Northern Flicker*	<i>(Colaptes auratus)</i>	MF/GM	(a)	c	(a)
Flycatchers					
Easter-wood Pewee*	<i>(Contopus virens)</i>	MF	c	c	u
Alder Flycatcher*	<i>(Empidonax alnorum)</i>	FE	u	u	u
Willow Flycatcher*	<i>(Empidonax traillii)</i>	FE	u	u	u
Least Flycatcher*	<i>(Empidonax minimus)</i>	FE	c	c	u
Eastern Phoebe*	<i>(Sayornis phoebe)</i>	MF	c	c	c
Great Crested Flycatcher*	<i>(Myiarchus crinitus)</i>	MF	c	c	c
Eastern Kingbird*	<i>(Tyrannus tyrannus)</i>	FE	c	c	c
Vireos					
Yellow-throated Vireo*	<i>(Vireo flavifrons)</i>	MF	u	u	u
Red-eyed Vireo*	<i>(Vireo olivaceus)</i>	MF/FE	c	c	u
Solitary Vireo	<i>(Vireo solitarius)</i>	MF	o	o	u
Jays, Magpies, and Crows					
Blue Jay*	<i>(Cyanocitta cristata)</i>	MF	(a)	c	(a)
American Crow*	<i>(Corvus brachyrhynchos)</i>	MF	a	a	a
Common Raven*	<i>(Corvus corax)</i>	MF	c	c	c
Swallows					
Tree Swallow	<i>(Tachycineta bicolor)</i>	FE	c	c	c
Barn Swallow*	<i>(Riparia riparia)</i>	GM	c	c	c
Cliff Swallow	<i>(Petrochelidon pyrrhonota)</i>	SB/RS	c	c	c
Chickadees and Titmice					
Black-capped Chickadee*	<i>(Poecile atricapillus)</i>	MF	a	a	a
Nuthatches					
White-breasted Nuthatch*	<i>(Sitta carolinensis)</i>	MF	u	u	u
Red-breasted Nuthatch	<i>(Sitta canadensis)</i>	MF	c	c	c
Creepers					
Brown Creeper*	<i>(Certhia americana)</i>	MF	(c)	u	u
Wrens					
House Wren*	<i>(Troglodytes aedon)</i>	FE	c	c	c
Winter Wren*	<i>(Troglodytes troglodytes)</i>	W	c	u	u
Sedge Wren*	<i>(Cistothorus platensis)</i>	W	c	u	u
Marsh Wren	<i>(Cistothorus palustris)</i>	W	c	u	u
Kinglets, Bluebirds, and Thrushes					
Golden-crowned Kinglet	<i>(Regulus satrapa)</i>	MF/FE	(c)		(c)
Ruby-crowned Kinglet	<i>(Regulus calendula)</i>	MF/FE	(c)		(c)
Blue-gray Gnatcatcher	<i>(Poliophtila caerulea)</i>	MF	(u)		
Eastern Bluebird*	<i>(Sialia sialis)</i>	GM	c	c	c
Veery*	<i>(Catharus fuscescens)</i>	MF	u	u	
Gray-cheeked Thrush	<i>(Catharus minimus)</i>	MF	(u)		

Species	Scientific Name	Habitat	Spring	Summer	Fall
Swainson's Thrush	<i>(Catharus ustulatus)</i>	MF	(u)		
Hermit Thrush*	<i>(Catharus guttatus)</i>	MF	(u)	u	
American Robin*	<i>(Turdus migratorius)</i>	MF/FE	(a)	c	(a)
Mimics					
Gray Catbird*	<i>(Dumetella carolinensis)</i>	FE	c	c	u
Brown Thrasher*	<i>(Toxostoma rufum)</i>	FE	(c)	c	u
European Starling*	<i>(Sturnus vulgaris)</i>	FE/GM	c	c	c
Waxwings					
Cedar Waxwing*	<i>(Bombycilla cedrorum)</i>	FE	c	c	c
Warblers					
Golden-winged Warbler	<i>(Vermivora chrysoptera)</i>	MF/FE	(u)		
Tennessee Warbler	<i>(Vermivora peregrina)</i>	MF/FE	(u)		
Nashville Warbler*	<i>(Vermivora ruficapilla)</i>	FE	(c)	c	(u)
Northern Parula	<i>(Parula americana)</i>	MF	(u)		
Yellow Warbler*	<i>(Dendroica petechia)</i>	FE	c	c	c
Chestnut-sided Warbler	<i>(Dendroica pensylvanica)</i>	FE	(u)	(u)	
Magnolia Warbler	<i>(Dendroica magnolia)</i>	FE	(u)		
Cape May Warbler	<i>(Dendroica tigrina)</i>	MF	(u)		
Yellow-rumped Warbler	<i>(Dendroica coronata)</i>	FE	(c)	(c)	(u)
Black-throated Green Warbler*	<i>(Dendroica virens)</i>	MF	c	c	u
Black-throated Blue Warbler	<i>(Dendroica caerulescens)</i>	MF	(u)		
Blackburnian Warbler	<i>(Dendroica fusca)</i>	MF	(c)	u	u
Pine Warbler	<i>(Dendroica pinus)</i>	MF	(u)		
Palm Warbler	<i>(Dendroica palmarum)</i>	FE	(c)		(c)
Blackpoll	<i>(Dendroica striata)</i>	MF	(u)		
Black-and-white Warbler*	<i>(Mniotilta varia)</i>	MF	(u)		
American Redstart*	<i>(Setophaga ruticilla)</i>	FE/W	c	c	(u)
Ovenbird*	<i>(Seiurus aurocapilla)</i>	MF	c	c	u
Mourning Warbler*	<i>(Oporornis philadelphia)</i>	MF	(c)	(c)	
Common Yellowthroat*	<i>(Geothlypis trichas)</i>	W	c	c	c
Canada Warbler	<i>(Wilsonia pusilla)</i>	MF	(c)	u	
Tanagers					
Scarlet Tanager*	<i>(Piranga olivacea)</i>	FE/MF	u	u	u
Sparrows, Buntings, and Grosebeaks					
Rufus-Sided Towhee*	<i>(Pipilo erythrophthalmus)</i>	FE	u	u	u
Chipping Sparrow*	<i>(Spizella passerina)</i>	GM	c	a	c
Field Sparrow	<i>(Spizella pusilla)</i>	GM	c	c	c
Savannah Sparrow	<i>(Passerculus sandwichensis)</i>	GM	c	c	u
Song Sparrow*	<i>(Melospiza melodia)</i>	FE	a	a	a
Lincoln's Sparrow	<i>(Melospiza lincolni)</i>	FE	(u)		(u)
Swamp Sparrow	<i>(Melospiza georgiana)</i>	W	u	u	(u)
White-throated Sparrow*	<i>(Zonotrichia albicollis)</i>	FE	(c)		(u)
White-crowned Sparrow	<i>(Zonotrichia leucophrys)</i>	FE	(u)		(u)
Dark-eyed Junco	<i>(Junco hyemalis)</i>	FE/GM	(a)		(a)
Northern Cardinal*	<i>(Cardinalis cardinalis)</i>	MF	c	c	c
Rose-breasted Grosbeak*	<i>(Pheucticus ludovicianus)</i>	MF	c	c	u
Indigo Bunting*	<i>(Passerina cyanea)</i>	FE	c	c	c
Blackbirds and Orioles					
Red-winged Blackbird*	<i>(Agelaius phoeniceus)</i>	GM/W	c	c	c
Common Grackle*	<i>(Quiscalus quiscula)</i>	FE	c	c	c
Brown-headed Cowbird*	<i>(Molothrus ater)</i>	FE	c	c	c
Baltimore Oriole*	<i>(Icterus galbula)</i>	FE	c	c	u
Finches					
House Finch*	<i>(Carpodacus mexicanus)</i>	FE	u	u	u
American Goldfinch*	<i>(Carduelis tristis)</i>	FE/GM	c	c	c

* Denotes species nesting on the refuge

Abundance Code	decode
a	abundant
c	common
o	occasional
r	rare
u	uncommon
()	during migration
Habitat Code	decode
MF	Mixed Coniferous/Hardwood Forest
FE	Forest Edge
W	Wetlands/Ephemeral Ponds
GM	Grassy Meadow
SB	Sandy Beach/Dunes
RS	Rocky Shoreline
OW	Open Water/Off-shore Islands

Season	Dates
Spring	April-mid-June
Summer	mid-June- August
Fall	September-November
Winter	December-March

Reptiles, Amphibians and Mammals of Plum Island

Reptiles	
Scientific Name	Common Name
<i>Thamnophis sirtalis</i>	common garter snake
<i>Storeria dekayi</i>	brown snake
<i>Elaphe vulpina</i>	Western fox snake
<i>Diadophis puntatus edwardsi</i>	Northern ringneck snake
<i>Nerodia sipedon</i>	Northern water snake
Amphibians	
Scientific Name	Common Name
<i>Ambystoma laterale</i>	blue-spotted salamander
<i>Notophthalmus viridens</i>	central newt
<i>Pseudacris crucifer</i>	spring peeper
<i>Bufo americanus</i>	American toad
<i>Hyla versicolor</i>	Eastern gray tree frog
Mammals	
Scientific Name	Common Name
<i>Peromyscus maniculatus</i>	deer mouse
<i>Odocoileus virginianus</i>	white-tailed deer
<i>Canis latrans</i>	coyote
<i>Procyon lotor</i>	raccoon

Harbor Island NWR

Plant Species of Harbor Island

Plants of Harbor Island National Wildlife Refuge as depicted by Scharf and Chamberlin (1978). Where possible, taxonomy has been updated and generally follows Gray's Manual of Botany; nomenclature follows Cobb's A Field Guide to the Ferns and Gray's Manual of Botany.

PTERIDOPHYTA

FERNS AND THEIR ALLIES

EQUISETACEAE

HORSETAIL OR SCOURING RUSH FAMILY

Equisetum

Dwarf Souring Rush; Dwarf Horsetail

Equisetum scirpoides

LYCOPODIACEAE

CLUBMOSS FAMILY

Lycopodium

Ground Pine; Ground Cedar

Lycopodium tristachyum

OPHIOGLOSSACEAE

ADDER'S-TONGUE FAMILY

Botrychium

Rattlesnake Fern

Botrychium virginianum

POLYPODIACEAE

TRUE FERN OR FERN FAMILY

Dryopteris

see *Gymnocarpium dryopteris*

Dryopteris disjuncta

Oak Fern

Gymnocarpium dryopteris

Beech fern

Dryopteris phegopteris

Spinulose Woodfern

Dryopteris spinulosa

(variety of the above)

Dryopteris spinulosa var. intermedia

Pteridium

Bracken Fern

Pteridium aquilinum

GYMNOSPERMAE

GYMNOSPERMS

PINACEAE

PINE FAMILY

Larix

Larch; Tamarack

Larix laricina

Pinus

White Pine

Pinus strobus

Red Pine

Pinus resinosa

Abies

Balsam Fir

Abies balsamea

Tsuga

Hemlock

Tsuga canadensis

Picea

Picea mariana Black Spruce
Picea glauca White Spruce

*** CUPRESSACEAE**

(included here as a subfamily in the Pinaceae)

Thuja

Thuja occidentalis Arbor Vitae; White Cedar

Juniperus

Juniperus horizontalis Creeping Juniper

MONOCOTYLEDONEAE

TYPHACEAE

Typha latifolia

CAT-TAIL FAMILY

Common Cat-tail

POTAMOGETONACEAE

Potamogeton

Potamogeton pectinatus

Potamogeton natans

Potamogeton zosteriformis

PONDWEED FAMILY

Sago Pondweed

GRAMINAE (POACEAE)

POEAE (Tribe)

Phragmites

Phragmites australis

GRASS FAMILY

Common Reed

Poa

Poa compressa

Canada Bluegrass

Glyceria

Glyceria grandis

Marsh Grass

TRITICEAE (Tribe)

Agropyron

Agropyron repens

Quack Grass

AGROSTIDEAE (Tribe)

Phleum

Phleum pratense

Timothy

CYPERACEAE

Scirpus

Scirpus acutus

Scirpus americanus

SEDGE FAMILY

Hardstem Bulrush

Threesquare

ARACEAE

Acorus

Acorus calamus

ARUM FAMILY

Sweetflag

RUSCACEAE

Maianthemum

Maianthemum canadense

Canada lily

PONTEDERIACEAE

Pontederia

Pontederia cordata

PICKEREL-WEED FAMILY

Pickeralweed

ORCHIDACEAE

Corallorhiza

Corallorhiza striata

ORCHID FAMILY

Striped Coral-root

Goodyera

**Goodyera oblongifolia*

**Goodyera tessellata*

Giant Rattlesnake plantain,
Checkered Rattlesnake plantain

Cypripedium

Cypripedium arietinum

Ramshead Orchid (Bald Island)

DICOTYLEDONEAE

SALICAEAE

Populus

Populus tremuloides

Populus balsamifera

WILLOW FAMILY

Quaking Aspen

Balsam Poplar

MYRICACAE

Myrica

Myrica gale

BAYBERRY FAMILY

Sweet Gale

BETULACEAE (formerly Corylaceae)

Alnus

Alnus rugosa

BIRCH FAMILY

Speckled Alder; Tag Alder

Betula

Betula papyrifera

Paper, White, or Canoe Birch

Ostrya

Ostrya virginiana

Ironwood

FAGACEAE

Quercus

Quercus rubra

BEECH FAMILY

Oak

Red Oak

ULMACEAE

Ulmus

Ulmus americana

Ulmus thomasi

ELM FAMILY

American or White Elm

Rock Elm

POLYGONACEAE

Rumex

SMARTWEED FAMILY

Rumex acetosella
Rumex orbiculatus

RANUNCULACEAE**Anemone**

Anemone cylindrica

Coptis

Coptis groenlandica
(see *C. trifolia*)

Thalictrum

Thalictrum dioicum

Ranunculus

Ranunculus abortivus

SAXIFRAGACEAE**Mitella**

Mitella nuda

ROSACEAE**Rubus**

Rubus strigosus(-idaeus)

Rosa

Rosa palustris

Prunus

Prunus virginiana

Malus

Malus pumila

Fragaria

Fragaria vesca
F. virginiana

Potentilla

Potentilla anserina
Potentilla recta

GERANIACEAE**Geranium**

Geranium robertianum

ANACARDIACEAE**Toxicodendron**

Toxicodendron radicans

Rhus

Sheep or Red Sorrel

Water dock

BUTTERCUP FAMILY

Long-headed Thimbleweed

Goldthread

Early Meadow Rue

Kidney Leaf Buttercup

SAXIFRAGE FAMILY

Naked miterwort

ROSE FAMILY

Wild Red Raspberry

Swamp Rose

Choke Cherry

Apple

Woodland Strawberry

Virginia Strawberry

Silverweed

Rough Cinquefoil

GERANIUM FAMILY

Herb Robert

CASHEW FAMILY

Poison-ivy

Rhus typhina

CELASTRACEAE

Celastrus

Celastrus scandens

ACERACEAE

Acer

Acer saccharum

Acer rubrum

Acer pensylvanicum

VITACEAE

Vitis

Vitis riparia

GUTTIFERAE (CLUSIACEAE)

Hypericum

Hypericum perforatum

VIOLACEAE

Viola

Viola conspersa

Viola pallens

(see *V. macloskeyi*)

Viola pubescens

Viola incognita

ELAEAGNACEAE

Shepherdia

Shepherdia canadensis

ONAGRACEAE

Oenothera

Oenothera biennis

UMBELLIFERAE (APIACEAE)

Osmorhiza

Osmorhiza claytonii

Cicuta

Cicuta bulbifera

CORNACEAE

Cornus

Cornus canadensis

OLEACEAE

Fraxinus

Fraxinus nigra

Fraxinus americana

Staghorn Sumac

BITTERSWEET FAMILY

Bittersweet

MAPLE FAMILY

Sugar Maple or Hard Maple

Red Maple

Striped Maple

GRAPE FAMILY

Wild Grape

ST. JOHNSWORT FAMILY

Common St. Johnswort

VIOLET FAMILY

Dog Violet

Smooth White Violet

Downy Yellow Violet

Large Leaf Violet

OLEASTER FAMILY

Buffalo Berry

EVENING-PRIMROSE FAMILY

CARROT OR PARSLEY FAMILY

Sweet-cicely

Sweet-cicely

DOGWOOD FAMILY

Bunchberry; Dwarf Cornel

OLIVE FAMILY

Black Ash

White Ash

GENTIANACEAE

Gentianaceae

Gentiana crinita

ASCLEPIADACEAE

Asclepias

Asclepias incarnata

Asclepias syriaca

VERBENACEAE

Verbena

Verbena hastata

LABIATAE (LAMIACEAE)

Prunella

Prunella vulgaris

Clinopodium

Clinopodium vulgare

Nepeta

Nepeta cataria

Lycopus

Lycopus virginicus

SOLANACEAE

Physalis

Physalis heterophylla

SCROPHULARIACEAE

Verbascum

Verbascum thapsus

RUBIACEAE

Galium

Galium triflorum

Galium boreale

Galium asprellum

CAPRIFOLIACEAE

Sambucus

Sambucus racemosa

Linnea

Linnea borealis

CAMPANULACEAE

Lobelia

Lobelia siphilitica

GENTIAN FAMILY

MILKWEED FAMILY

Swamp Milkweed

Common Milkweed

VERVAIN FAMILY

Blue Vervain

MINT FAMILY

Self-heal; Heal-all

Wild-basil

Catnip; Catmint

Waterhorehound

NIGHTSHADE FAMILY

Ground Cherry

SNAPDRAGON FAMILY

Mullien; Flannel Plant

MADDER FAMILY

Sweet Scented Bedstraw

Northern Bedstraw

Rough Bedstraw

HONEYSUCKLE FAMILY

Red Elderberry

Twin Flower

BELLFLOWER FAMILY

Great Blue Lobelia

Lobelia kalmii
Lobelia spicata

Brook Lobelia
Pale Spike Lobelia

COMPOSITAE (ASTERACEAE)

ASTER OR DAISY FAMILY

Tragopogon

Tragopogon dubius
(*T. major* included in above)

Hieracium

Hieracium aurantiacum

Orange Hawkweed

Hieracium florentinum
(see *H. piloselloides*)

Yellow Hawkweed

Bidens

Bidens cernuus

Nodding Beggar-ticks

Tanacetum

Tanacetum huronense

Lake Huron Tansy

Eupatorium

Eupatorium perfoliatum

Boneset

Solidago

Solidago ulmifolia
Solidago erecta

Goldenrod
Goldenrod

Hypochoeris

Hypochoeris radicata

Cats Ear

Erigeron

Erigeron philadelphicus

Fleabane

Aster

Aster novae
Aster prealtus

New England Aster
Willow Aster

Arctium

Arctium minus

Common Burdock

Centaurea

Centaurea maculosa

Spotted Knapweed

Cirsium

Cirsium vulgare
Cirsium arvense

Bull Thistle
Canada or Field Thistle

Anaphalis

Anaphalis margaritacea

Pearly Everlasting

Heliopsis

Heliopsis helianthoides

Ox Eye Daisy

Taraxacum

Taraxacum erythrospermum

Red Seeded Dandelion

Taraxacum officinale

Common Dandelion

OTHER TAXA

Streptopus roseus

Rosty Twisted-Stalk

Scrophularia lanceolata

Figwort

Gerardia paupercula

Purple Gerardia

Urtica dioica

Common Nettle

Pilea fontana

Cynoglossum officinale

Hounds Tongue

Conopholis americana

Squaw Root

Mammals of Harbor Island

Mammals of Harbor Island National Wildlife Refuge as depicted by Scharf and Chamberlin (1978) and including surveys of other authors.

¹Region 3 Conservation Priorities (FWS 2002)

²Regional Forester Sensitive (USFS 2003)

³Michigan Special Animal (1999)

Common Name	Scientific Name	Ordinal Abundance	Habitat(s) ^b
Little brown bat	<i>Myotis lucifugus</i>	Unknown	RES
Red bat	<i>Lasiurus borealis</i>	Unknown	DDF, MDF, DMF, DCF, MCF
Snowshoe hare	<i>Lepus americanus</i>	Abundant	DMF, MMF, MCF, DCF
Red squirrel	<i>Tamiasciurus hudsonicus</i>	Abundant	DCF, MCF, DMF, MMF
Beaver	<i>Castor canadensis</i>	Common	SHO
Woodland deer mouse	<i>Peromyscus maniculatus gracilis</i>	Abundant	SUP, DCF, MCF, DDF, MDF, DMF, MMF
Red-backed vole	<i>Clethrionomys gapperi</i>	Unknown	MDF, MMF, MCF, SWE, SHO
Coyote	<i>Canis latrans</i>	Unknown	DDF, MDF, DMF, MMF, DCF, MCF, PAS, GRA, HAY
Red fox	<i>Vulpes vulpes</i>	Unknown	DDF, OLD, PAS, HAY
Black bear ²	<i>Ursus americanus</i>	Uncommon	DDF, MDF, DMF, MMF, DCF, MCF
Raccoon	<i>Procyon lotor</i>	Unknown	DDF, MDF, DMF, MMF
Mink	<i>Mustela vison</i>	Common	OWA, SWA
River otter ²	<i>Lutra canadensis</i>	Unknown	OWA
Canada lynx ³	<i>Lynx canadensis</i>	Unknown	DCF, MCF, WCF
Bobcat ²	<i>Lynx rufus</i>	Unknown	DMF, MMF, DCF, MCF
White-tailed deer	<i>Odocoileus virginianus</i>	Abundant	

^aHabitat information obtained from: Kurta (2001).

^bHabitat Definitions (Brewer et al. 1991): DDF= Dry Deciduous Forest or Savanna; MDF= Mesic Deciduous Forest; WDF= Wet Deciduous Forest; DMF= Dry Mixed Forest or Savanna; MMF= Mesic Mixed Forest; WMF=Wet Mixed Forest; DCF=Dry Coniferous Forest; MCF=Mesic Coniferous Forest; WCF= Wet Coniferous Forest; SUP= Shrub Uplands; SWE= Shrub Wetland; OLD= Old Field; GRA= Grassland ; PAS= Pasture; HAY= Hayfield; OWE=Open Wetland; SHO= Shoreland; OWA= Open Water

Herptofauna of Harbor Island

Common Name	Scientific Name	Ordinal Rate of Encounter	Habitat(s)
Northern water snake	<i>Nerodia sipedon sipedon</i>	Common	Permanent wetlands, rivers and streams
Eastern Garter Snake	<i>Thamnophis sirtalis sirtalis</i>	Abundant	Ephemeral wetlands, permanent wetlands, rivers and streams, forests, grasslands and savannas, caves and springs, agricultural areas, urban areas
Northern Ring-necked Snake	<i>Diadophis punctatus edwardsi</i>	Unknown	Forests, grasslands and savannas
Northern Spring Peeper	<i>Pseudacris crucifer crucifer</i>	Abundant	Permanent wetlands, forests, grasslands and savannas
Wood Frog	<i>Rana sylvatica</i>	Common	Ephemeral wetlands, permanent wetlands, forests
Eastern American Toad	<i>Bufo americanus americanus</i>	Abundant	Ephemeral wetlands, permanent wetlands, rivers and streams, forests, grasslands and savannas, caves and springs, agricultural areas, urban areas
Spotted Salamander	<i>Ambystoma maculatum</i>	Unknown	Ephemeral wetlands, permanent wetlands, forests

¹Region 3 Conservation Priorities (FWS 2002)

²Regional Forester Sensitive (USFS 2003)

³Michigan Special Animal (1999).

Expert review by James H.

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Bird Species of Harbor Island

Birds of Harbor Island National Wildlife Refuge as depicted by Scharf and Chamberlin (1978) and including surveys of other authors.

Species of note that have been found more recently breeding in the area are shown in bold italics (under the “Common Name” column). This list is not exhaustive, as many migrants species (especially waterfowl, raptors, and songbirds) are not represented.

¹Region 3 Conservation Priorities (FWS 2002)

²Regional Forester Sensitive (USFS 2003)

³Michigan Special Animal (1999)

Common Name	Scientific Name	Breeding Status				Preferred Habitat(s) ^a
		Known Breeder	Probable Breeder	Potential Breeder	Migrant or Status Unknown	
Common Loon ^{1,2,3}	<i>Gavia immer</i>		x			OWA
Horned Grebe	<i>Podiceps auritus</i>				x	OWA
Red-necked Grebe	<i>Podiceps grisegena</i>				x	OWA
<i>Pied-billed Grebe</i>	<i>Podilymbus podiceps</i>	x				OWA
<i>Double-crested Cormorant</i> ¹	<i>Phalacrocorax auritus</i>	x				OWA
American Bittern ^{1,3}	<i>Botaurus lentiginosus</i>	x				OWE
Black-crowned Night Heron ^{1,2,3}	<i>Nycticorax nycticorax</i>			x		OWE
Great Blue Heron	<i>Ardea herodias</i>			x		OWA, OWE
<i>Mute Swan</i>	<i>Cygnus olor</i>	x				OWA
<i>Trumpeter Swan</i> ^{1,2,3}	<i>Cygnus buccinator</i>					OWA
Canada Goose ¹	<i>Branta canadensis</i>		x			OWA
American Black Duck ¹	<i>Anas rubripes</i>	x				OWA
Lesser Scaup ¹	<i>Aythya affinis</i>				x	OWA
Greater Scaup					x	OWA
Surf Scoter	<i>Melanitta americana</i>				x	OWA
White-winged Scoter	<i>Melanitta nigra</i>				x	OWA
Long-tailed Duck	<i>Clangula hyemalis</i>				x	OWA
Bufflehead	<i>Bucephala albeola</i>				x	OWA
Common Goldeneye	<i>Bucephala clangula</i>	x				OWA
Wood Duck ¹	<i>Aix sponsa</i>	x				OWA, OWE
Mallard ¹	<i>Anas platyrhynchos</i>	x				OWA, OWE
Blue-winged Teal ¹	<i>Anas discors</i>				x	OWA, OWE
Green-winged Teal	<i>Anas crecca</i>				x	OWA, OWE
Hooded Merganser	<i>Lophodytes cucullatus</i>				x	OWA, OWE
Red-breasted Merganser	<i>Mergus serrator</i>	x				OWA, OWE
Common Merganser	<i>Mergus merganser</i>				x	OWA, OWE
Osprey ³	<i>Pandion haliaetus</i>			x		OWA
Bald Eagle ^{1,3}	<i>Haliaeetus leucocephalus</i>			x		OWA
Broad-winged Hawk	<i>Buteo platypterus</i>		x			DCF, DMF, WCF, WMF
Sharp-shinned Hawk	<i>Accipiter striatus</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Cooper's Hawk ³	<i>Accipiter cooperii</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Northern Goshawk ^{1,2,3}	<i>Accipiter gentilis</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Northern Harrier ^{1,2,3}	<i>Circus cyaneus</i>				x	OWE, GRA, HAY, OLD
Ruffed Grouse	<i>Bonasa umbellus</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Sora	<i>Porzana carolina</i>	x				OWE

American Coot	<i>Fulica americana</i>		x		OWA, OWE
Sandhill Crane	<i>Grus canadensis</i>			x	OWE, GRA, HAY, OLD
Whimbrel	<i>Numenius phaeopus</i>			x	
Short-billed Dowitcher	<i>Limnodromus griseus</i>			x	
Greater Yellowlegs ¹	<i>Tringa melanoleuca</i>			x	SHO
Spotted Sandpiper	<i>Actitis macularius</i>		x		SHO
Semi-palmated Sandpiper	<i>Calidris pusilla</i>			x	SHO
Least Sandpiper	<i>Calidris minutilla</i>			x	SHO
White-rumped Sandpiper	<i>Calidris fuscicollis</i>			x	SHO
Dunlin	<i>Calidris alpina</i>			x	SHO
Sanderling	<i>Calidris alba</i>			x	SHO
Ruddy Turnstone	<i>Arenaria interpres</i>			x	SHO
American Woodcock	<i>Scolopax minor</i>	x			SHO
Bonaparte's Gull	<i>Larus philadelphia</i>			x	OWA
Ring-billed Gull	<i>Larus delawarensis</i>			x	OWA
Herring Gull	<i>Larus argentatus</i>			x	OWA
Caspian Tern ^{2,3}	<i>Hydroprogne caspia</i>			x	OWA
Common Tern ^{1,2,3}	<i>Sterna hirundo</i>			x	OWA
Black Tern ^{1,2,3}	<i>Chlidonias niger</i>	x			OWA, OWE
Black-billed Cuckoo ¹	<i>Coccyzus erythrophthalmus</i>	x			SWE, SUP
Great Horned Owl	<i>Bubo virginianus</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Barred Owl	<i>Strix varia</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Northern Hawk Owl	<i>Surnia ulula</i>			x	OWE, GRA, HAY, OLD
Common Nighthawk	<i>Caprimulgus vociferus</i>			x	DCF, GRA, HAY, OLD
Whip-poor-will ¹	<i>Troglodytes aedon</i>		x		DCF, GRA, HAY, OLD
Ruby-throated Hummingbird	<i>Archilochus colubris</i>		x		DCF, DMF, MCF, MMF, WCF, WMF, RES
Belted Kingfisher	<i>Megaceryle alcyon</i>			x	OWA, OWE
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Downy Woodpecker	<i>Picoides pubescens</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Hairy Woodpecker	<i>Picoides villosus</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
American Three-toed Woodpecker ^{2,3}	<i>Picoides dorsalis</i>			x	DCF, DMF, MCF, MMF, WCF, WMF
Northern Flicker ¹	<i>Colaptes auratus</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Pileated Woodpecker	<i>Dryocopus pileatus</i>	x			DCF, DMF, MCF, MMF, WCF, WMF
Eastern Wood-Pewee	<i>Contopus virens</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Great Crested Flycatcher	<i>Myiarchus crinitus</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Blue-headed Vireo	<i>Vireo solitarius</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Red-eyed Vireo	<i>Vireo olivaceus</i>	x			DCF, DMF, MCF, MMF, WCF, WMF
Blue Jay	<i>Cyanocitta cristata</i>		x		WCF, WMF
American Crow	<i>Corvus brachyrhynchos</i>		x		GRAY, HAY, OLD, RES
Common Raven	<i>Corvus corax</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Tree Swallow	<i>Tachycineta bicolor</i>		x		GRA, HAY, OLD
Barn Swallow	<i>Hirundo rustica</i>			x	GRA, HAY, RES, OLD
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>			x	GRA, HAY, RES, OLD
Purple Martin	<i>Progne subis</i>			x	RES
Black-capped Chickadee	<i>Poecile atricapillus</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
Red-breasted Nuthatch	<i>Sitta canadensis</i>		x		DCF, DMF, WCF, WMF
Brown Creeper	<i>Certhia americana</i>		x		DCF, DMF, MCF, MMF, WCF, WMF
House Wren	<i>Euphagus cyanocephalus</i>		x		DCF, GRA, HAY, OLD

Marsh Wren ³	<i>Cistothorus palustris</i>	x				OWE, SWE
Winter Wren	<i>Troglodytes troglodytes</i>	x				WCF, WMF
American Robin	<i>Turdus migratorius</i>	x				DCF, DMF, WCF, WMF, RES
Gray-cheeked Thrush	<i>Catharus minimus</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Veery	<i>Catharus fuscescens</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Hermit Thrush	<i>Catharus guttatus</i>		x			DCF, DMF
Swainson's Thrush ²	<i>Catharus ustulatus</i>	x				WCF, WMF
European Starling	<i>Sturnus vulgaris</i>		x			RES
Cedar Waxwing	<i>Bombycilla cedrorum</i>		x			
Nashville Warbler	<i>Vermivora ruficapilla</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Magnolia Warbler	<i>Dendroica magnolia</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Yellow-rumped Warbler	<i>Dendroica coronata</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Black-throated Green Warbler	<i>Dendroica virens</i>		x			DCF, DMF, MCF, MMF, WCF, WMF
Ovenbird	<i>Seiurus aurocapillus</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Blackburnian Warbler	<i>Dendroica fusca</i>		x			MCF, MMF
Black-and-White Warbler	<i>Mniotilta varia</i>		x			MCF, MMF, WCF, WMF
Black-throated Blue Warbler ^{1,2}	<i>Dendroica caerulescens</i>		x			MDF
Yellow Warbler	<i>Dendroica petechia</i>		x			OWE, SWE
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>		x			SUP
Wilson's Warbler	<i>Wilsonia pusilla</i>				x	SWE
Tennessee Warbler	<i>Vermivora peregrina</i>		x			WCF, WMF
Northern Parula	<i>Parula americana</i>		x			WCF, WMF
Bay-breasted Warbler ²	<i>Dendroica castanea</i>		x			WCF, WMF
Blackpoll Warbler	<i>Dendroica striata</i>		x			
American Redstart	<i>Setophaga ruticilla</i>	x				SUP, SWE
Common Yellowthroat	<i>Geothlypis trichas</i>	x				SWE
Scarlet Tanager	<i>Piranga olivacea</i>				x	MDF, MMF
Dark-eyed Junco	<i>Junco hyemalis</i>		x			DCF, WCF
White-throated Sparrow	<i>Zonotrichia albicollis</i>		x			DCF, DMF
Fox Sparrow	<i>Passerella iliaca</i>				x	RES
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>		x			RES
Chipping Sparrow	<i>Spizella passerina</i>				x	SUP, DCF, OLD
American Tree Sparrow	<i>Spizella arborea</i>				x	RES
Vesper Sparrow	<i>Pooecetes gramineus</i>				x	SUP, DCF, OLD
Song Sparrow	<i>Melospiza melodia</i>		x			SUP, SWE, OLD
Swamp Sparrow	<i>Melospiza georgiana</i>		x			SWE, OWE
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	x				OWE
Brown-headed Cowbird	<i>Molothrus ater</i>		x			RES
Purple Finch	<i>Carpodacus purpureus</i>				x	DCF, DMF, MCF, MMF, WCF, WMF, RES
Evening Grosbeak	<i>Coccothraustes vespertinus</i>				x	DCF, DMF, MCF, MMF, WCF, WMF, RES
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>				x	MDF, MMF
Pine Grosbeak	<i>Pinicola enucleator</i>				x	WCF, WMF, RES

^aHabitat Definitions (Brewer et al. 1991): DDF= Dry Deciduous Forest or Savanna; MDF= Mesic Deciduous Forest; WDF= Wet Deciduous Forest; DMF= Dry Mixed Forest or Savanna; MMF= Mesic Mixed Forest; WMF=Wet Mixed Forest; DCF=Dry Coniferous Forest; MCF=Mesic Coniferous Forest; WCF= Wet Coniferous Forest; SUP= Shrub Uplands; SWE= Shrub Wetland; OLD= Old Field; GRA= Grassland ; PAS= Pasture; HAY= Hayfield; OWE=Open Wetland; SHO= Shoreland; OWA= Open Water

Huron NWR

Ferns and Gymnosperm Species of the Huron Islands

Huron NWR Gymnosperms

Taxonomy according to *Gray's Manual of Botany*, where applicable; nomenclature follows Cobb's *A Field Guide to the Ferns* and *Gray's Manual of Botany*.

PTERIDOPHYTA

FERNS AND THEIR ALLIES

EQUISETACEAE

Equisetum

Equisetum arvense

HORSETAIL OR SCOURING RUSH FAMILY

Horsetail

Field Horsetail

LYCOPODIACEAE

Lycopodium

Lycopodium annotinum

Lycopodium clavatum

Lycopodium dendroideum

Huperzia

Huperzia lucidula

CLUBMOSS FAMILY

Clubmoss

Stiff or Bristly Clubmoss

Staghorn or Wolf's Claw Clubmoss

Tree Groundpine

Shining Clubmoss

SELAGINELLACEA

Selaginella

Selaginella rupestris

Spring Northern

Selaginella

OSMUNDACEAE

Osmunda

Osmunda regalis

Osmunda claytoniana

FLOWERING FERN FAMILY

Flowering Fern

Royal Fern

Interrupted Fern

DRYOPTERIDACEAE

Dryopteris

Dryopteris carthusiana

Dryopteris filix-mas

Dryopteris intermedia

Athyrium

Athyrium filix-femina

WOOD FERN FAMILY

Spinulose Woodfern

Male Fern

Intermediate Woodfern

Lady Fern

POLYPODIACEAE

Polypodium

Polypodium virginianum Rock Polypody

Pteridium

Pteridium aquilinum

TRUE FERN OR FERN FAMILY

Bracken Fern

GYMNOSPERMAE

PINACEAE

Pinus

1. *Pinus strobus*
2. *Pinus resinosa*

Abies

1. *Abies balsamea*

Picea

1. *Picea mariana*
2. *Picea glauca*

TAXACEA

Taxus

- Taxus canadensis*

CUPRESSACEAE

1. Thuja

1. *Thuja occidentalis*

2. Juniperus

1. *Juniperus communis*
Juniperus horizontalis

GYMNOSPERMS

PINE FAMILY

Pine

White Pine

Red Pine

Fir

Balsam Fir

Spruce

Black Spruce

White Spruce

Canada Yew

Arbor Vitae; White Cedar

Juniper

Ground Juniper

Creeping Juniper

Plants of the Huron Islands

Taxonomy and nomenclature according to Voss' *Michigan Flora*, Parts 1-3.

MONOCOTYLEDONEAE (see *Michigan Flora*, Part 1)

POACEAE

POEAE (Tribe)

Poa

- Poa compressa
- Poa palustris

Melica

- Melica smithii

TRITICEAE (Tribe)

Deschampsia

- Deschampsia cespitosa
- Deschampsia flexuosa

Danthonia

- Danthonia spicata

AGROSTIDEAE (Tribe)

Calamagrostis

- Calamagrostis canadensis
- Calamagrostis stricta

Agrostis

- Agrostis gigantea
- Agrostis hyemalis

PHALARIDEAE (Tribe)

Phalaris

- Phalaris arundinacea

CYPERACEAE

Carex

- Carex arctata
- Carex brunnescens
- Carex buxbaumii
- Carex crinita
- Carex echinata
- Carex lenticularis
- Carex paupercula
- Carex trisperma
- Carex viridula

Scirpus

- Scirpus cyperinus
- Scirpus caespitosus

JUNCACEAE

Juncus

GRASS FAMILY

- Bluegrass
- Canada Bluegrass
- Fowl Meadow Grass

- Smith's Melicgrass

- Tufted Hairgrass
- Wavy Hairgrass

- Poverty Oatgrass

- Reedgrass
- Blue-joint
- Northern Reedgrass
- Bentgrass
- Redtop
- Ticklegrass

- Reed Canarygrass

SEDGE FAMILY

- Sedge
- Drooping Woodland Sedge

- Buxbaum's Sedge

- Bulrush
- Wool-grass
- Tufted Bulrush

RUSH FAMILY

Juncus tenuis
Juncus brevicaudatus

LILIACEAE

Clintonia

Clintonia borealis

Hemerocallis

Hemerocallis fulva

Maianthemum

1. Maianthemum canadense

IRIDACEAE

1. **Sisyrinchium**

8. Sisyrinchium montanum

2. **Iris**

6. Iris versicolor

DICOTYLEDONEAE (see Michigan Flora, Part 2)

SALICAEAE

Salix

Salix discolor

Populus

Populus tremuloides

MYRICACEAE

Myrica

Myrica gale

BETULACEAE (formerly Corylaceae)

Alnus

Alnus rugosa

Betula

Betula papyrifera

FAGACEAE

Quercus

Quercus rubra

URTICACEAE

Urtica

Urtica dioica

POLYGONACEAE

Rumex

Rumex acetosella

Polygonum

Polygonum cilinode

Polygonum hydropiperoides

LILY FAMILY

Bluebead

Orange Daylily

Wild or False Lily-of-the-valley;
Canada Mayflower

IRIS FAMILY

Blue-eyed-grass

Iris; Flag

Wild Blue Flag

WILLOW FAMILY

Willow

Pussy Willow

Poplar

Quaking Aspen

BAYBERRY FAMILY

Bayberry; Wax-myrtle

Sweet Gale

BIRCH FAMILY

Alder

Speckled Alder; Tag Alder

Birch

Paper, White, or Canoe Birch

BEECH FAMILY

Oak

Red Oak

NETTLE FAMILY

Nettle

Stinging Nettle

SMARTWEED FAMILY

Dock

Sheep or Red Sorrel

Smartweed; Knotweed

Fringed False Buckwheat

Mild Water-pepper

CARYOPHYLLACEAE

Cerastium

Cerastium fontanum

Dianthus

Dianthus barbatus

RANUNCULACEAE

Aquilegia

Aquilegia canadensis

Thalictrum

Thalictrum dasycarpum

Actaea

Actaea rubra

Coptis

Coptis trifolia

Ranunculus

Ranunculus acris

Ranunculus hispidus

FUMARIACEAE

Corydalis

Corydalis sempervirens

CRUCIFERAE (BRASSICACEAE)

Arabis

Arabis lyrata

DROSERACEAE

Drosera

Drosera rotundifolia

CRASSULACEAE

Sedum

SAXIFRAGACEAE

***GROSSULARIACEAE**

(Often included in the Saxifragaceae)

Ribes

Ribes glandulosum

82. ROSACEAE

Agrimonia

Agrimonia striata

Rubus

Rubus strigosus(-idaeus)

Rubus canadensis

Rubus parviflorus

Rosa

Rosa acicularis

Sorbus

PINK FAMILY

Chickweed

Mouse-ear Chickweed

Pink

Maiden Pink

BUTTERCUP FAMILY

Columbine

Wild Columbine

Meadow-rue

Purple Meadow-rue

Baneberry

Red Baneberry

Goldthread

Buttercup; Crowfoot

Tall or Common Buttercup

Bristly Buttercup

FUMITORY FAMILY

Rock Harlequin

MUSTARD FAMILY

Lyrate Rockcress

SUNDEW FAMILY

Sundew

Round-leaved Sundew

ORPINE FAMILY

Stonecrop; Sedum; Orpine

SAXIFRAGE FAMILY

GOOSEBERRY FAMILY

Currant; Gooseberry

Skunk Currant

ROSE FAMILY

Roadside Agrimony

Bramble; Raspberries; Dewberries; Blackberries

Wild Red Raspberry

Thimbleberry

Wild Rose

Mountain-ash

Sorbus decora	Northern Mountain Ash
Prunus	Cherry; Plum
Prunus virginiana	Choke Cherry
Prunus pensylvanica	Pin or Fire Cherry
Physocarpus	
Physocarpus opulifolius	Ninebark
Spiraea	Spiraea
Spiraea alba	Meadowsweet
Aronia	
Aronia melanocarpa	Black chokeberry
Amelanchier	
Amelanchier spp.	Serviceberry
Amelanchier bartramiana	Oblongfruit Serviceberry
Fragaria	Strawberry
Fragaria virginiana	Virginia Strawberry
Potentilla	Cinquefoil; Five-finger
Potentilla arguta	Tall Cinquefoil
Potentilla tridentata	Three-toothed Cinquefoil
Potentilla norvegica	Rough Cinquefoil
Geum	
Geum aleppicum	
LEGUMINOSAE (FABACEAE)	PEA FAMILY
Trifolium	Clover
Trifolium repens	White Clover
GERANIACEAE	GERANIUM FAMILY
Geranium	Wild Geranium; Crane's-bill
Geranium bicknellii	
AQUIFOLIACEAE	HOLLY FAMILY
Ilex	Holly
Ilex verticillata	Michigan Holly; Winterberry;
	Black Alder
ACERACEAE	MAPLE FAMILY
Acer	Maple
Acer rubrum	Red Maple
Acer pensylvanicum	Striped Maple
Acer spicatum	Mountain Maple
BALSAMINACEAE	TOUCH-ME-NOT FAMILY
Impatiens	
Impatiens capensis	Spotted Touch-me-not
GUTTIFERAE (CLUSIACEAE)	ST. JOHNSWORT FAMILY
Hypericum	St. Johnswort
Hypericum punctatum	
VIOLACEAE	VIOLET FAMILY
Viola	Violet

Viola spp.

Violet

ONAGRACEAE

Epilobium

Epilobium angustifolium

EVENING-PRIMROSE FAMILY

Willow-herb

Fireweed; Great Willow-herb

ARALIACEAE

Aralia

Aralia nudicaulis

Aralia hispida

Wild Sarsaparilla

Bristly Sarsaparilla

UMBELLIFERAE (APIACEAE)

Heracleum

Heracleum maximum

CARROT OR PARSLEY FAMILY

Common Cowparsnip

130. CORNACEAE

Cornus

Cornus canadensis

Cornus stolonifera

DOGWOOD FAMILY

Dogwood

Bunchberry; Dwarf Cornel

Red-osier

DICOTYLEDONEAE (see Michigan Flora, Part 3)

PYROLACEAE

Pyrola

Pyrola elliptica

SHINLEAF OR WINTERGREEN FAMILY

Shinleaf; *Pyrola*

ERICACEAE

Ledum

Ledum groenlandicum

Chamaedaphne

Chamaedaphne calyculata

Vaccinium

Vaccinium myrtilloides

Vaccinium angustifolium

Gaultheria

Gaultheria procumbens

Gaultheria hispidula

Arctostaphylos

Arctostaphylos uva-ursi

HEATH FAMILY

Labrador-tea

Leatherleaf

Blueberries and Cranberries

Velvetleaf or Canada Blueberry

Low Sweet Blueberry

Teaberry; Wintergreen

Creeping Snowberry

Bearberry; Kinnikinnick

PRIMULACEAE

Lysimachia

Lysimachia terrestris

Trientalis

Trientalis borealis

PRIMROSE FAMILY

Loosestrife

Swamp-candles

Star-flower

OLEACEAE

Fraxinus

Fraxinus pensylvanica

OLIVE FAMILY

Ash

Green Ash

ASCLEPIADACEAE

Asclepias

Asclepias incarnata

MILKWEED FAMILY

Milkweed

Swamp Milkweed

LABIATAE (LAMIACEAE)

Lycopus

Lycopus uniflorus

Lycopus americanus

Scutellaria

Scutellaria lateriflora

Clinopodium

Clinopodium vulgare

Galeopsis

Galeopsis tetrahit

MINT FAMILY

Bugleweed; Water-horehound

Water Horehound

Skullcap

Blue Skullcap

Wild-basil

Hemp-nettle

SCROPHULARIACEAE

Verbascum

Verbascum thapsus

Veronica

Veronica serpyllifolia

SNAPDRAGON FAMILY

Mullien

Mullien; Flannel Plant

Speedwell; Brooklime

Melampyrum	Melampyrum lineare	Narrowleaf Cowwheat
RUBIACEAE		MADDER FAMILY
Galium	Galium triflorum	Bedstraw
	Galium asprellum	
CAPRIFOLIACEAE		HONEYSUCKLE FAMILY
Symphoricarpos	Symphoricarpos albus	Snowberry
		Snowberry
Lonicera	Lonicera dioica	Honeysuckle
		Glaucous Honeysuckle
Sambucus	Sambucus racemosa	Elderberry
		Red-berried Elder; Red Elderberry
Linnaea	Linnaea borealis	Twinflower
Diervilla	Diervilla lonicera	Bush-honeysuckle
CAMPANULACEAE		BELLFLOWER FAMILY
Campanula	Campanula rotundifolia	Bellflower
	Campanula rapunculoides	Bluebell Bellflower
		Rampion Bellflower
Lobelia	Lobelia kalmii	Ontario Lobelia
COMPOSITAE (ASTERACEAE)		ASTER OR DAISY FAMILY
<u>Group A</u>		
Hieracium	Hieracium aurantiacum	Hawkweed
	Hieracium florentinum	Orange Hawkweed; Devil's-paintbrush
	Hieracium canadense	King Devil; Yellow Hawkweed
		Canadian Hawkweed
Lactuca	Lactuca biennis	Tall Blue Lettuce
<u>Group B</u>		
Chrysanthemum	Chrysanthemum leucanthemum	Chrysanthemum
		Ox-eye Daisy
Achillea	Achillea millefolium	Yarrow
		Yarrow; Milfoil
Tanacetum	Tanacetum vulgare	Tansy
<u>Group C</u>		
Eupatorium	Eupatorium maculatus	Spotted Joe Pye Weed
Euthamia	Euthamia graminifolia	Flat-topped, Bushy, or Grass-leaved
Goldenrod		
Solidago	Solidago canadensis	Goldenrod
	Solidago hispida	Canada Goldenrod
		Hairy Goldenrod

Oligoneuron

Oligoneuron album

Aster

Aster macrophyllus

Arctium

Arctium minus

Carduus

Carduus acanthoides

Cirsium

Cirsium arvense

Anaphalis

Anaphalis margaritacea

Conyza

Conyza canadensis

Prenanthes

Prenanthes alba

Taraxacum

Taraxacum officinale

Prairie Goldenrod

Aster

Large- or Big-leaved Aster

Burdock

Common Burdock

Plumeless Thistle

Thistle

Canada or Field Thistle

Pearly Everlasting

Horseweed

White Rattlesnake Root

Common Dandelion

Herptofauna of the Huron Islands

The primary data sources used was: Corin, C.W. 1976. The land vertebrates of the Huron Islands, Lake Superior. The Jack-Pine Warbler 54:138-147. Other miscellaneous refuge notes were also used.

Common Name	Scientific Name	Habitat(s)
Northern red-bellied snake	<i>Storeria occipitomaculata occipitomaculata</i>	Permanent wetlands, rivers and streams, forests, grasslands and savannas, agricultural areas, urban areas
Eastern garter snake	<i>Thamnophis sirtalis sirtalis</i>	Ephemeral wetlands, permanent wetlands, rivers and streams, forests, grasslands and savannas, caves and springs, agricultural areas, urban areas
Northern spring peeper	<i>Pseudacris crucifer crucifer</i>	Permanent wetlands, forests, grasslands and savannas
Green frog	<i>Rana clamitans melanota</i>	Ephemeral wetlands, permanent wetlands, forests, grasslands and savannas
Eastern American toad	<i>Bufo americanus americanus</i>	Ephemeral wetlands, permanent wetlands, rivers and streams, forests, grasslands and savannas, caves and springs, agricultural areas, urban areas
Ambystoma salamander	<i>Ambystoma spp.</i>	Ephemeral wetlands, permanent wetlands, forests, grasslands and savannas

Bird Species of the Huron Islands

The primary data sources used was: Corin, C.W. 1976. The land vertebrates of the Huron Islands, Lake Superior. *The Jack-Pine Warbler* 54:138-147. Other miscellaneous refuge notes were also used.

¹Region 3 Conservation Priorities (FWS 2002)

²Regional Forester Sensitive (USFS 2003)

³Michigan Special Animal (1999).

Common Name	Scientific Name	Abundance by Species that are Possible, Probable, or Confirmed Breeders				Preferred Habitat(s)
		Abundant	Common	Uncommon	Occasional-Rare-Vagrant Non-Breeders	
Common Loon ^{1,2,3}	<i>Gavia immer</i>		X			OWA
Red-necked Grebe	<i>Podiceps grisegena</i>				X	OWA
Double-crested Cormorant ¹	<i>Phalacrocorax auritus</i>				X	OWA
Great Blue Heron	<i>Ardea herodias</i>		X			OWA, OWE
Canada Goose ¹	<i>Branta canadensis</i>		X			OWA
American Black Duck ¹	<i>Anas rubripes</i>		X			OWA
Mallard ¹	<i>Anas platyrhynchos</i>		X			OWA, OWE
Red-breasted Merganser	<i>Mergus serrator</i>		X			OWA, OWE
Common Merganser	<i>Mergus merganser</i>		X			OWA, OWE
Osprey ³	<i>Pandion haliaetus</i>		X			OWA
Bald Eagle ^{1,3}	<i>Haliaeetus leucocephalus</i>		X			OWA
Peregrine Falcon ^{1,2,3}	<i>Falco peregrinus</i>					OWE, GRA, HAY
Merlin	<i>Falco columbarius</i>					
American Kestrel	<i>Falco sparverius</i>					GRA, HAY, OLD
Killdeer	<i>Charadrius vociferus</i>			X		GRA, HAY, OLD
Spotted Sandpiper	<i>Actitis macularius</i>		X			SHO
Wilson's Phalarope	<i>Steganopus tricolor</i>				X	
Herring Gull	<i>Larus argentatus</i>	X				OWA
Caspian Tern ^{2,3}	<i>Hydroprogne caspia</i>					OWA
Chimney Swift	<i>Chaetura pelagica</i>		X			RES
Common Nighthawk	<i>Caprimulgus vociferus</i>			X		DCF, GRA, HAY, OLD
Ruby-throated Hummingbird	<i>Archilochus colubris</i>		X			DCF, DMF, MCF, MMF, WCF, WMF, RES
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>					DCF, DMF, MCF, MMF, WCF, WMF
Downy Woodpecker	<i>Picoides pubescens</i>					DCF, DMF, MCF, MMF, WCF, WMF
Northern Flicker ¹	<i>Colaptes auratus</i>					DCF, DMF, MCF, MMF, WCF, WMF
Pileated Woodpecker	<i>Dryocopus pileatus</i>					DCF, DMF, MCF, MMF, WCF, WMF
Eastern Kingbird	<i>Tyrannus tyrannus</i>		X			GRA, HAY, OLD
Eastern Wood-Pewee	<i>Contopus virens</i>					DCF, DMF, MCF, MMF, WCF, WMF
Yellow-bellied Flycatcher ²	<i>Empidonax flaviventris</i>		X			DCF, DMF, MCF, MMF, WCF, WMF
Great Crested Flycatcher	<i>Myiarchus crinitus</i>			X		DCF, DMF, MCF, MMF, WCF, WMF

³Habitat Definitions (Brewer et al. 1991): DDF= Dry Deciduous Forest or Savanna; DMF= Mesic Deciduous Forest; WDF= Wet Deciduous Forest; DMF= Dry Mixed Forest or Savanna; MMF= Mesic Mixed Forest; WMF=Wet Mixed Forest; DCF=Dry Coniferous Forest; MCF=Mesic Coniferous Forest; WCF= Wet Coniferous Forest; SUP= Shrub Uplands; SWE= Shrub Wetland; OLD= Old Field; GRA= Grassland ; PAS= Pasture; HAY= Hayfield; OWE=Open Wetland; SHO= Shoreland; OWA= Open Water

(Continued)

¹Region 3 Conservation Priorities (FWS 2002)²Regional Forester Sensitive (USFS 2003)³Michigan Special Animal (1999).

Common Name	Scientific Name	Abundance by Species that are Possible, Probable, or Confirmed Breeders in Schoolcraft County				Preferred Habitat(s)
		Abundant	Common	Uncommon	Occasional-Rare-Vagrant Non-Breeders	
Least Flycatcher	<i>Empidonax minimus</i>		X			GRA, HAY, OLD
Eastern Phoebe	<i>Sayornis phoebe</i>					GRAY, HAY, OLD, RES
Blue-headed Vireo	<i>Vireo solitarius</i>					DCF, DMF, MCF, MMF, WCF, WMF
Red-eyed Vireo	<i>Vireo olivaceus</i>	X				DCF, DMF, MCF, MMF, WCF, WMF
Blue Jay	<i>Cyanocitta cristata</i>			X		WCF, WMF
American Crow	<i>Corvus brachyrhynchos</i>			X		GRAY, HAY, OLD, RES
Common Raven	<i>Corvus corax</i>			X		DCF, DMF, MCF, MMF, WCF, WMF
Tree Swallow	<i>Tachycineta bicolor</i>	X				GRA, HAY, OLD
Barn Swallow	<i>Hirundo rustica</i>	X				GRA, HAY, RES, OLD
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>		X			GRA, HAY, RES, OLD
Purple Martin	<i>Progne subis</i>				X	RES
Black-capped Chickadee	<i>Poecile atricapillus</i>		X			DCF, DMF, MCF, MMF, WCF, WMF
Red-breasted Nuthatch	<i>Sitta canadensis</i>	X				DCF, DMF, WCF, WMF
House Wren	<i>Euphagus cyanocephalus</i>				X	DCF, GRA, HAY, OLD
Winter Wren	<i>Troglodytes troglodytes</i>			X		WCF, WMF
Golden-crowned Kinglet	<i>Regulus satropa</i>					
Ruby-crowned Kinglet	<i>Regulus calendula</i>		X			WCF
American Robin	<i>Turdus migratorius</i>		X			DCF, DMF, WCF, WMF, RES
Swainson's Thrush ²	<i>Catharus ustulatus</i>		X			WCF, WMF
European Starling	<i>Sturnus vulgaris</i>					RES
Cedar Waxwing	<i>Bombycilla cedrorum</i>	X				
Nashville Warbler	<i>Vermivora ruficapilla</i>		X			DCF, DMF, MCF, MMF, WCF, WMF
Magnolia Warbler	<i>Dendroica magnolia</i>	X				DCF, DMF, MCF, MMF, WCF, WMF
Yellow-rumped Warbler	<i>Dendroica coronata</i>	X				DCF, DMF, MCF, MMF, WCF, WMF
Black-throated Green Warbler	<i>Dendroica virens</i>			X		DCF, DMF, MCF, MMF, WCF, WMF
Pine Warbler	<i>Dendroica pinus</i>					
Ovenbird	<i>Seiurus aurocapillus</i>			X		DCF, DMF, MCF, MMF, WCF, WMF
Blackburnian Warbler	<i>Dendroica fusca</i>		X			MCF, MMF

³Habitat Definitions (Brewer et al. 1991): DDF= Dry Deciduous Forest or Savanna; MDF= Mesic Deciduous Forest; WDF= Wet Deciduous Forest; DMF= Dry Mixed Forest or Savanna; MMF= Mesic Mixed Forest; WMF=Wet Mixed Forest; DCF=Dry Coniferous Forest; MCF=Mesic Coniferous Forest; WCF= Wet Coniferous Forest; SUP= Shrub Uplands; SWE= Shrub Wetland; OLD= Old Field; GRA= Grassland ; PAS= Pasture; HAY= Hayfield; OWE=Open Wetland; SHO= Shoreland; OWA= Open Water

(Continued)

¹Region 3 Conservation Priorities (FWS 2002)

²Regional Forester Sensitive (USFS 2003)

³Michigan Special Animal (1999).

Common Name	Scientific Name	Abundance by Species that are Possible, Probable, or Confirmed Breeders in Schoolcraft County				Preferred Habitat(s)
		Abundant	Common	Uncommon	Occasional-Rare-Vagrant Non-Breeders	
Black-and-White Warbler	<i>Mniotilta varia</i>	X				MCF, MMF, WCF, WMF
Canada Warbler ¹	<i>Wilsonia canadensis</i>	X				MDF, WMF, MMF
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>		X			SUP
Mourning Warbler	<i>Oporornis philadelphia</i>			X		SUP
Tennessee Warbler	<i>Vermivora peregrina</i>			X		WCF, WMF
Northern Parula	<i>Parula americana</i>			X		WCF, WMF
Blackpoll Warbler	<i>Dendroica striata</i>				X	
American Redstart	<i>Setophaga ruticilla</i>	X				SUP, SWE
Common Yellowthroat	<i>Geothlypis trichas</i>		X			SWE
Northern Cardinal	<i>Cardinalis cardinalis</i>				X	RES
Indigo Bunting	<i>Passerina cyanea</i>			X		SUP, MMF
Dark-eyed Junco	<i>Junco hyemalis</i>					DCF, WCF
White-throated Sparrow	<i>Zonotrichia albicollis</i>	X				
Chipping Sparrow	<i>Spizella passerina</i>		X			SUP, DCF, OLD
Song Sparrow	<i>Melospiza melodia</i>	X				SUP, SWE, OLD
Red-winged Blackbird	<i>Agelaius phoeniceus</i>			X		OWE
Common Grackle	<i>Quiscalus quiscula</i>			X		OWE
Bobolink ^{1,2}	<i>Dolichonyx oryzivorus</i>				X	GRA, HAY, OLD, PAS
White-winged Crossbill	<i>Loxia leucoptera</i>					DCF, DMF, WCF, WMF
Purple Finch	<i>Carpodacus purpureus</i>			X		DCF, DMF, MCF, MMF, WCF, WMF, RES
Pine Siskin	<i>Carduelis pinus</i>			X		DCF, DMF, MCF, MMF, WCF, WMF, RES

^aHabitat Definitions (Brewer et al. 1991): DDF= Dry Deciduous Forest or Savanna; MDF= Mesic Deciduous Forest; WDF= Wet Deciduous Forest; DMF= Dry Mixed Forest or Savanna; MMF= Mesic Mixed Forest; WMF=Wet Mixed Forest; DCF=Dry Coniferous Forest; MCF=Mesic Coniferous Forest; WCF= Wet Coniferous Forest; SUP= Shrub Uplands; SWE= Shrub Wetland; OLD= Old Field; GRA= Grassland ; PAS= Pasture; HAY= Hayfield; OWE=Open Wetland; SHO= Shoreland; OWA= Open Water

Mammals of the Huron Islands

Mammals of Seney National Wildlife Refuge listed phylogenetically.

The primary data sources used was: Corin, C.W. 1976. The land vertebrates of the Huron Islands, Lake Superior. The Jack-Pine Warbler 54:138-147. Other miscellaneous refuge notes were also used.

¹Region 3 Conservation Priorities (FWS 2002)

²Regional Forester Sensitive (USFS 2003)

³Michigan Special Animal (1999)

Common Name	Scientific Name	Ordinal Abundance	Habitat(s) ^a	Habitat(s) ^b
Red bat	<i>Lasiurus borealis</i>	Unknown	Leafy trees (elms, maples) or in conifers	DDF, MDF, DMF, DCF, MCF
Snowshoe hare	<i>Lepus americanus</i>	Abundant	Heavily forested areas with dense understory. Thrives in coniferous and mixed woods including cedar bogs and spruce swamps.	DMF, MMF, MCF, DCF
Woodland deer mouse	<i>Peromyscus maniculatus gracilis</i>	Abundant	Forested habitats, shrubby areas, regenerating clear-cuts, and recent burns.	SUP, DCF, MCF, DDF, MDF, DMF, MMF
Red-backed vole	<i>Clethrionomys gapperi</i>	Common	Coniferous forests are preferred, deciduous or mixed coniferous/deciduous woods acceptable with standing water nearby.	MDF, MMF, MCF, SWE, SHO
Meadow vole	<i>Microtus pennsylvanicus</i>	Common	Moist, grassy fields and also frequents marshes and bog thick with greases, sedges and rushes.	SWE, OLD, OWE
Coyote	<i>Canis latrans</i>	Common	Prairies, brushy area, wooded edges	DDF, MDF, DMF, MMF, DCF, MCF, PAS, GRA, HAY
Black bear ²	<i>Ursus americanus</i>	Common	Dense coniferous or deciduous woods having a thick understory.	DDF, MDF, DMF, MMF, DCF, MCF
Raccoon	<i>Procyon lotor</i>	Common	In or near wooded areas, often near a stream or pond. More abundant in hardwood stands than coniferous	DDF, MDF, DMF, MMF
<p>^aHabitat information obtained from: Kurta (2001). ^bHabitat Definitions (Brewer et al. 1991): DDF= Dry Deciduous Forest or Savanna; MDF= Mesic Deciduous Forest; WDF= Wet Deciduous Forest; DMF= Dry Mixed Forest or Savanna; MMF= Mesic Mixed Forest; WMF=Wet Mixed Forest; DCF=Dry Coniferous Forest; MCF=Mesic Coniferous Forest; WCF= Wet Coniferous Forest; SUP= Shrub Uplands; SWE= Shrub Wetland; OLD= Old Field; GRA= Grassland ; PAS= Pasture; HAY= Hayfield; OWE=Open Wetland; SHO= Shoreland; OWA= Open Water</p>				

Michigan Islands NWR

Plants of Gull Island

Plants of Gull Island (Michigan Islands National Wildlife Refuge) according to the ongoing studies of Leuck and Lueck. Where possible, taxonomy has been updated and generally follows *Gray's Manual of Botany*; nomenclature follows Cobb's *A Field Guide to the Ferns* and *Gray's Manual of Botany*.

Abies

Abies balsamea

Balsam Fir

Thuja

Thuja occidentalis

Arbor Vitae; White Cedar

Juniperus

Juniperus horizontalis

Creeping Juniper

Maianthemum

Maianthemum canadense

Canada lily, Canada mayflower

Alnus

Alnus rugosa

Speckled Alder; Tag Alder

Betula

Betula papyrifera

Paper, White, or Canoe Birch

Prunus

Prunus virginiana

Choke Cherry

Potentilla

Potentilla anserina

Silverweed

Toxicodendron

Toxicodendron radicans

Poison-ivy

Rhus

Rhus typhina

Staghorn Sumac

Acer

Acer saccharum

Sugar Maple or Hard Maple

Hypericum

Hypericum perforatum

Common St. Johnswort

Verbascum

Verbascum thapsus

Mullien; Flannel Plant

Cirsium

<i>Cirsium vulgare</i>	Bull Thistle
OTHER TAXA	
<i>Urtica dioica</i>	Common Nettle
<i>Aquilegia spp.</i>	Columbine
<i>Solidago spp.</i>	Goldenrod
<i>Trillium spp.</i>	Trillium
<i>Viola spp.</i>	Violet
<i>Myosotis spp.</i>	Forget-me-not
<i>Impatiens spp.</i>	Jewelweed
<i>Descurainia spp.</i>	Tansymustard
<i>Aralia nudicaulis</i>	Wild Sarsaparilla
<i>Galium spp.</i>	Bedstraw
<i>Acer spicatum</i>	Mountain maple
<i>Sorbus Americana</i>	Mountain ash
<i>Prunus serotina</i>	Black Cherry
<i>Physocarpus opulifolius</i>	Ninebark
<i>Taxus canadensis</i>	Canada Yew
<i>Heracleum maximum</i>	Cow-parsnip
<i>Botrypus virginianus</i>	Rattlesnake fern
<i>Lycopodiaceae</i> (2 spp.)	
<i>Dropteris spp.</i>	Wood fern
<i>Streptopus spp.</i>	White twisted-stalk
<i>Lonicera spp.</i>	Honeysuckle
<i>Sambucus spp.</i>	Red elder, Red-berried elder
<i>Thalictrum spp.</i>	Meadow rue
<i>Clintonia borealis</i>	Blue-bead lily

<i>Maianthemum racemosum</i>	False Solomon's seal
<i>Fraxinus pennsylvanica</i>	Green ash
<i>Cornus sericea</i>	Red-osier dogwood
<i>Viburnum trilobum</i>	High-bush cranberry
<i>Viburnum acerifolium</i>	Maple-leaf viburnum
<i>Sedum acre</i>	Stonecrop
<i>Cakile edentula</i>	Sea-rocket

Plants of Hat Island

Plant species list based on the work of F.C. Gates (1950). *Transactions of the Kansas Academy of Science* **53**:217-228.

Genus species

Achillea millefolium
Agrostis capillaris
Amelanchier canadensis
Aquilegia canadensis
Arabis glabra
Arctium minus
Asclepias syriaca
Bromus tectorum
Betula papyrifera
Brassica nigra
Campanula rotundifolia
Capnoides sempervirens
Capsella burs-pastoris
Carex peckii
Carex sterilis
Celastrus scandens
Cerastium arvense
Chenopodium album
Ceratodon purpureus
Chrysanthemum leucanthemum pinnatifidum
Cirsium vulgare
Comandra richardsiana
Cornus stolonifera
Cryptotaenia canadensis
Descurainia pinnata
Diervilla lonicera
Dryopteris spp.
Elymus canadensis
Epilobium angustifolium
Euphorbia esula
Fragaria virginiana
Galium aparine
Geranium robertianum
Heracleum lanatum
Juncus arcticus littoralis
Lepidium campestre
Lonicera dioica
Lychnis dioica
Milium effusum
Nepeta cataria
Oenothera biennis
Pastinaca sativa
Phleum pratense
Poa compressa

Common

Yarrow
 Colonial bentgrass
 Canadian serviceberry
 Canadian Columbine
 Tower mustard
 Burrweed
 Common milkweed
 Drooping brome or Cheat grass
 Paper birch
 Black mustard
 Harebell
 Pale corydalis
 Shepherd's purse
 Peck's sedge
 Fen Star Sedge
 American bittersweet
 Field chickweed
 White goosefoot
 Ceratodon moss or Fire moss
 Ox-eyed daisy
 Spear thistle or Bull thistle
 False toadflax
 Red osier dogwood
 Honewort
 Western tansymustard
 Northern bush-honeysuckle
 Wood ferns
 Canada wild rye
 Fireweed
 Green spurge or Leafy spurge
 Virginia Strawberry
 Cleavers or Clivers
 Robert geranium
 Cow parsnip
 Mountain rush
 Field pepperweed
 Limber honeysuckle
 Red Champion
 American milletgrass
 Catnip
 Common evening primrose or Evening star
 Parsnip
 Timothy grass
 Canada bluegrass or flattened meadowgrass

<i>Poa pratensis</i>	Meadow Grass or Kentucky bluegrass
<i>Polygonum convolvulus</i>	Black-bindweed or Wild buckwheat
<i>Polygonum ramosissimum</i>	Bushy knotweed
<i>Populus tremuloides</i>	Quaking aspen
<i>Argentina anserina</i>	Common silverweed
<i>Potentilla norvegica</i>	Rough cinquefoil
<i>Prunus pensylvanica</i>	Pin cherry or Fire cherry
<i>Prunus pumila</i>	Sand cherry
<i>Prunus virginiana</i>	Choke Cherry
<i>Ranunculus abortivus</i>	Littleleaf buttercup
<i>Toxicodendron radicans</i>	Poison ivy
<i>Ribes cynosbati</i>	Eastern prickly gooseberry
<i>Rosa blanda</i>	Smooth rose
<i>Rubus strigosus</i>	American Red Raspberry
<i>Rumex crispus</i>	Curled dock or yellow dock
<i>Sambucus racemosa</i>	Red elderberry
<i>Satureja vulgaris</i>	Wild basil
<i>Silene antirrhina</i>	Sleepy silene or sleepy catchfly
<i>Maianthemum stellatum</i>	Star-flowered or False Solomon's seal
<i>Solidago canadensis</i>	Canada goldenrod
<i>Sorbus americana</i>	American mountain-ash
<i>Taraxacum officinale</i>	Common Dandelion
<i>Thuja occidentalis</i>	Northern White Cedar
<i>Tragopogon dubius</i>	Western Salsify
<i>Verbascum thapsus</i>	Common Mullein
<i>Viburnum opulus</i>	Guelder rose or Water elder

Avian Species (Beaver Island Archipelago)

Avian Species on Seney NWR – Michigan Islands Satellite Refuges
Beaver Archipelago, 2000-2009
Nancy E. Seefelt
Central Michigan University

Gull Island

Common Loon (offshore)	Blackburnian Warbler
Herring Gull	Black-throated Green Warbler
Ring-billed Gull	Common Yellowthroat
Caspian Tern	American Redstart
Common Tern	Gray Catbird
Double-crested Cormorant	Winter Wren
American White Pelican (offshore, flying)	House Wren
Common Merganser	Black-capped Chickadee
Red-breasted Merganser	Veery
Mallard	Hermit Thrush
White-winged Scoter (offshore)	Yellow Warbler
Canada Goose	Yellow-rumped Warbler
Mute Swan	Magnolia Warbler
American Bittern	
Great Blue Heron	
Black-crowned Night-Heron	
Sora	
American Woodcock	
Least Sandpiper	
Solitary Sandpiper	
Spotted Sandpiper	
Killdeer	
Semipalmated Plover	
Ruddy Turnstone	
Mourning Dove	
Bald Eagle	
Northern Harrier	
Merlin	
Great Horned Owl	
Belted Kingfisher	
Least Flycatcher	
Eastern Phoebe	
American Crow	
Common Raven	
European Starling	
Red-winged Blackbird	
Common Grackle	
American Goldfinch	
Indigo Bunting	
White-throated Sparrow	
Song Sparrow	
Chipping Sparrow	
Cedar Waxwing	
Red-eyed Vireo	
Black-and-white Warbler	
Nashville Warbler	

Pismire Island

Common Loon (offshore)
Herring Gull
Ring-billed Gull
Caspian Tern
Common Tern
Double-crested Cormorant
American White Pelican
Common Merganser
Red-breasted Merganser
Mallard
Greater Scaup (offshore)
Lesser Scaup (offshore)
Ring-necked Duck (offshore)
Common Goldeneye (offshore)
Bufflehead (offshore)
White-winged Scoter (offshore)
Canada Goose
Mute Swan
Great Blue Heron
American Coot (offshore)
Least Sandpiper
Spotted Sandpiper
Black-bellied Plover
Killdeer
Ruddy Turnstone
Bald Eagle (flying, also dead)
Osprey (flying)
American Crow
Red-winged Blackbird
Common Grackle
Song Sparrow
Yellow Warbler
Common Yellowthroat

Hat Island

Common Loon (offshore)
Herring Gull
Ring-billed Gull
Caspian Tern
Common Tern
Double-crested Cormorant
American White Pelican
Common Merganser
Red-breasted Merganser
Mallard
Greater Scaup (offshore)
Common Goldeneye (offshore)
Bufflehead (offshore)
White-winged Scoter (offshore)
Canada Goose
Mute Swan
Great Blue Heron
Black-crowned Night-heron
Least Sandpiper
Solitary Sandpiper
Spotted Sandpiper
Unidentified Sandpiper
Black-bellied Plover
Semipalmated Plover
Killdeer
Ruddy Turnstone
Snowy Owl (dead)
Red-winged Blackbird
Common Grackle
Song Sparrow
Yellow Warbler
Common Yellowthroat

Shoe Island

Herring Gull
Ring-billed Gull
Double-crested Cormorant
Least Sandpiper
Unidentified Sandpiper
Black-bellied Plover
Ruddy Turnstone

Gull Island Plants

Gull Island Vegetation Additional Species—2009

These are species observed in addition to the species recorded in the 2007 report. We established two more transects on the west side of the island.

St. Johnswort
columbine
poison ivy
staghorn sumac
forget-me-not
bull thistle
jewelweed
mullein
goldenrod
tansy mustard
trillium
violet (unidentified)
wild sarsaparilla
fern (unidentified)
bedstraw
mountain maple
sugar maple

Bird Species (Gull, Hat, Shoe, and Pismire Islands)

Birds of Michigan Islands National Wildlife Refuge (Gull, Hat, Shoe, and Pismire Islands) by island (N. Seefelt, Central Michigan University, 2000-2009).

This list is not comprehensive as most survey work has been done during the breeding season and not year-round. Areas around these islands are known to support large numbers of waterfowl (especially northern diving species) during migration. Source citations are shown by (Author Year).

¹Region 3 Conservation Priorities (FWS 2002)

²Regional Forester Sensitive (USFS 2003)

³Michigan Special Animal (1999).

Common Name	Scientific Name	Gull Island	Hat Island	Shoe Island	Pismire Island	Preferred Habitat(s)
Common Loon ^{1,2,3}	<i>Gavia immer</i>	x	x		x	OWA
American White Pelican	<i>Pelecanus erythrorhynchos</i>	x	x		x	OWA
Double-crested Cormorant ¹	<i>Phalacrocorax auritus</i>	x	x	x	x	OWA
American Bittern ^{1,3}	<i>Botaurus lentiginosus</i>	x				OWE
Black-crowned Night Heron ^{1,2,3}	<i>Nycticorax nycticorax</i>	x	x			OWE
Great Blue Heron	<i>Ardea herodias</i>	x	x		x	OWA, OWE
Mute Swan	<i>Cygnus olor</i>	x	x		x	OWA
Canada Goose ¹	<i>Branta canadensis</i>	x	x		x	OWA
Greater Scaup	<i>Aythya marila</i>		x		x	
Lesser Scaup ¹	<i>Aythya affinis</i>				x	OWA
White-winged Scoter	<i>Melanitta nigra</i>	x	x		x	OWA
Bufflehead	<i>Bucephala albeola</i>		x		x	OWA
Common Goldeneye	<i>Bucephala clangula</i>		x		x	OWA
Mallard ¹	<i>Anas platyrhynchos</i>	x	x		x	OWA, OWE
Ring-necked Duck	<i>Aythya collaris</i>				x	OWA, OWE
Red-breasted Merganser	<i>Mergus serrator</i>	x	x		x	OWA, OWE
Common Merganser	<i>Mergus merganser</i>	x	x		x	OWA, OWE
Osprey ³	<i>Pandion haliaetus</i>				x	OWA
Bald Eagle ^{1,3}	<i>Haliaeetus leucocephalus</i>	x			x	OWA
Merlin ³	<i>Falco columbarius</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Northern Harrier ^{1,2,3}	<i>Circus cyaneus</i>	x				OWE, GRA, HAY, OLD
American Coot	<i>Fulica americana</i>				x	OWA, OWE
Sora	<i>Porzana carolina</i>	x				OWE
Killdeer	<i>Charadrius vociferus</i>	x	x		x	GRA, HAY, OLD
American Woodcock ¹	<i>Scolopax minor</i>	x				SUP
Solitary Sandpiper	<i>Tringa solitaria</i>	x	x			SHO
Spotted Sandpiper	<i>Actitis macularius</i>	x	x		x	SHO
Least Sandpiper	<i>Calidris minutilla</i>	x	x	x	x	SHO
Black-bellied Plover	<i>Pluvialis squatarola</i>		x	x	x	OWE
Semipalmated Plover	<i>Charadrius semipalmatus</i>	x	x			OWE
Ruddy Turnstone	<i>Arenaria interpres</i>	x	x	x	x	SHO
Bonaparte's Gull	<i>Larus philadelphia</i>					OWA
Ring-billed Gull	<i>Larus delawarensis</i>	x	x	x	x	OWA
Herring Gull	<i>Larus argentatus</i>	x	x	x	x	OWA
Caspian Tern ^{2,3}	<i>Hydroprogne caspia</i>	x	x		x	OWA
Common Tern ^{1,2,3}	<i>Sterna hirundo</i>	x	x		x	OWA
Mourning Dove	<i>Zenaidura macroura</i>	x				RES
Great Horned Owl	<i>Bubo virginianus</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Snowy Owl	<i>Bubo scandiacus</i>		x			OWE, GRA, HAY, OLD

Belted Kingfisher	<i>Megaceryle alcyon</i>	x				OWA, OWE
Least Flycatcher	<i>Empidonax minimus</i>	x				GRA, HAY, OLD
Eastern Phoebe	<i>Sayornis phoebe</i>	x				GRAY, HAY, OLD, RES
Red-eyed Vireo	<i>Vireo olivaceus</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
American Crow	<i>Corvus brachyrhynchos</i>	x			x	GRAY, HAY, OLD, RES
Common Raven	<i>Corvus corax</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Black-capped Chickadee	<i>Poecile atricapillus</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
House Wren	<i>Euphagus cyanocephalus</i>	x				DCF, GRA, HAY, OLD
Winter Wren	<i>Troglodytes troglodytes</i>	x				WCF, WMF
Veery	<i>Catharus fuscescens</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Hermit Thrush	<i>Catharus guttatus</i>	x				DCF, DMF
Gray Catbird	<i>Dumetella carolinensis</i>	x				SWE, SUP
European Starling	<i>Sturnus vulgaris</i>	x				RES
Cedar Waxwing	<i>Bombycilla cedrorum</i>	x				
Nashville Warbler	<i>Vermivora ruficapilla</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Magnolia Warbler	<i>Dendroica magnolia</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Yellow-rumped Warbler	<i>Dendroica coronata</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Black-throated Green Warbler	<i>Dendroica virens</i>	x				DCF, DMF, MCF, MMF, WCF, WMF
Blackburnian Warbler	<i>Dendroica fusca</i>	x				MCF, MMF
Black-and-White Warbler	<i>Mniotilta varia</i>	x				MCF, MMF, WCF, WMF
Yellow Warbler	<i>Dendroica petechia</i>	x	x		x	OWE, SWE
American Redstart	<i>Setophaga ruticilla</i>	x				SUP, SWE
Common Yellowthroat	<i>Geothlypis trichas</i>	x	x		x	SWE
Indigo Bunting	<i>Passerina cyanea</i>	x				SUP, MMF
Chipping Sparrow	<i>Spizella passerina</i>	x				SUP, DCF, OLD
White-throated Sparrow	<i>Zonotrichia albicollis</i>	x				DCF, DMF
Song Sparrow	<i>Melospiza melodia</i>	x	x		x	SUP, SWE, OLD
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	x	x		x	OWE
Common Grackle	<i>Quiscalus quiscula</i>	x	x		x	OWE
American Goldfinch	<i>Carduelis tristis</i>	x				SUP, RES

^aHabitat Definitions (Brewer et al. 1991): DDF= Dry Deciduous Forest or Savanna; MDF= Mesic Deciduous Forest; WDF= Wet Deciduous Forest; DMF= Dry Mixed Forest or Savanna; MMF= Mesic Mixed Forest; WMF=Wet Mixed Forest; DCF=Dry Coniferous Forest; MCF=Mesic Coniferous Forest; WCF= Wet Coniferous Forest; SUP= Shrub Uplands; SWE= Shrub Wetland; OLD= Old Field; GRA= Grassland ; PAS= Pasture; HAY= Hayfield; OWE=Open Wetland; SHO= Shoreland; OWA= Open Water

Appendix E: Compliance Requirements

Administrative Procedures Act of 1946

Outlines administrative procedures to be followed by federal agencies with respect to identification of information to be made public; publication of material in the *Federal Register*; maintenance of records; attendance and notification requirements for specific meetings and hearings; issuance of licenses; and review of agency actions.

American Indian Religious Freedom Act of 1978

Establishes as policy of the United States the protection and preservation for American Indians of their inherent right to freedom to believe, express, and practice their traditional religions. The Act directs federal agencies to evaluate their policies and procedures, in consultation with native traditional religious leaders, in order to determine changes required to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act of 1990, as amended by the ADA Amendments Act of 2008

Prohibits discrimination of individuals based on disability. It requires that public transportation services be accessible to individuals with disabilities and prohibits discrimination in employment of qualified individuals with disabilities. It requires the Equal Employment Opportunity Commission to issue regulations relating to discrimination of disabled individuals, and requires the National Council on Disability to conduct a study of areas designated as wilderness to determine the effect of the designation on the ability of individuals to enjoy such areas. The ADA Amendments Act of 2008 restored the intent and protections of the original act.

Antiquities Act of 1906

Authorizes the President to designate as National Monuments objects or areas of historic or scientific interest on lands owned or controlled by the United States. The Act requires that a permit be obtained for examination of ruins, excavation of archaeological sites, and the gathering of objects of antiquity on lands under the jurisdiction of the Secretaries of Interior, Agriculture, and Army; and provides penalties for violations.

Archaeological Resources Protection Act of 1979

Largely supplanted the resource protection provisions of the Antiquities Act for archaeological items. This Act established detailed requirements for issuance of permits for any excavation for or removal of archaeological resources from federal or Indian lands. It also established civil and criminal penalties for the unauthorized excavation, removal, or damage of any such resources; for any trafficking in such resources removed from federal or Indian land in violation of any provision of federal law; and for interstate and foreign commerce in such resources acquired, transported or received in violation of any state or local law. This act also required the land managing agencies to establish public awareness programs regarding the value of archaeological resources to the Nation.

Archeological and Historic Preservation Act of 1960, as amended

This act carries out the policy established by the Historic Sites, Buildings and Antiquities Act of 1935 (known as the Historic Sites Act). It directs federal agencies to notify the Secretary of the Interior whenever they find a federal or federally assisted, licensed, or permitted project may cause loss or destruction of significant scientific, prehistoric, or archaeological data. The Act authorizes use of appropriated, donated, and/or transferred funds for the recovery, protection, and preservation of such data.

Archeological and Historic Preservation Act of 1974

Directs the preservation of historic and archaeological data in federal construction projects.

Architectural Barriers Act of 1969

Ensures that certain buildings financed or leased by federal agencies are constructed (or renovated) so that they will be accessible to the physically handicapped.

Bald and Golden Eagle Protection Act of 1940, as amended

Prohibits the possession, sale, or transport of any bald or golden eagle, alive or dead, or part, nest, or egg except as permitted by the Secretary of the Interior for scientific or exhibition purposes or for the religious purposes of Indians.

Bankhead-Jones Farm Tenant Act of 1937

Directs the Secretary of Agriculture to develop a program of land conservation and utilization in order to correct maladjustments in land use and thus assist in such things as control of soil erosion, reforestation, preservation of natural resources, and protection of fish and wildlife. Some early refuges and hatcheries were established under authority of this Act.

Clean Air Act of 1970

Regulates air emissions from area, stationary, and mobile sources. The Act and its amendments charge federal land managers with direct responsibility to protect the "air quality and related values" of land under their control. These values include fish, wildlife, and their habitats.

Emergency Wetlands Resources Act of 1986

Authorized the purchase of wetlands from Land and Water Conservation Fund moneys, removing a prior prohibition on such acquisitions. Requires the Secretary of the Interior to establish a National Wetlands Priority Conservation Plan, requires the states to include wetlands in their comprehensive outdoor recreation plans, and transfers to the Migratory Bird Conservation Fund amounts equal to import duties on arms and ammunition. It established entrance fees at national wildlife refuges. It also extended the Wetlands Loan Act authorization through 1988 and required the Secretary to report to Congress on wetlands loss. In addition, it directed the Secretary, through the U.S. Fish and Wildlife Service, to continue the National Wetlands Inventory; to complete mapping of the contiguous United States; and to produce at ten-year intervals reports to update and improve in the September 1982 "Status and Trends of Wetlands and Deepwater Habitat in the Conterminous United States, 1950s to 1970s." This act also increased the price of duck stamps.

Endangered Species Act of 1973, as amended

Directs federal agencies to take actions that would further the purposes of the Act and to ensure that actions they carry out, authorize, or fund do not jeopardize endangered species or their critical habitat. The Act also provides authority for land acquisition. Conservation of threatened and endangered species has become a major objective of both land acquisition and refuge management programs.

Endangered Species Conservation Act of 1969

This act expanded the provisions of the Endangered Species Preservation Act of 1966 to include the listing of species in danger world-wide and added mollusks and crustaceans to the animals that could be listed.

Endangered Species Preservation Act of 1966

This act was the predecessor to the Endangered Species Act of 1973 and directed the Secretary of the Interior to produce a list of native U.S. vertebrate species in danger of extinction for the limited protection of those animals.

Environmental Education Act of 1990

Established the Office of Environmental Education within the Environmental Protection Agency to develop and administer a federal environmental education program in consultation with other federal natural resource management agencies, including the U.S. Fish and Wildlife Service.

Executive Order 11593: Protection and Enhancement of the Cultural Environment (1971)

States that if the U.S. Fish and Wildlife Service proposes any development activities that may affect the archaeological or historic sites, the Service will consult with federal and state Historic Preservation Officers to comply with section 106 of the National Historic Preservation Act of 1966, as amended.

Executive Order 11644: Use of Off-road Vehicles on the Public Lands (1972)

Established policies and procedures to ensure that the use of off-road vehicles on public lands will be controlled and directed to protect the resources of those lands, to promote the safety of all users of those lands, and minimize conflicts among the various uses of those lands. EO 11989 (1977) amends section 2 of EO 11644 and directs agencies to close areas negatively impacted by off-road vehicles.

Executive Order 11988: Floodplain Management (1977)

Prevents federal agencies from contributing to the “adverse impacts associated with occupancy and modification of floodplains” and the “direct or indirect support of floodplain development.” In the course of fulfilling their respective authorities, federal agencies “shall take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains.

Executive Order 11990: Protection of Wetlands (1977)

Directs federal agencies to: (1) minimize destruction, loss, or degradation of wetlands; and (2) preserve and enhance the natural and beneficial values of wetlands when a practical alternative exists.

Executive Order 12372: Intergovernmental Review of Federal Programs (1982)

Seeks to foster intergovernmental partnerships by requiring federal agencies to use the state process to determine and address concerns of state and local elected officials with proposed federal assistance and development programs.

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994)

Mandates that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. This order also creates an Interagency Working Group on Environmental Justice to provide guidance to federal agencies in overcoming these issues.

Executive Order 12906: Coordinating Geographical Data Acquisition and Access: The National Spatial Data Infrastructure (1994), as amended by Executive Order 13286:

Amendment of Executive Orders, and Other Actions, in Connection With the Transfer of Certain Functions to the Secretary of Homeland Security (2003)

Recommended that the executive branch develop, in cooperation with state, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data. Of particular importance to Comprehensive Conservation Plans is the National Vegetation Classification System (NVCS), which is the adopted standard for vegetation mapping. Using NVCS facilitates the compilation of regional and national summaries, which, in turn, can provide an ecosystem context for individual refuges.

Executive Order 12962: Recreational Fisheries (1995)

Directs federal agencies to improve the quantity, function, sustainable productivity, and distribution of United States aquatic resources for increased recreational fishing opportunities in cooperation with states and tribes.

Executive Order 12996: Management and General Public Use of the National Wildlife Refuge System (1996)

Defines a conservation mission for the National Wildlife Refuge System, six compatible wildlife-dependent recreational activities, and four guiding principles for management of the Refuge System. Directs the Secretary of the Interior to undertake several actions in support of management and public use and to ensure the maintenance of the biological integrity and environmental health of the Refuge System. It also provides for the identification of existing wildlife-dependent uses that will continue to occur as lands are added to the Refuge System.

Executive Order 13007: Indian Sacred Sites (1996)

Directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Executive Order 13061: Federal Support of Community Efforts Along American Heritage Rivers (1997)

Established the American Heritage Rivers initiative for the purpose of natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The Act directs federal agencies to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage.

Executive Order 13084: Consultation and Coordination With Indian Tribal Governments (2000)

Provides a mechanism for establishing regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications.

Executive Order 13112: Invasive Species (1999)

Directs federal agencies to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, accurately monitor invasive species, provide for restoration of native species and habitat conditions, conduct research to prevent introductions, to control invasive species, and to promote public education on invasive species and the means to address them. This EO replaces and rescinds EO 11987: Exotic Organisms (1977).

Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds (2001)

Instructs federal agencies to conserve migratory birds by several means, including the incorporation of strategies and recommendations found in Partners in Flight Bird Conservation plans, the North American Waterfowl Plan, the North American Waterbird Conservation Plan, and the United States Shorebird Conservation Plan, into agency management plans and guidance documents.

Executive Order 13443: Facilitation of Hunting Heritage and Wildlife Conservation (2007)

Directs federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

Farmland Protection Policy Act of 1981, as amended

Minimizes the extent to which federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. Federal programs include construction projects and the management of federal lands.

Federal Advisory Committee Act of 1972, as amended

Governs the establishment of and procedures for committees that provide advice to the federal government. Advisory committees may be established only if they will serve a necessary, nonduplicative function. Committees must be strictly advisory unless otherwise specified and meetings must be open to the public.

Federal-Aid Highways Act of 1968

Establishes requirements for approval of federal highways through wildlife refuges and other designated areas to preserve the natural beauty of such areas. The Secretary of Transportation is directed to consult with the Secretary of the Interior and other federal agencies before approving any program or project requiring the use of land under their jurisdiction.

Federal Aid in Sport Fish Restoration Act (Dingell-Johnson Act) of 1950

Authorizes the Secretary of the Interior to provide financial assistance for state fish restoration and management plans and projects. It is financed by excise taxes paid by manufacturers of rods, reels, and other fishing tackle.

Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act) of 1937

Taxes the purchase of ammunition and firearms and earmarks the proceeds to be distributed to the states for wildlife restoration.

Federal Cave Resources Protection Act of 1988

Established requirements for the management and protection of caves and their resources on federal lands, including allowing the land managing agencies to withhold the location of caves from the public and requiring permits for any removal or collecting activities in caves on federal lands.

Federal Lands Recreation Enhancement Act (REA) of 2004

Allows the government to charge a fee for recreational use of public lands managed by the U.S. Fish and Wildlife Service and other agencies. The recreation fee program is a program by which fees paid by visitors to certain federal recreation sites are retained by the collecting site and used to improve the quality of the visitor experiences at those sites.

Federal Noxious Weed Act of 1975, as amended

The Secretary of Agriculture was given the authority to designate plants as noxious weeds and to cooperate with other federal, state, and local agencies; farmers associations, and private individuals in measures to control, eradicate, prevent, or retard the spread of such weeds. The Act requires each federal land-managing agency, including the U.S. Fish and Wildlife Service, to designate an office or person to coordinate a program to control such plants on the agency's land and implement cooperative agreements with the states, including integrated management systems to control undesirable plants.

Federal Records Act of 1950

Directs the preservation of evidence of the government's organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Federal Water Pollution Control Act of 1948, as frequently amended particularly by the Clean Water Act of 1977

This Act and its amendments have as their objectives the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters and, therefore, regulates the discharge of pollutants into waters of the United States. The act protects fish and wildlife, establishes operation permits for all major sources of water pollution, limits the discharge of pollutants or toxins into water, and makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit is obtained under the Clean Water Act. Section 404 charges the U.S. Corps of Engineers with regulating discharge of dredge or fill materials into waters of the United States, including wetlands. The "Clean Water Act" became the common name with amendments in 1977.

Federal Water Project Recreation Act of 1965, as amended

Declares the intent of Congress that recreation and fish and wildlife enhancement be given full consideration as purposes of federal water development projects. The Act also authorizes the use of federal water project funds for land acquisition in order to establish refuges for migratory waterfowl when recommended by the Secretary of the Interior, and authorizes the Secretary to provide facilities for outdoor recreation and fish and wildlife at all reservoirs under his control, except those within national wildlife refuges.

Fish and Wildlife Act of 1956, as frequently amended

Establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also with a direction to administer the Act with regard to the inherent right of every citizen and resident to fish for pleasure, enjoyment, and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. The 1998 amendments to the Act modified the powers of the Secretary of the Interior in regard to volunteer service, community partnerships, and education programs.

Fish and Wildlife Conservation Act of 1980, as amended

Requires the Service to monitor non-gamebird species, identify species of management concern, and implement conservation measures to preclude the need for listing under the Endangered Species Act.

Fish and Wildlife Coordination Act of 1934

Promotes equal consideration and coordination of wildlife conservation with other water resource development programs by requiring consultation with the U.S. Fish and Wildlife Service and the state fish and wildlife agencies where the "waters of a stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted...or otherwise controlled or modified" by any agency under federal permit or license. This act also

authorized use of surplus federal property for wildlife conservation purposes and authorized the Secretary of the Interior to provide public fishing areas and accept donations of lands and funds.

Fish and Wildlife Improvement Act of 1978

Improves the administration of fish and wildlife programs and amends several earlier laws including the Refuge Recreation Act, the National Wildlife Refuge System Administration Act, and the Fish and Wildlife Act of 1956. It authorizes the Secretary of the Interior to accept gifts and bequests of real and personal property on behalf of the United States. It also authorizes the use of volunteers on Service projects and appropriations to carry out a volunteer program.

Food Security Act of 1985 (Farm Bill), as amended

Known as the Farm Bill, this act contains several provisions that contribute to wetland conservation. The Swampbuster provisions state that farmers who convert wetlands for the purpose of planting after enactment of the law are ineligible for most farm program subsidies. The Act also established the Wetlands Reserve Program to restore and protect wetlands through easements and restoration of the functions and values of wetlands on such easement areas.

Freedom of Information Act of 1966

Requires all federal agencies to make available to the public for inspection and copying administrative staff manuals and staff instructions; official, published and unpublished policy statements; final orders deciding case adjudication; and other documents. Special exemptions have been reserved for nine categories of privileged material. The Act requires the party seeking the information to pay reasonable search and duplication costs.

Geothermal Steam Act of 1970, as amended

Authorizes and governs the lease of geothermal steam and related resources on public lands. Section 15(c) of the Act prohibits issuing geothermal leases on virtually all U.S. Fish and Wildlife Service-administered lands.

Historic Sites, Buildings and Antiquities Act of 1935

Popularly known as the Historic Sites Act, as amended in 1965, declared it a national policy to preserve historic sites and objects of national significance, including those located on refuges. It provided procedures for designation, acquisition, administration, and protection of such sites. Among other things, National Historic and Natural Landmarks are designated under authority of this Act.

Lacey Act of 1900, as amended

Originally designed to help states protect their native game animals and to safeguard U.S. crop production from harmful foreign species. The Act prohibits interstate and international transport and commerce of fish, wildlife, or plants taken in violation of domestic or foreign laws. It regulates the introduction to the United States of foreign species into new locations.

Land and Water Conservation Fund Act of 1965

Provides funding through receipts from the sale of surplus federal land, appropriations from oil and gas receipts from the outer continental shelf, and other sources for land acquisition under several authorities. Appropriations from the fund may be used for matching grants to states for outdoor recreation projects and for land acquisition by various federal agencies including the Fish and Wildlife Service.

Migratory Bird Conservation Act of 1929

Establishes a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. Authorizes the Secretary of the Interior to cooperate with local authorities in wildlife conservation and to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges. The Act provides for cooperation with states in enforcement. It establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Commission for migratory birds. This act includes acquisition authority for purchase or rental of a partial interest in land or waters and requires the Secretary of the Interior to consult with the appropriate units of local government and with the governor of the state concerned, or the appropriate state agency, before recommending an area for purchase or rental. This provision was subsequently amended in 1983, 1984, and 1986 to require that either the governor or the state agency approve each proposed acquisition. The role of the Commission was expanded by the North American Wetland Conservation Act to include approving wetlands acquisition, restoration, and enhancement proposals recommended by the North American Wetlands Conservation Council.

Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) of 1934

Known as the Duck Stamp Act, this act requires every waterfowl hunter 16 years of age or older to carry a stamp, and earmarks proceeds of Duck Stamps to buy or lease waterfowl habitat. A 1958 amendment authorizes the acquisition of small wetland and pothole areas to be designated as “Waterfowl Production Areas,” which may be acquired without the limitations and requirements of the Migratory Bird Conservation Act.

Migratory Bird Treaty Act of 1918

Implements various treaties and conventions between the United States and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Except as allowed by special regulations, the Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, barter, export, or import any migratory bird, part, nest, egg, or product.

Mineral Leasing Act for Acquired Lands of 1947, as amended

Authorizes and governs mineral leasing on acquired public lands.

Minerals Leasing Act of 1920, as amended

Authorizes and governs leasing of public lands for development of deposits of coal, oil, gas, and other hydrocarbons, sulphur, phosphate, potassium, and sodium. Section 185 of this act contains provisions relating to granting rights-of-way over federal lands for pipelines.

Mining Act of 1872, as amended

Authorizes and governs prospecting and mining for the so-called “hardrock” minerals (such as gold and silver) on public lands.

National and Community Service Act of 1990

Authorizes several programs to engage citizens of the United States in full and/or part-time projects designed to combat illiteracy and poverty, provide job skills, enhance educational skills, and fulfill environmental needs. Among other things, this law established the American Conservation and Youth Service Corps to engage young adults in approved human and natural resource projects, which will benefit the public or are carried out on federal or tribal lands.

National Environmental Policy Act of 1969 (NEPA), as amended

This act and the implementing regulations developed by the Council on Environmental Quality (40 CFR 1500–1508) require federal agencies to integrate the National Environmental Policy Act (NEPA) process with other planning at the earliest possible time to provide a systematic

interdisciplinary approach to decisionmaking; to identify and analyze the environmental effects of their actions; to describe appropriate alternatives to the proposed actions; and to involve the affected state and federal agencies, tribal governments, and public in the planning and decisionmaking process. This act requires the disclosure of the environmental impacts of any major federal action significantly affecting the quality of the human environment.

National Historic Preservation Act of 1966

Repeatedly amended, the Act provides for preservation of significant historical features (buildings, objects, and sites) through a grant-in-aid program to the states. It established a National Register of Historic Places and a program of matching grants under the existing National Trust for Historic Preservation (16 U.S.C. 468-468d). The Act established an Advisory Council on Historic Preservation, which was made a permanent independent agency in 1976 (90 Stat. 1319). That Act also created the Historic Preservation Fund. Federal agencies are directed to take into account the effects of their actions on items or sites listed or eligible for listing in the National Register. Section 110 requires federal agencies to manage historic properties, e.g., to document historic properties prior to destruction or damage; section 101 requires federal agencies consider Indian tribal values in historic preservation programs and requires each federal agency to establish a program leading to inventory of all historic properties on its land.

National Trails System Act of 1968

Established the National Trails System to protect the recreational, scenic, and historic values of some important trails. National Recreation Trails may be established by the Secretaries of the Interior or Agriculture on land wholly or partly within their jurisdiction, with the consent of the involved state(s) and other land managing agencies, if any. National scenic and national historic trails may only be designated by an Act of Congress. Several national trails cross units of the National Wildlife Refuge System.

National Wildlife Refuge System Administration Act of 1966 (amended by the National Wildlife Refuge System Improvement Act of 1997)

This act consolidates the authorities relating to the various categories of lands for the conservation of fish and wildlife administered by the Secretary of the Interior through the U.S. Fish and Wildlife Service by designating all such areas part of a single National Wildlife Refuge System. Areas include wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas. The law also prohibits knowingly disturbing any area within the system or the take of Refuge System wildlife without a permit. The Act addresses the growing need for recreational opportunities by providing a decision framework for allowing appropriate and compatible uses of the Refuge System.

National Wildlife Refuge System Centennial Act of 2000

Establishes a commission to promote awareness by the public to develop a long-term plan to meet priority needs of the National Wildlife Refuge System, require an annual report on the needs, and improve public use programs and facilities.

National Wildlife Refuge System Improvement Act of 1997

This act, which amends the National Wildlife Refuge System Administration Act of 1966, serves as the "organic act" for the National Wildlife Refuge System. The Act states first and foremost that the mission of the National Wildlife Refuge System is focused singularly on wildlife conservation. It establishes a unifying mission for the Refuge System, reinforces the importance of refuge purposes to guide management direction, articulates a process for determining

compatible uses of refuges, identifies six priority wildlife-dependent recreation uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation), and adds a requirement for preparing comprehensive conservation plans through a public planning process. The Act requires the Secretary of the Interior to maintain the biological integrity, diversity, and environmental health of the Refuge System.

National Wildlife Refuge System Volunteer and Community Partnership Enhancement Act of 1998

Amends the Fish and Wildlife Act of 1956 to encourage the use of volunteers to help in the management of refuges within the National Wildlife Refuge System; facilitates partnerships between the Refuge System and nonfederal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

National Wildlife Refuge Volunteer Improvement Act of 2010

Maintains the current funding authorization level for the U.S. Fish and Wildlife Service's volunteer and community partnerships programs that are vital to national wildlife refuges but makes a number of important amendments. The law amends the National Wildlife Refuge Volunteer and Community Partnership Enhancement Act of 1998 to direct the Service to carry out a National Volunteer Coordination Program within the National Wildlife Refuge System. It also requires the Director of the Service to publish a national strategy for the coordination and utilization of volunteers within the Refuge System and provide at least one regional volunteer coordinator for each Service region to implement the strategy.

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990

Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession. This act imposes serious delays on a project when human remains or other cultural items are encountered in the absence of a plan.

Neotropical Migratory Bird Conservation Act of 2000

Establishes a matching grants program to fund projects that promote the conservation of neotropical migratory birds in the United States, Latin America, and the Caribbean.

North American Wetlands Conservation Act of 1989

Provides funding and administrative direction for implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between the United States, Canada, and Mexico. North American Wetlands Conservation Council is created to recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. Available funds may be expended for up to 50 percent of the United States' share cost of wetlands conservation projects in Canada, Mexico, or the United States (or 100 percent of the cost of projects on federal lands).

Partnerships for Wildlife Act of 1992

Established a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the state fish and game agencies in carrying out their responsibilities for conservation of non-game species. The funding formula is no more than 1/3 federal funds, at least 1/3 foundation funds, and at least 1/3 state funds.

Refuge Recreation Act of 1962, as amended

Requires that any recreational use on areas of the National Wildlife Refuge System be "compatible" with the primary purpose(s) for which the area was acquired or established. This Act also requires that sufficient funding be available for the development, operation and maintenance of recreational uses that are not directly related to the area's primary purpose(s).

Refuge Revenue Sharing Act of 1935

Provides for payments to counties in lieu of taxes, using revenues derived from the sale of products from refuges. A major revision in 1964 requires all revenues received from refuge products be distributed to counties for public schools and roads (this stipulation later removed). Another revision in 1974 requires that any remaining funds be transferred to the Migratory Bird Conservation Fund for land acquisition. A 1978 amendment stated payments to counties were established as:

- on acquired land, the greatest amount calculated on the basis of 75 cents per acre, three-fourths of one percent of the appraised value, or 25 percent of the net receipts produced from the land, and
- on land withdrawn from the public domain, 25 percent of net receipts and basic payments.

This amendment also required counties to pass payments along to other units of local government within the county that suffer losses in revenues due to the establishment of U.S. Fish and Wildlife Service areas.

Rehabilitation Act of 1973, as amended

Prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance.

Rivers and Harbors Appropriations Act of 1899, as amended

Requires the authorization by the Chief of Engineers prior to any work in, on, over, or under navigable waters of the United States. The Fish and Wildlife Coordination Act provides authority for the U.S. Fish and Wildlife Service to review and comment on the effects on fish and wildlife activities proposed to be undertaken or permitted by the COE. Service concerns include contaminated sediments associated with dredge or fill projects in navigable waters.

Secretarial Order 3289 Amendment 1: Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources (2010)

Secretarial Order 3285, issued in March of 2009, made production and transmission of renewable energy on public lands a priority for the Department of the Interior. This Secretarial Order, 3289A1, issued in February of 2010 establishes a Department-wide approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and on the land, water, ocean, fish and wildlife, and cultural resources that the Department manages.

Sikes Act of 1960, as amended

Provides for the cooperation by the U.S. Departments of the Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources and outdoor recreation facilities on military reservations throughout the United States. It requires the Secretary of each military department to use trained professionals to manage the wildlife and fishery resource under his jurisdiction and requires federal and state fish and wildlife agencies be given priority in management of fish and wildlife activities on military reservations.

Surface Mining Control and Reclamation Act of 1977

Regulates surface mining activities and reclamation of coal-mined lands. Further regulates the coal industry by designating certain areas as unsuitable for coal mining operations.

Transfer of Certain Real Property for Wildlife Conservation Purposes Act of 1948

Provides that upon a determination by the Administrator of the General Services Administration, real property no longer needed by a federal agency can be transferred without reimbursement to the Secretary of the Interior if the land has particular value for migratory birds or to a state agency for other wildlife conservation purposes.

Transportation Equity Act for the 21st Century of 1998

Established the Refuge Roads Program, requires transportation planning that includes public involvement, and provides funding for approved public use roads and trails and associated parking lots, comfort stations, and bicycle/pedestrian facilities.

Treasury and General Government Appropriations Act of 2000

In December 2002, Congress required federal agencies to publish their own guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information that they disseminate to the public (44 U.S.C. 3502). The amended language is included in section 515(a). The Office of Budget and Management directed agencies to develop their own guidelines to address the requirements of the law. The Department of the Interior instructed bureaus to prepare separate guidelines on how they would apply the Act. The U.S. Fish and Wildlife Service has developed "Information Quality Guidelines" to address the law.

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970

Provides for uniform and equitable treatment of persons who sell their homes, businesses, or farms to the U.S. Fish and Wildlife Service. The Act requires that any purchase offer be no less than the fair market value of the property.

Water Resources Planning Act of 1965

Established the Water Resources Council to be composed of Cabinet representatives, including the Secretary of the Interior. The Council reviews river basin plans with respect to agricultural, urban, energy, industrial, recreational, and fish and wildlife needs. The Act also established a grant program to assist states in participating in the development of related comprehensive water and land use plans.

Wild and Scenic Rivers Act of 1968

Established a National Wild and Scenic Rivers System and prescribes the methods and standards through which additional rivers may be identified and added to the system. Section 5(d)(1) requires that in all planning by federal agencies for the use and development of water and related land resources, consideration be given to potential wild, scenic, and recreation rivers. Rivers are added to the national system based on their free-flowing character and their outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural, ecological, or other values. Rivers in the system are managed to maintain and protect these outstandingly remarkable values for present and future generations.

Wilderness Act of 1964

Defined the Wilderness resource and established the National Wilderness Preservation System. It directed the Secretary of the Interior, within 10 years, to review every roadless area of 5,000 or more acres and every roadless island (regardless of size) within National Wildlife Refuge and National Park Systems and to recommend to the President the suitability of each such area or island for inclusion in the National Wilderness Preservation System, with final decisions made

by Congress. The Secretary of Agriculture was directed to study and recommend suitable areas in the National Forest System. This act also prescribes the management of new inclusions as wilderness.

Youth Conservation Corps Act of 1970

Established a permanent Youth Conservation Corps program within the Departments of the Interior and Agriculture. Within the U.S. Fish and Wildlife Service, YCC participants perform many tasks on refuges, fish hatcheries, and research stations.

Appendix F: Mailing List

The following is an initial list of government offices, private organizations, and individuals who will receive notice of the availability of this Comprehensive Conservation Plan. We continue to add to this list.

Federal Officials

U.S. Senator Carl Levin
U.S. Senator Debbie Stabenow
U.S. Senator Ron Johnson
U.S. Senator Herb Kohl
U.S. Representatives from Michigan and Wisconsin

Federal Agencies

USDA/Natural Resource Conservation Service
USDA/ Forest Service, Hiawatha National Forest
USDI/Fish and Wildlife Service, Albuquerque, New Mexico; Anchorage, Alaska; Atlanta, Georgia; Denver, Colorado; Fort Snelling, Minnesota; Hadley, Massachusetts; Portland, Oregon; Sacramento, California; Washington, D.C.
USDI/East Lansing Private Lands Office; East Lansing Field Office; Alpena Fishery Resources Office; Ann Arbor Law Enforcement Field Office; Great Lakes Science Center, Biological Resources Division, USGS
USEPA, Great Lakes National Program Office, Chicago, Illinois

State Officials

Governor Rick Snyder
Governor Scott Walker

State Agencies

Director, Michigan and Wisconsin Department of Natural Resources
Area Managers and Biologists, Michigan and Wisconsin DNR
State Historic Preservation Officer, Michigan and Wisconsin

City/County/Local Governments

Numerous local government contacts on Horicon, Seney and Shiawassee Refuge Lists

Libraries

Numerous local libraries on Horicon, Seney and Shiawassee Refuge Lists

Organizations

The Nature Conservancy
National Audubon Society
Conservation Fund
Michigan United Conservation Clubs

Wildlife Management Institute
Ducks Unlimited
Michigan Duck Hunters Association
Great Lakes Commission
Wildlife Management Institute
PEER Refuge Keeper
The Wilderness Society, Washington, D.C.
National Wildlife Federation, Ann Arbor, Michigan
The Conservation Fund, Arlington, Virginia

Media

Local Radio and TV Stations; Refuge Media Contacts

Federally-recognized Tribes and Historical Societies

Michigan State Historic Preservation Officer
Michigan Office of the State Archeologist
The Grand Traverse Band of Ottawa and Chippewa Indians
Michigan Anishinabe Cultural Protection and Repatriation Alliance (Ojibwa)
The Advisory Council on Historic Preservation

Individuals

Individuals who participated in open houses, sent written comments, or requested to be on the mailing list

Appendix G: Bibliography

- Barrows, W.B. 1912. Michigan Bird Life. *Michigan Agricultural College Special Bulletin*.
- Carlquist, Sherwin. 1974. Island biology. First ed. New York: Columbia University Press.
- Corin, C.W. 1976. The land vertebrates of the Huron Islands, Lake Superior. *The Jack-Pine Warbler* 54:138-147.
- Crispin, Susan. 1998. The global significance of Great Lakes islands. In *State of the Great Lakes Islands Report*, edited by K. E. Vigmostad. East Lansing, MI: Department of Resource Development, Michigan State University.
- Cuthbert, F.J. 1985. Interseasonal movement between colony sites by Caspian terns in the Great Lakes. *Wilson Bulletin* 97:502-510.
- Cuthbert, F.J. 1985. Mate retention in Caspian Terns. *Condor* 87:74-78.
- Cuthbert, F.J. 1988. Reproductive success and colony site tenacity in Caspian terns. *Auk* 105:339-344.
- Cuthbert, F.J., L.R. Wires and J.E. McKearnan. 2002. Potential impacts of double-crested cormorants on nesting great blue herons and black-crowned herons in the U.S. Great Lakes. *International Journal of Great Lakes Research* 28:145-154.
- Cuthbert, F.J., J.E. McKearnan, L.R. Wires, and A. Joshi. 2003. Distribution and abundance of colonial waterbirds in the US Great Lakes: 1997-1999. Draft report to US Fish and Wildlife Service, Ft. Snelling, MN.
- Cuthbert, F.J. and L.R. Wires. 2011. Long-term monitoring of colonial waterbird populations in the U.S. Great Lakes: improving the scientific basis for conservation and management. Final Report to U.S. Fish and Wildlife Service, Region 3.
- Frehlich, L.E. 2002. Forest dynamics and disturbance regimes. Cambridge Press.
- Gates, F. C. 1950. Hat Island, Lake Michigan: its revegetation after bombing. *Transactions of the Kansas Academy of Science* 53:217-228.
- Hatt, R.T., J. Van Tyne, L.C. Stuart, C.H. Pope, and A.B. Grobeman. 1948. Island Life: A Study of the Land Vertebrates of the Islands of Eastern Lake Michigan. Cranbrook Institute of Science, Bull. No. 27, Bloomfield Hills, MI.
- MacArthur, R.H. and E.O. Wilson. 1967. The theory of island biogeography. Princeton University Press.
- McEachern, John, and Edward L. Towle. 1974. Ecological guidelines for island development. First ed, IUCN Publications New Series No. 30. Morges, Switzerland: International Union for Conservation of Nature and Natural Resources.
- Meffe, Gary K., and C. Ronald Carroll, eds. 1994. Principles of Conservation Biology. Sunderland, MA: Sinauer Associates, Inc.

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- Quammen, David. 1997. *The song of the Dodo: Island biogeography in an age of extinctions*. New York, New York: Simon and Shuster.
- Rooney, T.P. 2001. Impacts of white-tailed deer on forest ecosystems: a North American perspective. *Forestry* 74:201-208.
- Scharf, W.C. and M.L. Chamberlin. 1978. Ecological inventory of Harbor Island, Chippewa County, Michigan. Report to The Nature Conservancy, Midwest Regional Office.
- Scharf, W.C. and Shugart, G.W. 1998. Distribution and abundance of gull, tern, and cormorant nesting colonies of the Great Lakes, 1989 and 1990. Publication No. 1, Gale Gleason Environmental Institute, Lake Superior State University, Sault Ste. Marie, Michigan.
- Seefelt, N.E. and J.C. Gillingham. 2004. A new colony location for double-crested cormorant (*Phalacrocorax auritus*) and other waterbirds in the Beaver Archipelago, Northern Lake Michigan. *Michigan Birds and Natural History* 11:122-127.
- Seefelt, N.E. and J.C. Gillingham. 2006a. A comparison of three methods to investigate the diet of breeding double-crested cormorants (*Phalacrocorax auritus*) in the Beaver Archipelago, Northern Lake Michigan. *Hydrobiologia* (Special Publication) 567:57-67.
- Seefelt, N.E. and J.C. Gillingham. 2006b. Foraging locations of double-crested cormorants in the Beaver Archipelago of Northern Lake Michigan: implications for smallmouth bass declines. *Waterbirds* 29:473-480.
- Seefelt, N.E. and J.C. Gillingham. 2008. Bioenergetics and prey consumption of breeding double-crested cormorants in the Beaver Archipelago, Northern Lake Michigan. *Journal of Great Lakes Research* 34:122-133.
- Selzer, M.D. 2000. A plant community survey of Harbor Island National Wildlife Refuge, Chippewa County, Michigan. Senior Thesis, Lake Superior State University.
- Shugart, G.W., W.C. Scharf, and F.J. Cuthbert. 1979. Status and reproductive success of the Caspian tern (*Sterna caspia*) in the U.S. Great Lakes. *Colonial Waterbirds* 2:146-156.
- Soule, J.D. 1993. Biodiversity of Michigan's Great Lakes islands: knowledge, threats and protection. Report for Land and Water Management Division, Michigan Natural Features Inventory, Lansing, MI.
- Soule, Judith D. 1998. Biodiversity of Michigan's Great Lakes islands: Knowledge, threat, protection. In *State of the Great Lakes islands report*, edited by K. E. Vigmostad. East Lansing, MI: Department of Resource Development, Michigan State University.
- Udall, Stewart L. 1963. *The quiet crisis*. New York: Holt, Rinehart and Winston, Inc.
- Vigmostad, Karen E. 1998. State of the Great Lakes islands. Paper read at State of the Great Lakes Islands Workshop, August 18-20, 1996, at Roscommon, Michigan.
- Weiner, Jonathan. 1994. *The beak of the finch: A story of evolution in our time*. New York: Alfred A. Knopf, Inc.
- Wilson, E. O., and F. M. Peter, eds. 1988. *Biodiversity*. Washington, DC: National Academy Press.

Wires, L.R. and F.J. Cuthbert. 2000. Trends in Caspian tern numbers and distribution in North America: a review. *Waterbirds* 23:388-404.

Wires, L.R. and F.J. Cuthbert 2006. Historical populations of the double-crested cormorant: implications for conservation and management in the 21st century. *Waterbirds* 29:9-37.

Appendix H: Glossary

Adaptation: Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.

Adaptive Management: The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. A process that uses feedback from refuge research and monitoring and evaluation of management actions to support or modify objectives and strategies at all planning levels (FWS, 602 FW1 1.6).

Alternatives: Different sets of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the National Wildlife Refuge System mission, and resolving issues (FWS, 602 FW1 1.6).

Appropriate Use: A proposed or existing use on a refuge that meets at least one of the following four conditions (FWS, 603 FW1 1.6):

- The use is a wildlife-dependent recreational use as identified in the Fish and Wildlife Improvement Act of 1978.
- The use contributes to fulfilling the refuge purpose(s), the National Wildlife Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the National Wildlife Refuge System Improvement Act of 1997 was signed into law.
- The use involves the take of fish and wildlife under state regulations.
- The use has been found to be appropriate as specified in section 1.11.

Approved Acquisition Boundary: A project boundary that the Director of the U.S. Fish and Wildlife Service approves upon completion of the planning and environmental compliance process. An approved acquisition boundary only designates those lands that the Service has authority to acquire and/or manage through various agreements. Approval of an acquisition boundary does not grant the Service jurisdiction or control over lands within the boundary, and it does not make lands within the refuge boundary part of the National Wildlife Refuge System. Lands do not become part of the Refuge System until they are purchased or are placed under an agreement that provides for management as part of the refuge system.

Biological Control: The use of organisms or viruses to control weeds or other pests.

Biological Diversity: The variety of life, including the variety of living organisms, the genetic differences among them, and the communities in which they occur (FWS, 602 FW1 1.6).

Biological Integrity: Biotic composition, structure, and functioning at the genetic, organism, and community levels consistent with natural conditions, including the natural biological processes that shape genomes, organisms, and communities (FWS, 602 FW1 1.6).

Candidate Species: Plants and animals for which the U.S. Fish and Wildlife Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Carbon Sequestration: The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen, and store the carbon. Fossil fuels were at one time biomass and continue to store the carbon until burned.

Climate Change: Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from 1) natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; 2) natural processes within the climate system (e.g., changes in ocean circulation); 3) human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification, etc.).

Code of Federal Regulations (CFR): The codification of the general and permanent rules published in the *Federal Register* by the departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to federal regulation. The 50 subject matter titles contain one or more individual volumes, which are updated once each calendar year, on a staggered basis.

Council on Environmental Quality (CEQ): An Executive Office of the President whose members are appointed by the President. CEQ recommends national policies to promote the improvement of the quality of the environment.

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge (FWS, 603 FW 2 2.6).

Compatibility Determination (CD): A written determination signed and dated by the Refuge Manager and the U.S. Fish and Wildlife Service Regional Chief signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. The director of the Service makes this delegation through the Regional Director (FWS, 603 FW 2 2.6).

Comprehensive Conservation Plan (CCP): A document that describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purposes of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the ecological integrity of each refuge and the National Wildlife Refuge System; helps achieve the goals of the National Wilderness Preservation System; and meets other mandates (FWS, 602 FW1 1.6).

Consumptive Use: Use of a refuge resource that removes the resource from the refuge (e.g., killing an animal to eat, catching and keeping fish, harvesting berries or plants, or removal of mineral or other specimens).

Cultural Resource Inventory: A professionally conducted study designed to locate and evaluate evidence of cultural resources present within a defined geographic area. Inventories

may involve various levels, including background literature search, comprehensive field examination to identify all exposed physical manifestations of cultural resources, or sample inventory to project site distribution and density over a larger area. Evaluation of identified cultural resources to determine eligibility for the National Register of Historic Places follows the criteria found in 36 CFR 60.4.

Cultural Resources: “Those parts of the physical environment—natural and built—that have cultural value to some kind of sociocultural group . . . [and] those non-material human social institutions . . .” Cultural resources include historic sites, archeological sites and associated artifacts, sacred sites, traditional cultural properties, cultural items (human remains, funerary objects, sacred objects, and objects of cultural patrimony), and buildings and structures.

Easement: A privilege or right that is held by one person or other entity in land owned by another.

Ecological Integrity: The integration of biological integrity, natural biological diversity, and environmental health; the replication of natural conditions (FWS, 602 FW1 1.6).

Ecosystem: A biological community together with its environment, functioning as a unit. For administrative purposes, 53 ecosystems covering the United States and its possessions have been designated. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary (FWS, 602 FW1 1.6).

Effects (Impacts): Effects include:

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
- Cumulative effects, which result from past, present, and reasonably foreseeable future actions that, collectively, become significant over time.

Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial (40 CFR 1508.8).

Endangered Species: Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the *Federal Register*.

Endangered Species Act (ESA): Through federal action and by encouraging the establishment of state programs, the Endangered Species Act of 1973 provided for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. The Act authorizes the determination and listing of species as endangered and threatened;

prohibits unauthorized taking, possession, sale, and transport of endangered species; provides authority to acquire land for the conservation of listed species, using land and water conservation funds; authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for endangered and threatened wildlife and plants; authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the Act or any regulation issued thereunder.

Section 7 of the Endangered Species Act requires federal agencies to insure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

Environmental Action Statement (EAS): The decision document for an environmental assessment for the U.S. Fish and Wildlife Service. The EAS will consist of a one-page document indicating the proposal, the Service decision, references to supporting documents (if any), and a signature block. The purposes of the EAS are to establish a process for internal review of National Environmental Policy Act-related decision documents and to provide an appropriate administrative record of NEPA-related decisions at all management levels of the Service (FWS, 550 FW3 3.3 C).

Environmental Analysis: The process associated with preparing documents such as environmental assessments and environmental impact statements and the decision whether to prepare an environmental impact statement. It is an analysis of alternative actions and their predictable short-term and long-term effects, which include physical, biological, economic, and social factors and their interactions.

Environmental Assessment (EA): A systematic analysis to determine if proposed actions would result in a significant effect on the quality of the environment.

Environmental Consequences: The scientific and analytic basis for the comparison of alternatives. The environmental impacts of the alternatives including the proposed action, any adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources that would be involved in the proposal should it be implemented (40 CFR 1502.16).

Environmental Health: Abiotic composition, structure, and functioning of the environment consistent with natural conditions, including the natural abiotic processes that shape the environment (FWS, 602 FW1 1.6).

Environmental Impact Statement (EIS): A detailed written statement, required by section 102(2)(C) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Environmental Justice: The fair treatment and meaningful involvement of all people in the development, implementation, and enforcement of environmental laws regardless of race, color, national origin, or income.

Extirpation: The local extinction of a species that is no longer found in a locality or country but exists elsewhere in the world.

Finding of No Significant Impact (FONSI): A document prepared in compliance with the National Environmental Policy Act and supported by an environmental assessment that briefly presents why a federal action will have no significant effects on the human environment and for which an Environmental Impact Statement will not be prepared (40 CFR 1508.13).

Global Warming: Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities.

Goal: A descriptive, open-ended, and often broad statement of desired future conditions that conveys purposes but does not define measurable units (FWS, 602 FW1 1.6).

Greenhouse Gas (GHG): Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O₃), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Habitat: The physical and biological resources required by an organism for its survival and reproduction; these requirements are species-specific. Food and cover are major components of habitat and must extend beyond the requirements of the individual to include a sufficient area capable of supporting a viable population.

Incompatible: Any use (recreational or nonrecreational) of a refuge that, in the sound professional judgment of the Director of the U.S. Fish and Wildlife Service, will materially interfere with or detract from the fulfillment of the mission of the National Wildlife Refuge System or the purposes of the refuge. Incompatible uses are not allowed to occur on Service areas.

Indicator: In effects analysis, a way for measuring effects from management alternatives on a particular resource or issue.

Interjurisdictional Fish: Fish that occur in waters under the jurisdiction of one or more states, for which there is an interstate fishery management plan or which migrates between the waters under the jurisdiction of two or more states bordering on the Great Lakes.

Invasive Species: Invasive species are organisms that are introduced into a non-native ecosystem and that cause, or are likely to cause, harm to the economy, environment, or human health.

Inventory: Accepted biological methods to determine the presence, relative abundance, and/or distribution of species (FWS, 702 FW2 2.6).

Issue: Any unsettled matter that requires a management decision—that is, a U.S. Fish and Wildlife Service initiative, opportunity, resource management problem, a threat to the resources

of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition (FWS, 602 FW1 1.6).

Major Federal Action: Includes action with effects that may be major and that are potentially subject to federal control and responsibility. “Major” reinforces but does not have a meaning independent of significantly. “Actions” include new and continuing activities. Federal actions include adoption of official policy, formal plans, programs, and approval of specific projects (40 CFR 1508.18).

Memorandum of Understanding or Agreement (MOU or MOA): A legal document outlining the terms and details of an agreement between parties (often U.S. Fish and Wildlife Service and a state natural resource agency), including each party’s requirements and responsibilities. It sets forth the basic principles and guidelines under which the parties will work together to accomplish their goals. A memorandum of understanding or agreement are generally recognized as binding, even if no legal claim could be based on the rights and obligations laid down in them.

Migratory Birds: Birds that follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

Monitoring: Accepted biological methods to determine the status and/or demographics of species over time (FWS, 702 FW2 2.6).

National Environmental Policy Act (NEPA): This act, promulgated in 1969, requires all federal agencies to disclose the environmental effects of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements and must prepare appropriate NEPA documents to facilitate better environmental decisionmaking (40 CFR 1500). The law also established the Council on Environmental Quality to implement the law and to monitor compliance with the law.

National Wilderness Preservation System: A network of federally owned areas designated by Congress as wilderness and managed by one of four federal agencies: the U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, or the U.S. Forest Service. Includes over 600 areas and more than 105 million acres. The National Wildlife Refuge System includes over 20 million acres of wilderness in more than 60 refuges (FWS, 610 FW1 1.9).

National Wildlife Refuge (NWR, Refuge): A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include Coordination Areas. A complete listing of all units of the Refuge System is located in the current Report of Lands Under Control of the U.S. Fish and Wildlife Service (FWS, 602 FW1 1.6).

National Wildlife Refuge System (NWRS, Refuge System): All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife, and plant resources.

National Wildlife Refuge System Improvement Act of 1997 (Improvement Act): Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System. Clearly defines a unifying mission for the Refuge System; establishes the legitimacy and

appropriateness of the six priority public uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); establishes a formal process for determining compatibility; establishes the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; and requires a Comprehensive Conservation Plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

Native Species: A species, subspecies, or distinct population that occurs within its natural range or natural zone of potential dispersal (i.e., the geographic area the species occupies naturally or would occupy in the absence of direct or indirect human activity or an environmental catastrophe).

No-Action Alternative: In the context of a Comprehensive Conservation Plan, this refers to the current management direction. With this alternative, no change from the current CCP would be implemented.

Non-consumptive Uses: Recreational activities (e.g., hiking, photography, and wildlife observation) that do not involve the taking or catching of fish, wildlife, or other natural resources.

Non-native Species: A species, subspecies, or distinct population that has been introduced by humans (intentionally or unintentionally) outside its natural range or natural zone of potential dispersal.

Objective: A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Objectives are to be attainable, time-specific, and measurable (FWS, 602 FW1 1.6).

Ozone (O3): Ozone, the triatomic form of oxygen (O₃), is a gaseous atmospheric constituent. In the troposphere, it is created both naturally and by photochemical reactions involving gases resulting from human activities (photochemical smog). In high concentrations, tropospheric ozone can be harmful to a wide range of living organisms. Tropospheric ozone acts as a greenhouse gas. In the stratosphere, ozone is created by the interaction between solar ultraviolet radiation and molecular oxygen (O₂). Stratospheric ozone plays a decisive role in the stratospheric radiative balance. Depletion of stratospheric ozone, due to chemical reactions that may be enhanced by climate change, results in an increased ground-level flux of ultraviolet (UV) B radiation.

Planning Area: The area upon which the planning effort will focus. A planning area may include lands outside existing planning unit boundaries currently studied for inclusion in the National Wildlife Refuge System and/or partnership planning efforts. It also may include watersheds or ecosystems outside of our jurisdiction that affect the planning unit. At a minimum, the planning area includes all lands within the authorized boundary of the refuge (FWS, 602 FW1 1.6).

Planning Team: A planning team is interdisciplinary in membership and function. A team generally consist of a Planning Team Leader, Refuge Manager, staff biologists, a state natural resource agency representative, and other appropriate program specialists (e.g., social scientist, ecologist, recreation specialist). Other federal and Tribal natural resource agencies may also be asked to provide team members, as appropriate. The planning team prepares the

Comprehensive Conservation Plan and appropriate National Environmental Policy Act documentation (FWS, 602 FW1 1.6).

Prescribed Burning: Controlled application of fire to the landscape that allows the fire to be confined to a predetermined area while producing the intensity of heat and rate of spread required to achieve planned management objectives.

Preferred Alternative: A proposed action in the National Environmental Policy Act document for the Comprehensive Conservation Plan identifying the alternative that the U.S. Fish and Wildlife Service believes best achieves planning unit purposes, vision, and goals; helps fulfill the National Wildlife Refuge System mission; maintains and, where appropriate, restores the ecological integrity of each refuge and the Refuge System; addresses the significant issues and mandates; and is consistent with principles of sound fish and wildlife management.

Priority Public Uses: Six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority and are found to be compatible with the refuge purposes. This includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

Proposed Action: In the context of a Comprehensive Conservation Plan, this is the same as the Preferred Alternative.

Public Involvement: A process that offers affected and interested individuals and organizations opportunities to become informed about, and to express their opinions on, U.S. Fish and Wildlife Service actions and policies. In the process, these public views are studied thoroughly and are thoughtfully considered in shaping decisions for refuge management.

Purposes of the Refuge: The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit. For refuges that encompass congressionally designated wilderness, the purposes of the Wilderness Act are additional purposes of the refuge (FWS, 602 FW1 1.6).

Record of Decision (ROD): A concise public record of a decision prepared by the federal agency, pursuant to National Environmental Policy Act, that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

Resident Species: A nonmigratory species inhabiting a given locality throughout the year. Examples include white-tailed deer, muskrat, raccoon, mink, and fox.

Scoping: A process for determining the scope of issues to be addressed by a Comprehensive Conservation Plan and for identifying the significant issues. Involved in the scoping process are federal, state, and local agencies; private organizations; and individuals.

Shorebird: Long-legged birds, also known as waders, belonging to the order Charadriiformes that use shallow wetlands and mud flats for foraging and nesting.

Significant Issue: A significant issue is typically: within Service jurisdiction, suggests different actions or alternatives, and will influence the decision (FWS, 602 FW3 3.4 3b).

Species: A distinctive kind of plant or animal having distinguishable characteristics, and that can interbreed and produce young. A category of biological classification.

Sound Professional Judgment: A finding, determination, or decision that is consistent with principles of sound fish and wildlife management and administration, available science and resources, and adherence to the requirements of the National Wildlife Refuge System Administration Act and other applicable laws.

Stakeholder: A person or group who has an interest in activities within the Planning Area.

Step-down Management Plan: A plan that provides specific guidance on management subjects (e.g., habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting Comprehensive Conservation Plan goals and objectives (FWS, 602 FW1 1.6).

Strategic Habitat Conservation (SHC): A structured, science-driven approach for making efficient, transparent decisions about where and how to expend Service resources for species, or groups of species, that are limited by the amount or quality of habitat. It is an adaptive management framework integrating planning, design, delivery, and evaluation.

Strategy: A specific action, tool or technique, or combination of actions, tools, and techniques used to meet unit objectives (FWS, 602 FW 1.6).

Threatened Species: Those plant or animal species likely to become endangered species throughout all of or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the Endangered Species Act of 1973 and published in the *Federal Register*.

Vision Statement: A concise statement of what the planning unit should be or hope to do, based primarily upon the National Wildlife Refuge System mission, specific refuge purposes, and other mandates. The vision statement for the refuge should be tied to the mission of the Refuge System; the purpose(s) of the refuge; the maintenance or restoration of the ecological integrity of each refuge and the Refuge System; and other mandates (FWS, 602 FW1 1.6).

Waterfowl: A group of birds that include ducks, geese, and swans (belonging to the order Anseriformes).

Waterfowl Production Area (WPA): Prairie wetlands with associated uplands managed to provide nesting areas for waterfowl and owned in fee title by the U.S. Fish and Wildlife Service. These lands are purchased from willing sellers with funds from Federal Duck Stamp sales. They are open to public hunting, fishing, and trapping according to state and federal regulations.

Watershed: The entire land area that collects and drains water into a river/stream or river/stream system.

Wetland: A wetland is land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For the purposes of this classification a wetland must have one or more of the following three attributes: 1) at

least periodically, the land supports predominantly hydrophytes; 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al., 1979).

Wetland Management District (WMD): An area covering several counties that acquires (with Federal Duck Stamp funds), restores, and manages prairie wetland habitat critical to waterfowl and other wetland birds.

Wildlife-Dependent Recreational Use: A use of a refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. These are the six priority public uses of the National Wildlife Refuge System as established in the National Wildlife Refuge System Administration Act, as amended. Wildlife-dependent recreational uses, other than the six priority public uses, are those that depend on the presence of wildlife. These other uses will also be considered in the preparation of refuge Comprehensive Conservation Plans; however, the six priority public uses always will take precedence (FWS, 602 FW1 1.6).

Wildlife Diversity: A measure of the number of wildlife species in an area and their relative abundance.

Waterbirds: This general category includes all birds that inhabit lakes, marshes, streams and other wetlands at some point during the year. The group includes all waterfowl, such as ducks, geese, and swans and other birds such as loons, rails, cranes, herons, egrets, ibis, cormorants, pelicans, shorebirds, and passerines that nest and rely on wetland vegetation.

Appendix I: List of Preparers and Contributors

Refuge Staff

Patti Meyers, Former Refuge Manager, Gravel Island/Green Bay National Wildlife Refuges (managed by Horicon NWR)

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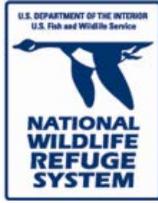
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Mark Hogeboom, Writer/Editor

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Gravel Island NWR and Green Bay NWR

W 4279 Headquarters Road, Mayville, WI 53050

Harbor Island NWR, Huron NWR, and portions of Michigan Islands NWR (Hat, Shoe, Pismire, Gull Islands)

1674 Refuge Entrance Rd., Seney, MI 49883

Portions of Michigan Islands NWR (Big and Little Charity, Scarecrow, Sugar, Thunder Bay Islands)

6975 Mower Road, Saginaw, MI 48601

<http://www.fws.gov/midwest/planning/GreatLakesIslands/index.html>

U.S. Fish and Wildlife Service

<http://www.fws.gov>

Region 3, U.S. Fish and Wildlife Service

<http://www.fws.gov/midwest>