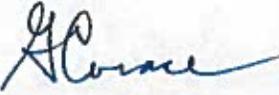
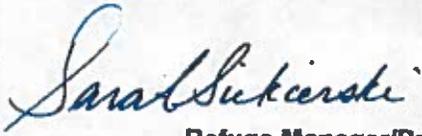


HABITAT MANAGEMENT PLAN FOR HARBOR ISLAND NWR, HURON NWR, MICHIGAN ISLANDS NWR (MICHIGAN, 2015)



Cover Photo: View of Huron Mountains on the mainland of the Upper Peninsula of Michigan as seen from Huron NWR. Note the boreal forests growing on Canadian-shield bedrock on the islands. It is unlikely that any other refuge in R3 has similar vegetation communities.

HABITAT MANAGEMENT PLAN FOR HARBOR ISLAND NWR, HURON NWR, MICHIGAN ISLANDS NWR

Approvals		
Action	Signature/Name	Date
Prepared By:	 Wildlife Biologist/Ecologist	3/12/15
Submitted By:	 Refuge Manager/Project Leader	3/12/15
Reviewed By:	 Regional Refuge Biologist	3/12/15
Reviewed By:	 Refuge Supervisor	4/2/15
Approved By:	 Regional Refuge Chief	4-2-15

SYNOPSIS	5
I. INTRODUCTION	7
A. LEGAL MANDATES.....	8
<i>Mission statements</i>	8
B. RELATIONSHIP TO OTHER PLANS.....	9
II. BACKGROUND	10
A. INVENTORY AND DESCRIPTION OF HABITAT.....	11
(1) <i>Location</i>	11
(3) <i>Historic condition</i>	14
(4) <i>Changes from historic condition</i>	14
(5) <i>Current habitat types</i>	15
III. RESOURCES OF CONCERN	16
A. IDENTIFICATION OF REFUGE RESOURCES OF CONCERN.....	16
B. POTENTIAL REFUGE CONTRIBUTION TO THE HABITAT NEEDS OF THE RESOURCES OF CONCERN.....	18
C. RECONCILING CONFLICTING HABITAT NEEDS FOR RESOURCES OF CONCERN.....	20
IV. HABITAT GOALS, OBJECTIVES, AND STRATEGIES (DESIRED FUTURE CONDITION)	21
V. MANAGEMENT STRATEGY CONSTRAINTS.....	33
A. STAFFING AND SAFETY.....	33
B. CLIMATE CHANGE.....	33
C. CONTAMINANTS AND ALTERED FOOD CHAINS.....	34
VI. MANAGEMENT STRATEGY IMPACTS, PRESCRIPTIONS, ETC.	34
A. IMPACTS TO THE RESOURCES OF CONCERN ASSOCIATED WITH THE IMPLEMENTATION OF THE PROPOSED HABITAT MANAGEMENT STRATEGIES.....	34
B. MANAGEMENT STRATEGY PRESCRIPTIONS (TIMING, FREQUENCY, SEVERITY, ETC.).....	35
C. MANAGEMENT STRATEGY DOCUMENTS.....	35
(1) <i>Necessary resources</i>	35
(2) <i>Documentation of special uses</i>	35
(3) <i>Documentation of compliance</i>	35
LITERATURE CITED AND OTHER REFERENCES	36
APPENDIX: SPECIES LISTS.....	39
PLANT SPECIES OF HARBOR ISLAND NWR.....	39

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

MAMMALS OF HARBOR ISLAND NWR 47
HERPTOFAUNA OF HARBOR ISLAND NWR 48
BIRD SPECIES OF HARBOR ISLAND NWR 49
FERNS AND GYMNOSPERM SPECIES OF HURON NWR 54
PLANTS OF HURON NWR 56
HERPTOFAUNA OF HURON NWR 64
BIRD SPECIES OF HURON NWR 65
MAMMALS OF HURON NWR 69
PLANTS OF GULL ISLAND (MICHIGAN ISLANDS NWR) 70
PLANTS OF HAT ISLAND (MICHIGAN ISLANDS NWR) 73
BIRD SPECIES OF MICHIGAN ISLANDS NWR 75
THREATENED AND ENDANGERED PLANT SPECIES 78

Synopsis

1. The Project Leader at Seney National Wildlife Refuge (NWR) administers the following Great Lakes Island Refuges: Harbor Island NWR in Lake Huron, Huron NWR in Lake Superior, and Gull, Hat, Shoe, and Pismire Islands of Michigan Islands NWR in Lake Michigan.
2. The *Comprehensive Conservation Plan* (CCP, 2013) for these islands focused on passive colonial waterbird conservation at Michigan Islands NWR. No specific habitat management objectives were listed in the CCP to support wildlife goals beyond the generic objectives common to all the Great Lakes Island Refuges.
3. To better clarify future management directions, amendments to the CCP goals and objectives for these islands are stated in Chapter 4 of this document.
4. *Resources of Concern* for these refuges include forest ecosystems and Lake Huron tansy (*Tanacetum huronense*) at Harbor Island NWR; forest ecosystems and narrow-leaved reedgrass (*Calamagrostis stricta*) at Huron NWR; and Caspian Tern (*Hydroprogne caspia*), Double-crested Cormorant (*Phalacrocorax auritus*), Black-crowned Night-Heron (*Nycticorax nycticorax*), Herring Gull (*Larus smithsonianus*), and Ring-billed Gull (*Larus delawarensis*) breeding colonies at Michigan Islands NWR.
5. Because these island refuges are far removed from Seney NWR, have Wilderness Area status (most), have current vegetation features that are likely representative of historic conditions and currently appropriate for the *Resources of Concern*, and have shown to provide appropriate conditions for *Resources of Concern* in the absence of habitat management for many decades, passive management (*de facto* Wilderness management) is the preferred approach.
6. Few extensive or intensive manipulative activities will occur on these lands and, for those islands designated as Wilderness Areas, any management actions will follow standard protocols for activities in Wilderness Areas (see U.S. Fish and Wildlife Service 2012: Wilderness Monitoring Report for Michigan Islands Wilderness; 2013: Wilderness Monitoring Report for Huron Islands Wilderness).
7. We will conduct inventories, monitor *Resources of Concern*, and manage human use and conflict on a yearly basis on all refuges. An inspection checklist that takes into account refuge-specific *Resource of Concern* issues and identified Wilderness Area (or *de facto* Wilderness Area) measures will be drafted by 2018 and used during trips conducted yearly (at a minimum) to all islands.
8. Double-crested Cormorant management will only occur on Great Lakes islands managed by Seney NWR if/when the management activities do not adversely affect *Resources of Concern* such as Caspian Tern and Black-crowned Night-Heron. Currently, management should only occur at Gull and Pismire Islands in Michigan Islands NWR due to Caspian Terns breeding at Shoe and Hat Islands. Management of Double-crested Cormorants at Gull Island should be done in such a way so as to minimize any adverse impacts to nesting Black-crowned Night-Herons, Herring Gulls, and Ring-billed Gulls.
9. Currently, invasive plant management will only occur on Harbor Island NWR, but may occur elsewhere as warranted. If management is proposed on islands with Wilderness status, a *Minimum Requirements Analysis* will be conducted beforehand.
10. Applied research and graduate student education is an integral part of adaptive management and fulfills many aspects of inventory and monitoring.

Note: Many terms used in this document were defined in the Seney NWR CCP and readers can view that document for more definitions. The term “ecological integrity” is used with the definition being: “A natural community has ecological integrity if: 1) ecological processes are intact and within their natural range of variation; 2) species distribution, composition, and relative abundance are within their natural range of variation; 3) the community is resilient, or able to recover from severe disturbance events.” The term “restoration” is used to describe the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. “Conservation” is defined as active management to maintain existing conditions, more or less. “Preservation” is defined as passive management that allows patterns to develop without intervention. “Benchmark” or “reference” refers to sites or conditions that have not been altered since pre-European times. “Natural range of variation” (NRV) means the range of values explaining patterns/processes expected in natural (unaltered) systems.

Acknowledgments: The authors appreciate the support of colleagues at Seney NWR and elsewhere in the National Wildlife Refuge System, including those who previously worked on the CCP from the Regional Office. Special thanks to Nancy Seefelt (Central Michigan University). We would also like to thank the Applied Sciences Program interns who assisted with data collection, analysis, and reporting, especially Ashlee Baker. Seney NWR and Regional Office staff were given the opportunity to comment and provide edits and their suggestions improved this document.

I. Introduction

The Great Lakes of North America contain one-fifth of the world's fresh surface water or 95% 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% 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 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.

Great Lakes islands have unique landforms, plant and animal assemblages, and cultural history. They are living laboratories of natural selection. 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 wildlife species of conservation priority. 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.

This Habitat Management Plan (HMP) covers those Great Lakes island refuges managed by staff from Seney National Wildlife Refuge (NWR).

The U.S. Fish and Wildlife Service

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 (NWRS), 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%) are in Alaska, with approximately 16 million acres located in the Lower 48 states and several island territories.

The NWRS 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 units of the NWRS 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 Comprehensive Conservation Plans (CCPs) is one of those mandates. The legislation directs the Secretary of the Interior to ensure that the mission of the NWRS 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, plants, and their habitats.

A. Legal mandates.

Mission statements — The mission of the U. S. Fish and Wildlife Service (Service) is: *“Working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefits of the American people.”*

The mission of NWRS 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.”*

The Vision Statement of the 2013 Great Lakes Island CCP was: *“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.”*

B. Relationship to other plans.

This HMP is a step-down plan to Great Lakes Islands CCP. As much as is possible, this HMP takes information directly from the CCP and provides more specific information regarding habitat or resource management. Other related plans are shown below.

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 or State), the U.S. Fish and Wildlife Service, The U.S. Forest Service, The Nature Conservancy, 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. 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.

Wilderness Character Monitoring Reports

A Report on Wilderness Character Monitoring was drafted for both Michigan Islands Wilderness (O'Dell, 2012) and Huron Islands Wilderness (Payne and Zweber, 2013). Selected measures for Michigan Islands Wilderness were: 1) untrammeled quality, 2) natural quality, and 3) undeveloped quality. For Huron Islands Wilderness, selected measures were: 1) untrammeled quality, 2) undeveloped quality, and 3) solitude or primitive and unconfined recreation quality. Edits to these documents are currently being conducted and any changes or additions made to these documents will be taken into account in future island management, including the drafting of a 1-page trip summary/report document.

II. Background

Michigan is 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. NWRS 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). Nonetheless, even with these past land uses and lack of active habitat management since refuge establishment, these refuges have—since their establishment—provided appropriate conditions for *Resources of Concern*.

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). 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.

A. Inventory and description of habitat.

(1) Location

Figure 1. Huron NWR (Lake Superior) and Harbor Island NWR (Lake Huron).

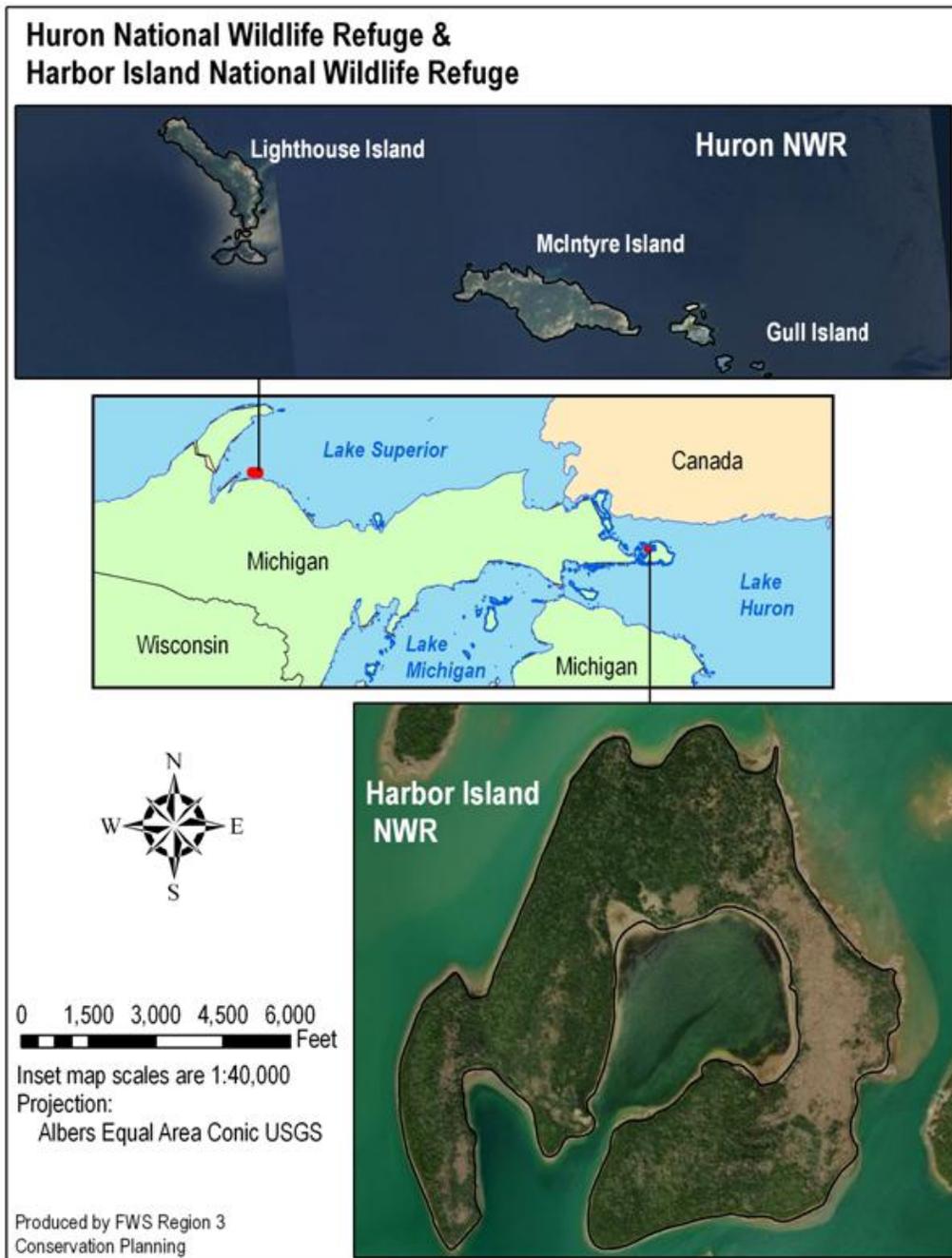


Figure 2. Michigan Islands NWR units in Lake Michigan are managed by Seney NWR.

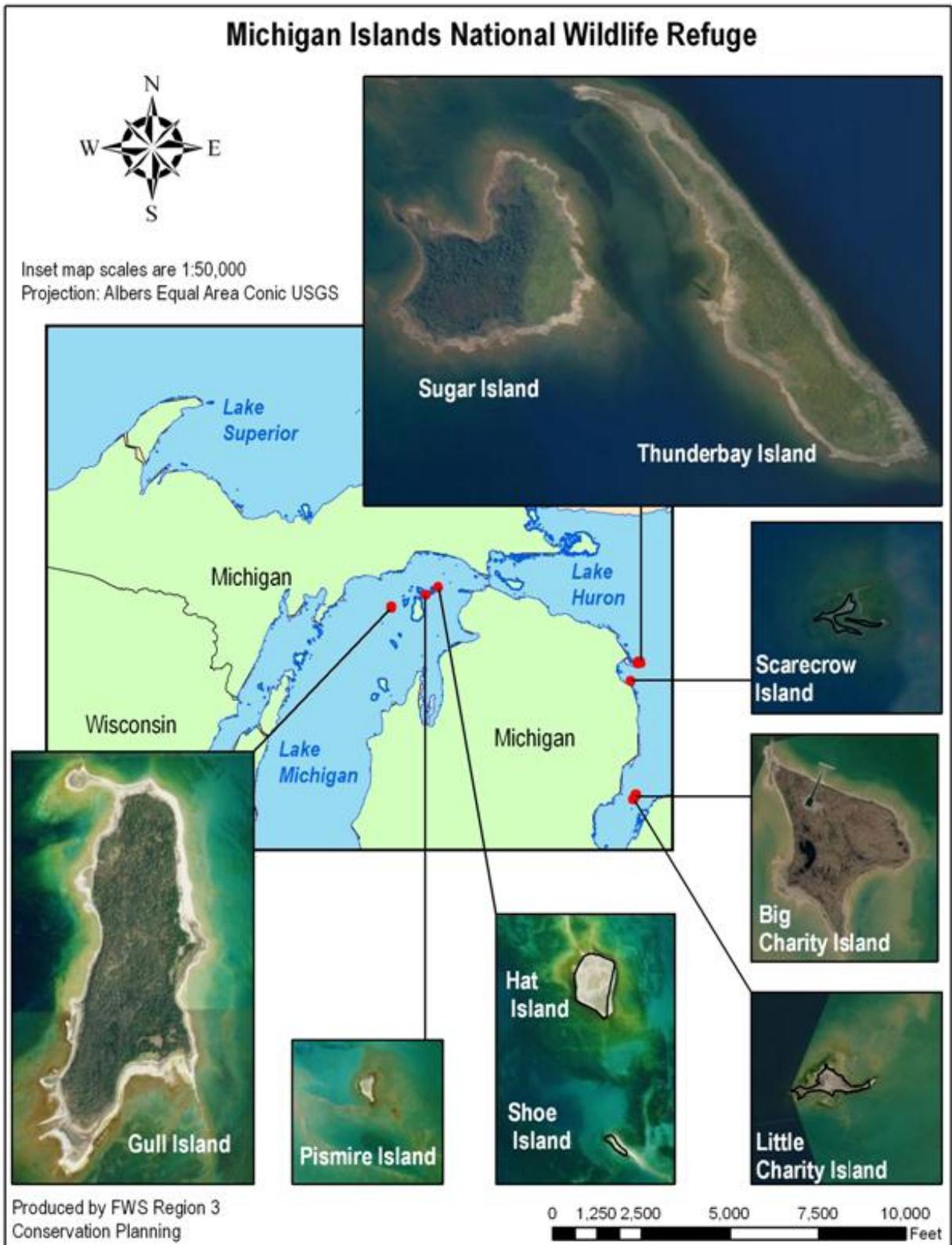




Figure 3. View from Harbor NWR.

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. 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 (Fig. 1 above and 3). Harbor Island NWR is not a Federal Wilderness Area, but management (habitat management and other management) has been *de facto* Wilderness and should continue as such. Forest ecosystems dominate the island.



Figure 4. View from Huron NWR.

Huron NWR

The refuge is located three miles off the south shore of Lake Superior and 18 miles east of the Keweenaw Peninsula. Huron NWR is comprised of eight islands: West Huron (or Lighthouse) Island, McIntyre Island (East Huron), Gull 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 Wilderness Area designation (Fig. 2 above and 4). Forest ecosystems dominate the island.

The lighthouse on West Huron Island was built in 1868 and is listed in the National Register of

Historic Places. Manned operations of the light ceased in 1972. The Huron Islands Lighthouse Preservation Association was formed to raise funds for its restoration. Of the eight islands, only West Huron 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. Exceptions are emergency landings by boats in distress.

Michigan Islands NWR

Michigan Islands NWR is comprised of nine islands in Lakes Michigan and Huron. 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. Gull Island is the most remote of these and is located approximately 25 miles southeast of Manistique, MI; forest ecosystems dominate this island. In 1970, Scarecrow, Pismire, and Shoe Islands were officially designated as Michigan Islands Wilderness Area; these islands are dominated by glacial deposits with little woody vegetation. The portion of Michigan Islands NWR managed by Seney NWR totals 262 acres, with Gull Island accounting for 230 of those acres (Fig. 2).

(2) Physical or Geographic Setting

a. Climate

Due to its inland location, northern latitude, and relatively high elevation, these northern Great Lakes islands are characterized by a 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).

b. 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 managed by Seney NWR 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. **Huron NWR and Harbor Island NWR are examples.**
- **Non-resistant Rock** - Limestone and dolomite are represented on many islands in northern Lake Michigan, Lake Huron, Lake Erie, and Lake Ontario. **Most of the islands of Michigan Island NWR are this type.**
- **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. **Pismire Island in Michigan Islands NWR is an example.**

(3) Historic condition — No studies that we are aware of have described the pre-EuroAmerican conditions of these islands. Such an analysis would be a critical first-step in assessing their current degree of ecological integrity and provide a framework for other studies of pattern and process.

(4) Changes from historic condition — Current vegetation structural conditions of these islands are likely within the general natural range of variation of past conditions. However, some non-native (exotic) invasive species are found on all islands. Harbor Island was settled and some small-scale farming did occur, but evidence of that is being removed by forest succession. The current overstory vegetation of this forested island is likely representative of past conditions, but invasive earthworms and high browse levels by white-tailed deer have degraded the understory (especially the groundflora and seedling layer, see below). Future developmental trajectories of the forests are unknown and would be a worthy research project. At Huron NWR, West Huron (Lighthouse) Island was a manned station for almost 100 years and many non-native species can be found. Currently, the presence of these non-native plants does not seem to adversely impact *Resources of Concern* nor are they deemed to be invasive. The other islands at Huron NWR are much more pristine even though some pasturing of stock likely occurred in the past. Some of the Michigan Islands were actually used as bombing sites during World War II and many of the herbaceous plants currently comprising the islands are non-native. Gull Island, the most forested of the Michigan Islands NWR, has an unknown forest management past, but it is likely that harvesting of some sort did occur. In all cases, ecosystems have been allowed to develop relatively unaltered for the past 70+ years and these patterns should continue to develop, unabated, in

the future as no evidence can be found that any habitat management will provide more suitable conditions for *Resources of Concern*. Moreover, as stated above, the isolation of these islands from Seney NWR and the mainland makes the feasibility of most habitat management low.

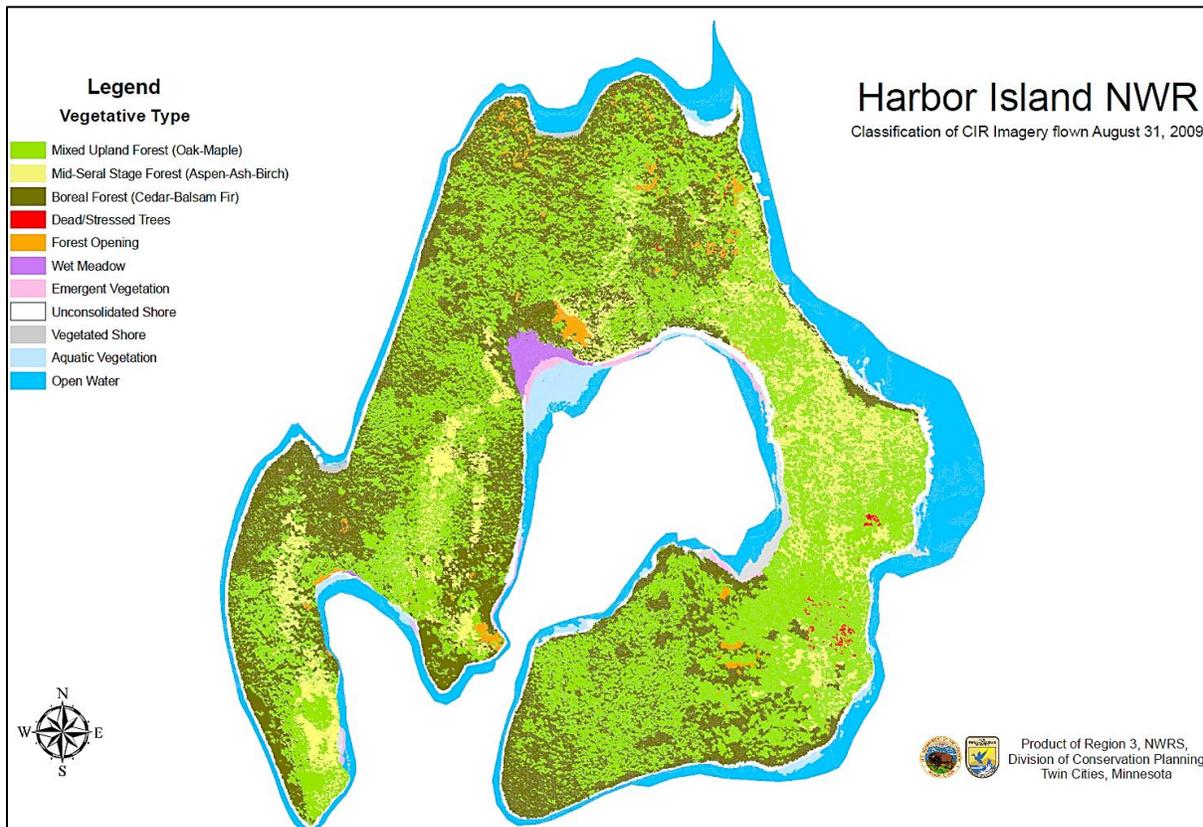
(5) Current habitat types

Harbor Island NWR

Soils on this island consist of shallow organics or sands over dolomite rock. During past observations, 127 species of flora have been observed. Four major vegetative associations are on the island. Areas containing northern white cedar (*Thuja occidentalis (canadensis)*) and balsam fir (*Abies balsamea*) predominate. The next most prevalent community is a mixed upland community containing red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), trembling aspen (*Populus tremuloides*), white ash (*Fraxinus americana*), and paper birch (*Betula papyrifera*). The red oak, in particular, is quite impressive, growing very well in 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. Figure 5 shows the major vegetative associations and is adapted from the unpublished plant community survey by Selzer (2000).

Harbor Island is the only island managed by Seney NWR that has the habitat to support white-tailed deer. A 1978 pre-acquisition survey indicated a year-round deer population and island vegetation was showing the stress imposed by overabundant deer. More recent visual inspection substantiates this prior claim. See Chapter 4 for data from 2014 from which the adverse effects of deer browse can be inferred.

Figure 5. Vegetation of Harbor Island NWR.



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). 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 (*Pinus strobus*), red pine (*P. resinosa*), white spruce (*Picea glauca*), red maple (*Acer rubrum*), aspen (*Populus* spp.), and paper birch. Much of the balsam fir is decadent and contributes to a significant fuel loading. The understory contains cherry species, balsam fir regeneration, Canada yew (*Taxus canadensis*), various woody shrubs, grasses, and forbs. There are a few areas on East Huron (McIntyre) that contain small sphagnum bogs with an occasional black spruce (*Picea mariana*). Only West Huron (Lighthouse), East Huron (McIntyre), Cattle, and Gull Rock Islands have substantial vegetation.

Michigan Islands NWR

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. Forty-seven 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, 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, white cedar, balsam fir, white spruce, and trembling aspen. The groundcover is dominated by Canada yew. 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.

III. Resources of Concern

A. Identification of refuge resources of concern.

No formal analysis of *Resources of Concern* was conducted for the CCP. For the purposes of this document, we took the known list of species present on these islands (see Appendix) and queried multiple published lists of plants and vertebrate animal species of conservation priority (see above list of related conservation plans). Because these islands are relatively small, most wildlife species were excluded for further consideration as the small size of a refuge precluded significant breeding or migratory season value. For instance, although many migratory landbird species might find these islands useful during migration, productivity on these islands is relatively minimal compared to the nearby mainland of the Upper Peninsula. Mammal and herptofauna use of these islands is also minimal, relative to the mainland. Our final *Resources of Concern* list included plant species of conservation priority (Lake Huron tansy at Harbor Island NWR; narrow-leaved reedgrass at Huron NWR) and R3 (Midwest) *Conservation Priority Species*, USFS *Sensitive Species*, and/or species listed on *Michigan Special Animal* list (MDNR) that breed in significant numbers on these islands and were identified in the 2010-2011 *Important Bird Area (IBA)* assessment for Michigan.

Harbor Island NWR

One-hundred-forty-nine species of fauna (16 mammal species, 7 herptofaunal species, and 126 bird species) have been observed (see Appendix for all species binomials). Fourteen R3 *Birds of Concern Species* have been observed on or near Harbor Island NWR: American Bittern, Black-crowned Night-Heron, 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. Although no records of black bear exist in refuge files, this species, too, is thought to use the island. **Because none of the above listed species breeds in significant numbers on the island, no wildlife are considered *Resources of Concern*. Instead, the ecological integrity of the forest ecosystems, as a whole, should be a *Resource of Concern*. Past surveys have also indicated the presence of Lake Huron tansy at Harbor Island NWR and surveys should be conducted in the future to assess the status of this *Resource of Concern*.**

Huron NWR

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 R3 *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). **Because none of the above listed species breeds in significant numbers on the island, no wildlife are considered *Resources of Concern*. Instead, the ecological integrity of the forest ecosystems, as a whole, should be a *Resource of Concern*. No other refuge in R3 has boreal forests. Past surveys have also indicated the presence of narrow-leaved reedgrass at Huron NWR and surveys should be conducted in the future to assess the status of this *Resource of Concern*.**

Michigan Islands NWR

Sixty-nine bird species and two mammal species (deer mouse and snowshoe hare) have been observed at Michigan Islands NWR. Of these 69 bird species, 10 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. Only Caspian Tern and Black-crowned Night-Heron are regular breeders.

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 10 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. ***Resources of Concern* are Caspian Tern, Double-crested Cormorant, Black-crowned Night-Heron, Herring Gull, and Ring-billed Gull.**

B. Potential refuge contribution to the habitat needs of the resources of concern.

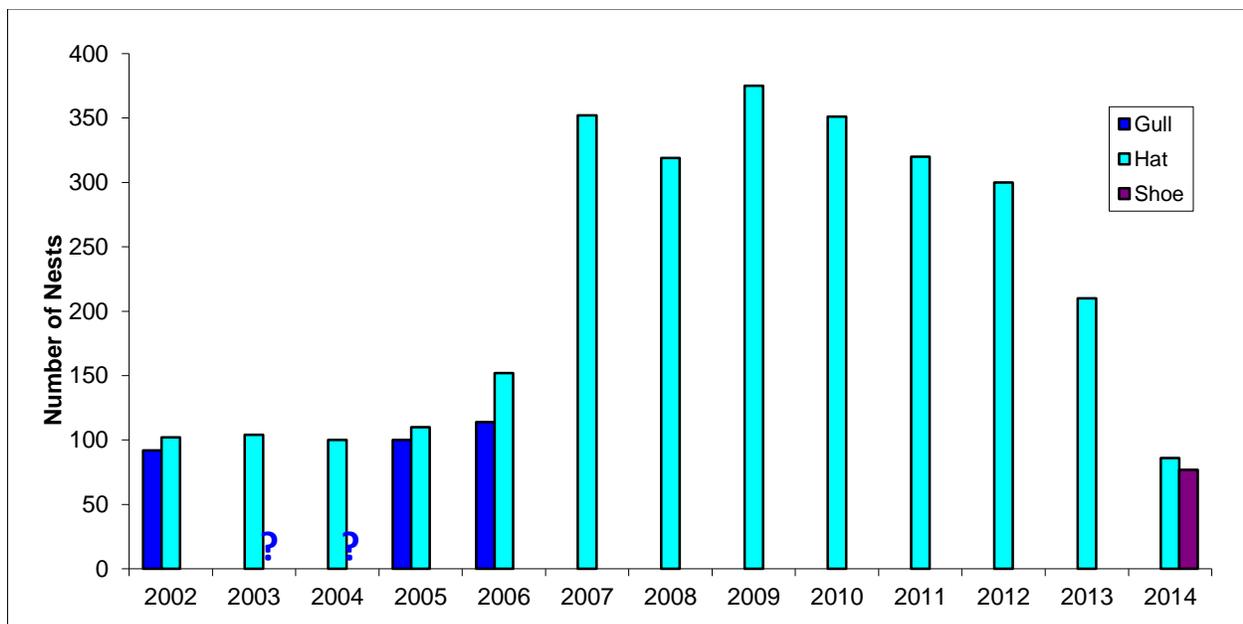
Due to their small size relative to mainland areas that provide similar habitat conditions, neither Harbor Island NWR nor Huron NWR provide significant contributions to wildlife species that would be considered *Resources of Concern*. The current contribution to Lake Huron tansy and narrow-leaved reedgrass is unknown. However, both refuges have forest types not represented on any other refuge in R3 and, as such, the ecological integrity of these forest ecosystems should be a conservation focus.

Michigan Islands NWR

Michigan Islands NWR has exceptional value to colonial nesting waterbird conservation in the Great Lakes Region and specific islands are *Important Bird Areas* as defined by the National Audubon Society. Gull Island was so designated for Black-crowned Night-Heron and Hat Island was so designated for Caspian Tern. 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), Charles L. Cass visited Shoe Island in July 1896 and found nesting Caspian Terns. Caspian Terns have nested on Shoe Island or nearby Hat Island since Cass first visited, 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 (Fig. 6). 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 6. Number of Caspian Tern nests/ breeding pairs at Michigan Islands NWR.



Double-crested Cormorants were first recorded nesting on Gull, Hat and Pismire Islands in 1984, and these sites have been used consistently since (Ludwig, 1984; Table 1). Hat Island has become the most important colony for this species in the archipelago. The peak population in the archipelago was in 1997 (Cuthbert et al., 2003); however, the Michigan Islands NWR supported its largest number of 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 1. Number of Double-crested Cormorant nests/breeding pairs at Michigan Islands NWR.

Year	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
2011	449	2608	142	3199
2012	352	3295	0	3647
2013	Wildlife Service data unk.	2354	0	Unk.
2014	Wildlife Service data unk.	2143	0	Unk.

^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 difficult 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 of 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.

C. Reconciling conflicting habitat needs for resources of concern.

The conflict between the conservation of other, high-priority colonial waterbirds (e.g., Caspian Terns, Black-crowned Night-Herons, Herring Gulls) and the management of Double-crested Cormorant (DCCO) populations is a significant challenge for land managers. The most recent Great Lakes Colonial Waterbird Census estimate for DCCO (Cuthbert and Wires, 2011) was approximately 103,000 pairs in the Great Lakes during 2007-2009. 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 three 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. When DCCO management is proposed for National Wildlife Refuges, the Service also has to assess whether it is an appropriate use and then grant permission if other action agencies handle the management. Because DCCO management activities can negatively affect breeding of other species (e.g., Caspian Tern, Black-crowned Night-Heron, Herring Gull, Ring-billed Gull), all efforts to minimize negative impacts, include exclusion of DCCO management activities from some islands (e.g., Hat Island, Shoe Island), are required.

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.

Environmental Assessments (EAs) were conducted where significant DCCO take has been proposed. In 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. Mary's River.

A 2006 EA established an allowable take of up to 10,500 DCCOs annually in Michigan, which would be ~14% 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 management activity. Michigan accounts for about 40% of the birds killed and 50% of the eggs oiled in the U.S. under the PRDO.

IV. Habitat Goals, Objectives, and Strategies (Desired Future Condition)

The goals of a CCP are to represent broad statements of the desired future conditions for a given Refuge. The CCP objectives are to be developed as concise ideas that specify what needs to be achieved, how much needs to be achieved, when and where it needs to be achieved, and who is responsible for the work. Goals and objectives provide a framework for Refuge management over a 15-year timeframe. The CCP goals and objectives for these islands were developed in 2013. The development of this HMP and its associated Inventory and Monitoring Plan satisfies the need outlined in the CCP to provide "specific management recommendations to maintain..." the Refuge's various habitats.

During initial development of this HMP, the planning team reviewed the CCP goals and objectives to determine if they were still representative of existing Refuge conditions, current Service policies, and desired future management. The CCP states that its goals were intentionally broad, descriptive statements of purpose. The goals highlight elements of the vision statement that emphasize future refuge management. After detailed review and discussion, the planning team determined that it was necessary to provide more detail objectives under the Ecosystem, Habitat, and Wildlife Goals. HMP policy allows for revision of CCP objectives and strategies, and the planning team believes that by adding detail to these objectives, management of the Refuge's natural resources will be clear, concise, and realistic with regard to available staffing and budgets.

The USFWS requires habitat objectives be developed using the SMART criteria, specifically that objectives be Specific, Measurable, Achievable, Result-oriented, and Time-fixed. In preparation of this HMP, the planning team identified objectives needing refinement in order to meet the requirements of SMART criteria. Rationales are provided for each habitat objective in order to summarize the scientific information, expert opinion, and professional judgment used to formulate each objective.

The planning team reviewed the Service's Writing Goals and Objectives Handbook and its guidance on hierarchical relationships of Refuge goals and objectives to other aspects of the planning process. The CCP discusses all five NWR's collectively as one entity, but also provides some individual detail for specific units. The objectives, including those revised for this document, provide the needed specificity for the units managed by Seney NWR and bring the objectives into compliance with policy.

The *general* preferred alternative listed in the CCP for these islands (as a group) was:

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

Objective — No habitat objectives were listed in the CCP. The general approach to conservation is therefore “coarse-filtered” (Hunter, 2005); in other words, setting these lands aside from most manipulative activities meets the conservation needs of *Resources of Concern*. No extensive or intensive manipulative activities should occur on these lands.

The following *more specific* management goals and objectives and rationale (based on the identified *Resources of Concern* discussed above) were compiled for this HMP. Some of them are common to all NWRS units each (Harbor Island NWR, Huron NWR, and Michigan Islands NWR (Gull, Hat, Shoe, and Pismire Islands) and some are specific to a given refuge.

Harbor Island NWR

Ecosystem Goal

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

Ecosystem Objective 1: Maintain and Evaluate de-facto Wilderness Characteristics Yearly

By 2018, prepare a 1-page trip inspection and evaluation form to be used on all visits. This form will allow for a rapid evaluation of all issues considered to be goals and objectives in this HMP on a refuge-specific basis. For Harbor Island NWR, this document would include (but not be limited to) current status of *Phragmites* and any new invasive plants observed (cooperation with area Cooperative Weed Management Areas will be helpful); condition of Refuge signs; evidence of camping or other illegal activities; etc.

Rationale

Because this island refuge is far removed from Seney NWR and active land management is cost-prohibitive (or logistically too difficult) and unwarranted as it is unlikely to produce vegetation features that are more representative of historic conditions or promote *Resources of Concern*, passive management (*de facto* Wilderness management) is the preferred approach with limited invasive plant management allowed (see below).

Ecosystem Objective 2: Evaluate and Monitor Forest Ecosystems

Forest ecosystem integrity is often characterized by the presence of certain forest structure or composition and/or the occurrences of certain ecological processes (e.g., regeneration of representative species). To provide some insight into such patterns and processes, a rapid ecological assessment of Harbor Island NWR forests was conducted in 2014 (Weiss and Corace, 2014). By 2024, revisit these 28 plots and conduct a second assessment. Improvement to ecological integrity will be measured by 100-fold increase in densities of maple seedlings at each plot in which red or sugar maple is present in the overstory.

Rationale

See Weiss and Corace (2014) for more details on methods. Across the 28 plots sampled, 13 tree species were observed. The dominant tree species according to both trees per acre and basal area per acre (ft²/ac) was northern white-cedar. Transect B was the only transect not to be dominated by northern white-cedar, and was instead dominated by sugar maple (Table 2). The mean trees per acre across all transects was 173.5 (±105.1), with Transect A having the greatest number of trees per acre. Mean live tree basal area was 130.4 (±101.6) ft²/ac. Transect A also had the highest percent closed canopy. The overall average live tree diameter was 10.6 (±5.0) in, with the majority of trees sampled falling into the 5-6.9 in size class (Table 2, Fig. 7).

Table 2. Composition summary of overstory trees sampled.

Transect	Number of plots	Number of species	Mean (±SD) number of species per plot	Dominant species (greatest number of trees per acre)	Dominant species (greatest basal area, ft ² /ac)
A	10	7	2.2 ± 1.0	Northern white-cedar	Northern white-cedar
B	12	9	2.2 ± 1.0	Sugar maple	Sugar maple
C	6	7	2.2 ± 1.2	Northern white-cedar	Northern white-cedar
Overall	28	13	2.2 ± 1.0	Northern white-cedar	Northern white-cedar

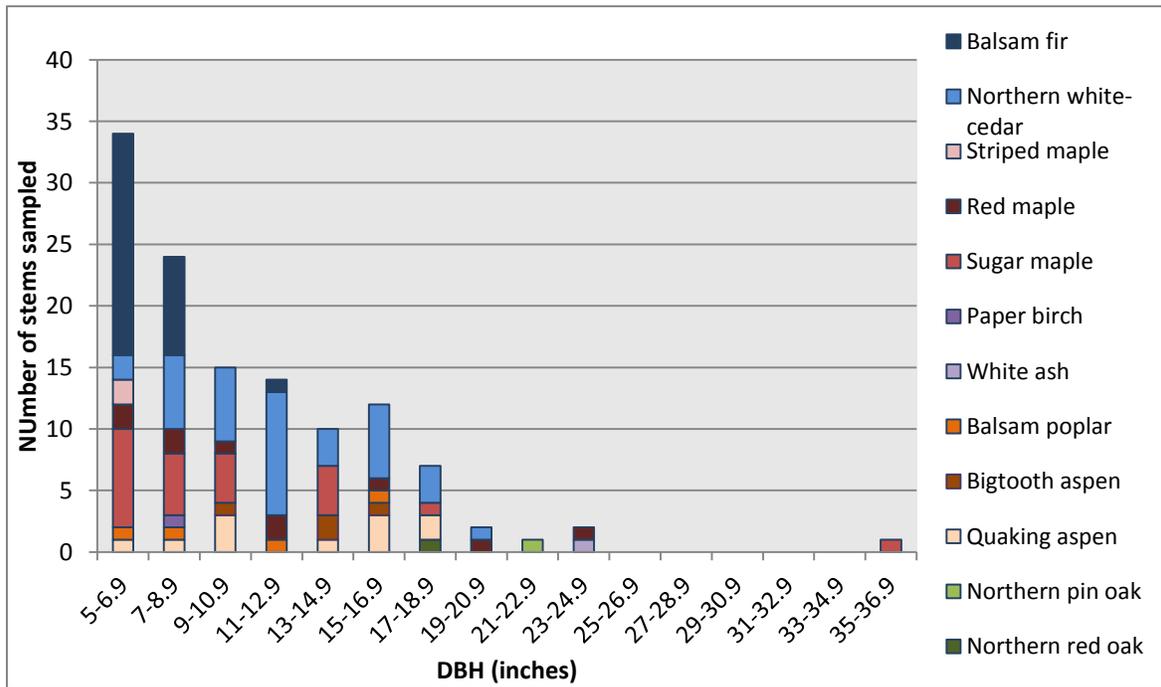


Figure 7. Size classes for live tree species observed according to diameter at breast height (dbh).

No saplings were present in 32% (9/28) of plot quarters sampled. The average number of saplings per acre was 420 (± 513.7 , range: 0-2560). By species, balsam fir was the only species to be present as saplings for all three transects (Fig. 8). Groundcover was dominated by lichen, moss and/or bare ground (83%); very few seedlings were present overall or at any given plot (Table 3).

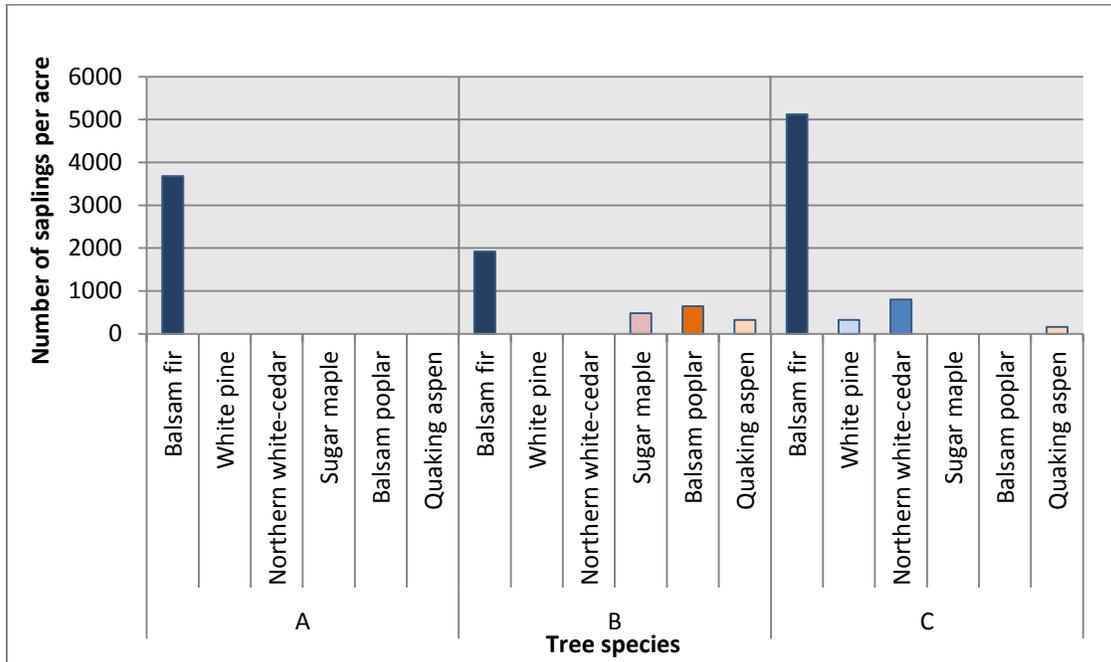


Figure 8. Numbers of saplings per acre for species observed along each transect.

Table 3. Average percent cover of woody plants, herbaceous plants and lichen/moss/bare ground.

Transect	Average Woody Cover (%)	Average Herbaceous Cover (%)	Average Lichen/Moss/Bare Ground Cover (%)
A	5	20.45	78.4
B	7	24.3	83.1
C	6.4	10.25	88
Overall	6.2	19.9	82.5

The overstory of Harbor Island NWR is heterogeneous. Forest cover shifts from lowland conifers to mixed upland forests as topography changes. Many of the trees are growing on rocky soils. Site potential—based on soils—for existing tree species is good, but the future of this forest is uncertain due to the potential adverse effects of climate change, non-native pathogens, and browse. For instance, our findings suggest that browse by white-tailed deer is—and has been for some time—a significant factor affecting forests at Harbor Island NWR. Very few saplings of any tree species commonly browsed by deer (e.g., sugar or red maple, northern red oak, etc.) are to be found. Balsam fir (a species not browsed upon unless deer are in starvation mode) comprises the majority of the midstory and groundcover or seedling layer, even though many other coniferous and deciduous species comprise the overstory (sugar maple is dominant and not present in midstory or groundcover even though it is highly shade-tolerant). Past observations of non-native earthworms (*Corace pers. obs.*) may indicate that browse and the effects of earthworms are working together to alter these forests. Finally, the forests on Harbor Island NWR are being adversely affected by the insect-fungi complex referred to as

beech bark disease as well as the non-native insect, emerald ash borer (*Agrilus planipennis*). These species are causing overstory mortality and canopy gaps.

Habitat Goals

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

Habitat Objective 1: Exotic and Invasive Species

Make yearly inspections of *Phragmites* and treat new invasions of the non-native phenotype when they occur (see Seney NWR HMP for invasive plant management guidance). Work with Cooperative Weed Management Areas to perform early detection, rapid response (EDRR) as was done in 2014.

Rationale

No inventories of invasive plants were conducted on the Great Lakes islands refuges for the CCP. However, island ecosystems are extremely vulnerable to harm caused by natural or intentional introduction of non-native plants. Non-native phenotype of *Phragmites australis* has recently colonized Harbor Island NWR. Twenty-eight stands of *Phragmites* were mapped along the periphery of the Refuge in 2003 (Fig. 9). Samples were collected and sent to Dr. B. Blossey at Cornell Univ. for phenotypic identification. All samples were identified as the native genotype by Dr. Blossey on 27 August 2003. However, by 2012 the non-native phenotype had invaded the island and now warrants management. In 2014, staff at Seney NWR worked with the Upper Peninsula Resource Conservation and Development Council to treat a 0.15 ac stand during early September. Treatments were done using backpack sprayers and 2.5% a.i. glyphosate (*Rodeo*, the approved formulation for wetland use).

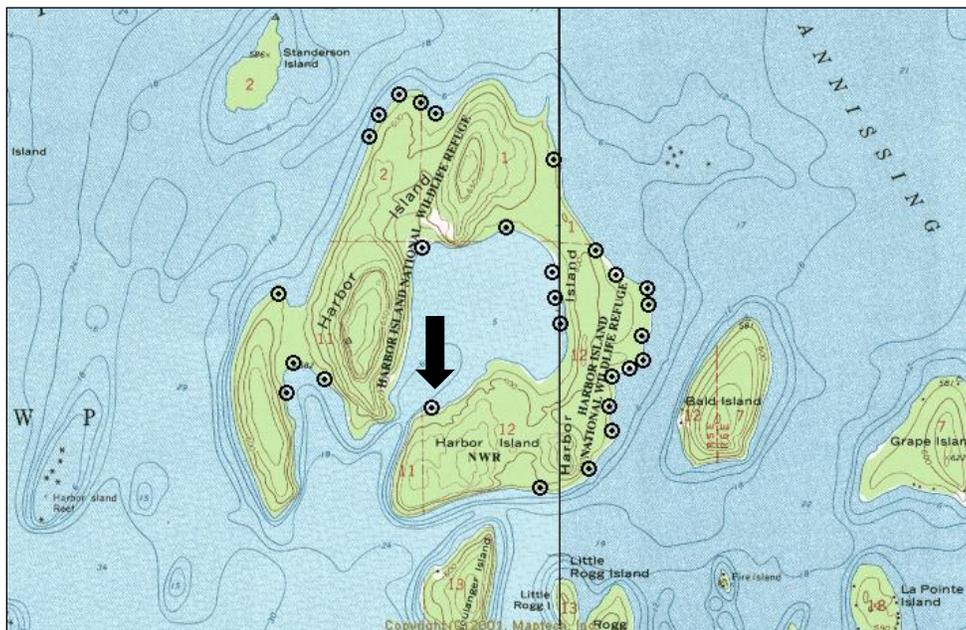


Figure 9. Approximate locations of native *Phragmites* stands at Harbor Island NWR (~2003). One non-native stand (located at arrow) was treated in 2014. Note the close proximity of nearby islands that are privately-owned and on which white-tailed deer are supplementally fed. Deer move among these islands easily.

Wildlife Goal

Protect, restore and maintain a natural diversity of fish and wildlife native to the Great Lakes.

Wildlife Objective 1: Liberalize Hunting of White-tailed Deer

By 2018, work with the State and other cooperators to liberalize legal hunting by allowing antlerless hunting by permit during established State hunting seasons.

Rationale

Prior to inclusion in the NWRS, the ecological inventory by Scharf and Chamberlin (1978) indicated that deer browse was adversely impacting forest ecosystems of Harbor Island. Because even small populations of white-tailed deer can cause adverse effects to forest composition and structure in ecosystems that developed with relatively few deer (as did most ecosystems of the Upper Peninsula of Michigan during pre-European times), Seney NWR staff installed 6 deer exclosures in 1997 to quantify the effects of browse. Sampling occurred until 2003 when the exclosures were removed. These exclosures were designed to allow lagomorphs access, but not deer. However, the rocky soil made construction difficult and posts could not be driven into the earth well. Consequently, the exclosures did not always exclude deer. On one occasion, a fawn was actually found in the exclosure! More recently, sampling by Seney NWR staff in 2012 verified the presence of *Lumbricus* earthworms at each plot sampled at Harbor Island NWR. This finding is noteworthy because the impacts of non-native earthworms have been shown to exacerbate the effects of deer browse and produce forest understory conditions as are found on the island (i.e., a bed of *Carex* with little to no regeneration of tree species or other herbaceous plants, see above). Together, this information suggests that the forests at Harbor Island NWR (used by many native forest birds) are under multiple threats. Little can be done about earthworms or other pathogens impacting these ecosystems (e.g., beech bark disease, Emerald ash borer), but liberalizing legal hunting of deer would be a cost-effective method at potentially reducing browse pressure on the island while encouraging a wildlife-dependent recreational activity.

Wildlife Objective 2: Inventory and Monitoring

See above Ecosystem Objective. By 2018, implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of Lake Huron tansy.

Rationale

Forest ecosystems and Lake Huron tansy are the identified *Resources of Concern* for Harbor Island NWR. Inventory and monitoring of forest ecosystems is discussed above. Currently Seney NWR is without any data regarding the distribution or abundance of Lake Huron tansy at Harbor Island NWR. Lake Huron tansy is a threatened plant of the coastal dunes, occurring on the northern shores of Lakes Michigan and Huron and the Lake Superior shoreline. This large headed tansy, which also occurs in northeastern North America, has lacy, hairy leaves and bright yellow, virtually rayless flower heads that emerge in mid to late summer. Like the common garden tansy, which can be distinguished by its much smaller flower heads and non-hairy leaves, all parts of the plant have a very characteristic pungent odor when crushed.

Wildlife Objective 3: Applied Research

Promote applied research aimed at answering wildlife-, habitat-, community-, and ecosystem-based questions without compromising wildlife, visitor, and other values. As the need arises, implement research to answer questions about *Resources of Concern* (e.g., forest ecosystems and Lake Huron tansy).

Rationale

The islands have served as research sites for past studies. These studies contribute valuable information about the overall biota. Currently, no research projects are being conducted. Research related to developing successional trajectories of forest ecosystems should be a priority.

Huron NWR

Ecosystem Goal

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

Ecosystem Objective 1: Maintain and Evaluate Wilderness Characteristics Yearly

By 2018, prepare a 1-page trip inspection and evaluation form to be used on all visits. This form will allow for a rapid evaluation of all issues considered to be goals and objectives in this HMP and the Wilderness measures specific for this refuge (see below). For Huron NWR other items would include (but not be limited to) any new invasive plants observed (cooperation with area Cooperative Weed Management Areas will be helpful); human conflict issues (e.g., are proper posting in place on islands); etc.

Rationale

A Report on Wilderness Character Monitoring drafted for Huron Islands Wilderness listed the following measures: 1) untrammled quality; 2) undeveloped quality; and 3) solitude or primitive and unconfined recreation quality.

Ecosystem Objective 2: Evaluate and Monitor Forest Ecosystems

By 2018, conduct rapid ecological assessment of forest ecosystems.

Rationale

The ecological integrity of the forest ecosystems at Huron NWR is considered to be high as no alterations have occurred in nearly 100 years and the few exotic plant species are not known to be altering system patterns or processes. Moreover, no white-tailed deer are found on these islands and browse is not an issue. It is unknown if non-native earthworms are to be found. Nonetheless, no other refuge in R3 has boreal forests and these forests could change under climate change scenarios. Baseline data on the dominant ecosystem type found on Huron NWR would be useful for quantifying potential effects/change. Methods may follow those of Weiss and Corace (2014) for Harbor Island NWR.

Habitat Goal

No Habitat Goals or Objectives specific to Huron Island NWR were identified in the CCP. Non-native (exotic) plant species were purposely brought to these islands, but do not seem to be adversely impacting *Resources of Concern*. The probability of accidental introductions by visitors does not warrant consideration here. Nonetheless, Seney NWR staff should continue to work with Cooperative Weed Management Area colleagues for early detection, rapid response consideration (EDRR).

Wildlife Goal

Protect, restore and maintain a natural diversity of fish and wildlife native to the Great Lakes, with an emphasis on the identified *Resource of Concern*: narrow-leaved reedgrass.

Wildlife Objective 1: Inventory and Monitoring

By 2018, implement a monitoring program to track the presence, abundance, population trends, and/or habitat associations of narrow-leaved reedgrass.

Rationale

Forest ecosystems and narrow-leaved reedgrass are the identified *Resources of Concern* for Huron NWR. Inventory and monitoring of forest ecosystems is discussed above. Currently, Seney NWR is without any data regarding the distribution or abundance of narrow-leaved reedgrass at Huron NWR. This species is known from several sites on cliffs along the north shore of Lake Superior, as well as farther southeast in Ontario, and may be found on rock ledges on Lake Superior.

Wildlife Objective 2: Applied Research

Promote applied research aimed at answering wildlife-, habitat-, community-, and ecosystem-based questions without compromising wildlife, visitor, and Wilderness values. As the need arises, implement research to answer questions about *Resources of Concern* (e.g., forest ecosystems and narrow-leaved reedgrass).

Rationale

The islands have served as research sites for past studies. These studies contribute valuable information about the overall biota. Currently, no studies are being conducted. Forest ecosystem studies should be prioritized.

Michigan Islands NWR (Seney NWR Administrative Units: Gull, Hat, Shoe, and Pismire Islands)

Ecosystem Goal

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

Ecosystem Objective 1: Maintain and Evaluate Wilderness Characteristics Yearly

By 2018, prepare a 1-page trip inspection and evaluation form to be used on all visits. This form will allow for a rapid evaluation of all issues considered to be goals and objectives in this HMP and the Wilderness measures specific for this refuge (see below). For Michigan Islands NWR, other items on this document would include (but not be limited to) new invasive plants observed (cooperation with Cooperative Weed Management Areas will be helpful); human conflict issues (e.g., are proper posting in place on islands); etc.

Rationale

During 2012, *A Report on Wilderness Character Monitoring* was drafted for Michigan Islands Wilderness. Selected measures for Michigan Islands Wilderness were 1) untrammelled quality; 2) natural quality, and 3) undeveloped quality.

Habitat Goal

No Habitat Goals or Objectives specific to Michigan Islands NWR were identified in the CCP. Exotic and invasive plant species do not seem to adversely affect *Resources of Concern* and it is unlikely that any practical management is possible. Nonetheless, refuge staff should continue to work with Cooperative Weed Management Area colleagues for early detection, rapid response consideration (EDRR).

Wildlife Goal

Protect, restore, and maintain a natural diversity of fish and wildlife native to the Great Lakes, with an emphasis on identified *Resources of Concern*: Caspian Tern, Double-crested Cormorant, Black-crowned Night-Heron, Herring Gull, and Ring-billed Gull.

Wildlife Objective 1: Protect Waterbird Colonies

Limit any human disturbance (other than research and monitoring) on islands that currently have Caspian Terns (Hat Island and Shoe Island). Re-evaluate access to Shoe Island in three (3) years. Currently, DCCO management should only occur at Gull and Pismire Islands in Michigan Islands NWR. Management of Double-crested Cormorants at Gull Island should be done in such a way so as to minimize any impact to nesting Black-crowned Night-Herons, Herring Gulls, and Ring-billed Gulls. Work with the State, the Department of Agriculture-Wildlife Services, and others to minimize any adverse effects of DCCO management on other species on refuge land.

Rationale

Colonial waterbirds are extremely sensitive to human disturbance. Disturbance during the pre-nesting and nest-building phases can cause birds to abandon islands 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 and heat stress, which can kill eggs and chicks in a matter of minutes on a hot day.

Double-crested Cormorant management (DCCO, see above) poses a challenge to the protection of other colonial waterbirds. Disturbance by DCCO management can have negative effects on other species. Refuge islands managed by Seney NWR where DCCO management has occurred include:

- Gull Island;
- Pismire Island; and
- Hat Island.

Currently, management is allowed at Gull Island and Pismire Island. Pismire Island is so low-lying that cormorant use has been minimal and thus management has been minimal. During high water years, the island is mostly submerged. In 2014, Caspian Terns bred on Shoe Island and it should remain closed to access for cormorant control for the next three (3) years—at minimum—to encourage continued tern nesting. As with Hat Island, DCCO management may occur offshore as long as it does not disturb nesting birds.

Wildlife Objective 2: Inventory and Monitoring

By 2018, formalize a monitoring program to track the presence, abundance, population trends, and/or habitat associations of *Resources of Concern*: Caspian Tern, Double-crested Cormorant, Black-crowned Night-Heron, Herring Gull, and Ring-billed Gulls. As the need arises, implement research to answer questions that have been raised regarding the management of resources and other issues.

Rationale

The current long-term monitoring of *Resources of Concern* should be formalized in the Inventory and Monitoring Plan.

Wildlife Objective 3: Applied Research

Continue to promote applied research aimed at answering wildlife-, habitat-, community-, and ecosystem-based questions without compromising wildlife, visitor, and wilderness values. As the need arises, implement research to answer questions about *Resources of Concern* (e.g., Caspian Tern, Double-crested Cormorant, Black-crowned Night-Heron, Herring Gull, and Ring-billed Gull).

Rationale

Long-term research on colonial waterbird population dynamics is being conducted under a Special Use Permit by Dr. Nancy Seefelt (Central Michigan University). These studies contribute valuable information about colonial waterbirds and are integrated into inventory and monitoring. These islands also offer rare opportunities to study the changes that are occurring on the landscape with minimal human intrusion.

Table 4 summarizes the objective amendments from the CCP to the HMP. Section 4.2 lists goals and objectives as used in the HMP and a rationale for their inclusion as management directives.

Table 4. Revision and reorganization of the CCP goals and objectives per the above objectives in this plan.

CCP Objective	Change between CCP and HMP	HMP Objective	Rationale
Ecosystem Goal			
Climate Change	Updated to meet SMART criteria and make specific to Harbor Island NWR, Huron NWR, and Gull, Hat, Shoe, and Pismire Islands of Michigan Islands NWR.	Island populations and habitats under climate change, with emphasis on <u>forest ecosystems</u> of Huron NWR and Harbor Island NWR.	Original CCP objective was overly broad and not specific enough for management activities at the Unit level. Secretarial order 3226 requires that climate change impacts be considered and analyzed when planning or decision making. Forest baseline assessment (ecological assessments) as described in HMP provides foundation for some climate change impact evaluations.
Wilderness	Added to HMP to meet <i>Wilderness Act</i> requirements for Harbor Island NWR (<i>de facto</i>), Huron NWR, and Gull, Hat, Shoe, and Pismire Islands of Michigan Islands NWR	Evaluate Wilderness characteristics.	Original CCP objective did not exist, but <i>Wilderness Act</i> requires.
Land Acquisition	None	Not addressed	-
Wildlife Goal			
Inventory and Monitoring	Same, but updated to meet SMART criteria and make specific to Harbor Island NWR, Huron NWR, and Gull, Hat, Shoe, and Pismire Islands of Michigan Islands NWR.	-	Original CCP objective did not exist, but need section to link to required Inventory and Monitoring Plan (in draft).

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

Applied Research	Same, but updated to meet SMART criteria and make specific to Harbor Island NWR, Huron NWR, and Gull, Hat, Shoe, and Pismire Islands of Michigan Islands NWR.	-	On some Units, applied research is now occurring. On others, it is not. Promote applied research as needed to address issues/topics in the HMP.
Protect Waterbird Colonies	Same, but updated to meet SMART criteria and make specific to Gull, Hat, Shoe, and Pismire Islands of Michigan Islands NWR.	-	These islands are the only ones managed by Seney NWR that have ongoing Double-crested Cormorant management activities.
None	Added to HMP.	Liberalize hunting of white-tailed deer (Harbor Island NWR)	See details in HMP. Only Harbor Island NWR has white-tailed deer and its forest ecosystems are being impacted by high browse levels.
Habitat Goal			
None	Added to HMP.	Exotic and invasive species.	Only island that justifies actions now is Harbor Island NWR (<i>Phragmites</i>). Added SMART criteria.

V. Management Strategy Constraints

A. Staffing and safety.

All island refuges are unstaffed and habitat management, inventorying and monitoring, and applied research are done under the leadership of Seney NWR staff. **The closest island is three hours (under perfect conditions) from Seney NWR. Consideration of safety issues in the open waters of the Great Lakes precludes visitation during any time other than periods with low winds and waves (<3 ft). Hypothermia is possible nearly every month of the year.** Therefore, severe limitations exist in what can practically be done on these lands.

B. Climate change.

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% 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 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% 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.

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%. The resulting decreases in average lake levels will be from ½ to 2 meters, depending on the GCM used.

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. For instance, climate change has the likelihood of causing significant mortality to boreal forests found on Huron NWR. Non-native species of plants and wildlife will pioneer onto some islands, due to climate change. 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.

C. Contaminants and altered food chains.

Wildlife managers inherently talk about habitat as a factor that limits populations or communities. While often true, many examples exist of other activities that adversely affect populations or communities; the NWRS was established because the widespread slaughter of birds, not because habitat was limiting. Conservation of *Resources of Concern* on islands managed by Seney NWR provides another example as contaminants in the Great Lakes have long been shown to affect many wildlife species herein discussed, including Double-crested Cormorants and Caspian Terns (Ludwig, 2013). These contaminants still pose a threat to many species in the Great Lakes. Similarly, the introduction of invasive fish has changed the food chains in the Great Lakes (Ludwig, 2013). Neither of these, however, are factors that staff of Seney NWR can manage; the USFWS as an agency, overall, may be able to address these issues, but not field staff.

VI. Management Strategy Impacts, Prescriptions, etc.

A. Impacts to the resources of concern associated with the implementation of the proposed habitat management strategies.

Other than invasive species at Harbor Island NWR, no active management of the vegetation (habitat) is currently proposed; it is not believed that active management of vegetation or other factors that together comprise “habitat” is either feasible or critical for the maintenance of *Resources of Concern* on these refuges. Instead, these islands will be managed as Wilderness Areas or *de facto* Wilderness Areas. If management of invasive plants is done on other islands, the following should be considered: a *Minimum Tool Analysis* should be conducted and no work should be done on any Michigan Islands NWR island that would adversely disturb nesting colonial waterbirds, especially at Hat Island. Invasive plant management could be done late in the season, after fledging or prior to nest initiation.

B. Management strategy prescriptions (timing, frequency, severity, etc.).

Invasive Plant Management (Harbor Island NWR)

Triggers – Population thresholds for *Phragmites* management at Harbor Island NWR have already been met through past surveys and interactions with regional colleagues (i.e., presence of any stems of the non-native phenotype is the threshold).

Frequency – Stands should be treated with an approved, glyphosate-based herbicide during late summer/early fall as was done in 2014. Other herbicides at other concentrations could be used as warranted. Details of all invasive plant management are found in the Seney NWR HMP (2013).

Severity – N/A

Management of White-tailed Deer (Harbor Island NWR)

Triggers – The existence of deer on the island for management has already been met through past surveys (see above). As stated above, until a 100-fold increase in regeneration of maple species is observed in plots inventoried in 2014, white-tailed deer hunting should be liberalized as much as possible.

Frequency – Proposed management is for yearly liberalizing of deer hunting per State guidelines (i.e., to make antlerless hunting allowable on a yearly basis during State seasons).

Severity – N/A

C. Management strategy documents.

(1) Necessary resources — All proposed activities require primarily staff time (labor) and that is the major limitation to inventory, monitoring, and management. Staff should make annual trips to all islands, with trips to Michigan Island NWR planned for June to observe colonial waterbirds and other trips as needed (management of *Phragmites* usually occurs late summer/early fall). A permanent, seasonal technician would be of great benefit in conducting inventory, monitoring, and treatments listed above.

(2) Documentation of special uses — Compatibility Determinations (CDs) were done for the CCP.

(3) Documentation of compliance — This document is a step-down to the CCP and its associated regulatory documents (e.g., NEPA). A categorical exclusion for the proposed actions is employed.

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Appendix: Species Lists

Plant Species of Harbor Island NWR

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*

Equisetum scirpoides

Dwarf Scouring Rush; Dwarf Horsetail

LYCOPODIACEAE

CLUBMOSS FAMILY

Lycopodium

Lycopodium tristachyum

Ground Pine; Ground Cedar

OPHIOGLOSSACEAE

ADDER'S-TONGUE FAMILY

Botrychium

Botrychium virginianum

Rattlesnake Fern

POLYPODIACEAE

TRUE FERN OR FERN FAMILY

Dryopteris

Dryopteris disjuncta

Gymnocarpium dryopteris

Dryopteris phegopteris

Dryopteris spinulosa

Dryopteris spinulosa var. intermedia

see *Gymnocarpium dryopteris*

Oak Fern

Beech fern

Spinulose Woodfern

(variety of the above)

Pteridium

Pteridium aquilinum

Bracken Fern

GYMNOSPERMAE

GYMNOSPERMS

PINACEAE

PINE FAMILY

Larix

Larix laricina

Larch; Tamarack

Pinus

Pinus strobus

Pinus resinosa

White Pine

Red Pine

Abies

Abies balsamea

Balsam Fir

Tsuga

Tsuga canadensis

Hemlock

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

ARUM FAMILY

Acorus

Acorus calamus

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

MYRICACEAE

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

ELM FAMILY

American or White Elm

Ulmus thomasi
POLYGONACEAE
Rumex

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

Rock Elm
SMARTWEED FAMILY

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

Toxicodendron

Toxicodendron radicans

Poison-ivy

Rhus

Rhus typhina

Staghorn Sumac

CELASTRACEAE

Celastrus

Celastrus scandens

BITTERSWEET FAMILY

Bittersweet

ACERACEAE

Acer

Acer saccharum

Acer rubrum

Acer pensylvanicum

MAPLE FAMILY

Sugar Maple or Hard Maple

Red Maple

Striped Maple

VITACEAE

Vitis

Vitis riparia

GRAPE FAMILY

Wild Grape

GUTTIFERAE (CLUSIACEAE)

Hypericum

Hypericum perforatum

ST. JOHNSWORT FAMILY

Common St. Johnswort

VIOLACEAE

Viola

Viola conspersa

Viola pallens

(see *V. macloskeyi*)

Viola pubescens

Viola incognita

VIOLET FAMILY

Dog Violet

Smooth White Violet

Downy Yellow Violet

Large Leaf Violet

ELAEAGNACEAE

Shepherdia

Shepherdia canadensis

OLEASTER FAMILY

Buffalo Berry

ONAGRACEAE

Oenothera

Oenothera biennis

EVENING-PRIMROSE FAMILY

UMBELLIFERAE (APIACEAE)

Osmorhiza

Osmorhiza claytonii

CARROT OR PARSLEY FAMILY

Sweet-cicely

Sweet-cicely

Cicuta

Cicuta bulbifera

CORNACEAE

Cornus

Cornus canadensis

DOGWOOD FAMILY

Bunchberry; Dwarf Cornel

OLEACEAE

Fraxinus

Fraxinus nigra

Fraxinus americana

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

OLIVE FAMILY

Black Ash

White Ash

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

Linnea

Linnea borealis

Twin Flower

CAMPANULACEAE

Lobelia

Lobelia siphilitica

Lobelia kalmii

Lobelia spicata

BELLFLOWER FAMILY

Great Blue Lobelia

Brook Lobelia

Pale Spike Lobelia

COMPOSITAE (ASTERACEAE)

Tragopogon

Tragopogon dubius

(*T. major* included in above)

ASTER OR DAISY FAMILY

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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

Cirsium vulgare
Cirsium arvense

Bull Thistle
Canada or Field Thistle

Anaphalis

Anaphalis margaritacea

Pearly Everlasting

Heliopsis

Heliopsis helianthoides

Ox Eye Daisy

Taraxacum

Taraxacum erythrospermum
Taraxacum officinale

Red Seeded Dandelion
Common Dandelion

OTHER TAXA

Streptopus roseus
Scrophularia lanceolata
Gerardia paupercula
Urtica dioica
Pilea fontana
Cynoglossum officinale
Conopholis americana

Rosty Twisted-Stalk
Figwort
Purple Gerardia
Common Nettle

Hounds Tongue
Squaw Root

Mammals of Harbor Island NWR

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 NWR

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. Harding (Michigan State University)

Bird Species of Harbor Island NWR

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 migrant 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 or Migrant	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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

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 solitaries</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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

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	<i>Agelaius phoeniceus</i>	x				OWE

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

Blackbird						
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
^a Habitat 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						

Ferns and Gymnosperm Species of Huron NWR

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 GYMNOSPERMS

PINACEAE PINE FAMILY

Pinus

1. *Pinus strobus*
2. *Pinus resinosa*

Pine

White Pine

Red Pine

Abies

1. *Abies balsamea*

Fir

Balsam Fir

Picea

1. *Picea mariana*
2. *Picea glauca*

Spruce

Black Spruce

White Spruce

TAXACEA

Taxus

- Taxus canadensis*

Canada Yew

CUPRESSACEAE

1. Thuja

1. *Thuja occidentalis*

Arbor Vitae; White Cedar

2. Juniperus

1. *Juniperus communis*
- Juniperus horizontalis*

Juniper

Ground Juniper

Creeping Juniper

Plants of Huron NWR

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

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

JUNCEAE

Juncus

- 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

RUSH FAMILY

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

Polygonum Polygonum cilinode Polygonum hydropiperoides	Smartweed; Knotweed Fringed False Buckwheat Mild Water-pepper
CARYOPHYLLACEAE Cerastium Cerastium fontanum Dianthus Dianthus barbatus	PINK FAMILY Chickweed Mouse-ear Chickweed Pink Maiden Pink
RANUNCULACEAE Aquilegia Aquilegia canadensis Thalictrum Thalictrum dasycarpum Actaea Actaea rubra Coptis Coptis trifolia Ranunculus Ranunculus acris Ranunculus hispidus	BUTTERCUP FAMILY Columbine Wild Columbine Meadow-rue Purple Meadow-rue Baneberry Red Baneberry Goldthread Buttercup; Crowfoot Tall or Common Buttercup Bristly Buttercup
FUMARIACEAE Corydalis Corydalis sempervirens	FUMITORY FAMILY Rock Harlequin
CRUCIFERAE (BRASSICACEAE) Arabis Arabis lyrata	MUSTARD FAMILY Lyrate Rockcress
DROSERACEAE Drosera Drosera rotundifolia	SUNDEW FAMILY Sundew Round-leaved Sundew
CRASSULACEAE Sedum	ORPINE FAMILY Stonecrop; Sedum; Orpine
SAXIFRAGACEAE *GROSSULARIACEAE (Often included in the Saxifragaceae) Ribes Ribes glandulosum	SAXIFRAGE FAMILY GOOSEBERRY FAMILY Currant; Gooseberry Skunk Currant
82. ROSACEAE Agrimonia Agrimonia striata Rubus Rubus strigosus(-idaeus) Rubus canadensis	ROSE FAMILY Roadside Agrimony Bramble; Raspberries; Dewberries; Blackberries Wild Red Raspberry

Rubus parviflorus	Thimbleberry
Rosa	
Rosa acicularis	Wild Rose
Sorbus	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

Hypericum punctatum

St. Johnswort

VIOLACEAE

Viola

Viola spp.

VIOLET FAMILY

Violet

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; Kinnikinick

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

SNAPDRAGON FAMILY

Mullien

Mullien; Flannel Plant

Speedwell; Brooklime

Veronica serpyllifolia	
Melampyrum	
Melampyrum lineare	Narrowleaf Cowwheat
RUBIACEAE	MADDER FAMILY
Galium	Bedstraw
Galium triflorum	
Galium asprellum	
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY
Symphoricarpos	Snowberry
Symphoricarpos albus	Snowberry
Lonicera	Honeysuckle
Lonicera dioica	Glaucous Honeysuckle
Sambucus	Elderberry
Sambucus racemosa	Red-berried Elder; Red Elderberry
Linnaea	
Linnaea borealis	Twinflower
Diervilla	
Diervilla lonicera	Bush-honeysuckle
CAMPANULACEAE	BELLFLOWER FAMILY
Campanula	Bellflower
Campanula rotundifolia	Bluebell Bellflower
Campanula rapunculoides	Rampion Bellflower
Lobelia	
Lobelia kalmii	Ontario Lobelia
COMPOSITAE (ASTERACEAE)	ASTER OR DAISY FAMILY
Group A	
Hieracium	Hawkweed
Hieracium aurantiacum	Orange Hawkweed; Devil's-paintbrush
Hieracium florentinum	King Devil; Yellow Hawkweed
Hieracium canadense	Canadian Hawkweed
Lactuca	
Lactuca biennis	Tall Blue Lettuce
Group B	
Chrysanthemum	Chrysanthemum
Chrysanthemum leucanthemum	Ox-eye Daisy
Achillea	Yarrow
Achillea millefolium	Yarrow; Milfoil
Tanacetum	Tansy
Tanacetum vulgare	
Group C	
Eupatorium	
Eupatorium maculatus	Spotted Joe Pye Weed
Euthamia	
Euthamia graminifolia	Flat-topped, Bushy, or Grass-leaved
Goldenrod	
Solidago	Goldenrod

Solidago canadensis	Canada Goldenrod
Solidago hispida	Hairy Goldenrod
Oligoneuron	
Oligoneuron album	Prairie Goldenrod
Aster	Aster
Aster macrophyllus	Large- or Big-leaved Aster
Arctium	Burdock
Arctium minus	Common Burdock
Carduus	Plumeless Thistle
Carduus acanthoides	
Cirsium	Thistle
Cirsium arvense	Canada or Field Thistle
Anaphalis	
Anaphalis margaritacea	Pearly Everlasting
Conyza	
Conyza canadensis	Horseweed
Prenanthes	
Prenanthes alba	White Rattlesnake Root
Taraxacum	
Taxacum officinale	Common Dandelion

Herptofauna of Huron NWR

The primary data sources used was Corin, C.W. (1976). 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 Huron NWR

The primary data sources used was Corin, C.W. (1976). 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	-Rare-Vagrant Non-	
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 vociferous</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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

Common Nighthawk	<i>Caprimulgus vociferous</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
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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

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
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	<i>Agelaius</i>			X		OWE

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

Blackbird	<i>phoeniceus</i>					
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
^a Habitat 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 Huron NWR

The primary data sources used was Corin, C.W. (1976). 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

^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

Plants of Gull Island (Michigan Islands NWR)

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

Cirsium vulgare

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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

<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

Gull Island Vegetation Additional Species—2009

These are species observed in addition to the species recorded in the 2007 report.

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

Plants of Hat Island (Michigan Islands NWR)

Plant species list based on the work of F.C. Gates (1950).

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 richardsoniana
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
Poa pratensis

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 tansy mustard
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
Meadow Grass or Kentucky bluegrass

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

<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

Bird Species of Michigan Islands NWR

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	<i>Circus cyaneus</i>	x				OWE, GRA,

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

Harrier ^{1,2,3}						HAY, OLD
American Coot	<i>Fulica Americana</i>				x	OWA, OWE
Sora	<i>Porzana Carolina</i>	x				OWE
Killdeer	<i>Charadrius vociferous</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>Zenaida 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

Harbor Island NWR, Huron NWR, Michigan Islands NWR-HMP (2015)

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 coronate</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 petechial</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 passerine</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

Threatened and Endangered Plant Species

These are plant species known to inhabit Great Lakes islands based on Michigan Natural Features Inventory, East Lansing, MI. Species with * have records from Harbor Island NWR, + from Huron NWR.

Common Name

Climbing Fumitory, Alleghany Vine
Pumpell's Brome

Narrow-Leaved Reedgrass+

Calypso, Fairy-Slipper
American Chestnut
Dune Thistle, Pitcher's Thistle
Ram's Head Lady-Slipper
English Sundew
Seaside Crowfoot
Dwarf Lake Iris
American Shore-Grass
Michigan Monkey-Flower
Clustered Broom Rape
Butterwort
Houghton's Goldenrod

Lake Huron Tansy*

Downy Oatgrass

Binomial Name

Adlumia fungosa
Bromus pumpellianus
Calamagrostis stricta
Calypso bulbosa
Castanea dentata
Cirsium pitcheri
Cypripedium arietinum
Drosera anglica
Ranunculus cymbalaria
Iris lacustris
Ammophila breviligulata
Mimulus michiganensis
Orobanche fasciculata
Pinguicula vulgaris
Solidago houghtonii
Tanacetum huronense
Trisetum spicatum