

## Chapter 4:

# Habitat and Biodiversity

### Our Goal:

- All biological communities are healthy, diverse, and self-sustaining.

Over the last 150 years, the Lake St. Clair region has undergone a dramatic transformation from open space and wetlands to agriculture and urban development, which now dominate the landscape. This conversion has resulted in drained wetlands, loss of tallgrass prairie, fragmented forest habitats, increased sedimentation, excess nutrient loading, and dredged aquatic habitats. Lake St. Clair's original shoreline has been altered significantly during the last century, resulting in decreased populations of fish and wildlife species that require undisturbed shoreline for critical portions of their life cycle.

Changes to the Lake St. Clair ecosystem to accommodate agricultural, residential, municipal, industrial, commercial, and recreational and shipping activities, along with introductions of invasive species, have led to declines in habitat quality and native species distribution and abundance. Today, the shoreline of the St. Clair system displays sharply contrasting land uses. Selected portions of the upper St. Clair River are heavily industrialized and a string of oil and chemical companies from Sarnia to Corunna, utilizes much of the river shoreline on the Canadian side. In Michigan, industrialization of the river shoreline is less intensive and is mainly centered at Port Huron with additional industrial facilities located in Marysville and the Marine City/St. Clair area. Along the Ontario shoreline of Lake St. Clair, wetlands and agriculture dominate, whereas in Michigan the entire shoreline is highly urbanized.

Despite these changes, the region provides important habitat for many rare and endangered species. Lake St. Clair was identified as a Biodiversity Investment Area at the 2000 State of the Lakes Ecosystem Conference (SOLEC), sponsored by Environment Canada and the U.S. Environmental Protection Agency. SOLEC also identified Lake St. Clair and the adjacent Detroit River as priority "eco-reaches" that provide essential habitat for a large number of plant and animal species, especially in Lake St. Clair's coastal wetlands.

This chapter provides an overview of the types of habitat and wildlife found in the Lake St. Clair and St. Clair River region and reviews key threats and impairments to the region's habitat and biodiversity. Major findings and U.S. recommendations regarding key habitat and biodiversity issues in the Lake St. Clair watershed are also presented.

### Key Issues:

- 1) Loss and degradation of habitat
- 2) Invasive species
- 3) Impacts from boating and shipping
- 4) Lake levels

### Did you know....

Lake St. Clair was identified as a Biodiversity Investment Area at the 2000 State of the Lakes Ecosystem Conference.

## Habitat

Habitats within the Lake St. Clair watershed can generally be divided into the following five types, which are described in detail below:

- Coastal wetlands
- Nearshore or coastal habitats
- St. Clair River and tributaries
- Open lake
- Inland habitats.

### Coastal Wetlands

Wetlands provide numerous beneficial services for people and for fish and wildlife. Some of these functions include trapping and filtering sediments and nutrients, buffering wave action, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods.

Wetlands function like natural sponges, storing water and slowly releasing it. This process slows the water's momentum, reduces flood heights, and allows for ground water recharge. Wetlands also filter nutrients from fertilizer application, manure, leaking septic tanks, and municipal sewage that are dissolved in the water. This filtration process can remove much of the water's pollutant load by the time it leaves a wetland. Finally, wetlands are some of the most biologically productive natural ecosystems in the world. Abundant vegetation and shallow water provide diverse habitats for fish and wildlife.

Lake St. Clair contains some of the most important coastal wetlands in the Great Lakes region. Large lake processes such as waves; wind tides, ice scour and long- and short-term water level fluctuations shape coastal wetlands.

Coastal wetlands provide critical habitat for many of the plant and animal species in the Lake St. Clair watershed. They also represent the most biologically significant habitat for migratory birds in the watershed. Many bird species rely on large contiguous wetland areas that have a diversity of aquatic plant species and shallow open water as feeding and resting areas during migration and breeding. Lake St. Clair wetlands are second only to Long Point, on Lake Erie, as an important area in the lower Great Lakes for waterfowl use during the spring and fall migration.

While losses of submerged wetlands around the perimeter of the lake are not well documented, it is estimated that more than 13,000 acres of this important fish and wildlife habitat have been adversely affected or lost since the late 1800s, primarily due to dredging, diking, and filling along shorelines for marina, residential, or agricultural development. Remaining coastal wetlands protect nearshore terrestrial ecosystems from erosion by dispersing wave energy and deflecting ice flows. Their role in water filtering, erosion and sediment control also contributes to the overall improvement of water quality in the lake and in the coastal wetlands themselves.

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#### Did you know...

More than 13,000 acres (5,260 hectares) of wetlands have been lost in the Lake St. Clair watershed since the 1800s.

## ***St. Clair Delta Wetland and Walpole Island***

### **Did you know...**

The Lake St. Clair Delta represents the largest active delta wetland system in the Great Lakes and is recognized as one of Michigan's most valuable natural resources.

The St. Clair Delta, located at the mouth of the St. Clair River, is the largest active delta wetland system in the Great Lakes. The delta is shaped like a “bird’s foot,” and features a webbed configuration of channels and complex coastal wetlands, wet prairies, forested wetlands, marshes, and savanna-like uplands.

This delta provides important breeding and migration habitat for grassland birds, waterfowl, marshbirds and other migratory birds. The delta also provides habitat for a diverse array of mammals, reptiles, amphibians, rare invertebrates, and rare plants. Ecologically, it is important because it harbors some of the last, high quality lake plain prairies and oak savannas in the entire Great Lakes basin, most of these which lie within the Walpole Island First Nation, a Native American Reserve located on the large delta island complex.

Walpole Island First Nation contains the most extensive wetlands remaining in Lake St. Clair. These wetlands are approximately 17,050 acres (6,900 hectares) in area and are the largest wetland complex in the Great Lakes basin. Much of the Walpole Island delta islands and wetlands remain relatively undisturbed. In addition, the delta has a rich mosaic of natural area, including tallgrass prairie, oak savanna and Carolinian forests. Many of the species considered rare or at risk in the United States and Canada are abundant on Walpole Island. While Walpole Island First Nation makes up only 0.002% of Canada’s landmass, it contains 12% of Canada’s wildlife species at risk, including fish, birds, reptiles, plants, butterflies, and one mammal – the southern flying squirrel. In addition, there are 108 provincially rare plant species found on Walpole Island, including 6 plant species found nowhere else in Canada.

The Ontario Ministry of Natural Resources (OMNR) and the Michigan Department of Natural Resources (MDNR) have identified several sites in this ecosystem as significant based on their unique qualities, extent, sensitivity to disturbance, threat of loss, and educational and scientific value. The islands that compose the St. Clair Delta are fringed with extensive coastal marshes, portions of which are still in a natural condition. Due to their relative isolation, they are considered important areas for diverse animal and plant life.

## **Nearshore and Coastal Habitats**

Nearshore habitats are critical and essential to the Great Lakes ecosystem, providing an important buffer and link between the open water and inland ecosystems. The nearshore coastal habitat includes both the nearshore waters and the terrestrial zone along the shoreline. The nearshore waters begin at the shoreline or the lakeward edge of coastal wetlands and extend offshore to the deepest lakebed depth contour where the thermocline intersects with the lake bed in late summer or early fall. The nearshore terrestrial zone is defined differently for each lake. The physical changes wrought by the edge of the lakes and the local climatic effects of large water bodies exert huge influences on shoreline habitats. The nearshore terrestrial zone ecosystems may be as narrow as a beach or they may extend several kilometers inland as part of contiguous forests or dune fields. The nearshore zone has also been described to include wetlands that are affected by variations in lake levels.

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### **Did you know...**

In 1980, Walpole Island was noted as an Environmentally Significant Area by the University of Waterloo. Walpole Island First Nation was selected by the Carolinian Canada Identification Subcommittee as one of the top 36 unprotected natural areas in the Carolinian life zone of Canada. Of these 36 sites, it was distinguished as being the only site that fulfilled all ten criteria used for selection.

### **Did you know...**

A thermocline is a layer in a large body of water, such as a lake, that sharply separates regions differing in temperature, so that the temperature gradient across the layer is abrupt.

Little is known about the nearshore coastal habitat for Lake St. Clair and the St. Clair River. Indeed, this information gap exists for much of the Great Lakes. Efforts are underway as part the U.S. Geological Survey's Great Lakes Aquatic GAP Program (GAP) to better understand the coastal habitats of the Great Lakes, including Lake St. Clair. The goal of the GAP Program is to evaluate the biological diversity of aquatic species and their habitats, and to identify gaps in the distribution and protection of these species and their habitats within the Great Lakes basin. As part of this effort, the GAP program is developing a preliminary coastal habitat classification system in which the coastline will be divided into segments based on physical factors such as circulation, currents, wind and wave action, and coastal geomorphology. Using a Geographic Information System (GIS), maps of coastal habitats and fish distribution can be overlaid with maps of land ownership. Scientists and resource managers can then use this information to make better-informed decisions when identifying priority areas for conservation.

Complementary to the GAP effort but on a foreshortened timeline, the Great Lakes Commission, in cooperation with the U.S. National Oceanic and Atmospheric Administration (NOAA), is working on a project to characterize Lake St. Clair's coastal habitat and develop tools to assist with restoration and conservation. More information on this initiative is provide below under "Loss and Degradation of Habitat" within the "Findings and Recommendations" section.

## **St. Clair River and Tributaries**

### **St. Clair River Impairments:**

1. Restrictions on fish and wildlife consumption
2. Degradation of benthos
3. Dredging restrictions
4. Beach closings
5. Degradation of aesthetics
6. Loss of fish and wildlife habitat

The Detroit and St. Clair rivers provide a broad diversity of habitats in close proximity to one another and include many habitat types along the shallow river shoulders and deeper channel waters.

The St. Clair River extends from the mouth of Lake Huron where the Blue Water Bridge is located and includes important wetlands at the southern end from St. Johns Marsh on the west (near Anchor Bay) to the north shore of Mitchell's Bay in Ontario.

In general, the St. Clair River's bays and wetlands provide important fish spawning and nursery habitats, in particular the St. Clair Flats area. The St. Clair River Remedial Action Plan has attributed the diversity of fish species in the river to the abundant assortment of habitat types that provide valuable spawning and nursery habitat in the main river, its tributaries and the delta.

The St. Clair River is an international Area of Concern (AOC) that is managed through a binational Four Agency Letter of Commitment and the Binational Public Advisory Committee. The St. Clair River was designated as an AOC due in part to loss of fish and wildlife habitat along the river shoreline.

Several small tributaries drain into the St. Clair River, mostly from the U.S. side. These include the Black, Pine and Belle rivers. Several large tributaries also flow into Lake St. Clair. These include the Clinton River, and from the Canadian side the, Sydenham and Thames rivers. Like the St. Clair River, the Clinton River is an AOC.

These tributaries, which contribute water, chemicals, organic materials, nutrients and sediments to the St. Clair River and Lake St. Clair, are also habitat for diverse aquatic

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communities. The Thames River provides important spawning and nursery habitat for the walleye populations of Lakes St. Clair, Erie and Huron. Tributary habitats vary, depending upon size, slope, substrate, geology and land-use in the drainage basin, groundwater characteristics, climate, and the nature of the terrestrial vegetation.

## Open Lake

The open-lake habitat includes all waters of Lake St. Clair except those within the coastal wetlands.

The shallow lake habitats support a wide variety of fish and provide resting spots for migrating waterfowl. Phytoplankton occupy the upper layers of the open lake and benthic algae colonize the shallower portions of the lakebed where sunlight is sufficient to support photosynthesis. Zooplankton colonizes the open lake from the surface of the water to the lakebed, and productive and diverse benthic invertebrate communities occupy the lakebed wherever it has not been degraded by pollution or dredging. Waterfowl are an important user of the open-lake habitat.

In the last 30 years, there has been an increase in water transparency resulting in an increase in light penetration in the lake. This has been attributed, in part, to lower water levels, but it also relates to the impact of non-native zebra mussels, *Dreissena polymorpha*, that began colonizing the lake in 1988. The overall change in transparency has been implicated in other ecological changes such as decreased preferred habitat for walleye and increased submerged rooted aquatic vegetation. Changes that were observed on the Ontario side of Lake St. Clair were not observed to the same extent on the Michigan side primarily because of differences between the hydrology on the two sides of the lake. See Chapter 1 for more information on the hydrology of Lake St. Clair.

## Terrestrial Habitats

Terrestrial habitats refer to the natural features in the watershed, excluding rivers and streams. The terrestrial habitats of Southeast Michigan and Southwest Ontario play a significant role in the chemical and flow regime of the groundwater and surface water that eventually flows into Lake St. Clair. The quality of vegetation determines the rate of erosion and, thus, the amount of sediments transported into the lake. They also provide important habitat for many animals, including nesting sites for birds.

Terrestrial habitats include a wide variety of forest types, most of which are subtypes of the northern mixed deciduous forest. Isolated prairies, lakeplain openings, savannas, and sand barrens also occur in the region. The inland aquatic habitats include a wide variety of fens, as well as bogs, marshes, wet meadows, hardwood swamps, and a variety of pond and lake types. In Ontario, lands draining to Lake St. Clair have lost over 90 percent of the wetland area and original forest to agricultural and urban development.

### Did you know...

Over 99 percent of Michigan's tallgrass prairie has been lost, the majority of which was located along the shore and inland in the region of Lake St. Clair, the Detroit River, and Lake Erie.

## Lakeplain / Tallgrass Prairie



Lakeplain Prairie at St. John's Marsh

Tallgrass prairies consist of rich deep soil on which a variety of tall grasses and flowers grow. Grasses, which reach up to 12 feet (3 to 4 meters) in height, undulate like wind-swept waves. Birds and other animals use coastal and inland prairies as refuges from flooding as well as nesting and feeding.

Periodic burning was critical in maintaining the open conditions that kept many prairie/savanna plant species from being shaded or choked out. In Ontario, these open spaces were easy to convert to agricultural uses and it is estimated that less than 3 percent of the original habitat remains. There are some extensive remnants of tall grass prairie and oak savanna in the St. Clair watershed, primarily in the St. Clair River Delta.

In Michigan, over 99 percent of the tallgrass prairie has been lost, the majority of which was located along the shore and inland in the region of Lake St. Clair, the Detroit River, and Lake Erie. Of Michigan's original 158,000 acres (64,000 hectares) of tallgrass prairie, only 1,068 acres (433 hectares) of degraded prairie remain in fragmented, tiny parcels in Wayne and St. Clair counties, the Saginaw watershed, and in the southwest part of the state. Some of the best examples of remaining prairies are found along the St. Clair Delta in Michigan, and at Walpole Island and the Windsor Ojibway Prairies in Southern Ontario.

Many of the remaining prairies are impacted by the presence of invasive plants, especially *Phragmites australis* (common reed) and *Lythrum salicaria* (purple loosestrife), which threaten native plants and wildlife.

## Biodiversity

Biodiversity refers to the number and variety of organisms found within a specified area. The Lake St. Clair watershed supports diverse fish and wildlife populations even though some lake communities have undergone major changes and some species have been lost. Hundreds of species of amphibians, mammals, reptiles, insects, fish, plankton, and birds occur in aquatic, wetland, and adjacent terrestrial habitats in the St. Clair system. Many of these species are considered at risk.

The availability of many different habitats and a climate moderated by the Great Lakes support a tremendous biodiversity in the native flora and fauna of the Lake St. Clair watershed. The region's biodiversity can be divided into the following five types, which are described below:

- Open lake biodiversity
- Wetland biodiversity
- Terrestrial flora and fauna
- Fisheries
- Waterfowl

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### Did you know...

Wildlife managers are being challenged to maintain the diversity of plants and wildlife habitat due to invasive plants such as phragmites and purple loosestrife.

### Did you know...

Lake St. Clair continues to support a valuable fish community and fishery in spite of significant loss of most valuable wetland habitat and colonization by exotic organisms.

## **Open Lake Biodiversity**

Due to the changes in the lake since the invasion by zebra mussels, nutrient concentrations have decreased, water clarity has increased, and submerged aquatic vegetation beds have expanded, carpeting the shallow lake bottom. More ducks are using Lake St. Clair habitats than before - a rare positive response to an invasive species. Diving ducks of a variety of species, feeding on the abundant vegetation, are now found in large 'rafts' scattered across the lake.

There have been changes in benthic invertebrate communities, most notably in native mussel populations. In 1988, when non-native zebra mussels were first detected in Lake St. Clair, there were 18 native species of mussels found throughout the lake. As early as 1991 declines in the abundance of native mussels had been noted and recent surveys have indicated that native mussels have essentially been removed from the lake's open waters. Surveys conducted between 1998 and 2001 found 22 remnant populations of native mussel species in nearshore waters off the St. Clair Delta and eastern shore of Lake St. Clair; however, their numbers and distributions had been considerably reduced. Zebra mussels were commonly found attached to native mussels in high enough numbers that they likely interfered with respiration and feeding.

Additional threats to open-lake biodiversity include boating activities during migration and breeding, invasion by non-native flora and fauna, nutrient and chemical inputs (including spills), and alterations to the lake hydrology and sedimentation processes.

## **Wetland Biodiversity**

The Lake St. Clair wetlands provide habitat for more than 65 species of fish. Some fish species, such as northern pike and bowfin, are particularly dependent on wetland habitat, while other species, such as yellow perch and white bass, use the wetlands during some portion of their life, but are not dependent upon the habitat.

Numerous plant species have been found in the coastal wetlands of Lake St. Clair, including the very rare four-angled spikerush, southern tickseed, Emory's sedge, honey locust, tapered rush, swamp rose mallow, American lotus, many-fruited false loosestrife and prairie fringed orchid.

Numerous amphibian and reptile species live in the wetlands of the Lake St. Clair watershed including salamanders, frogs, toads, snakes, and turtles. Many are rare in both Ontario and Michigan, have experienced declines in their populations and are in imminent danger of disappearing from the wild. Noteworthy examples include the blue-spotted salamander, eastern spiny softshell turtle, and the massasauga rattlesnake.

More than two-dozen species of mammals use the Lake St. Clair wetlands. The non-native Virginia opossum, eastern cottontail rabbit, muskrat, raccoon, striped skunk and white-tailed deer are common.

The St. Clair wetlands provide critical breeding habitat for wetland birds including the many U.S. and Canadian threatened and endangered species such as King rail and least

bittern. Since the 1960s, there has been a significant decline in the use of wetlands by many marsh-dwelling waterfowl, due primarily to habitat loss and degradation and the impacts from invasive species.

Invasive species, such as purple loosestrife, *Phragmites* and mute swans, adversely impact wetland communities. Both purple loosestrife and *Phragmites* can out-compete native vegetation and in many areas now dominate the vegetation community, to the detriment of most native wildlife species. Wild mute swans impact marsh vegetation communities due to their feeding behavior, and their aggressive demeanor impacts native marsh birds.

Key threats to wetland biodiversity in the Lake St. Clair watershed include

- Alterations to the lake hydrology and natural sediment movement processes
- Direct wetland loss and degradation
- Disturbance during migration and breeding seasons
- Increases in invasive plant and animal species
- Risk of nutrient, chemical and fuel spills
- Increases in marina and residential development, and
- Lack of buffers.

Current species population monitoring and habitat assessments are lacking. Work to preserve and restore wetland habitat, and to educate the public about their impacts during sensitive periods is an effective way to reduce further population declines and to minimize the possibility of extinction.

## Terrestrial Flora and Fauna

The plant life of the Lake St. Clair watershed is extremely rich and diverse, spanning two forest types: the Eastern deciduous forest and the Great Lakes-St. Lawrence. The watershed is home to more than 2,200 species of plants including 70 species of trees. Trees that are common in this region include beech, sugar maple, and basswood. Less common species include black walnut, butternut, tulip tree, and sassafras. Small pockets of tallgrass prairie are still found in the watershed or are being re-established in areas with suitable habitat. Slender grasses with deep roots that characterize these areas include Canada wild rye, Indian grass and little blue stem. Some of the more colorful sun-loving plants include butterfly weed and wild bergamot.

The watershed supports a diverse mammal population and numerous species of mammals have been recorded, including the southern flying squirrel, woodland vole, porcupine, beaver, hairy-tailed moles, bats, and badgers.

The Lake St. Clair watershed provides habitat for many species of year-round resident, breeding, wintering, and migratory birds. The St. Clair River Remedial Action Plan lists 90 bird species occurring in the vicinity of Lake St. Clair with 20 resident, 36 breeding, 25 migrant and 9 wintering species. The *Atlas of Breeding Birds of Ontario 1981-1985*, documented over 157 species of birds breeding in the Lake St. Clair area. This represents almost 55 percent of all birds that breed in Ontario.

Terrestrial biodiversity is threatened by habitat loss, invasive species, and fragmentation of remaining habitats. The loss of natural areas for the development of agricultural and urban land uses has significantly impacted vegetation and wildlife populations. Efforts are underway in Michigan and Ontario to promote sustainable development, restore habitat connectivity and increase the extent of remnant habitats.

## **Fisheries**

The fish community of the St. Clair watershed is a diverse mixture of more than 70 warmwater and coolwater fish species. Several species, such as walleye, lake whitefish and yellow perch, move between lakes Huron, St. Clair and Erie through the St. Clair and Detroit river systems. Migrations are particularly important during the spring and fall spawning periods when the local abundances of fish increase.

From the early 1900s to about 1970, several factors impacted the structure of fish communities, including commercial and sport fisheries, extensive nearshore modifications, increased human activities in the watershed, and the introduction of various invasive species. In general, the changes were minor, with the notable exception of the near removal of lake herring and lake whitefish. Since 1970, however, the changes have been substantial and rapid, particularly to the walleye community.

The fish community of Lake St. Clair also includes several species of special concern in both the United States and Canada, including the channel darter and the eastern sand darter. These species are quite rare and the condition of their populations remains unknown. Abundant forage species provide a healthy forage base for the lake's predator populations, which include smallmouth bass, walleye, northern pike, and muskellunge.

Lake St. Clair is one of the major sites for colonization by invasive organisms in the Great Lakes. The goby and white perch are exotic species that often out-compete native species for food and habitat. While the impact of the round goby on the native fish community of the lake is unclear, the densities of Johnny darter and log perch have greatly declined since 1996. This decline could be a result of competitive interactions with the exotic round goby. Tubenose goby, also an invasive species that tend to occur in more heavily vegetated areas, are present throughout the lake, but densities remain much lower than those attained by the round goby.

The lake and river provide habitat and are an important corridor for lake sturgeon that are distributed from Lake St. Clair, through the St. Clair River and into Lake Huron. Once abundant in Lake St. Clair, sturgeon populations declined because of habitat loss and over-exploitation. Recovery of the populations may have occurred since the early 1970s in response to improved water quality and protection of spawning adults.

The St. Clair-Detroit corridor is also important for walleye that move throughout the year between lakes Huron and Erie. In Lake St. Clair walleye are often found in the center of the lake where light levels are lower. Historically the Thames River in Ontario was one of the main spawning rivers for walleye in the basin. Walleye still spawn in the river; however the numbers of young that enter the lake from the Thames River is much lower now than it was previously

Lake St. Clair also plays an important role in the life cycle of steelhead trout, which are the basis of a highly successful urban fishery in the Clinton River. Steelhead trout are anadromous rainbow trout that spawn in the springtime, remain in their home rivers for 1-3 years, and then migrate out into the Great Lakes where they mature to 8-10 lbs before returning as mature fish to their native rivers. The steelhead fishery in the Clinton River is very successful and well established, and is an indicator of improving water quality conditions in the river. The river's fish habitat and existing fishery are also good indicators of the importance of the Clinton River to the health of the Lake St. Clair watershed.

Threats to the fishery include changes to the lake's erosion and deposition cycle, invasion of invasive species, alterations to hydrology, reduced access to spawning grounds, climate change, changes in the food web, and changes in productivity.

## Waterfowl

The Atlantic and Mississippi flyways funneling through the St. Clair watershed have resulted in Lake St. Clair becoming a premier area for migrating waterfowl. The flat topography of the St. Clair basin and seasonal water level changes contribute to very productive and diverse wetlands and support a variety of waterfowl species that utilize both the emergent coastal wetlands and the extensive beds of submerged aquatic vegetation in the open lake. Recent increases in light penetration in the open lake have resulted in larger submerged beds of aquatic vegetation, such as wild celery, increasing the food available to migrating waterfowl.

In recent years, 150,000 canvasbacks have been counted in Lake St. Clair. Canada geese are common throughout the area and a variety of wading and shorebirds are also found. Canadian Wildlife Service (CWS) surveys in the 1970s and 1980s of the southern Great Lakes shoreline during migration periods determined that the wetlands associated with the eastern shore of Lake St. Clair were the most important migration staging areas in southern Ontario for mallards, black ducks, Canada geese and tundra swans. The only area in Ontario comparable to Lake St. Clair is the extensive wetland/open water complex at Long Point on the north shore of Lake Erie.

The Coordinated Canvasback Survey (CCS), conducted by various Canadian and American federal and provincial/state agencies, documents the importance of Lake St. Clair to migrating canvasbacks (see Figure 4-1). This coordinated survey of North America's major canvasback staging areas during the peak of migration consistently shows the vital role of the waters and marshes of the lake.

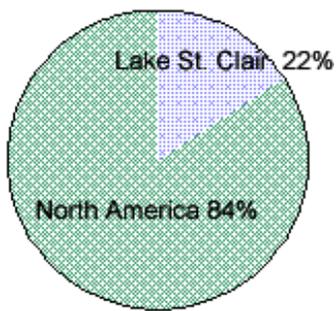
The principal threats to migratory birds and associated wetlands in the Lake St. Clair watershed include disturbance to birds during migration and breeding by human activity, wetland loss and degradation due to residential, marina and agricultural development, increases in non-native fauna and flora, the risk of oil and hazardous substance spills in Lake St. Clair and St. Clair River, a lack of riparian (shoreline) and wetland buffers, increases in marina and residential development within or adjacent to wetlands, and habitat loss and degradation. Agencies' efforts to identify and remediate these threats are hindered by a lack of population monitoring and habitat assessment

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### Did you know...

The Lake St. Clair waterway contains the largest wetland complex in the Great Lakes and serves as a vital link for the migration of North American waterfowl.

**Figure 4-1: Proportion of North American Canvasback Population at Lake St. Clair, Fall 2000 Coordinated Canvasback Survey**



### Did you know...

Canadian Wildlife Service surveys of the southern Great Lakes shoreline during migration periods determined that the wetlands associated with the eastern shore of Lake St. Clair are the most important migration staging areas in southern Ontario for mallards, black ducks, Canada geese and tundra swans.

## Findings and Recommendations

Declines in ecosystem health can be directly attributed to loss and degradation of habitat. Two centuries of human activities, including agriculture, urbanization, dredging, pollution, and introduction of invasive species have caused accelerated and, in many cases, irreparable losses of some habitats and species.

The following pages review major findings and U.S. recommendations regarding the key habitat and biodiversity issues in the Lake St. Clair watershed. These issues include

- Loss and degradation of habitat
- Invasive species
- Impacts from boating and shipping
- Lake levels

The U.S. recommendations regarding Lake St. Clair are presented as part of this management plan. Canadian recommendations for Lake St. Clair will be developed following public review of and input into the management plan. In addition, the St. Clair River has a set of binational goals and objectives that were established as part of the binational St. Clair River RAP (see [www.friendsofstclair.ca](http://www.friendsofstclair.ca)).

Many Lake St. Clair issues are being addressed, in part, by existing efforts to mediate problems in the watershed tributaries and the Great Lakes. Both public input and existing objectives will be important in developing Lake St. Clair ing binational recommendations.

### Loss and Degradation of Habitat

Agricultural, municipal, industrial, and recreational related development has had the most significant impact on the watershed. This development has resulted in much of the watershed's natural habitat being removed or fragmented, adversely impacting its overall quality and stressing plant and animal communities.

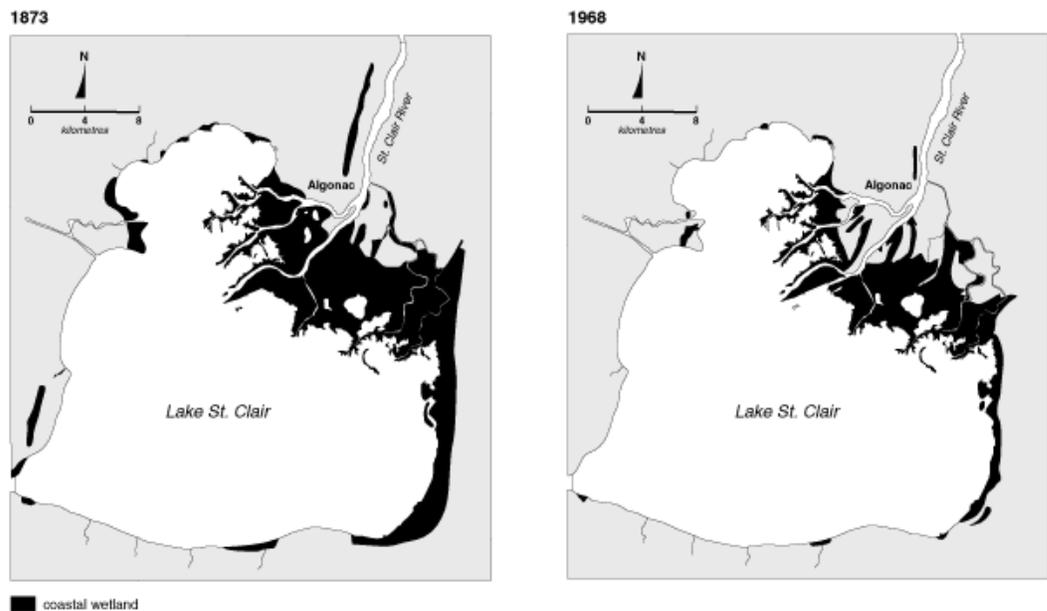
Wetland loss has been significant in both Michigan and Ontario. In spite of improved wetland protection laws in the U.S. and Canada, the piecemeal conversion of wetlands to residential and agricultural uses continues, posing a threat to fish and wildlife. Since 1873, over 70 percent of the wetlands have been lost on the U.S. side of Lake St. Clair due to urbanization, industrialization and residential and recreational development.

**Figure 4-2: Coastal wetlands reduction 1873 to 1968**

*St. Clair River Remedial Action Plan*

**Extent of Lake St. Clair coastal wetlands in 1873 and in 1968**

(Hendendorff et al. 1986)



Between 1873 and 1968, much of the land in the Canadian portion of the watershed was drained for residential and agricultural purposes. By the mid-1960s more than 40 percent of the wetlands directly associated with the lake had been destroyed (see Figure 4-2). By 1982, Kent and surrounding counties had lost 80-100 percent of their original wetland areas. Essex County lands draining to Lake St. Clair have lost over 97 percent of the wetland area and 95 percent of the original forest to agricultural and urban development. Currently 92 percent of the Essex County lands are in agricultural use and 5 percent urban infrastructure (roads and towns) with only 3 percent as natural lands. The rate of conversion to agriculture has slowed in recent years, and some of the drained pasturelands and poorer cropland in the areas have been reflooded.

Among waterfowl, the threat due to loss of wetland habitat is probably most severe for populations of mallard and black ducks, Canada geese, tundra swans, and significant portions of the North American populations of canvasback and redhead ducks, which use the open lake and its wetlands during their annual migration.

Marina and residential development in the Lake St. Clair marshes has resulted in the hardening of the shoreline and the removal of bottom sediments (through dredging and/or channeling). Dredging and the corresponding movement of the sediments to another location can remove the original wetland habitat and can significantly alter the hydrology of the lake. Dredging can also create new channels in wetlands, altering natural flow patterns and, in turn, changing habitat diversity for local plant and animal communities.

The removal of natural or permanent vegetative cover (buffers) along tributaries, shorelines, drains and ditches increases stress on the remaining habitats. It also threatens their biodiversity by increasing sedimentation into tributaries and wetlands, and impairing water quality by increasing nutrients and chemicals entering the system.

Agricultural runoff, municipal wastewater and municipal stormsewer outfalls contribute nutrients, bacteria, sediments, and chemical contaminants to the Lake St. Clair system that in turn impact the biodiversity of tributaries, wetlands, and open lake habitats. These contributions increase the presence of nuisance algae, exposure to bacteria and chemicals, and reduce the overall quality of habitat and biodiversity of the ecosystem.

Most habitat losses due to physical changes (e.g. filling, bulk heading, etc.) are very costly to reverse. While reversal and restoration is often an option, it also makes sense to focus on stopping the ongoing pattern of loss and impairment. Present habitat losses are rarely large-scale conversion to other uses. Rather, degradation is now varied and subtle and, thus, requires a broad-based approach both to understand the process and to reverse or mitigate it.

Significant alteration to the original shoreline of Lake St. Clair has occurred during the last century to the detriment of fish and wildlife populations that depend upon undisturbed shoreline for critical portions of their life cycle. Specifically, altered shorelines change the sediment erosion and deposition areas of the lake, and alter wave action and current direction, which then impact fish and wildlife habitat. While many of these developments pertain to industrial, commercial, agricultural and residential developments unrelated to boating activity, public and private marinas, boat launch facilities, and dredged channels constructed to accommodate commercial shipping have contributed to nearshore alterations that are detrimental to fish and wildlife populations. One example is the loss of important wetlands that provide fish spawning and nursery areas.

Small islands and wetlands within the St. Clair Flats are particularly sensitive. Shallow water depths, often less than two feet and populated by emergent vegetation habitat, have historically protected these important fish and wildlife areas from major disturbance by watercraft. However, the growing popularity of jet-propelled personal watercraft (PWCs) poses a threat to these shallow areas even where emergent vegetation grows. The Walpole Island First Nation has experienced a number of problems with boaters making inappropriate use of beaches and lands where no on-shore sanitation facilities exist. Aquatic vegetation is often cut or uprooted by propellers, causing increased quantities of vegetation washing ashore or fouling fishing and boating gear. Therefore, in 1999, the MDNR declared St. Clair Flats off-limits to PWCs and prohibited wake speeds in water less than two feet deep.

Michigan and U.S federal restrictions on dredging, filling, and altering wetlands and changes to shoreline areas of Lake St. Clair has significantly reduced the size and impact of new shoreline development activities since the early 1970s. However, the maintenance of existing recreational navigation channels and shoreline structures continue to have effects. In addition, restoration of altered areas has not been a high priority and not much has been accomplished to replace or restore conditions that will again support valuable fish and wildlife habitat.

In Canada, the Department of Fisheries and Oceans (DFO) is responsible for the management and protection of fish habitat under Section 35 of the Fisheries Act. Approval must be obtained before alterations to the shoreline or construction associated with building or modifying a dock, boathouse or boat ramp. To improve client services, DFO has agreements with local Conservation Authorities (CAs) to review such projects.

## ***Programs and Initiatives***

In recent years, local groups and federal, states, and provincial agencies, have developed numerous initiatives to address critical impacts to the coastal habitat.

**United States:** The U.S. Environmental Protection Agency-Great Lakes National Program Office (U.S. EPA-GLNPO) has specifically identified Lake St. Clair as a special focus area in its *Strategic Plan for the Great Lakes Ecosystem* ([www.epa.gov/glnpo/gls](http://www.epa.gov/glnpo/gls)), with an emphasis on coastal wetlands.

The USACE is the permitting agency for Clean Water Act Section 404 permits that regulate the dredging or filling of wetlands. In Michigan, the USACE jointly administers this program with the MDEQ.

The Southeast Michigan Planning Team of the Michigan Department of Natural Resources began an ecosystem management planning process in 1995 that primarily addresses public lands in the watershed.

The Michigan Natural Features Inventory (MNFI) maintains a continuously updated information base on Michigan's endangered, threatened, or special concern plant and animal species, natural communities, and other natural features. MNFI has responsibility for inventorying and tracking the State's rarest species and exceptional examples of the whole array of natural communities. MNFI also provides information to land managers for many types of permit applications regarding these elements of diversity.

The Wildlife Habitat Council, with funding from the U.S. Environmental Protection Agency's Great Lakes National Program Office and in partnership with many agencies, organizations, academic institutions, and municipalities, is producing the "Biodiversity Atlas of the Lake Huron to Lake Erie Corridor." The Atlas will describe the geology, biodiversity, and sociology of the region, including historical and current natural resource issues.

At the local level, Macomb and St. Clair counties have established citizen-led water quality boards and are developing a watershed management plan for Anchor Bay, located at the northern end of Lake St. Clair. The two counties are also coordinating their efforts via the Macomb-St. Clair Intercounty Watershed Advisory Group. A St. Clair River Waterways for Wildlife program engages the private sector in voluntary habitat conservation and protection efforts.

In 2002, the Great Lakes Commission, in cooperation with the U.S. National Oceanic and Atmospheric Administration (NOAA), initiated a two-year project to characterize

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**For more information...**  
The Lake St. Clair Coastal Habitat  
Restoration and Conservation  
project is online at:  
[www.glc.org/habitat/](http://www.glc.org/habitat/)

Lake St. Clair's coastal habitat and develop tools to assist with restoration and conservation. The project will consolidate information about the status of and stressors to the lake's coastal habitat. The project will produce

- A web site focusing on habitat in the study area
- An integrated coastal management (ICM) tool for use by state, provincial, tribal, non-profit and local coastal resource managers
- A draft coastal habitat restoration and conservation plan that can be finalized and implemented within the framework of this management plan.

**Canada:** The Eastern Habitat Joint Venture (EHJV) in Ontario under the North American Waterfowl Management Plan has identified Lake St. Clair as a Priority I focus area. EHJV partners (Canadian Wildlife Service- Environment Canada, Ontario Ministry of Natural Resources, Ducks Unlimited Canada, Wildlife Habitat Canada, Nature Conservancy of Canada and the Ontario Ministry of Agriculture and Food) have targeted wetlands along the eastern shore for protection, management, restoration and creation.

The St. Clair National Wildlife Area, located on the eastern shore of Lake St. Clair, is designated as a Wetland of International Importance under the Ramsar Convention as a representative of the entire eastern shore, and is part of a provincially-designated Area of Natural and Scientific Interest (ANSI).

Much of the remaining coastal wetlands are diked and managed by private hunt clubs for waterfowl production. At present, all wetlands existing along the eastern shore of Lake St. Clair are maintained primarily as private duck hunting clubs, with the exception of the St. Clair National Wildlife Area managed by the Canadian Wildlife Service. Without the committed ownership of these wetlands, it is likely that wetland losses would have continued. Management agreements between many of these private owners and Ducks Unlimited Canada have contributed to the retention of these vital areas of wildlife habitat.

Work is being done to restore terrestrial habitat in Essex County through the Essex Region Conservation Authority's Biodiversity Conservation Strategy. A plan was developed that identified the locations for potential restoration opportunities. When completely implemented, Essex County forest cover will increase and will support 50-60 percent of forest bird species and 20 percent of forest-interior bird species. Riparian (streamside vegetation) habitat will increase along all tributaries leading into Lake St. Clair from Essex County. More information on the Biodiversity Conservation Strategy can be found at [www.erca.org](http://www.erca.org).

There is a need for additional buffers and improved management practices in Ontario along watercourses and agricultural drains to mitigate environmental impacts. Regulations, such as those being proposed under the Nutrient Management Act calling for the development of Nutrient Management Plans for farms, support a proposed 3-meter permanent cover/vegetated buffer along all watercourses, which will provide significantly more filtering of agricultural runoff than is currently occurring. In addition, Agriculture and Agri-Food Canada has begun a new national initiative called the Greencover Program, which will encourage permanent cover, buffers, and shelterbelts via the conversion of sensitive agricultural lands to permanent vegetated

cover. Ontario's Environmental Farm Plan Program is an on-farm voluntary risk assessment and strategy to address environmental issues.

## **Habitat and Diversity**

### **Candidate Management Plan Recommendations for Actions in the U.S. Watershed:**

#### **Loss and Degradation of Habitat**

- 4-1. Develop a habitat strategy to protect and restore and maintain natural physical and biological diversity and identify priority habitat areas for restoration and conservation. The strategy should:
  - 4-1.a. *Provide a single coordinated inventory of wetlands and other habitats that identifies protected and managed habitats as well as rare and environmentally sensitive habitats*
  - 4-1.b. *Locate, inventory and map imperiled species*
  - 4-1.c. *Restore degraded priority habitat areas by working with landowners and public land managers to promote beneficial land management practices and natural community restoration practices.*
  - 4-1.d. *Coordinate land acquisition programs with existing federal, state, provincial, and local habitat protection programs to maximize habitat protection efforts*
  - 4-1.e. *Develop a public outreach program to increase interest in, and awareness of, habitat restoration and conservation. Develop outreach tools that outline habitat conservation and restoration programs available through government agencies and conservation organizations*
  - 4-1.f. *Develop a public education program that focuses on the unique habitat within the watershed and methods to protect it*
  - 4-1.g. *Encourage local units of government to preserve and protect unique habitat areas and to restrict development in environmentally sensitive areas. Provide technical assistance to local units of government to manage local habitat areas*
- 4-2 Use the findings of the Lake St. Clair Coastal Habitat Restoration and Conservation Plan to contribute to a Lake St. Clair habitat strategy

## **Invasive Species**

### **Did you know...**

Since the 1800s, more than 160 invasive species have become established in the Great Lakes.

Invasive species are a concern for nearly all habitat types. Since the 1800s, more than 160 aquatic invasive organisms, including plants, fish, algae, and mollusks, have established themselves in the Great Lakes. These species often have no native predators that are native to the area and out-compete more desirable species for food and habitat until existing predators learn to feed in the invading species. Approximately 10 percent of these species are considered a nuisance and have created severe problems. More than one-third of the organisms have been introduced in the past 30 years, a surge coinciding with the expansion of the St. Lawrence Seaway. A Cornell University study estimates that \$132 billion is spent annually in the United States managing impacts from invasive species, including damage to the sport and commercial fishing industries, among many other activities.

Many of these invasive species, including the zebra mussel, roundnose goby, and Eurasian water milfoil, are now found in Lake St Clair.

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**Zebra mussel colony**

The zebra mussel, native to the Caspian Sea region of Asia, was first discovered in Lake St. Clair in 1988. Since then, it has spread to all five Great Lakes. Because zebra mussels attach themselves in barnacle-like colonies to water intake screens and restrict water flow, they have caused extensive problems for industries and municipalities that rely on large-scale water withdrawals from Great Lakes. The ecology of native communities changed substantially after the invasion of the zebra mussel. Native mussels were unable to adequately compete with the zebra mussel and virtually all of the 18 native species have been extirpated from the open lake. Zebra mussels effectively filter water at relatively high rates and have consequently increased water transparency, particularly on the Ontario side of the lake. An additional concern with zebra mussels is that they may bioaccumulate contaminants that could then be passed to predators, many of which are popular sport and commercial fish species.

The change to community composition due to zebra mussel invasion and the filtering impacts of the mussels have had a significant impact on the Lake St. Clair system. Increased water clarity has changed the previously turbid system into a clear water system dominated by macrophytes. These changes have had significant impacts on the sport fishes. Increased macrophyte abundance has increased spawning and feeding habitat for many sport fishes, including muskellunge, smallmouth bass, and yellow perch. It has also decreased the low light habitat preferred by walleye.

Round and tubenose gobies were discovered in the St. Clair River in 1990. The goby is a bottom-dwelling fish that has great potential for causing impacts on Great Lakes fisheries. Round goby are aggressive, voracious feeders that can forage in total darkness. The round goby takes over prime spawning sites traditionally used by native species, competing with native fish for habitat and changing the balance of the ecosystem. Gobies can also survive in degraded water conditions, and spawn more often and over a longer period than native fish. They are found in high abundance in the St. Clair River and Lake St. Clair, and are also common along the tributaries to the lake and river. In Lake St. Clair, round gobies have become an important component of the diet of muskellunge, smallmouth bass and yellow perch.

Several invasive fishes also compete successfully with native species in Lake St. Clair. Carp were introduced in the late 1800s, rapidly increased in abundance with negative impacts on native fishes and their habitats, became a major item in the commercial catch by the turn of the 20<sup>th</sup> century, and remain prominent today. Rainbow smelt and alewives, both invasive species, seasonally dominate the forage fish population and help support the fishery. White perch, an invasive fish from eastern North America, are also found in the lake. The spiny water flea, a macroscopic invertebrate, was observed in high abundances in the St. Clair River by the late 1990s and has become an integral part of the zooplankton community; however its effect on native species remains essentially unknown.

Invasive plants such as purple loosestrife, *Phragmites*, and European frogbit can dominate wetland areas and replace native vegetation leading to decreases in biodiversity. The aggressive non-native mute swan will out-compete native wetland nesting species.

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#### **Did you know...**

Many experts believe that the continued introduction of invasive species is one of the greatest threat to biodiversity.

#### **Potential new invasive species:**

The *fishhook waterflea* has the potential to compete with juvenile fish for zooplankton, a common food source. The fish hook waterflea has already caused problems in other Great Lakes for recreational anglers, boaters, and commercial fishing.

The *European ruffe* is an adaptable fish species that reproduces quickly. It may compete with native fish species for food and habitat.

The *Asian carp* eats considerable amounts of plankton and becomes agitated by propeller noise, causing them to leap out of the water. This phenomenon can be dangerous for recreational boaters that may be hit by these large fish.

While there are limited studies of the impact of these invasive species specific to Lake St. Clair, experts believe that continued introduction of invasive species is one of the greatest threats to the lake's biodiversity.

Shipping practices, most notably hull fouling and the discharge of ballast water from ocean-going vessels, are primarily responsible for the unintentional introduction of aquatic invasive species in the Great Lakes. However, invasive species can also enter the Great Lakes through aquaculture practices, bait harvest operations, aquarium trade, and other vectors and mechanisms. Published literature dating back to the 1890s suggests that these invasions have been occurring for decades. This literature also suggests that many more unwanted pests are poised to make their journey to the Great Lakes in the future.

Programs should be developed, from a coordinated lake-wide perspective, to limit the spread of established invasive species and to prevent future unwanted invasions. Action is needed now, as there are several species that may be on the verge of entering the St. Clair watershed, including the fishhook waterflea and the European ruffe, which have the potential to disrupt the aquatic ecosystem.

### ***Programs and Initiatives***

Efforts at all levels of government are underway to prevent and control the spread of invasive species (see Chapter 7 for more information). Given interstate commerce protections, international trade agreements, and the geographic scope of the Great Lakes, many believe that action at the federal level in the United States and Canada is the only means to effectively address this issue.

The Great Lakes Panel on Aquatic Nuisance Species (Panel) has been working since its formation to prevent and control the occurrence of invasive aquatic nuisance species in the Great Lakes. The Panel was officially convened in 1991 by the Great Lakes Commission in response to section 1203 of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. Panel membership is drawn from U.S. and Canadian federal agencies, the eight Great Lakes states and the province of Ontario, regional agencies, user groups, local communities, tribal authorities, commercial interests, and the university/research community. The Panel is directed to identify Great Lakes priorities, make recommendations to a national Task Force on Aquatic Nuisance Species, coordinate invasive species programs and activities in the region, and advise public and private interests on control efforts.

The Michigan Governor created the Michigan Aquatic Nuisance Species Council in November 2002. The purpose of the Council is to advise the Office of the Great Lakes and the Departments of Environmental Quality, Natural Resources, Agriculture and Transportation on the implementation of Michigan's newly developed Aquatic Nuisance Species Management Plan Update, released in October 2002. The Council also advises the departments on the state's efforts to prevent and control invasive species introductions and spread within Michigan, information/education activities about invasive species, and the coordination of invasive species research and monitoring activities.

**Habitat and Biodiversity**  
**Candidate Management Plan Recommendations for Actions in the U.S. Watershed:**

**Invasive Species**

- 4-3. Prevent and control the introduction of aquatic invasive species into the Great Lakes-St. Lawrence system
- 4-4. Support the implementation of Michigan's Aquatic Nuisance Species State Management Plan Update
- 4-5. Develop and distribute educational information regarding identification and control of invasive species

**Did you know...**

Navigation-related dredging has altered the character of the St. Clair River and Lake St. Clair by altering flow regimes and replacing productive shoal-water habitat with less productive channel habitat.

## **Impacts from Boating and Shipping**

Channel construction and deepening for commercial shipping has altered the character of the St. Clair River and Lake St. Clair by altering flow regimes and replacing productive shoal-water habitat with less productive channel habitat. Shoreline hardening, bulk heading, dredging, and backfilling have also resulted in loss of significant amounts of nearshore habitat. Historical loss of this habitat and lack of expansion to the St. Clair Delta represent a significant loss of spawning and early-life nesting/feeding area for many Great Lakes fishes, waterfowl, marshbirds and shorebirds.

Large commercial vessels that pass through the connecting channels also disturb and destroy habitat. These ships cause rapid fluctuations of water levels and disrupt normal flow conditions to such a degree that submerged aquatic plants are fragmented or uprooted and substrates that provide attachment for these plants are eroded. Recreational watercraft can cause similar problems with their wake and propeller action. The result is a substantial destruction of living plants, increased turbidity as sediment is resuspended, decaying plants washing onshore, and degradation of valuable fish habitat. Shoreline hardening to protect against ship or boat wakes and flooding including diking associated with residential areas, cottages, marinas and agriculture restrict the necessary landward movement of wetland communities during high water periods. This causes a backstopping effect that reduces the size and diversity of wetland communities.

The increased use of recreational watercraft and fishing activities on Lake St. Clair has negatively impacted migrating and nesting birds. This is especially critical during the spring and fall migration when large numbers of birds are traditionally using offshore areas. Watercraft can

- Disturb bottom sediments, decreasing water quality and uprooting aquatic vegetation
- Increase traffic and noise, reducing nesting success
- Disrupt traditional feeding and resting areas.

There is a need to educate the boating community about these impacts to fish and wildlife during peak migration and nesting periods, ideally encouraging a no-disturbance zone.

Marina and residential development in wetlands around Lake St. Clair has led to dredging, shoreline hardening and channeling for boat access. Dredging with the accompanying filling can completely remove wetland habitat. These alterations to the lake bottom can also change the natural sediment loading in the lake. Deepening the water adjacent to a marsh can prevent the natural lakeward shift of a marsh during low water levels since the deep channel does not support emergent vegetation. Thus, dredging reduces both the amount of wetland and its habitat diversity, allowing either dry land or deep water to remain. Dredging can also create new channels in wetlands and alter the natural flow patterns, thereby changing the flow of water and nutrients and impacting the aquatic plant and phytoplankton communities.

## **Programs and Initiatives**

See chapter 7 for information on programs and initiatives to address environmental impacts from recreational boating and commercial navigation. Additional recommendations can also be found in Chapter 7.

### **Habitat and Diversity**

#### **Candidate Management Plan Recommendations for Actions in the U.S. Watershed:**

##### **Impacts from Boating and Shipping**

- 4-6. Limit watercraft access to environmentally sensitive areas during certain seasons of the year to protect waterfowl nesting and fish spawning.
- 4-7. Develop a focused public education program to promote understanding and protection of the lake by watercraft users.
  - 4-7.a. *Disseminate public information materials to registered watercraft owners in the region*
  - 4-7.b. *Post signage at boat launches and piers on the importance of protecting Lake St. Clair resources*
  - 4-7.c. *Educate boaters about aquatic vegetation and its important ecological role in the lake, and the need to avoid damage to it by boating and related activities*

### **Did you know...**

The major factors affecting the water supply to the Great Lakes —precipitation, evaporation, and runoff — cannot be controlled or accurately predicted for more than a few weeks into the future. The influence of man-made regulation of Lake St. Clair levels is very limited.

## **Lake Levels**

Fluctuating water levels are an important part of coastal lake habitats (including wetlands and nearshore) and help create greater diversity among plants and animals that adapt to, and depend on, a changing environment.

High and stable water levels favor some lake fish stocks by providing more spawning and nursery areas, whereas low water conditions rejuvenate stands of many wetland plants and benefit wetland fauna. The major natural influences on Great Lakes hydrology are weather and climate, which affect the balance of water in Lake St. Clair and connecting channels. The major factors affecting the water supply to the Great Lakes—precipitation, evaporation, and runoff—cannot be controlled or accurately predicted for more than a few weeks into the future. The influence of man-made regulation of Lake St. Clair levels is very limited.

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The shallow nature of Lake St. Clair makes it particularly vulnerable to annual and seasonal changes in depth and water level. Large shallow areas that can be significantly impacted by water level changes characterize the nearshore habitat. This is of particular concern on the eastern and northern shores that are influenced by prevailing southwest winds.

The recent drop in water levels throughout the Great Lakes may positively impact coastal areas such as wetlands. However, algal blooms were also more common and boaters experienced higher maintenance costs due to shallow waters. More information on lake levels and lake hydrology is provided in Chapter 1.

## **Programs and Initiatives**

The International Joint Commission (IJC), through its International Lake Superior Board of Control, regulates the outflows of Lake Superior through a gated control structure — the Compensating Works — across the St. Marys River and a diversion of water for power generation in Canada and the United States. Therefore, in 2001, the IJC assembled a team to develop a Plan of Study (POS) to review the operation of structures regulating outflows from Lake Superior and the impact of that outflow on water levels, flows, and affected interests from Lake Superior through Lake Erie. The team completed and submitted a final POS to the IJC in 2002. The draft addresses

- Impacts of water-level regulation on current interests, including demographic changes and enhanced understanding of the environment since the 1970s;
- Relationships between water-level regulation and coastline erosion, which is of particular concern in Lake Michigan; and
- Climate change and variability, which indicate that current regulations may not be adequate to address future changes.

The study focuses on assessing the current state of water flowing from Lake Superior and, where appropriate, identifies optimal water level conditions and associated regulation changes necessary to enhance that resource. Implementation of the study recommendations is pending funding. The final report is available at [http://155.79.127.50/Storage/HH/IJC/uglpos/pos\\_draft.shtml](http://155.79.127.50/Storage/HH/IJC/uglpos/pos_draft.shtml). At this time, it is unclear how the study will impact water levels in Lake St. Clair and the St. Clair River.

## **Conclusion**

Two centuries of human activities, including agriculture, dredging, and urbanization and industrialization have caused accelerated and, in many cases, permanent losses of some natural habitats in the Lake St. Clair watershed. Together with the increasing burdens posed by invasive species, these habitat losses are threatening the richly diverse biological heritage of the Lake St. Clair region. Human activities are diminishing the quality and quantity of habitat in the region and are impairing the abundance of species that are native to this region. Diverse biological communities are more resistant to stress and more effective at providing the numerous services humans obtain from them. Timely and well-coordinated efforts are needed to reverse the trend

of habitat and biodiversity loss and allow the threatened biological community of the Lake St. Clair region to recover.

Most habitat losses due to physical changes are very costly to reverse. Often such reversal is not possible at any cost. Accordingly, focused efforts must be made to stop the ongoing pattern of habitat loss and impairment. Conservation actions aimed at protecting Lake St. Clair must target key sources of stress. Efficient land use is essential in this region, which is heavy in population, agriculture, industry, and transportation. Early efforts should focus on protecting and restoring the functions of habitats that are most important to the lake's ecosystem: the coastal and delta wetlands.

Continued coordination and cooperation among resource agencies and organizations are needed for continued success of fish and wildlife management programs that benefit both game and non-game species. Management practices must be responsive to emerging issues as well as current threats to fish and wildlife species, including habitat loss, invasive species, contaminants, and conflicting uses. Effective conservation must involve cooperation of government agencies, commercial interests, and the public.

Continued action is needed to prevent new introductions of invasive species into the Great Lakes and to prevent the spread of those already present. Most experts consider invasive species to be among the most serious threats to biodiversity in the Great Lakes. Since established invasive organisms are virtually impossible to eradicate and very costly to fight, preventing such introductions from occurring is the only viable option. Such efforts are underway at the state/provincial and federal levels and should be supported by stakeholders in the Lake St. Clair watershed.

It is clear that the biodiversity of the Lake St. Clair region is threatened. However, it is not certain what actions are needed to preserve the abundant natural heritage of this region. Accordingly, more information is required to assess the status of rare, threatened, and endangered flora and fauna and their habitats, which are being impacted by habitat loss, exotic species, and other factors. Quality information lays the foundation for sound and effective action. Although acquiring this knowledge base is essential, it should not delay the initiation of a comprehensive habitat restoration plan.