

# Islands of Life



## A Biodiversity and Conservation Atlas of the Great Lakes Islands



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# Islands of Life: A Biodiversity and Conservation Atlas of the Great Lakes Islands

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*The maps presented in this report are for illustrative purposes only. These maps are not intended as a precise indication of routes, locations of features, or as a guide to navigation.*

## Executive Summary

With over 32,000 islands<sup>1</sup>, the North American Great Lakes contain the largest collection of freshwater islands in the world. Ranging in size from small rocky knolls to the largest freshwater island in the world, these special places are globally unique and rich in biodiversity.

By their very nature, islands are isolated and sensitive to change. The attributes that make them refuges for natural heritage and biological diversity, also makes many of them relatively unknown and understudied.

This project produced a comprehensive spatial database of Great Lakes islands and their associated biodiversity values, threats and conservation status. Then an ecologically-based analysis identified the islands and island complexes within the Great Lakes that are the highest priority for conservation action.

The results identify individual islands or island complexes with high biodiversity and confirm the high conservation value of previously known globally significant biodiversity island areas. Many of the islands that are highest in biodiversity are also subject to greater threats from human activity.

Over 318,000 hectares of Great Lakes islands and island complexes have been defined as having important natural heritage values and biodiversity significance. Nearly one-third of this area is protected under federal, provincial or state legislation.

This project could not have been successful without an international collaboration. We now have a framework upon which we can build a program of inventory, assessment, monitoring and reporting that will continue to enhance our knowledge and understanding of Great Lakes biodiversity. Future Great Lakes island biodiversity conservation will depend on the participation and cooperation of all people with a shared interest in the Great Lakes to develop conservation approaches that achieve local, regional, and basin-wide goals while maintaining a shared common interest in this global ecological resource.

The information contained in this report can help inform Great Lakes island resource management and land-use decision making and contribute to the growing global appreciation of Great Lakes biodiversity.

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<sup>1</sup> The total number of islands in the Great Lakes varies from year to year depending on water levels. In regions such as eastern Georgian Bay, groups of small islands are often based on a common shallow reef and may be connected in periods of low water levels or separate during periods of higher water. For this report, these dynamic island groups are generally treated as a single unit.

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## 1.0 Introduction

The islands of the Great Lakes have always been important to the people of the basin. For native people, they were significant for both their resources and spiritual values. Today, many island regions are key areas for tourism and recreation, and still provide a unique sense of place within the Great Lakes landscape.

The Great Lakes islands are outstanding in terms of biological diversity. These islands form the world's largest collection of freshwater islands and contain significant biodiversity including endemic species, rare habitats and critical biological functions. They are important breeding and staging areas for colonial nesting waterbirds, harbour noteworthy assemblages of plants and animals and provide important stopover sites for migrating birds. They make a significant contribution to the physical and biological diversity of the Great Lakes and surrounding basin (Vigmostad et al., 2007).

Our understanding of Great Lakes biogeography has been largely based on studies of isolated individual islands or island groups. These studies have provided tremendous information about specific island regions and insight into the unique ecology of island systems.

**A collaborative effort has resulted in the classification and assessment of all Great Lakes islands to enhance our understanding of the biodiversity of these islands and to identify and prioritize significant areas for biodiversity conservation.**

The Collaborative for the Conservation of Great Lakes Islands is comprised of government and non-government organizations in Canada and the United States and was initiated to assemble information on Great Lakes islands and identify conservation needs. In participation with the Collaborative, the Ontario Ministry of Natural Resources (OMNR), the Nature Conservancy of Canada (NCC) and The Nature Conservancy (TNC) built a science-based, multi-disciplinary approach. The analysis builds on the work previously completed by Ewert et al. (2004). This work directly contributes to the creation of a robust, enduring framework to ensure long-term island conservation in the Great Lakes basin.

This process results in a strategic step toward ensuring long-term conservation of priority island areas in the Great Lakes basin. Islands

can be prioritized for increased protection and/or land conservation. Assessing Great Lakes islands, regardless of geo-political boundaries, using similar methodologies, will better inform the significance of the biodiversity of Canadian and U.S. islands in a Great Lakes basin context. The results from this project are designed to integrate and present information that can be used as a guide to help individuals and groups focus their local conservation efforts throughout the Great Lakes region.

### *1.1 Global Context*

Freshwater islands are rare. Fresh water represents only three percent of the Earth's water, and about two-thirds of this is frozen in glaciers and polar ice caps, and the remaining third is mostly underground. Global surface freshwater represents 0.3% of the Earth's surface, with the majority of this contained within freshwater lakes.


With over 32,000 islands, the Great Lakes support the largest collection of freshwater islands in the world. Other freshwater areas with large numbers of freshwater islands include the Amazon's Anavilhanas Archipelago (about 400 islands), Lake Victoria in Africa (about 3,000 islands) and Lake of the Woods which straddles the Canada-United States border (14,552 islands).

### *1.2 Origin*

The physical structure of islands is in a constant state of change. The geography of islands we have today is different than the past, and will change in the future. The major force shaping islands are water levels. Some of these changes occur in small regular increments over long periods of time, such as erosion of bedrock islands or island emergence or submergence due to isostatic rebound (Table 1). Other changes, such as ice scouring of fine sediment islands or deposition of cobbles can happen rapidly. The rate, frequency and magnitude of these changes are determined by the type of island and the force of change, such as climate, weather, coastal and geological processes.

The Great Lakes basin was originally formed in the Precambrian era (3 billion years BP) and has been subjected to numerous episodes of glaciation and post-glacial events, such as isostatic rebound and changing drainage patterns, which have continually modified the size and configuration of its waters. The modern configuration has existed only for about the past 5,000 years (Karrow and Calkin, 1985).

**Table 1: Cause and rate of change in physical structure of islands.**

Event	Island Type	Rate of Change	Example
Major storms	Fine sediments	Rapid  Slow	Turkey Island (Detroit River)
Ice scouring	Cobble		Beausoleil Island (Georgian Bay)
Short-term water level changes	Low profile island		South Limestone Island (Georgian Bay)
Deposition	Non-resistant rock		Les Cheneaux Islands (Lake Huron)
Erosion	Moderately resistant bedrock		Flowerpot Island (Lake Huron)
Isostatic rebound	Resistant rock		Sandy Islands (Lake Superior)

Present day islands are very young in geological terms, having existed only in the last 15,000 to 2,500 years (Dorr and Eschman, 1970). Many islands were once connected to the mainland, and were formed by rising waters after the last glaciers retreated. These “land-bridge” islands presumably once had similar species composition to the mainland, and their present day flora and fauna are a combination of pre-existing species, present since the island was part of the mainland, and species that have colonized since isolation. Other islands have always been isolated, and emerged as water levels dropped and lands rebounded. Present day species composition on these “primary” islands has developed based on successful colonization from the mainland.

The majority of islands of the lower Great Lakes were part of the mainland for approximately 8,000 years after the retreat of the last glaciers (Forsyth, 1988). Up until about 4,000 years ago, lower water levels in the western basin of Lake Erie and the eastern basin of Lake Ontario connected these islands with land bridges. These land bridges were important linkages for the northward range expansion of species following glaciation. Presumably, complete mainland faunas would have existed on these islands before lake levels rose. Thus all islands in the lower Great Lakes would be land bridge islands and presumably their faunas would be extinction-driven as supersaturated faunas relaxed to reduced areas (Wilcox, 1980).

Many of the islands in Lake Huron and Georgian Bay were also part of the mainland following the last period of glaciation. Low water levels initially would have connected many of the islands. However, during the Lake Nipissing stage (approximately 5,500 years ago), because of isostatic rebound and changes in outflows, the water level rose about eight metres above present-day levels before receding again (King, 1988). Islands with lower relief would have been submerged, only to have the lands re-emerge.

This region thus includes a combination of “land-bridge” and “primary islands”.

Lake Superior also contains islands that were formerly connected to the mainland. Post-glacial water levels in western Lake Superior were at their lowest point about 10,500 years ago during the Lake Minong stage. Many present day islands were part of the mainland. As the land rebounded and reduced outflow from the basin, the lake level rose to nearly present-day levels about 5,000 years ago. Some of the low islands in Lake Superior such as Caribou Island have emerged in the recent past as the land continues to rebound following the last glacial period.

### 1.3 Types of Great Lakes Islands

Island systems in the Great Lakes vary greatly in both diversity and complexity. What constitutes an “island” in this analysis is explained on page 5. While some island areas are characterized by several large islands with similar features, other areas contain hundreds of islands with variable shorelines and features, but are highly integrated in ecological functions. Islands can be roughly categorized by the following categories:

- **Resistant Rock.** Precambrian islands of basalt and granite dominate the northern shores of Lake Superior, Lake Huron and the St. Lawrence River. Islands on the southern shore of Lake Superior are composed of Precambrian and Cambrian sandstones.
- **Non-resistant Rock.** Many islands in northern Lake Michigan, Lake Huron, Lake Erie and Lake Ontario are comprised of limestone and dolostone.
- **Unconsolidated Sediments.** These islands can include fine sediments such as Turkey Island in the Detroit River and small dynamic islands that form along the Lake Erie sand spits. Cobbles can accumulate on

reefs in Lake Superior to form islands. Deltaic islands are found at mouths of rivers, such as the St. Clair River, which is the largest freshwater delta in the world.

- Anthropogenic. Islands that are not natural and are artificially created can also include key biodiversity significance for birds and fish. Types of artificial islands include breakwaters and breakwalls.
- Floating. Floating islands can be characterized as organic marsh 'mats' that can occur in some coastal wetlands. These islands are transitory.

#### 1.4 Island Biogeography

The adaptive responses of species to island environments have been well described. Originating in the theory of island biogeography (McArthur and Wilson, 1963 and 1967) several predictable patterns of diversity on islands have been established. These include:

- larger islands tend to be more species-rich than small islands
- less isolated islands tend to be more species-rich than more isolated islands
- species-richness is lower on small, isolated islands than on large, less isolated islands due to higher extinction rates and slower colonization rates
- high rates of endemism are found on islands, especially islands that have been isolated for long time periods (tens of thousands to millions of years)
- some species are curiously absent, or disproportionately abundant on islands.
- islands tend to be more susceptible to extrinsic anthropogenic disturbances (Cronk, 1997)

These concepts best apply to oceanic islands but many of them also apply to other islands, including Great Lakes islands, and islands of terrestrial habitat.

Because of their isolation and complex history, many islands lack species common on the mainland, support other species in great abundance, or harbor species largely restricted to islands given their land area. This unusual species composition results in island biotas that are globally distinctive and therefore of great importance for conservation and ecological research.

Island biota is dynamic. For islands that were, at one time part of the mainland, their species composition could include the original set of species associated with the mainland plus any species that

have dispersed to the island after its separation from the mainland.

The primary mechanisms bringing species to islands include flotsam (debris floating in the water), air transport (e.g., seeds carried by birds or bats), swimming to or walking on ice from the mainland, or deliberate or accidental anthropogenic introductions (Scharf, 1973). Some reptiles and amphibians may have arrived on some Great Lakes islands via flotsam (Hatt et al., 1948) or simply carried by water currents to island shorelines. Gulls may transport seeds of plants on their feathers and feet when they fly from mainland feeding sites to island nesting areas (Hogg and Morton, 1983). Migratory birds visit islands frequently during migration; some remain to breed (Scharf, 1973). Mammals, such as Black Bears, are known to cross water barriers of at least several kilometers to visit islands (Corin, 1976) while non-hibernating mammals, such as coyotes and wolves travel to islands over the ice (Judziewicz, 2001), therefore increasing their chances of colonization.

Anthropogenic activities may be increasingly important mechanisms for dispersing species to islands. Some introductions are deliberate, such as the introduction of White-tailed Deer to islands in the Beaver Island archipelago (Hatt et al., 1948), while other introductions are almost certainly accidental, such as the arrival of Garlic Mustard on Washington Island in Lake Michigan (Judziewicz, 2001). Possibly all but the smallest islands have received new species through either direct or indirect anthropogenic activities, a trend that will likely increase.

#### 1.5 Specialized Biodiversity

Many islands in the Great Lakes basin provide habitat for specialized plants, animals and ecological communities. These Great Lakes islands may support:

- relict species and plant communities
- unusual or high quality plant communities due to the absence of some biota (e.g., some herbivores or invasive species) or human disturbance due to isolation
- high concentrations of migrating and nesting birds, or other taxa (e.g., snakes)
- important spawning areas for fishes in offshore shoals (Manny, 2004)

Examples of the specialized aspects of biodiversity evident on Great Lakes islands are further discussed in highlight pieces throughout the document. These characteristics contribute to defining island biota and are therefore important for conservation purposes.

## Island Biogeography

The biogeography of islands has been a theme capturing biologists' interest for a very long time. Charles Darwin contemplated how islands of the Galapagos archipelago, even though in close proximity to each other, had their own distinct species of tortoise, birds and plants (1845). Alfred Russel Wallace described the biodiversity of Malaysian islands and the influence of island isolation in his *The Malay Archipelago* (1869). He noticed a sharp contrast in the geology, vegetation and "natural production" in the islands he visited and speculated on the reasons for the differences. Much more recently, MacArthur and Wilson explored in a quantitative way how geographic factors such as remoteness and size affect populations of species and species diversity on islands (1967). They plotted the relationship between island area and number of species and postulated that an equilibrium would be reached between immigration of new species and extinction of existing species. Island biogeography is now a major field of study in ecology and the subject of textbooks (e.g. Whittaker and Fernandez-Palacios, 2007). The concepts developed have been applied to other isolated ecosystems, such as tallgrass prairies, old growth forests and alpine ecosystems. These systems are isolated not by water but by different physical conditions and other plant communities. Most ecological communities can be considered as patches or islands of habitat that are more or less separated from other similar patches.

Great Lakes islands demonstrate some of the concepts that have been developed in the context of oceanic islands. For example, large islands tend to be higher in biodiversity than small islands because they often have a broader array of habitats and more of each habitat. Manitoulin Island and Drummond Island are among the largest islands in the Great Lakes and also among the highest in species diversity and rare species. Plant species richness was observed to be positively correlated with island size on the Grand Traverse islands of Green Bay, Lake Michigan (Judziewicz, 2001). Colder climate, geology and relatively short length of time since deglaciation may contribute to the relatively depauperate biodiversity of more northerly large islands like Michipicoten Island and Isle Royale in Lake Superior (Dorr and Eschmann, 1970).

Islands throughout the world frequently support disjunct or relict species and ecological communities. Northern Great Lakes islands subject to cold climatic conditions sometimes have a unique flora including disjunct arctic-alpine species like Entire-leaved Mountain Avens and Small-



Centre Island, Partridge Island and Badgeley Point in Georgian Bay.

flowered Anemone. A Caribou population on the isolated Slate Islands in Lake Superior is, together with another small population on the nearby coast in Pukaskwa National Park, separated from most of its range further north. The globally-rare Red-tailed Leafhopper, found on Manitoulin Island, is a relict from a time when tallgrass prairie habitat occurred further eastward than it does today. Most other occurrences of this species are now found in the Midwest United States (Hamilton, 1997).

The isolation of islands means that they frequently contain species and ecosystems that are not found elsewhere, that is they are *endemic* (Whittaker and Fernandez-Palacios, 2007). In most, if not all, Great Lakes examples, such species are endemic to the Great Lakes basin rather than to a particular island. Some examples of Great Lakes endemic species found on islands are Pitcher's Thistle, Lakeside Daisy, Dwarf Lake Iris, Houghton's Goldenrod and the Lake Erie Watersnake (a subspecies). Plant communities can be endemic too; the dune grasslands found along Great Lakes islands and mainland shorelines are found nowhere else in the world. Endemic species and systems are of particular concern to conservationists. To conserve the full spectrum of biodiversity, we need to protect not only representative systems, whether on islands or on the mainland, but also the unique ecosystems and species.

## 2.0 Methodology

A geographic information system (GIS) approach was used to score and analyze islands within the Great Lakes. Polygons for islands as well as reefs and submerged rocks that are periodically exposed were identified from a variety of the best available provincial and state digital layers.

### *Coastal Environments*

The Great Lakes system was divided into eight regions related to the geography of the basins of the Great Lakes; Lake Superior (including St. Marys River), North Channel and Georgian Bay, Lake Michigan, Lake Huron, Lake St. Clair (including the St. Clair and Detroit Rivers), Lake Erie, Lake Ontario and St. Lawrence River. In order to create manageable units for the analysis, islands were grouped according to their Great Lakes coastal environment.

The term coastal environment was coined by Owens (1979), and was used to further subdivide the Great Lake basin regions into 33 coastal environments in Ontario. These coastal environments are based on shore-zone sediment transport systems which are generally influenced by relief and geology, coastal zone characteristics (shore-zone character and beach character), fetch, wave exposure and ice, sediment availability and transport (Owens, 1979). This report splits some larger islands (e.g. Manitoulin) into different zones to reflect distinctive coastal characteristics. A list of these islands that were split, resulting in more than one polygon for each island that was analyzed individually is provided (Table 2).

In the United States, islands were grouped according to their coastal reach based on the integrated Biodiversity Investment Areas (BIAs) (Reid et al., 2001). These BIAs are areas having clusters of biodiversity values: species or communities of special interest, a diversity of habitats, communities and species, and productivity and integrity. Seventy coastal reaches were identified through this process to address nearshore zones (terrestrial, coastal wetlands, aquatic). Each coastal reach was then renamed to integrate with the coastal environment naming conventions. Any coastal reach that overlapped with a Canadian coastal environment was renamed to the associated coastal environment.

Islands and island complexes were analyzed within a particular coastal environment in Canada, and a particular coastal ecoreach in the United States. Islands were not analyzed or compared across these particular coastal environments and ecoreaches. For reporting in this document, these two sets of stratification

units were combined and lumped into logical grouped coastal environments that reflect similar biological and physical diversity and geographic location. For example, St. Mary's River in Figure 1 is comprised of two coastal ecoreaches analyzed in the United States and one coastal environment analyzed in Canada with the results combined for ease of reporting in this document. Not all coastal environments contain islands, such as Lake Superior Southeast Coast. This report also displays the analysis results at a Great Lakes basin level as well as the Great Lakes ecosystem level to provide insight of islands and island complexes across of variety of spatial scales. However, the analysis was conducted at the coastal environment scale and appropriate caution and interpretation should be exercised when reviewing these results at other scales.

**Island:** any land mass (natural or anthropogenic) within the Great Lakes or connecting channels that is surrounded by an aquatic ecosystem. Therefore, a particular island can be periodically connected to the mainland or part of a reef depending on water levels. Rock, shoals, shallow reefs and breakwaters can all be considered islands in this report.

**Island complex:** a group of islands that function as a larger collective entity because of their proximity. Each island in an island complex has island-specific biodiversity values, however groups of islands are linked to each other by ecological functions or species movements.

### *Defining Islands*

Fluctuation of water levels subject low-lying islands to periodic inundation. Depending on the water level, rocks, reefs and shoals may or may not be present within the best available digital mapping in order to distinguish and designate them as islands. Therefore, some small islands may not have been included or may not be treated separately from other islands in the islands dataset and were not included in the analysis. This definition can also include sand spits such as Long Point that are periodically separated from the mainland.

### *Identifying Large Islands and Island Complexes*

Portions of the Great Lakes (e.g. eastern Georgian Bay) contain thousands of islands, many of which are very small, close together

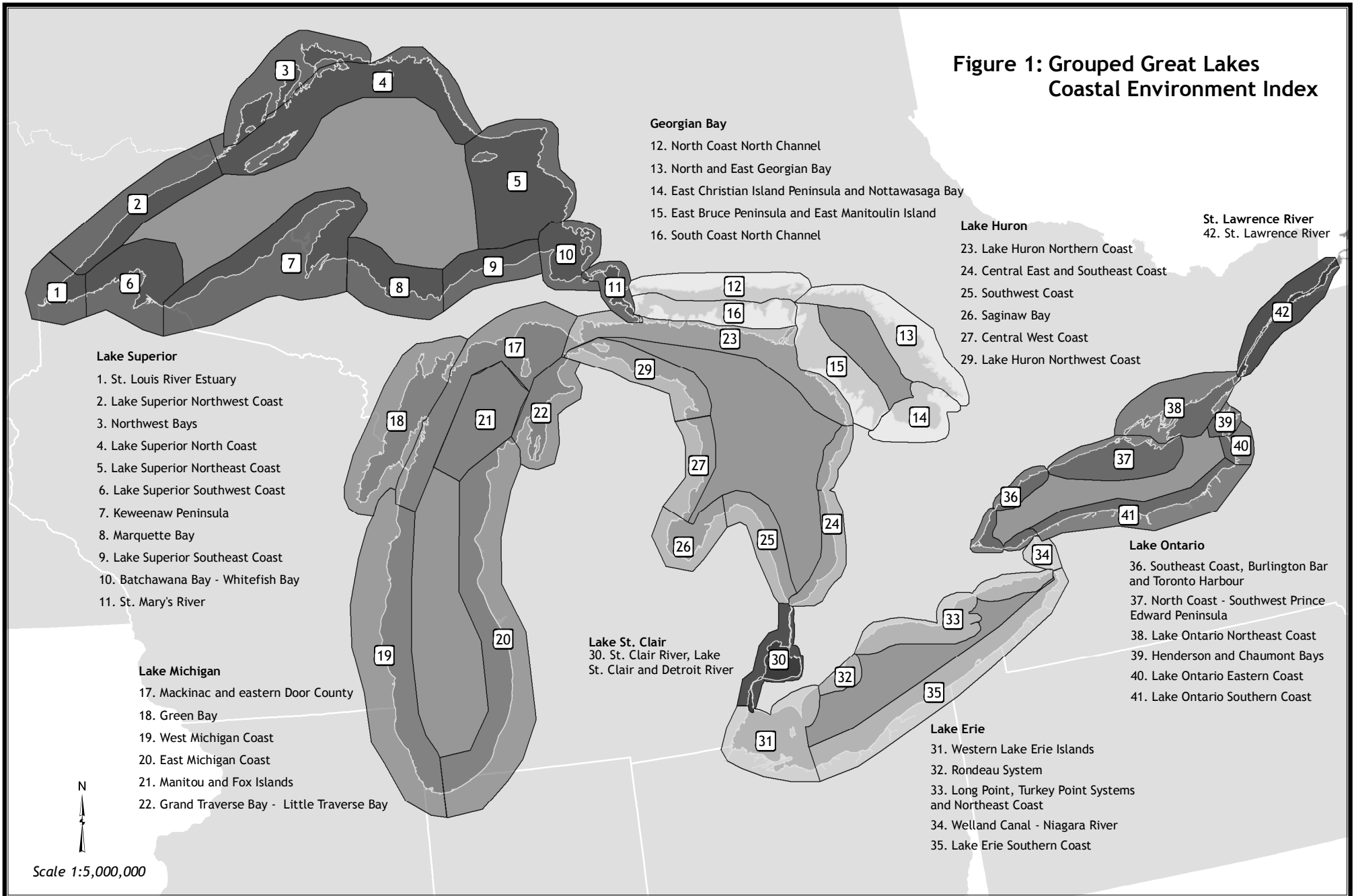
and have similar characteristics. These complexes of small islands function as a landscape unit. Within each coastal environment large islands and island complexes were identified. Large islands were extracted based on the range of sizes of islands within the coastal environment and maintained as a single

unit of analysis. Clusters of smaller islands were grouped into island complexes based on proximity (common coastal environment, within 200 m of each other and without any intervening land) and similar geology. The analysis was then done on the island complex, rather than small individual islands.

Table 2: Great Lake islands separated into more than one polygon for analysis.

Island	Components	Coastal Environment
Isle Royale	Main	Lake Superior North Coast
	Southern	Lake Superior North Coast
St. Ignace Island	North	Northwest Bays
	South	Lake Superior North Coast
Simpson Island	North	Northwest Bays
	South	Lake Superior North Coast
Green Island	West	Green Bay
	East	Green Bay
Saint Martin Island	Northwest	Green Bay
	Southeast	Mackinac and Eastern Door County
Washington Island	West	Green Bay
	East	Mackinac and Eastern Door County
Middle Grounds Island	North	Saginaw Bay
	South	Saginaw Bay
St. Joseph Island	West	St. Marys River
	Northeast	North Coast North Channel
	Southeast	South Coast North Channel
Drummond Island	Southwest	St. Marys River
	Southcentral	Lake Huron Northern Coast
	Southeast	Lake Huron Northern Coast
	Main	South Coast North Channel
Cockburn Island	North	South Coast North Channel
	South	Lake Huron Northern Coast
Manitoulin Island	North	South Coast North Channel
	South	Lake Huron Northern Coast
	East	East Bruce Peninsula and East Manitoulin Island
Fitzwilliam Island	West	Lake Huron Northern Coast
	East	East Bruce Peninsula and East Manitoulin Island
Middle Bass Island	East Point	Western Lake Erie Islands
	Main	Western Lake Erie Islands
Johnson Island	North Half	Western Lake Erie Islands
	South Half	Western Lake Erie Islands
Pelee Island	North	Western Lake Erie Islands
	Main	Western Lake Erie Islands
Grand Island	East	Welland Canal - Niagara River
	West	Welland Canal - Niagara River
Stony Island	West	Henderson and Chaumont Bays
	East	Henderson and Chaumont Bays

**Figure 1: Grouped Great Lakes Coastal Environment Index**



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; National Atlas of the United States, 2005

## Alvars - Globally Rare Ecosystems



Alvar grassland on McGregor Island

Islands of the Great Lakes support globally rare ecosystems known as alvars which are open areas of flat limestone, dolostone or marble bedrock with little or no soil and are usually sparsely covered with herbs and shrubs. Trees are either absent or sparse (Catling and Brownell, 1995). The vegetation and animals of alvars are distinctive - only a relatively small subset of plant species can withstand the extreme environmental conditions which are an outcome of the shallow soil layer. Alvars typically have poor drainage, so they are flooded in the spring and dry later in the summer. Some alvars contain fissures in the bedrock that allow precipitation to drain. The shallowness of the soil in alvars limits the depth to which roots of plants can penetrate, as well as the ability to retain moisture. Alvars with exposed bedrock absorb heat from the sun and become very hot and dry in the summer.

The importance of alvars to biodiversity conservation was highlighted in The International Alvar Initiative, a collaboration of conservationists and biologists from the U.S. and Canada (Reschke et al., 1999, Brownell and Riley, 2000). Most of the alvars of the Great Lakes region were surveyed as part of this initiative and assessed using a standard set of criteria.

Significant examples of alvars are found on the western Lake Erie islands, on Manitoulin and Drummond Islands in Lake Huron and in the Cloche Islands in the North Channel. There are several different types of alvars. Pavement alvars have little or no soil and support such species as Wild Chives and Lakeside Daisy (Catling and Brownell, 1995). These species gain a foothold in the small cracks that retain moisture and a small amount of soil. Larger cracks often support woody vegetation such as Creeping Juniper. Magnificent examples of alvar pavements occur on Manitoulin Island. Along shorelines of limestone-based islands where there is periodic inundation with water, the vegetation includes both alvar species as well as species that are also found in other wetlands.

Characteristic plants include Wild Savory, Crawe's Sedge, Little Bluestem and Longleaf Bluets (Catling and Brownell, 1995). Alvar grasslands and savannahs occur where there is more soil present. Extensive alvar grasslands dominated by Northern Dropseed are found on Little Cloche Island in the North Channel. Little Bluestem is also frequently dominant in alvar grasslands. Alvar savannah has some trees present (up to 50% of the cover). Chinquapin Oak and Blue Ash are dominant species in the Stone Road alvar savannah (Pelee Island), while White Spruce, Jack Pine and White Pine are the dominant trees in Lake Huron treed alvars.

Alvars provide habitat to many species that are endemic to the Great Lakes region, and are rare at the state, province, national or global level. Some have been designated as being at risk. Lakeside Daisy and Dwarf Lake Iris are found only in the Great Lakes region and are globally rare. Ram's-head Lady's-slipper, Cooper's Milkvetch, Laurentian Fragile Fern and Houghton's Goldenrod are also globally rare. Gattinger's Purple False Foxglove is extremely rare in Ontario and is designated as Endangered in Canada. Some of the rare animals found in alvars include Eastern Massasauga, Eastern Fox Snake, Mottled Duskywing and several endemic land snails.

While many alvars have received protected status by governments and non-governmental organizations, they still face a number of threats. Quarrying and recreational activities are of greatest concern. The limestone bedrock is readily accessible for quarrying as it is close to the surface and it is often desirable for building products. The vegetation of alvars is also vulnerable to trampling by walkers or vehicles. Intensive grazing by cattle will result in the loss of sensitive native species and the introduction of non-native species such as Common St. John's-wort and Common Mullein. The alvars of Great Lakes islands are often less disturbed than examples on the mainland, due to their isolation, and therefore are excellent candidates for conservation.

## Biodiversity Analysis

Islands and island complexes were scored based on a suite of scoring criteria to determine their associated conservation value by assigning each island or islands complex a total biodiversity score. Conservation Data Centres information was the source for species and plant community information. Digital data that was available and extended throughout much of the basin was incorporated into the analysis, however there are data known to be missing from available digital layers. An analysis at a Great Lakes scale reveals multiple digital data gaps and provides an opportunity to focus efforts on creating and improving digital information. Some of the biodiversity scoring criteria were based on the previous work of Ewert et al., 2004. These scoring criteria are not mutually exclusive and certain species or communities may be included in more than one criterion and therefore scored multiple times. For example, graminoid coastal meadow marshes are tracked by Conservation Centres, are globally rare and are defined as a key shoreline type. The scoring criteria can be described as follows and Table 3.

### Biological Diversity:

- Species (composed up to 20% of the total biodiversity score). This group of criteria included the diversity of extant element occurrences of rare species tracked by the state Heritage Programs and the Ontario Conservation Data Centre (NHIC), breeding sites of colonial nesting waterbirds, species at risk (Ontario only<sup>2</sup>), and species of global biodiversity value including those that are either endemic, disjunct (scored in Ontario only) or declining (scored in Ontario only) in the Great Lakes, and species that are globally rare (Global Rank of G1- G3).
- Plant Communities (composed up to 11% of the total biodiversity score). This group of criteria included the diversity of extant element occurrences of plant communities tracked by the state Heritage Programs and Ontario's NHIC, and the diversity of globally

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<sup>2</sup> There are some differences between the Ontario and United States list of biodiversity scoring criteria, in part a consequence of data availability and different lists of threatened and endangered species by different states, however there is no significant difference between the scoring of criteria for Ontario islands and United States islands that would impact a comparison of island scores and island prioritization. The lack of digital information or inventory in certain geographical areas, regardless of nation, could pose more differences among the island criteria scoring than the changes in the scoring criteria between nations.

rare plant communities (Global Rank of G1- G3).

- Ecological Systems (composed up to 33% of the total biodiversity score). Ecological systems differ from plant communities and are defined as dynamic spatial assemblages of ecological communities characterized by both biotic and abiotic components that 1) occur together on the landscape, are 2) tied together by similar ecological processes, underlying environmental features or gradients and 3) form a robust and cohesive unit on the ground. This group of criteria included terrestrial ecological system diversity (number of different natural ecological system types), presence of key ecological systems (e.g. alvars, wetlands, meadows, prairie and savannahs, limestone plain forests), presence of key shoreline combination types (i.e. wetlands, exposed bedrock bluffs and cliffs, shelving bedrock, sand beaches), presence of rivers and streams, presence of wetlands and presence of lakes.
- Ecosystem Functions (composed up to 17% of the total biodiversity score). This group of criteria included the degree of isolation the island or island complex has from other islands and/or the mainland, presence of roosting and foraging shorebirds, waterfowl and landbirds, and the known occurrences and suitable habitat of interjurisdictional fish species. Interjurisdictional fish species are defined as fish species that migrate and move between different national jurisdictions (Ewert et al., 2004)<sup>3</sup>.

Physical Diversity: (composed up to 17% of the total biodiversity score). This group of criteria included an index of shape complexity, geological diversity and shoreline diversity.

Size of the island or island complex: (composed up to 6% of the total biodiversity score). This criterion categorized the islands and islands complexes within each coastal environment or coastal reach into 10 natural breaks based on size and scored them accordingly. Therefore, the size range of islands vary depending on the their associated coastal environment or coastal reach rather than comparing an island's relative size in Lake Superior to an island's relative size in Lake Erie for example.

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<sup>3</sup> See Ewert et al., 2004 for rationale and a complete list of interjurisdictional fish species.

Distinctiveness: (composed up to 5% of the total biodiversity score - scored in Ontario only)  
 This criterion was scored only in Ontario and can also be described as a similarity index to compare ecological systems, geology and

shorelines of islands and island complexes throughout the coastal environment to provide a measure of which islands or islands classes are representative and which are unique within their coastal environment.

Table 3: Biodiversity Scoring Criteria.

Measures for Scoring Criteria (all classes)		Scoring Category	Area Analyzed
<b>Biological Diversity</b>			
<b>Species</b>			
C1	Diversity of Rare Species	all extant rare species Element Occurrences (EOs)	ON, US
C2	Colonial Nesting Waterbirds		ON, US
C2P1	Diversity of colonial waterbird use	Known breeding by selected species	ON, US
C2P2	Importance for colonial waterbird populations	Top breeding island sites for all species	ON, US
C3	Global Biodiversity Values - species		ON, US
C3P1		diversity of G1-G3 species	ON, US
C3P2		diversity of Great Lakes endemic species	ON, US
C3P3		diversity of Great Lakes disjunct species	ON only
C3P4		diversity of Great Lakes declining species	ON only
C4	Species At Risk (SAR)	Federal and/or provincial SAR (Endangered, Threatened, Special Concern)	ON only
<b>Plant Communities</b>			
C5	Diversity of Rare Plant Communities	all extant EOs of plant communities	ON, US
C6	Diversity of Globally Rare Communities	all extant G1-G3 occurrences	ON, US
<b>Ecological Systems</b>			
C7	Ecological system diversity (terrestrial)	Number of different natural ecological systems	ON, US
C8	Presence of key ecological systems		ON, US
C9	Presence of key shoreline combination type		ON, US
C10	Presence of rivers and streams		ON, US
C11	Presence of wetlands		ON, US
C12	Presence of lakes		ON, US
<b>Ecosystem Functions</b>			
C13	Isolation	distance from mainland and other classes	ON, US
C14	Birds		ON, US
C14P1		Presence of roosting, foraging shorebirds	ON only
C14P2		Presence of roosting, foraging waterfowl	ON only
C14P3		Stopover sites for landbirds	ON, US
C15	Fish Habitat		ON, US
C15P1		Known occurrences of interjurisdictional fish species	ON, US
C15P2		Suitable habitat for interjurisdictional fish species	ON, US
<b>Physical Diversity</b>			
C16	Shape Complexity	area:perimeter ratio	ON, US
C17	Geological Diversity		ON, US
C17P1		Presence of key geology types	
C17P2		Number of different geology types	
C18	Shoreline Diversity	Number of different shoreline types	ON, US
<b>Size</b>			
C19	Size (Island or Island Complex)	based on 10 natural breaks within a coastal environment	ON, US
<b>Distinctiveness</b>			
C20	Similarity Index		ON only

## Colonial Nesting Waterbirds

Islands throughout the world provide essential habitat for colonial nesting birds. Food resources are available in the surrounding waters and the isolation of islands from the mainland provides nesting birds refuge from predators. Great Lakes islands support large nesting colonies of Ring-billed Gull, Herring Gull, Black-crowned Night-heron, Common Tern, Caspian Tern and Double-crested Cormorant. Most of the world's Ring-billed Gull population occurs in the Great Lakes region and nests on islands. Great Blue Heron, Great Egret and Great Black-backed Gull also nest in colonies on islands but these species are less dependent on Great Lakes island habitat. While most of these species are common in the Great Lakes region, the number of areas where they find suitable nesting habitat is relatively low. Two southern heron species, Cattle Egret and Little Blue Heron, nest on West Sister Island in Lake Erie near the northern limit of their range in interior North America.

Most colonial nesting sites are found in Lakes Michigan, Huron, Erie and Ontario but even the more nutrient-poor waters of Lake Superior hosts some colonies of nesting birds. The islands most important for colonial nesting waterbirds include, but are not limited to: Gull Island, High Bluff Island, Little Galloo Island and Pigeon Island in Lake Ontario; Middle Island, East Sister Island and West Sister Island in Lake Erie; Hat Island, Rocky Island, Round Island and Snake Island in Lake Michigan; Bird Island, Chantry Island, Green Island, Saginaw Combined Disposal Facility and South Watcher Island in Lake Huron; and Interstate Island in Lake Superior (Wires and Cuthbert, 2001; Patrikeev, 2006).

The colonial nesting species have slightly different habitat requirements (Cadman et al., 2007). For example Caspian Terns prefer the more elevated areas of islands, but several species may nest in close proximity to each other. Herring Gull, Ring-billed Gull, Great Black-backed Gull, Common Tern and Caspian Tern all nest on the ground while Black Crowned Night-heron, Great Blue Heron and Great Egret prefer to nest in shrubs and trees. Double-crested Cormorant nests in trees but will nest on the ground if no trees are available. Perennial use of the same trees for nesting by cormorants results in the destruction of the trees after 7-10 years due to excessive levels of nitrogen from their deposited guano.

Adverse effects of organic contaminants on colonial nesting birds were observed in the Great Lakes region in the early 1970s. These included egg shell thinning, bill deformities and lowered reproduction were reported widely. Heavy metals such as mercury, organochlorine pesticides like DDT, dieldrin and



Caspian Tern and Ring-billed Gull nesting colony, South Watcher Island, Georgian Bay.

mirex, and other chlorinated organic compounds like PCBs, HCBs, dioxins and furans were also contaminating the lake ecosystem. All of these contaminants have been detected in Herring Gull eggs (Rychman et al., 1997). The attention that this issue received resulted in regulations to control the release of contaminants and in expanded monitoring programs. The levels of many of these contaminants have decreased but some adverse effects may still be occurring.

Reliable quantitative data are now available on the overall abundance of colonial nesting species in the Great Lakes. For example, in four of the Great Lakes, the number of Herring Gulls increased from the first census in the late 1970s to the second census in the late 1980s but then had decreased by the third census in the late 1990s (Morris et al., 2003). In Lake Huron there was a decline throughout this period. Inter-colony and inter-lake movement of colonial waterbirds can also affect the abundance at any one location.

The number of Double-crested Cormorants in the Canadian Great Lakes increased from approximately 21,000 pairs to 76,000 pairs between 1990 and 2000 (Weseloh et al., 2002). The abundance of this species in the Great Lakes region has become a concern due to the destruction of vegetation at some nesting sites, nutrient enrichment from guano and perceived competition with humans for fish resources. Middle Island and East Sister Island in Lake Erie, for example are land-bridge islands and support many rare and at-risk plant species but these are being negatively impacted by growing Double-crested Cormorant colonies. Culls have been carried out by management agencies on a few Great Lakes islands, but this activity has been controversial.

### *Protection Analysis*

Each island and island complex was assessed to determine the proportion of protected and/or conservation lands. This analysis was used to identify gaps in protected areas and conservation needs and to identify key islands that have already been protected.

**Protected lands** are described as areas regulated as such by federal, state or provincial laws. These can include regulated provincial parks and conservation reserves, unregulated (or proposed) provincial parks and conservation reserves as defined during Ontario Living Legacy (OMNR, 1999), national parks (CAN and U.S.), national marine conservation areas (CAN), national wildlife areas (CAN), migratory bird sanctuaries (CAN), state parks (U.S.), wilderness areas (U.S.), U.S. federal ecological reserves and nature preserves, national wildlife refuges (U.S.), waterfowl production areas (U.S.) and natural areas (U.S.).

**Other natural heritage designations** are areas not regulated as protected lands by federal, state or provincial laws but are within conservation ownership or subject to designations or policies that limits the threat of development to key biodiversity features. These can include Conservation Authority lands (CAN), land trust (e.g., Nature Conservancy of Canada, The Nature Conservancy, Michigan Nature Association properties), Ontario Ministry of Natural Resources evaluated wetlands (including both provincially and locally significant), Life science Areas of Natural and Scientific Interest (ANSI) (either provincially or regionally significant)(CAN), and Nature Preserves, Wilderness Areas and Wildlife Reserves from county, local and non-government organizations (U.S.). These areas may also be currently unregulated areas but are recommended to be regulated by federal, state or provincial laws in the future. Important Bird Areas (IBA) (CAN and US) are also included in this category.

**Other land use designations** are generally areas that are on public land where protection of natural heritage is a priority but some resource use can take place with appropriate conditions. These can include enhanced management areas (CAN), forest reserves (CAN, U.S.) and wetland reserve program land (U.S.).

It should be noted that some of these conservation lands and protected lands are not mutually exclusive and overlaps between area

types can occur. There is also wide variation of management emphasis and permanency of conservation designation on lands defined as protected.

### *Threats Analysis*

A suite of threats to island biodiversity were identified to categorize islands and island complexes in each coastal environment into five general threat categories based on natural breaks of the total relative threat score. These general categories are low, low/medium, medium, medium/high and high. The threat category suggests the level of threat on a particular island in relation to other islands in the same coastal environment - it does not suggest the level of threat on an island in relation to islands in other coastal environments. For example, a higher level of threat of an island in Northwest Bays does not equate to the same higher level of threat associated with an island in the Detroit River. The higher level of threat associated with an island in Northwest Bays is in relation to the relative level of threat to other islands in Northwest Bays. Therefore, a comparison of level of threat *across* coastal environments should not be conducted. In general, islands close to major population centers are more highly threatened than remote islands.

The suite of threats on islands and island complexes in both nations included presence of and proximity to pits and quarries, distance to mining claims, road densities (primary secondary and tertiary roads), building densities (the number of buildings per island or island complex per square kilometre of island area) and the percent of island or island complex converted to cropland. Islands and island complexes in Ontario were also scored on direct threats that included high-use recreational beach area, recreational dive sites, lighthouses, anchorage sites, boat launches, access site for land vehicles, residential/ recreational or cottage use areas, camp/ recreation sites, tourism establishment areas, cottage residential areas, cottage residential sites, and building density as well as the presence of aquatic invasive species. There was insufficient data in the United States to include the occurrences of these direct threats on American islands and island complexes. This list of threats is not exhaustive, but limited to the availability of digital data during the analysis. Vigmostad et al., 2007 includes descriptions of other types of threats to Great Lakes islands.

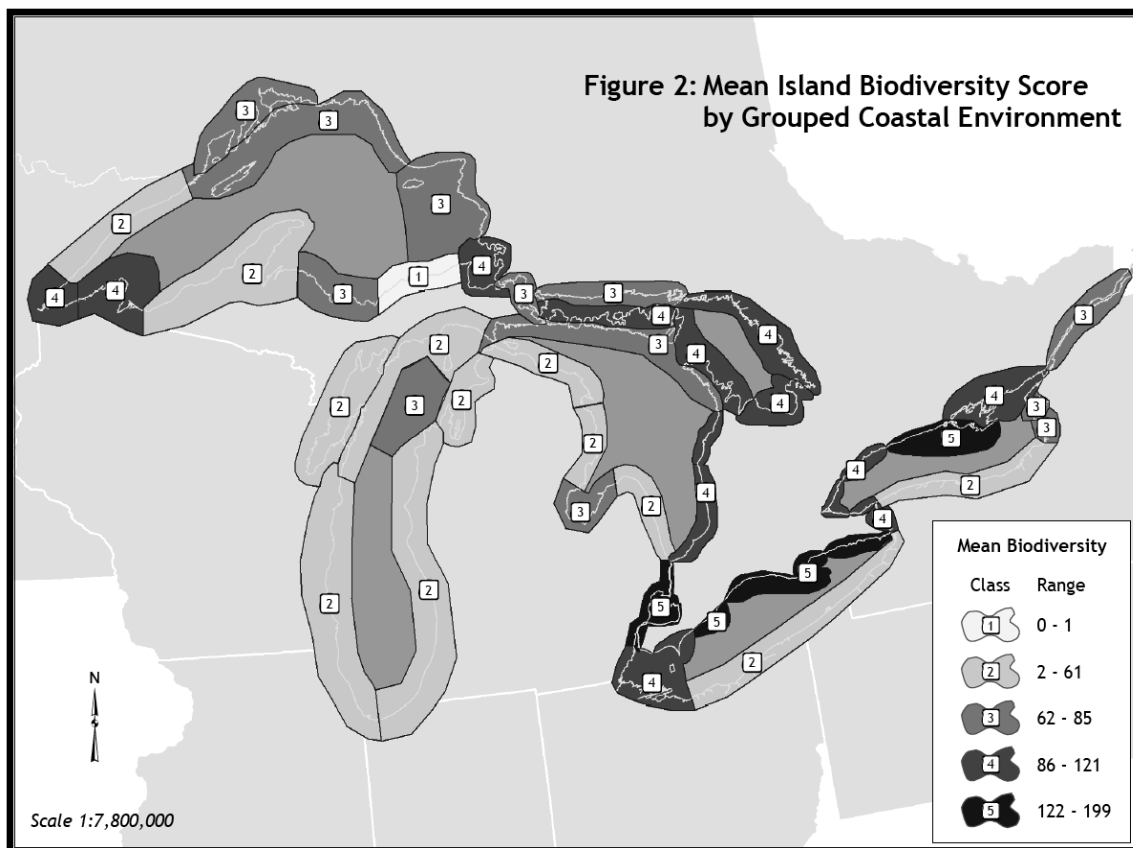
### 3.0 Islands of the Great Lakes

The Great Lakes islands contain an abundance of nationally and globally significant biodiversity values that vary across the basin (Table 4). The highest mean biodiversity score was found in the Rondeau System coastal environment followed by the Long Point, Turkey Point Systems and the Lake Erie Northeast Coast; the St. Clair River, Detroit River, Lake St. Clair; and the North Coast - Southwest Prince Edward Peninsula

coastal environments (Figure 2). Top scoring islands throughout the Great Lakes are found in Table 5. This table includes adjusted total biodiversity scores for islands with criteria that were scored in both Canada and the United States. This analysis confirms the importance of several islands that are already well known for their biodiversity.

Table 4: Total biodiversity score and relative threat scores for 15 of the grouped coastal environments (see Figure 1 for the grouped Great Lakes coastal environment index).

Grouped Coastal Environment	No. individual islands	No. islands/ complexes	Total Biodiversity Score		Relative Threats Score	
			Mean	Range	Mean	Range
St. Louis Estuary	5	5	98	27-207	1	0-3
Lake Superior Southwest Coast	75	33	99	24-228	1	0-33
Mackinac and eastern Door County	418	275	45	27-273	0	0-32
North and East Georgian Bay	17,615	848	90	0-290	12	0-56
East Christian Island Peninsula and Nottawasaga Bay	74	40	95	47-244	7	1-46
East Bruce Peninsula and East Manitoulin Island	290	90	104	39-300	4	1-44
St. Clair River, Detroit River, Lake St. Clair	403	77	143	44-370	7	0-47
Western Lake Erie Islands	130	75	100	22-388	4	0-64
Rondeau System	66	13	199	154-340	5	1-32
Long Point, Turkey Point Systems and the Northeast Coast	1484	50	155	37-333	9	0-42
Welland Canal and Niagara River	37	18	105	42-225	7	0-44
Southwest Coast, Burlington Bar and Toronto Harbour	43	20	121	86-190	5	1-24
Lake Ontario North Coast and Southwest Prince Edward Peninsula	74	32	131	83-231	3	1-22
Lake Ontario Northeast Coast	911	236	98	27-302	3	0-140
St. Lawrence River	852	191	83	27-241	11	0-75



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; National Atlas of the United States, 2005

The southern portion of Manitoulin Island had the highest overall score for biodiversity (Table 5) (Note: Manitoulin Island occurs in three different coastal environments and has an associated score for each portion). Manitoulin Island is known as the largest freshwater island

in the world. Larger islands, like Manitoulin, tended to score higher for biodiversity because of their size, they typically support a greater range of habitats than do smaller islands and their lime-rich environment on bedrock that provide a range of unique species and habitats.

Table 5: Top 10 islands based on highest total biodiversity scores

Number	Island Name	Grouped Coastal Environment	Total Biodiversity Score
1	Manitoulin Island (South)	Lake Huron Northern Coast	430
2	Manitoulin (North)	South Coast North Channel	341
3	Pelee Island (Main)	Western Lake Erie Islands	328
4	Walpole Island	St. Clair River, Lake St. Clair and Detroit River	310
5	Point aux Pins	Rondeau System	302
6	Drummond Island (Main)	South Coast North Channel	299
7	Great LaCloche Island	North Coast North Channel	298
8	Long Point	Long Point, Turkey Point Systems and Northeast Coast	297
9	Drummond Island (Southcentral)	Lake Huron Northern Coast	284
10	Squirrel Island and Cockburn Island (South)	Lake Huron Northern Coast	282

Manitoulin Island was separated into subsections that fall within different coastal environments (Table 2 and Figure 1) and may have scored higher if it had been lumped into one coastal environment. Manitoulin Island scored high for species at risk, the diversity of globally rare plant communities, the presence of wetlands, lakes, rivers and fish habitat as well as size. Manitoulin supports habitat for many globally rare species including Pitcher's Thistle, Lakeside Daisy and Dwarf Lake Iris. The extensive areas of large and globally rare alvar communities are also particularly significant.

Pelee Island is the second highest scoring individual island and the highest within the Western Lake Erie Islands (Table 5). Pelee Island also supports a high diversity of globally rare, endemic and disjunct species and species at risk as well as rare plant communities. It had high scores for key ecological systems and wetland, stopover sites for land birds, colonial nesting birds, fish habitat and size. Per unit area, Pelee Island is one of the richest sites in the Ontario portion of the Great Lakes, supporting dozens of nationally rare species such as Blue Racer, Lake Erie Watersnake and Yellow-breasted Chat.

To summarize the analysis results in this report, islands from each grouped coastal environment were selected as priority islands based on the top natural breaks of the total biodiversity score (Jenks optimization method) (Jenks, 1967).

**Priority Islands:** All top scoring islands were captured as a priority area regardless of its conservation status. This approach can be used to recognize key islands that have been protected, where there may still be gaps, or identify potential need for more resources for management on highlighted islands.

All coastal environments will not have the same number of priority islands identified. For those coastal environments that have less than ten islands, all islands were selected as priorities. For complete listings of priority islands for each grouped coastal environment, see Appendix A.

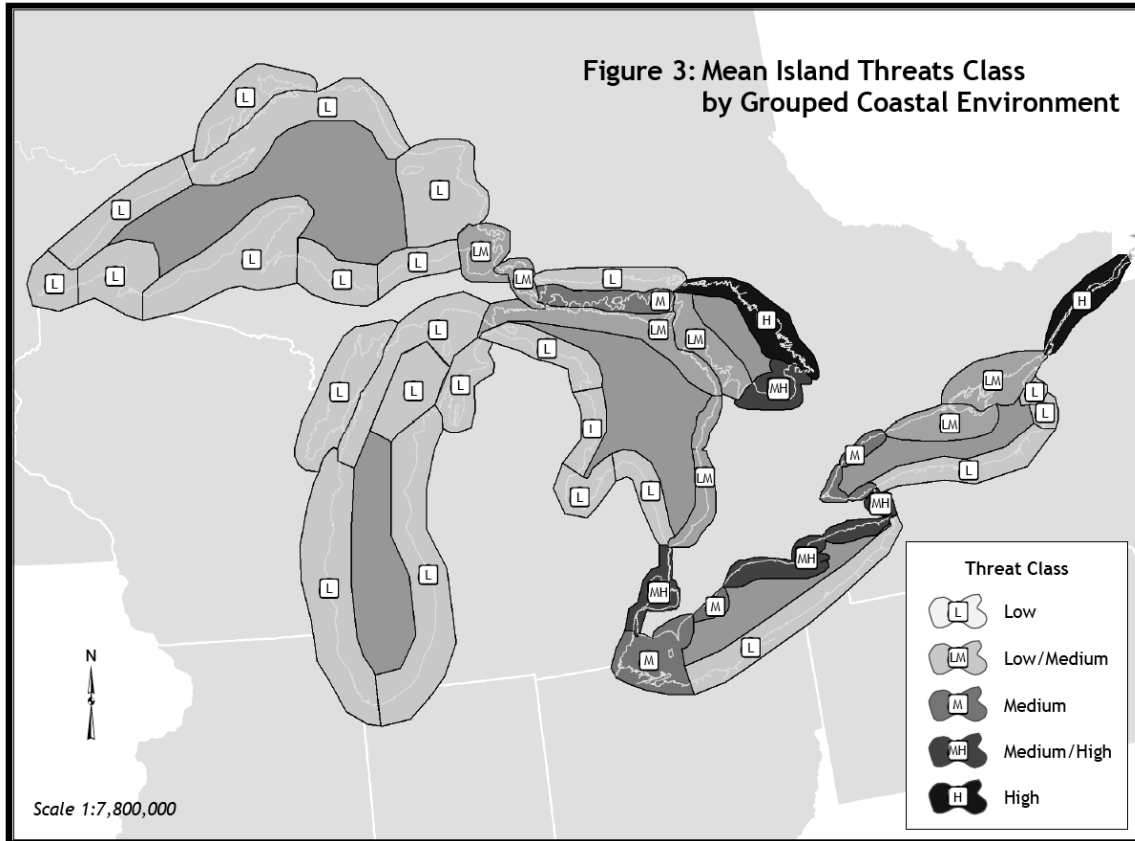
In addition to assigning priority to islands based on the total biodiversity score, islands were also assessed based on key attributes that are unique to island systems. Key island attributes include habitat for colonial nesting waterbirds. Islands with a relatively low total biodiversity score can nevertheless be critical for nesting waterbirds. For example, Wallis Rocks, a complex of 12 small islands in Georgian Bay contains important Great Lakes nesting habitat for colonial nesting

birds: Herring Gull, Caspian Tern, Ring-billed Gull and Great Black-backed Gull.

Priority islands were also assessed based on the score for the diversity of ecological systems and physical environments largely based on imagery and remotely sensed data. These measures may be less biased than some of the species and plant community measures, which are based on field data. Remote-sensing data often has more continuous coverage of data in a region, whereas field data is often only at specific sites and may be limited by resources and capacity for thorough data collection. However, field data has the potential to be very precise and inclusive in many areas, but not always spatially available. It was demonstrated in our analysis that often the sites with high scores for their diversity of ecological systems and physical environments also have high overall biodiversity scores.

There is also a wide range in relative threat scores across the islands within and among the coastal environments (Table 4). The highest mean threats score was found in both the North and East Georgian Bay coastal environment and the St. Lawrence River coastal environment (Figure 3). There are many potential threats to the biodiversity of these Great Lakes islands. Extensive residential and cottage development occur on the islands of the lower Great Lakes as well as development related to tourism and recreation, such as marinas, resorts and roads. Large aggregate operations are located on some islands. Larger islands support permanent residential development, roads and agriculture. Invasive species also pose a considerable threat to some islands.

There are additional threats to the biodiversity of Great Lakes islands that were not included in this analysis due to the lack of digital data or availability of data at the time of analysis. These threats include wind power development, oil and gas exploration and extraction, chemical spills and climate change. Hyper-abundant species on some islands, such as Double-crested Cormorant, may be perceived as a threat to biodiversity but they were also beyond the scope of this analysis. Digital data included in the analysis may not be comprehensive and errors and omissions may have occurred. Some threats may also be more serious than other threats and the magnitude often varies within each coastal environment. The available information did not allow the analysis to accommodate these variations to this degree of resolution. The types of threats faced by the Great Lakes islands are described in further details in Vigmostad et al., 2007.



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; National Atlas of the United States, 2005

The most threatened islands throughout the Great Lakes are found in Table 6. This table includes adjusted threat scores for islands with only measures of threats that were scored in both analyses. There is a moderate degree of correlation between total biodiversity score and relative threat score (Pearson correlation

coefficient of 0.38). Figure 4 demonstrates the relative threat and relative total biodiversity scores for the top 10 islands with high biodiversity (Table 5). Some of these islands with high biodiversity are also listed in Table 6 as islands most threatened.

Table 6: Top 10 most threatened islands

Number	Island Name	Grouped Coastal Environment	Relative Threats Score
1	Manitoulin Island (North)	South Coast North Channel	265
2	St. Joseph Island (West)	St. Mary's River	62
3	Grosse Isle	St. Clair and Detroit River	45
4	Grand Island (West)	Welland Canal - Niagara River	44
5	Grand Island (East)	Welland Canal - Niagara River	43
6	Manitoulin (South)	Lake Huron Northern Coast	37
7	Kelleys Island	Western Lake Erie Islands	36
8	Drummond Island (Main)	South Coast North Channel	35
9	Wellesley, Sugar, South Bass, Harsens, Madeline Islands	(Lake Ontario, Lake Erie, St. Marys River, Lake St. Clair)	33
10	Beaver Island, Wolfe Island	(Lake Michigan, Lake Ontario)	32

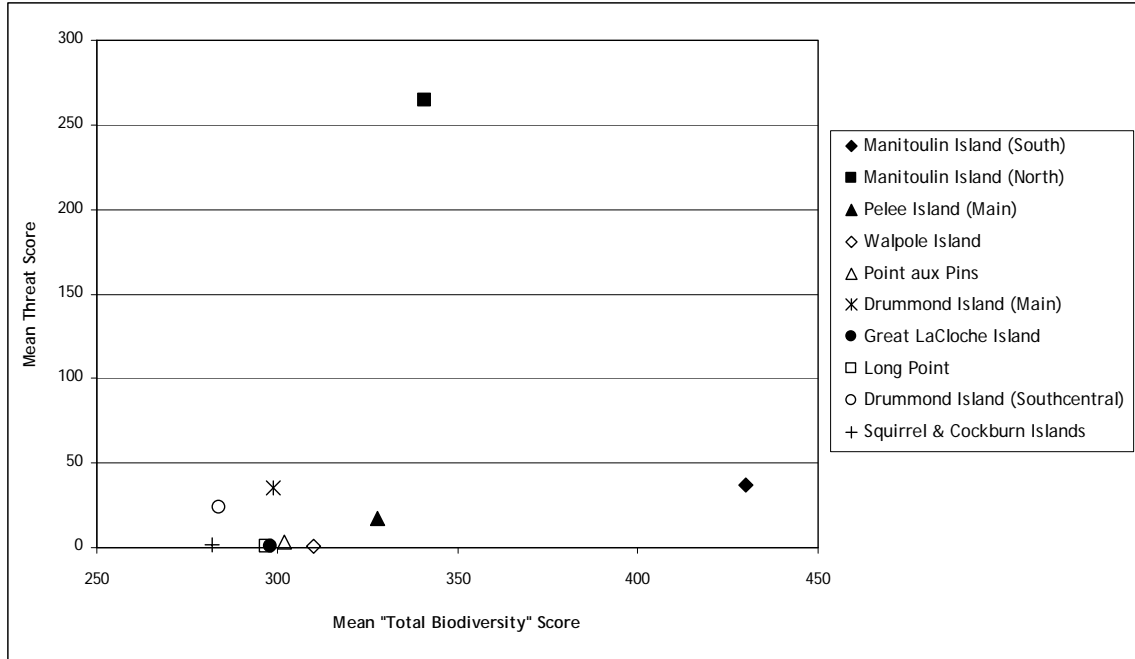


Figure 4: Relative threat and total biodiversity scores for the top 10 islands with highest biodiversity.

In general the level of relative threat is higher in the lower Great Lakes, as a result of the greater human population and its consequent impacts. However, many islands, due to their isolation or small size, have been relatively free of human impacts and represent excellent opportunities for conserving representative or unique ecological systems.

Figure 5 demonstrates the mean total biodiversity scores for grouped coastal environments and their associated mean threat scores. Collectively Lake Erie and St. Clair River, Detroit River and Lake St. Clair have higher total biodiversity and they exhibit a higher relative threat than the majority of other coastal environments in the Great Lakes.

Georgian Bay coastal environments have similar mean total biodiversity scores across Georgian Bay but there is a wide range of relative threats amongst the coastal environments. There is a wider range of total biodiversity scores and relative threat scores across Lake Ontario, illustrating the range of physical and biological diversity from the east to west, and the range between high concentrations of urban centres to areas of increasing natural cover and their associated relative threats.

Twenty-seven percent of the island land base across the Great Lakes basin is protected under

federal, provincial or state legislation (207,659 hectares). An additional 14% of the islands have natural heritage designations (110,800 hectares). Nearly three-quarters of Lake Superior islands are protected totalling 145,500 hectares (see Table 7). Large islands dot the north coast of Lake Superior, including Isle Royale, St. Ignace Island, Simpson Island and Patterson Island. This coastal environment's islands are largely contained within the Lake Superior National Marine Conservation Area, Isle Royale National Park, Slate Islands Provincial Park and Sleeping Giant Provincial Park.

Georgian Bay has more than two-thirds of all Great Lakes islands and the Georgian Bay island landbase has more than 10% (over 33,000 hectares) protected. The islands on the North Coast North Channel and the North and East Georgian Bay coastal environments have the majority of the protected landbase in this waterbody. Several provincial parks and protected areas have been identified through the Ontario Living Legacy (OMNR, 1999).

Lake Ontario islands have less than five percent of their landbase protected; however Lake Ontario has more than two-thirds of the island landbase identified as having a natural heritage designation. These areas are currently either protected areas not yet regulated or natural heritage designations which are primarily



## Arctic-alpine Flora

Some Great Lakes islands, especially those in Lake Superior, provide habitat for a distinct group of plants whose main distribution is much further north in arctic tundra environments, or in alpine environments and marine coastal areas elsewhere in the continent. These disjunct occurrences (those separated widely from the main area of distribution) of arctic alpine flora are a significant feature of Great Lakes islands and shorelines.

Botanists have been fascinated with this aspect of the Great Lakes flora since the nineteenth century when Louis Agassiz and John Macoun identified occurrences of arctic-alpine plants on Great Lakes shorelines (Voss, 1978). Geological evidence indicates that most of the Great Lakes basin was ice-covered during the Wisconsin glaciation, consequently there was a complete extinction of plants and animals at that time (Given and Soper, 1981). As the ice retreated approximately 11,000 years ago, the area was colonized by plants characteristic of arctic and alpine environments which occurred along the glacial margin. With continued warming, most of the arctic-alpine vegetation was replaced by other types of vegetation representing warmer climates, but arctic-alpine species persisted where there was a colder than average microclimate: on exposed rocky shorelines of Lake Superior and northern Lake Huron, and on north-facing cliffs and narrow canyons.

Some notable examples of islands with arctic alpine flora are the Slate Islands, Pic Islands, the Black Bay archipelago, Isle Royale, Michipicoten Island and the Apostle Islands in Lake Superior. There are also examples on coastlines, cliffs and canyons on the mainland, for example the Ouimet Canyon in Ontario and the Keweenaw Peninsula in Michigan.

Some of these species are relatively showy in flower, like Lake Huron Tansy, Entire-leaved Mountain Avens, Small-flowered Anemone and Northern Indian-paintbrush; others are less conspicuous: Russet Sedge, Alpine Sedge and Alpine Bluegrass. Most arctic-alpine plants are low-lying, an adaptation to take advantage of the heat available near the ground and to resist the strong winds they are subjected to. They prefer sites where the substrate is calcareous and some species, like Small-flowered Anemone and Entire-leaved Mountain Avens, can grow with very little soil, in the crevices of rocks.

A few of these arctic-alpine plants are rare in Great Lakes states. For example, the Lake Huron Tansy is considered rare in Wisconsin and in Michigan



Small False Asphodel, a disjunct arctic plant found on Lake Superior island shorelines.

(NatureServe, 2009). Alpine Milk-vetch is rare in Wisconsin and Minnesota. These and other arctic-alpine species are not rare or designated as being at risk in Ontario or globally because they are relatively abundant along the Hudson Bay coast. Arctic-alpine plants are regionally rare in the Great Lakes basin and are of conservation importance both because they are a distinct part of the flora and because they reflect the glacial history of the area. They may also be genetically distinct as a result of a long period of isolation. Most occurrences are in remote and inaccessible locations, so they are not threatened directly by human activities. They are however, threatened by human-induced climate warming, as they are completely dependant on the cold microclimate of their habitats. In Ontario, highly disjunct occurrences of arctic alpine species in the Great Lakes basin are considered to be of conservation concern and are tracked by the Natural Heritage Information Centre, while their occurrences in the Hudson and James Bay lowlands are not (Oldham, 2006).



### *Landscape Context*

Lake Superior is the world's largest freshwater lake and the deepest of the Great Lakes. The Lake Superior coastline and its islands are sparsely populated and the lake is considered the least impacted lake of all the Great Lakes.

Many of the islands are concentrated in the northwest portion of the lake, along Black Bay Peninsula, while the remainder of the islands generally hug the mainland shoreline across the lake (Figure 6). Isle Royale, St. Ignace Island and Michipicoten Island are the largest of the islands in this basin. Lake Superior also contains Caribou Island, the most isolated island in the Great Lakes located in the east end of the lake.

### *Biodiversity Assessment*

The islands are characterized as resistant bedrock outcrops in high energy coastal environments. Larger islands can include communities such as mature boreal forests and inland wetlands, cliffs, cobble beach ridges and swales and rocky shorelines that may contain unique arctic-alpine disjunct communities. Smaller islands are characterized by cobble terraced beaches or rock outcrops that often have sparse vegetation or are exposed due to the lake winds.

More than one dozen globally rare species are documented on Lake Superior islands, including American White Pelican, Auricled Twayblade and several species of Moonwort. There are four globally rare species that are also Great Lakes endemic - two species of Moonwort, Pitcher's Thistle and Kiyi. More than 50 Great Lakes disjunct species including Western Moonwort, Mountain Bladder Fern and Black Sedge also have documented occurrences.

Many islands of the Black Bay Peninsula have high biological diversity and provide important ecosystem functions such as providing suitable habitat for fish and stopover sites for landbirds. The highest scoring islands for biodiversity in Lake Superior include Pie Island, St. Ignace Island, Isle Royale and St. Joseph

Island. Many of the Lake Superior islands also have key terrestrial ecological system diversity and the presence of rivers and lakes on larger islands.

### *Threats to Biodiversity*

Many of the islands in Lake Superior do not have documented threats associated with them. Some islands such as Isle Royale, Michipicoten Island and St. Ignace Island have limited residential development and other building structures such as lighthouses. There is also evidence of aquatic invasive species such as Ruffe, Rusty Crayfish and Rainbow Smelt associated with some islands along the Black Bay Peninsula. The western part of St. Joseph Island, that is included in a Lake Superior coastal environment, is considered to be the most threatened island in the basin as it has considerable residential and recreational development as well as quarries.

### *Conservation Assessment*

Approximately half of the islands have some type of conservation status or designation, with nearly three-quarters of the highest biological diversity scoring islands being protected. Pie Island, a high scoring island in terms of biodiversity, has some land use designations but has few documented threats. St. Joseph Island and Sugar Island are also high scoring biodiversity islands with limited natural heritage designations and higher levels of associated threats.

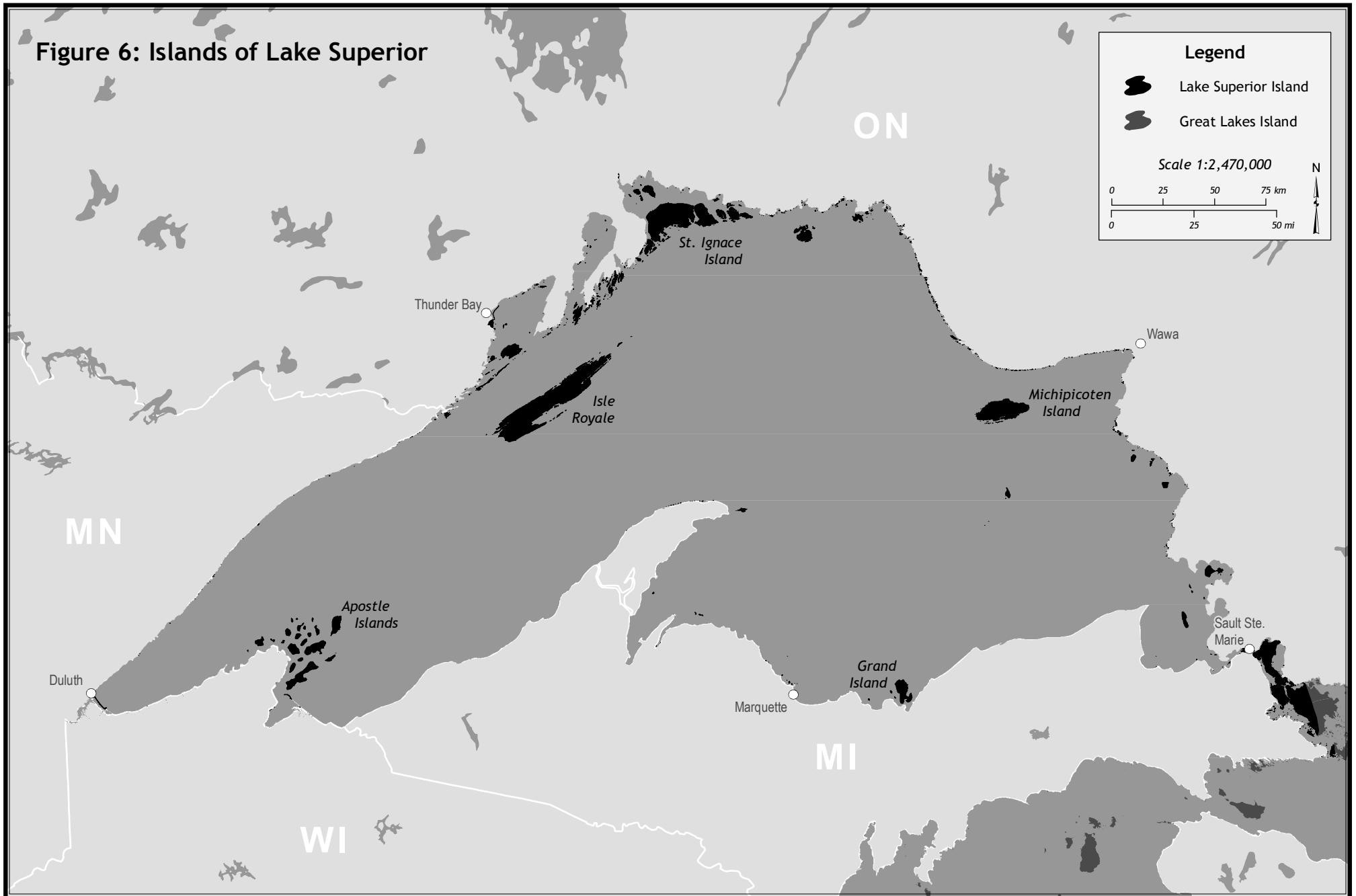
#### **Overview:**

- Total number of islands: 2,591
- Total area of islands (ha): 197,360
- Total length of island coastline (km): 2,468
- Total island area as regulated protected areas (ha): 145,500

#### **Key Islands for Biodiversity Conservation:**

- Pie Island, St. Ignace Island, St. Joseph Island, Ile Parisienne, Patterson Island, Isle Royale

Figure 6: Islands of Lake Superior



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006; National Atlas of the United States, 2005



# Lake Michigan

## *Landscape Context*

Lake Michigan is the third largest of the Great Lakes, and the only Great Lake located entirely within the United States. The Lake Michigan coastline supports 12 million people, with the southern tip of the lake heavily industrialized. Many small cities in Northern Michigan are centred on recreational development and tourism. There is a large seasonal population that is attracted to the Lake Michigan beaches and the 'Singing Sands', with this recreational development extending to some of the islands.

The majority of the islands are concentrated in the northern portion of the lake close to the mainland (Figure 7). The remainder of the islands primarily hug the mainland shoreline further south in the lake. Beaver Island, in the northeastern portion of the lake, is the largest island in the lake basin.

## *Biodiversity Assessment*

The bedrock of the islands is predominantly dolomite. Manitou Islands are limestone with limited representation of shale and black shale. Larger islands can include communities such as mature forests and inland wetlands and beach shorelines. Smaller islands are characterized by beaches or rock outcrops that may have sparse vegetation.

There are more than six globally rare species documented on Lake Michigan islands, including Dwarf Lake Iris, Houghton's Goldenrod, Pitcher's Thistle and Piping Plover. Over a dozen species are documented from Lake Michigan islands that are rare in Michigan and Wisconsin. These species include American Bittern, Common Tern, Michigan Monkey-flower, Calypso and Pumpelly's Bromegrass.

Many of the islands in upper Lake Michigan have high biological diversity, including sites for colonial nesting waterbirds along the northern fringe and Door Peninsula as well as providing important ecosystem functions such as suitable habitat and occurrence of fish. The highest scoring islands for biodiversity in Lake Michigan

include Beaver Island, Washington Island (east and west), Garden Island and Hog Island. Many of the northern Lake Michigan islands also have key terrestrial ecological system diversity and the presence of globally rare species.

## *Threats to Biodiversity*

Many of the islands in Lake Michigan do not have documented threats associated with them. Approximately five percent of the islands in Lake Michigan have limited residential and recreational development. Beaver Island and Washington Island are considered to be the most threatened islands in the basin as they have considerable residential and recreational development. Washington Island also has sand and gravel pits on its western side.

## *Conservation Assessment*

Approximately six percent of the islands have some type of conservation status or designation. Nearly one-third of Lake Michigan islands having high biological diversity scores are protected. Beaver Island, the highest scoring biodiversity island, has approximately one-third of its area protected as nature preserves or conservation easements as well as wildlife areas and forest management areas. Beaver Island has a higher number of documented threats for Lake Michigan. Nearby Garden Island and Hog Island are also high scoring biodiversity islands but with very limited threats and are included within the Beaver Island State Wildlife Research Area Beaver Islands Group managed for conservation.

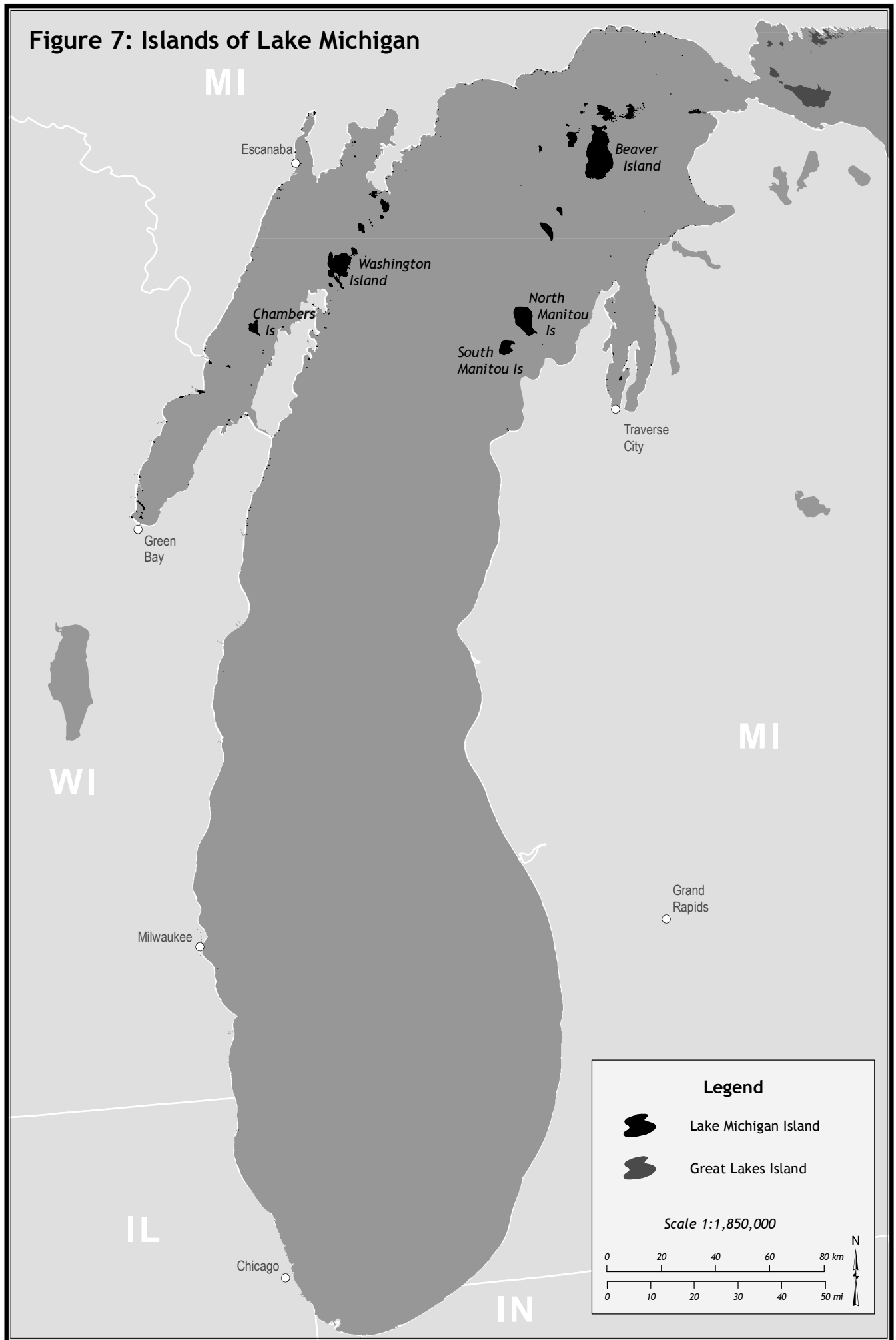
### Overview:

- Total number of islands: 726
- Total area of islands (ha): 34,818
- Total length of island coastline (km): 530
- Total island area as regulated protected areas (ha): 15,898

### Key Islands for Biodiversity Conservation:

- Beaver Island, Washington Island, Garden Island, Hog Island

Figure 7: Islands of Lake Michigan



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; ESRI, 2006; National Atlas of the United States, 2005



*Landscape Context*

Lake Huron is the second largest of the Great Lakes and includes Georgian Bay; however for this report, Lake Huron and Georgian Bay have been analyzed separately because of the great difference in the number and types of islands. Therefore, Lake Huron, in this context, describes the portion of Lake Huron that includes islands east of the Straits of Mackinac, the southern portions of Drummond Island to Manitoulin Island, the western shores of Bruce Peninsula and areas southward (Figure 8). This summary does not include Georgian Bay and the North Channel.

A large portion of islands in Lake Huron (in this context) are concentrated east of the Straits of Mackinac, Saginaw Bay and along the southern shores of Manitoulin Island and western shores of the Bruce Peninsula. Excluding Manitoulin Island, Cockburn Island, Drummond Island and Bois Blanc Island, the majority of islands in Lake Huron are small, primarily hugging the shores of these larger islands or the mainland.

*Biodiversity Assessment*

Manitoulin Island, the largest freshwater island in the world, is part of the chain of Niagara Escarpment islands that are characterized by limestone and dolomite. Southern islands are often either sand/sandy-loam soils or silty substrates usually with little relief. The islands that are dominated by Great Lakes - St. Lawrence forests are primarily coniferous forests and mixed coniferous and deciduous forests in the north and deciduous forests in the south. Alvars and Great Lakes beaches and dunes are present particularly on limestone islands. Wetlands are also present, primarily in sheltered embayments.

There are more than one dozen globally rare species documented on Lake Huron islands, including Piping Plover, Eastern Foxsnake, Ram’s-head Lady’s Slipper, Hill’s Thistle and Western Moonwort. There are four globally rare species that are also endemic to the Great Lakes - Lakeside Daisy, Pitcher’s Thistle, Houghton’s Goldenrod, Dwarf Lake Iris and Lake Huron

Locust. Many islands of Lake Huron have high biological diversity, including important ecosystem functions such as suitable habitat and occurrence of fish and stopover sites for birds.

*Threats to Biodiversity*

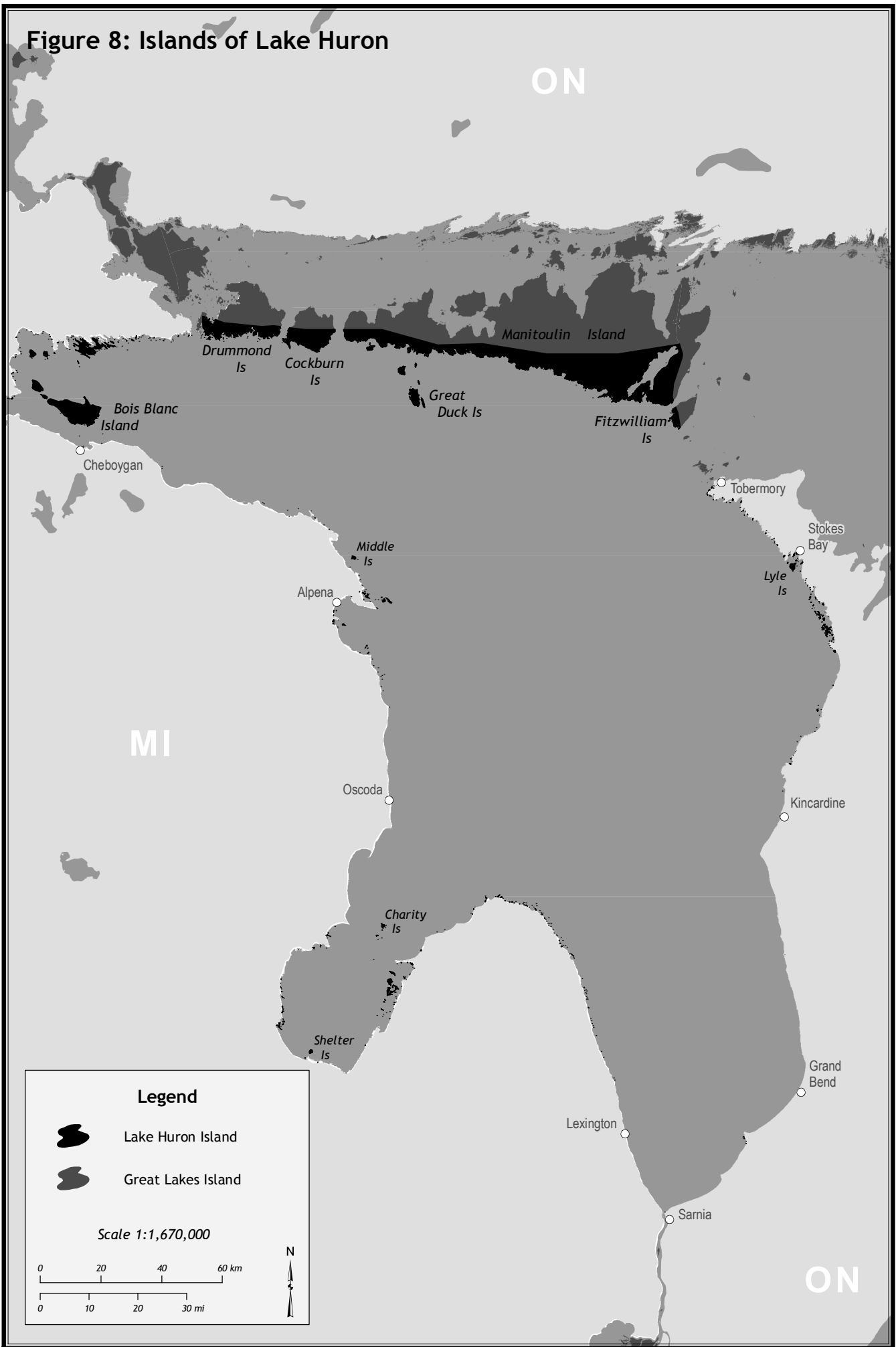
The majority of the islands in Lake Huron (excluding Georgian Bay), have little or no documented threats associated with them. The remainder of the islands are largely affected by building densities, of which 14 islands are considered to have high building densities. These islands are generally unprotected complexes along the base on the Bruce Peninsula and Bois Blanc Island in the Straits of Mackinac. Manitoulin Island is considered to be the most threatened island in the area as it has considerable residential development, recreational areas, access points, presence of quarries and aquatic invasive species. Drummond Island also has many threats, including quarrying, recreational activities and deer overbrowsing.

*Conservation Assessment*

Less than 10% of the islands have some type of conservation status or designation. Less than one-quarter of the highest biological diversity scoring islands are protected. The southern portion of Manitoulin Island, a high scoring island in terms of biodiversity, has some land use designations but has many documented threats. Cockburn Island, also a high scoring biodiversity island, does not have natural heritage designations and has low threat levels.

<p><b>Overview:</b></p> <ul style="list-style-type: none"> <li>• Total number of islands: 1,687</li> <li>• Total area of islands (ha): 119,917</li> <li>• Total length of island coastline (km): 1,438</li> <li>• Total island area as regulated protected areas (ha): 2,301</li> </ul> <p><b>Key Islands for Biodiversity Conservation:</b></p> <ul style="list-style-type: none"> <li>• Manitoulin Island, Cockburn Island, Drummond Island</li> </ul>
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Figure 8: Islands of Lake Huron



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; ESRI, 2006; National Atlas of the United States, 2005



*Landscape Context*

Georgian Bay is part of Lake Huron, the second largest of the Great Lakes. The Georgian Bay coastal environments, in the context of this study, encompass Georgian Bay and the North Channel, including the northern portion of Manitoulin Island and the eastern side of the Bruce Peninsula. Only islands within the Georgian Bay coastal environments are included in this summary (Figure 9).

The Georgian Bay area has the largest number of islands in the Great Lakes, which are generally distributed along the mainland south of the North Channel to Nottawasaga Bay. There are some additional islands in Nottawasaga Bay and on the eastern side of the Bruce Peninsula. The majority of the islands are small and clustered together with the exception of large islands such as Parry Island, Phillip Edward Island, Great LaCloche Island, Clapperton Island and Manitoulin Island.

*Biodiversity Assessment*

The complex shoreline of the North Channel and the northern portion of Georgian Bay are composed of bedrock outcrops, bays and many islands that are sheltered from wind and wave action. Forested islands are primarily coniferous forests and mixed coniferous and deciduous forests in the north and deciduous forests in the south. Alvars, beaches and dunes are also present, particularly on calcareous limestone islands. Beaches and dunes along the north shore differ in that they are composed of acidic sands. Wetlands of complex plant communities have developed in the protected embayments of islands and along the mainland.

There are more than one dozen globally rare species documented on Georgian Bay islands, including Hill’s Thistle, Eastern Foxsnake, Massasauga, Ram’s-head Lady’s-slipper, Laurentian Bladderfern and several land snails. There are two globally rare species that are also endemic to the Great Lakes - Houghton’s Goldenrod and Lakeside Daisy. There are more than 20 Great Lakes disjunct species, including *Hypnum recurvatum* (globally rare moss), Garita Skipperling, Small-flowered Blue-eyed Mary, American Beachgrass and Carey’s Smartweed.

Many islands in Georgian Bay have high biological diversity, including important ecosystem functions such as suitable habitat and occurrence of fish and stopover sites for landbirds.

*Threats to Biodiversity*

A considerable portion of islands in Georgian Bay have moderate to lower levels of threats, particularly in the North Channel. However, the islands along the eastern side of Georgian Bay north of Severn Sound are primarily exposed to moderate and/or higher levels of threat. These threats are primarily from high building densities and tourism development. Manitoulin Island is by far the most threatened island; despite having a relatively low building density it has significant areas of residential development, access points, and quarry development. Manitoulin Island also has considerable documentation of invasive aquatic species.

*Conservation Assessment*

Over one-third of these islands have some type of conservation status or designation. Less than one-quarter of the highest biological diversity scoring islands are protected. The northern portion of Manitoulin Island, a high scoring biodiversity island, has some land use designations and many documented threats. Great La Cloche Island, also a high scoring biodiversity island, has no natural heritage designations and low levels of threats.

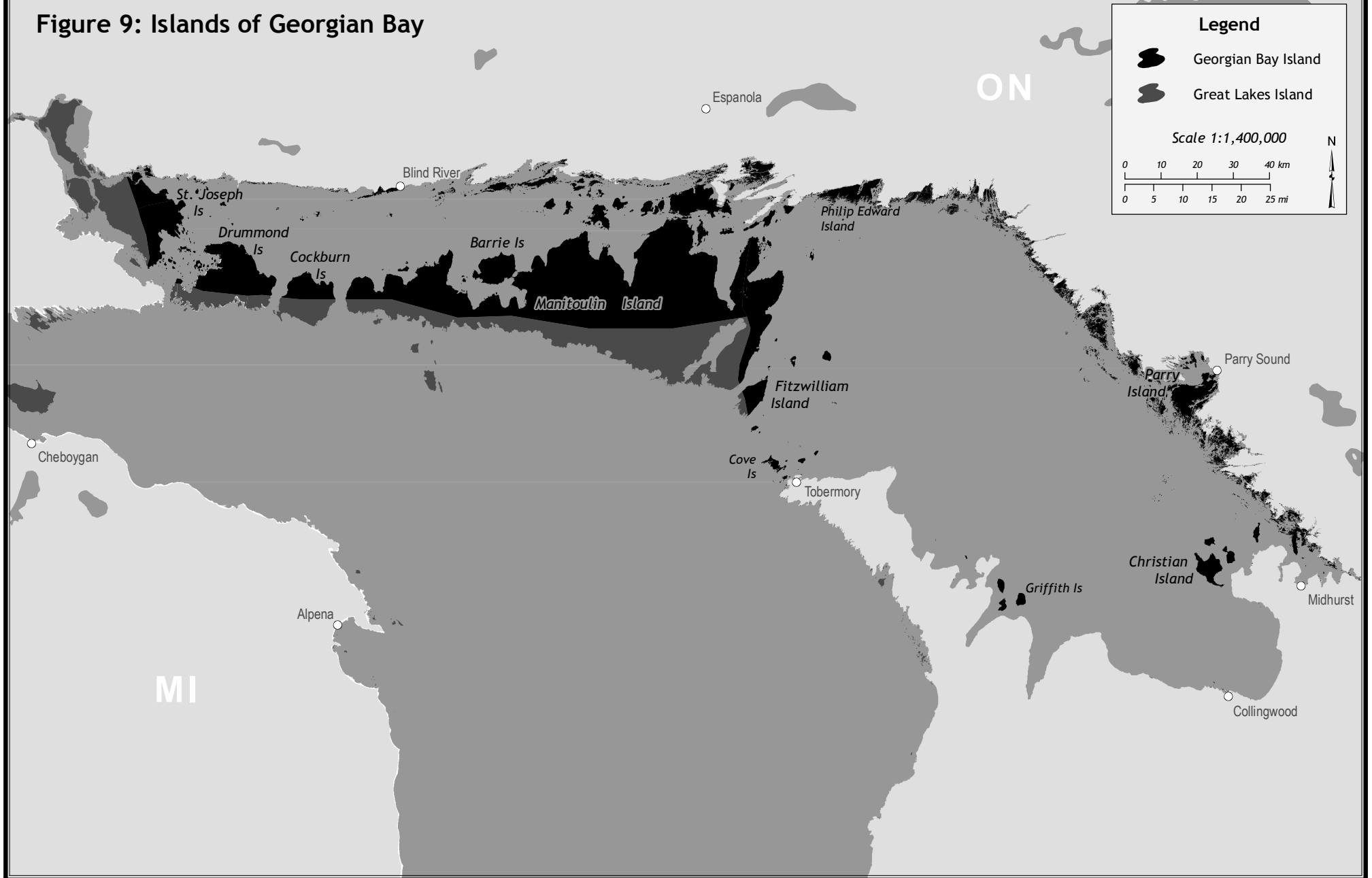
**Overview:**

- Total number of islands: 22,196
- Total area of islands (ha): 334,879
- Total length of island coastline (km): 6,355
- Total island area as regulated protected areas (ha): 33,887

**Key Islands for Biodiversity Conservation:**

- Manitoulin Island, Great LaCloche Island, Parry Island, Beausoleil Island, Philip Edward Island

Figure 9: Islands of Georgian Bay



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006; National Atlas of the United States, 2005



*Landscape Context*

The St. Clair coastal environments include the St. Clair River, Lake St. Clair and the Detroit River. The St. Clair River connects the outlet of Lake Huron to Lake St. Clair and has few islands, most of which are surrounded by rip-rap and retaining walls (Figure 10). Although not considered a Great Lake, Lake St. Clair is the shallowest and youngest lake in the Great Lakes system and has many islands that are generally congregated at the delta of the St. Clair River, the largest freshwater delta in the world. The Detroit River connects Lake St. Clair to Lake Erie and contains islands that are predominantly surrounded by hardened mainland shorelines in a highly urbanized landscape.

*Biodiversity Assessment*

The islands of the St. Clair River and Lake St. Clair along the delta are predominantly sand and gravel thought to have formed from the southern shores of Lake Huron and support extensive wetlands. Some areas of upland sand plain deciduous forests and oak savannahs are also present. The Detroit River was historically lined with marshes and some islands also contained lowland swamp forests and prairies. At present, some islands are created or modified by human activity, and the remaining islands are primarily coastal wetlands and some pockets of upland forests. Great Lakes coastal marsh complexes and lakeplain prairies and oak savannahs are found on some Lake St. Clair islands and are considered to be imperiled globally (Great Lakes Commission, 2004).

There are four globally rare species documented on St. Clair region islands - Prairie Fringed Orchid, Skinner’s Agalinis, Eastern Foxsnake and Pugnose Shiner. The Pugnose Shiner is also endemic to the Great Lakes. An additional 115 species are rare in Ontario and/or Michigan occur including American Bittern, King Rail, Channel Darter, Spotted Turtle, Butler’s Gartnersnake, Pink Milkwort, Sullivant’s Milkweed and Small White Lady’s-slipper.

Much of this region is identified as the Lake St. Clair Important Bird Area (IBA) and the Lower Detroit River IBA, which are globally significant areas for waterfowl and congregatory species.

The islands and surrounding nearshore waters and mudflats are important areas for migratory waterfowl and uplands are stopover sites for landbirds.

*Threats to Biodiversity*

Over one-third of the islands scattered throughout the St. Clair area are considered moderately to highly threatened. The primary threats to this area include building and road densities and invasive plant species (not part of the U.S. ranking system). A dozen islands, including Grosse Isle and Stag Island have high building densities. Rare oak savannah and prairies are at risk due to residential and/or cottage development on some of the islands.

*Conservation Assessment*

More than one-third of the islands have some type of conservation status or designation. The majority of the highest biological diversity scoring islands have a natural heritage designation, but few are protected. Walpole Island, Squirrel Island, St. Anne Island, Harsens Island and Bassett Island are all high scoring biodiversity islands at the mouth of the St. Clair River. These islands have some natural heritage designation and have some threats. Harsens Island has a higher building density. The remaining islands that scored high in biodiversity at the mouth of the St. Clair River are included in the St. Clair Flats State Wildlife Area and are primarily protected or have natural heritage designation. These islands have high levels of associated threats due primarily to building densities and invasive species, especially

**Overview:**

- Total number of islands: 403
- Total area of islands (ha): 22,844
- Total length of island coastline (km): 689
- Total island area as regulated protected areas (ha): 3,012

**Key Islands for Biodiversity Conservation:**

- Walpole Island, Squirrel Island, St. Anne Island Complex, Johnston Channel Island Complex, Harsens Island



**Figure 10: Islands of St. Clair River, Lake St. Clair and the Detroit River**

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ON



**Legend**

-  St. Clair River, Lake St. Clair and Detroit River Island
-  Great Lakes Island

Scale 1:480,000

0 10 20 km  
0 5 10 mi

N

# Lake Erie



## *Landscape Context*

Lake Erie is the most southern and shallowest lake in the Great Lakes system. The islands found in the western-most area of the lake in the warm, shallow part of the basin are primarily composed of limestones and dolomites and are considered the most ecologically significant among the islands in Lake Erie. The group of islands known as the western Lake Erie islands include Pelee Island and Kelleys Island (Figure 11). Many species documented on these islands are considered at the northern edge of their distribution range.

## *Biodiversity Assessment*

Several large sand spits project out into Lake Erie, including Long Point, Turkey Point, Rondeau Peninsula and Point Pelee. Some areas along these sand spits are considered islands as water levels rise and separate areas from the mainland. In this study, there are islands identified in each of these areas except for Point Pelee. Extensive coastal wetlands have developed behind the large sand spits and are considered globally significant areas for migratory birds. The islands in the western basin are important for colonial nesting waterbirds.

The Niagara River is a connecting channel in the Great Lakes and drains Lake Erie into Lake Ontario. The islands here are predominantly composed of dolomite and are included in the Niagara Escarpment landform. Most of the islands in the Niagara River lie near Niagara Falls, the second largest waterfall in the world. Historically, many islands were composed of upland forests that were once cleared and used for agriculture and orchards. Several of the islands, including Navy Island, contain remnant old-growth Carolinian forests; natural succession and restoration is beginning to re-establish native communities. There are some wetlands surrounding islands in the reaches that are sheltered from the fast flow of the river.

There are seven globally rare species documented on Lake Erie islands including Eastern Foxsnake, Spatterdock Darner, Lakeside Daisy and Tuckerman's Panic Grass. Lake Erie Watersnake, a globally rare subspecies of Northern Watersnake, is also a Great Lakes

endemic species restricted to this lake. An additional five Great Lakes disjunct species are known to occur in Lake Erie, including Bushy Cinquefoil, Bayberry and Black-edged Sedge. There are some documented occurrences of Sand Cherry, a Great Lakes declining species.

## *Threats to Biodiversity*

Approximately one-third of the islands in Lake Erie and the Niagara River are considered to have moderate to higher levels of threat. About half of these islands, such as Pelee Island, Grand Island and island areas associated with Long Point, Turkey Point and Rondeau, are predominantly threatened from higher levels of building densities and recreational development. Pelee Island is considered to be the most threatened island in Lake Erie due to moderate building densities, residential development, high recreational use areas, conversion to cropland, aggregate extraction and several documented aquatic invasive species.

## *Conservation Assessment*

Approximately one-third of the islands are predominantly assigned some type of conservation status or designation, with approximately half of the highest biological diversity scoring islands being protected. Pelee Island, a high scoring biodiversity island, has natural heritage designations on approximately two-thirds of its landbase and has considerable documented threats. Kelleys Island is also a high scoring biodiversity island and has limited natural heritage designations with high levels of associated threats.

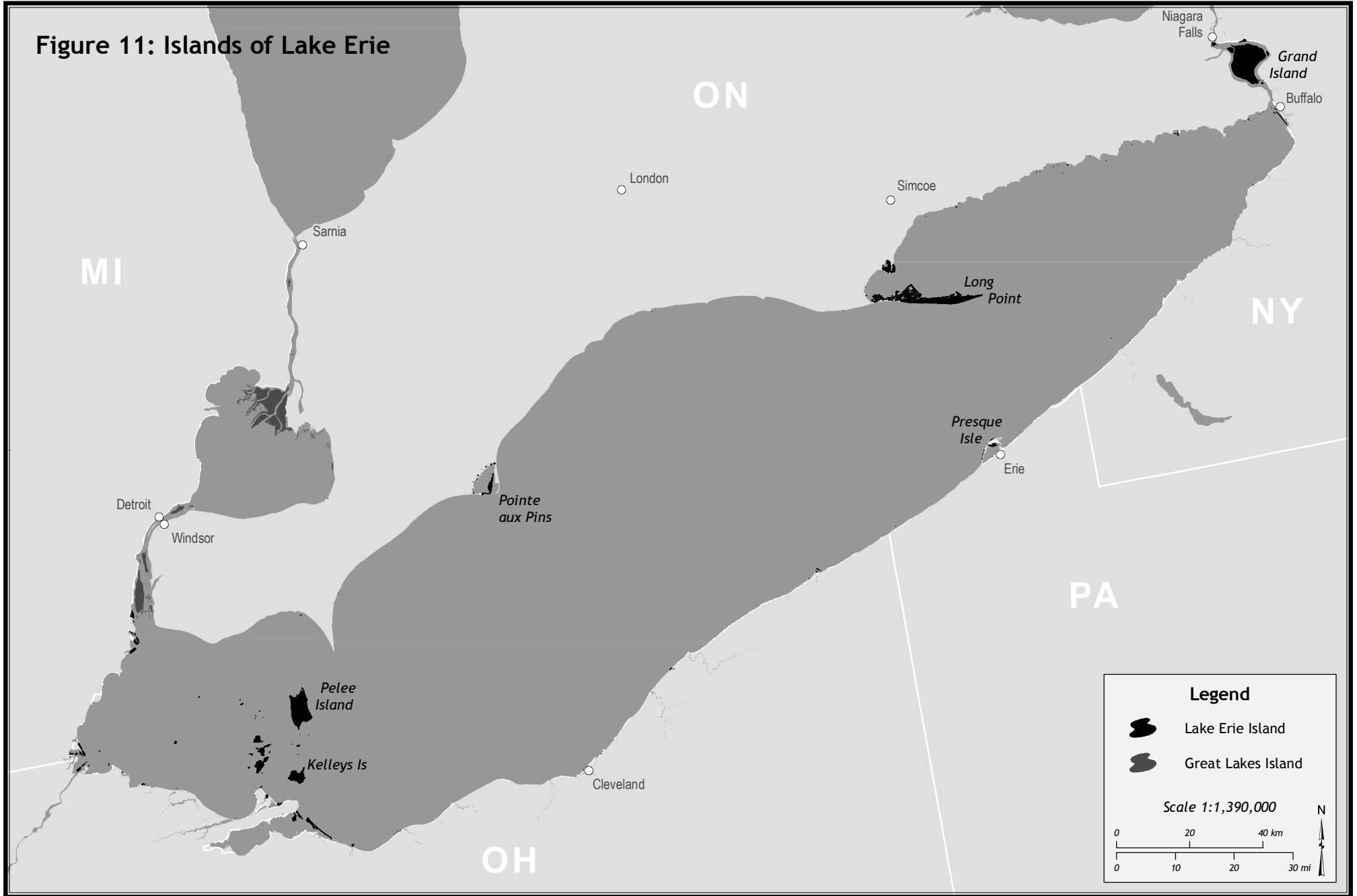
### **Overview:**

- Total number of islands: 1,773
- Total area of islands (ha): 17,330
- Total length of island coastline (km): 1,233
- Total island area as regulated protected areas (ha): 3,132

### **Key Islands for Biodiversity Conservation:**

- Pelee Island, Pointe Aux Pins, Long Point, Turkey Point, Kelleys Island

Figure 11: Islands of Lake Erie



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006; National Atlas of the United States, 2005



*Landscape Context*

Lake Ontario is the smallest and the second deepest lake in the Great Lakes. Several major cities line the northwestern end of the lake in Canada and the southern boundary of the lake is largely rural with some intermingled cities. Many of the islands hug the mainland shoreline across the lake, therefore making them easily accessible to the large population of urban dwellers (Figure 12).

The majority of islands are found in the eastern portion of Lake Ontario which also contains the largest group of islands for the lake. The largest island on the lake is Wolfe Island, located near the entrance of the St. Lawrence River, with other large islands such as Amherst Island, Howe Island, Grindstone Island and Big Island nearby.

*Biodiversity Assessment*

The southwestern portion of Lake Ontario contains a limited number of islands that are predominantly unconsolidated materials such as clay-silts, sand and gravel with some sedimentary rock outcrops. These islands are close to the mainland and many have been impacted by the densely populated shoreline. The central and eastern part of the lake contains islands that are predominantly limestone outcrops and resistant Precambrian Shield rock. The complex shorelines and embayments surrounding these islands provide for wetlands, as well as some upland deciduous forests, mixed forests and alvars.

Nearly one dozen state or provincially rare species are documented on Lake Ontario islands including Common Tern, Black Tern, Short-eared Owl, Northern Map Turtle, Eastern Ratsnake, Deerberry and Awned Sedge. There are documented occurrences of American Sea-rocket and Seaside Spurge, two Great Lakes disjunct species.

The islands of Lake Ontario are important for colonial nesting waterbirds and migratory birds, particularly in the eastern portion of the lake where there are identified Important Bird Areas and Bird Conservation Areas.

*Threats to Biodiversity*

Historically many of the larger islands in this area have been cleared and converted to agriculture. Several islands have undergone natural succession and some restoration back to a more natural state. The islands within the western portion of the lake are subjected to threats, primarily due to residential and recreational development and documented invasive aquatic species. The islands in the central and eastern part of the lake are considerably less threatened; primarily from buildings and historical development. The exceptions include islands used heavily for recreation such as Amherst, Howe, Cornwall and Wolfe Islands. Wolfe Island is by far considered the most threatened island in the area due to threats such as residential development, aggregate extraction, construction of wind turbines and some documented aquatic invasive species. Black Swallowwort (also known as Dog Strangling Vine) is listed as the most common invasive plant in the Lake Ontario basin and is in the top 20 list of invasives of New York natural areas (Kaufman and Kaufman, 2007)

*Conservation Assessment*

Approximately one-third of the islands have some type of conservation status or designation. A limited number of highest biological diversity scoring islands are protected. Wolfe Island and Amherst Island, both high scoring biodiversity islands, are identified as Important Bird Areas and have higher levels of threats primarily from recreational and residential development. Howe Island also has high biodiversity and higher levels of associated threats with limited natural heritage designations.

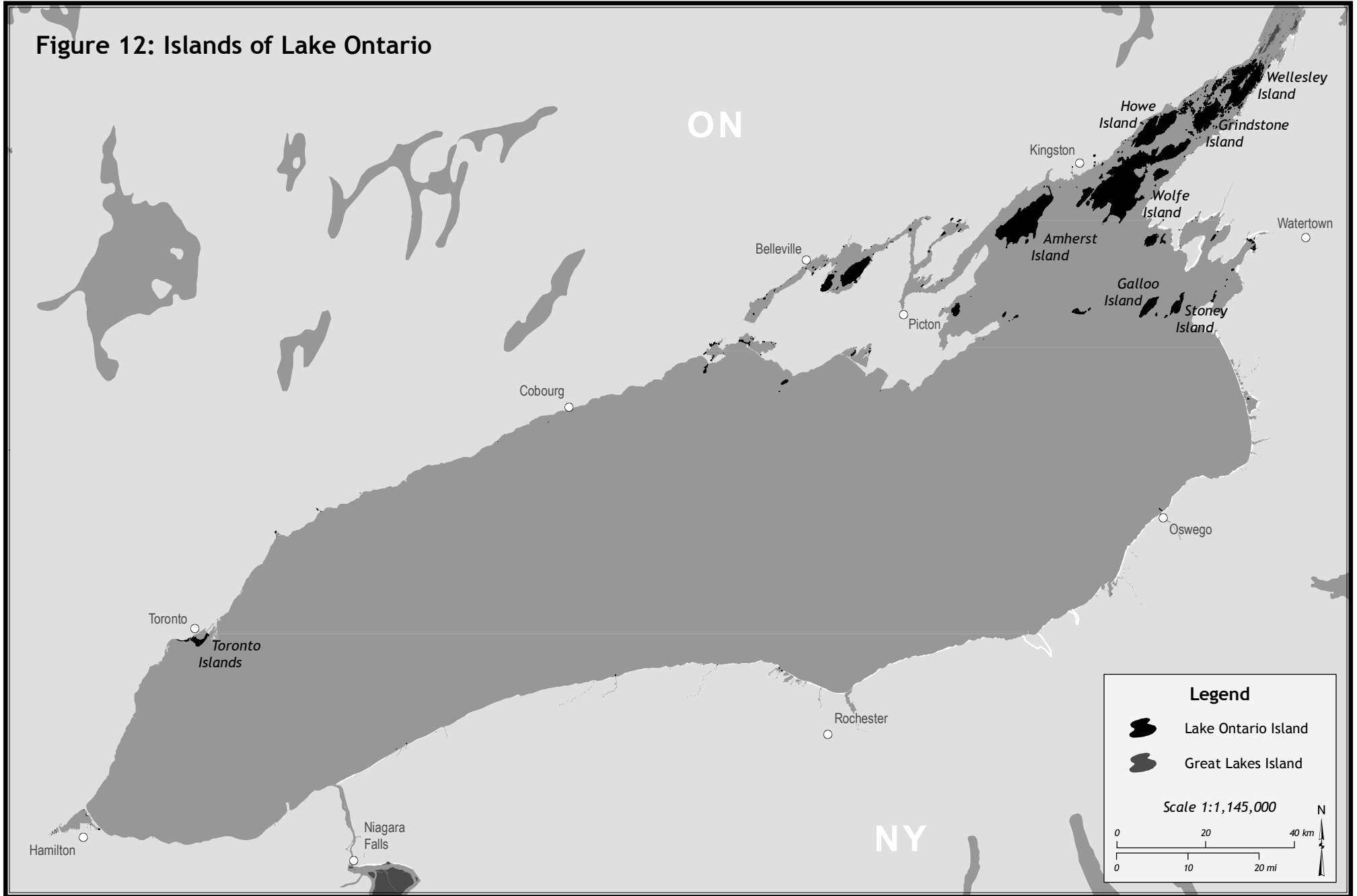
**Overview:**

- Total number of islands: 1,847
- Total area of islands (ha): 34,638
- Total length of island coastline (km): 964
- Total island area as regulated protected areas (ha): 942

**Key Islands for Biodiversity Conservation:**

- Wolfe Island, Amherst Island, Howe Island, Big Island, Wellesley Island

Figure 12: Islands of Lake Ontario



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006; National Atlas of the United States, 2005



*Landscape Context*

The St. Lawrence River drains Lake Ontario and is the outlet for the Great Lakes system into the Atlantic Ocean. This river has the largest discharge of any river in North America (Environment Canada, 1994). It is a complex of islands and channels, and contains the well-recognized Thousand Islands region near the outlet of Lake Ontario. A smaller concentration of islands occurs in the vicinity of Barnhart Island.

Islands in the St. Lawrence River are generally sheltered and are influenced more by river processes than wind-generated wave processes. Barnhart Island and Cornwall Island are the largest of the islands in the St. Lawrence River.

*Biodiversity Assessment*

The islands of the St. Lawrence River occur at the transition zone between the deciduous and mixed forest regions, and contain several species at their northern range limits. Many of the islands are very rugged and experience pronounced micro-climatic effects. Many of these islands are characterized by low vegetated banks, exposed bedrock bluffs and wetlands. Some island shorelines have been modified with rip-rap.

Nearly 20 state or provincially rare species are documented on St. Lawrence River islands including Bald Eagle, Common Tern, Black Tern, Least Bittern, Eastern Ratsnake, Lake Sturgeon, Blackchin Shiner, Deerberry and Lesser Fringed Gentian.

Several islands in the St. Lawrence River have high biological diversity, including important ecosystem functions such as wetland habitats, and occurrences of important stopover sites for landbirds. The highest scoring islands for

biodiversity in the St. Lawrence River include Ault Island, Grenadier Island, Barnhart Island and Tar Island. Many of the St. Lawrence River islands also have key terrestrial ecological system diversity including key shoreline systems.

*Threats to Biodiversity*

The islands in the St. Lawrence River exhibit moderate to lower levels of threat from residential and cottage development. The exceptions include islands used heavily for recreation such as Bloomsfield Island and the Smith Island Complex. Cornwall Island is considered the most threatened island in the area primarily due to residential development, boat launches, aggregate extraction and some documented aquatic invasive species.

*Conservation Assessment*

Approximately one-quarter of the islands have some type of conservation status or designation, with very few of the highest biological diversity scoring islands being protected. Ault Island, a high scoring biodiversity island, is protected as a migratory bird sanctuary but has a moderate level of documented threats primarily due to development. Grenadier Island is also a high scoring biodiversity island and has large portions designated as protected within the St. Lawrence Islands National Park and other portions designated as important natural heritage designations. This island has lower to medium levels of associated threats.

**Overview:**

- Total number of islands: 852
- Total area of islands (ha): 8,545
- Total length of island coastline (km): 594
- Total island area as regulated protected areas (ha): 2,988

**Key Islands for Biodiversity Conservation:**

- Ault Island, Grenadier Island, Barnhart Island

Figure 13: Islands of the St. Lawrence River



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006; National Atlas of the United States, 2005

## Pitcher's Thistle and Dune Ecosystems

Humans tend to think of dunes and the associated beaches as areas primarily for our recreation. The more accessible beaches are often popular holiday destinations and they can be crowded with sunbathers, vehicles and cottages. Dune ecosystems of the Great Lakes are also globally unique ecosystems that provide habitat for many rare plants and animals and are now the focus of significant conservation efforts. The Great Lakes contain the most extensive freshwater dune systems in the world (Pitcher's Thistle - Dune Grasslands website, 2009).

Dunes are formed at the head of small coves, in large arching bays, or on the tops of low forelands, baymouth bars and tombolo bars (a sandbar that connects an island to the mainland or another island) (Jalava, 2006). Sand is carried by currents flowing along the shore and deposited where the current slows. It is carried on shore and deposited on higher ground by the wind. Dune systems in coastal areas of islands and the mainland can consist of a single low beach ridge or of multiple ridges, varying in size and shape. Dunes and beaches are inherently dynamic systems and are eroded and added to continually by the wind, currents and storm events. Dune ecosystems are adapted to constant natural disturbances but they are vulnerable to overuse by humans. Vegetation colonizing dunes helps to stabilize them: grasses and small herbaceous plants are the first colonizers, followed by shrubs and trees. Dune vegetation can be very extensive with wetlands, grasslands and forests interspersed along former beach ridges.

Dune vegetation types cover a range from sparsely vegetated dune grasslands to meadow marshes to dune and swale forests and swamps. Some of these types are nationally and globally rare and are of conservation concern.

Excellent examples of Great Lakes dune ecosystems occur on islands. Great Duck Island, Western Duck Island, and Manitoulin Island in Lake Huron; the



Pitcher's Thistle with Monarch Butterfly



Dune grassland at Desert Point on Great Duck Island.

Manitou Islands, Beaver Island, High Island, Garden Island and Bois Blanc Island in Lake Michigan; and Grand Island in Lake Superior all support outstanding dune ecosystems.

Dune grasslands support an array of uncommon and rare plants and animals. Pitcher's Thistle is an endangered species (nationally endangered in Canada, nationally threatened in the U.S.) that occurs in dune grasslands, and is found only in the Great Lakes region (Jalava, 2006). It occurs in dune ecosystems along the shores of Lake Michigan, Lake Huron and at one location along the south eastern shore of Lake Superior. Islands contain some of the largest populations of the species. Plants growing in association with Pitcher's Thistle include American Beach Grass, Long-leaved Sand Reed, Little Bluestem, Wild Rye and Lyre-leaved Sand Cress (Higman and Penskar, 1999). It sometimes occurs in association with another Great Lakes endemic, Houghton's Goldenrod, a species that also occurs in alvars (Morton, 1979). Pitcher's Thistle produces a substantial basal rosette of leaves but requires 5-8 years of growth before it flowers. Insects, like bees and butterflies, are important agents in pollination and the seeds are dispersed by wind and water. This plant, like other plants of dune ecosystems, is adapted to a changing environment subject to periodic disturbance, but intensive foot and vehicular traffic can increase erosion, destroying vegetation and introducing non-native species like Bouncing Bet and Spotted Knapweed (Albert, 2000).

Historically, the beaches and fore-dunes of Great Lakes islands provided extensive breeding habitat for the Piping Plover, a bird designated as Endangered in both the U.S. and Canada (Powell and Cuthbert, 1992). The number of pairs nesting in the Great Lakes declined drastically in the 1940s and 1950s, along with increasing shoreline development. A small number of Piping Plovers continues to breed on islands in the Great Lakes, so there is still hope that this population can recover.

## 4.0 Recommendations and Next Steps

The Great Lakes support the largest collection of freshwater islands in the world, and these islands are a key component of the region's biodiversity. They are home to distinct plant and animal communities composed of species able to colonize islands or, for those islands that once were part of the mainland, were able to persist on islands following isolation. The net result is a rich biological legacy that includes colonial nesting waterbirds, endemic species and plant communities, disjunct species, critical stopover sites for migratory birds, rich reptile fauna on some island archipelagos, and important fish spawning and nursery areas. Islands may also provide important refugia for species sensitive to climate change and, in some cases, are buffered from colonization by invasive species, especially small islands with little human activity.

This report is intended to provide information to land managers, property owners and decision-makers on the importance of conserving Great Lakes islands, the continuation of protection and identify priorities for action. Information generated from this analysis can also be integrated into local conservation planning. The analysis also revealed that there is a continuing need to improve information gathering and assessment of these islands and that conservation work does not consistently include Great Lakes islands, resulting in some considerable information gaps. The following provides a summary of suggested next steps to advance the conservation of Great Lakes islands. There is a growing appreciation of the importance of Great Lakes biodiversity, and opportunities, such as the renewal of the Great Lakes Water Quality Agreement, the Canada-Ontario Agreement Respecting the Great Lakes and the U.S. Great Lakes Restoration Initiative which may provide the incentives required to complete conservation actions that have long-term benefits. These recommendations are summarized below, and have been organized using the IUCN taxonomy of conservation actions (IUCN-CMP, 2006):

### *1. Land/Water Protection*

The coastal environment summaries presented in Appendix A often identify islands that contain areas of high conservation significance that are unprotected. These sites should be considered priorities for land protection.

Regional, state and provincial assessments of biological and physical representation and condition for parks and protected areas planning

should consider islands separately from the mainland given their unique functions and composition.

### *2. Land/Water Management*

Many high priority islands occur within existing parks and protected areas. Updating inventories and management plans to some of these sites would be beneficial to guide zoning and visitor use.

There are significant opportunities to assist private landowners and associations in the development of management strategies for priority islands.

### *3. Species Management*

There are gaps in the inventory of many Great Lakes islands. Updating or conducting new inventories would strengthen the ability to identify, compare and prioritize areas for a variety of purposes.

Islands offer an opportunity to manage for "invasive species free zones".

### *4. Education & Awareness*

There are many opportunities to share information with island landowners and decision-makers on the importance of Great Lakes islands. Several local sessions were held as part of this project (through the Great Lakes Islands Framework) to provide information on the context of Great Lakes islands and locally significant features. The Great Lakes Islands Symposium should be regularly repeated at different locations.

### *5. Law & Policy*

Species policies related to land-use planning should be considered for islands given their significance for natural heritage conservation. This could include local land-use studies and Official Plans, and comprehensive planning policies such as Ontario's Provincial Policy Statement.

### *6. Livelihood, Economic & Other Incentives*

The natural values of islands are an important asset to support existing and future ecotourism.

### *7. External Capacity Building*

Many local organizations in the Great Lakes have been instrumental in protecting islands. Further steps to enable and build capacity in these organizations could be supported through special funding programs that are targeted at promoting Great Lakes island conservation.

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## Appendix A: Coastal Environments



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\*See Figure 1 (page 7) for geographic location and spatial extent of coastal environments in the Great Lakes.

## Northwest Bays

### Lake Superior 1 Coastal Environment

Number of islands: 167  
Number of large islands: 27  
Number of island complexes: 117  
Total island area (ha): 25,256  
Total length of coastline (km): 278

**Major Habitat Types:** Temperate Broadleaf and Mixed Forest; Western Great Lakes Forests; Boreal Forest; Central Canadian Shield Forests.

**Key Islands for Biodiversity Conservation:** La Grange Island, McKellar Island, Mission Island, Pie Island, Simpson Island, St. Ignace Island-North, Vert Island.

#### Landscape Context

The Northwest Bays are characterized by rugged bedrock uplands and low energy rocky shores with many bays and large islands. This coastal environment includes Thunder Bay, Black Bay and Nipigon Bay. White Spruce and Balsam Fir are most abundant in the forested coastal areas. The cooler summers and high humidity of this area provide conditions suitable for relict arctic vascular plants associated with the bedrock shoreline. Red Pine and White Pine also occur here at their northern limit. The island shoreline is characterized by low vegetation banks, exposed bedrock bluffs and mixed pebble and cobble beaches.

The Northwest Bays also include a high diversity of island types. Pie Island, one of the largest islands completely within this coastal environment, includes a striking mesa hill with gully-bisected cliffs that rise 120 m above the lake (Noble, 1976). In contrast to the high cliffs of Pie Island, Flatland Island is less than 5m above the lake, and is one of the youngest islands in western Lake Superior, emerging as post-glacial lake levels have slowly dropped (Noble, 1980). Flatland Island includes a moist Balsam Fir forest and Black Spruce-Eastern White Cedar bog complex. This island also has cobble and gravel terraced beach ridges. These dynamic ridges result from major storm events and ice scouring. Many small, low islands within this coastal environment are dominated, or even formed by these terraced beaches (e.g Bonnet Island, Nuttall Island, Bent Island).

#### Biodiversity Assessment

##### *Biological Diversity:*

**Species:** Rare species in Northwest Bays include American White Pelican, Peregrine Falcon and Woodland Caribou and Laurentian Bladder Fern. Five Great Lake disjunct species and two globally rare species have been documented in the Northwest Bays.

**Ecological Systems:** Dominant terrestrial system types include mixed and coniferous forests on bedrock and mixed forests on till and intolerant hardwoods on bedrock. The key ecological system of the Northwest Bays is wetland bogs. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), exposed bedrock bluffs, exposed sediment bluffs and shelving bedrock.

**Ecosystem Functions:** The islands in the Northwest Bays are primarily near-shore islands and therefore have lower importance for stopover sites for landbirds. The more isolated islands, such as Chrichton Island, Burnt Island, Frog Island and Hare Island, may provide emergency refugia. There are known occurrences of seasonal fish spawning for Brook Trout, Lake Trout, Lake Whitefish, Northern Pike and Lake Herring. There is some evidence of Bloater, Shortjaw Cisco, Walleye and Yellow Perch. Suitable habitat for interjurisdictional fish species includes boulder, cobble and sand beaches, fringing wetlands, broad wetlands and submerged rock.

##### *Physical Diversity:*

The majority of islands and island complexes have low to medium shape complexity. Nisbet Island is among the islands with the most shape complexity. The geology of the Northwest Bays islands includes conglomerate, sandstone and shale, mafic and related intrusive rocks, and sedimentary rocks. Nine islands contain basaltic bedrock, including St. Ignace Island and Simpson Island. The dominant shoreline diversity is characterized as low vegetated banks and exposed bedrock bluffs ranging from one to five metres in elevation.

##### *Island Size:*

Nine large islands dominate the area with size ranging from 136 to 13,116 hectares. St. Ignace, Pie, Simpson and Vert Islands are the largest islands in the Northwest Bays. The remaining islands are predominantly less than two hectares in size.

##### **Threats to Biodiversity**

The near-shore islands of the Northwest Bays include some of the largest islands in Lake Superior, which result in these islands being some of the most accessible on the Canadian portion of Lake Superior. The predominant threat on a limited number of islands is recreational development such as St. Ignace Island. However most islands in the Northwest Bays have little to no documented threats and generally remain as undeveloped intact wilderness.

Many of the islands are likely used for wilderness camping by canoeists and kayakers. There is also evidence of aquatic invasive species on some islands including St. Ignace Island, Mission Island and McKellar Island. Some islands in this region are within the Thunder Bay and Nipigon Bay Great Lakes Areas of Concern (AOC). Thunder Bay was listed as an AOC due to contaminated sediments, and Nipigon Bay due to loss of shoreline habitats and declining fish populations (Environment Canada, 2006).

### Conservation Assessment

#### Existing Conservation

The 250 hectare westernmost mesa on Pie Island, Le Pate, is protected by the Le Pate Provincial Nature Reserve. Mission Island includes the provincially significant wetland, the Mission Marsh, which spans 160 hectares. The features of this provincially significant area, approximately half swamp and half marsh, are protected by the provincially significant wetland natural heritage designation.

More than half of the islands in the Northwest Bays are within the proposed 51,577 hectare Lake Superior Archipelago Conservation Reserve which if approved, will provide many of these islands with legislative protection.

The Lake Superior National Marine Conservation Area includes much of this coastal environment, encompassing all of Black Bay and Nipigon Bay. Several islands are included within this protected

area, including Fluor Island, Brodeur Island, Outan Island and the Cat Islands.

#### Conservation Assessment

All the islands in the table below are those with high biodiversity scores. St. Ignace, Vert and Simpson Islands have key ecological systems and shoreline diversity. All three islands and La Grange Island are included in the Lake Superior Archipelago Conservation Reserve that has been recommended for regulated protection. There are limited documented threats associated with Vert Island and Simpson Island. St. Ignace Island has some recreational development, anchorage sites and aquatic invasive species.

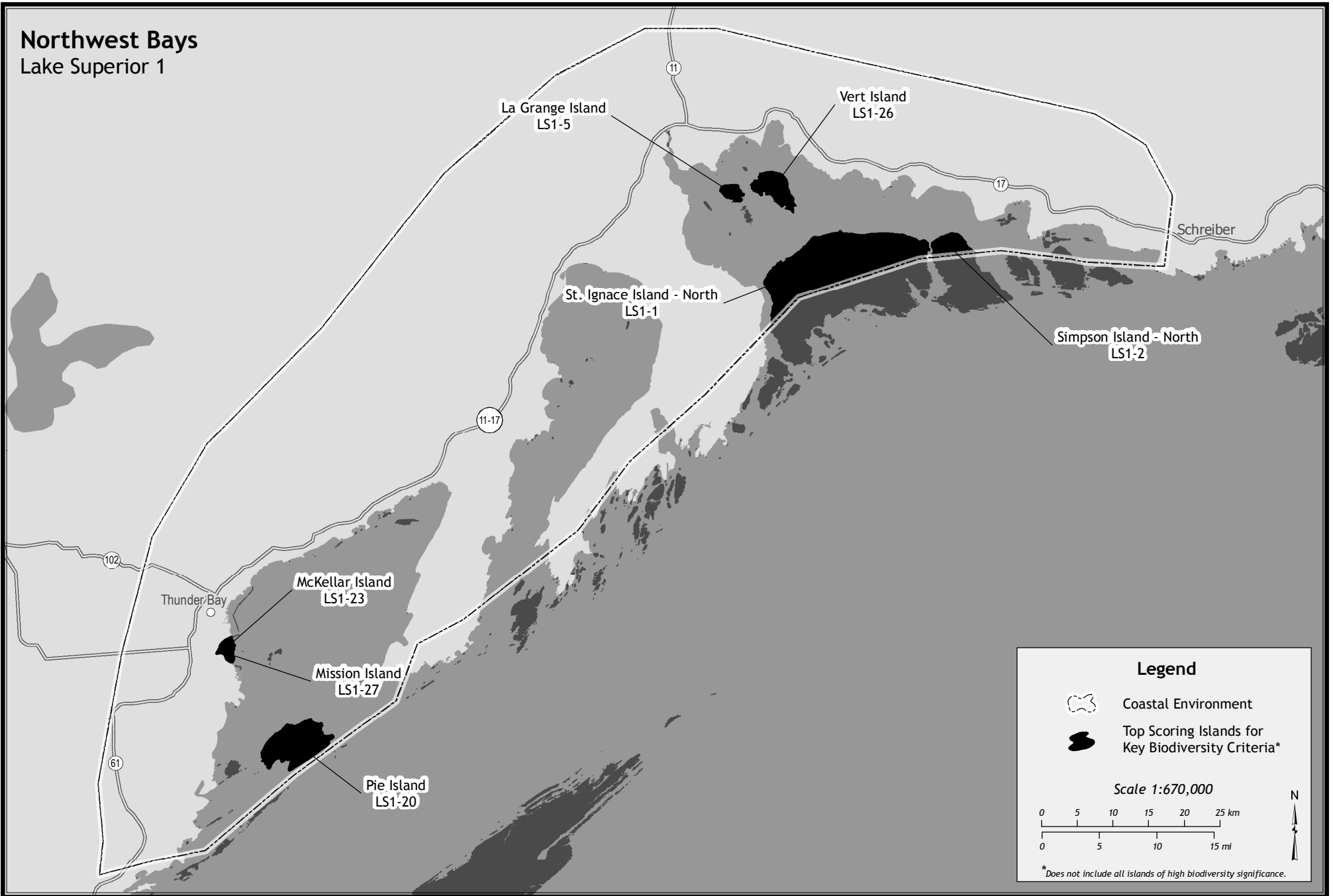
Pie Island provides habitat for several provincially rare species, globally rare species, species at risk and Great Lakes disjunct species. Pie Island also includes key ecological and physical diversity important for a variety of species including interjurisdictional fish. There is a lower level of threat known for this island. Mission Island and adjacent McKellar Island provide habitat for a provincially rare species and a Great Lakes disjunct species. These islands also provide key ecological systems and shorelines. Both islands have been threatened to some extent by aquatic invasive species as well as some boat launch sites. La Grange Island has key shoreline diversity and provides stopover sites for landbirds.

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Pie Island (LS1-20)	290		✓	✓		Lower	Largely unprotected
St. Ignace Island - North (LS1-1)	259		✓	✓		Higher	Protected
Vert Island (LS1-26)	230		✓	✓		Lower	Protected
McKellar Island (LS1-23)	181			✓		Higher	Unprotected
Mission Island (LS1-27)	179			✓		Higher	Some natural heritage protection
Simpson Island - North (LS1-2)	164		✓			Lower/Medium	Protected
La Grange Island (LS1-5)	163		✓			Lower	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Northwest Bays Lake Superior 1



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009, Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

# Lake Superior North Coast

## Lake Superior 2, 18 and 19 Coastal Environments

Number of islands: 1693  
Number of large islands: 95  
Number of island complexes: 581  
Total island area (ha): 86,067  
Total length of coastline (km): 1,169

**Major Habitat Types:** Temperate Broadleaf and Mixed Forest; Western Great Lakes Forests; Boreal Forest; Central Canadian Shield Forests.

**Key Islands for Biodiversity Conservation:** Edward Island, Fluor Island, Isle Royale-Main, Isle Royale-Southern, Mortimer Island, Patterson Island, Porphyry Island, Simpson Island, St. Ignace Island-South, Vein Island.

### Landscape Context

The north coast of Lake Superior includes the rugged outer islands that form an arch from Pigeon River east to Pukaskwa National Park as well as Isle Royale. This region is an exposed, high energy coast with fetch distances up to 500 km. The island coastlines are predominantly resistant bedrock shores with few beaches that have high terraced beaches and log debris lines. Like the Northwest Bays, this area has cooler summers and high humidity which provides suitable conditions for relict arctic vascular plants along the shoreline. Red and White Pine also occur here at their northern limit.

The outer north shore contains more islands than any other coastal environment in Lake Superior. This region includes the outer sections of many large islands that also include protected coasts (see Northwest Bays). Many of the islands are small and remote and remain undisturbed. This region is generally characterized by small isolated islands. Some islands, such as the linear chain of islands in the west, include high rocky outcrops. Distinctive cliffs, such as the "Sugarloaf" on Spar Island rise 60-80m above Lake Superior.

The Slate Islands and Isle Royale are perhaps the most noteworthy in this region due to their large size, relative isolation and presence of arctic-disjunct plants. These islands also have unique animal populations. Woodland Caribou occur on Slate Islands in the absence of predators<sup>4</sup>, resulting in a dense population that is altering plant communities (Sanders, 1990). Isle Royale has a cyclical relationship between Moose and Gray Wolves (Peterson et al., 1998).

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<sup>4</sup> Wolves did arrive on the islands in the early 1990s, but disappeared a few years later.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** More than one dozen rare species occur in the North Coast include Bald Eagle, Laurentian Bladder Fern and Woodland Caribou. Twenty four Great Lake disjunct species and two globally rare species have been documented on the North Coast. Colonial nesting waterbird populations of American White Pelican, Great Black-backed Gull, Herring Gull, Ring-billed Gull, Great Blue Heron and Common Loon have also been observed nesting or staging on the islands.

**Ecological Systems:** Dominant terrestrial system types include mixed forests on bedrock, coniferous forests on bedrock, and rock. The North Coast also includes the American Dune Grass - Beach Pea - Sand Cherry Dune Grassland Type, a globally rare plant community. The key ecological system of the North Coast is wetland bogs. Key shoreline communities include fringing wetlands, beaches (boulder, cobble, pebble, sand and mixed), exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The islands in the North Coast are primarily near-shore islands and therefore have a lower importance for stopover site for landbirds. The more isolated islands, such as Hawk Island, may provide emergency refugia for landbirds. There are known occurrences of seasonal fish spawning for Lake Trout. Bloater, Brook Trout, Lake Herring, Lake Whitefish, Northern Pike, Shortjaw Cisco and Walleye also occur here. Suitable habitat for interjurisdictional fish species includes boulder, cobble and sand beaches, fringing wetlands and submerged rock and reef.

#### *Physical Diversity:*

The majority of islands and island complexes have low to medium shape complexity. The majority of the exposed rocks such as Seagram Rock and Stench Rock have high shape complexity. The islands of Les Petits Ecris are among the islands with the most shape complexity. Over 100 islands in the North Coast contain metasedimentary rocks and over 500 islands contain basaltic rock. The dominant shoreline diversity is exposed bedrock bluffs ranging from one to five metres in elevation.

#### *Island Size:*

Ten large islands dominate the area with size ranging from 340 to 50,349 hectares. Ile Royale is, by far, the largest island in the North Coast. The remaining islands are predominantly less than 19 hectares in size.

### Threats to Biodiversity

The majority of the islands in the North Coast have no documented threats associated with them. A dozen islands have buildings and are generally single structures or clusters of small buildings for recreational camps. Several islands are also noted as anchorage sites, or as being used as residential, recreational or cottage areas. The islands which are documented as having the greatest overall threat include Isle Royale, Patterson Island, Porphyry Island, and St. Ignace Island. St. Ignace Island has also been noted to have aquatic invasive species.

Some islands in this region are within Jackfish Bay and Peninsula Harbour Great Lakes Areas of Concern (AOC). These sites were listed as AOCs primarily due to contaminated sediments (Environment Canada 2006).

### Conservation Assessment

#### Existing Conservation

Approximately 70% of the islands in this coastal environment have some portion of their area protected or assigned natural heritage designations. Isle Royale is a designated National Park and Important Bird Area. In Canada, federally owned islands less than 100 hectares in size located between Thunder Cape and Bottle Point, and nine larger islands with high heritage values are protected within Lake Superior National Marine Conservation Area. Patterson Island, Porphyry Island and portions of Edward Island are provincial parks. Several islands in the North Coast are included in the proposed Lake Superior Archipelago Conservation Reserve.

Bowman and Paradise Islands together comprise a life science area of natural and scientific interest (ANSI). These islands are also recognized as earth science ANSIs: Bowman Island for its raised cobble beaches and Pukaskwa pits and Paradise Island for its raised beach ridges with exceptionally small beach material. Most of Bowman Island is within the Lake Superior National Marine Conservation Area. Paradise Island is owned by the Thunder Bay Field Naturalists.

#### Conservation Assessment

The islands in the table below are those with high biodiversity scores. These islands are all large islands and many provide habitat for rare species, Great Lakes disjunct species and colonial nesting waterbirds. They also contain key ecological systems and shoreline types important to maintain biodiversity in this coastal environment. All of these islands are either protected through regulation as national parks, provincial parks or are within the proposed Lake Superior Archipelago Conservation Reserve. All of these islands have some limited level of residential development, primarily some small buildings or camp sites. The most threatened high scoring island in the North Coast is Isle Royale with seasonal residential development, a visitor centre and campgrounds as well as pits and trenches remaining from the copper mining operations once conducted on the island. The island was also a site of Lake Trout and Whitefish fisheries, as well as resorts. The remainder of these islands is exposed to limited recreational use, and St. Ignace Island has some evidence of aquatic invasives.

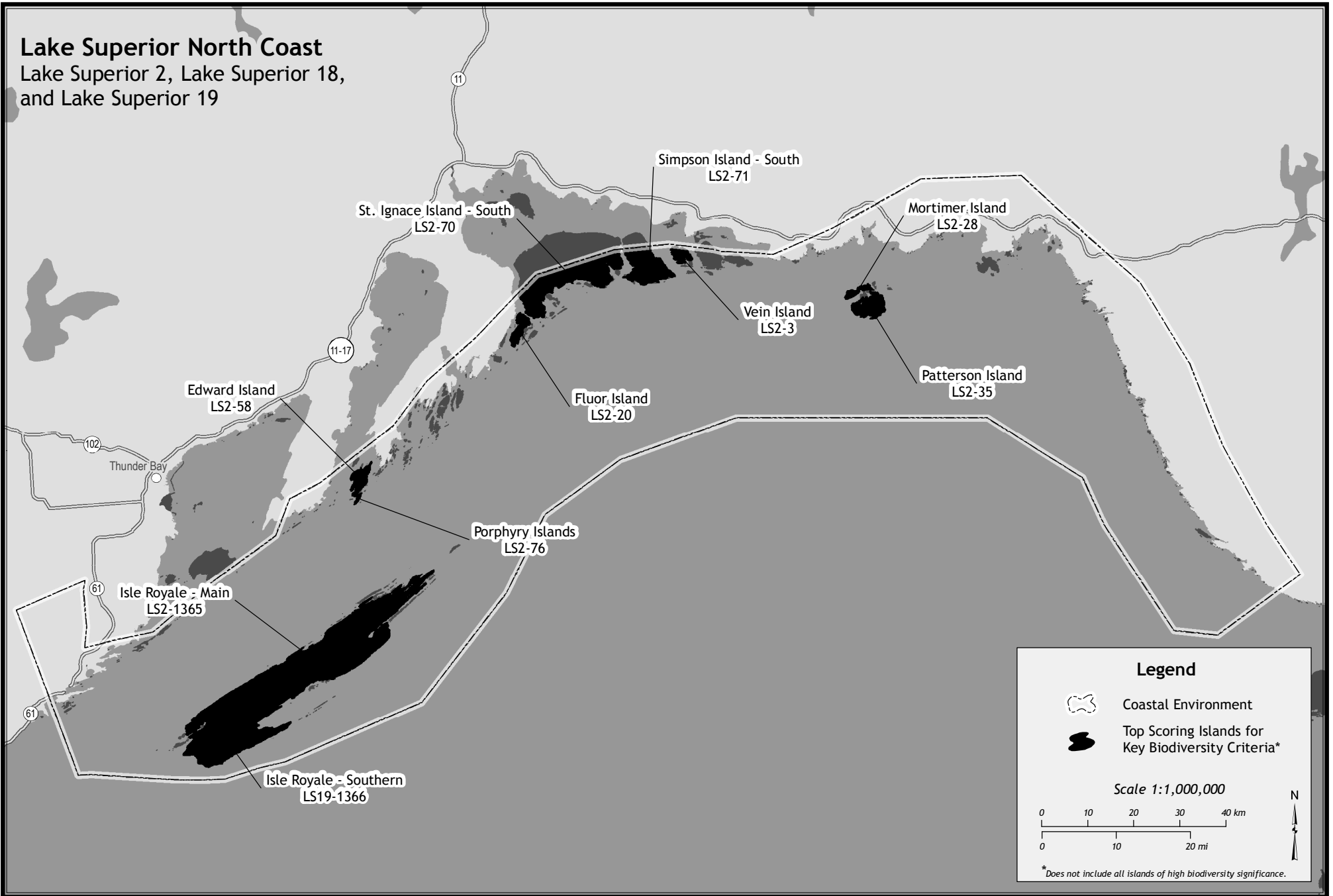
Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
St. Ignace Island - South (LS2-70)	288			✓		Higher	Proposed protected
Patterson Island (LS2-35)	253			✓	✓	Medium/Higher	Protected
Simpson Island - South (LS2-71)	246			✓		Medium	Proposed protected
Edward Island (LS2-58)	243			✓		Medium	Partly protected
Isle Royale - Main (LS2-1365)	237	✓			✓	Higher	Protected
Porphyry Island (LS2-76)	214			✓		Medium	Protected
Isle Royale - Southern (LS19-1366)	211	✓			✓	Higher	Protected
Vein Island (LS2-3)	204		✓			Medium/Higher	Protected
Fluor Island (LS2-20)	204			✓		Lower	Protected
Mortimer Island (LS2-28)	196			✓		Lower	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Superior North Coast

Lake Superior 2, Lake Superior 18,  
and Lake Superior 19



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009, Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

# Lake Superior Northeast Coast

## Lake Superior 3 Coastal Environment

Number of islands: 497  
Number of large islands: 9  
Number of island complexes: 162  
Total island area (ha): 21,091  
Total length of coastline (km): 231

**Major Habitat Types:** Temperate Broadleaf and Mixed Forest: Eastern Forest/ Boreal Transition.

**Key Islands for Biodiversity Conservation:** Agawa Islands, Cozens Cove Island Complex, Devils Chair, Leach Island, Michipicoten Island, Montreal Island and Rowe Island.

### Landscape Context

The islands of Lake Superior's Northeast Coast are characterized by small to medium sized nearshore islands that extend in a discontinuous archipelago along the shore. This region also includes some of the most isolated freshwater islands in the world.

The Northeast Coast is characterized by high energy coasts extending from Pukaskwa National Park to just south of Montreal River. The less severe microclimate in this region allows more southern Sugar Maple and Yellow Birch to dominate with extensive areas of wetlands in the valleys. Shoreline outcrops support arctic-alpine disjunct plant assemblages and beach ridge and swale communities can occur throughout islands. The islands along the mainland are characterized by rugged shorelines and beaches set within the transition between the Great Lakes - St. Lawrence and Boreal Forests.

The largest island in the Northeast Coast, and one of the largest islands in Lake Superior is Michipicoten Island at over 35,000 ha. This island has very rugged relief, with rocky knobs, talus slopes and cliff faces, and includes over 40 headwater lakes and large beaver ponds, and a variety of wetland types. The forests in the central portion of the island are more temperate than the western portion of Lake Superior and include Sugar Maple and Yellow Birch. Boreal types are represented along the shores and in exposed areas. The shoreline is very diverse and includes exposed rock, raised cobble beaches, beach ridge and swale complexes and sandy beaches. The beach near West Sand Bay includes dune communities. Exposed rocky outcrops support a lichen-low shrub heath community. Shoreline outcrops support arctic-alpine disjunct plant assemblages.

Located approximately 40 km south of Michipicoten Island, Caribou Island is the most isolated freshwater island in the world. The shores of Caribou Island include large sections of sandy beaches and dunes

(the island was formerly called the "Isle of the Golden Sands" on some earlier European maps). This island is based on Jacobsville Sandstone, although only few outcrops occur and most of the island is covered by sand or peat. Vegetation on the island includes forested dunes, wetlands between the dune ridges, open bogs and treed muskeg (Liebermann, 1998).

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are three rare species documented in the Northeast Coast including Algae-like Pondweed and *Diplophyllum taxifolium* (Liverwort). Four Great Lake disjunct species and the globally rare Peregrine Falcon have been documented on islands in the Northeast Coast. Colonial nesting waterbird populations of Great Black-backed Gull, Herring Gull and Ring-billed Gull have also been observed on the islands.

**Ecological Systems:** Dominant terrestrial system types include mixed forests on bedrock and mixed forests on glaciolacustrine deposits. The Northeast Coast also includes the American Dune Grass - Beach Pea - Sand Cherry Dune Grassland Type, a globally rare plant community. The key ecological system of the Northeast Coast is treed bogs. Key shoreline communities include beaches (boulder, cobble, pebble, sand and mixed), barrier beaches, exposed bedrock bluffs and exposed sediment bluffs.

**Ecosystem Functions:** The islands in the Northeast Coast are primarily near-shore islands and therefore have a lower importance for stopover site for landbirds. The more isolated islands, such as Caribou Island, Leach Island and Montreal Island may provide some refugia for landbirds. There are known occurrences of seasonal fish spawning for Lake Trout and seasonal fish migration for Brook Trout. There is some evidence of Bloater, Lake Herring, Lake Sturgeon, Shortjaw Cisco and Yellow Perch. Suitable habitat for interjurisdictional fish species includes boulder, cobble and sand beaches, mixed beaches and submerged rock.

#### *Physical Diversity:*

The islands and island complexes in the Northeast Coast are evenly spread among the varying degrees of shape complexity. Fourteen islands contain coarse clastic metasedimentary rock, four contain metasedimentary rock (wacke, siltstone, arkose), 75 islands contain mafic to ultramafic metavolcanic rocks (metasedimentary rocks), and 44 islands contain basalt and associated conglomerate. The dominant shoreline diversity is exposed bedrock bluffs ranging from one to five metres in elevation.

#### Island Size:

Nine large islands dominate the area with size ranging from 11 to 16,700 hectares. Michipicoten Island, Montreal Island, Caribou Island and Leach Island are the largest islands in the Northeast Coast. The remaining islands are predominantly less than one hectare in size.

#### Threats to Biodiversity

Few islands in the Northeast Coast have documented threats associated with them. Approximately one dozen islands, including Michipicoten Island, Dixon Island and Fawcett Island, have limited residential development and other building structures such as lighthouses. Other threats include anchorage sites, access sites for land vehicles and close proximity to mining claims, but the overall threat ranking for most islands in this coastal environment is quite low.

#### Conservation Assessment

##### Existing Conservation

Caribou Island, a 677 ha island at the southwestern boundary of the Northeast Coast, has been proposed as a life science area of natural and scientific Interest (ANSI). As both an important stopover site for migrating birds and a refuge for many rare plants, the protection of this island would be quite beneficial (Brown, 1982; Noble, 1982a Wormington, 1979).

Michipicoten Island Provincial Park provides protection to all of Michipicoten Island, offshore shoals, and all islands within 2.5 km of the shore.

The park protects a variety of significant features including lava bedrock formations, arctic-alpine disjunct species, caves, flower pots and post glacial beaches (OCDC, 1990).

Overall, approximately one-third of the islands in the Northeast Coast are protected through Michipicoten Island Provincial Park and Lake Superior Provincial Park. Other than the proposed Life science ANSI on Caribou Island, existing conservation and non-regulated natural heritage designations in this coastal environment is somewhat limited.

##### Conservation Assessment

All the islands in the table below are those with high biodiversity scores. These islands contain key ecological diversity and physical diversity. All of these islands, except for Cozens Cove Island Complex, are protected as part of Michipicoten Island Provincial Park or Lake Superior Provincial Park. Threats to these islands are very low, and include some buildings and limited recreational use. Cozens Cove Island Complex is located south of Pointe aux Mines, and contains key ecological diversity and shoreline diversity, and provides habitat for interjurisdictional fish and colonial nesting waterbirds. The Cozen Cove islands do not have any natural heritage designation and may only have very low threat from the adjacent mainland road.

#### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Michipicoten Island (LS3-1)	195		✓	✓		Higher	Protected
Montreal Island (LS3-9)	176			✓	✓	Lower	Protected
Leach island (LS3-5)	146			✓	✓	Lower	Protected
Cozens Cove Island Complex (LS3-67)	122		✓			Lower	Unprotected
Devils Chair (LS3-11)	122		✓			Lower	Protected
Agawa Islands (LS3-37)	119		✓			Medium	Protected
Rowe Island (LS3-6)	109					Lower	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Superior Northeast Coast

## Lake Superior 3

Hawk Junction

101

Wawa

Michipicoten River

Michipicoten Island  
LS3-1

Devils Chair  
LS3-11

Rowe Island  
LS3-6

Leach Island  
LS3-5

17

Agawa Islands  
LS3-37

Montreal Island  
LS3-9



Montreal River  
Harbour

Cozens Cove Island Complex  
LS3-67

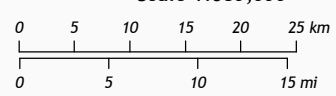
Batchawana  
Bay

77

### Legend

-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:680,000



\* Does not include all islands of high biodiversity significance.

## Batchawana Bay - Whitefish Bay

### Lake Superior 4 and Lake Superior 7 Coastal Environments

Number of islands: 81

Number of large islands: 5

Number of island complexes: 32

Total island area (ha): 3,587

Total length of coastline (km): 68

**Major Habitat Types:** Temperate Broadleaf and Mixed Forest: Eastern Forest/ Boreal Transition.

#### **Key Islands for Biodiversity Conservation:**

Batchawana Island, Coppermine Rock, Flowerpot Islands Complex, Ile Parisienne, Mamainse Point Island Complex, Maple Island, North Sandy Island, Rosseau Island Complex, South Sandy Island, Tugis Island Complex.

#### **Landscape Context**

The Lake Superior shoreline is a predominantly long stretch of exposed bedrock sloping steeply into deep water. However, the sheltered Whitefish Bay and Batchawana Bay provide examples of both deep and shallow water marsh communities such as those fringing wetland surrounding Batchawana Island. The islands farther from the sheltered Batchawana Bay are often characterized by sand beaches along the eastern side and exposed bedrock and cobble beaches on the west.

The nearshore islands of the Whitefish Bay are characterized by large islands of Jacobsville Sandstone (moderately resistant) and smaller islands of granite and basalt. The Sandy Islands and Ile Parisienne have outcrops of low exposed red and white sandstones, and shorelines dominated by sand and cobble beaches. Both contain excellent examples of beach and dune systems.

Wetlands are limited on these islands, with the exception of Batchawana Island located in Batchawana Bay and Ile Parisienne. The Batchawana Island wetlands are over 800 ha in size and represent the largest shoreline wetlands in eastern Lake Superior (Northeast Coast and Whitefish Bay). These diverse wetlands include emergent marshes (bulrush dominated), submerged aquatic beds and sedge meadows (Noble, 1982b).

#### **Biodiversity Assessment**

##### *Biological Diversity:*

**Species:** Bald Eagle is the documented rare species occurring in Batchawana Bay. This region also has documented observations of Lake Huron Tansy, a Great Lake disjunct species. Colonial nesting waterbirds, including Great Black-backed Gull, Herring Gull and Ring-billed Gull have also been observed on the islands.

**Ecological Systems:** Dominant terrestrial system types include tolerant hardwoods on glaciolacustrine deposits and Black Spruce and Pine on glaciolacustrine deposits and treed muskeg. This region also includes the Great Lakes Arctic-Alpine Basic Open Bedrock Shoreline Type, a provincially rare plant community in Ontario. The key ecological system of this region is bogs. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The islands in Batchawana Bay - Whitefish Bay are primarily near-shore islands and therefore have lower importance for stopover site for landbirds. The isolated Ile Parisienne may provide emergency refugia for landbirds by providing suitable habitat for food and shelter. This region also has known occurrences of seasonal fish spawning for Lake Trout and Lake Whitefish and some evidence of Lake Herring and Yellow Perch. Suitable habitat for interjurisdictional fish species includes boulder, cobble and sand beaches, mixed beaches, fringing wetlands and broad wetlands.

##### *Physical Diversity:*

All large islands have the least shape complexity, with the majority of island complexes having low to medium shape complexity. The majority of the islands contain sandstone, shale, conglomerate or basalt and associate conglomerate and arkose. The dominant shoreline diversity is sand beaches, low vegetated banks, boulder beaches and fringing wetlands.

##### *Island Size:*

Five large islands dominate the area with size ranging from 25 to 1,870 hectares. Batchawana and Ile Parisienne Islands are the largest islands in Batchawana Bay - Whitefish Bay. The remaining islands are mostly less than one hectare in size.

##### **Threats to Biodiversity**

There are few known threats to islands in this region. The Causeway (Harmony Island), Ile Parisienne and Mamainse Island Complex exhibit limited threat with some residential development and a few building structures. The structures on Ile Parisienne are a lighthouse and a few residential/recreational buildings. Large patches of Common Reed have been noted from the coastal marshes of Batchawana Island (Noble, 1982b). The remaining islands exhibit few or no documented threats.

### Conservation Assessment

#### Existing Conservation

Ile Parisienne is protected as a provincially regulated conservation reserve, covering an area of 933 hectares. Portions of North Sandy Island and South Sandy Island have been given natural heritage designations by an earth science area of natural and scientific interest covering 64 ha. North Sandy Island sandstone bedrock exposure is unique in Ontario, and the entire ANSI includes significant geological features that are either provincially or regionally rare or significant (Kor, 1995). The Sandy Islands are also protected through Sandy Islands Provincial Park, which covers an area of 76 ha (OMNR, 1999) and includes five islands in total.

### Conservation Assessment

All the islands in the table below are those with high biodiversity scores. Ile Parisienne contains key ecological and physical diversity, and provides habitat for interjurisdictional fish species. The island is regulated as Ile Parisienne Conservation Reserve and generally has a low level of threat from some buildings, including lighthouses. Batchawana Island provides habitat for a provincially rare species and contains key ecological and shoreline diversity, including fringing wetlands important for migratory waterfowl. The island does not have any natural heritage designation. There are very little documented threats for this island.

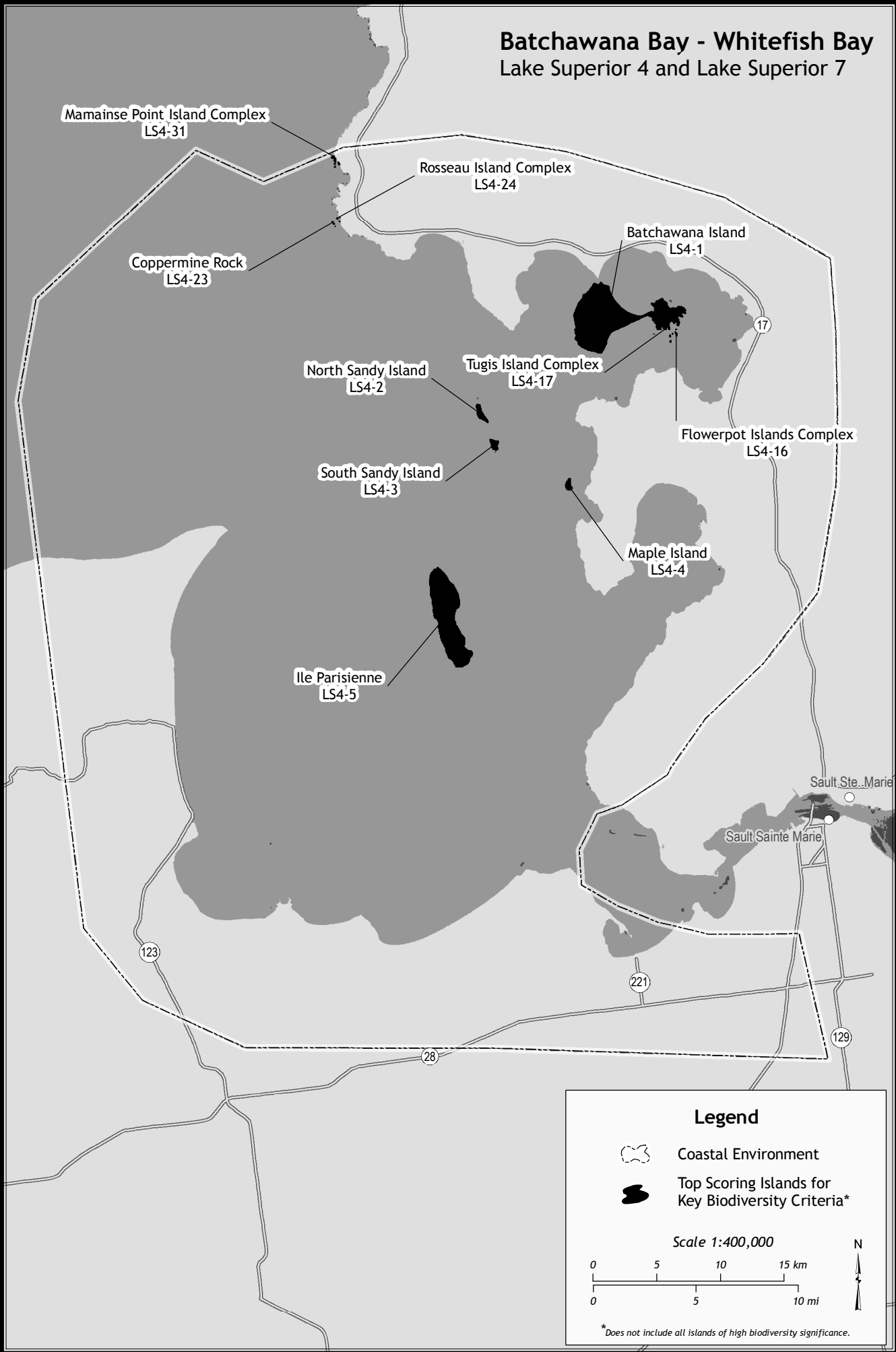
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Ile Parisienne (LS4-5)	253			✓	✓	Medium	Protected
Batchawana Island (LS4-1)	218			✓		Lower	Unprotected
South Sandy Island (LS4-3)	144			✓		Lower	Protected
Tugis Island Complex (LS4-17)	128		✓			Lower	Unprotected
Mamainse Point Island Complex (LS4-31)	125			✓		Medium	Unprotected
North Sandy Island (LS4-2)	124			✓		Lower	Protected
Maple Island (LS4-4)	114			✓		Lower	Other land use designations
Flowerpot Islands Complex (LS4-16)	108		✓			Lower	Unprotected
Coppermine Rock (LS4-23)	100		✓			Lower	Unprotected
Rousseau Island Complex (LS4-24)	100		✓			Medium	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Batchawana Bay - Whitefish Bay

Lake Superior 4 and Lake Superior 7



**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:400,000

0 5 10 15 km

0 5 10 mi

N

\* Does not include all islands of high biodiversity significance.

Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

# St. Marys River

## Lake Superior 5 (Can), Lake Superior 5, 6 (US) Coastal Environments

**Number of islands:** 694

**Number of large islands:** 17

**Number of island complexes:** 165

**Total island area (ha):** 36,199

**Total length of coastline (km):** 2,468

**Major Habitat Types:** Temperate Broadleaf and Mixed Forest, Eastern Forest/Boreal Transition; Eastern Great Lakes Lowland Forest.

**Key Islands for Biodiversity Conservation:** St. Joseph Island - West, Sugar Island, Squirrel Island, East Neebish Island, Neebish Island, Drummond Island - Southwest, Sankey Island Complex, Foreshaw Island Complex, North Hay Marsh Complex, Lime Island.

### Landscape Context

The St. Marys River is characterized by a mixture of low rock outcrops, narrow mixed sediment beaches and extensive wetland areas common in the sheltered bays. The island shorelines are generally sheltered from wave action, and sediments are transported through the river. Shorelines are characterized by cobble beaches, fringing wetlands, broad wetlands and low vegetation banks. Some of the island shoreline has been modified with rip-rap, particularly along Whitefish Island, Shingwauk Island and the McGregor Bay along the northern portion of St. Joseph Island.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Rare species in St. Marys River include Bald Eagle, Black Tern, Osprey and Sharp-tailed Grouse. Colonial nesting waterbirds, including the Common Tern, Black Tern, Double-crested Cormorant, Great Blue Heron and Herring Gull, have been observed on several of these islands. Lime Island once supported the largest Common Tern colony in the Great Lakes. St. Joseph Island has the most northerly population of Redside Dace, a species designated as Endangered in Canada.

**Ecological Systems:** Dominant terrestrial system types include sand plain forests, clay plain forest and pasture/abandoned fields. The key ecological systems of the St. Marys River islands include wetlands (bogs, fens, marshes and swamps), grass/meadow and beach and shorecliff forest complexes. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed) and exposed bedrock bluffs.

**Ecosystem Functions:** Colonial nesting waterbirds frequently use the sand and gravel shorelines of

smaller islands in the lower St. Marys River (Harris et al., 2009). There are known occurrences of seasonal fish spawning for species such as Lake Trout, Lake Whitefish, Brown Bullhead, Lake Herring, Lake Sturgeon and Walleye. Suitable habitat for interjurisdictional fish species includes cobble, sand and boulder beaches, fringing wetlands, broad wetlands and submerged rock.

#### *Physical Diversity:*

The majority of large islands have the least shape complexity, and the small islands and island complexes have medium shape complexity. Foreshaw Island Complex is among the islands with the most shape complexity. The geology of the St. Marys River islands includes quartz sandstone, diabase sills, sandstone and shale. The dominant shoreline diversity is cobble beaches and exposed bedrock bluffs. There are some low vegetated banks that also dominate some island shorelines.

#### *Island Size:*

Seventeen large islands dominate the area with size ranging from 15 to 17,827 hectares. St. Joseph Island, Sugar Island and Neebish Island are the largest islands in this region. The remaining islands are mostly less than two hectares in size.

#### **Threats to Biodiversity**

St. Joseph Island is the most threatened island in the St. Marys River as it has considerable residential and recreational development, and the presence of quarries. Five other small nearby islands are characterized with having a medium level of threat due to residential development primarily along their shorelines. Squirrel Island is threatened by residential and recreational development as well as the presence of a recreational dive site. The Foreshaw Island Complex has similar threats and includes a lighthouse. Whitefish Island is connected to the mainland via the International Bridge and the gap south of this island is bridged by 18 water control gates. The bridge to St. Joseph Island also crosses several small islands (e.g. Montague Island). Other threats include dredging, wake from freighters and invasive species. The remaining islands in this region have limited documented threats associated with them. The upper two-thirds of the St. Marys River have been listed as a Great Lakes Area of Concern due primarily to contamination. This has resulted in the loss of habitat and unhealthy wildlife populations (Environment Canada, 2006).

#### **Conservation Assessment**

##### *Existing Conservation*

The southern tip of St. Joseph Island is protected as the Fort St. Joseph National Historic Site of Canada

and managed by Parks Canada. This area is also designated as a Migratory Bird Sanctuary by the Canadian Wildlife Service of Environment Canada. Approximately 20% of the St. Marys River islands have natural heritage designations. For example, the northern coast of St. Joseph Island and portions of Sugar Island and Neebish Island and their associated fringing wetlands are contained within the St. Marys River Complex (Echo Bay, Ontario to Maxton Bay, Michigan) Important Bird Area. This area is nationally significant for colonial species such as the Black Tern. Several nationally threatened species have also been found to breed within the IBA, including the Common Tern and the Least Bittern (IBA Canada, 2004).

The Federation of Ontario Naturalists (Ontario Nature) owns and manages the Hay Marsh Nature Reserve (John Kerastas Tract) and the Nature Conservancy of Canada owns the adjacent Lanway and Caulka property. Both of these properties are located near the southern tip of St. Joseph Island. Hay Marsh is also designated as a Provincially Significant Wetland. Thirteen islands/island complexes within the St. Marys River that are Crown Land are within the Great Lakes Coast Enhanced Management Area (OMNR, 2007).

The Little Traverse Land Conservancy owns and manages Bailey Lagerstrom Preserve, Cook Island Preserve, Hay Pickering Preserve and Koren Preserve on Sugar Island. Other island parcels on Sugar Island are owned and managed by The Nature Conservancy, Michigan Nature Association and University of Michigan.

*Conservation Assessment*

All the islands in the table below are those with high biodiversity scores. Sugar Island, Foreshaw Island Complex and Sankey Island Complex provide important habitat for colonial nesting waterbirds. St. Joseph Island provides habitat for provincially rare species. East Neebish Island, Foreshaw Island Complex, Sankey Island Complex and the northern edge of St. Joseph Island are contained within the St. Marys River Complex Important Bird Area, a nationally significant area for congregatory species. East Neebish Island has limited threats from adjacent islands and the mainland. Foreshaw Island Complex and Squirrel Island has medium threat primarily from residential development. St. Joseph Island, Sugar Island and Drummond Island have the highest levels of threat in the St. Marys River with residential, recreational and industrial development.

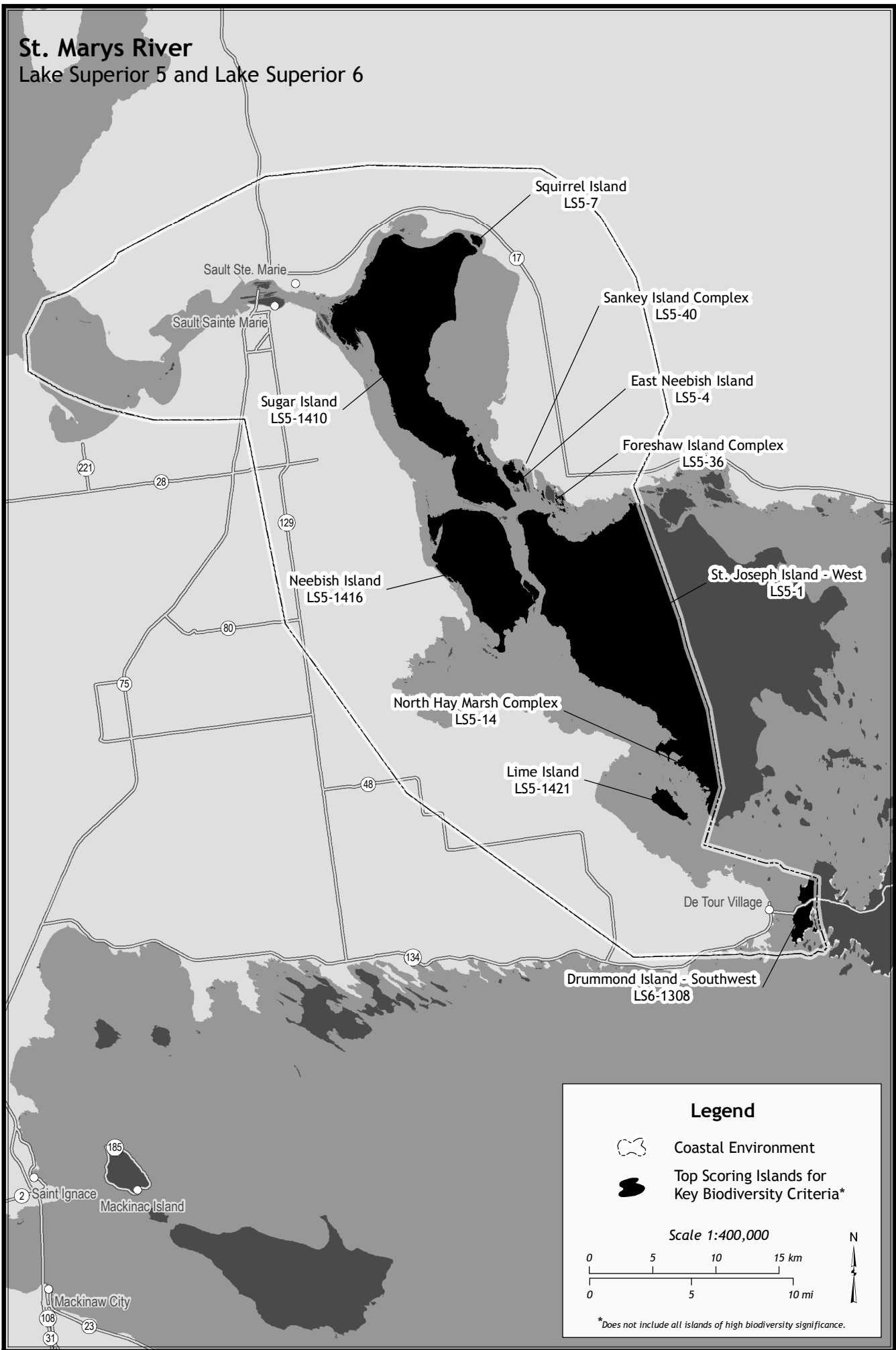
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
St. Joseph Island - West (LS5-1)	275		✓	✓		Higher	Some natural heritage designation areas
Sugar Island (LS5-1410)	237	✓		✓		Higher	Natural heritage designation
Squirrel Island (LS5-7)	188			✓		Medium/Higher	Unprotected
East Neebish Island (LS5-4)	184			✓		Lower	Natural heritage designation
Neebish Island (LS5-1416)	170		✓	✓		Medium/Higher	Unprotected
Drummond Island - Southwest (LS5-1308)	162		✓	✓		Higher	Unprotected
Sankey Island Complex (LS5-40)	159	✓		✓		Lower/Medium	Natural heritage designation
Foreshaw Island Complex (LS5-36)	151	✓	✓	✓		Medium/Higher	Natural heritage designation
North Hay Marsh Complex (LS5-14)	142		✓			Lower	Some natural heritage designation areas
Lime Island (LS5-1421)	136	✓		✓		Lower/Medium	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# St. Marys River

## Lake Superior 5 and Lake Superior 6



# Marquette Bay

## Lake Superior 9 Coastal Environment

Number of islands: 25  
Number of large islands: 4  
Number of island complexes: 13  
Total island area (ha): 5,054  
Total length of coastline (km): 63

**Major Habitat Types:** Deciduous forest, mixed forest, woody wetlands.

**Key Islands for Biodiversity Conservation:** Au Train Island, Grand Island, Granite Island, Little Presque Isle, Partridge Island, Wood Island.

### Landscape Context

Marquette Bay lies on the southern shores of Lake Superior and extends from Huron Mountain west of Conway Bay to Grand Island. The City of Marquette includes several small islands including Middle Island, Gull Island, Lover's Island, Presque Isle Pt. Rocks, White Rocks, Ripley Rock and Picnic Rocks.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Eight rare species in Marquette Bay include Bald Eagle, Flat Oat Grass, American Dune Wild-rye, Slender Cliff-brake and two globally rare species - Cudweed and Goblin Moonwort. The globally rare Great Lakes Marsh plant community is also documented here.

Several islands in Marquette Bay provide habitat for colonial nesting waterbirds, including Herring Gull and Double-crested Cormorants.

**Ecological Systems:** Dominant terrestrial system types include deciduous forests, mixed forests and woody wetlands. Grand Island contains a tombolo. Some islands, including AuTrain Island, support dense strands of Canada Yew. The key ecological system of Marquette Bay is the Great Lakes Marsh plant community. Key shoreline communities include baymouth barrier beaches and semi-protected wetlands.

**Ecosystem Functions:** The islands in the Northwest Bays are primarily near-shore islands and therefore have a lower importance for stopover site for landbirds. The more isolated islands, such as

Granite Island and Au Train Island, may provide emergency refugia. There are known occurrences of seasonal fish spawning for Lake Trout and Lake Whitefish.

#### *Physical Diversity:*

The islands and island complexes of Marquette Bay have low to medium shape complexity. The geology of Marquette Bay islands includes sandstone with some representation of shale, siltstone and conglomerate.

#### *Island Size:*

Four large islands dominate the area with size ranging from 33 to 4,887 hectares. Grand Island, Wood Island, Partridge Island and Au Train Island are the largest islands in Marquette Bay. The remaining islands are predominantly less than five hectares in size.

### Threats to Biodiversity

There is minimal documented development on Grand Island. The remaining islands in Marquette Bay do not have documented threats. Many islands are for sale for development, such as AuTrain Island.

### Conservation Assessment

#### *Existing Conservation*

Grand Island is designated for forest management within the Hiawatha National Forest. The remaining islands in Marquette Bay are not protected and are not identified as having any natural heritage designations.

#### *Conservation Assessment*

The islands in the following table are higher scoring biodiversity islands. Grand Island has high biodiversity significance and provide habitat for Lake Trout and Lake Whitefish. The island also provides habitat for eight documented rare species, including the globally rare Cudweed, Goblin Moonwort and the Great Lakes Marsh plant community. The island is within the Hiawatha National Forest. Grand Island was logged in the past, along with the construction of several cottages; the island is now managed for very limited development.



### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance						
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
Grand Island (LS9-1382)	235		✓	✓		Higher	Protected
Au Train Island (LS9-1384)	129			✓		Medium	Unprotected
Wood Island (LS9-1383)	112			✓		Lower	Unprotected
Partridge Island (LS9-1385)	86					Lower	Unprotected
Little Presque Isle (LS9-1391)	78		✓			Lower	Other land use designations
Granite Island (LS9-1386)	75					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Marquette Bay Lake Superior 9

**Legend**

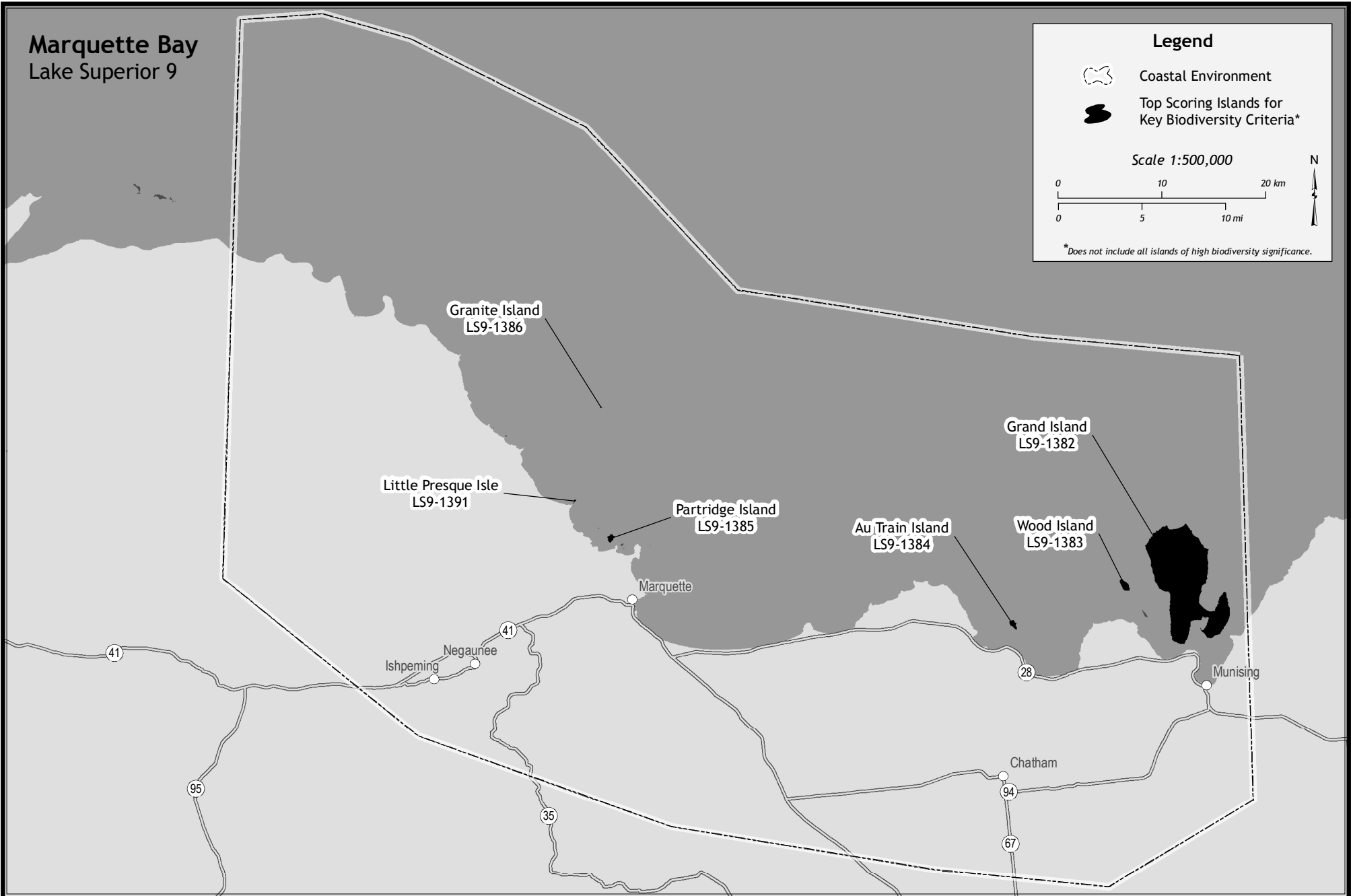
-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:500,000

0 10 20 km  
0 5 10 mi

N

\*Does not include all islands of high biodiversity significance.



# Keweenaw Peninsula

## Lake Superior 10, Lake Superior 11, Lake Superior 12 Coastal Environments

Number of islands: 70

Number of large islands: 4

Number of island complexes: 30

Total island area (ha): 477

Total length of coastline (km): 37

**Major Habitat Types:** Coniferous forests, mixed forests, beaches.

**Key Islands for Biodiversity Conservation:** Agate Point, Huron NWR - islands next to Lighthouse Island, Huron NWR - McIntyre Island, Huron NWR - Lighthouse Island, Manitou Island, Porters Island, Traverse Island, LS10-1104, LS11-1138.

### Landscape Context

The Keweenaw Peninsula is the most northern part of Michigan's Upper Peninsula that extends into Lake Superior. The Keweenaw Peninsula region also includes Manitou Island off the northeastern tip of the Upper Peninsula, several small islands along the northern edge of the Upper Peninsula and islands within Keweenaw Bay and Finlander Bay.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Rare species of Keweenaw Peninsula include Bald Eagle and Downy Oat-grass. The Peninsula is also rich in disjunct species from the Pacific Northwest (Cordilleran region) (Chaplin et al., 2001). The Keweenaw Peninsula also has documented observations of volcanic conglomerate bedrock lakeshore and conglomerate lakeshore cliff which are both globally rare plant communities.

Colonial nesting waterbirds, including Herring Gull, Double-crested Cormorant and Great Blue Heron are found on several islands within this region.

**Ecological Systems:** Dominant terrestrial system types include mixed and coniferous forests and beaches. Key shoreline communities include sandy beach/dunes, sedimentary rocks and open shoreline wetlands.

**Ecosystem Functions:** Some of the islands in the Keweenaw Peninsula are near-shore islands and therefore have a lower importance for stopover site for landbirds. The more isolated islands, such as Manitou Island and Traverse Island, provide refugia

for large numbers of landbirds. There are known occurrences of seasonal fish spawning for Lake Herring, Lake Trout, Lake Whitefish and Round Whitefish.

#### *Physical Diversity:*

All the islands and island complexes in Keweenaw Peninsula have low to medium shape complexity. The geology of the Keweenaw Peninsula islands includes conglomerate, sandstone and siltstone.

#### *Island Size:*

Four large islands dominate the area with size ranging from 16 to 373 hectares. Manitou Island, Traverse Island, Huron NWR - McIntyre Island and Huron NWR - Lighthouse Island are the largest islands in the Keweenaw Peninsula. The remaining islands are predominantly less than one hectare in size.

### Threats to Biodiversity

There are limited documented threats associated with the islands of Keweenaw Peninsula.

### Conservation Assessment

#### *Existing Conservation*

The Huron Islands, which includes Lighthouse Island, McIntyre Island, Gull Island and others, are included in the Huron National Wildlife Refuge. The eastern edge of Manitou Island is owned and managed by Keweenaw Land Trust, Inc as the Manitou Island Light State Preserve, adjacent to the Baraga State Forest Area under forest management. Porters Island is designated as Fort Wilkins Historic State Park.

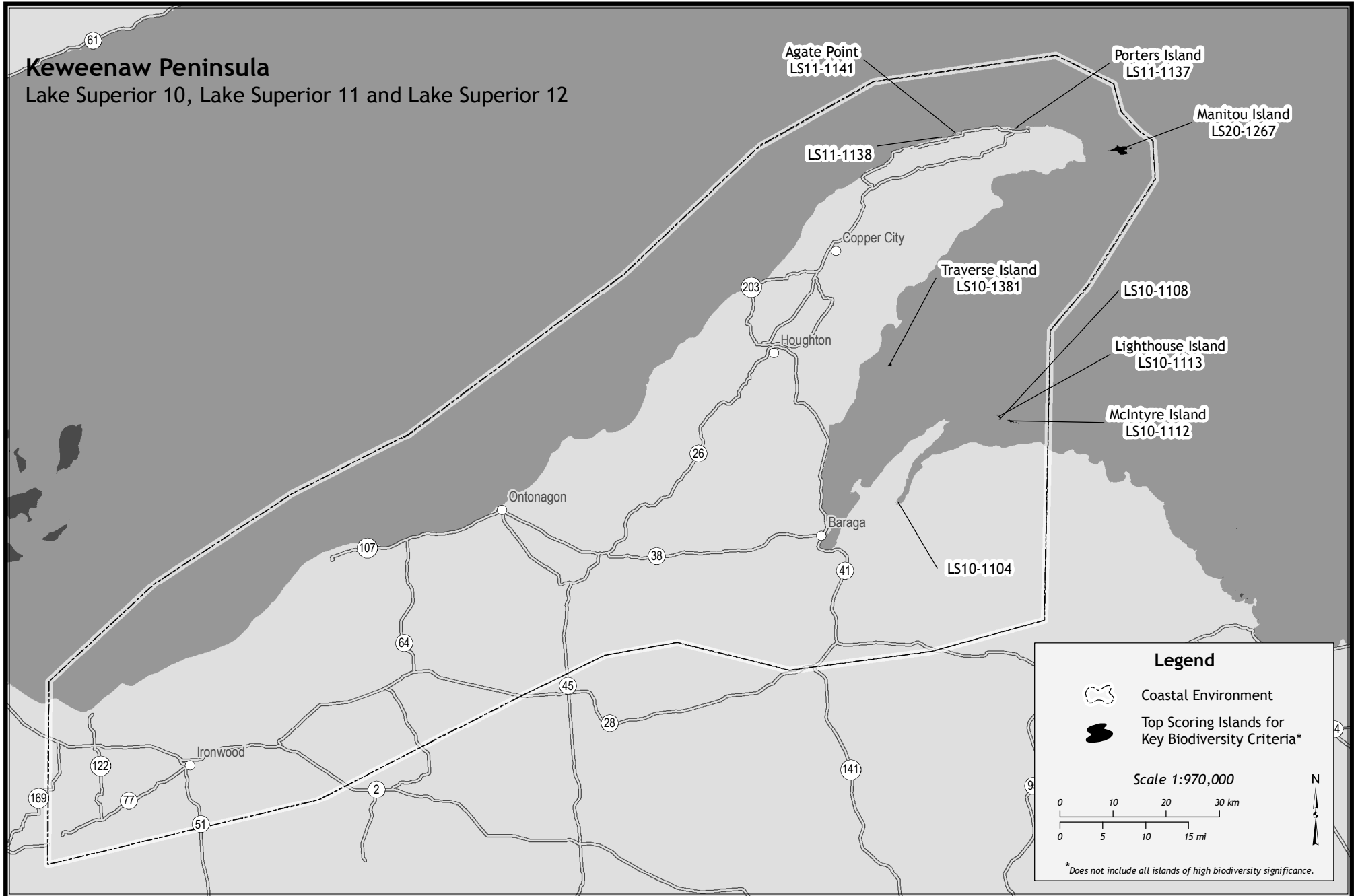
#### *Conservation Assessment*

The islands in the following table are higher scoring biodiversity islands. Manitou Island has seen limited impact from human activity, due to its remote location and the strong current at the peninsula's tip. This primarily forested island is important for migratory landbirds, raptors and waterbirds. Portions of Manitou Island are managed for forestry and the eastern edge of the island is owned as a nature preserve by Keweenaw Land Trust, Inc. Manitou Island has limited recreational development because of the difficulty reaching the island. The island also has a lighthouse.

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Manitou Island (LS20-1267)	166		✓	✓		Higher	Unprotected
Traverse Island (LS10-1381)	118			✓		Lower	Unprotected
Porters Island (LS11-1137)	100		✓	✓		Higher	Portions are protected
LS10-1104	91			✓		Lower	Unprotected
Agate Point (LS11-1141)	85			✓		Lower	Unprotected
Huron NWR - McIntyre Island (LS10-1112)	80		✓			Lower	Protected
Huron NWR - Lighthouse Island (LS10-1113)	74		✓			Medium	Protected
LS11-1138	62					Lower	Unprotected
Huron NWR - islands next to Lighthouse Islands (LS10-1108)	60					Lower	Protected

\*Not all islands considered to have biodiversity significance are included in this table.



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# Lake Superior Southwest Coast

## Lake Superior 13 and Lake Superior 14 Coastal Environments

Number of islands: 75  
Number of large islands: 21  
Number of island complexes: 33  
Total island area (ha): 19,382  
Total length of coastline (km): 288

**Major Habitat Types:** Coniferous forest, deciduous forest.

**Key Islands for Biodiversity Conservation:** Bear Island, Devils Island, Long Island, Madeline Island, Michigan Island, Outer Island, Raspberry Island, Rocky Island, Sand Island, Stockton Island.

### Landscape Context

The Lake Superior Southwest Coast includes the Apostle Islands, an archipelago of 22 islands off the northern tip of Wisconsin known for sea caves, diverse sandspits and beaches and diverse population of nesting and migratory birds. This area is the continental northwestern limits of the hemlock-white pine-northern hardwood forests and the area transitions into boreal forest.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Islands in the Lake Superior Southwest Coast are known for nesting Bald Eagles and Piping Plover. Many of the islands also support colonial nesting waterbirds, including Herring Gulls and Double-crested Cormorants. The Apostle Island National Lakeshore Important Bird Area (IBA) contains important nesting habitat for colonial waterbirds and a concentration area for migrating birds (National Audubon Society, 2009). Long Island is also included in the Kakagon-Bad River Wetlands & Forest Corridor IBA which is an important migratory concentration area in spring and fall. Long Island is a known nesting site for Piping Plover. The Lower Chequamenon Bay IBA includes Ashland Tern Island, known for the oldest and one of the most important Common Tern breeding colonies in Wisconsin (National Audubon Society, 2009).

**Ecological Systems:** Dominant terrestrial system types include coniferous forests and deciduous forests. Some islands have extensive stands of Canada Yew. Key shoreline communities include baymouth barrier beaches.

**Ecosystem Functions:** The islands in the Southwest Coast are primarily near-shore islands and therefore have a lower importance for stopover site for landbirds. There are known occurrences of seasonal

fish spawning for Bloater, Brook Trout, Burbot, Kiyi, Lake Herring, Lake Trout, Lake Whitefish, Ninespine Stickleback, Northern Pike and Round Whitefish.

#### *Physical Diversity:*

The majority of islands and island complexes have low to medium shape complexity. Madeline Island and Long Island are among the islands with the most shape complexity. The geology of the Southwest Coast islands is primarily sandstone and siltstone. Sand Island and Devils Island are composed of quartz arenite (Devils Island Sandstone).

#### *Island Size:*

Five large islands dominate the area with size ranging from 1,032 to 5,251 hectares. Madeline Island, Stockton Island, Outer Island, Oak Island and Sand Island are the largest islands in the Southwest Coast.

#### **Threats to Biodiversity**

The majority of islands in the region do not have documented threats. Madeline Island is by far the most threatened by roads, residential and recreational development. Sand Island also has residential development. Deer overbrowsing is a threat to some islands.

#### **Conservation Assessment**

##### *Existing Conservation*

The majority of these islands are protected within the boundary of the Apostle Islands National Lakeshore IBA and the Kakagon-Bad River Wetlands & Forest Corridor IBA. Madeline Island is not included in the Apostle Islands National Lakeshore, but portions of this island are designated as a federal forest reserve as well as a forest management area.

##### *Conservation Assessment*

The islands in the following table are high scoring biodiversity islands. Stockton Island has high biological significance that includes the tombolo on the southern shores, a variety of rare plant communities and providing spawning habitat for a variety of fish species. The island also supports a high concentration of Black Bears. Stockton Island is included in the Apostle Islands National Lakeshore and has some recreational development.

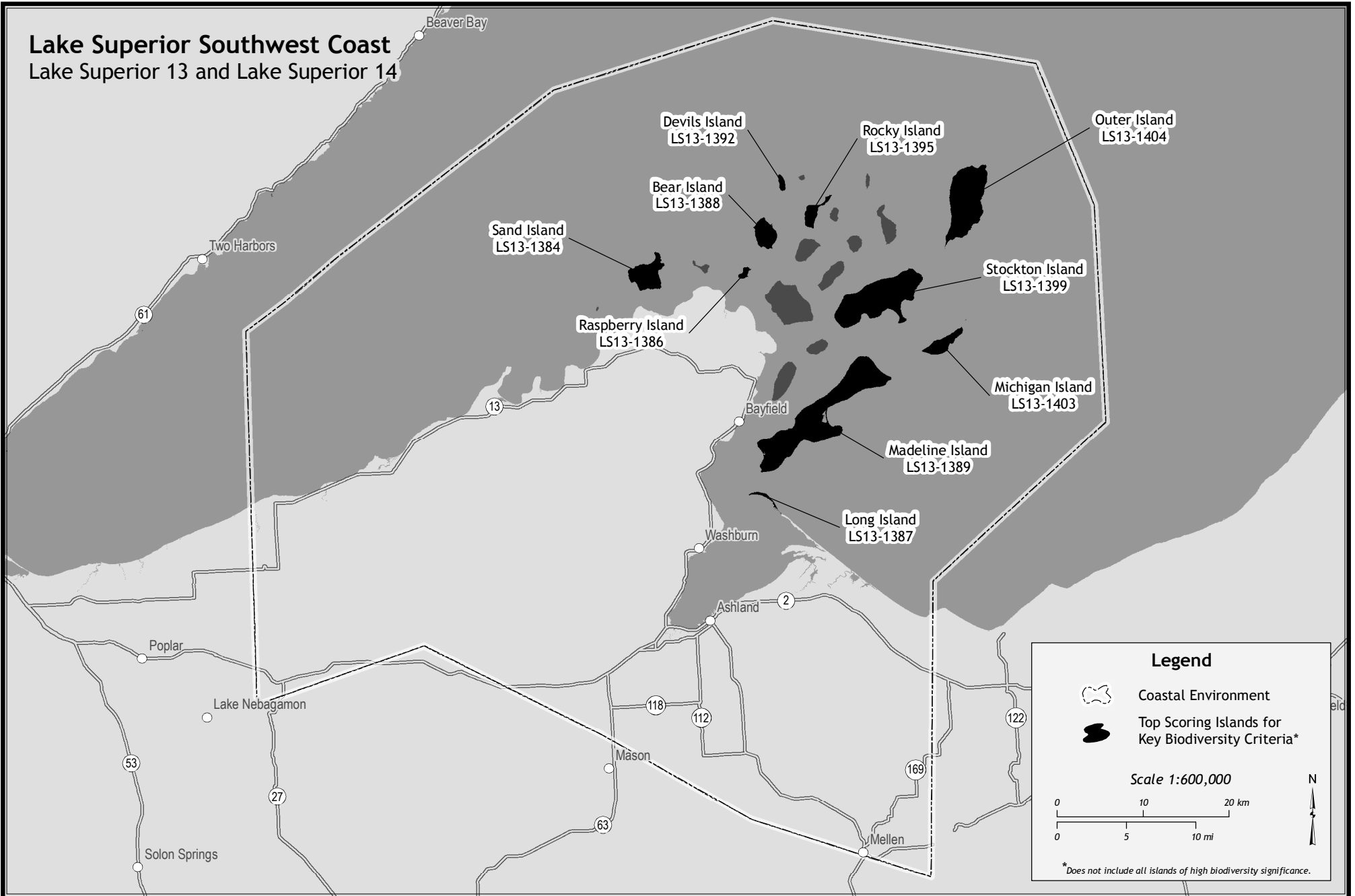
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Stockton Island (LS13-1399)	228		✓	✓		Lower/Medium	Protected
Outer Island (LS13-1404)	220			✓		Lower	Protected
Madeline Island (LS13-1389)	218		✓	✓		Higher	Largely unprotected
Michigan Island (LS13-1403)	168			✓		Lower	Protected
Sand Island (LS13-1384)	159		✓	✓		Medium/Higher	Protected
Long Island (LS13-1387)	135		✓			Lower	Unprotected
Devils Island (LS13-1392)	133			✓		Lower	Protected
Rocky Island (LS13-1395)	125		✓			Lower/Medium	Protected
Raspberry Island (LS13-1386)	123					Lower	Protected
Bear Island (LS13-1388)	122					Lower	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Superior Southwest Coast

## Lake Superior 13 and Lake Superior 14



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# St. Louis River Estuary

## Lake Superior 15 and Lake Superior 16 Coastal Environments

Number of islands: 5  
 Number of large islands: 2  
 Number of island complexes: 5  
 Total island area (ha): 208  
 Total length of coastline (km): 27

**Major Habitat Types:** Emergent herbaceous wetlands, coniferous forests.

**Key Islands for Biodiversity Conservation:** Barkers Island, Hog Island, Knife Island, Knife River Island, LS15-1108.

### Landscape Context

The St. Louis River Estuary, the largest U.S. tributary to Lake Superior, has an array of coastal wetlands, old growth forests, fisheries, baymouth bars and sand dunes, and is a critical mid-continent bird fly-way and nesting ground. The Estuary has been threatened by residential and recreational development, commercial shipping, sedimentation, introduction of exotic species and exposure to contaminants from historical and current industries.

The St. Louis River Estuary includes Barkers Island and Hog Island of the Minnesota Point and Knife Island near Knife River and Granite Point.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Twelve rare species are documented in the St. Louis River Estuary, including the globally rare Lake Sturgeon, Pointed Moonwort, Pale Moonwort, Michigan Moonwort and St. Lawrence Grapefern. Herring Gulls and Double-crested Cormorants, colonial nesting waterbirds, regularly nest on Knife Island.

**Ecological Systems:** Dominant terrestrial system types include emergent herbaceous wetlands and coniferous forests. Key shoreline communities include baymouth barrier beaches and semi-

protected wetlands (protected by natural features such as baymouth barriers).

**Ecosystem Functions:** The islands in the St. Louis River Estuary are primarily near-shore islands and therefore have a lower importance for stopover site for landbirds. There are known occurrences of seasonal fish spawning for Emerald Shiner along Minnesota Point.

#### *Physical Diversity:*

The majority of islands and island complexes have medium shape complexity. Barkers Island and Hog Island have a high level of shape complexity. The geology of the St. Louis River Estuary islands is basalt with rhyolite and conglomerate.

#### *Island Size:*

Two large islands, Hog Island and Barkers Island, dominate the area with sizes of 93 and 114 hectares respectively. The remaining islands are less than one hectare in size.

### Threats to Biodiversity

Barkers Island and Hog Island are threatened with residential development and roads. The remaining islands do not have documented threats.

### Conservation Assessment

#### *Existing Conservation*

None of the islands in this region are protected or have natural heritage designations.

#### *Conservation Assessment*

All the islands in the table below are higher scoring biodiversity islands. Hog Island and Barkers Island comprise Minnesota Point and have higher biodiversity significance providing habitat for important fish species and globally rare plant species. These islands are not protected, do not have natural heritage designations and are subject to residential development.

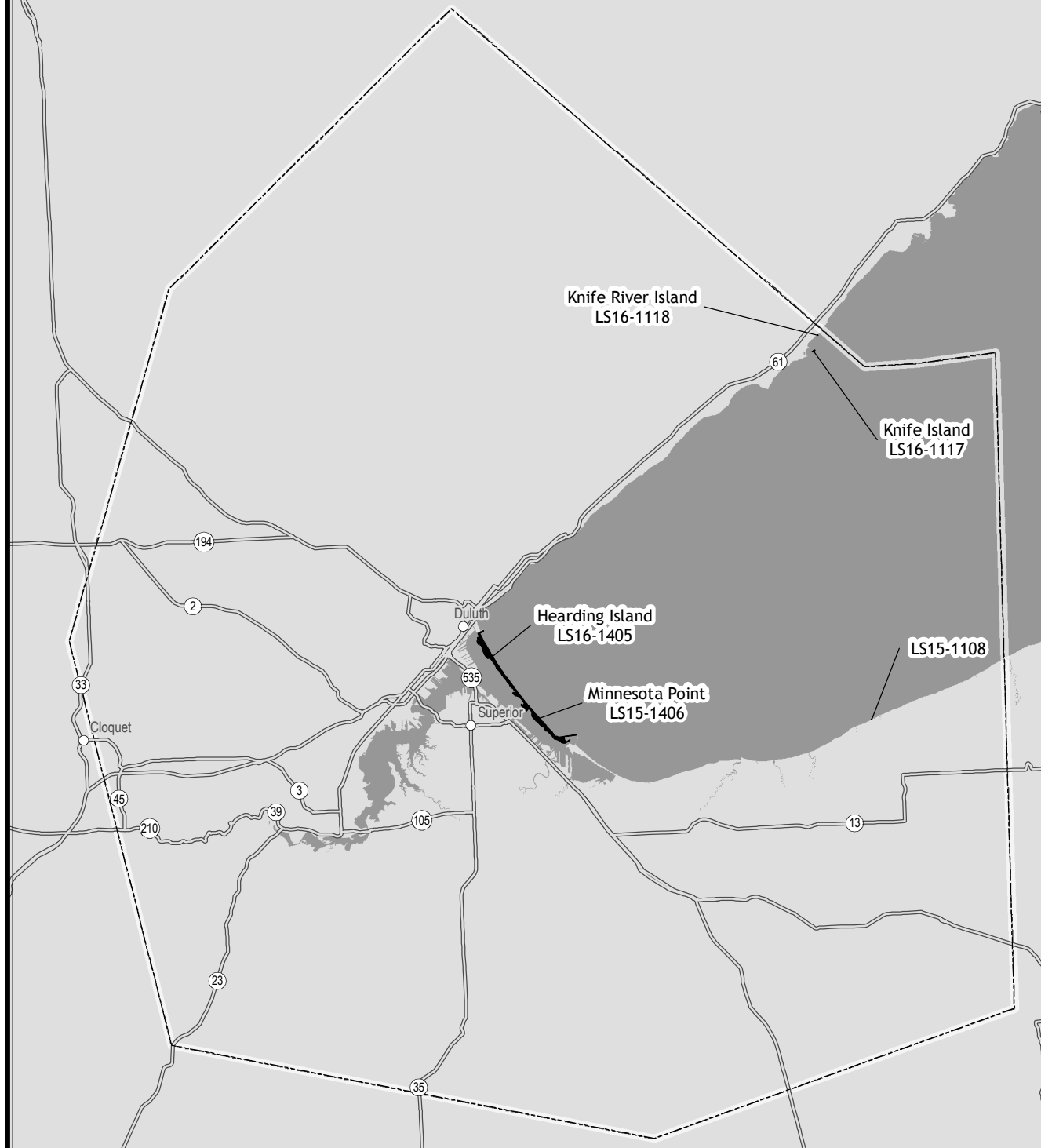
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Minnesota Point (LS15-1406)	207		✓	✓		Higher	Unprotected
Hearing Island (LS16-1405)	134		✓	✓		Higher	Unprotected
Knife Island (LS16-1117)	78			✓		Lower	Unprotected
Knife River Island (LS16-1118)	44	✓				Lower	Unprotected
LS15-1108	27					Lower	Unprotected



\*Not all islands considered to have biodiversity significance are included in this table.

# St. Louis River Estuary

## Lake Superior 15 and Lake Superior 16



**Legend**

-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:390,000

0 5 10 15 km

0 5 10 mi

N

\* Does not include all islands of high biodiversity significance.

Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

# Lake Superior Northwest Coast

## Lake Superior 17 Coastal Environment

Number of islands: 26  
 Number of large islands: 1  
 Number of island complexes: 26  
 Total island area (ha): 38  
 Total length of coastline (km): 11

**Major Habitat Types:** Coniferous forest, deciduous forest.

**Key Islands for Biodiversity Conservation:**  
 Encampment Island, Gull and Bear Islands, Pancake Island, Grand Portage Island, LS17-1122, LS17-1129, LS17-1130, LS17-1145, LS17-1152.

### Landscape Context

The Lake Superior Northwest Coast extends from Grand Portage Bay in the north to south of Two Harbors and Agate Bay in the south.

### Biodiversity Assessment

#### *Biological and Physical Diversity:*

Eight rare species in the Lake Superior Northwest Coast include Creeping Juniper, Hoary Draba and Peregrine Falcon. This region has documented observations of two globally rare species, Marsh Reedgrass and Kiyi.

Dominant terrestrial system types include coniferous, mixed and deciduous forests. The islands in the Northwest Coast are primarily near-shore islands and therefore have lower importance for stopover site for landbirds. There are several

occurrences of colonial nesting waterbirds on these islands, including Double-crested Cormorant and Herring Gull.

The geology of the Northwest Coast islands includes gabbro (olivine gabbro) and basalt with rhyolite and conglomerate.

#### *Island Size:*

One large island, Grand Portage Island, dominates the area with a size of 19 hectares. The remaining islands are less than two hectares.

### Threats to Biodiversity

There are no documented threats on the islands of the Lake Superior Northwest Coast.

### Conservation Assessment

#### *Existing Conservation*

None of the islands in this region are protected or have natural heritage designations.

#### *Conservation Assessment*

All the islands in the table below are higher scoring biodiversity islands. Gull and Bear Islands provide nesting sites for Herring Gulls and also include documented occurrences of Hoary Draba and the State Threatened Encrusted Saxifrage and Peregrine Falcon. There are no documented threats on this unprotected island.

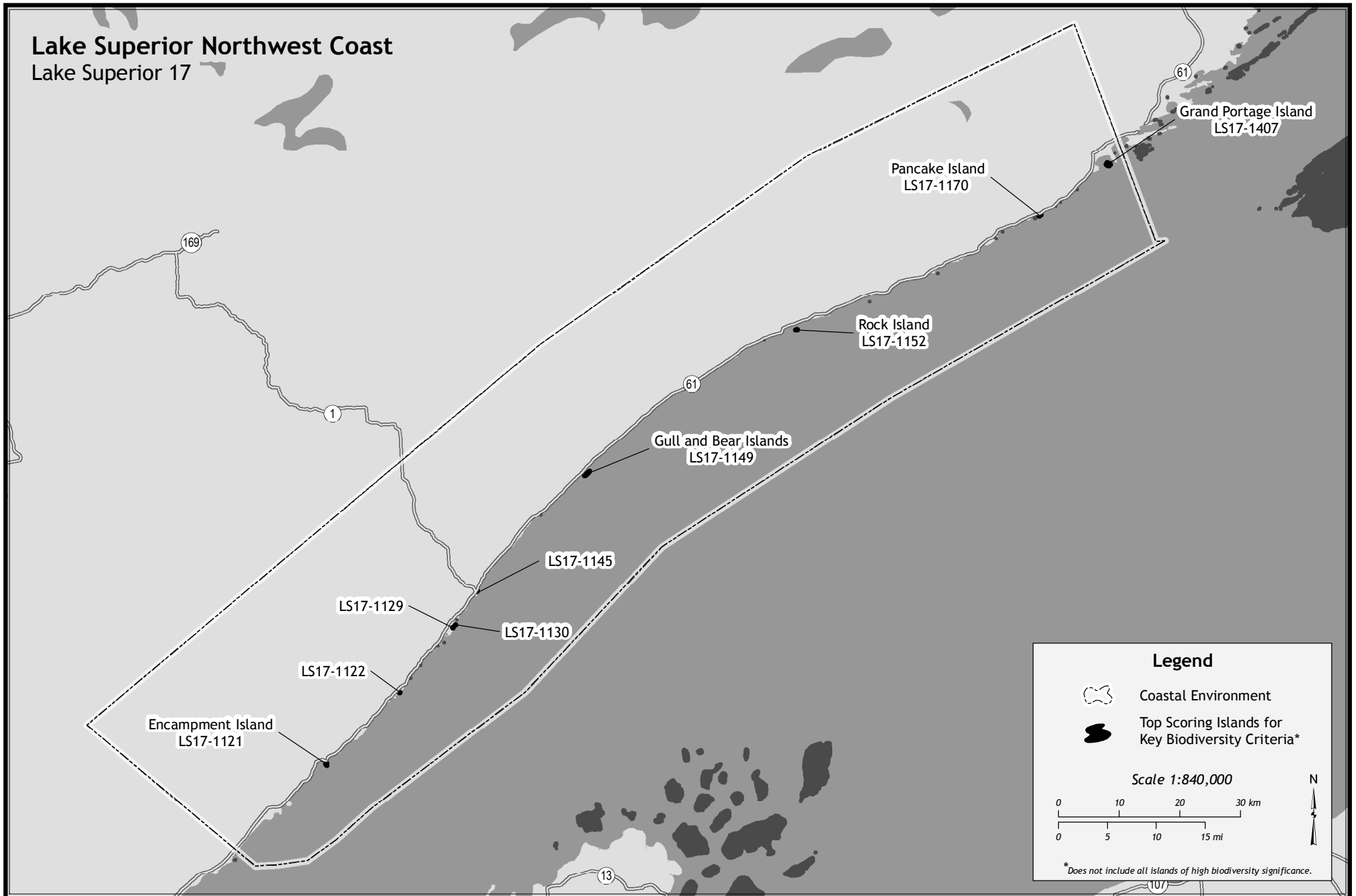
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Gull and Bear Islands (LS17-1149)	96		✓	✓		Lower	Unprotected
LS17-1145	67			✓		Lower	Unprotected
Encampment Island (LS17-1121)	63			✓		Lower	Unprotected
Grand Portage Island (LS17-1407)	58					Lower	Unprotected
LS17-1129	54			✓		Lower	Unprotected
Rock Island (LS17-1152)	48					Lower	Unprotected
Pancake Island (LS17-1170)	47					Lower	Unprotected
LS17-1122	46					Lower	Unprotected
LS17-1130	45					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Superior Northwest Coast

## Lake Superior 17



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# Grand Traverse Bay, Little Traverse Bay

## Lake Michigan 1 and Lake Michigan 2 Coastal Environments

Number of islands: 75  
 Number of large islands: 1  
 Number of island complexes: 65  
 Total island area (ha): 78  
 Total length of coastline (km): 7,560

**Major Habitat Types:** Deciduous forest, beaches, woody wetlands.

**Key Islands for Biodiversity Conservation:** Basset Island, Bellow Island, Fisherman Island, Marion Island, LM1-405, LM1-406, LM1-429, LM1-493, LM2-319.

### Landscape Context

This group of coastal environments stretches from Sturgeon Bay in the north to Good Harbour Bay in the south. Fifty-eight of the islands identified in this region are navigational caution points (rocks, reefs or shoals), the remaining islands are relatively small islands located primarily in Grand Traverse Bay.

### Biodiversity Assessment

#### *Biological and Physical Diversity:*

There are no rare species documented on the islands in this region. There is an occurrence of mesic northern forest, a rare plant community on one of the islands in Grand Traverse Bay. Several colonial waterbirds nest on Bellow Island and Fisherman's Island. There are known occurrences of seasonal fish spawning for Lake Whitefish, Round Whitefish, Lake Trout and Yellow Perch in Grand Traverse Bay.

Beaches are known to occur along shorelines of some of these islands, however limited information is

known on ecological and physical diversity and the ecosystem functions of these islands.

The geology of the Grand Traverse Bay and Little Traverse Bay islands include black shale and limestone, as well as representation of shale and sandstone.

#### *Island Size:*

Marion Island is the only large island in this region and is approximately 71 hectares in size. The remaining islands are predominantly less than one hectare in size.

### Threats to Biodiversity

There is limited documented development on the islands in Grand Traverse Bay and Little Traverse Bay.

### Conservation Assessment

#### *Existing Conservation*

Fisherman Island is designated as a State Park. Gull Island is owned and managed by the Leelanau Land Conservancy as a nature preserve. Bellow Island is identified as an Important Bird Area. The remaining islands are unprotected and have no natural heritage designations.

#### *Conservation Assessment*

The islands in the table below are higher scoring biodiversity islands. Marion Island contains key ecological systems such as wetlands, and provide habitat for Round Whitefish, Yellow Perch and Lake Trout. There are no known documented threats on this island which is not protected.

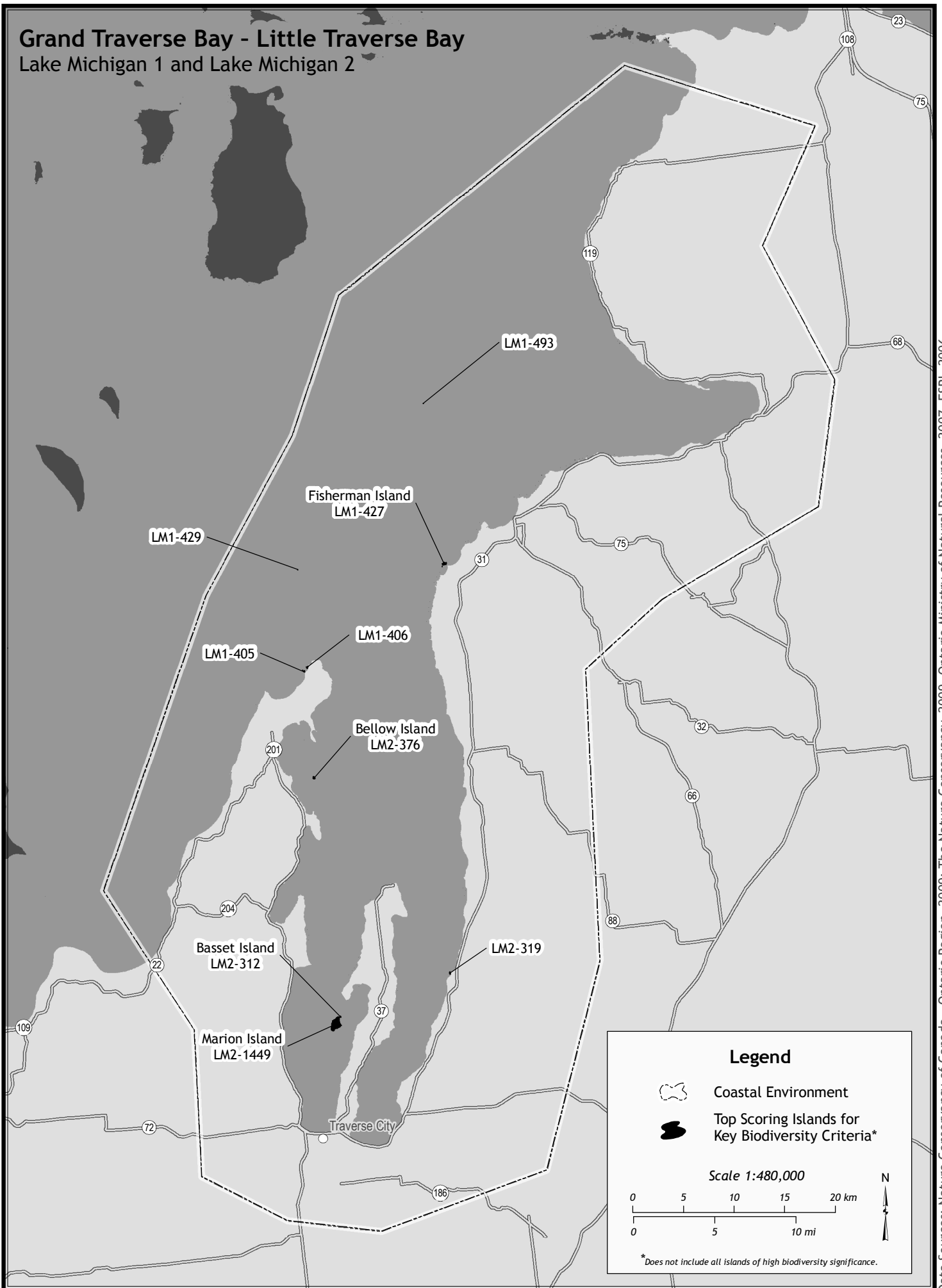
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Marion Island (LM2-1449)	113		✓	✓		Lower	Unprotected
Fisherman Island (LM1-427)	111	✓	✓	✓		Lower	Largely protected
Bellow Island (LM2-376)	74	✓	✓	✓		Higher	Natural heritage designation
LM1-405	54		✓			Lower	Unprotected
LM1-406	53		✓			Lower	Unprotected
LM2-319	51		✓			Lower	Unprotected
Basset Island (LM2-312)	48					Lower	Unprotected
LM1-429	42					Lower	Unprotected
LM1-493	42					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Grand Traverse Bay - Little Traverse Bay

Lake Michigan 1 and Lake Michigan 2



## East Michigan Coast

### Lake Michigan 3, Lake Michigan 4 and Lake Michigan 5 Coastal Environments

Number of islands: 2  
 Number of large islands: 0  
 Number of island complexes: 2  
 Total island area (ha): <1ha  
 Total length of coastline (km): <1 km

Major Habitat Types: Unknown.

Key Islands for Biodiversity Conservation: LM3-291, LM3-292.

#### Landscape Context

East Michigan Coast extends west of Good Harbour Bay in the north, along the eastern side of Lake Michigan to just east of Gary Harbour along the southern shores of Lake Michigan. The two islands identified in this region are navigational caution points (rocks, reefs or shoals), located off of Platte River Point, west of Platte Bay.

#### Biodiversity Assessment

##### *Biological and Physical Diversity:*

There are no rare species or plant communities documented on the islands in the East Michigan Coast. There is no available information on whether

colonial nesting waterbirds or interjurisdictional fish use these areas. No information is known on ecological and physical diversity and the ecosystem functions of these islands.

##### *Island Size:*

Both islands in this region are very small and are less than one hectare in size.

#### Threats to Biodiversity

There are no documented threats associated with islands of the East Michigan Coast.

#### Conservation Assessment

##### *Existing Conservation*

None of the islands in this region are protected or have natural heritage designations.

##### *Conservation Assessment*

There is no documentation on the biodiversity significance of these islands. There are no documented threats on these islands, and the islands are unprotected.

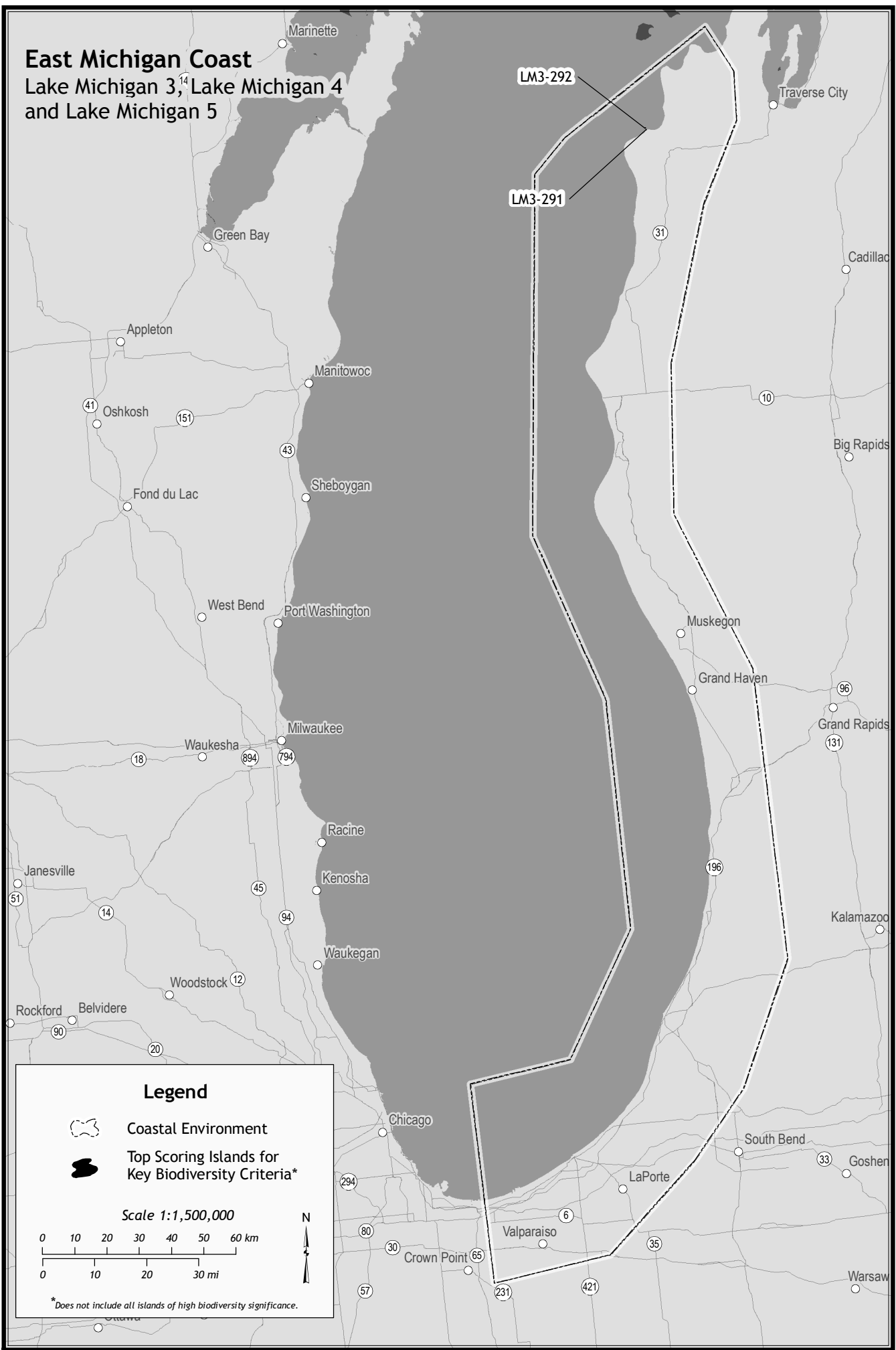
#### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance						
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
LM3-291	37					Lower	Unprotected
LM3-292	27					Lower	Unprotected



\*Not all islands considered to have biodiversity significance are included in this table.

# East Michigan Coast

## Lake Michigan 3,<sup>14</sup> Lake Michigan 4 and Lake Michigan 5



**Legend**

-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:1,500,000

0 10 20 30 40 50 60 km

0 10 20 30 mi

N

\* Does not include all islands of high biodiversity significance.

Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

## West Michigan Coast

### Lake Michigan 6, Lake Michigan 7 and Lake Michigan 8 Coastal Environments

Number of islands: 3  
 Number of large islands: 0  
 Number of island complexes: 3  
 Total island area (ha): <1ha  
 Total length of coastline (km): <1 km

Major Habitat Types: Unknown.

Key Islands for Biodiversity Conservation: LM7-64, LM7-80, LM8-207.

#### Landscape Context

Two of the islands identified in this region are submerged rocks associated with Manitowoc and Milwaukee. The third island is located in the Waukegan Harbour area.

#### Biodiversity Assessment

##### *Biological and Physical Diversity:*

There are no rare species or plant communities documented on the islands in the West Michigan coast. There is no available information on whether colonial nesting waterbirds or interjurisdictional fish use these areas. No information is known on

ecological and physical diversity and the ecosystem functions of these islands.

##### *Island Size:*

All three islands in this region are very small and are less than one hectare in size.

#### Threats to Biodiversity

There is no documented development on the islands of the west Michigan coast.

#### Conservation Assessment

##### *Existing Conservation*

None of the islands in this region are protected or have natural heritage designations.

##### *Conservation Assessment*

All the islands in the table below are higher scoring biodiversity islands in this region. There is limited documentation on their biodiversity significance. There are no documented threats on these islands, and the islands are unprotected.

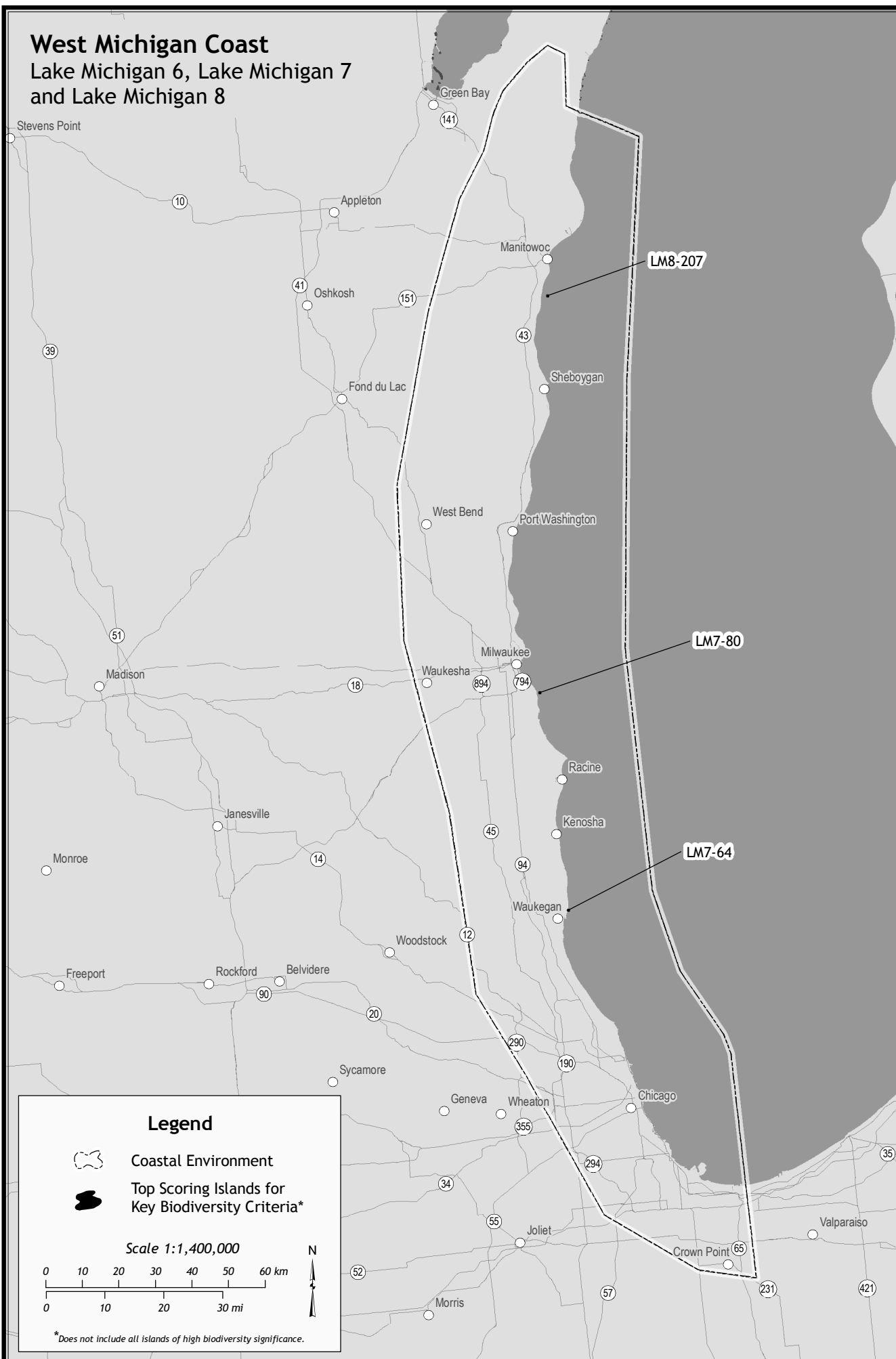
#### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands		Biodiversity Significance					
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
LM7-64	50					Lower	Unprotected
LM7-80	27					Lower	Unprotected
LM8-207	42					Lower	Unprotected



\*Not all islands considered to have biodiversity significance are included in this table.

# West Michigan Coast

## Lake Michigan 6, Lake Michigan 7 and Lake Michigan 8



**Legend**

-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:1,400,000

0 10 20 30 40 50 60 km

0 10 20 30 mi

N

\*Does not include all islands of high biodiversity significance.

# Green Bay

## Lake Michigan 9 and Lake Michigan 10 Coastal Environments

**Number of islands:** 213

**Number of large islands:** 9

**Number of island complexes:** 99

**Total island area (ha):** 4,866

**Total length of coastline (km):** 156

**Major Habitat Types:** Temperate Broadleaf Forest, beaches, shrub/scrub, wood wetlands.

**Key Islands for Biodiversity Conservation:** Bass Islands, Chambers Island, Little Summer Island, Long Tail Point, Peshtigo Harbor East Bay Islands, Peshtigo Harbor Peninsula, Saint Martin Island - Northwest, Washington Island - West, LM9-563.

### Landscape Context

The Green Bay islands occur throughout Green Bay, with the larger islands concentrated in succession across the mouth of the bay as an extension of the Door Peninsula. Green Bay is considered one of the largest freshwater estuaries in the world and is a highly ecologically productive ecosystem in the Great Lakes. This area has been subject to considerable pollutants, sediment and invasive species. Over one-third of the islands described in this region are navigational caution points (rocks, reefs or shoals).

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Documented occurrences of Bald Eagle are known from an island in Green Bay. One rare plant community, the Dry Non-Acid Cliff, has also been documented on an island here.

Several colonial nesting waterbirds, including Herring Gull, Double-crested Cormorants and Black-crowned Night Herons, are known to occur on several islands in the region. Cat Island and Lone Tree Islands are included in the Lower Green Bay-Bay Beach Wildlife Sanctuary Important Bird Area (IBA) and are important for breeding colonial waterbirds such as the American White Pelican, Double-crested Cormorant and Great Egret (National Audubon Society, 2009).

**Ecological Systems:** Dominant terrestrial system types include broadleaf forests, beaches, wooded wetlands and scrub. The key shoreline communities of Green Bay are sandy beaches/dunes, baymouth barrier beaches, sedimentary rocks, open shoreline wetlands and semi-protected wetlands.

**Ecosystem Functions:** The islands in Green Bay are primarily close to shore and therefore have lower importance for stopover site for landbirds. The

more isolated islands, such as Round Island, may be more important in this respect. There are known occurrences of seasonal fish spawning for Black Bullhead, Bowfin, Brook Trout, Burbot, Carp, Green Sunfish, Lake Herring, Lake Trout, Lake Whitefish, Longnose Sucker, Northern Pike, Smallmouth Bass, Trout-perch, Walleye, White Sucker, Yellow Perch.

#### *Physical Diversity:*

The majority of islands and island complexes have low to medium shape complexity. Peshtigo Harbor Peninsula has the most shape complexity. The geology of Green Bay islands is primary limestone; there is also representation of dolomite, shale, dolomitic shale and black shale.

#### *Island Size:*

Nine islands dominate the area with size ranging from 10 to 2,951 hectares. Washington Island - West and Chambers Island are by far the largest islands in this region. The remaining islands are predominantly less than two hectares in size.

#### **Threats to Biodiversity**

There are limited documented threats known from the Green Bay islands. Many of the islands in Green Bay have no documented threats. Washington Island - West is, by far, the most threatened island in the region. Washington Island has residential and recreational development, roads and aggregate extraction. The remaining islands have some associated threats which are primarily due to development and some construction of buildings.

#### **Conservation Assessment**

##### *Existing Conservation*

State forest areas in this region include the Shingleton State Forest Area and Escanaba State Forest Area. The Hiawatha National Forest and USGS forest reserves also include islands in the Green Bay region. The Nature Conservancy has also established a nature preserve on Squaw Island.

##### *Conservation Assessment*

The islands in the following table are higher scoring biodiversity islands in this region. Washington Island - West has biodiversity significance including providing adequate spawning habitat for several fish species. This island is not protected and has not been given any natural heritage designation. The island does have residential and recreational development.

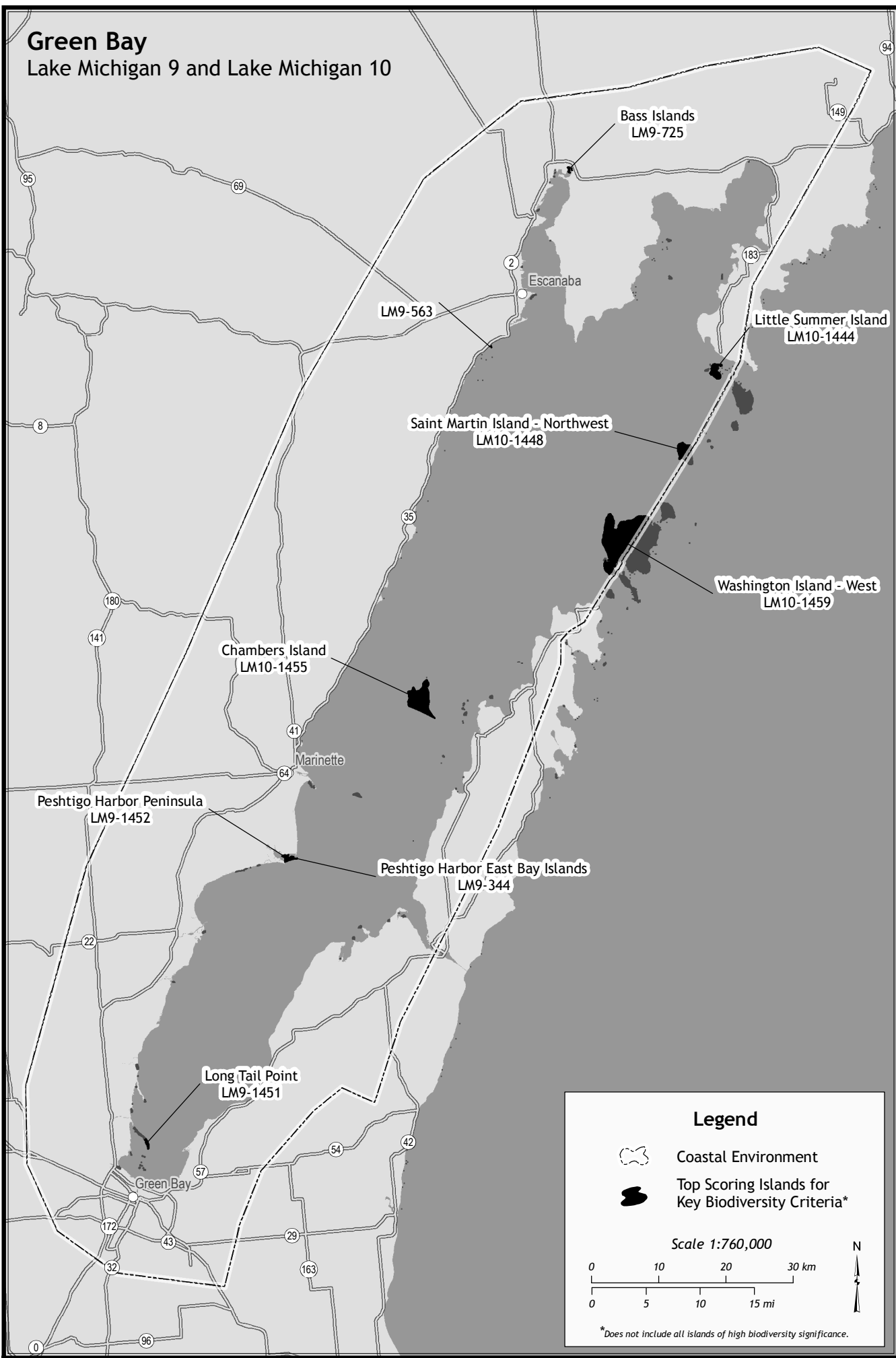
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Washington Island - West (LM10-1459)	225			✓		Higher	Unprotected
Chambers Island (LM10-1455)	202			✓		Medium/Higher	Unprotected
Saint Martin Island - Northwest (LM10-1448)	144					Lower	Unprotected
Peshtigo Harbor Peninsula (LM9-1452)	139					Higher	Protected
Peshtigo Harbor East Bay Islands (LM9-344)	131		✓			Lower	Unprotected
Long Tail Point (LM9-1451)	129					Lower	Unprotected
Little Summer Island (LM10-1444)	117					Lower	Unprotected
LM9-563	117					Lower	Other land use designations
Bass Islands (LM9-725)	117					Lower/Medium	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Green Bay

## Lake Michigan 9 and Lake Michigan 10



**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:760,000

0 10 20 30 km  
0 5 10 15 mi

N

\*Does not include all islands of high biodiversity significance.

Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

# Mackinac and Eastern Door County

## Lake Michigan 11 and Lake Michigan 12 Coastal Environments

Number of islands: 418  
Number of large islands: 16  
Number of island complexes: 275  
Total island area (ha): 21,174  
Total length of coastline (km): 284

**Major Habitat Types:** Temperate broadleaf forest, beaches, wooded wetlands and grasslands.

**Key Islands for Biodiversity Conservation:** Beaver Island, Garden Island, High Island, Hog Island, Plum Island, Rock Island, Washington Island - East, Waugoshance Island.

### Landscape Context

The Mackinac and eastern Door County coastal environments stretches from the east side of Door Peninsula along the northern boundary of Lake Michigan and to the edge of the Straits of Mackinac.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 17 rare species in the Mackinac and Eastern Door County coastal environments including American Bittern, Lake Huron Tansy and Slender Cliff-brake. These species also include the globally rare Piping Plover, Lake Huron Locust, Pitcher's Thistle and Dwarf Lake Iris.

Twelve rare plant communities are also documented for this region, including globally rare wetlands, Great Lakes marsh, northern fen, wooded dune and swale complex, open dunes and limestone pavement lakeshore communities.

Colonial nesting waterbirds, including Caspian Tern, Common Tern, Double-crested Cormorant, Herring Gull, Ring Billed Gull, Black-crowned Night-Herons and Great Blue Heron have been documented from these islands.

**Ecological Systems:** Dominant terrestrial system types include deciduous and coniferous forests and wooded wetlands. High Island has extensive stands of Canada Yew. The key ecological systems of the Mackinac and Eastern Door County are bog, Great Lakes marsh, hardwood-conifer swamp, limestone pavement lakeshore, northern fen, northern wet meadow and wooded dune and swale complex. Key shoreline communities include sand beach/dunes, sedimentary rocks and open shoreline wetlands.

**Ecosystem Functions:** The majority of the islands in this region are primarily near-shore islands and therefore have a lower importance for stopover site for landbirds. The more isolated islands, such as Fish Island, Fisherman Shoal, Plum Island and Trout

Island, may provide emergency refugia. There are known occurrences of seasonal fish spawning for Lake Trout, Lake Whitefish, Largemouth Bass, Northern Pike, Rock Bass, Smallmouth Bass and Yellow Perch.

#### *Physical Diversity:*

The majority of islands and island complexes have low shape complexity. Hog Island and Detroit Island are among the islands with the most shape complexity. The geology of the Mackinac and Eastern Door County islands are predominantly dolomite with some representation of limestone and shale.

#### *Island Size:*

Sixteen islands dominate the area with size ranging from 27 to 13,221 hectares. Beaver Island, Washington Island - East, Garden Island and High Island are the largest islands in this region. The remaining islands are predominantly less than one hectare in size.

### Threats to Biodiversity

Many of the islands in this region do not have documented threats. The most threatened islands in the Mackinac and Eastern Door County region are Beaver Island and Washington Island - East primarily because of their residential and recreational development and roads. Some islands are threatened by the invasive Common Reed (*Phragmites australis*); the Michigan Department of Natural Resources is undertaking a comprehensive approach to control this species.

### Conservation Assessment

#### *Existing Conservation*

There are several federally designated areas in this region, including the Michigan Islands National Wildlife Refuge, the Green Bay National Wildlife Refuge and the Gravel Island National Wildlife Refuge. Hog Island and Gravel Island National Wildlife Refuge are included in the Wisconsin Islands Wilderness Area.

The State of Michigan has designated areas for conservation, wildlife and forest management which include Wilderness State Park, Shingleton State Forest Area, Beaver Island State Wildlife Research Area Beaver Islands Group and Gaylord State Forest Area. Gull Harbour Preserve and the St. James Township Park are managed under local jurisdictions.

The Little Traverse Land Conservancy and Michigan Nature Association own and manage several parcels of land on islands in the northern portion of the

region as nature preserves. The Little Traverse Land Conservancy also manages conservation easements on private land on several islands.

*Conservation Assessment*

All the islands in the table below are higher scoring biodiversity islands. Beaver Island has occurrences of 13 rare species, including the globally rare Piping Plover, Lake Huron Locust, Pitcher’s Thistle and Dwarf Lake Iris, as well as five rare plant communities. This island has occurrences of seasonal fish spawning of Lake Whitefish, Lake

Trout, Rock Bass, Smallmouth Bass and Yellow Perch. Beaver Island has had a long history of development including residential and recreational development, agriculture and timber management. Portions of this island are within the state and local parks and wildlife areas. The Little Traverse Land Conservancy also has parcels designated as nature preserves and conservation easements with private landowners.

**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
Beaver Island (LM12-1442)	273			✓		Higher	Largely unprotected
Washington Island - East (LM11-1458)	237			✓		Higher	Unprotected
Garden Island (LM12-1436)	221			✓		Medium	Protected
Hog Island (LM12-1435)	212			✓		Lower/Medium	Protected
High Island (LM12-1443)	181					Medium	Protected
Plum Island (LM11-1460)	168					Lower	Unprotected
Waugoshance Island (LM12-1438)	168					Lower	Protected
Rock Island (LM11-1463)	164					Lower/Medium	Protected

\*Not all islands considered to have biodiversity significance are included in this table.



# Manitou and Fox Islands

## Lake Michigan 13 Coastal Environment

Number of islands: 19  
Number of large islands: 5  
Number of island complexes: 13  
Total island area (ha): 8,699  
Total length of coastline (km): 83,338

**Major Habitat Types:** Broadleaf deciduous forest, beaches.

**Key Islands for Biodiversity Conservation:** Gull Island, North Fox Island, North Manitou Island, South Fox Island, South Manitou Island, LM13-518, LM13-560.

### Landscape Context

The islands associated with the Manitou Islands and Fox Islands are west of Grand Traverse Bay and Little Traverse Bay and south of Beaver Island.

Approximately half of the 13 island complexes identified in this region are described as navigational caution points (rocks, reefs or shoals). The remaining island complexes are primarily large islands composed of broadleaf forests and sand beaches.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Eight rare species are documented from the Manitou and Fox Islands region including the globally rare Piping Plover, Lake Huron Locust and Pitcher's Thistle.

Colonial nesting waterbirds, including Herring Gull, Ring Billed Gull, Double-crested Cormorant, Caspian Tern and Black-crowned Night-Heron have been documented on three of the islands in the region.

**Ecological Systems:** Dominant terrestrial system types include broadleaf deciduous forests, coniferous forests, sand beaches and sand dunes. Key shoreline communities are sand beaches and dunes.

**Ecosystem Functions:** The islands in the Manitou and Fox Islands region are farther offshore from the mainland and may have a higher importance for stopover site for landbirds. There are known occurrences of seasonal fish spawning for Lake Sturgeon, Lake Whitefish, Round Whitefish and Lake Trout.

#### *Physical Diversity:*

The majority of islands and island complexes have low to medium shape complexity. Gull Island is among the islands with the most shape complexity. The geology of the islands in the Manitou and Fox

Islands region includes dolomite and limestone, limestone and shale, and Point Aux Chenes Shale.

#### *Island Size:*

Five islands dominate the area with sizes ranging from 88 to 5,173 hectares. North Manitou Island, South Manitou Island and South Fox Island are the largest islands in this region. The remaining islands are predominantly less than one hectare in size.

### Threats to Biodiversity

There is limited documented development on a few islands of the Manitou and Fox Islands region, including South Fox Island. All islands in the Beaver Island archipelago are surveyed for the presence of Common Reed (*Phragmites australis*), with control programs underway. Another invasive here is Purple Loosestrife. The majority of the other islands in the region have no documented threats.

### Conservation Assessment

#### *Existing Conservation*

North Fox Island and portions of South Fox Island are included in the Beaver Island State Wildlife Research Area Fox Islands Group. South Fox Island has been identified as an Important Bird Area (IBA). Gull Island is federally protected within the Michigan Islands National Wildlife Refuge boundary. North Manitou Island and portions of South Manitou Island are also federally protected and are included in the Sleeping Bear Dunes National Lakeshore.

#### *Conservation Assessment*

The islands in the following table are high scoring biodiversity islands in the region. North Manitou Island and South Manitou Island have high biodiversity significance including globally rare species, colonial waterbirds and occurrences and offshore habitat for interjurisdictional fish species. These islands are included in the Sleeping Bear Dunes National Lakeshore. There is a higher level of threat on these islands compared to other islands in the region due to the recreational development from the federal park.

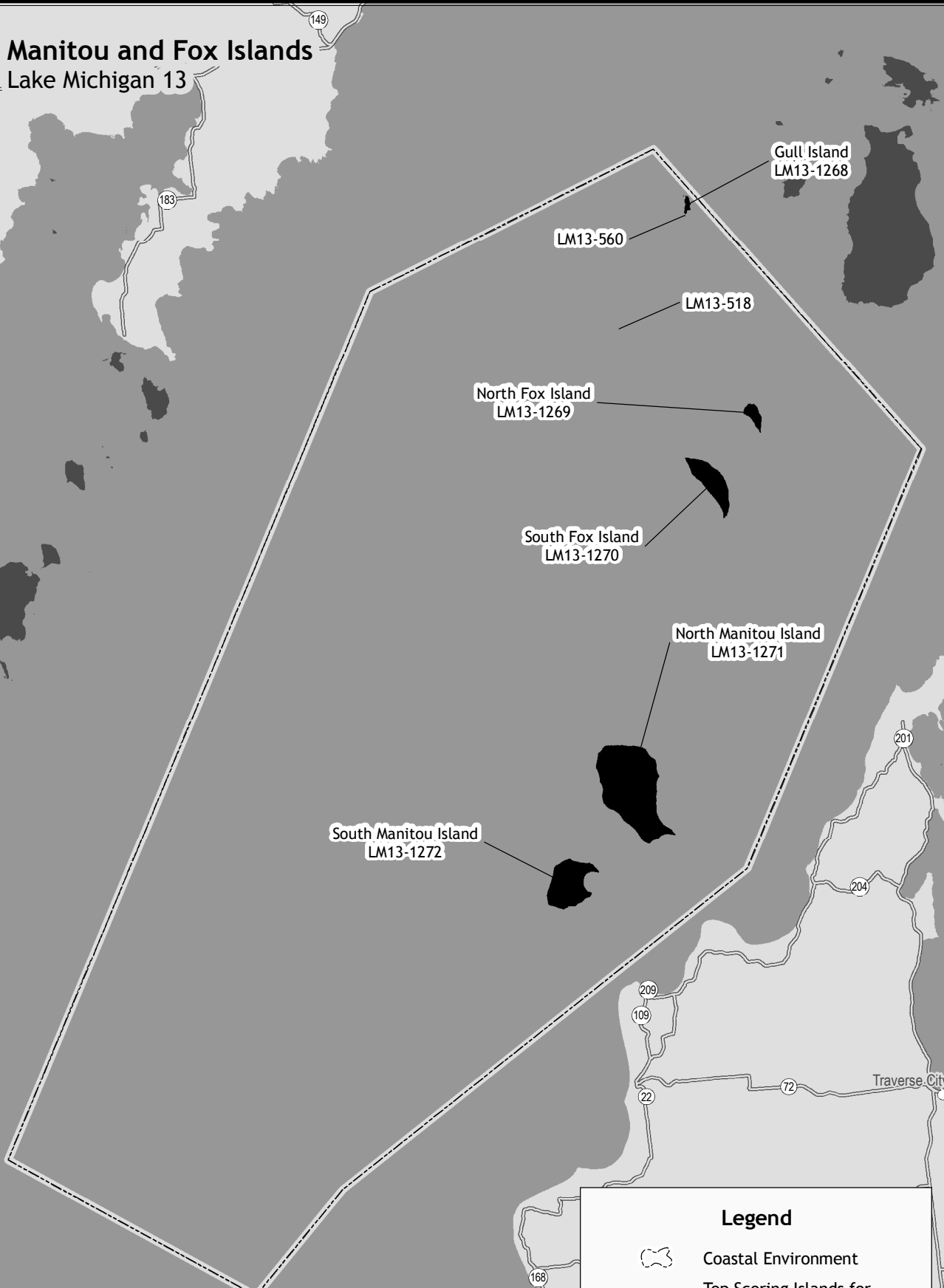
South Fox Island also has some biodiversity significance including occurrences of two globally rare species and occurrences and suitable habitat for interjurisdictional fish species. This island was identified as an IBA and portions of this island are included in the Beaver Island State Wildlife Research Area Fox Island Group. Much of the island is in private ownership. There is limited residential development on this island.

### Top Scoring Islands for Key Biodiversity Criteria



Top Scoring Islands	Biodiversity Significance						
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
North Manitou Island (LM13-1271)	195			✓		Medium	Protected
South Manitou Island (LM13-1272)	175	✓		✓		Higher	Protected
North Fox Island (LM13-1269)	163			✓		Lower	Protected
South Fox Island (LM13-1270)	129	✓				Medium	Portions are protected
Gull Island (LM13-1268)	91	✓				Lower	Protected
LM13-518	57					Lower	Unprotected
LM13-560	56					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

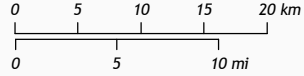
# Manitou and Fox Islands Lake Michigan 13



### Legend

-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:600,000



\*Does not include all islands of high biodiversity significance.

# Lake Huron Northern Coast

## Lake Huron 1, Lake Huron 9 and Lake Huron 10 Coastal Environments

Number of islands: 1,167

Number of large islands: 34

Number of island complexes: 355

Total island area (ha): 110,074

Total length of coastline (km): 1,178

**Major Habitat Types:** Rock, Limestone Plain Coniferous Forests, Wetlands, Sand Plain Mixed Forests.

**Key Islands for Biodiversity Conservation:** Cockburn Island - South, Dorcas Bay Island Complex, Drummond Island - Southeast, Drummond Island - South Central, Fitzwilliam Island - West, Great Duck Island, Lyal Island, Manitoulin Island - South, Marquette Island (Les Cheuneaux Islands), Tamarack Island Complex, Waughoshance Point.

### Landscape Context

The northeast coast of Lake Huron is predominantly resistant sedimentary rock outcrops. The irregular shoreline along Manitoulin Island and the Bruce Peninsula are characteristically comprised of wide, shallow, boulder-strewn rock platforms. There are many small islands and reefs in this area and marshes along the embayments and sheltered areas. Most of the islands are characterized by shelving bedrock, cobble beaches and areas of fringing wetlands and low vegetation banks.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 65 documented rare species occurring in this region. There are 15 documented occurrences of globally rare species, 14 occurrences of Great Lakes disjunct species and six Great Lakes endemic species. For example, Lakeside Daisy and Pitcher's Thistle are globally rare and are Great Lakes endemic species.

There are 33 documented occurrences of rare plant communities, including 16 globally rare communities. These globally rare plant communities include alvar shrubland types, alvar grassland types, an alvar pavement type, coastal meadow marsh types, a graminoid fen type, a limestone beach type and a limestone cliff type.

Eight colonial nesting waterbird species have been observed on the islands.

**Ecological Systems:** Dominant terrestrial system types include limestone plain forests as well as sand plain forests and pasture/abandoned fields. The key ecological systems of this region are wetlands (bogs, fens, marshes and swamps), alvars, beach and shorecliff forest complexes and limestone plain

forest complexes. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), barrier beaches, exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The majority of islands in this region are near-shore islands, and Thibault Island, Western Duck Island and Middle Duck Island are moderately isolated. These more isolated islands could provide stopover sites for birds. The Northern Coast is an area of seasonal spawning for Northern Pike, Yellow Perch and Lake Whitefish and seasonal migration for Lake Trout. There is also evidence of Lake Herring and Lake Sturgeon. Suitable habitat for interjurisdictional fish species includes fringing and broad wetlands, beaches (cobble, sand, boulder, mixed), and submerged rock.

#### *Physical Diversity:*

The majority of the islands in this region have medium shape complexity with all large islands having medium to low shape complexity. Islands in the Northern Coast are predominantly composed of sandstone, shale, dolostone and siltstone. The dominant shoreline type is shelving bedrock, as well as some fringing wetlands, low vegetation banks and cobble beaches.

#### *Island Size:*

Eight large islands dominate the area with size ranging from 479 to 83,537 hectares. Manitoulin Island and Cockburn Island are the largest islands in this region. The remaining islands are predominantly less than two hectares in size.

### Threats to Biodiversity

The majority of islands in the Northern Coast have some threat associated with them, including the presence of buildings and roads. The strong recreational pressures in the area have also contributed to the construction of boat launch sites and access for land vehicles. Manitoulin Island is considerably more threatened than other islands in this region, as it has high levels of residential and recreational development, quarries and evidence of the introduction of aquatic invasive species. The threats associated with Manitoulin Island have resulted in Manitoulin Island - South being the second most threatened island in all of the Great Lakes coastal environments (Manitoulin Island - North is the most threatened island).

### Conservation Assessment

#### *Existing Conservation*

One island complex is protected and within the Fathom Five National Marine Park of Canada.

Portions of Manitoulin Island are protected by Misery Bay Provincial Nature Reserve, Blue Jay Creek Provincial Park and Macs Bay Conservation Reserve.

Two islands are protected in Michigan as a Wilderness State Park and the Hiawatha National Forest. Non-government organizations own and manage the Misery Bay Conservation Reserve and Conservation Easement, and the Quarry Bay Nature Reserve on Manitoulin Island as well as numerous properties in the St. Martin Bay area.

Many of the island complexes along the western flank of the Bruce Peninsula are identified as provincially significant areas of natural and scientific interest (ANSI) and there are some provincially significant wetlands. Great Duck Island contains one of the only established Life science ANSIs in the Lake Huron Northern Coast. Other islands in the Northern Coast have sites nominated as candidate Life science ANSIs. This includes Cockburn Island, the northeast portion of Western Duck Island and the western of Fitzwilliam Island.

Many islands along the southern coast of Manitoulin Island are identified as proposed Life science ANSIs including the Michael Bay Beach Ridges, the Carter Bay Sand Dunes, Square Bay Beach Ridges, Dominion Bay Beach Ridges, Timber Bay Beach/Dune Complex, the Dean Bay-Sand Lakes natural area and Shrigley Bay - Marsh Lake.

Two Important Bird Areas can be found in this region, both located on the southern coast of Manitoulin Island. The first is the Spring Bay IBA, important for Eastern Sandhill Cranes and the Lake Huron, Quarry Bay IBA, important for Red-necked Grebes (IBA Canada, 2004).

*Conservation Assessment*

The islands in the following table are high scoring biodiversity islands. Great Duck Island and Cockburn Island provide habitat for provincially and globally rare species and provincially rare plant communities. They also contain key ecological and physical diversity and are among the most diverse islands in the Northern Coast. There are some buildings on these islands that pose a lower level of threat. The western portion of Fitzwilliam Island is included in this region. This area provides key ecological systems, shorelines and ecological functions.

The southern portion of Manitoulin Island is contained within the Northern Region. The island provides habitat for several rare species and plant communities, as well as species at risk. The island also contains key ecological and physical diversity areas. Some areas of the southern edge of this island are protected or have natural heritage designation. The remainder of islands have a higher level of threat from residential use, high recreational use and development, aquatic invasives and quarries.

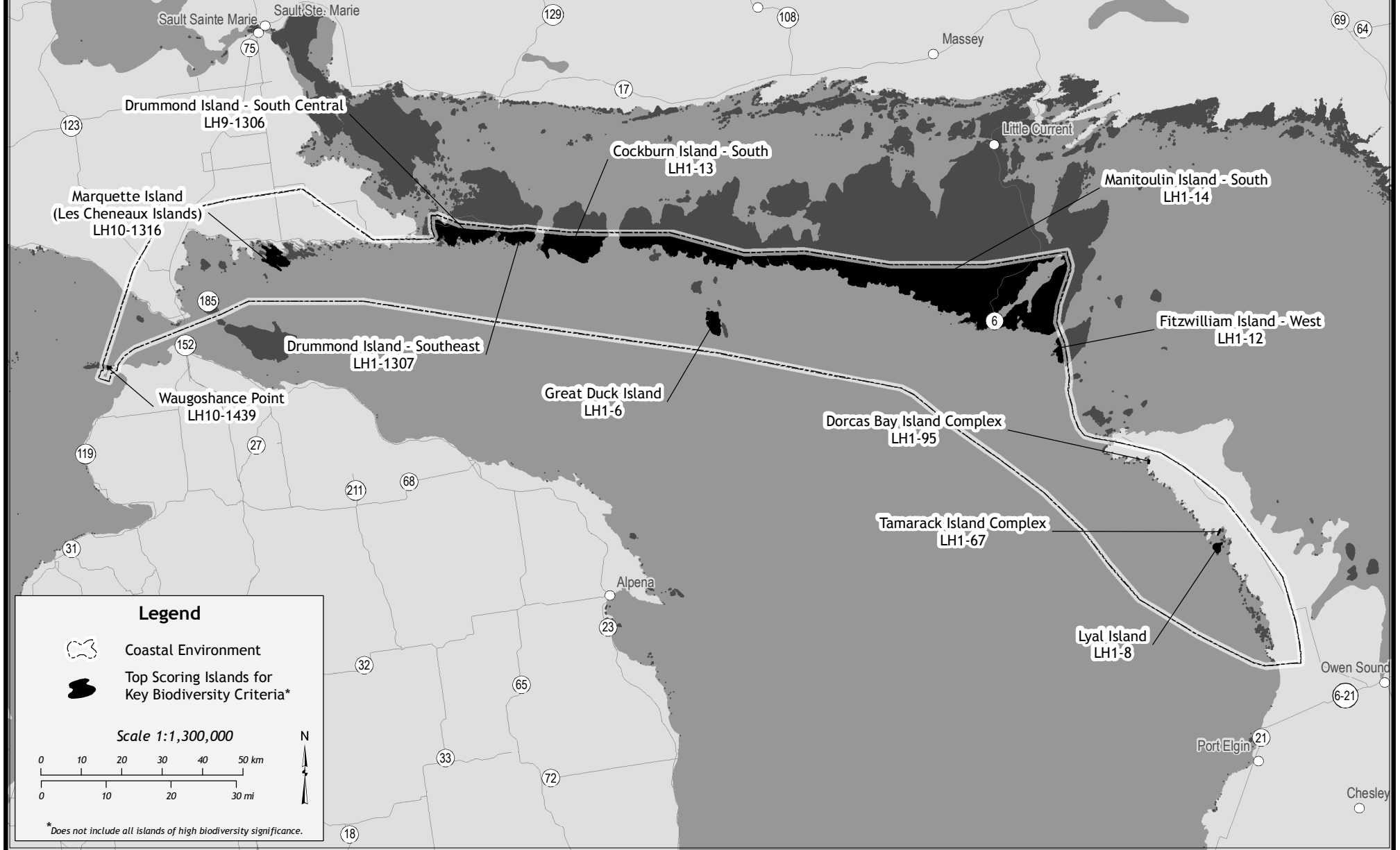
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Manitoulin Island - South (LH1-14)	490		✓	✓		Higher	Portions are protected
Cockburn Island - South (LH1-13)	318		✓	✓		Lower	Some natural heritage designations
Drummond Island - South Central (LH9-1306)	284			✓		Higher	Other land use designations
Fitzwilliam Island - West (LH1-12)	240			✓		Lower	Natural heritage designation
Great Duck Island (LH1-6)	235			✓		Lower	Unprotected
Drummond Island - Southeast (LH1-1307)	228			✓		Higher	Other land use designations
Marquette Island (Les Cheneaux Islands) (LH10-1316)	205			✓		Lower/Medium	Unprotected
Tamarack Island Complex (LH1-67)	189					Medium	Unprotected
Lyal Island (LH1-8)	178					Lower	Unprotected
Dorcas Bay Island Complex (LH1-95)	171		✓			Lower	Unprotected
Waugoshance Point (LH10-1439)	159			✓		Low	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Huron Northern Coast

## Lake Huron 1, Lake Huron 9 and Lake Huron 10



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# Lake Huron Central East and Southeast Coast

## Lake Huron 2 and Lake Huron 3 Coastal Environments

Number of islands: 39

Number of large islands: 1

Number of island complexes: 24

Total island area (ha): 26

Total length of coastline (km): 8

**Major Habitat Types:** Rock, wetlands, Sand Plain Deciduous Forest.

**Key Islands for Biodiversity Conservation:** Baie du Dore North Island Complex, Baie du Dore South Island Complex, Brucedale Island, Chantry Island, Kettle Point Central Island, Kettle Point North Island, Kettle Point South Island, Point Edward Island, Shashawandah Creek Island Complex, Southampton Island.

### Landscape Context

The central east coast of Lake Huron is primarily resistant sedimentary rock dipping gently to the west with sections of beaches (sand and pebble) and boulder-strewn rock platforms. This is a high-energy exposed coast with some sheltered bays. The southeast coast of Lake Huron is characterized by a steep coast in the northern portion with cliffs up to 20 metres, and two extensive beach-dune systems in the south. This area is also an exposed high-energy coast. The islands of the Central East and Southeast Coast are predominantly small rock outcrops that hug the shoreline. The island shorelines are predominantly broad wetlands.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are six documented rare species occurring in the Central East and Southeast Coast. These rare species include the documented observations of Sand Reed Grass (a Great Lakes endemic species) and American Beachgrass (a Great Lakes disjunct species). Colonial nesting waterbird species, including Black-crowned Night-heron, Great Black-backed Gull, Herring Gull and Ring-billed Gull, have been observed on the islands. Chantry Island supports Black-crowned Night-heron and is recognized as an Important Bird Area (IBA) and a Migratory Bird Sanctuary as an important migratory stop for birds traveling to northern nesting sites.

**Ecological Systems:** Dominant terrestrial system types include bedrock outcrops, sand plain deciduous forests, swamps and marshes. The key ecological system of this region is wetlands (marshes and swamps) as well as till plain forest complexes. Key shoreline communities include fringing wetlands, broad wetlands, cobble beaches, mixed beaches and depositional sand beaches.

**Ecosystem Functions:** The islands in Central East and Southeast Coast are near-shore islands and therefore have lower importance as stopover sites for landbirds. Occurrences of seasonal fish spawning are not documented for this region; however there is suitable habitat for interjurisdictional fish species such as broad wetlands, fringing wetlands, sand beaches, cobble beaches and mixed beaches.

#### *Physical Diversity:*

The majority of the island complexes have medium to high shape complexity. The majority of the islands are predominantly limestone, dolostone and siltstone. Other islands are composed of sandstone, shale, dolostone and siltstone. The dominant shoreline types are mixed pebble and cobble beaches, and wetlands.

#### *Island Size:*

One large island, Chantry Island, dominates the area with a size of 18 hectares. The remaining islands are predominantly less than two hectares in size.

#### **Threats to Biodiversity**

Most islands in these coastal environments have very low levels of threat. Approximately a dozen islands are affected by the presence of buildings. Access sites for land vehicles can be found on several islands, one island is affected by residential/recreational development, and two islands are used as agricultural cropland, one of which includes Chantry Island.

#### **Conservation Assessment**

##### *Existing Conservation*

Chantry Island is the only protected island in this coastal environment. It is designated as a Migratory Bird Sanctuary and is also identified as an Important Bird Area (IBA). The IBA covers 40 ha, including the 17 ha island and its surrounding area, as well as an additional island complex.

##### *Conservation Assessment*

The islands in the following table are higher scoring biodiversity islands in this region. Chantry Island contains key ecological systems for biological and physical diversity, and is designated a Migratory Bird Sanctuary as well as a Canadian nationally significant Important Bird Area supporting species such as Great Egret and Black-crowned Night-heron. There are a few buildings on this island, increasing its level of threat relative to other islands in the Central East and Southeast Coast of Lake Huron. Shashawandah Creek Island Complex and Kettle Point South Island are located south of Kettle Point provide wetland and shoreline habitat suitable for species such as fish. They contain representative ecological and

physical diversity. Both of these islands have fairly low threat from adjacent mainland roads. Baie du Dore South Island Complex contains key ecological and physical diversity, including shoreline types suitable for important fish species. This island is one

of the more distinct islands in the coastal environment, has no natural heritage designation and a very low level of threat.

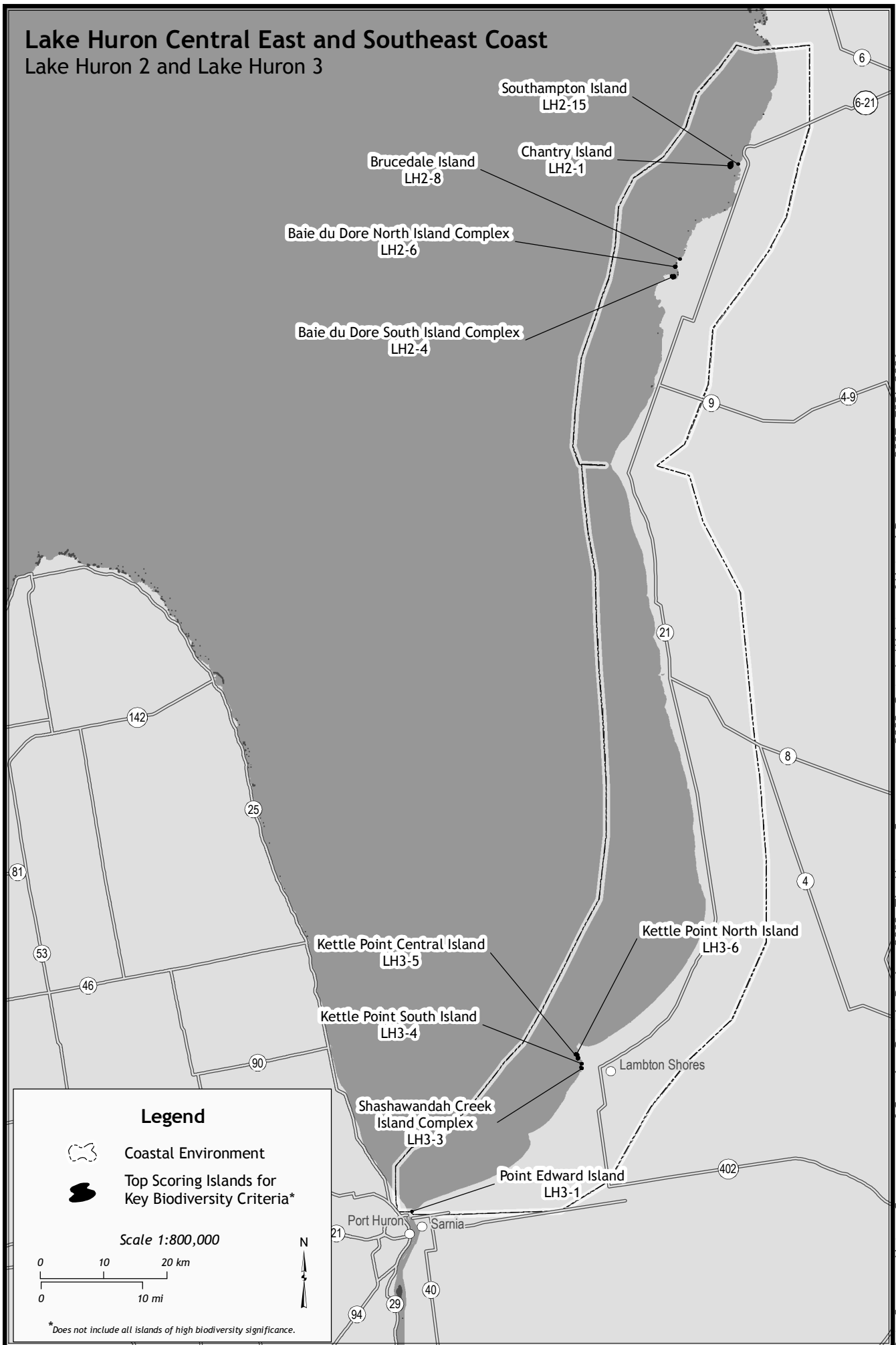
#### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
Shashawandah Creek Island Complex (LH3-3)	145	✓	✓	✓		Medium/Higher	Natural heritage designation
Baie du Dore South Island Complex (LH2-4)	137		✓	✓		Lower/Medium	Unprotected
Kettle Point South Island (LH3-4)	128		✓			Medium	Natural heritage designation
Point Edward Island (LH3-1)	126		✓			Higher	Unprotected
Southampton Island (LH2-15)	126		✓	✓		Lower	Unprotected
Baie du Dore North Island Complex (LH2-6)	124			✓		Lower	Unprotected
Kettle Point Central Island (LH3-5)	122	✓				Lower/Medium	Unprotected
Kettle Point North Island (LH3-6)	114		✓	✓		Higher	Unprotected
Brucedale Island (LH2-8)	114		✓			Medium/Higher	Unprotected
Chantry Island (LH2-1)	104	✓	✓	✓		Higher	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Huron Central East and Southeast Coast

## Lake Huron 2 and Lake Huron 3



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:800,000

0 10 20 km  
0 10 mi

N

\*Does not include all islands of high biodiversity significance.

# Lake Huron Southwest Coast

## Lake Huron 4 Coastal Environment

Number of islands: 194  
 Number of large islands: 0  
 Number of island complexes: 71  
 Total island area (ha): 31  
 Total length of coastline (km): 34

**Major Habitat Types:** Emergent herbaceous wetlands.

**Key Islands for Biodiversity Conservation:** Burnt Cabin Point, Harbor Beach Breakwater, Oscube Point, Port Austin Reef Light Complex, LH4-174, LH4-168, LH4-231, LH4-113, LH4-201, LH4-203, LH4-234.

### Landscape Context

This coastal environment stretches from Port Crescent to Port Huron at the southern base of Lake Huron. The islands within this region are small in size, close to the mainland and extend from Flat Rock Point (east of Port Crescent) to Port Sanilac. Approximately 60% of the 71 island complexes identified are described as navigational caution points (rocks, reefs or shoals). The remaining island complexes are small islands composed of wetlands.

### Biodiversity Assessment

#### *Biological and Physical Diversity:*

There are no rare species or plant communities documented on the islands in the Lake Huron

southwest coast. Wetlands are known to occur along shorelines of many of these islands, however limited information is known on ecological and physical diversity and the ecosystem functions of these islands.

#### *Island Size:*

There are no large islands that dominate the area. The islands in the Southwest Coast range from six hectares to less than one hectare. The majority of the islands in this region are less than one hectare in size.

#### **Threats to Biodiversity**

There is limited documented development on the islands of the Lake Huron southwest coast.

#### **Conservation Assessment**

##### *Existing Conservation*

None of the islands in this region are protected or have natural heritage designations.

##### *Conservation Assessment*

All the islands in the table below are higher scoring biodiversity islands in this region. There is little documentation of their biodiversity significance. There are limited documented threats on these islands and the islands are unprotected.

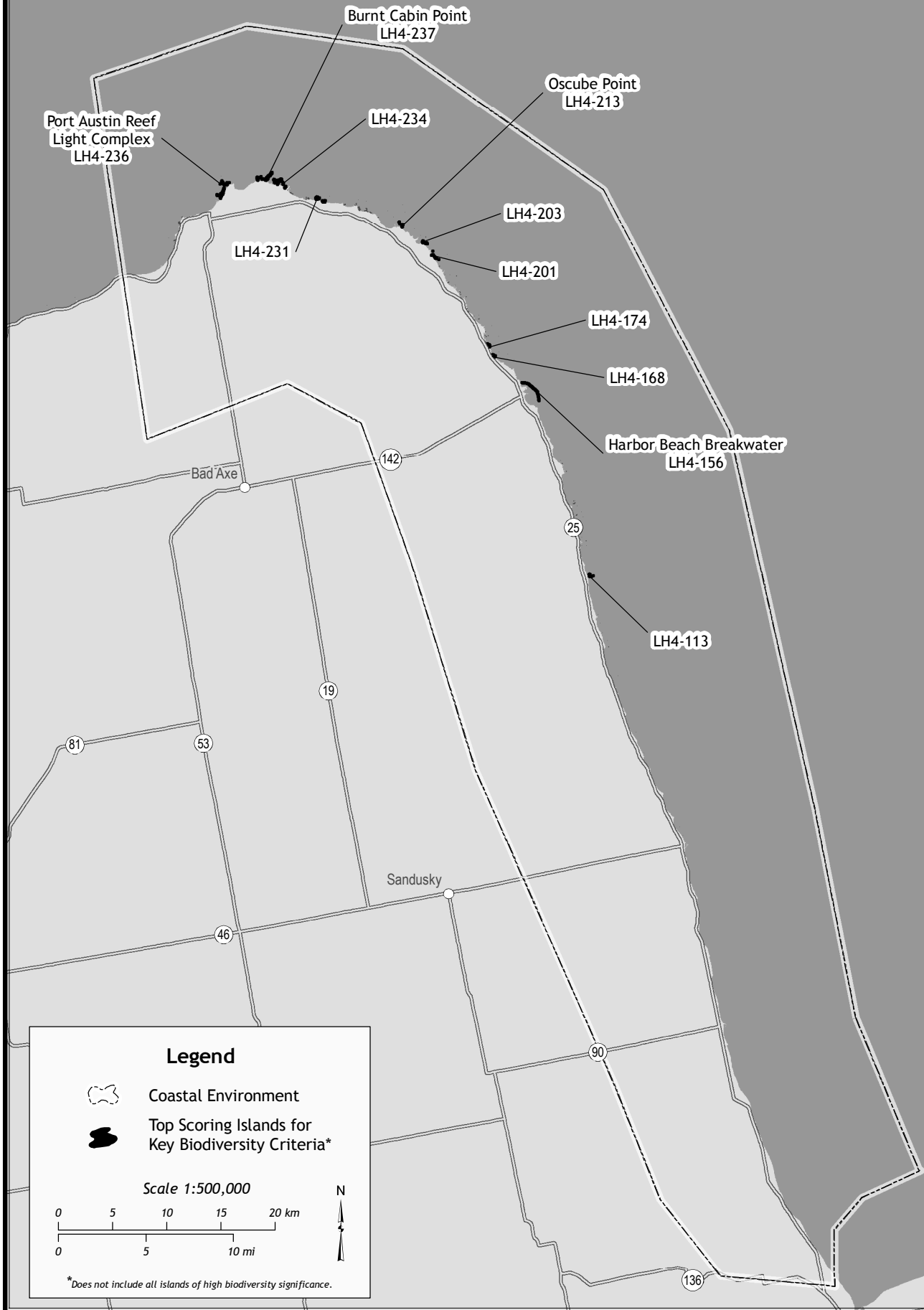
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
LH4-174	102			✓		Lower	Unprotected
LH4-168	100		✓	✓		Medium	Unprotected
Port Austin Reef Light Complex (LH4-236)	100			✓		Higher	Unprotected
Harbor Beach Breakwater (LH4-156)	98		✓			Lower	Unprotected
LH4-231	95			✓		Lower	Unprotected
LH4-113	91		✓			Lower	Unprotected
LH4-201	91			✓		Lower	Unprotected
LH4-203	89			✓		Lower	Unprotected
Oscube Point (LH4-213)	89			✓		Lower	Unprotected
LH4-234	88					Lower	Unprotected
Burnt Cabin Point (LH4-237)	85					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Huron Southwest Coast

## Lake Huron 4



# Saginaw Bay

## Lake Huron 5 Coastal Environment

Number of islands: 142  
Number of large islands: 9  
Number of island complexes: 69  
Total island area (ha): 791  
Total length of coastline (km): 108

**Major Habitat Types:** Rock, woody wetlands, emergent herbaceous wetlands, deciduous forest, grasslands/herbaceous areas.

**Key Islands for Biodiversity Conservation:** Au Gres Island Complex, Charity Island, Heisterman Island, Maisou Island, Middle Grounds Island - North, Middle Grounds Island - South, North Island, Pitchers Reef, Wild Fowl Bay Complex, Wild Fowl Bay Rush Cut.

### Landscape Context

Saginaw Bay is located in the southwestern portion of Lake Huron and is the outlet for the Saginaw River. Over half of the land use in the Saginaw Bay area is agriculture. Many of the islands in this region are close to the mainland and are predominantly wetlands or bare rock. Some larger islands such as Heisterman Island, Middle Grounds Island and Shelter Island are dominated by treed wetlands, emergent open wetlands and some deciduous forests.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** Rare species in Saginaw Bay include Least Bittern and Blanding's Turtle. Saginaw Bay also includes occurrences of the globally rare Lake Sturgeon and Pitcher's Thistle. The globally rare Lakeplain Oak openings plant community also occurs in this region.

Colonial nesting waterbird populations of Herring Gull, Caspian Tern, Forster's Tern, Common Tern, Black Tern, Great Blue Heron and Black-crowned Night-heron have been observed on the islands.

**Ecological Systems:** Dominant terrestrial system types include woody wetlands, emergent herbaceous wetlands and deciduous forest. The key ecological system of the islands of Saginaw Bay is Lakeplain Oak openings. Key shoreline communities include sandy beach/dunes, baymouth barrier beaches and open shoreline wetlands.

**Ecosystem Functions:** There are known occurrences of Lake Herring, Lake Whitefish, Round Whitefish, Lake Trout, Carp, Channel Catfish, Pumpkinseed, Smallmouth Bass, Largemouth Bass, Yellow Perch and Walleye.

#### *Physical Diversity:*

The majority of islands and island complexes have medium to high shape complexity. Middle Grounds Island and Maisou Island are among the islands with the most shape complexity. The geology of Saginaw Bay islands includes shale, black shale, limestone and sandstone. The dominant shoreline diversity is sand, vegetated banks and emergent wetlands.

#### *Island Size:*

Nine large islands dominate the area with size ranging from 24 to 204 hectares. Heisterman Island, Maisou Island and Shelter Island are the largest islands in the region. The remaining islands are predominantly less than two hectares in size.

### Threats to Biodiversity

There is little documented development on the islands of the Saginaw Bay. Non-native and invasive Common Reed (*Phragmites australis*) stands are affecting the Bay with the likelihood of occurring on islands within the Bay. There has been a history of phosphorus pollution in Saginaw Bay.

### Conservation Assessment

#### *Existing Conservation*

Approximately one-quarter of the islands in Saginaw Bay are protected. Those islands that are protected, such as Middle Grounds Island, Maisou Island and Heisterman Island, are either entirely or predominantly protected. These islands are included in the Wildfowl Bay State Wildlife Area. Nayanquing Point State Wildlife Area also includes islands.

#### *Conservation Assessment*

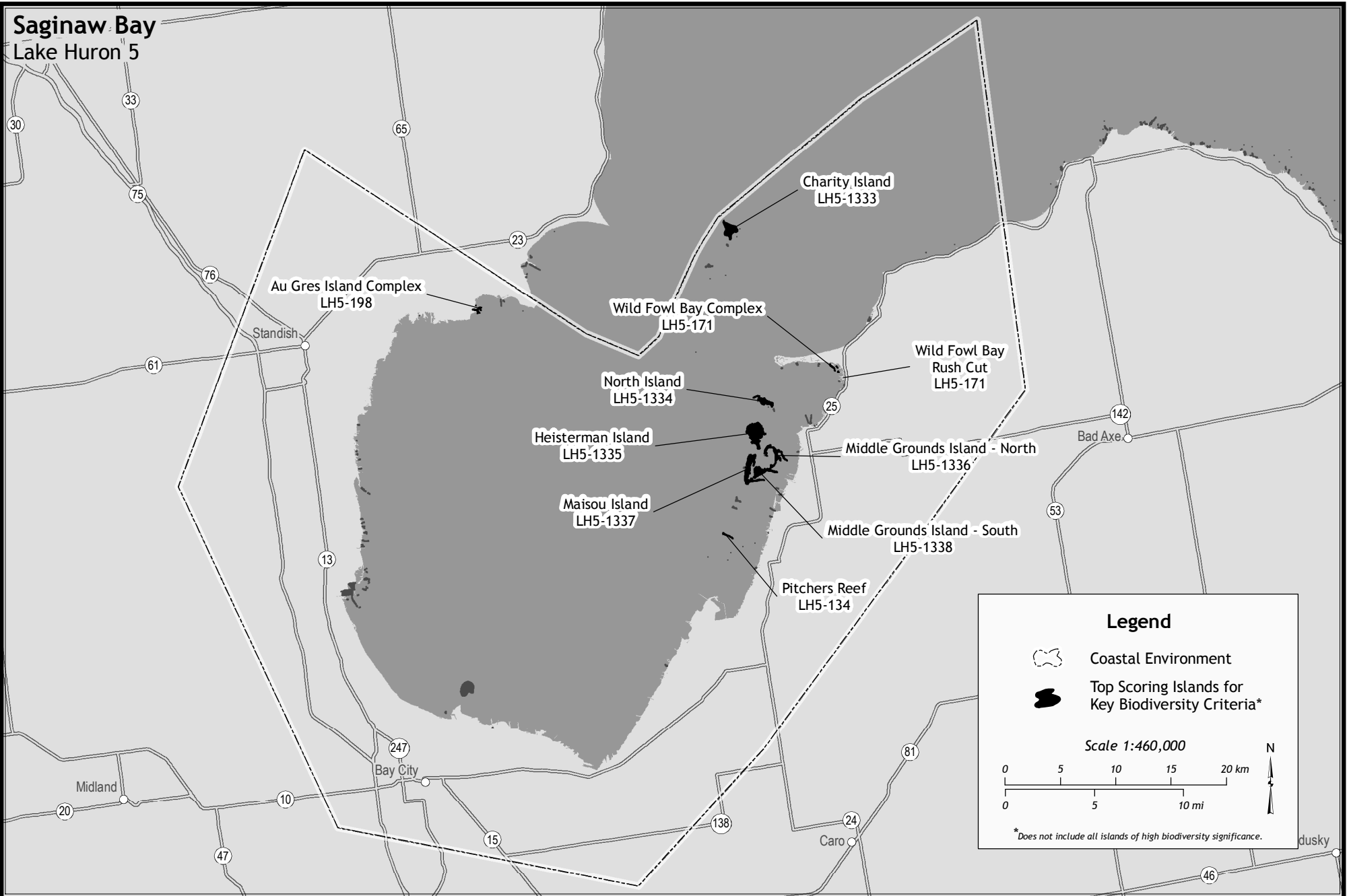
The islands in the following table are high scoring biodiversity islands. Heisterman Island is a high scoring, priority island with occurrences of Common Tern, Bald Eagle and a Great Blue Heron rookery. The island also includes Lakeplain Oak openings, a globally rare plant community. It has been included in the Wildfowl Bay State Wildlife Area and has no documented threats.

North Island is also a high scoring, priority limestone island with key open shoreline wetland ecosystems. This island does not have a natural heritage designation and is not included in the nearby Wildfowl Bay State Wildlife Area.

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance						
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
Heisterman Island (LH5-1335)	164		✓	✓		Lower	Protected
Charity Island (LH5-1333)	152			✓		Lower	Protected
North Island (LH5-1334)	150		✓			Medium	Unprotected
Middle Grounds Island - South (LH5-1338)	147			✓		Lower	Protected
Maisou Island (LH5-1337)	140		✓			Medium	Protected
Middle Grounds Island - North (LH5-1336)	139		✓			Medium	Protected
Au Gres Island Complex (LH5-198)	130		✓			Lower	Largely unprotected
Wild Fowl Bay Complex (LH5-171)	122		✓			Medium	Unprotected
Wild Fowl Bay Rush Cut (LH5-149)	120		✓			Lower	Protected
Pitchers Reef (LH5-134)	119		✓			Medium	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009, Ontario Ministry of Natural Resources, 2007, ESRI, 2006.

# Lake Huron Central West Coast

## Lake Huron 6 Coastal Environment

Number of islands: 25  
 Number of large islands: 0  
 Number of island complexes: 19  
 Total island area (ha): 4  
 Total length of coastline (km): 5

**Major Habitat Types:** Beaches, emergent herbaceous wetlands.

**Key Islands for Biodiversity Conservation:** Au Gres Coastal Marsh, Au Gres River Channel Wall and Dikes, Scarecrow Island, Bird Island, Au Gres South - Old Marina Channel Walls, LH6-321, LH6-226, LH6-325.

### Landscape Context

This coastal environment includes the northwestern portion of Saginaw Bay and extends to the southern boundary of Thunder Bay. There are three island complexes at the mouth of the Au Gres River as it enters the Saginaw Bay, and the remaining islands are predominantly navigational caution points (rocks, reefs or shoals) that extend from the areas around South Point to Sturgeon Point.

### Biodiversity Assessment

#### *Biological and Physical Diversity:*

There are no documented rare species on these islands; however there is an occurrence of the globally rare Great Lakes marsh, which is also defined as a key ecological system in the coastal environment. Scarecrow Island has significant numbers of overwintering Trumpeter Swans and is also used for nesting by colonial nesting waterbirds including Great Blue Heron, Herring Gull, Double-crested Cormorant, Black-crowned Night Heron, Caspian Tern and Common Tern.

#### *Physical Diversity:*

The majority of islands and island complexes have low to medium shape complexity. The geology of the Lake Huron Central West Coast is characterized by black shale with sandstone and limestone. The dominant shoreline is rock and sand beaches. A key shoreline system is open shoreline wetlands.

#### *Island Size:*

There are no large islands that dominate the area. Scarecrow Island and Bird Island are approximately five hectares in size. Most of the remaining islands are less than one hectare in size.

### Threats to Biodiversity

There are no documented threats on the islands of the Lake Huron central west coast.

### Conservation Assessment

#### *Existing Conservation*

Scarecrow Island is one of the islands included in the Michigan Islands National Wildlife Refuge. The remaining islands in this region are not protected or do not have any natural heritage designations.

#### *Conservation Assessment*

All the islands in the table below are higher scoring biodiversity islands in this region. There is little documentation on their biodiversity significance. The majority of the islands are unprotected. Scarecrow Island is protected within the Michigan Islands National Wildlife Refuge and is an important site for colonial nesting waterbirds.

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Au Gres River Channel Wall and Dikes (LH6-211)	124		✓	✓		Lower	Unprotected
Au Gres Coastal Marsh (LH6-214)	82		✓	✓		Lower	Unprotected
Scarecrow Island (LH6-323)	73	✓	✓			Lower	Protected
Bird Island (LH6-324)	60		✓			Lower	Unprotected
Au Gres South - Old Marina Channel Walls (LH6-206)	55			✓		Lower	Unprotected
LH6-321	44					Lower	Unprotected
LH6-226	39					Lower	Unprotected
LH6-325	36					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Huron Central West Coast

## Lake Huron 6



Scarecrow Island  
LH6-323

LH6-325

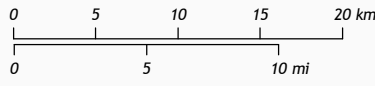
Bird Island  
LH6-324

LH6-321

### Legend

-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:460,000



\*Does not include all islands of high biodiversity significance.

Au Gres Coastal Marsh  
LH6-214

LH6-226

Au Gres River Channel  
Wall and Dikes  
LH6-211

Au Gres South -  
Old Marina Channel Walls  
LH6-206

# Lake Huron Northwest Coast

## Lake Huron 7 and Lake Huron 8 Coastal Environments

Number of islands: 115

Number of large islands: 7

Number of island complexes: 58

Total island area (ha): 8,992

Total length of coastline (km): 102

**Major Habitat Types:** Woody wetlands, coniferous forest, deciduous forest.

**Key Islands for Biodiversity Conservation:** Bois Blanc Island, Crooked Island, Middle Island, Round Island, Round Island Complex, Sugar Island, Sulphur Island, Thunder Bay Island.

### Landscape Context

The Lake Huron Northwest Coast extends from the northern portion of Thunder Bay to the South Channel and Straits of Mackinac in the north. The islands are generally concentrated in two areas: around Thunder Bay and north to North Bay, and adjacent to the mainland Mackinaw State Forest. The largest island in this region is Bois Blanc Island located in the South Channel. Smaller adjacent islands, including Round Island, are associated with this region. Mackinac Island and other northerly islands are included in the Lake Huron North Channel coastal environment.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 12 rare species in the Lake Huron Northwest Coast including Bald Eagle, and Lake Huron Tansy. The Northwest Coast has documented observations of Pitcher's Thistle and Dwarf Lake Iris, two globally rare species.

There are six plant communities with documented occurrences, including three globally rare communities; northern fen, wooded dune and swale complex and cobble beach.

Colonial nesting waterbirds, including Herring Gull and Ring-billed Gull, are documented on several islands in this region. Great Blue Heron, Great Egret and Black-crowned Night-Heron nest on Grass Island, and Caspian Tern and Common Tern have nested on Thunder Bay Island.

**Ecological Systems:** Dominant terrestrial system types include beaches, woody wetlands, shoreline wetlands, coniferous forests and deciduous forests. The key ecological systems of the Northwest Coast are rich conifer swamp, northern fen and wooded dune and swamp complex. Key shoreline communities are open shoreline wetlands.

**Ecosystem Functions:** The islands in the Northwest Coast are primarily near-shore islands and therefore have lower importance as stopover sites for landbirds. There are known occurrences of Alewife, Lake Whitefish and Lake Trout.

#### *Physical Diversity:*

The majority of islands and island complexes have low to medium shape complexity. Gull Island is among the islands with the most shape complexity. The geology of the Northwest Coast islands include limestone on islands around Thunder Bay, dolomite and limestone on Bois Blanc Island and Round Island, and black shale and limestone at the southern most area of Thunder Bay in this region.

#### *Island Size:*

Seven large islands dominate the area with size ranging from 29 to 8,505 hectares. Bois Blanc Island, Round Island and Middle Island are the largest islands in this region. The remaining islands are predominantly less than one hectare in size.

### Threats to Biodiversity

Many of the islands in the Northwest Coast of Lake Huron have no documented threats associated with them. The remaining islands have limited development, primarily identified as roads. Bois Blanc Island has the highest associated threats for this region which include limited residential and recreational development.

### Conservation Assessment

#### *Existing Conservation*

A limited number of islands in this region are protected or have natural heritage designations. Sugar Island, Thunder Bay Island and Round Island are included in the Michigan Islands National Wildlife Refuge and the Hiawatha National Forest. Some islands are included in the Gaylord State Forest Area and Atlanta State Forest Area. The Nature Conservancy owns and manages several parcels of land on Bois Blanc Island as nature preserves. The Little Traverse Land Conservancy and Michigan Nature Association also own land on Bois Blanc Island and manages them as nature preserves.

#### *Conservation Assessment*

The islands in the following table are high scoring biodiversity islands. Bois Blanc Island has biodiversity significance in this region and has several key ecological systems, plant communities and species occurrences. Approximately one-third of the island is owned and managed by non-government organizations as nature preserves. There are some residential and recreational development and associated threats on this island.

Thunder Bay Island has biological significance, including occurrences of Common Tern and Caspian Tern. The majority of this island is included in the Michigan Island National Wildlife Refuge. There is limited development and access roads on this island,

resulting in a higher threat level compared to other islands in this region.

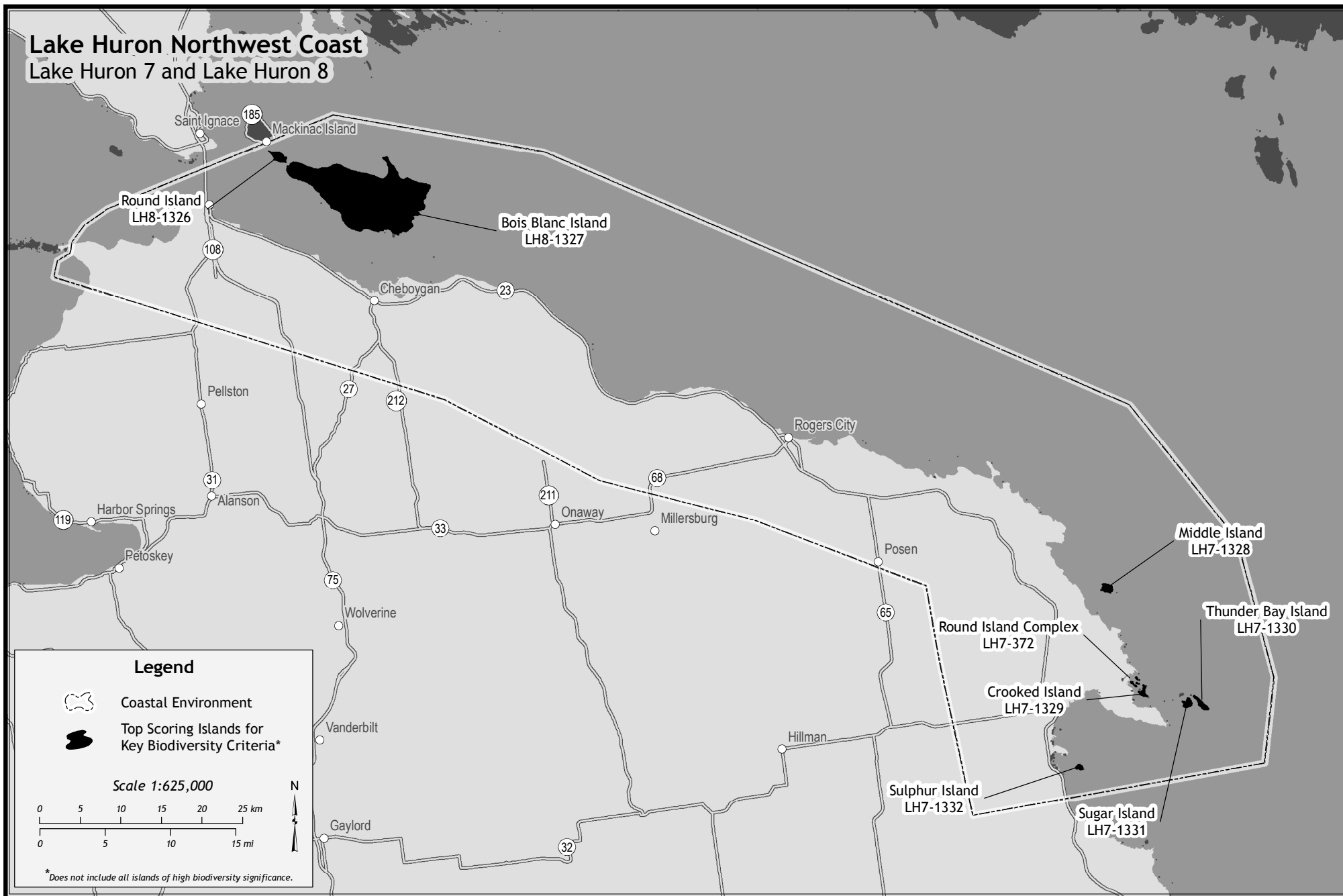
#### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance						
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
Bois Blanc Island (LH8-1327)	233		✓	✓		Higher	Largely unprotected
Thunder Bay Island (LH7-1330)	134	✓	✓	✓		Higher	Protected
Middle Island (LH7-1328)	131			✓		Medium	Unprotected
Crooked Island (LH7-1329)	127		✓	✓		Lower	Unprotected
Sugar Island (LH7-1331)	123		✓			Lower	Unprotected
Round Island (LH8-1326)	119			✓		Lower	Protected
Sulphur Island (LH7-1332)	115			✓		Higher	Unprotected
Round Island Complex (LH7-372)	92					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Huron Northwest Coast

## Lake Huron 7 and Lake Huron 8



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# North Coast North Channel

## Georgian Bay 1 Coastal Environment

Number of islands: 3,992  
Number of large islands: 87  
Number of island complexes: 595  
Total island area (ha): 33,258  
Total length of coastline (km): 1,348

**Major Habitat Types:** Rock, mixed forests often on limestone plain or bare rock ridge and shallow till, tolerant hardwoods on bedrock.

**Key Islands for Biodiversity Conservation:** Aird Island, Bedford Island, Blind River Island, Burton Island Complex, Campement d'Ours Island, Clapperton Island, Great La Cloche Island, Little La Cloche Island, St. Joseph Island - Northeast.

### Landscape Context

The North Channel includes a high concentration of low relief large and small islands that extends along the mainland from Bruce Mines to Killarney. This region is characterized by resistant bedrock of the Canadian Shield. Islands in this region are very sheltered. Most of these islands are characterized by low bluffs of resistant bedrock, dominated by tolerant hardwoods or mixed hardwoods and conifers. Fringing wetlands and low vegetated banks are also common in sheltered areas. Sediments are scarce and restricted to local transport systems in river mouths and low-lying embayments. As a result, sand beaches are rare, and characterized by cobble.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 12 documented rare species occurring in the North Coast North Channel. These rare species include the globally rare *Catinella exile* (A Mollusc), Hill's Thistle, Houghton's Goldenrod and Ram's-head Lady's-slipper. Three Great Lake disjunct species and Houghton's Goldenrod, a Great Lakes endemic species have been documented from the North Coast North Channel. Sand Cherry, a Great Lakes declining species, is also observed on islands in this region.

Colonial nesting waterbird populations of Caspian Tern, Common Tern, Great Black-backed Gull, Ring-billed Gull and Herring Gull have been observed on the islands. The Cousins island complex is recognized as an Important Bird Area and provides habitat for several colonial waterbirds, including nearly 1.5% of the estimated North American Caspian Tern population and almost 5% of the Great Lakes estimated population.

There are five documented rare alvar communities of which all are globally rare. These plant

communities include alvar pavement, alvar grassland and alvar shrubland types.

**Ecological Systems:** Dominant terrestrial system types include bare rock ridge and shallow till forests, sand plain deciduous forests and tolerant hardwoods on bedrock. The key ecological system of this region is wetlands (bogs and fens), limestone plain forest complexes, alvars, and grass and meadows. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The majority of islands in the North Coast North Channel are near-shore islands and therefore have lower importance as stopover site for landbirds. There may be some demonstrated use of wetlands by migratory waterfowl. There are known occurrences of seasonal fish spawning for Lake Trout, Northern Pike, Walleye, Lake Whitefish and Yellow Perch. Suitable habitat for interjurisdictional fish species includes fringing wetlands, cobble beaches, submerged rock, broad wetlands, sand beaches, boulder beaches and mixed beaches.

#### *Physical Diversity:*

The majority of the large island complexes have the least shape complexity, with the majority of island complexes and small islands having medium to high shape complexity. The majority of the islands include quartz-feldspar sandstone, conglomerate, sandstone, siltstone, mafic rocks, limestone, dolostone, shale and granite. The dominant shoreline type is exposed bedrock bluffs ranging from one to five metres in elevation.

#### *Island Size:*

Twenty-five large islands dominate the area with size ranging from 152 to 7,819 hectares. Great La Cloche Island, St. Joseph Island and Clapperton Island are the largest islands in the North Coast North Channel. The remaining islands are predominantly less than five hectares in size.

### Threats to Biodiversity

St. Joseph's Island exhibits the highest threat level in this coastal environment, and is primarily affected by the presence of buildings, residential areas, pits/quarries and a high use beach. More pit/quarry areas can be found on Little La Cloche Island and Goat Island. However, even in the face of this array of threats, over 90 percent of the islands within this coastal environment exhibit very low threat levels. Of the dozen islands that exhibit medium to high levels of threat, it is primarily due to residential and

recreational development and the associated higher road densities.

### Conservation Assessment

#### *Existing Conservation*

Most of the protected islands in the North Coast North Channel are managed by Ontario Parks as regulated provincial parks. The Mississagi Delta Provincial Park is a candidate life science area of natural and scientific interest (ANSI) which includes protection of several offshore islands. Some of these islands are characterized by the presence of wetland vegetation in remnant flooded channels (Noble, 1991).

An addition to La Cloche Provincial Park was made in 1999 to include Clapperton Island and other North Channel islands. Clapperton Island also contains a significant alvar, the Clapperton Island Alvar, which has been nominated as a candidate Life science ANSI due to its description as one of the highest quality alvars in the Manitoulin Island area (Noble, 1995).

The Killarney Coast and Islands Provincial Park (Waterway type) affords protection to several islands off the northeast shore of Manitoulin Island (OMNR, 1999). The Spanish River Mouth/Alluvial Islands are protected as a conservation reserve by the OMNR, covering an area of 61 hectares (OMNR, 1999). The Spanish River Mouth has also been nominated as a Life science ANSI due to the presence of varying types of wetlands, alluvial islands and regionally significant plant communities (Noble, 1991).

Other islands with natural heritage designations include those covered by The Cousins Important Bird Area (IBA). This IBA is comprised of several islands, made of limestone and cobble, with moderate tree and shrub growth. The islands are somewhat isolated from human disturbance and are owned by the Ontario provincial government (IBA Canada, 2004).

#### *Conservation Assessment*

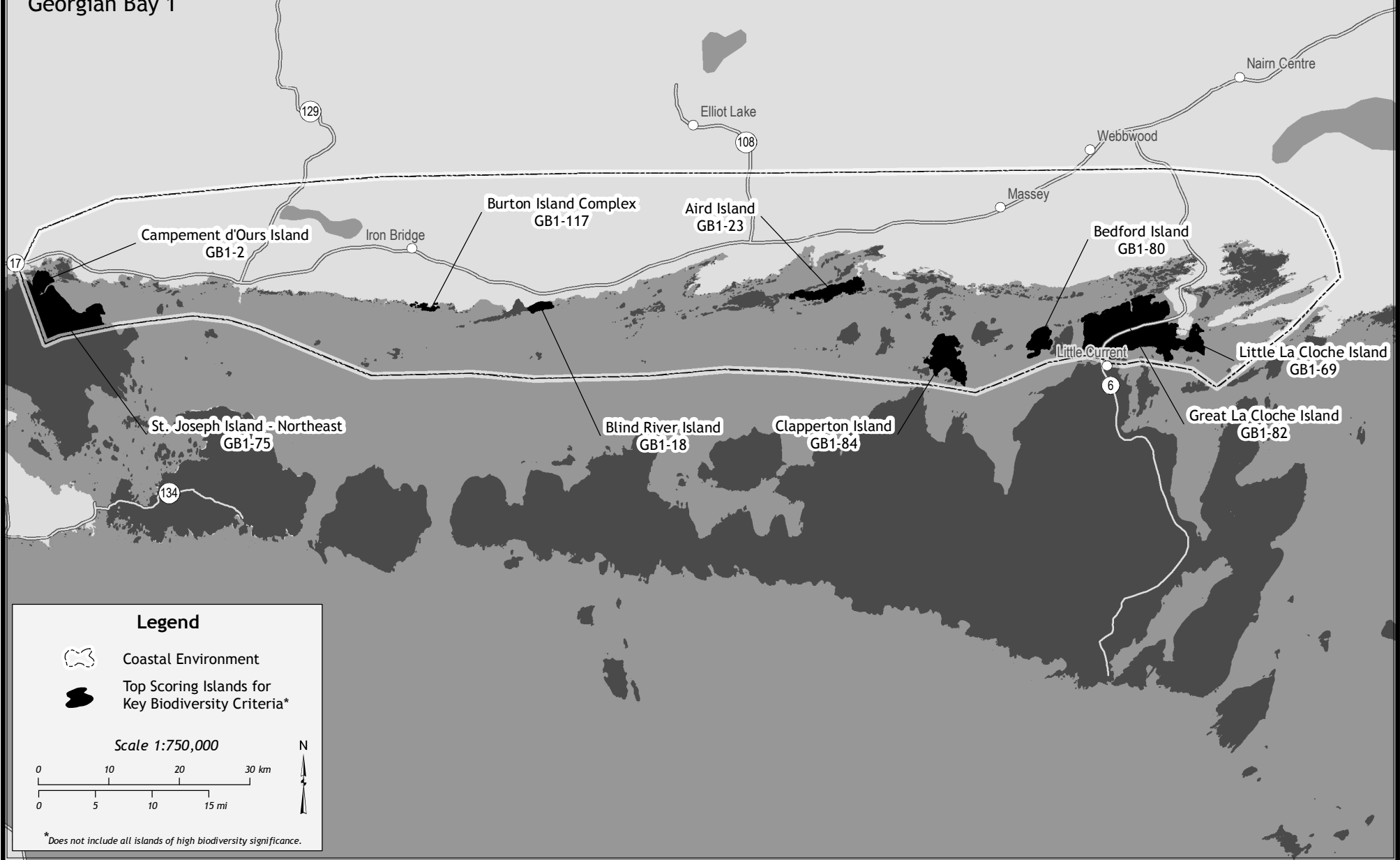
The islands in the following table are high scoring biodiversity islands. Great La Cloche Island has globally rare species, Great Lake endemic and disjunct species, and important ecological and physical diversity. There is currently no formal protection on this island. Aird Island has key ecological and physical diversity and its only known threat is very low road density. This island has interim protection as a proposed provincial park. Clapperton Island contains globally rare plant communities, has key ecological systems and provides habitat for several colonial waterbird species. This island has a low level of threat and has interim protection as a proposed provincial park. The portion of St. Joseph Island that is contained within this region has important shoreline and upland terrestrial ecosystems for biodiversity. This island has a high level of threat due to high recreational use, boat launches, residential areas, road development and quarries. There is no formal protection on this part of the island.

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Great La Cloche Island (GB1-82)	345		✓	✓		Lower	Unprotected
Clapperton Island (GB1-84)	259	✓		✓		Medium	Protected
Blind River Island (GB1-18)	242			✓		Medium	Unprotected
St. Joseph Island - Northeast (GB1-75)	227			✓		Higher	Unprotected
Little La Cloche Island (GB1-69)	211		✓			Lower/Medium	Unprotected
Aird Island (GB1-23)	208		✓	✓		Lower	Protected
Burton Island Complex (GB1-117)	198		✓			Lower/Medium	Unprotected
Campement d'Ours Island (GB1-2)	196			✓		Lower	Unprotected
Bedford Island (GB1-80)	196			✓		Lower	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

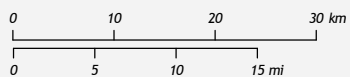
# North Coast North Channel Georgian Bay 1



### Legend

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:750,000



\*Does not include all islands of high biodiversity significance.

# North and East Georgian Bay

## Georgian Bay 2 Coastal Environment

Number of islands: 17,615  
Number of large islands: 203  
Number of island complexes: 848  
Total island area (ha): 37,945  
Total length of coastline (km): 4,051

**Major Habitat Types:** Rock, White Pine on bedrock, mixed forests on bedrock.

**Key Islands for Biodiversity Conservation:** American Camp Island Complex, Beausoleil Island, Bradden Island Complex, Colin Rock Complex, Irving Island Complex, McLaren Island, McCoy Islands Complex, Mink Islands Complex, Moon Island, Parry Island, Phillip Edward Island, Sandy Island, The Pines Island Complex (west of Parry Island).

### Landscape Context

The islands and shorelines of the North and East Georgian Bay are often characterized by granite rock formations and windswept White Pine, and are the largest group of treed and open granite rock barrens of their kind in the Great Lakes basin. This region is largely exposed to waves and ice; however the islands have considerable local sheltering to provide pockets of beaches and wetlands. Most of the islands are characterized by exposed bedrock bluffs with pockets of fringing wetlands. Very little of the island shorelines have been modified to include rip-rap, retaining walls and other structures.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 36 documented rare species occurring in North and East Georgian Bay. These rare species include the globally rare Eastern Foxsnake and Massasauga. Eleven Great Lake disjunct species and Stiff Yellow Flax, a Great Lakes endemic species have been documented from the North and East Georgian Bay region. Sand Cherry and Butternut, Great Lakes declining species, are also observed on islands in this region.

Colonial nesting waterbird populations of seven species have been observed on the islands. The Watchers Important Bird Area (IBA) is recognized as a globally significant area for colonial waterbirds and supports a significant concentration of nesting Caspian Terns and Ring-billed Gulls. Limestone Islands IBA is also a globally significant area for colonial waterbirds and supports significant colonies of Common Terns, Caspian Terns and Ring-billed Gulls (IBA Canada, 2004).

There are 12 documented rare plant communities of which eight are globally rare. These plant

communities include fens, swamps, bog and coastal meadow marsh types.

**Ecological Systems:** Dominant terrestrial system types include sand plain forests, bare rock ridge and shallow till forests, tolerant hardwoods on bedrock and grasslands. The key ecological system of this region is wetlands (marshes, swamps and bogs), and meadow. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), barrier beaches, exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The majority of islands in North and East Georgian Bay are near-shore islands and therefore has lower importance as stopover sites for landbirds. There may be some local use of wetlands by migratory waterfowl. There are known occurrences of seasonal fish spawning for Lake Trout, Northern Pike and Walleye. There is also evidence of Kiyi, Lake Herring, Lake Sturgeon, Lake Whitefish and Yellow Perch. Suitable habitat for interjurisdictional fish species includes fringing wetlands, submerged rock, broad wetlands and beaches (cobble, sand, boulder and mixed).

#### *Physical Diversity:*

The majority of the large island complexes have moderately complex shapes. The majority of the islands include migmatitic rocks and gneisses, as well as felsic igneous rocks, granitic rocks and mafic rocks. Fifty-seven island complexes along the southern portions of the North and East Georgian Bay have metasedimentary rock. The dominant shoreline type is exposed bedrock bluffs up to five metres in elevation.

#### *Island Size:*

Eighty-two islands dominate the area with size ranging from 32 to 7,656 hectares. Parry Island, Phillip Edward Island and Moon Island are the largest islands in this region. The remaining islands are predominantly less than three hectares in size.

### Threats to Biodiversity

Two-thirds of the islands within North and East Georgian Bay exhibit a very low level of threat. Of the 21 islands that exhibit a high level of threat, recreational development and associated increase in road densities, building densities, boat launches and access points are the main contributing factors. The accumulated threats from these various factors result in this region as being the second highest threatened coastal environment in all the Great Lakes. Parry Island is the most threatened island in this region, and faces threats mainly from buildings,

access sites for road vehicles, road density and the presence of pits and quarries. The Irving Island Complex faces nearly the same threat level as Parry Island and boasts a similar number of buildings, as well as boat launches and access sites for road vehicles. Burnt Island, Bradden Island Complex, and Centennial Island also show a high density of building points. Centennial Island, Beausoleil Island and George Island, among others, exhibit some threat level from the presence of recreational or residential sites. There are some islands documented as being somewhat affected by the presence of invasive aquatic species. Agricultural activities can be found on a number of islands in this region, including South Watcher Island.

### Conservation Assessment

#### *Existing Conservation*

Most of the protected islands in North and East Georgian Bay are managed by Ontario Parks as provincial parks. Limestone Islands Provincial Park includes North and South Limestone Islands and Wallis Rocks. These islands have also been nominated as a life science area of natural and scientific interest (LS ANSI) (MacDonald, 1986). The French River Provincial Park traverses the distance between Lake Nipissing and Georgian Bay. Additions to the provincial park encompass additional islands in North and East Georgian Bay including the Macoun Rocks and the Gull Rocks.

Massasauga Provincial Park was recently extended to include within its boundaries more than 100 islands in Georgian Bay, stretching from Five Mile Bay to Moon Bay. The islands represent a strikingly diverse group of islands now afforded protection and management by Ontario Parks (Jalava et al., 2002). Killbear Provincial Park includes Cousin Island, Davy Island and Day Island. The park's Natural Environment and Nature Reserve Zones, including the aforementioned offshore islands have also been nominated as a candidate LS ANSI (Brunton, 1993).

A proposed protected area in this region would include several islands identified as part of North and East Georgian Bay. Killarney Coast and Island Provincial Park would protect several of the islands found off the coast (OMNR, 1999).

Georgian Bay Islands National Park also occurs in this region and is managed by Parks Canada. This park consists of 63 islands, including Beausoleil Island, Centennial Island and the Northern and Southern Outlying Islands. Beausoleil Island has two Life science ANSIs: the Beausoleil Island Coastal Till Terrace ANSI and the Beausoleil and Associated Islands ANSI.

There are three Pine Island complexes in eastern Georgian Bay, with The Pine Islands Complex identified in the following table being located west

of Parry Island. This island complex has been noted as significant, but only one island within this complex is protected: South East Wooded Pine Island, which is owned and managed by the Nature Conservancy of Canada.

Sandy Island contains a candidate Life science ANSI and would afford protection to the island's bog, mature deciduous forests, juniper-dominated bedrock barrens, emergent beaches and southern plant species (Brunton, 1993).

Other important protected areas in the North and East Georgian Bay include the Franklin Island White Pine Forest Conservation Reserve, the Shawanaga Conservation Reserve (including Shawanaga Island and Nadeau Island) and the North Georgian Bay Coast and Islands Conservation Reserve (protecting over 20,000 hectares of land, water and islands).

Islands with other natural heritage designations include two Important Bird Areas (IBA). The first is the Limestone Islands IBA which supports large numbers of Common Terns, Caspian Terns and Ring-billed Gulls. The second is The Watchers IBA which is made up of North Watcher Island and South Watcher Island and supports large numbers of Caspian Tern and Ring-billed Gull populations. This IBA is identified as significant breeding area for these species.

#### *Conservation Assessment*

Parry Island has key ecological systems and shoreline diversity important to island conservation. This island is considered one of the more distinct islands within this coastal environment. There is moderate threat to this island with the presence of some buildings, access points and some quarries. Phillip Edward Island, Beausoleil Island and Moon Island also contain key ecological and physical biodiversity. Beausoleil Island also supports rare species and plant communities. These islands have high biodiversity value, but are formally protected or have interim protection as regulated or proposed parks.

Irving Island Complex contains species at risk, key ecological systems and provide habitat for key bird and fish species. Approximately half of this complex has some protection with natural heritage designations, but the remaining islands are threatened with buildings and recreational development pressures.

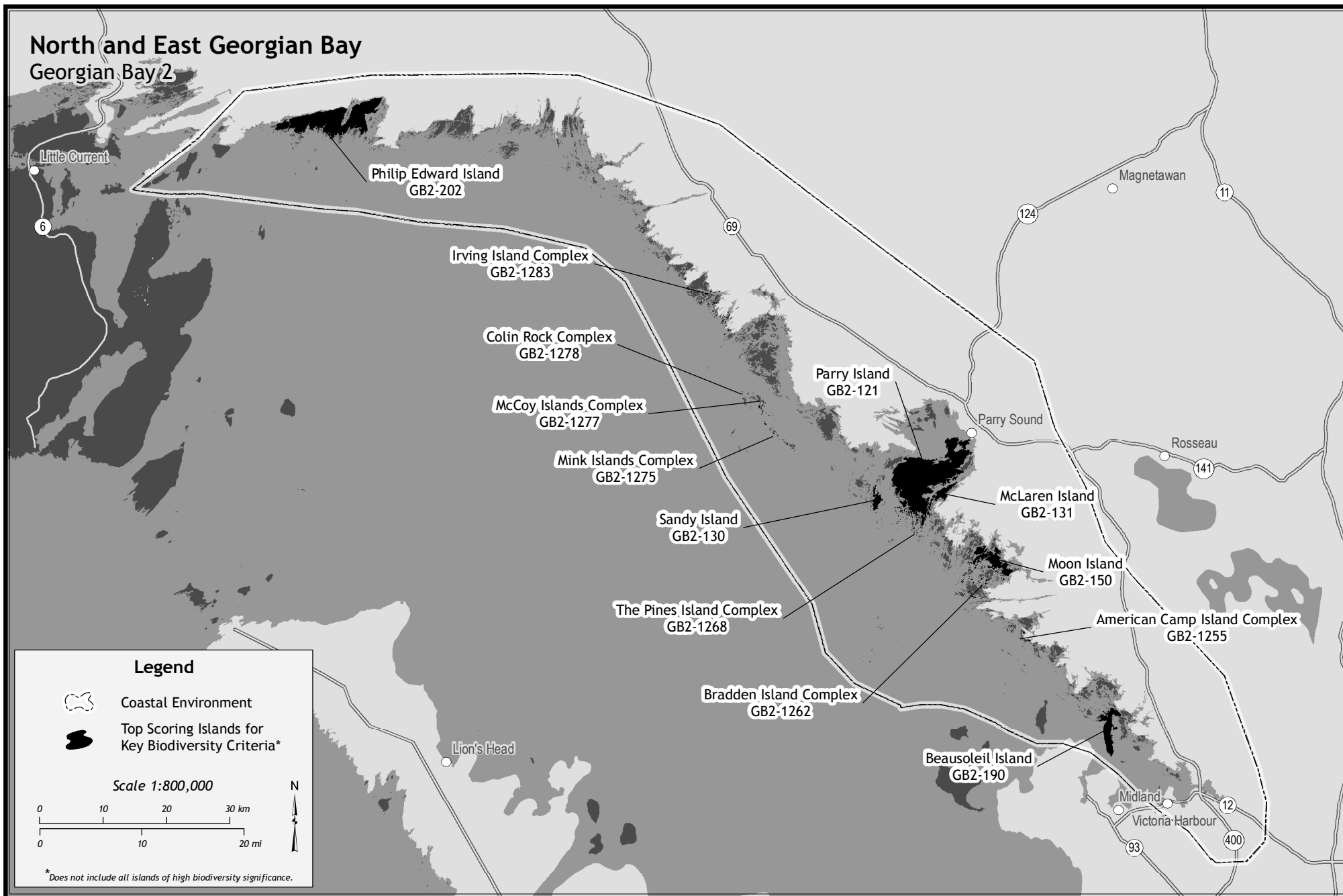
The Mink Islands Complex, Colin Rock Complex and McCoy Islands Complex are included in the Mink and McCoy chain of islands representing a significant example of granitic outer Georgian Bay islands which have documented significant species and plant communities, and significant ecological features (Jalava et al., 2005).

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance						
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
Parry Island (GB2-121)	290		✓	✓		Medium	Unprotected
Beausoleil Island (GB2-190)	270		✓	✓		Lower/Medium	Protected
Irving Island Complex (GB2-1283)	244		✓	✓		Higher	Largely unprotected
Bradden Island Complex (GB2-1262)	215		✓	✓		Medium/Higher	Largely unprotected
American Camp Island Complex (GB2-1255)	213			✓		Medium/Higher	Unprotected
Philip Edward Island (GB2-202)	217		✓	✓		Lower	Protected
Moon Island (GB2-150)	207			✓		Lower/Medium	Protected
The Pines Island Complex (GB2-1268)	200		✓			Medium/Higher	Unprotected
McLaren Island (GB2-131)	199			✓		Lower/Medium	Other land use designations
Sandy Island (GB2-130)	179			✓		Lower	Natural heritage designation
Mink Islands Complex (GB2-1275)	159	✓		✓		Lower	Other land use designations
Colin Rock Complex (GB2-1278)	150	✓		✓		Lower	Other land use designations
McCoy Islands Complex (GB2-1277)	126	✓	✓			Lower	Other land use designations

\*Not all islands considered to have biodiversity significance are included in this table.

# North and East Georgian Bay Georgian Bay 2



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# East Christian Island Peninsula and Nottawasaga Bay

## Georgian Bay 3 and Georgian Bay 4 Coastal Environments

Number of islands: 74  
Number of large islands: 3  
Number of island complexes: 40  
Total island area (ha): 5,401  
Total length of coastline (km): 70

**Major Habitat Types:** Till plain deciduous forests, sand plain deciduous forests.

**Key Islands for Biodiversity Conservation:** Beckwith Island, Brocks Beach Island Complex, Christian Island, East Black Bass Bay Island Complex, Hen and Chicken Island, Hope Island, Lora Bay Island Complex, Nottawasaga Island, Sunset Point Island Complex, Tiffin Basin Island Complex.

### Landscape Context

The Christian Island Peninsula is fairly sheltered with a low wave-energy environment. The irregular shorelines of boulders and rock outcrops with low relief are predominantly cobble-boulder beaches and pocket sand beaches. There are very few unmodified shorelines on these islands.

Nottawasaga Bay is an embayment formed by the erosion of less resistant sedimentary rocks and is characterized by an exposed coast, fetch of up to 200 km in the northwest, and areas of sand sediments and erosion of former beaches. Nearly one-third of the islands' shorelines here have been modified by rip-rap, and another 10% of shoreline is comprised of retaining walls. The remaining shoreline is dominated by broad wetlands, sand beaches and low vegetated banks.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 11 documented rare species occurring in the East Christian Island Peninsula and Nottawasaga Bay. These rare species include the globally rare Ram's-head Lady's-slipper and Forked Three-awned Grass. This region has documented observations of nine Great Lake disjunct species and the Great Lakes endemic species - Stiff Yellow Flax and Great Lakes Wheatgrass. Sand Cherry, a Great Lakes declining species, is also observed on islands in this region.

Colonial nesting waterbird populations, including Great Egret, Black-crowned Night-heron, Great Black-backed Gull, Ring-billed Gull and Herring Gull, have been observed on the islands. The Nottawasaga Island Important Bird Area (IBA) provides suitable breeding habitat for several species of colonial waterbirds. One of the only four large Great Egret colonies in Canada occur here,

along with the almost 3% of the Canadian population of Black-crowned Night-herons (IBA Canada, 2004).

There are two documented rare plant communities of which Sand Cherry Dune Shrubland Type is a globally rare community.

**Ecological Systems:** Dominant terrestrial system types include sand plain forests and till plain forests. The key ecological system of this region is wetlands (marshes, and swamps). Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed) and shelving bedrock.

**Ecosystem Functions:** The majority of islands of the East Christian Island Peninsula and Nottawasaga Bay areas are near-shore islands and may therefore have lower importance as stopover sites for landbirds. There may be some local use of wetlands by migratory waterfowl. There are known occurrences of seasonal fish spawning for Lake Whitefish. There is also evidence of Bloater, Brook Trout, Lake Herring and Yellow Perch. Suitable habitat for interjurisdictional fish species includes sand beaches, cobble beaches, broad wetlands, fringing wetlands, mixed beaches, boulder beaches and submerged rock.

#### *Physical Diversity:*

The majority of the large island complexes and small islands have medium to high shape complexity. The large islands have the least complex shapes. All the islands in all the Christian Island Peninsula area and the majority of islands in Nottawasaga Bay have limestone, dolostone, shale, arkose and sandstone. The remaining six islands in Nottawasaga Bay are composed of shale, limestone, dolostone and siltstone. The dominant shoreline type is mixed pebble and cobble beaches and depositional sand beaches.

#### *Island Size:*

Three large islands dominate the area with size ranging from 500 to 3,570 hectares. Christian Island, Beckwith Island and Hope Island are the largest islands in this region. The remaining islands are predominantly less than half a hectare in size.

#### **Threats to Biodiversity**

Sixty percent of the islands of the East Christian Peninsula and Nottawasaga Bay exhibit a very low level of threat. The remaining islands have varying degrees of threat primarily due to higher building and road densities from development. Christian Island is the most threatened island in this region, and these threats come in the form of building sites,

a lighthouse, access sites for land vehicles, pits and quarries, road density and cropland. Hope Island also has a lighthouse. Many islands show some presence of agricultural cropland.

#### Conservation Assessment

##### *Existing Conservation*

Christian, Hope and Beckwith Islands are part of the Christian Island Indian Reserve. Beckwith Island, noted for its conservation value, is protected in part by the presence of a First Nations Conservation Reserve (Jalava, 1998). A life science area of natural and scientific interest (ANSI) includes Beckwith Island, the Christian Islands and Hope Island.

The only other natural heritage designation within the East Christian Island Peninsula and Nottawasaga Bay occurs on Nottawasaga Island, which has been designated as the Nottawasaga Island Important Bird Area (IBA). This IBA is most notable for the large number of Great Egrets which have been observed breeding on the island, one of only four large Great

Egret colonies in Canada. The Black-Crowned Night Heron and Herring Gull are also present in the IBA in significant numbers (IBA Canada, 2004).

##### *Conservation Assessment*

All the islands in the table below are those with high biodiversity scores. Christian Island contains rare species and plant communities, including several that are globally rare. The island also contains ecological system and shoreline diversity and provides key habitat for birds and interjurisdictional fish species. Christian Island is not protected; threats include buildings, some recreational development and a quarry. Hope Island and Hen and Chicken Island both contain key ecological and physical diversity for these coastal environments. Hope Island also does not have formal protection and has some threat from building and road density. Hen and Chicken Island is adjacent to a Provincially Significant Wetland, but has no formal protection itself. This island is threatened primarily by cropland and some building development.

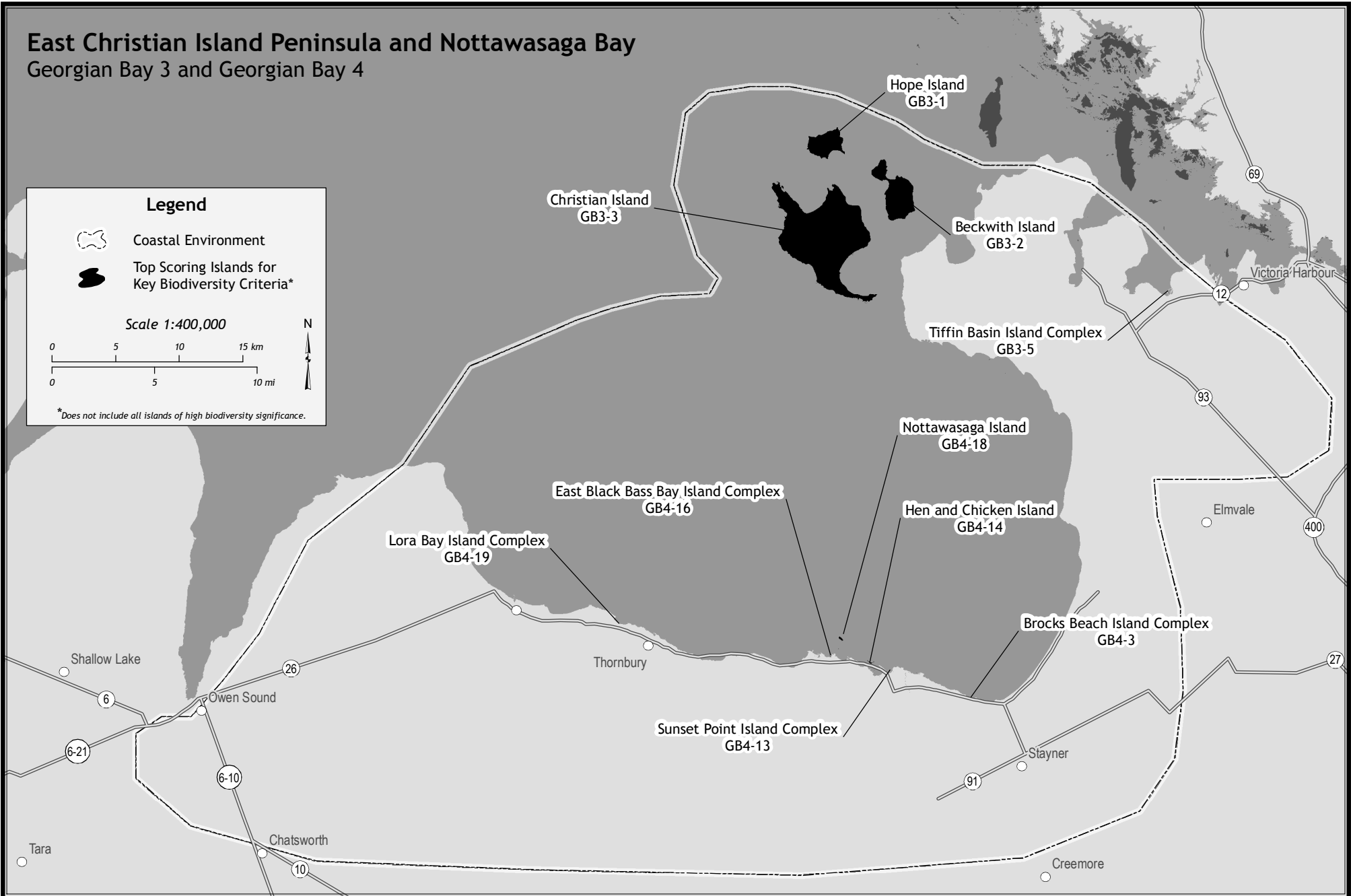
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Christian Island (GB3-3)	244			✓		Higher	Unprotected
Hen and Chicken Island (GB4-14)	195		✓	✓		Higher	Unprotected
Beckwith Island (GB3-2)	186			✓	✓	Lower	Unprotected
Hope Island (GB3-1)	147			✓		Medium	Unprotected
East Black Bass Bay Island Complex (GB4-16)	132			✓		Medium/Higher	Unprotected
Tiffin Basin Island Complex (GB3-5)	132		✓			Lower/Medium	Unprotected
Lora Bay Island Complex (GB4-19)	119		✓			Medium	Unprotected
Sunset Point Island Complex (GB4-13)	112			✓		Lower	Unprotected
Brocks Beach Island Complex (GB4-3)	122		✓	✓		Lower	Unprotected
Nottawasaga Island (GB4-18)	98	✓				Higher	Natural Heritage Designation

\*Not all islands considered to have biodiversity significance are included in this table.

# East Christian Island Peninsula and Nottawasaga Bay

## Georgian Bay 3 and Georgian Bay 4



**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:400,000

0 5 10 15 km  
0 5 10 mi

N

\*Does not include all islands of high biodiversity significance.

# East Bruce Peninsula and East Manitoulin Island

## Georgian Bay 5 Coastal Environment

Number of islands: 290  
Number of large islands: 26  
Number of island complexes: 90  
Total island area (ha): 30,161  
Total length of coastline (km): 283

**Major Habitat Types:** Limestone plain mixed forest and limestone plain coniferous forests.

**Key Islands for Biodiversity Conservation:** Anthony Island Complex, Cove Island, Fitzwilliam Island - East, Flowerpot Island, Griffith Island, Hay Island, Manitoulin Island - East, Northwest Burnt Island, Russel Island, Yeo Island.

### Landscape Context

The eastern Bruce Peninsula and eastern Manitoulin Island are dominated by the Niagara Escarpment landform. The coastal environment contains high backshore relief with cliffs up to 100 metres in the north, with low shore zones in the south and on Manitoulin. Upland coasts with bedrock cliffs are predominant in the north and on Manitoulin, with unconsolidated cliffs in the south. Many islands contain large portions of mixed forest and deciduous forests on limestone plain. The shorelines of these islands are predominantly coarse-sediment beaches of cobbles and boulders with pockets of low vegetation banks and wetlands.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 12 documented rare species occurring in the East Bruce Peninsula and East Manitoulin Island region. These rare species include the globally rare Massasauga, Hill's Thistle, Houghton's Goldenrod and Dwarf Lake Iris. This region has documented observations of eight Great Lakes disjunct species and Houghton's Goldenrod, a Great Lakes endemic species.

Colonial nesting waterbird populations of Caspian Tern, Common Tern, Black-crowned Night-heron, Great Black-backed Gull, Ring-billed Gull and Herring Gull have been observed on the islands. Barrier Island provides suitable habitat for a variety of colonial waterbirds.

There are two documented rare plant communities which are also globally rare: Shrubby Cinquefoil - Creeping Juniper - Scirpus-like Sedge Alvar Pavement Type and Northern Dropseed - Little Bluestem - Scirpus-like Sedge Alvar Grassland Type.

**Ecological Systems:** Dominant terrestrial system types include limestone plain forests, bedrock outcrops, sand plain forests and pasture/abandoned

fields. The key ecological system of this region is wetlands (bogs, marshes, and swamps), alvars, beach and shorecliff forest complexes and limestone plain forest complexes. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), barrier beaches, exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The use of islands of the East Bruce Peninsula and East Manitoulin Island region as stopover sites by landbirds is not documented. There may also be some demonstrated local use of wetlands on some islands in the region by migratory waterfowl. There are known occurrences of seasonal spawning for White Sucker. There is also evidence of Bloater. Suitable habitat for interjurisdictional fish species includes cobble beaches, broad wetlands, fringing wetlands, boulder beaches, submerged rock and mixed beach.

#### *Physical Diversity:*

The majority of islands and island complexes have medium to high shape complexity. Most large islands have the least complex shapes. The majority of the islands in the East Bruce Peninsula and East Manitoulin Island region have limestone-dolostone, sandstone-shale and shale-limestone. The shoreline is equally represented by low vegetation banks, cobble and pebble beaches, shelving bedrock/low bedrock bluffs and wetlands.

#### *Island Size:*

Sixteen large islands dominate the area with size ranging from 38 to 18,888 hectares. Manitoulin Island and Fitzwilliam Islands are the largest islands in the region. The remaining islands are predominantly less than four hectares in size.

### Threats to Biodiversity

Approximately three-quarters of the islands within this region are identified as having very low levels of threat. The islands that are identified as having high threat levels are primarily threatened by development and exhibit a high building density. Manitoulin Island, again ranked as having the highest threat level in its region, is mainly threatened by buildings, boat launches, access sites for land vehicles, residential/recreational development, pits and quarries and road density. Griffith Island is also quite threatened by buildings and also has some cropland. A number of islands in this coastal environment have lighthouses upon their perimeters, including Lonely Island (an island within complex GB5-61) and Flowerpot Island. Flowerpot Island is also threatened by recreational and residential usage. Cropland can be found on several islands.

## Conservation Assessment

### *Existing Conservation*

Over one-quarter of the islands in this region are contained within the Fathom Five National Marine Park of Canada. Other islands encompass a variety of natural heritage designations which aid in the conservation of their natural features. Barrier Island contains a significant alvar and the designation as a life science area of natural and scientific interest (ANSI). Portions of Bear's Rump Island have been classified as both a Life science ANSI and an International Alvar Initiative Site. Bear's Rump Island is also included in the Flowerpot and Bear's Rump Islands earth science ANSI which have many sea caves and karst caves.

Flowerpot Island also contains a Life science ANSI, a designation that helps protect the significant features of the Island, such as being the best representation of a Niagara Escarpment promontory island feature in the biosphere reserve (Varga, 1994).

Portions of Russell Island and Cove Island also contain Life science ANSIs. Halfmoon Island, fairly isolated near the eastern edge of this region, has an area which has been nominated as a candidate Life science ANSI. Yeo Island Spit and Lucas Island have

both been nominated as candidate life science ANSIs. The Owen Channel Important Bird Area (IBA) includes the northeast portion of Fitzwilliam Island and the extreme southeastern edge of Manitoulin Island. This IBA is noted for its abundant population of Red-necked Grebes.

### *Conservation Assessment*

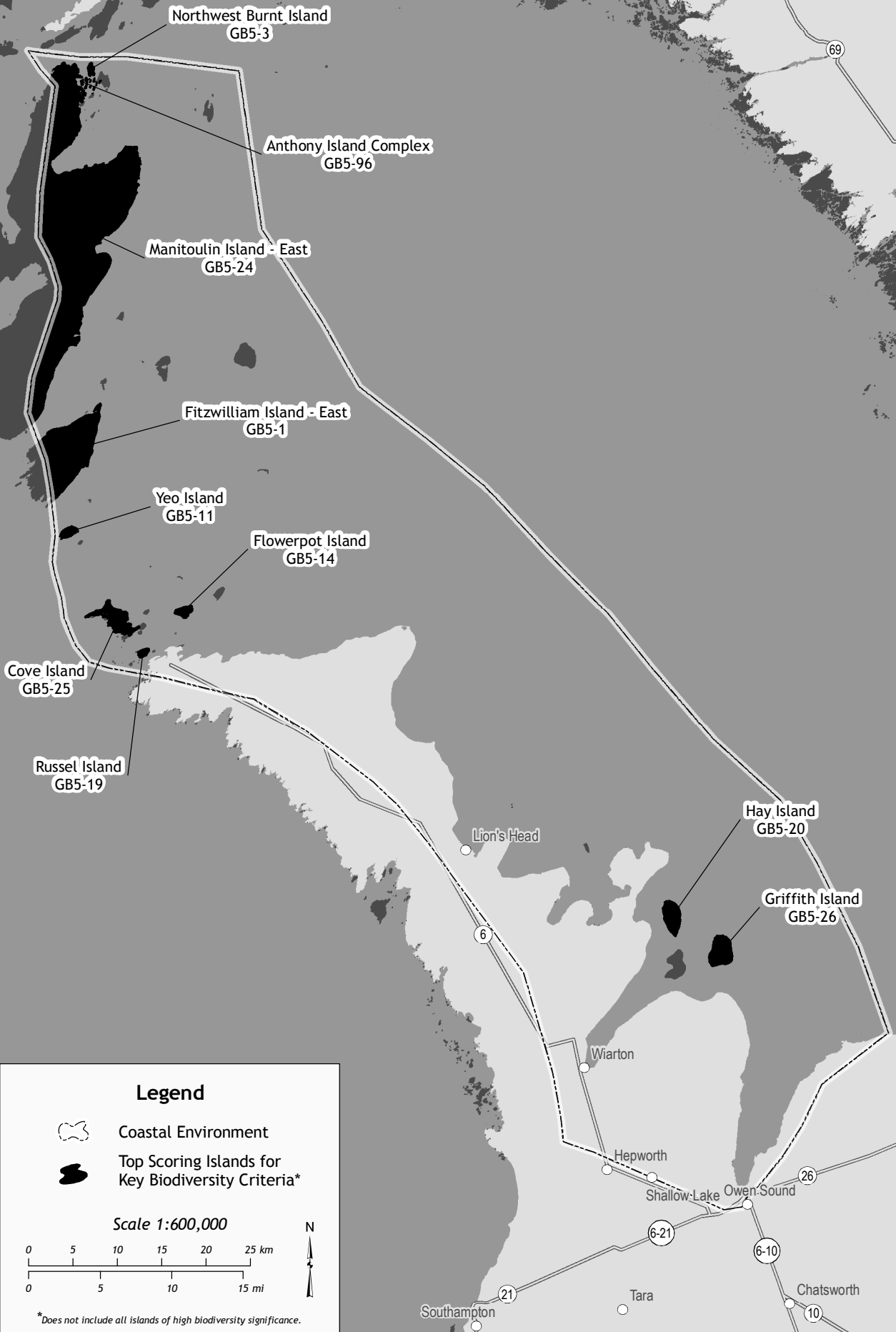
All the islands in the table below are those with high biodiversity scores. Manitoulin Island, Fitzwilliam Island, Griffith Island and Northwest Burnt Island all have important ecological and physical biodiversity and provide key shoreline and terrestrial habitats for rare species and interjurisdictional fish. Small portions of southeast Manitoulin Island and Fitzwilliam Island have some natural heritage designation. Griffith Island and Northwest Burnt Island do not have any current conservation status. Manitoulin Island is considered to be at the highest level of threat among these islands due to access sites, quarries, residential areas and low building and road densities. Griffith Island and Northwest Burnt Island has moderate to high threat because of low building and road densities, and the agricultural practices on Griffith Island. Fitzwilliam Island is associated with few anthropogenic threats.

## Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
Manitoulin Island-East (GB5-24)	300		✓	✓		Higher	Unprotected
Fitzwilliam Island - East (GB5-1)	263		✓	✓		Lower	Unprotected
Cove Island (GB5-25)	256		✓	✓		Lower	Protected
Anthony Island Complex (GB5-96)	196			✓		Lower	Unprotected
Russel Island (GB5-19)	185		✓			Lower/Medium	Protected
Griffith Island (GB5-26)	182			✓		Medium/Higher	Unprotected
Northwest Burnt Island (GB5-3)	182			✓		Medium/Higher	Unprotected
Hay Island (GB5-20)	176					Lower	Unprotected
Flowerpot Island (GB5-14)	170				✓	Medium/Higher	Protected
Yeo Island (GB5-11)	168		✓			Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# East Bruce Peninsula and East Manitoulin Island Georgian Bay 5



# South Coast North Channel

## Georgian Bay 6 Coastal Environment

Number of islands: 369  
Number of large islands: 36  
Number of island complexes: 202  
Total island area (ha): 228,114  
Total length of coastline (km): 960

**Major Habitat Types:** Sand plain deciduous forests on St. Joseph and Cockburn Islands; Limestone plain mixed forests, bedrock outcrops and alvars on Manitoulin Island.

**Key Islands for Biodiversity Conservation:** Barrie Island, Browning Island Complex, Cockburn Island - North, Drummond Island - Main, Manitoulin Island - North, St. Joseph Island - Southeast, Strawberry Island, Vidal Island.

### Landscape Context

Islands of the South Coast North Channel are part of the Niagara Escarpment. This region contains backshore relief of up to 150 metres in the east and low relief in the west. The shoreline is very sheltered with very low wave-energy levels. The indented coast is comprised of low vegetation banks and wetlands predominantly in isolated bays and are interspersed by cobble and mixed pebble and cobble beaches.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 28 documented rare species occurring in the South Coast North Channel. These rare species include the globally rare Massasauga, *Catinella exile* (A Mollusc), *Hypnum recurvatum* (A Moss), Hill's Thistle, Houghton's Goldenrod, Lakeside Daisy and Laurentian Bladder Fern. This region has documented observations of six Great Lake disjunct species and Houghton's Goldenrod and Lakeside Daisy, two Great Lakes endemic species.

Colonial nesting waterbird populations of Black Tern, Caspian Tern, Common Tern, Great Black-backed Gull, Ring-billed Gull and Herring Gull have been observed on the islands. Batture Island provides suitable habitat for a variety of colonial waterbirds.

There are six documented rare plant communities which include four globally rare alvar (pavement, grassland and shrubland) types.

**Ecological Systems:** Dominant terrestrial system types include limestone plain forests, sand plain forests and pasture/abandoned fields. The key ecological system of this region is wetlands (bogs, fens, marshes, and swamps), alvars, limestone plain forest complexes, beach and shorecliff forest complexes and grass/meadow. Key shoreline

communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The majority of islands in the South Coast North Channel is relatively near-shore islands and may therefore have lower importance as stopover sites for landbirds. There may also be some demonstrated local use of wetlands by migratory waterfowl. There are known occurrences of seasonal spawning for Lake Trout, Lake Whitefish, Walleye, Northern Pike and Yellow Perch. There is also evidence of Brook Trout and Lake Herring. Suitable habitat for interjurisdictional fish species includes fringing wetlands, cobble beaches, broad wetlands, submerged rock, sand beaches, boulder beaches and mixed beach.

#### *Physical Diversity:*

The majority of island complexes are of medium shape complexity. All large islands have the least complex shapes. The majority of the islands are composed of shale-limestone, limestone-dolostone and sandstone-shale. The shoreline is dominated by low vegetation banks and fringing wetlands.

#### *Island Size:*

Nine large islands dominate the area, with size ranging from 63 to 156,337 hectares. Manitoulin Island and St. Joseph Island are the largest islands in the region. Manitoulin Island is the largest freshwater islands in the world. The remaining islands are predominantly less than two hectares in size.

### Threats to Biodiversity

Nearly all of the islands in the South Coast North Channel exhibit very low levels of threat. Manitoulin Island and St. Joseph Island are the exceptions with recreational and residential development generally not observed on other islands. Manitoulin Island experiences the greatest level of threat from the number of buildings present. The number of boat launches, access sites, recreational and residential development areas, invasive species and pits and quarries are also exceptionally high. On St. Joseph Island, the same factors, without the presence of invasive species but with the addition of a high-use beach site contribute to another high overall threat ranking. Additional islands portray a wide variety of threats, and intensity of threats.

## Conservation Assessment

### Existing Conservation

On the north portion of Manitoulin Island and just off the north shore, there are a variety of natural heritage designations which lend a level of protection to this naturally significant piece of land.

Heywood Island Hogsback is a candidate life science area of natural and scientific interest (ANSI).

Strawberry Island contains part of a candidate Life science ANSI. The Strawberry Channel Wetlands have been nominated for protection status. Along the northeast quadrant of Manitoulin Island, many candidate Life science and earth science ANSIs have been designated: the Cup and Saucer Trail, the Bidwell Road Bog, Bass Lake Marsh/Swamp, Sheguiandah Hill and the Sheguiandah Quartzite Quarry.

The north/central portion of Manitoulin Island also contains several candidate Life science ANSIs. The Foxy Bur Oak Savannah, the Lake Wolsey Marsh and Swamp area, Gore Bay East Bluff Talus, the Nameless Lake, the Table Rock Flatlands, Robertson's Sugar Bush and the Kagawong River - Bridal Veil area. The northwest portion of Manitoulin Island has just one candidate Life science ANSI, the Vidal Island - Crescent Island Alvar.

The southwest portion of St. Joseph Island is included in this region and contains a few significant areas which are protected by various natural heritage designations. The Milford Haven Creek Swamp has been nominated as a candidate Life

science ANSI, the St. Joseph Island Nature Reserve, and the Mosquito Bay Wetland.

The few islands that are protected in this region are contained within either the St. Joseph Migratory Bird Sanctuary or the proposed North Channel Islands - La Cloche Provincial Park Addition. Nearly 40% of the islands in this region are identified as part of the Manitoulin Island North Shore Important Bird Area (IBA). This IBA is primarily significant due to the large number of Red-necked Grebes observed throughout the area. It has been estimated that 4% of the North American population of this bird occupies the IBA for moulting (IBA Canada, 2004).

### Conservation Assessment

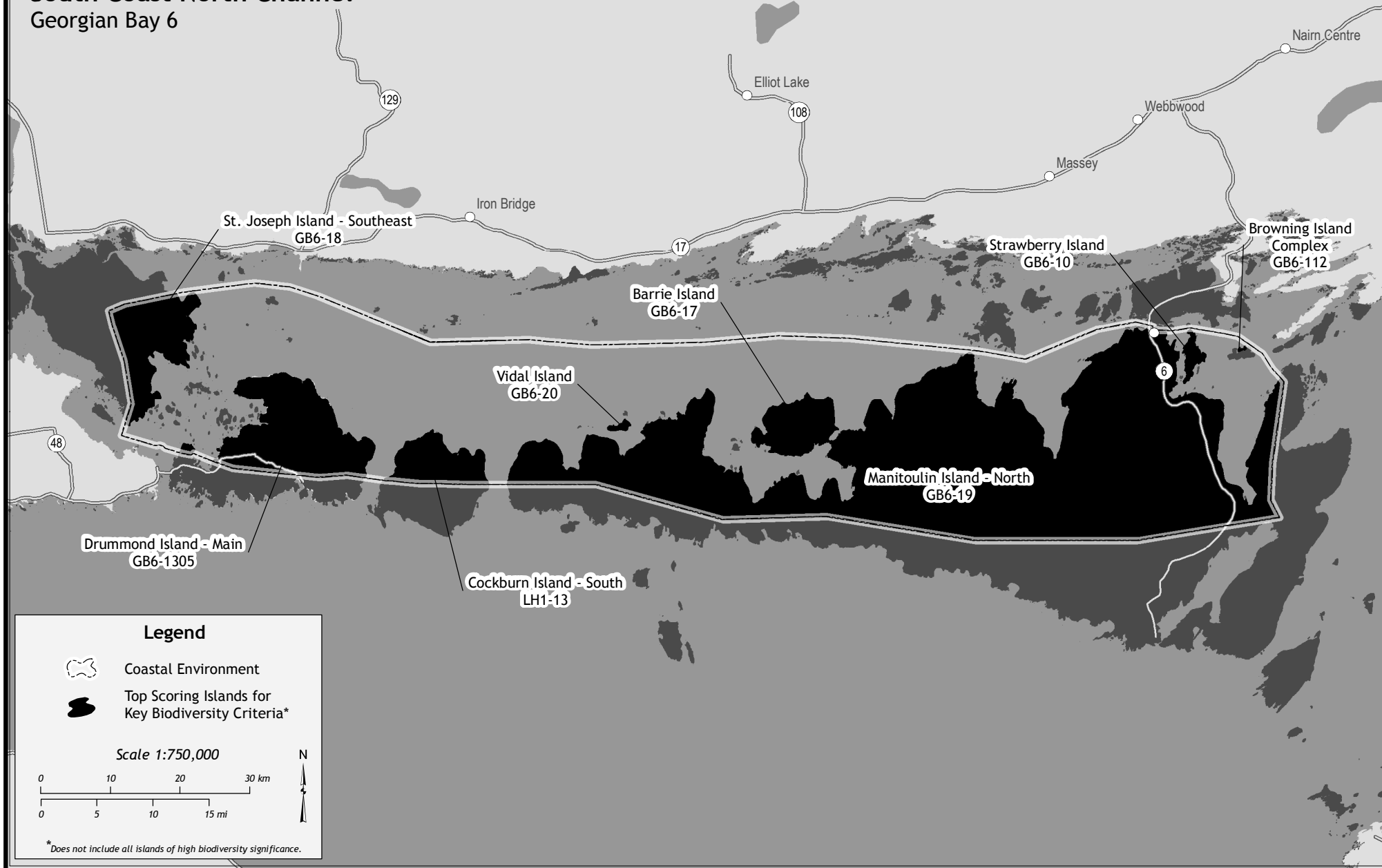
All the islands in the table below are those with high biodiversity scores. St. Joseph Island, Cockburn Island and Barrie Island are important islands for ecological and physical diversity in this coastal environment. All three islands are at moderate threat, primarily from access point, buildings and road densities. St. Joseph Island also has several quarries. The northern portion of Manitoulin Island has several rare species, plant communities and species at risk, some with global biodiversity value. The island contains key ecological and physical biodiversity and provides habitat for landbirds and interjurisdictional fish species. Approximately one-quarter of this island (of the portion in GB6) has natural heritage designation. This island is threatened by buildings and recreational development, boat launches and access points, aquatic invasives and quarries.

## Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
Manitoulin Island - North (BG6-19)	401			✓		Higher	Unprotected
Drummond Island - Main (GB6-1305)	299		✓	✓		Higher	Other land use designations
Barrie Island (GB6-17)	264	✓		✓		Medium	Natural heritage designations
Cockburn Island - North (GB6-1)	257			✓		Lower/Medium	Unprotected
St. Joseph Island - Southwest (GB6-18)	247		✓	✓		Medium/Higher	Unprotected
Strawberry Island (GB6-10)	225			✓		Lower	Protected
Browning Island Complex (GB6-10)	167		✓			Lower	Unprotected
Vidal Island (GB6-20)	166			✓		Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# South Coast North Channel Georgian Bay 6



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

## St. Clair River, Lake St. Clair and Detroit River

St. Clair 1, 2 (Can), 2 (U.S.), 3, 4, 5 (Can), 5 (U.S.), 7 Coastal Environments

Number of islands: 403

Number of large islands: 34

Number of island complexes: 103

Total island area (ha): 22,844

Total length of coastline (km): 689

**Major Habitat Types:** Marsh complex, prairies and savannahs.

**Key Islands for Biodiversity Conservation:** Bassett Channel Island Complex, Harsens Island, Johnston Channel Island Complex, Mitchell's Point Island Complex, Seaway Island, Squirrel Island, St. Anne Island, St. Anne Island Complex, St. Luke's Bay Island Complex, Turkey Creek Island Complex, Walpole Island.

### Landscape Context

The St. Clair River and Detroit River shorelines are characterized by heavy urban and industrial development with the exception of the St. Clair delta, which has extensive wetland areas and is internationally recognized for its marshes and prairie and oak savannah habitats. The delta has developed at the base of the St. Clair River as it enters Lake St. Clair. Material from Lake Huron is deposited at the river mouth where the current slows and there is shallow, low wave energy environment. This Delta is the largest freshwater delta in the world (TNC, 1995). The St. Clair Delta is dominated by three large delta islands in Ontario (Walpole, Squirrel and St. Anne) within the Walpole Island First Nation, which has maintained much of the land in natural cover. Two large delta islands occur in Michigan (Harsens and Dickinson). Collectively, these islands now represent one of the most extensive wetland-prairie systems and include many rare species and plant communities.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 115 documented rare species occurring in the St. Clair region. There are documented occurrences of the globally rare Lake Sturgeon, Pugnose Shiner, Eastern Foxsnake, Prairie Fringed Orchid and Skinner's Agalinis. Pugnose Shiner is also a Great Lakes endemic species. There is an occurrence of American Sea-rocket, a Great Lakes disjunct species. There are documented occurrences of several globally rare plant communities.

Eight species of colonial nesting waterbirds have been observed on the islands. Lake St. Clair is recognized as being a significant southern Ontario staging area for waterfowl as well as the Lake St. Clair marshes and Harsen's Island, which support

significant populations of breeding birds. This area has been designated as the Eastern Lake St. Clair Important Bird Area (IBA), St. Clair IBA and St. Clair Flats and Harsen's Island IBA, significant areas for waterfowl concentrations. The Lower Detroit River IBA is a globally significant staging and wintering area for colonial waterbirds and other waterfowl; it is especially important for Canvasbacks.

**Ecological Systems:** Dominant terrestrial system types include marshes, pasture/abandoned fields and sand plain forests. The key ecological systems of this region are wetlands (dominated by emergent marshes with some swamps) and savannahs. Key shoreline communities include fringing wetlands, broad wetlands, beaches, barrier beaches and exposed bedrock bluffs.

**Ecosystem Functions:** The majority of islands in this region are near-shore islands. The area is also an area of seasonal spawning for Yellow Perch, Walleye and Northern Pike. Suitable habitat for fish species includes broad wetlands, cobble beaches, fringing wetlands, sand beaches, boulder beaches and mixed beaches.

#### *Physical Diversity:*

The majority of the islands in this region have medium shape complexity with Stag Island among the islands with the most shape complexity. Islands in the St. Clair region, particularly in the Detroit River, are predominantly composed of sediments, with smaller islands of limestone, dolostone and shale. Lake St. Clair islands were mainly formed from material deposited by Lake St. Clair. The dominant shoreline type is broad wetlands and some anthropogenically modified areas.

#### *Island Size:*

Thirty-two islands dominate the area with size ranging from 15 to 2,507 hectares. Harsens Island, Squirrel Island and Grosse Isle are the largest islands in this region. The remaining islands are predominantly less than two hectares in size.

#### **Threats to Biodiversity**

Nearly half of the islands in this region are characterized as being highly threatened in relation to the other islands in the St. Clair area. This is primarily due to industrial and residential development and their associated impacts such as increased road density, anchorage sites and boat launches. Stag Island and Harsens Island have many cottages. Walpole also has residential development. Squirrel Island has also been identified as having several introduced aquatic species. The spread of Common Reed grass (*Phragmites communis*)

threatens wetlands. Lakeplain prairies suffer from lack of fire in some places and presence of invasive species such as Autumn Olive and Multiflora Rose.

This region is a very busy shipping lane with heavily developed shorelines and increased recreational development. This area is also subject to spills and pollution. The lower Detroit River and the St. Clair River have been identified as Areas of Concern under the Great Lakes Water Quality Agreement.

### Conservation Assessment

#### *Existing Conservation*

The islands located at the St. Clair River mouth have several natural heritage designations including the Walpole Island Marshes, Fens and Prairies Area of Natural and Scientific Interest (ANSI) and two provincially significant wetlands: the Snye River Marshes and the Chanel Ecarte Marshes. Portions of Harsens Island and most of Dickinson Island are protected in the St. Clair Flats State Wildlife Area. Several islands are protected in the Detroit River International Wildlife Refuge. The Detroit River is also designated as a Canadian Heritage River.

Other provincially significant wetlands found in this region include the St. Clair Marshes Provincially Significant Wetland complex, the Canard River Marshes, the Detroit River Marshes and the Fighting Island Provincially Significant Wetland.

The Lower Detroit River Important Bird Area (IBA) extends from the north end of Fighting Island to the mouth of the river. This portion of the river often remains unfrozen in the winter, attracting migratory birds to the open water sites when the remainder of the surrounding systems freezes (IBA Canada, 2004). The Eastern Lake St. Clair IBA is comprised of a significant combination of marshland, open water and savannah/prairie. The area supports many staging and breeding birds, including one of the largest colonies of Black Terns in Ontario (IBA Canada, 2004). Proposed IBAs in Michigan include much of Harsens and Dickinson Islands. These IBAs harbor large concentrations of migrating waterfowl and breeding sites for American and Least Bittern, Forster's and Black Tern, King Rail and Marsh Wren.

#### *Conservation Assessment*

The islands in the following table are high scoring biodiversity islands. Walpole Island provides habitat for globally rare species and plant communities and Great Lakes endemic species. The complex of islands within the delta is part of one interacting system that contributes to the globally significant biodiversity in the area, providing habitat for colonial nesting waterbirds, waterfowl and fish. Walpole Island is included in an IBA and has limited threats. St. Anne Island Complex and the Johnston Channel Island Complex provide habitat for rare species and colonial nesting waterbirds within the Eastern Lake St. Clair IBA. These islands have some residential development in concentrated areas.

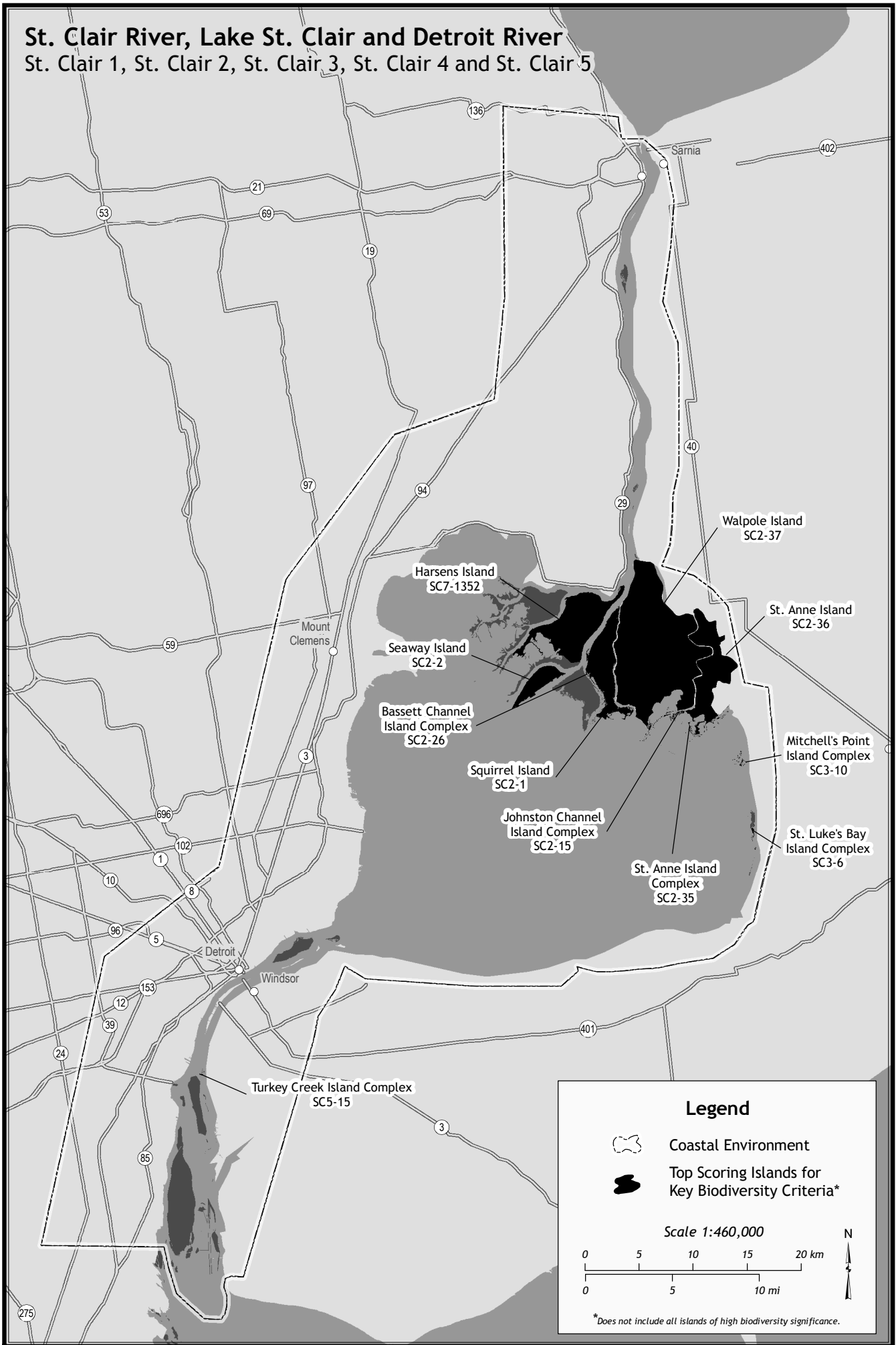
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Walpole Island (SC2-37)	370			✓		Lower/Medium	Natural heritage designation
Squirrel island (SC2-1)	336	✓		✓		Medium	Unprotected
St. Anne Island Complex (SC2-35)	274	✓	✓	✓		Medium/Higher	Natural heritage designation
Johnston Channel Island Complex (SC2-15)	266	✓	✓			Medium	Natural heritage designation
Harsens Island (SC7-1352)	255	✓		✓		Higher	Portions are protected
Bassett Channel Island Complex (SC2-26)	245	✓	✓			Medium	Natural heritage designation
Mitchell's Point Island Complex (SC3-10)	239	✓				Higher	Natural heritage designation
Seaway Island (SC2-2)	234	✓				Lower/Medium	Natural heritage designation
St. Luke's Bay Island Complex (SC3-6)	232	✓				Medium/Higher	Natural heritage designation
St. Anne Island (SC2-36)	231			✓		Lower	Natural heritage designation
Turkey Creek Island Complex (SC5-15)	231	✓	✓			Higher	Natural heritage designation

\*Not all islands considered to have biodiversity significance are included in this table.

# St. Clair River, Lake St. Clair and Detroit River

## St. Clair 1, St. Clair 2, St. Clair 3, St. Clair 4 and St. Clair 5



# Western Lake Erie Islands

## Lake Erie 1, Lake Erie 2, Lake Erie 3, Lake Erie 14, Lake Erie 15 Coastal Environments

Number of islands: 130  
Number of large islands: 21  
Number of island complexes: 75  
Total island area (ha): 7,210  
Total length of coastline (km): 243

**Major Habitat Types:** Limestone deciduous forests, marshes.

**Key Islands for Biodiversity Conservation:** East Sister Island, Hen Island, Kelleys Island, Middle Island, Middle Sister Island, Pelee Island - Main, Pelee Island - North, South Bass Island.

### Landscape Context

These islands are predominantly comprised of clay-silt sediments and shallow soils of limestone. The western Lake Erie Islands support globally rare shoreline, alvar, savanna and forest communities which support globally significant biodiversity and important ecological functions.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 156 rare species in the western Lake Erie islands which includes the globally rare Eastern Foxsnake, Duke's Skipper, Spatterdock Darter and Lakeside Daisy. Lake Erie Watersnake (a Great Lake endemic subspecies), Sand Cherry (a Great Lakes declining species), and Bushy Cinquefoil and Seaside Spurge (both are Great Lakes disjunct species) are all known from the western Lake Erie islands.

Five species of colonial nesting waterbirds stage or nest on islands such as Rattlesnake, Green, Starve and West Sister Islands. Breeding species on West Sister Island include Double-crested Cormorant, Snowy Egret, Black-crowned Night-Heron, Great Egret, Great Blue Heron, Herring Gull, Little Blue Heron and Cattle Egret. The Pelee Island Natural Areas Important Bird Area (IBA) marshes and surrounding area provide habitat for Double-crested Cormorants and various gull and heron species. Many of the herons, cormorants and gulls likely originate from the nesting colonies on Middle Island, East Sister Island and the other small islands in the archipelago (IBA Canada, 2004). The Western Lake Erie basin provided roosting and foraging habitat for a globally significant assemblage of wintering waterfowl.

There are ten documented rare plant communities of which four are globally rare. These plant communities include a sand beach type, a savannah type and alvar grassland types.

**Ecological Systems:** Dominant terrestrial system types include limestone plain forests, till plain forests and scrubland and alvars. The key ecological systems of the western Lake Erie islands are wetlands (marshes and swamps) and limestone plain forest complexes. Key shoreline communities include fringing wetlands, barrier beaches, beaches (pebble, sand and mixed), exposed bedrock bluffs, exposed sediment bluffs and shelving bedrock.

**Ecosystem Functions:** Middle Sister Island and West Sister Island are the most isolated islands in the region. Pelee Island Natural Areas IBA is recognized as a globally significant migratory landbird area. West Sister Island is an important island for colonial waterbird diversity and conservation. There are occurrences of Walleye and Yellow Perch. Suitable habitat for interjurisdictional fish species includes sand beaches, fringing wetlands and mixed beaches.

#### *Physical Diversity:*

Large islands in western Lake Erie have the least shape complexity, with the majority of island complexes having medium shape complexity. The geology of the western Lake Erie islands includes limestone, dolostone and shale. The dominant shoreline type is anthropogenically modified shorelines. Naturalized shorelines are often mixed pebble beaches.

#### *Island Size:*

Six islands dominate the area with size ranging from 208 to 4,105 hectares. Pelee Island is by far the largest island in this region, followed by Kelleys Island. The remaining islands are predominantly less than five hectares in size.

### Threats to Biodiversity

The majority of the islands in the Pelee System have relatively moderate threat. However, Pelee Island does have a higher level of threat primarily from residential and recreational development, as well as the presence of quarries, cropland, and the introduction of aquatic invasive species. Other islands, such as South Bass Island, Kelleys Island and Gibraltar show some threat, primarily from residential and recreational development. The invasive Common Reed (*Phragmites australis*) poses a serious threat to some of these islands.

### Conservation Assessment

#### *Existing Conservation*

Pelee Island contains Lighthouse Point Provincial Nature Reserve and Fish Point Provincial Nature Reserve. Each of these sites also includes a provincially significant wetland. Pelee Island also contains five life science areas of natural and

scientific interest (ANSI): the East - West Road Savannah, the Fish Point ANSI, the Lighthouse Point ANSI, the Stone Road Alvar and Middle Point Woods ANSI. Pelee Island also contains two Carolinian Canada Sites, the Stone Road Alvar and Middle Point Woods sites. In addition, several properties are owned and managed by non-government organizations across Pelee Island, including the Nature Conservancy of Canada and the Federation of Ontario Naturalists.

The majority of the Canadian islands of the Pelee System are contained within the Pelee Island Archipelago Important Bird Area (IBA) and the Pelee Island Natural Areas IBA. The Pelee Island Archipelago IBA is comprised of a series of limestone islands which include Middle Sister Island, Hen Island, and Middle Island, but not Pelee Island.

East Sister Island contains the East Sister Island Provincial Nature Reserve and the island and surrounding waterlot is a Life science ANSI. Middle Island contains both a Life science ANSI and a Carolinian Canada Site. Middle Island is included in Point Pelee National Park and is managed by Parks Canada as a Special Preservation area.

The majority of the islands in the North Maumee Bay are included in the Erie State Game Area or owned by The Nature Conservancy and the University of Toledo for an additional level of conservation in the Erie Marsh area. National Wildlife Refuges occur at West Sister Island and Cedar Point.

Several islands are contained within the Point Mouille State Game Area, a wildlife area that includes the Northeast Island and Milman Island. Other wildlife areas include the Green Island Wildlife Area, and Metzger Marsh Wildlife Area. Much of the

islands in this area are included in the Western Lake Erie basin IBA.

#### *Conservation Assessment*

The islands in the table below are those with high biodiversity scores. The majority of the islands in this region support one of the highest densities of rare species in Ontario and in the Great Lakes. Nearly all of the islands listed in the table below have documented occurrences of Lake Erie Watersnake, a Great Lakes endemic subspecies whose entire global distribution is limited to islands in the western end of Lake Erie. These islands also include globally rare shoreline, alvar, savanna and forest communities which supports globally significant biodiversity and important ecological functions. Many of these islands have a natural heritage designation and have some protection.

Pelee Island is the largest island in the region; its southern climate results in plant communities that are found nowhere else in Canada or the U.S. states. The island supports a wide variety of provincially rare species, species at risk, globally important species and plant communities as well as important ecological and shoreline diversity. Threats include high building and road densities in some areas of the island, high recreational use, residential and tourism development, aquatic invasives and quarries.

Kelleys Island also supports a wide variety of globally and state-wide rare species and plant communities as well as important ecological diversity and unique geological features. Kelleys Island has considerable residential and recreational development and some aggregate extraction resulting in a high level of threat to its biodiversity. A portion of the island is designated as a state park.

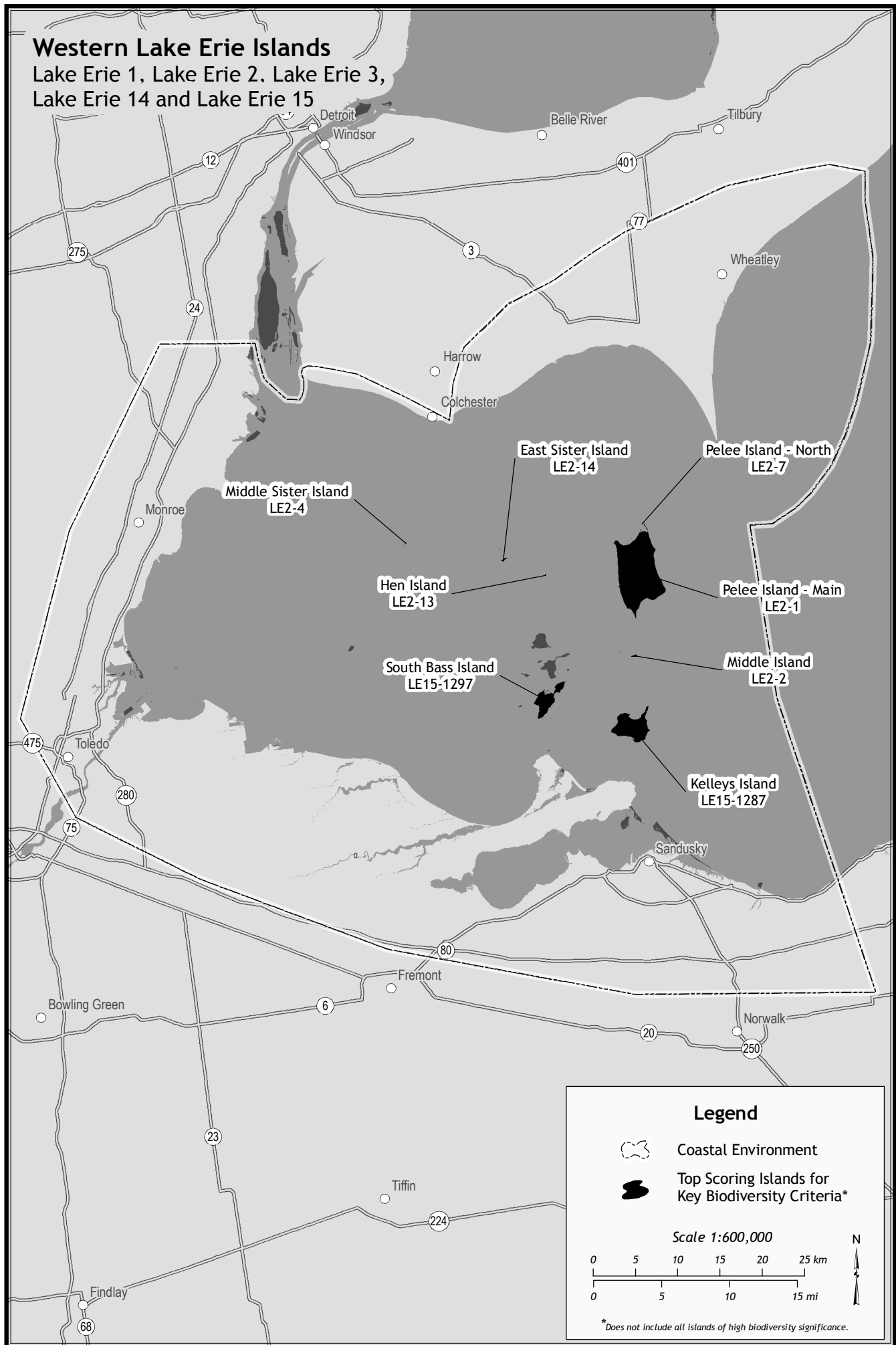
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Pelee Island - Main (LE2-1)	388	✓		✓		Higher	Natural heritage designation
Kelleys Island (LE15-1287)	251			✓		Higher	Some protection
Middle Sister Island (LE2-4)	187	✓		✓		Lower/Medium	Natural heritage designation
Pelee Island - North (LE2-7)	177	✓				Lower	Protected
Middle Island (LE2-2)	174	✓		✓		Lower	Protected
East Sister Island (LE2-14)	166	✓		✓		Lower	Protected
Hen Island (LE2-13)	160	✓				Medium	Natural heritage designation
South Bass Island (LE15-1297)	158			✓		Higher	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Western Lake Erie Islands

Lake Erie 1, Lake Erie 2, Lake Erie 3,  
Lake Erie 14 and Lake Erie 15



# Rondeau System

## Lake Erie 4 Coastal Environment

Number of islands: 66  
Number of large islands: 3  
Number of island complexes: 13  
Total island area (ha): 156  
Total length of coastline (km): 30

**Major Habitat Types:** Marsh complexes.

**Key Islands for Biodiversity Conservation:** Pointe Aux Pins 1, Pointe Aux Pins 2, Pointe Aux Pins 3, Pointe Aux Pins 4, Pointe Aux Pins 5, Pointe Aux Pins 6, Pointe Aux Pins 7.

### Landscape Context

The Rondeau system is one of the three major sandspits on the north shore of Lake Erie. The peninsula supports a large tract of deciduous forest, savannahs and marshes. The sand spit is believed to have been formed by transported sand and fine gravel by two converging currents along the shore of Lake Erie. The islands identified in this study contain the open wetlands to the west of the Rondeau peninsula within the sheltered Rondeau Bay. Approximately 15% of the island coastline has been modified anthropogenically.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 16 documented rare species occurring in the Rondeau system. These rare species include Fowler's Toad, King Rail, Spotted Gar, Spotted Turtle and Swamp Rose-mallow. The Rondeau system also has documented observations of Bushy Cinquefoil and American Beachgrass, two Great Lake disjunct species.

Colonial nesting waterbird populations of Black Tern and Caspian Tern have been observed on the islands. The Greater Rondeau Area Important Bird Area (IBA) supports Forster's Tern and significant populations of migrating waterfowl and shorebirds.

There is one documented globally rare plant community: Moist - Fresh Black Oak - White Oak Tallgrass Woodland Type.

**Ecological Systems:** Dominant terrestrial system types include predominantly marshes as well as limited areas of swamps, bedrock and pasture/abandoned fields. The key ecological system of this region is wetlands (marshes and swamps). Key shoreline communities include fringing wetlands, broad wetlands, barrier beaches and mixed beaches (predominantly sand).

**Ecosystem Functions:** The majority of islands in the Rondeau system are near-shore islands. The Great

Rondeau Area Important Bird Area (IBA) is recognized as a globally significant area for waterfowl and migratory landbirds. There is also evidence of Eastern Sand Darter and Yellow Perch, although no known areas of seasonal fish spawning. Suitable habitat for interjurisdictional fish species includes broad wetlands, fringing wetlands and mixed beaches.

#### *Physical Diversity:*

The majority of the large island complexes have moderately complex shapes, with the islands along the western side of Rondeau Bay exhibiting the most shape complexity. These islands are composed of shale, and the dominant shoreline type is broad wetlands and fringing wetlands.

#### *Island Size:*

Eleven large islands dominate the area with size ranging from 3 to 19 hectares. The remaining islands are predominantly less than two hectares.

### Threats to Biodiversity

Within the Rondeau system, several islands are threatened by the presence of buildings and associated road density, including the group of islands captured in Pointe Aux Pins. Cropland can be found on several of the islands in this coastal environment, and in the greatest density on LE4-13, Pointe Aux Pins 3 and Pointe Aux Pins 6, all occurring within the Pointe Aux Pins area. No other threats have been documented within the Rondeau system.

### Conservation Assessment

#### *Existing Conservation*

The majority of the islands in the Rondeau system are managed by Ontario Parks and contained in Rondeau Provincial Park. This 3,200 ha provincial park is also complemented by a 4,800 ha life science area of natural and scientific interest (ANSI) and a 1,000 ha provincially significant wetland. All designations work towards capturing the significant physical and natural features of the Rondeau Area, and the majority of the islands in this coastal environment are contained within these expansive natural heritage areas.

All the islands in this area are also identified as part of the Greater Rondeau Area Important Bird Area (IBA). This IBA covers 8,700 ha and includes Rondeau Provincial Park as well as many adjacent bays, wetlands, and fields. The wetlands of Rondeau Provincial Park have been identified as a significant waterfowl staging area and a congregatory area for shorebirds. Species present in numbers greater than 1% of their North American population are the Greater Scaup (1.6%), Tundra

Swan (4%), Common Goldeneye (about 1%), Ruddy Turnstone (1.2%) and Forster's Tern (about 1%). Other nationally significant species known to nest in the Rondeau Area IBA include the Prothonotary Warbler, Acadian Flycatcher, Least Bittern and King Rail (IBA Canada, 2004).

*Conservation Assessment*

All the islands in the table below are those with high biodiversity scores. Pointe Aux Pins 1 and Pointe Aux Pins 6 are marshy areas of Rondeau Provincial Park along the eastern side of Rondeau Bay. They contain important key ecological and physical diversity and habitats for rare species and plant communities, colonial waterbirds, important areas

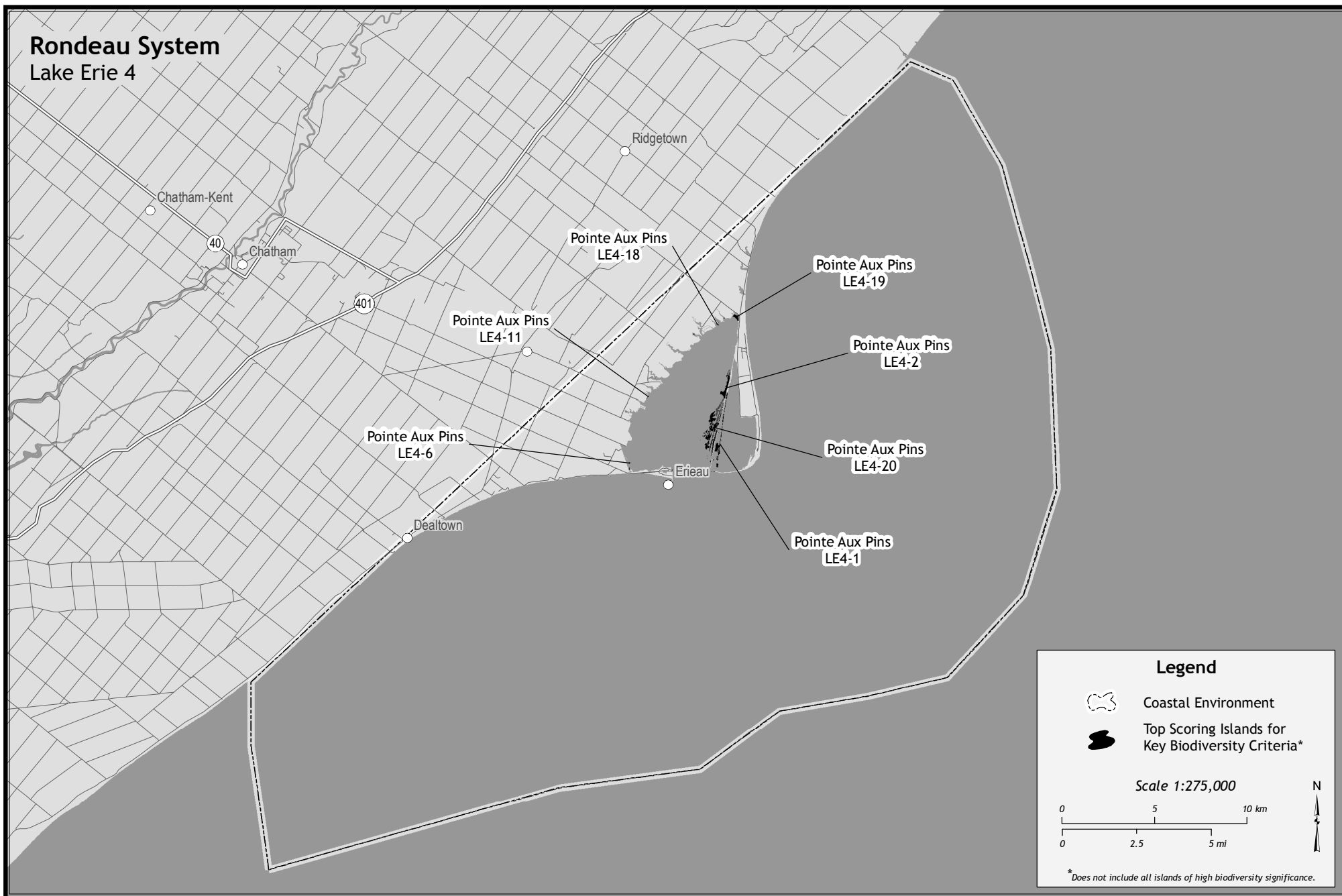
for waterfowl and landbird stopover areas and suitable habitat for interjurisdictional fish species. These islands have little threat associated with them. Pointe Aux Pins 7 and Pointe Aux Pins 2, located on the western side of Rondeau Bay, provide habitat for colonial nesting waterbirds, have ecological and physical diversity and provide key shoreline habitat. These islands are adjacent to the provincially significant Rondeau Bay Northwest Shore Wetland Complex (Tuininga et al., 1989) and are within the Greater Rondeau Area Important Bird Area. Few threats are currently known for these islands, including some minor impacts from nearby roads and some small areas of agricultural land.

**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Point Aux Pins 6 (LE4-20)	340	✓	✓	✓		Medium	Protected
Point Aux Pins 7 (LE4-6)	225	✓	✓			Lower/Medium	Natural heritage designation
Point Aux Pins 2 (LE4-11)	213	✓	✓			Medium/Higher	Natural heritage designation
Point Aux Pins 1 (LE4-1)	205	✓		✓		Lower	Protected
Point Aux Pins 3 (LE4-18)	201	✓	✓	✓		Medium/Higher	Natural heritage designation
Point Aux Pins 4 (LE4-19)	194	✓		✓		Medium	Natural heritage designation
Point Aux Pins 5 (LE4-2)	191	✓		✓		Lower	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Rondeau System Lake Erie 4



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# Long Point, Turkey Point Systems and Northeast Coast

## Lake Erie 5, Lake Erie 6 and Lake Erie 7 Coastal Environments

Number of islands: 1484  
Number of large islands: 10  
Number of island complexes: 50  
Total island area (ha): 3,098  
Total length of coastline (km): 496

**Major Habitat Types:** Marshes, beach and shorecliff deciduous forests.

**Key Islands for Biodiversity Conservation:** Long Point, Long Point 1, Long Point 2, Long Point 3, Long Point 4, Long Point 5, Long Point 6, Long Point 7, Long Point 8, Turkey Point.

### Landscape Context

The Long Point System includes the largest sand spit on the Great Lakes and supports a mosaic of plant community types including marshes, meadows, ponds, dunes, savannahs, swamps and forests. The islands associated with this system are predominantly marsh. The Long Point Bay and Turkey Point area is a sand spit and large embayment in the lee of the Long Point spit. This sheltered bay area provides extensive marshes. The remainder of the northeast coast of Lake Erie includes a few small islands and man-made structures.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 36 documented rare species occurring in this region. These rare species include Fowler's Toad, King Rail, Silver Chub, Eastern Hog-nosed Snake and Swamp Rose-mallow. These occurrences also include the globally rare Eastern Foxsnake and Fogg's Goosefoot. The Long Point, Turkey Point Systems and Northeast Coast also supports Bayberry, Black-edge Sedge, Spike-rush and American Beachgrass, all of which are Great Lake disjunct species. Sand Cherry, a Great Lakes declining species, is also observed on islands in this region.

Colonial nesting waterbird populations of eight species (gulls and terns) have been observed on the islands. The Long Point Peninsula Marshes is recognized as a globally significant Important Bird Area (IBA) in Canada, and provides habitat for a wide variety of species including large numbers of waterfowl.

There are three documented rare plant communities (wetlands), including the globally rare Graminoid Coastal Meadow Marsh Type.

**Ecological Systems:** Dominant terrestrial system types include marshes as well as fens, beach and

shorecliff forests and clay plain forests. The key ecological system of this region is wetlands (fens, marshes and swamps), beach and shorecliff forest complexes. Key shoreline communities include fringing wetlands, broad wetlands, beaches (pebble, sand and mixed), barrier beaches and shelving bedrock.

**Ecosystem Functions:** The majority of islands in this region are near-shore islands and the Long Point Peninsula and Marshes Important Bird Area (IBA) is recognized as a globally significant area for waterfowl and migratory landbirds. This area is also an area of seasonal fish spawning for Walleye, Yellow Perch and Northern Pike, and seasonal fish migration of Trout and Walleye. There is also evidence of Eastern Sand Darter and Lake Herring. Suitable habitat for interjurisdictional fish species includes broad wetlands, sand beaches, fringing wetlands and mixed beaches.

#### *Physical Diversity:*

The majority of island complexes and large islands have medium to high shape complexity, with the islands along the outer tip of Long Point having the most complex shapes. These islands are composed of limestone, dolostone and shale. The dominant shoreline type is broad wetlands and some barrier beaches.

#### *Island Size:*

Four large islands dominate the area with size ranging from 47 to 1,102 hectares. The remaining islands are predominantly less than half a hectare.

#### **Threats to Biodiversity**

Nearly two-thirds of the islands in the Long Point System have very low level of threat. The islands which exhibit the highest overall threat level are Long Point 2, followed by Turkey Point. The main threats to several islands are building density, access sites for road vehicles and cropland. A high-use beach can be found on Long Point 2; lighthouses on Mohawk Island and on an island contained within the LE7-12 complex; and Long Point 2 has some degree of residential and recreational development.

#### **Conservation Assessment**

##### *Existing Conservation*

Along Long Point, there are several natural heritage designations which afford protection to this naturally significant piece of land. Long Point Provincial Park is designated a recreational provincial park. Long Point National Wildlife Area is federally (CAN) protected, covering an area near the tip of the point. Long Point is also protected by a provincially significant wetland designation, covering 13,000 ha,

and includes Long Point, Inner Bay, Peripheral Marshes and Big Creek Marshes, and Turkey Point.

To the east of Long Point, also along the north shore of Lake Erie, lies Turkey Point, the final sand spit peninsula in a series of three beginning with Point Pelee. A portion of Turkey Point is also designated a provincial park (recreational type). Turkey Point and Long Point share a Life science ANSI between them (10,000 ha). The Turkey Point Marsh, a provincially significant wetland, encompasses some of the Turkey Island Complex.

Further east down the northern coast of Lake Erie lies Mohawk Island. This small island is protected as both a national wildlife area and a life science area of natural and scientific interest (ANSI).

The Long Point Peninsula and Marshes Important Bird Area (IBA) encompasses all of Long Point Peninsula and Turkey Point, and many of the islands affiliated with these points. This IBA (24,000 ha) includes the marshes and sand spits which provide habitat to several bird species which appear in nationally and/or globally significant numbers. Of these, the Tundra Swan, American Black Duck and Canvasback occur in globally significant numbers. The presence

of birds designated as being at risk, such as the King Rail, Least Bittern and Prothonotary Warbler make this IBA, its surrounding areas, and the islands affiliated with this region particularly significant.

#### *Conservation Assessment*

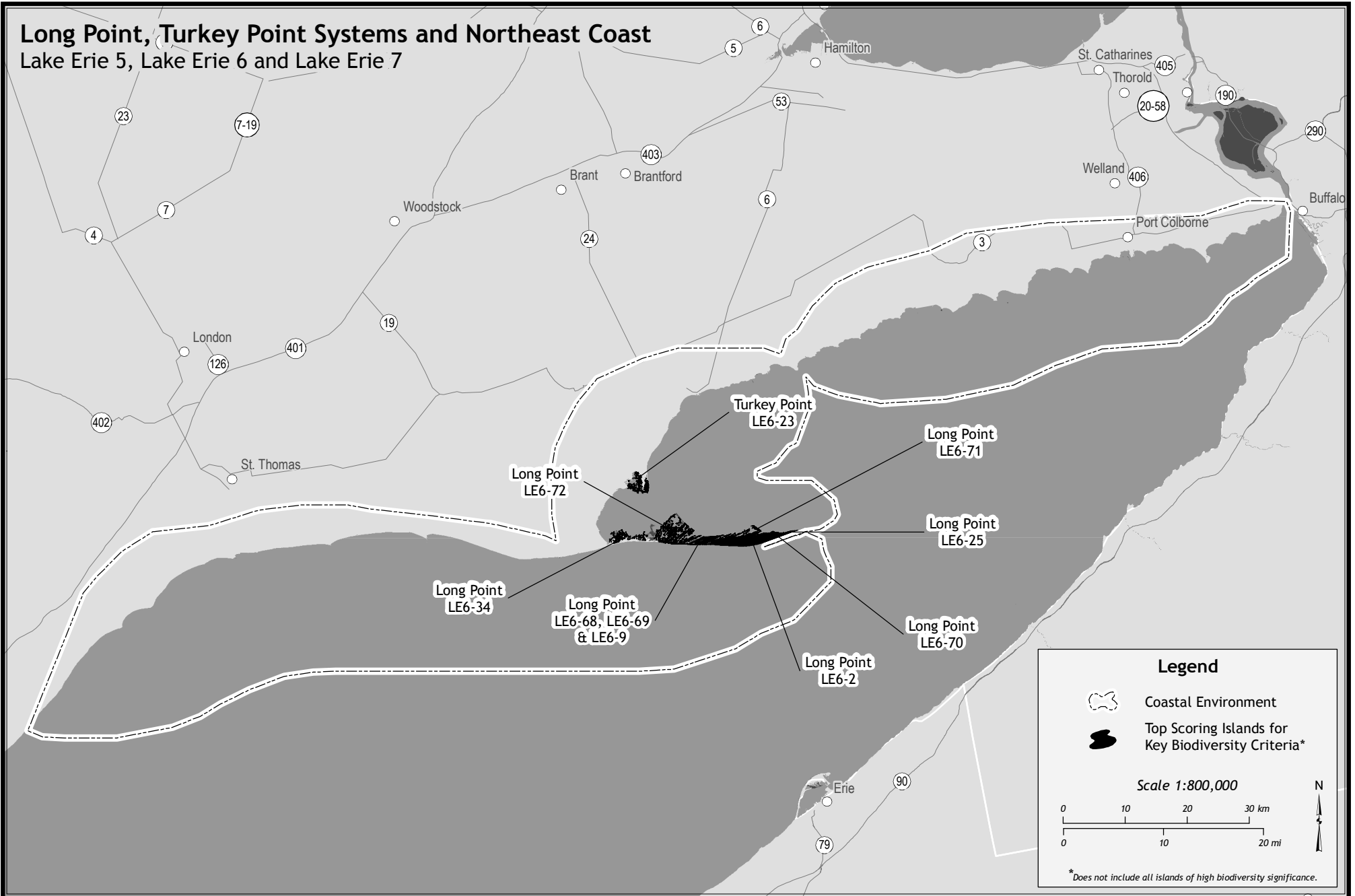
The islands in the following table are high scoring biodiversity islands. Long Point 1 and Long Point 6 are located on the northeastern fringes of Long Point and provide habitat for provincially rare species, interjurisdictional fish, colonial nesting waterbirds, waterfowl and stopover areas for land birds. These areas also contain key ecological systems, shorelines and ecological diversity. They are part of the Long Point National Wildlife Area (NWA), Long Point Peninsula and Marshes Important Bird Area (IBA), and a provincially significant life science ANSI. These areas are threatened by pockets of higher building densities. Long Point and Long Point 8 make up the bulk of the eastern half of Long Point Peninsula. Like Long Point 1 and Long Point 6, these areas provide important ecological and physical diversity, as well as having some level of protection under the NWA, IBA and ANSIs designations. However, Long Point and Long Point 8 have a much lower threat with only a few buildings in the area.

#### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
Long Point (LE6-2)	333	✓	✓	✓		Lower	Protected
Turkey Point (LE6-23)	311	✓	✓	✓		Medium	Natural heritage designation
Long Point 6 (LE6-71)	299	✓	✓	✓		Higher	Portions are protected
Long Point 2 (LE6-34)	289	✓	✓	✓		Medium/Higher	Natural heritage designation
Long Point 7 (LE6-72)	275	✓		✓		Medium/Higher	Natural heritage designation
Long Point 8 (LE6-9)	272	✓		✓		Lower	Protected
Long Point 4 (LE6-69)	265	✓				Medium/Higher	Natural heritage designation
Long Point 1 (LE6-25)	261	✓				Higher	Natural heritage designation
Long Point 3 (LE6-68)	255	✓	✓			Lower	Protected
Long Point 5 (LE6-70)	255	✓				Medium/Higher	Portions are protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Long Point, Turkey Point Systems and Northeast Coast Lake Erie 5, Lake Erie 6 and Lake Erie 7



**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:800,000

0 10 20 30 km  
0 10 20 mi

\* Does not include all islands of high biodiversity significance.

Data Sources: Nature Conservancy of Canada - Ontario Region, 2008; The Nature Conservancy, 2008; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# Welland Canal - Niagara River

## Lake Erie 8 and Lake Erie 9 Coastal Environments

Number of islands: 37  
Number of large islands: 7  
Number of island complexes: 18  
Total island area (ha): 6,790  
Total length of coastline (km): 90

**Major Habitat Types:** Deciduous forests, marshes, abandoned fields.

**Key Islands for Biodiversity Conservation:** Dufferin Island Complex, Goat Island, Grand Island - East, Grand Island - West, Horseshoe Falls Island Complex, Navy Island, Strawberry Island.

### Landscape Context

The Niagara River joins Lake Erie and Lake Ontario, and its banks are a mixture of human-made structures, bedrock outcrops and beaches. Grand Island is the primary island in this region located centrally in the region that splits the Niagara River into two parts before flowing to the Niagara Falls. The remaining islands are primarily along the periphery of Grand Island as well as a group of small islands along the Horseshoe Falls and the American Falls. There are no islands associated with the Welland Canal.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 19 rare species documented on islands in the Welland Canal - Niagara River. These include Round Pigtoe (a mussel), Lesser Fringed Gentian and Southern Blue Flag. There are also documented occurrences of two rare plant communities.

Colonial nesting waterbird populations, including Black-crowned Night-heron, Great Black-backed Gull, Ring-billed Gull, Herring Gull and Double-crested Cormorants, have been observed on the islands. The Niagara River Corridor is recognized by cooperating organizations in Canada and the United States as a globally significant Important Bird Area (IBA) and annually supports one of the largest and most diverse concentrations of gulls in the world such as the Herring Gull which occurs here in globally significant numbers (IBA Canada, 2004; National Audubon Society, 2009).

**Ecological Systems:** Dominant terrestrial system types include marshes, swamps and pasture/abandoned fields. Key ecological systems include wetlands (marshes and swamps). Key shoreline communities include low vegetation banks and exposed bedrock bluffs less than 5 metres in elevation.

**Ecosystem Functions:** The islands in the Welland Canal and Niagara River are all near-shore islands and may therefore have lower importance as a stopover site for landbirds. The Niagara River Corridor IBA is recognized as a globally significant waterfowl area. There are documented occurrences of seasonal migration for Northern Pike and White Sucker. Other fish occurrences include Atlantic Salmon, Muskellunge, Spottail Shiner, Threespine Stickleback, Rock Bass, Smallmouth Bass and Largemouth Bass.

#### *Physical Diversity:*

All large islands and island complexes have low to medium shape complexity with minimal variation of complexity among them. The geology of the Welland Canal and Niagara River islands include sandstone, shale, dolostone and siltstone. The dominant shoreline diversity is low vegetated banks and anthropogenically modified areas.

#### *Island Size:*

Seven islands dominate the area with size ranging from 15 to 4,130 hectares. Grand Island - West and Grand Island - East are by far the largest islands in this region. The remaining islands are predominantly less than two hectares in size.

### Threats to Biodiversity

There are few identified direct threats to the islands in the Niagara River, but these islands are generally threatened by adjacent development from the mainland. Some islands have higher levels of threats from development including Grand Island (East and West) and Cayuga Island. High road density and agricultural land use are additional threats in some areas.

### Conservation Assessment

#### *Existing Conservation*

Five islands, including Goat Island, Beaver Island and Three Sisters Island Complex have some protection, most often in the form of state parks. Navy Island is designated as a life science area of natural and scientific interest (ANSI) and a provincially significant wetland (PSW). The ANSI covers the entire island and protects significant forests such as Shagbark Hickory and White Elm as well as the oak-dominated clay plain forests which typify this region. The Navy Island Wetland PSW covers 25 hectares and encompasses two individual wetlands of mixed swamp and marsh formation.

Only a few islands, including Tonawanda Island and Cayuga Island, are not included in the Niagara River Corridor Important Bird Area (IBA). This IBA annually supports one of the largest and most diverse gull

populations in the world, with Bonaparte's Gull and Herring Gull appearing in globally significant numbers. Other species present in the IBA in significant numbers include Canvasback, Black-crowned Night Heron, Common Merganser, Greater Scaup and Ring-billed Gull (IBA Canada, 2004; National Audubon Society, 2009).

*Conservation Assessment*

The islands in the table below are those with high biodiversity scores. Grand Island (West and East) has documented rare species and plant communities as well as occurrences of colonial nesting waterbirds and provides suitable habitat for interjurisdictional

fish species. The Grand Island is largely unprotected. Dufferin Island Complex, Horseshoe Falls Island Complex and Navy Island are comparable with regards to their ecological and physical diversity, presence of rare species and provision of habitat for colonial nesting birds, waterfowl and interjurisdictional fish. All of these islands are within the Niagara River Corridor IBA. Navy Island contains the provincially significant Navy Island wetland and is designated as a Life science ANSI. All of these islands in the region have a limited number of threats.

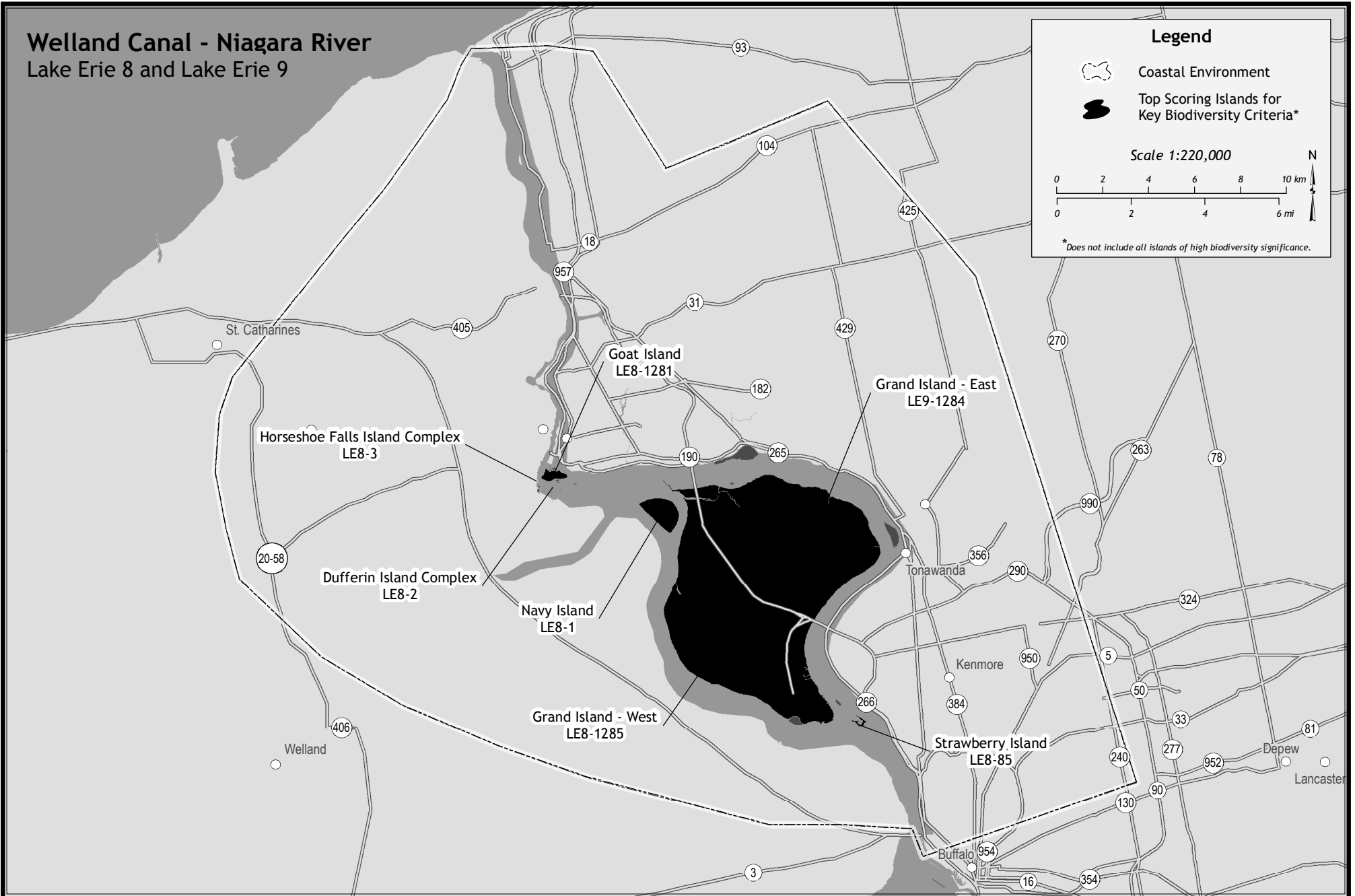
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Grand Island - West (LE8-1285)	225			✓		Higher	Largely unprotected
Grand Island - East (LE9-1284)	208			✓		Higher	Unprotected
Navy Island (LE8-1)	164	✓		✓		Medium/Higher	Natural heritage designation
Horseshoe Falls Island Complex (LS8-3)	161	✓	✓			Higher	Natural heritage designation
Dufferin Island Complex (LE8-2)	157	✓	✓			Medium/Higher	Natural heritage designation
Goat Island (LE8-1281)	113					Higher	Protected
Strawberry Island (LS8-85)	106					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Welland Canal - Niagara River

Lake Erie 8 and Lake Erie 9



**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:220,000

0 2 4 6 8 10 km  
0 2 4 6 mi

N

\*Does not include all islands of high biodiversity significance.

Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

## Lake Erie Southern Coast

### Lake Erie 10, Lake Erie 11, Lake Erie 12 and Lake Erie 13 Coastal Environments

Number of islands: 55  
 Number of large islands: 1  
 Number of island complexes: 23  
 Total island area (ha): 76  
 Total length of coastline (km): 33

Major Habitat Types: Unknown.

#### Key Islands for Biodiversity Conservation:

Ashtabula Breakwall - Inner, Ashtabula Breakwall - Outer, Buffalo Breakwall - Main, Buffalo Breakwater - Small North, Buffalo Breakwater - Small Outer, Mentor Harbor Peninsula, Presque Isle - Bay Side Small Island, Presque Isle - Bay Site Island, Presque Isle Breakwalls - Northeast, Presque Isle Breakwalls - Southwest.

#### Landscape Context

The Southern Coast of Lake Erie has a limited number of islands located near the mainland shoreline. Approximately half of these islands are artificial, many of which are breakwalls. Another third of these islands are navigational caution points (rocks, reefs or shoals). Limited information on biological and physical diversity is available for the natural islands.

#### Biodiversity Assessment

##### *Biological and Physical Diversity:*

Species: There are three rare species documented on islands on the Lake Erie Southern Coast, the

Common Tern, Inland Sea Rocket and Eel-grass. Colonial nesting waterbirds, including Common Terns, have been observed on the islands. Limited information is known on ecological and physical diversity and the ecosystem functions of these islands.

##### *Island Size:*

One island, Presque Isle - Bay Side Island dominates the area with approximately 56 hectares. The remaining islands are predominantly less than one hectare in size.

#### Threats to Biodiversity

There are few identified direct threats to the islands in the Lake Erie Southern Coast.

#### Conservation Assessment

##### *Existing Conservation*

None of the islands in this region are protected or have natural heritage designations.

##### *Conservation Assessment*

All the islands in the table below are higher scoring biodiversity islands in this region. There is little documentation on their biodiversity significance. There are limited documented threats on these islands, and the islands are unprotected.

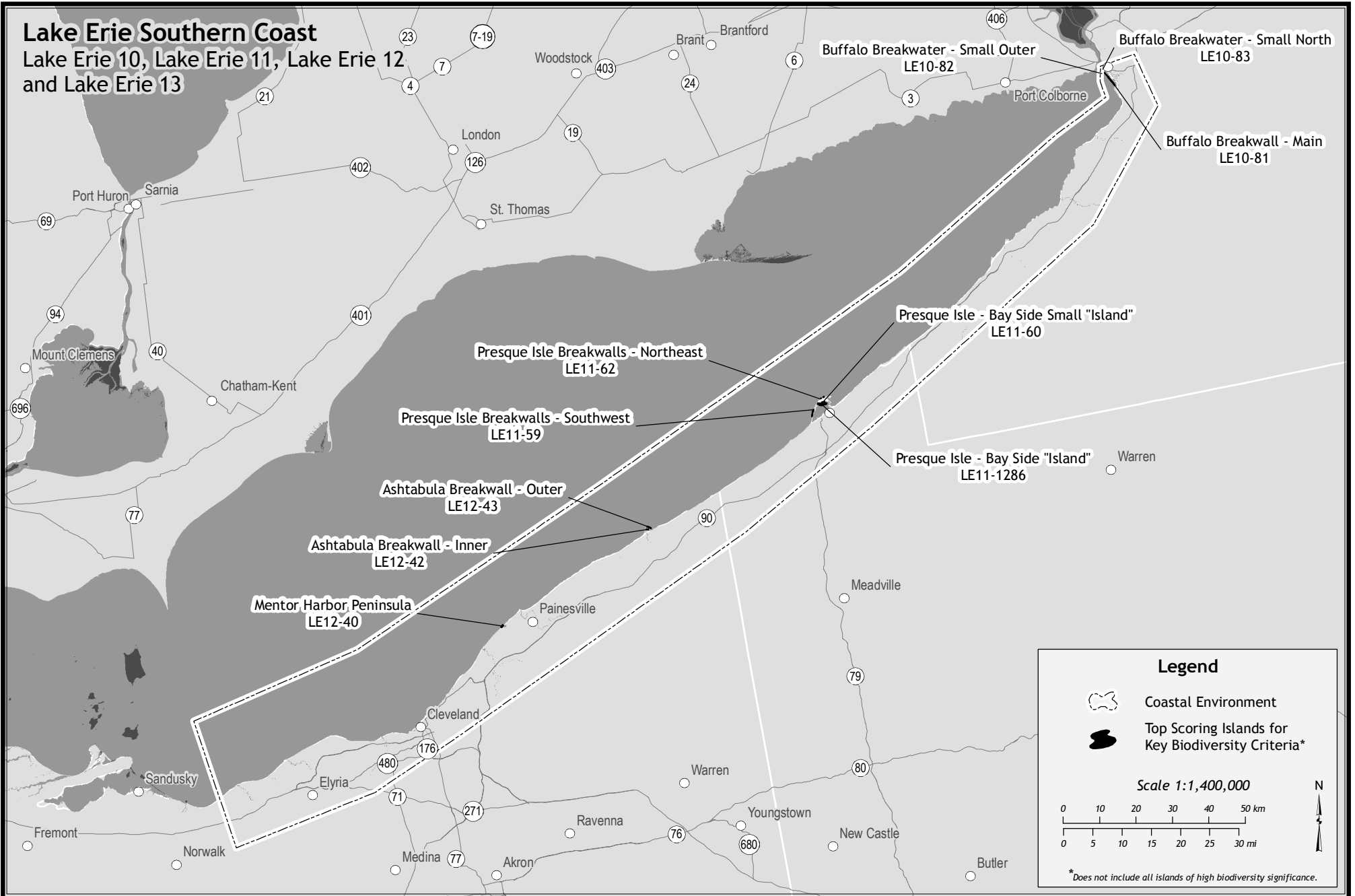
#### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Presque Isle - Bay Side Island (LE11-1286)	136		✓		✓	Higher	Unprotected
Presque Isle - Bay Side Small Island (LE11-60)	91				✓	Lower	Unprotected
Mentor Harbor Peninsula (LE12-40)	78					Higher	Unprotected
Buffalo Breakwater - Small North (LE10-83)	76		✓			Lower	Unprotected
Buffalo Breakwall - Main (LE10-81)	66		✓			Lower	Unprotected
Buffalo Breakwater - Small Outer (LE10-82)	53		✓			Lower	Unprotected
Presque Isle Breakwalls - Southwest (LE11-59)	47					Lower	Unprotected
Presque Isle Breakwalls - Northeast (LE11-62)	43					Lower	Unprotected
Ashtabula Breakwall - Inner (LE12-42)	43					Lower	Unprotected
Ashtabula Breakwall - Outer (LE12-43)	66		✓			Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Erie Southern Coast

## Lake Erie 10, Lake Erie 11, Lake Erie 12 and Lake Erie 13



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

## Southwest Coast, Burlington Bar and Toronto Harbour Lake Ontario 1, Lake Ontario 2 and Lake Ontario 3 Coastal Environments

Number of islands: 43  
Number of large islands: 3  
Number of island complexes: 20  
Total island area (ha): 373  
Total length of coastline (km): 47

**Major Habitat Types:** Marshes and swamp.

**Key Islands for Biodiversity Conservation:** Centre Island, Forestry Island Complex, Frenchman's Bay Island Complex, Frenchman's Bay South Island, Lynde Shores Island Complex, Olympic Island, Rat Island, Toronto Island, Winderemere Basin Island.

### Landscape Context

The Toronto Islands are the predominant group of islands in this region which were created from eroded alluvial deposits from the Scarborough Bluffs. The islands have been impacted from many recreational and residential developments, an airport as well as landfilling many areas of shoreline alteration. The Hamilton Harbour contains a small group of islands in sheltered bays, including Cootes Paradise. Over 40% of the island shorelines have been modified with man-made structures.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are two documented rare species occurring in this region - Black-crowned Night-heron and Northern Map Turtle. This region also has documented observations of American Sea-rocket and Seaside Spurge, two Great Lake disjunct species.

Colonial nesting waterbirds, including Black-crowned Night-heron, Caspian Tern, Common Tern, Double-crested Cormorant, Great Black-backed Gull, Ring-billed Gull and Herring Gull have been observed on the islands. The Hamilton Harbour is recognized as a globally significant colonial waterbird Important Bird Area (IBA). This site's significance includes almost 4.5% of the world's estimated Ring-billed Gull breeding population, 7% of the estimated Great Lakes population of Caspian Terns, 1.9% of the estimated North American population of Common Tern, and historically significant Black-crowned Night Heron breeding populations in Canada (IBA Canada, 2004).

**Ecological Systems:** Dominant terrestrial system types include clay marshes, swamps, sand plain deciduous forests and pasture/abandoned fields. The key ecological system of this region is wetlands (marshes and swamps). Key shoreline communities include fringing wetlands, broad wetlands and beaches (cobble, pebble and depositional sand).

**Ecosystem Functions:** The majority of islands in this region are near-shore islands and some are included in the Hamilton Harbour Waterbird Colonies IBA which is recognized as a globally significant area for waterfowl. This IBA is also an important site for gulls and terns. This area supports seasonal spawning of Yellow Perch and Northern Pike. There is also evidence of American Eel and Lake Herring. Suitable habitat for interjurisdictional fish species includes sand beaches, broad wetlands, fringing wetlands and cobble beaches.

#### *Physical Diversity:*

The majority of island complexes and large islands have medium shape complexity. These islands are composed of shale, limestone, dolostone and siltstone. The dominant shoreline type in this region is anthropogenically modified shorelines and some low vegetated banks.

#### *Island Size:*

Ten large islands dominate the area with size ranging from four to 230 hectares. Toronto Island and the surrounding islands are the largest islands in the region. The remaining islands are predominantly less than one hectare.

#### **Threats to Biodiversity**

Frenchman's Bay Island Complex is the most threatened island complex in this coastal environment due to a high number of buildings and road density. The Ontario Place island complex, which includes East Island and West Island, contains the next highest threat ranking due to access sites for land vehicles, residential and recreational development, and a high number of invasive aquatic species. Next is Winderemere Basin Island, threatened by buildings, associated roads and agriculture. Islands in the Toronto Islands area are threatened by access points for road vehicles and road density. Rat Island has also been noted for a distinct presence of invasive species.

#### **Conservation Assessment**

##### *Existing Conservation*

There are no islands currently under legislated protection. The Toronto Islands are protected to some degree by the following designations. The Toronto Islands Life Science ANSI covers 50 ha and includes the area's significant remnant dunes, wet meadows, lagoon edges and woodlands. Both provincially and regionally rare species can be found in the area of natural and scientific interest (ANSI), and along with the only group of vegetated dunes in western Lake Ontario, are given some protection from surrounding development through this natural heritage designation (Hanna, 1984). The Toronto

Island Wetland Complex has been recognized as a provincially significant wetland (PSW). Covering an area of 21 hectares, this PSW includes 21 individual wetlands, made up of a mixture of swamp and marsh (Forder and Killgannon, 1995).

Some of the smaller islands in the Burlington Bar System coastal environment are captured within the Hamilton Harbour Waterbird Colonies Important Bird Area, which covers a total area of just over 100 ha. This area is considered significant for at least four species: Ring-billed Gull, Caspian Tern, Common Tern and Black-crowned Night Heron. Some of the islands in this IBA have been altered to enhance the breeding habitat for these birds (IBA Canada, 2004).

*Conservation Assessment*

The islands in the following table are high scoring biodiversity islands. Toronto Island contains key ecological diversity, and provides habitat for provincially rare species, Great Lakes disjunct species and interjurisdictional fish species. Small portions of the island are designated as a

provincially significant wetland. The island is threatened with residential development and high recreational use. The adjacent Algonquin Island Complex (includes Algonquin Island, Snake Island, South Island and Olympic Island) also contains key ecological and physical diversity, with a minimal area included in the provincially significant wetland of the Toronto Islands. This island is also threatened by residential and recreational development. Rat Island, near Cootes Paradise, provides key ecological diversity and is recognized as part of the Dundas Valley and Dundas Marsh Important Bird Area and the provincially significant Cootes Paradise wetland. This island is threatened primarily from aquatic invasive species. Frenchman’s Bay Island Complex is located in Frenchman Bay, Pickering and provides key ecological systems and shoreline diversity particularly for fish habitat. The island complex is included in a provincially significant wetland. There is very low threat to this island complex, including nearby mainland roads and residential development.

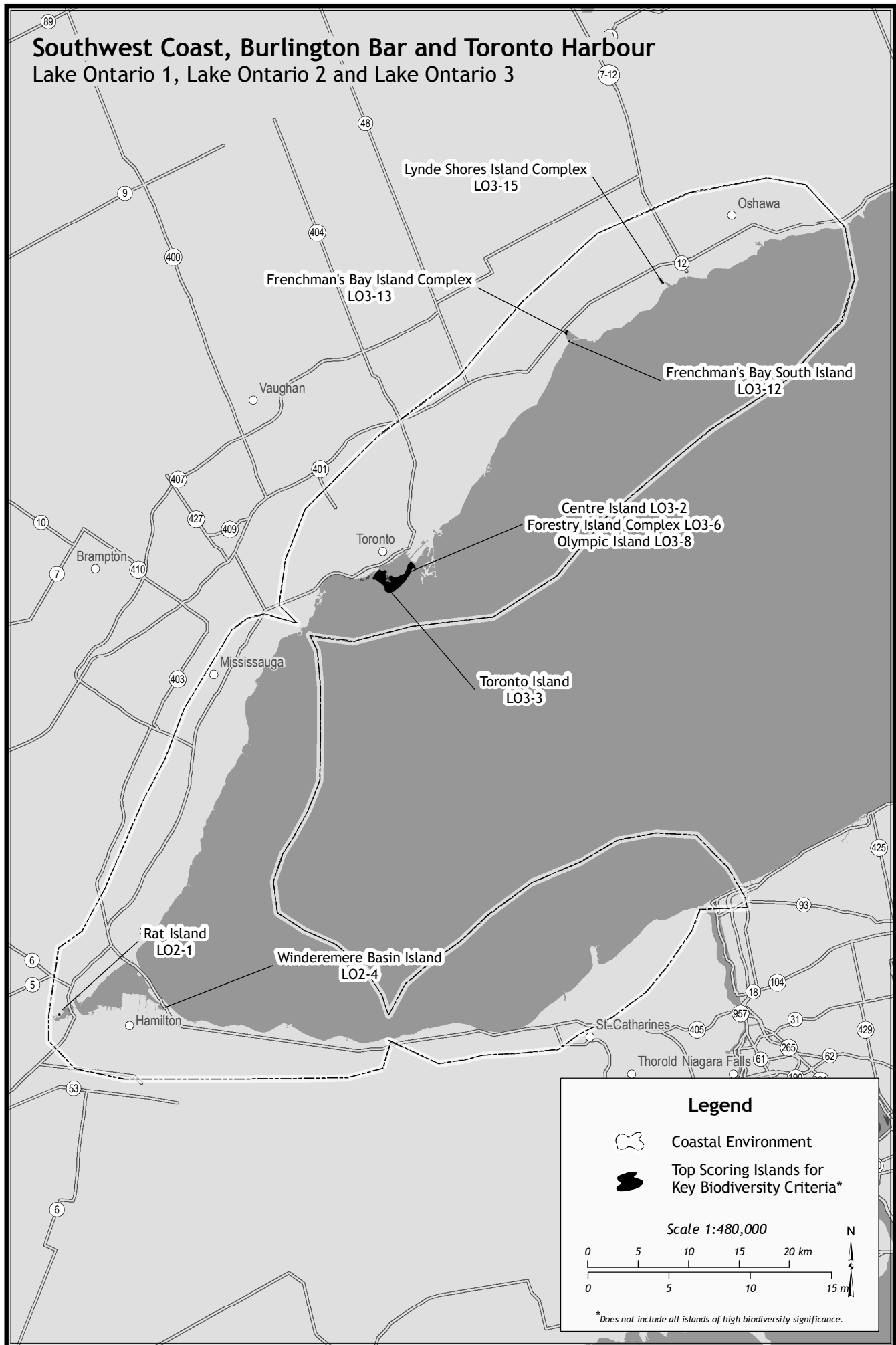
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Toronto Island (LO3-3)	190			✓		Medium/Higher	Unprotected
Olympic Island (LO3-8)	186			✓		Medium	Unprotected
Frenchman’s Bay Island Complex (LO3-13)	157		✓	✓		Lower	Natural heritage designation
Rat Island (LO2-1)	148			✓		Medium	Natural heritage designation
Centre Island (LO3-2)	133		✓			Medium/Higher	Unprotected
Forestry Island Complex (LO3-6)	133					Lower/Medium	Unprotected
Frenchman’s Bay South Island (LO3-12)	128		✓			Medium/Higher	Natural heritage designation
Lynde Shores Island Complex (LO3-15)	126		✓			Lower	Natural heritage designation
Winderemere Basin Island (LO2-4)	118	✓	✓			Medium	Natural heritage designation

\*Not all islands considered to have biodiversity significance are included in this table.

# Southwest Coast, Burlington Bar and Toronto Harbour

## Lake Ontario 1, Lake Ontario 2 and Lake Ontario 3



**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:480,000

0 5 10 15 20 km

0 5 10 15 m

N

\* Does not include all islands of high biodiversity significance.

## North Coast - Southwest Prince Edward Peninsula Lake Ontario 4 Coastal Environment

Number of islands: 74  
Number of large islands: 5  
Number of island complexes: 32  
Total island area (ha): 265  
Total length of coastline (km): 28

**Major Habitat Types:** Marshes, meadows and abandoned fields.

**Key Islands for Biodiversity Conservation:** Bald Head Island, Bald Island Complex, Gardenville Island Complex, Gosport Island, Gull Island, High Bluff Island, Presqu'ile Island Complex, Presqu'ile Peninsula Island Complex, Woods Point Island Complex.

### Landscape Context

The islands in this coastal environment are primarily congregated around Presqu'ile and the southern edge of Prince Edward County. This area can be characterized as alternating rock headlands and bay-mouth barriers with many backshore marshes. The bay-mouth barriers generally have wide sand beaches with dunes. The island shorelines are predominantly broad wetlands, but also include fringing wetlands and low vegetation banks.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are eight documented rare species occurring in this region as well as observations of American Sea-rocket, a Great Lake disjunct species.

Nine colonial nesting waterbird species have been observed on the islands. Presqu'ile Provincial Park is recognized as a globally significant Important Bird Area (IBA) for colonial waterbirds and supports globally significant breeding populations of Ring-billed Gull and Caspian Tern. Nesting Double-crested Cormorants are also present in significant numbers (IBA Canada, 2004).

**Ecological Systems:** Dominant terrestrial system types include clay marshes, swamps, pasture/abandoned fields and limited deciduous forests. The key ecological system of this region is wetlands (marshes and swamps). Key shoreline communities include fringing wetlands, broad wetlands, beaches (cobble, pebble, sand and mixed), exposed bedrock bluffs and shelving bedrock.

**Ecosystem Functions:** The majority of islands in this region are near-shore islands. Scotch Bonnet Island is moderately isolated and Peter Rock is the most isolated island in the region. Presqu'ile Provincial Park IBA is recognized as a globally significant area

for shorebirds. This IBA as well as Prince Edward Point IBA are recognized as globally significant areas for waterfowl and migratory landbirds. This area is also an area of seasonal spawning for Yellow Perch and Northern Pike. There is evidence of Lake Herring. Suitable habitat for interjurisdictional fish species includes broad wetlands, fringing wetlands, cobble beaches, sand beaches and boulder beaches.

#### *Physical Diversity:*

The large islands in this region have the least shape complexity and the majority of island complexes have medium to high shape complexity. Hickory Islands are among the islands with the most shape complexity. These islands are composed of limestone, dolostone, shale, arkose and sandstone. The dominant shoreline type is broad wetlands, as well as some shelving bedrock and cobble beaches.

#### *Island Size:*

Six large islands dominate the area with size ranging from seven to 79 hectares. Nicholson Island, Bald Head Island and High Bluff Island are the largest islands in this region. The remaining islands are predominantly less than one hectare in size.

### Threats to Biodiversity

Bald Head Island and LO4-21 are the most threatened islands in this region due to factors such as building and road density and boat launch sites. The Hickory Islands and LO4-22 both have access sites for land vehicles, the Presqu'ile Island Complex and LO4-27 complexes both have been developed to some extent for residential and recreational usage, and many islands including Nicholson Island and High Bluff Island have been utilized for cropland. The remainder of the islands in this region does not have any documented anthropogenic threats.

### Conservation Assessment

#### *Existing Conservation*

Most of the islands that have some protection in this region are within Presqu'ile Provincial Park. This area is geologically unique, in that its formation is the result of a limestone island becoming linked to the shore by a band of sand and gravel, called a tombolo. The park includes the two islands found just off the southwest tip of the tombolo, High Bluff Island and Gull Island Complex. These islands are also captured within the Presqu'ile Provincial Park Life Science ANSI. The tombolo as well as the presence of a collection of marsh, fen and swamp wetlands has also allowed for the designation of Presqu'ile Bay as a provincially significant wetland, and within this marsh area, much of the Presqu'ile Island Complex is captured (Mosquin and Wilson, 1986). The Presqu'ile Islands Wilderness Area,

including High Bluff and Gull Islands, adds an additional level of provincial protection to these sites (Ontario Government, 1990).

Weller's Bay occurs on the opposite shore from the Presqu'ile peninsula and includes a variety of natural heritage designations. Weller's Bay Coastal Sand Spit ANSI (provincial) and the Weller's Bay National Wildlife Area (federal). The Weller's Bay Provincially Significant Wetland complex covers 363 hectares and captures some of the islands contained in this region (Snetsinger and Kristensen, 1993).

Scotch Bonnet Island, a fairly isolated island, is classified as both a National Wildlife Area and a Life science ANSI. Presqu'ile Provincial Park is the only Important Bird Area encased entirely within this region. The area provides breeding habitat in the summer and stopover for many migrants in the fall and spring. The IBA is globally significant as a result of the large numbers of birds that it supports, including Greater Scaup, Whimbrel, Ring-billed Gull and Caspian Tern. The other IBA present in this region is known as Prince Edward Point, found on the southeastern tip of Prince Edward Point. There is a strong presence of migrating birds, and many nesting birds. The diversity of species at this site is exceptional with 162 species of landbirds recorded here. Birds found in groups exceeding 1% of their

North American populations include the Greater Scaup, Oldsquaw and White-singed Scoter (IBA, 2004).

#### *Conservation Assessment*

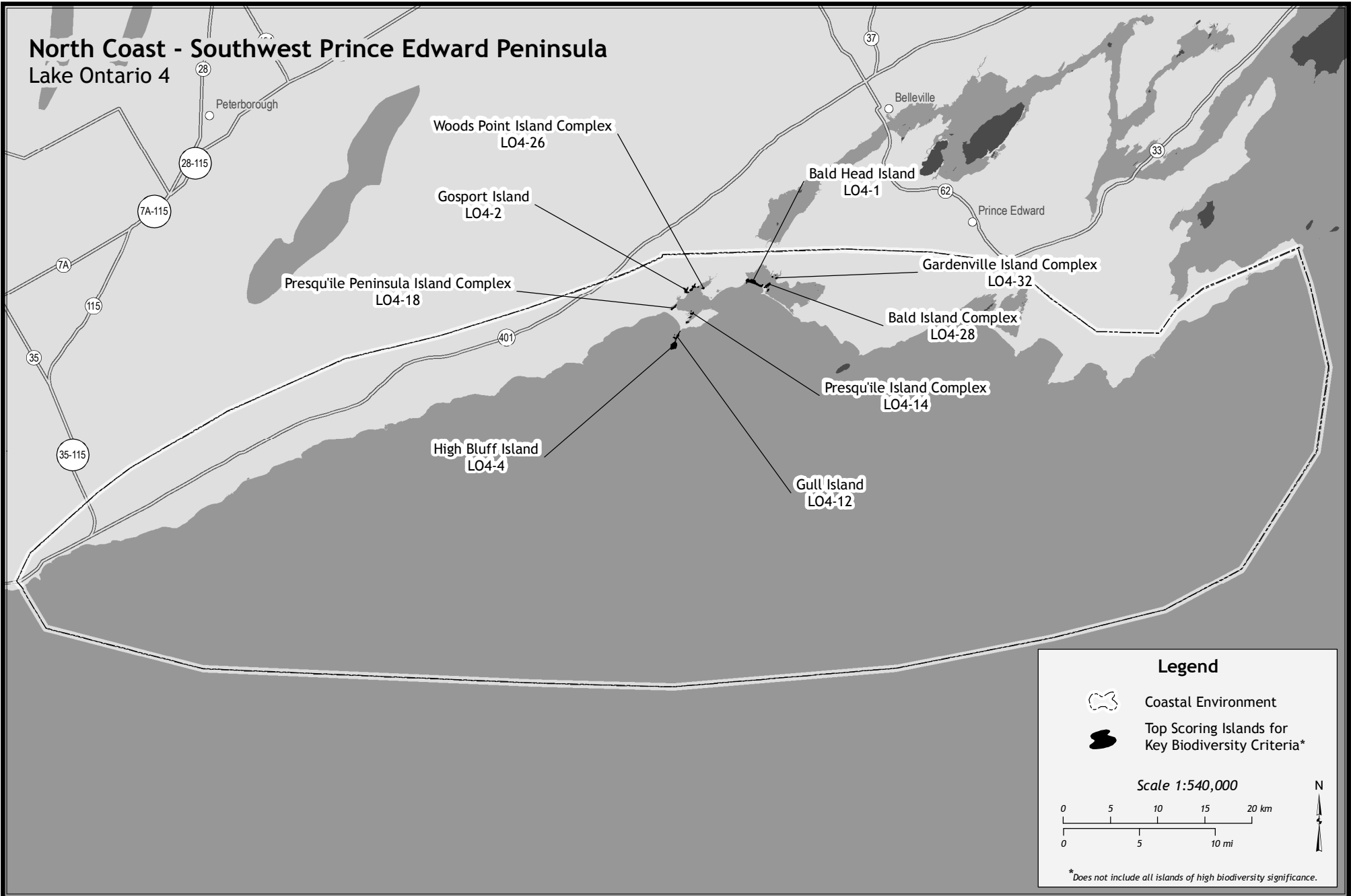
The islands in the following table are high scoring biodiversity islands. Woods Point Island Complex, located in Presqu-ile Bay, provides important habitat for a colonial waterbirds, waterfowl, shorebirds and migratory landbirds. It is associated with the Presqu'ile Provincial Park Important Bird Area and has very low level of threat. Bald Head Island and Bald Island Complex, located near Wellers Bay, provide important ecological and shoreline diversity for species, including some species at risk. Portions of these islands are part of the Weller Bay Complex Provincially Significant Wetland. These areas have a very low level of threat. Presqu'ile Island Complex is associated with The Fingers and Indian Point in Presqu'ile Provincial Park. Like Woods Point Island Complex, this complex provides important habitat for a wide variety of birds and some fish species. This complex is contained with in Presqu'ile Provincial Park and its associated Important Bird Area. There is slightly more threat to this island complex due to the adjacent road network through the park.

**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Woods Point Island Complex (LO4-26)	231	✓	✓	✓		Lower/Medium	Natural heritage designation
Presqu'ile Island Complex (LO4-14)	220	✓		✓		Medium/Higher	Protected
Gull Island (LO4-12)	218	✓	✓			Lower	Protected
Bald Head Island (LO4-1)	213			✓		Lower	Unprotected
Presqu'ile Peninsula Island Complex (LO4-18)	210	✓	✓	✓		Lower	Protected
Gosport Island (LO4-2)	198	✓		✓		Lower/Medium	Natural heritage designation
Bald Island Complex (LO4-28)	185		✓			Lower	Unprotected
High Bluff Island (LO4-4)	165	✓				Lower/Medium	Protected
Gardenville Island Complex (LO4-32)	161		✓			Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# North Coast - Southwest Prince Edward Peninsula Lake Ontario 4



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

\*Does not include all islands of high biodiversity significance.

# Lake Ontario Northeast Coast

## Lake Ontario 5 (Can), Lake Ontario 5 (U.S.) Coastal Environments

Number of islands: 911

Number of large islands: 34

Number of island complexes: 236

Total island area (ha): 32,537

Total length of coastline (km): 778

**Major Habitat Types:** Clay plain deciduous forests, abandoned field and pasture, marshes, limestone plain deciduous forests (south), till plain deciduous forests (north).

**Key Islands for Biodiversity Conservation:** Amherst Island, Big Island, Bostwick Island Complex, Collier Island Complex, Georgina Island Complex, Hill Island, Howe Island, Huffs Island, Spillsbury Island, Wellesley Island, Wolfe Island.

### Landscape Context

The Northeast Coast is a sheltered coast that is composed of channels, islands, headlands and bays. The island shorelines in this region are characterized by exposed bedrock bluffs and low vegetation banks. Fringing wetlands and broad wetlands occur in many of the sheltered bays.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 16 documented rare species occurring in the Northeast Coast including Black Tern, Southern Flying Squirrel, Eastern Ratsnake and Deerberry. There are documented occurrences of American Sea-rocket and Seaside Spurge, two Great Lakes disjunct species. There are also documented occurrences of three rare plant communities, including the globally rare Pitch Pine Treed Granite Barren Type.

Eight colonial nesting waterbird species have been observed on the islands. Several islands are recognized Important Bird Area (IBA) for colonial waterbirds. These significant areas include the Amherst Island IBA, Pigeon Island IBA, Wolfe Island IBA which are known for hosting large numbers of waterfowl species during the spring migration (IBA Canada, 2004). The Upper St. Lawrence/Thousand Islands IBA includes Wellesley Island and Grindstone Island and others in Chippewa Bay, is a waterfowl concentration area and Common Tern nesting area. Historically this IBA had the largest Great Blue Heron rookery in New York on Ironside Island (National Audubon Society, 2009). Amherst Island is well-known for providing over-wintering habitat for owls and other raptors.

**Ecological Systems:** Dominant terrestrial system types include pasture/abandoned fields, marshes, clay plain forests and swamps. The key ecological

systems of this region are wetlands (fens, bogs, marshes and swamps), alvars and limestone plain forest complexes. Key shoreline communities include fringing wetlands, broad wetlands, beaches (boulder, cobble, pebble, sand and mixed), barrier beaches, exposed bedrock bluffs, exposed sediment bluff and shelving bedrock.

**Ecosystem Functions:** The majority of islands in this region are near-shore islands; Salmon Island, Snake Island and Pigeon Island are moderately isolated. Wolfe Island IBA is recognized as a continentally significant area for waterfowl. The area is also an area of seasonal spawning for Northern Pike and Yellow Perch. There is also evidence of Bloater, Lake Herring and Lake Sturgeon. Suitable habitat for interjurisdictional fish species includes fringing wetlands, broad wetlands, cobble beaches, sand beaches and boulder beaches.

#### *Physical Diversity:*

The majority of the islands in this region have medium to high shape complexity. Islands in the Northeast Coast are predominantly composed of clastic metasedimentary rocks or late felsic plutonic rocks. The remaining islands are composed primarily of limestone, dolostone, shale, arkose and sandstone. The dominant shoreline type is exposed bedrock bluffs ranging from one to five metres in elevation, low vegetation banks and fringing wetlands.

#### *Island Size:*

Twelve large islands dominate the area with size ranging from 193 to 13,332 hectares. Wolfe Island, Amherst Island and How Island are the largest islands in this region. The remaining islands are predominantly less than five hectares in size.

### Threats to Biodiversity

Wolfe Island is by far the most threatened island in terms of recreational and residential development. This island also has several quarries, boat launches, access points, cropland areas and documented aquatic invasive species. Grindstone Island is also threatened, primarily from development. Howe Island and Amherst Island are considered moderately threatened as they are also affected by the majority of these threats with the addition of a recreational dive site threat on Howe Island. Lighthouses can be found on False Ducks Island and Main Duck Island.

### Conservation Assessment

#### *Existing Conservation*

Between Howe Island and Grenadier Island, the waters of Lake Ontario are peppered with the islands in the St. Lawrence Islands National Park. These

islands include many islands from Aubrey Island in the east to Hill Island in the west. Timber Island, found off the tip of Prince Edward Point, is protected by a life science area of natural and scientific interest (ANSI) and a provincial nature reserve designation.

Big Island is protected in part by a life science ANSI and a provincially significant wetland (PSW). This ANSI is part of Big Island Marsh PSW. Huffs Island is also protected by a Life science ANSI and works to protect the Huffs Island Coastal Wetland.

Amherst Island has a variety of natural heritage designations including Wemp's Bay Marsh, Nut Island Duck Club Marsh and Long Point Marsh PSWs. It has been proposed that these wetlands join together to create the Amherst Island Complex of wetlands.

Wolfe Island's dominated by seven PSWs: Reeds Bay Wetland, Big Sandy Bay Wetland, Barrett Bay Wetland, Button Bay Wetland, Bayfield Bay Marsh, Oak Point Wetland, and Lewis Bay Wetland. Most of these PSWs are captured in the Wolfe Island Wetland Complex. Wolfe Island is also protected in part by two Life science ANSIs: Beauvais Point and Wolfe Island Big Sandy Bay.

Howe Island is protected in part by two PSWs: Cassidy's Bay Wetland and Johnson Bay Wetland. Johnson Bay Coastal Wetland and Forest is also recognized as a Life science ANSI.

Northeast Coast islands that are partially or completely designated as Life science ANSIs include

Aubrey Island, Amherst Bay, Camelot Island, Hill Island, Long Point Bay, Mulcaster Island, Pigeon Island and Thwartway Island.

There are several IBAs within the Northeast Coast, including the northern half of the Prince Edward Point IBA, Amherst Island IBA, Wolfe Island IBA, Pigeon Island IBA and the Upper St. Lawrence/Thousand Islands IBA.

*Conservation Assessment*

The islands in the following table are high scoring biodiversity islands. Wolfe Island has provides key ecological systems diversity and physical diversity. This island is recognized as a continentally significant IBA for waterfowl, its only natural heritage designation. The island is covered with a network of gravel roads and is predominantly farmland interspersed with woodlots and marshes with some quarries. Housing, recreational development and aquatic invasive species also pose threats to the island. Amherst Island provides habitat for representative and globally rare species. The diversity of ecological systems also provides suitable habitat for other waterfowl and fish species. This island contains a provincially significant wetland and is also recognized as a globally significant IBA. There is some limited residential development, agriculture and quarry activity on this island. Howe Island provides key ecological and physical diversity. The island contains a provincially significant wetland. This island is threatened by recreational and residential development and quarries.

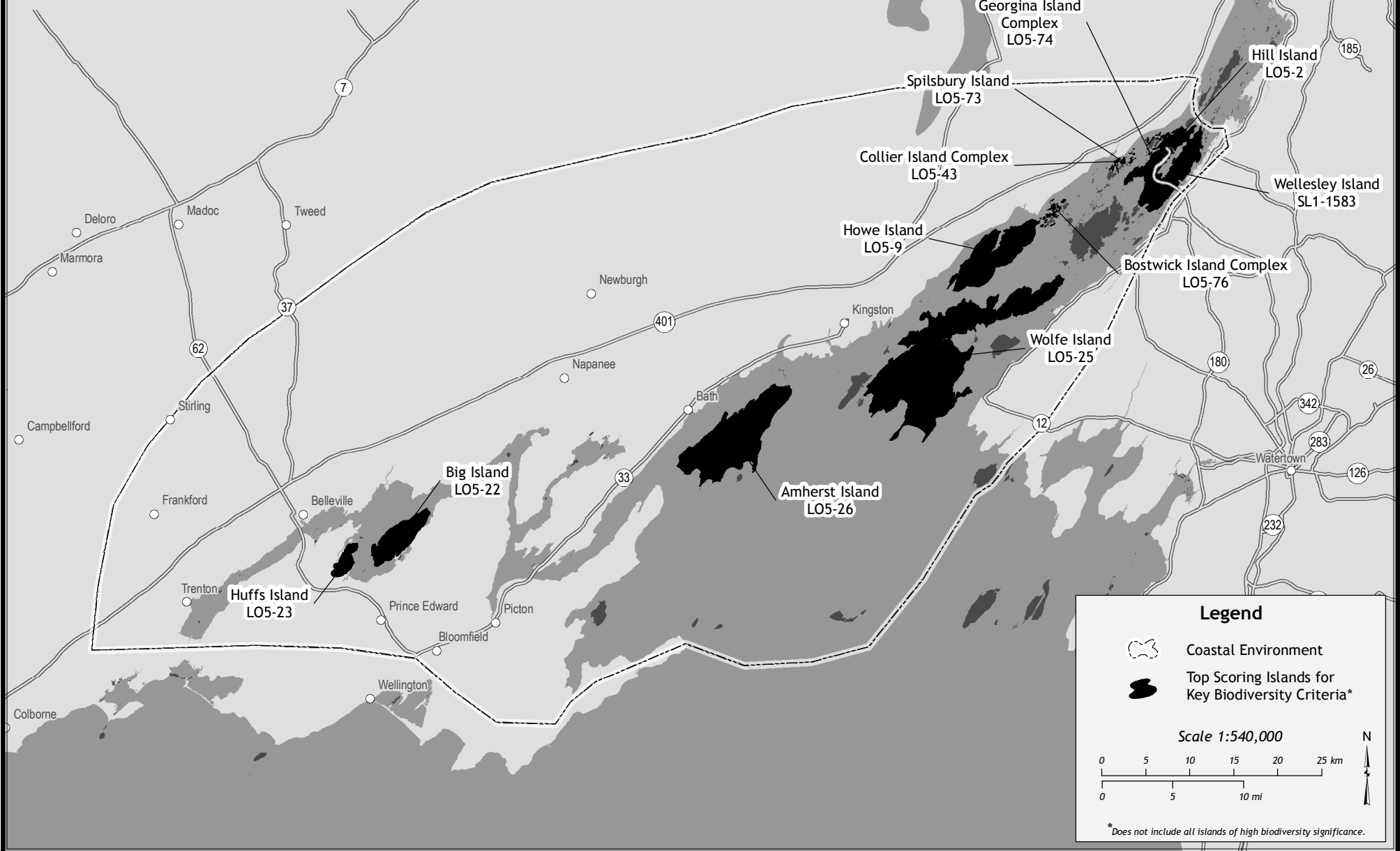
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
Wolfe Island (LO5-25)	302		✓	✓		Higher	Natural heritage designation
Amherst Island (LO5-26)	272	✓	✓	✓		Medium/Higher	Natural heritage designation
Howe Island (LO5-9)	259		✓	✓		Medium/Higher	Unprotected
Big Island (LO5-22)	241	✓		✓		Medium	Natural heritage designation
Wellesley Island (SL1-1583)	241		✓	✓		Higher	Largely unprotected
Bostwick Island Complex (LO5-76)	211		✓	✓		Medium	Largely unprotected
Collier island Complex (LO5-43)	208		✓	✓		Lower/Medium	Unprotected
Georgina Island Complex (LO5-74)	192		✓			Medium	Largely unprotected
Spilsbury Island (LO5-73)	186		✓			Medium	Largely unprotected
Huffs Island (LO5-23)	185	✓				Lower/Medium	Natural heritage designation
Hill Island (LO5-2)	184		✓			Lower/Medium	Protected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Ontario Northeast Coast

## Lake Ontario 5



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# Henderson and Chaumont Bays

## Lake Ontario 6 Coastal Environment

Number of islands: 71  
Number of large islands: 6  
Number of island complexes: 28  
Total island area (ha): 1,458  
Total length of coastline (km): 84

**Major Habitat Types:** Grasslands/herbaceous.

**Key Islands for Biodiversity Conservation:** Calf Island, Cherry Island, Fox Island, Hoveys Island, Little Galloo Island, LO6-249, Six Town Point, Stony Island - East, Stony Island - West.

### Landscape Context

The Henderson Bay and Chaumont Bay is located in the northeastern portion of Lake Ontario north of Stony Point and extending around to Fox Island. This region also contains Galloo Island, Little Galloo Island and the Stony Islands, all of which are found offshore of the Stony Point peninsula. Chaumont Bay and Henderson Bay has high recreational use.

### Biodiversity Assessment

#### *Biological Diversity:*

Occurrences of colonial nesting waterbird populations of Ring-billed Gull, Herring Gull, Caspian Tern, Double-crested Cormorants and Black-crowned Night Heron have been documented on some of the islands, including Little Galloo Island and Gull Island. Little Galloo Island contains one of the largest colonies of Ring-billed Gulls on the continent as well as the largest colony of Caspian Terns in U.S. Great Lakes waters. The islands associated with Chaumont Bay are included in the Point Peninsula Important Bird Area (IBA), which contains an important staging area for Caspian Tern, Common Tern and Black Tern and also hosts large numbers of waterfowl (National Audubon Society, 2009).

A warm-water fish concentration area and a waterfowl winter concentration area have been documented in the area. There are known occurrences of Lake Herring, Lake Whitefish, Lake Trout and Smallmouth Bass. Key shoreline communities include sandy beach/dunes and open shoreline wetlands.

#### *Physical Diversity:*

All islands and island complexes have low to medium shape complexity. Calf Island has the most shape complexity. The geology of the Henderson and Chaumont Bay islands is limestone.

#### *Island Size:*

Six large islands dominate the area with size ranging from 39 to 721 hectares. Galloo Island and the Stony Islands are the largest islands in this region. The remaining islands are predominantly less than two hectares in size.

### Threats to Biodiversity

There are few identified direct threats to the islands in this region. Several invasive species including Spotted Knapweed and Black Swallowwort have been documented for Galloo Island. Overbrowsing of White-tailed Deer is also a threat to this island. Hoveys Island is documented as an island in the region that has a high level of threats which is attributed to some development. Other Chaumont Bay islands have been infested with Black Swallowwort, also known as Dog Strangling Vine, which appears to be an increasing threat to islands in eastern Lake Ontario.

### Conservation Assessment

#### *Existing Conservation*

Two island complexes in Black River Bay are included in the Dexter Marsh Wildlife Management Area. Islands within Chaumont Bays are included in the Point Peninsula IBA which is primarily privately owned but which includes a small Wildlife Management Area and Long Point State Park (National Audubon Society, 2009).

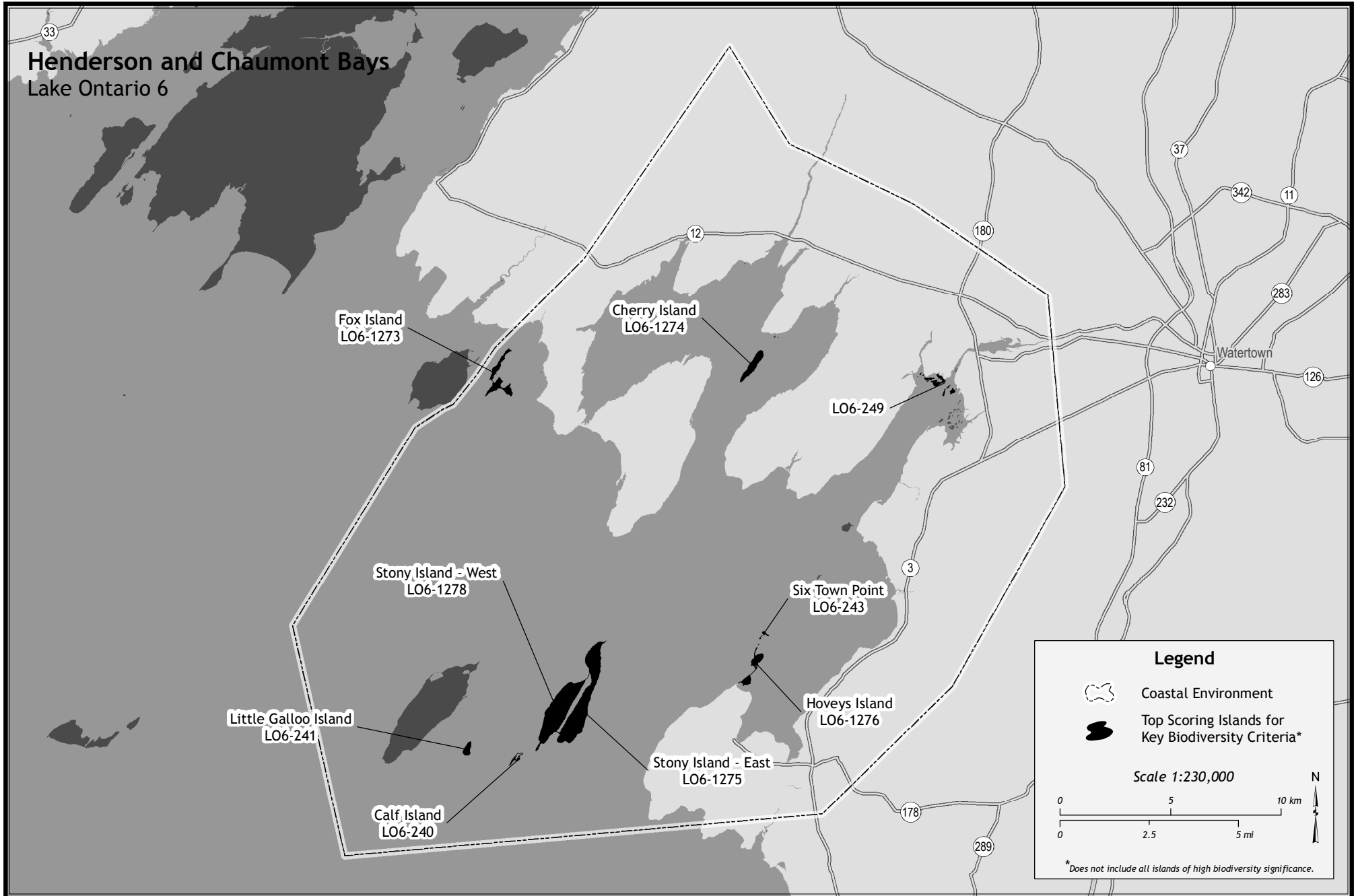
#### *Conservation Assessment*

The islands in the following table are higher scoring biodiversity islands in this region. There is limited documentation on their biodiversity significance. There are few documented threats and the majority of the islands are unprotected. Galloo Island is heavily infested with Black Swallowwort and Spotted Knapweed and is further degraded by overbrowsing deer (D. Klein, TNC, pers. comm.). Galloo Island has scored high for total biodiversity, but is currently in poor ecological condition with considerable threats. Therefore Galloo Island is not considered a priority at this time<sup>(1)</sup>.

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance						
Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation	Relative Threat Level	Primary Conservation Status
Galloo Island <sup>(1)</sup> (LO6-1276)	164			✓		Medium/Higher	Unprotected
Stony Island - East (LO6-1275)	141		✓	✓		Medium	Unprotected
Fox Island (LO6-1273)	131		✓	✓		Medium	Unprotected
Stony Island - West (LO6-1278)	130			✓		Medium	Unprotected
Hoveys Island (LO6-1276)	129		✓	✓		Higher	Unprotected
Calf Island (LO6-240)	121		✓			Lower	Unprotected
Cherry Island (LO6-1274)	118					Lower	Unprotected
LO6-249	113					Lower	Protected
Six Town Point (LO6-243)	106					Lower	Unprotected
Little Galloo Island (LO6-241)	90	✓				Medium	Largely other land use designations

\*Not all islands considered to have biodiversity significance are included in this table.



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# Lake Ontario Eastern Coast

## Lake Ontario 7 Coastal Environment

Number of islands: 14  
 Number of large islands: 0  
 Number of island complexes: 3  
 Total island area (ha): 3  
 Total length of coastline (km): 2

Major Habitat Types: Unknown.

**Key Islands for Biodiversity Conservation:** Carl Island, LO7-239, LO7-235.

### Landscape Context

The eastern shore of Lake Ontario is defined in this report as extending from Ramona Beach in Mexico Bay up to Stony Point at Ray Bay. One island complex is located along the outflow of Stony Creek, while the other two island complexes occur in Floodwood Pond and North Pond respectively. Limited information on biological and physical diversity is available for these small islands.

### Biodiversity Assessment

#### *Biological and Physical Diversity:*

There is no rare species or plant communities documented on the islands in the Lake Ontario eastern coast. There is no available information on whether colonial nesting waterbirds or interjurisdictional fish use these areas. There are

extensive wetlands occurring along and near the island complex near Stony Creek. Limited information is known on ecological and physical diversity and the ecosystem functions of these islands.

#### *Island Size:*

There are no large islands in the Eastern Coast of Lake Ontario. The islands range from approximately 2 hectares to less than one hectare in size.

### Threats to Biodiversity

There are no documented threats to the islands of the Lake Ontario southern coast.

### Conservation Assessment

#### *Existing Conservation*

The island complex in Floodwood Pond is included in the Lakeview State Wildlife Management Area.

#### *Conservation Assessment*

The islands in the table below are higher scoring biodiversity islands in this region. There is little documentation on their biodiversity significance or threats on these islands and the majority of the islands are unprotected.

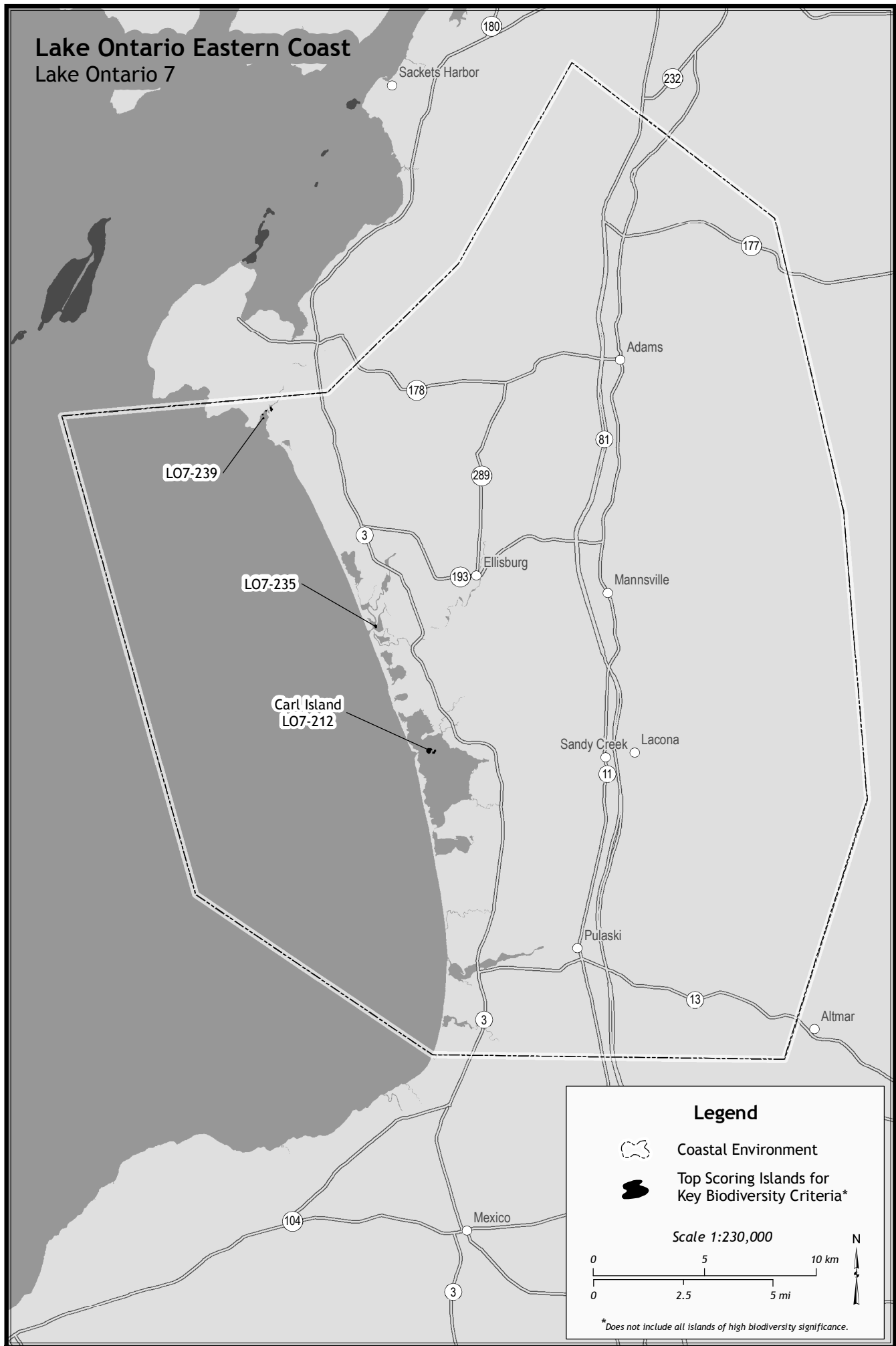
**Top Scoring Islands for Key Biodiversity Criteria**

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
Carl Island (LO7-212)	74					Lower	Unprotected
LO7-239	74					Lower	Unprotected
LO7-235	62					Lower	Protected



\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Ontario Eastern Coast

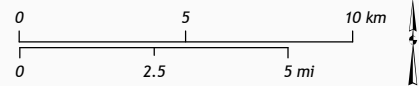
## Lake Ontario 7



### Legend

-  Coastal Environment
-  Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:230,000



\* Does not include all islands of high biodiversity significance.

# Lake Ontario Southern Coast

## Lake Ontario 8 and Lake Ontario 9 Coastal Environments

Number of islands: 14  
 Number of large islands: 0  
 Number of island complexes: 8  
 Total island area (ha): 3  
 Total length of coastline (km): 4

Major Habitat Types: Unknown.

**Key Islands for Biodiversity Conservation:** Eldridges Point, Point Breeze Breakwater, Sunset Beach Jetty, LO8-145, LO9-99, LO9-100, LO9-101, LO9-95.

### Landscape Context

The southern coast of Lake Ontario has a limited number of islands near the mainland shoreline. Three of these islands are anthropogenic. Several other islands are located within sheltered bays along the shoreline and are more likely to be reconnected to the mainland with lower water levels. Limited information on biological and physical diversity is available for these small islands.

### Biodiversity Assessment

#### *Biological and Physical Diversity:*

There is no rare species or plant communities documented on the islands in the Lake Ontario southern coast. No information was available on whether colonial nesting waterbirds or

interjurisdictional fish use these areas. Some wetlands are known to occur along shorelines of some islands, however limited information is known on ecological and physical diversity and the ecosystem functions of these islands.

#### *Island Size:*

There are no large islands in the Southern Coast of Lake Ontario. The islands are all under approximately one hectare in size.

### Threats to Biodiversity

There are no documented threats on the islands of the Lake Ontario Southern Coast.

### Conservation Assessment

#### *Existing Conservation*

None of the islands in this region are protected or have natural heritage designations.

#### *Conservation Assessment*

The islands in the table below are higher scoring biodiversity islands in this region. There is little documentation on their biodiversity significance. There are no documented threats on these islands, and the majority of the islands are unprotected.

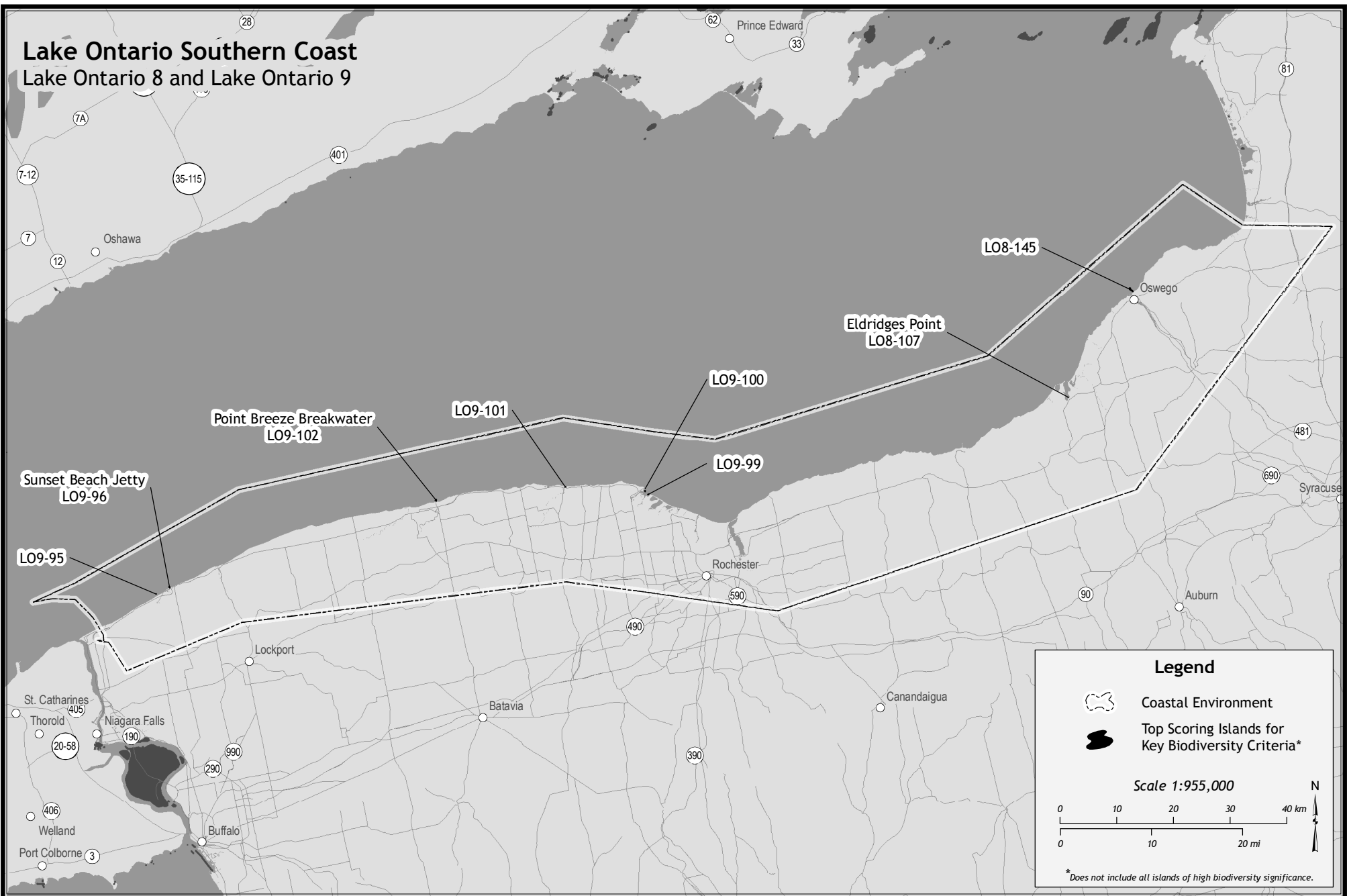
### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity	Isolation		
LO8-145	70					Lower	Unprotected
Sunset Beach Jetty (LO9-96)	58					Lower	Unprotected
Point Breeze Breakwater (LO9-102)	57					Lower	Largely unprotected
LO9-99	52					Lower	Protected
LO9-100	48					Lower	Unprotected
Eldridges Point (LO8-107)	37					Lower	Unprotected
LO9-101	36					Lower	Unprotected
LO9-95	27					Lower	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table.

# Lake Ontario Southern Coast

## Lake Ontario 8 and Lake Ontario 9



**Legend**

- Coastal Environment
- Top Scoring Islands for Key Biodiversity Criteria\*

Scale 1:955,000

0 10 20 30 40 km

0 10 20 mi

N

\* Does not include all islands of high biodiversity significance.

Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006

# St. Lawrence River

## St. Lawrence River (Can) and St. Lawrence (U.S.) Coastal Environments

Number of islands: 852  
Number of large islands: 32  
Number of island complexes: 191  
Total island area (ha): 8,545  
Total length of coastline (km): 594

**Major Habitat Types:** Eastern Great Lakes lowland forests.

**Key Islands for Biodiversity Conservation:** Ault Island, Barnhart Island, Berry Island, Cornwall Island, Grenadier Island, Macdonald Island Complex, Tar Island.

### Landscape Context

The St. Lawrence River has the largest discharge of any river in North America. It is a complex of islands and channels, and contains the well-recognized Thousand Islands region. Most of the islands occur on the Canadian Shield, and are on granite covered by a thin layer of soil.

Islands in the St. Lawrence River are sheltered, and mainly subject to river, rather than wave processes. Most of these islands are characterized by low vegetated banks, exposed bedrock bluffs and wetlands. Some island shorelines have been modified with rip-rap.

### Biodiversity Assessment

#### *Biological Diversity:*

**Species:** There are 17 documented rare species occurring in the St. Lawrence River including Black Tern, Cutlips Minnow, Eastern Ratsnake, Lesser Fringed Gentian and Deerberry. There are documented occurrences of Lake Sturgeon, a globally rare species.

Seven colonial nesting waterbird species have been observed on the islands. Croil Island and Long Sault Island are included in the Lower St. Lawrence River Important Bird Area (IBA) which supports large numbers of breeding Common Terns, and is also important for wintering waterfowl and Bald Eagles (National Audubon Society, 2009).

There are six documented rare plant communities, of which the Cobble Shore Wet Meadow is a globally rare community.

**Ecological Systems:** Dominant terrestrial system types include clay plain forests, till plain forests, marshes and pasture/abandoned fields. The key ecological systems of this region are wetlands (fens, marshes and swamps) and limestone plain forest complexes. Key shoreline communities include

fringing wetlands, broad wetlands, mixed beaches (predominantly sand) and depositional sand beaches.

**Ecosystem Functions:** The majority of islands in this region are near-shore islands. There is local use of wetlands by migratory waterfowl. The area is also an area of seasonal spawning by Walleye, Northern Pike and Yellow Perch. There are also suitable nursery and feeding habitats. Habitat for interjurisdictional fish species includes fringing wetlands, broad wetlands, cobble beaches, sand beaches and mixed beaches.

#### *Physical Diversity:*

The majority of the islands in this region have low to medium shape complexity. Large islands have the least complex shapes. Islands in the St. Lawrence River are predominantly composed of limestone, dolostone, sandstone and granite. A limited number of island complexes contain clastic metasedimentary rock. Other islands contain clastic metasedimentary rocks or late felsic plutonic rocks. The dominant shoreline type is low vegetation banks.

#### *Island Size:*

Sixteen large islands dominate the area with size ranging from 62 to 2,924 hectares. Grenadier Island, Cornwall Island and Ault Island are the largest islands in this region. The remaining islands are predominantly less than 19 hectares in size.

### Threats to Biodiversity

Cornwall Island is, by far, the most threatened in the St. Lawrence River. It is mainly affected by buildings, residential usage, boat launches, access sites, invasive species, pits and quarries, road density and agriculture. Moulinette Island and Ault Island have also been developed for residential use and are threatened by high building and road density. Several islands, including Skeleton Island Complex have high use beaches, while others, including Grenadier Island and Prison Island Complex feature recreational dive sites. Lighthouses can be found on island complexes which include Duck Island, Berry Island, O'Neil Island, Goose Island, DeWatteville Island, and Renshaw Island. Boat launches can be found on several islands, including Prison Island Complex, and access sites for road vehicles are located on over half of the islands in this region. Less than one-quarter of the islands have some intensity of usage for agricultural cropland.

Approximately one-quarter of the islands in the St. Lawrence River have medium to higher levels of building densities. This region has a long history as a cottage area and many of the islands are in private

ownership. Buildings occur at higher densities on less than 10% of the islands within the St. Lawrence River, all of which occur on small islands within island complexes. Many of these islands with higher building densities also exhibit higher recreational use and a higher road density.

The St. Lawrence River is an active shipping route and this traffic may pose a threat due to shoreline erosion, spills and invasive species.

### Conservation Assessment

#### Existing Conservation

Approximately one-quarter of the islands in the St. Lawrence River have a natural heritage designation and protection, of which half are protected through regulation. St. Lawrence Island National Park, established in 1904, includes approximately 20 islands between Kingston and Brockville. Grenadier Island is one of the larger islands in the band of islands which is captured within the National Park. The Grenadier Island is also partially designated as a life science area of natural and scientific interest (ANSI), and as part of the provincially significant Grenadier Island Complex Wetland. Nairne Island, found between Morrisburg and Cornwall, is a small island which has been designated an earth science ANSI. The remaining islands are in private ownership.

Some islands in the thousand island region are designated as State Parks such as Galop Island State Park and Croil Island State Park. Croil Island and Long Sault Island are also included in the Lower St. Lawrence River IBA.

#### Conservation Assessment

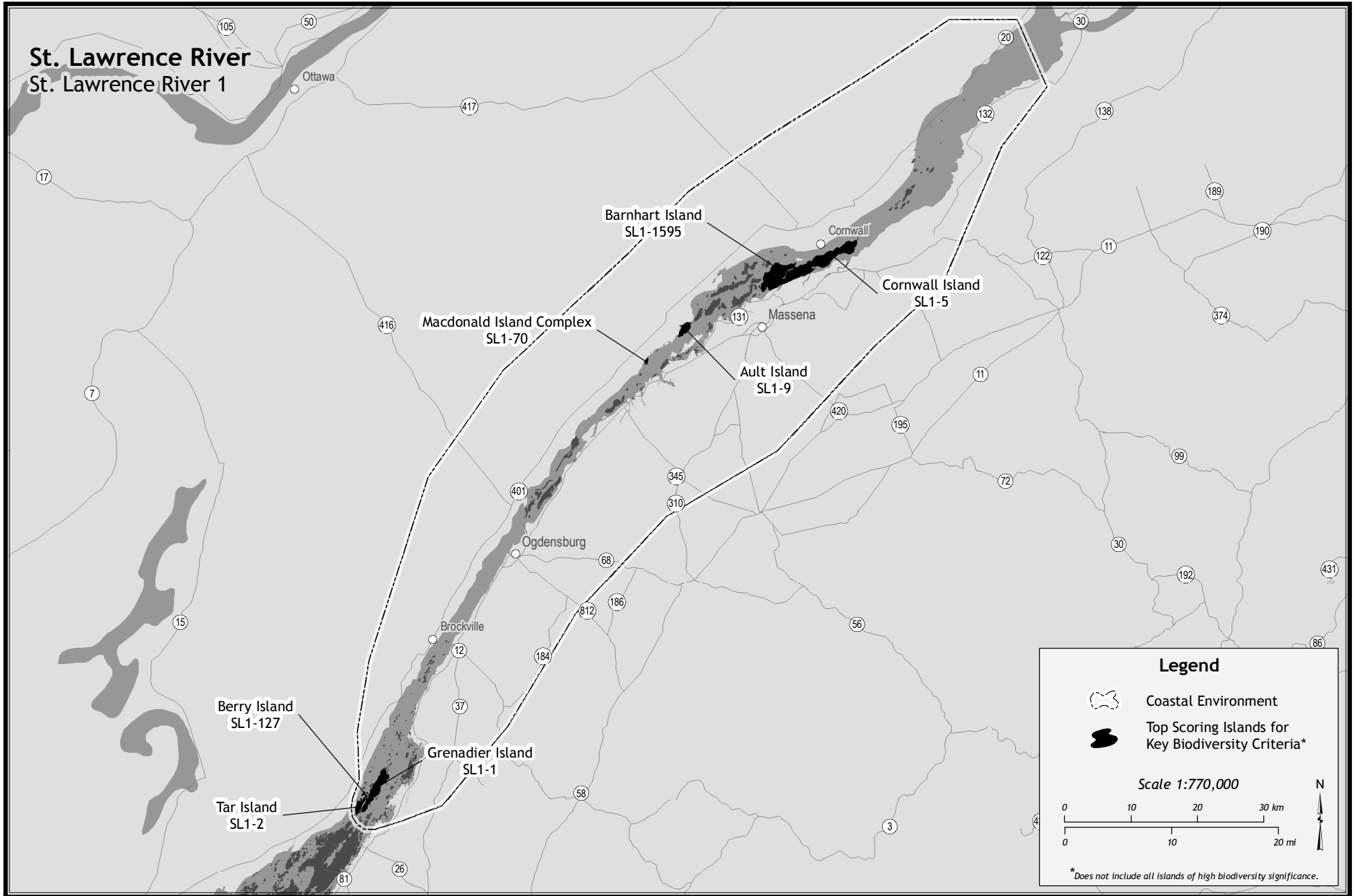
The islands in the following table are high scoring biodiversity islands. Cornwall Island has no areas with a natural heritage designation. Threats associated with this island include several recreational development areas, pits and quarries, and several locations of aquatic invasive species. Over half of Grenadier Island is included in the St. Lawrence Islands National Park, and the remaining areas have some limited development. Grenadier Island contains key ecological systems and shoreline diversity including important wetland areas. The island complex containing O'Neil Island contains important wetland systems and is partially included in the provincially significant Grenadier Island Wetland Complex. This island complex is threatened by roads and building development.

Tar Island contains important wetland systems and shoreline types which can provide suitable spawning and nursery habitat for a variety of warmwater fish species such as Smallmouth Bass and Muskellunge. This island has some building development. The Skeleton Island Complex (includes Stovin Island) provided habitat for colonial nesting waterbirds, exhibits physical diversity and is fairly distinct in relation to the other surround islands. This island complex is primarily threatened by recreation use. Stovin Island is part of the St. Lawrence Islands National Park. The Macdonald Island Complex had a high total biodiversity score, is a regional candidate ANSI and is currently under little threat. Ault Island has a high total biodiversity score and is contained within the Upper Canada Migratory Bird Sanctuary.

### Top Scoring Islands for Key Biodiversity Criteria

Top Scoring Islands	Biodiversity Significance					Relative Threat Level	Primary Conservation Status
	Island Name (Island ID)	Total Biodiversity Score	Colonial Nesting Waterbirds	Physical Diversity	Biological Diversity		
Ault Island (SL1-9)	211			✓		Medium/Higher	Protected
Grenadier Island (SL1-1)	196			✓		Lower/Medium	Portions are protected
Barnhart Island (SL1-1595)	183		✓	✓		Medium/Higher	Protected
Tar Island (SL1-2)	174			✓		Lower/Medium	Unprotected
Cornwall Island (SL1-5)	168			✓		Higher	Unprotected
Macdonald Island Complex (SL1-70)	167		✓			Lower	Unprotected
Berry Island (SL1-127)	161		✓			Medium/Higher	Unprotected

\*Not all islands considered to have biodiversity significance are included in this table



Data Sources: Nature Conservancy of Canada - Ontario Region, 2009; The Nature Conservancy, 2009; Ontario Ministry of Natural Resources, 2007; ESRI, 2006