

## Chapter 1:

# Introduction to Lake St. Clair and the St. Clair River

### Key Topics:

- 1) History and settlement
- 2) Resources in the watershed
- 3) Uses of the watershed
- 4) Impacts to the watershed
- 5) Resource management

Lake St. Clair and the St. Clair River are vital binational resources that provide a wide array of benefits to the nearly six million U.S. and Canadian residents who live in the watershed. With uses ranging from fishing, recreational boating, drinking water and commercial navigation, the lake and river are defining natural features of southeastern Michigan and southwestern Ontario.

They also are vital parts of the larger Great Lakes system. The lake and river are key connections between the upper and lower Great Lakes, both for commercial navigation as well as for fish and wildlife that reside or pass through the area. The St. Clair River-Lake St. Clair-Detroit River corridor is also the outlet for the three upper Great Lakes, contributing over 90 percent of the average annual water supply to Lake Erie and nearly 75 percent of the supply to Lake Ontario.

Human uses of Lake St. Clair and the St. Clair River have dramatically altered the natural processes of the system. Coastal wetlands have been drained and filled, the shoreline hardened, and a 27-foot-deep navigation channel dredged from the mouth of the St. Clair River to the head of the Detroit River (which has an average natural depth of about 12 feet). The vast majority of the watershed's original landscape has been replaced by residential, commercial or agricultural development.

Water quality in the lake and river has been impaired by pollutants from both industries and day-to-day human activities. Fish and wildlife communities have been impacted by loss of habitat, recreational/industrial activities, and the introduction of non-native species – including popular sport fish such as coho salmon and invasive species such as the zebra mussel (which was first detected in Lake St. Clair).

While human impacts on the Lake St. Clair watershed have been immense, efforts over the past three decades to mitigate those impacts have been substantial. A wide assortment of laws, regulations and pollution prevention activities has dramatically reduced the impact of industrial activities on water quality. Upgrades to municipal wastewater treatment facilities have likewise improved water quality conditions in the lake and its tributaries. Other programs have safeguarded public water supplies and reduced adverse public health impacts related to consuming fish contaminated with unhealthy levels of toxic chemicals.

The quality of Lake St. Clair and the St. Clair River is influenced by a wide array of factors, including the physical characteristics of the resources, human uses within the watershed, contaminants and impacts to the system, and institutional arrangements that manage the resources and work to mitigate negative impacts to the system. This chapter provides an overview of these diverse aspects of the watershed to help provide background and context for the management plan.

## History and Settlement

Lake St. Clair and the St. Clair River form a significant portion of the connecting channel from the upper to the lower Great Lakes. Together with the Detroit River, they provide an outlet of waters from Lake Huron into Lake Erie. The lake and river watershed area was formed during the retreat of the last glacier about 12,000 years ago, with the last significant geological modification occurring about 4,800 years ago. At that time, rising post-glacial landforms closed the upper lake system's northeast outlet and caused water to flow southward through the St. Clair River, Lake St. Clair, and the Detroit River.

The watershed area was probably inhabited as early as 100 B.C. by Woodland Indians. Prior to the initial European contact, the presence of aboriginal peoples had a limited impact on the ecosystem of the Lake St. Clair watershed. There was a drastic decrease in the aboriginal population through disease, displacement and warfare after European contact in the 1600s. The earliest Europeans were traders who did little to modify the landscape.

Beginning in the 1800s, settlers initiated logging, agricultural practices, and residential development that continue to impact land use in the watershed. The settlers logged forests, drained wetlands, and plowed tall grass prairies to make the land suitable for agriculture. Agriculture continued throughout the region during most of the 19<sup>th</sup> century. Railroads and passenger ships improved access to the region and aided the expansion of recreational facilities along the lake. Industrial development began to flourish along the St. Clair River, where the deeper channel provided better access for commercial vessels.

In the early 1900s, agricultural acreage in Michigan began to decline as the area became more urbanized with residential and commercial development. By World War II, this urbanization intensified and the region continues to experience growth and development. In Ontario, agriculture has remained the dominant land use in the watershed. Chapter 6 provides more detail about settlement and land use history in the watershed.

### Did you know...

Beginning in the 1800s, settlers initiated logging, agricultural practices, and residential development that continue to impact land use in the watershed through the present day.

## Resources in the Watershed

### St. Clair River

The St. Clair River is the natural outlet from Lake Huron and flows 40 mi (64 km) in a southerly direction from Lake Huron to Lake St. Clair. The river drops almost 5 ft (1.5 m) from the elevation of Lake Huron to that of Lake St. Clair. The river is a relatively straight channel with artificial structures, such as riprap and retaining walls, some narrow beaches, and vegetated cliffs. Both sides of the river have highly urbanized portions.

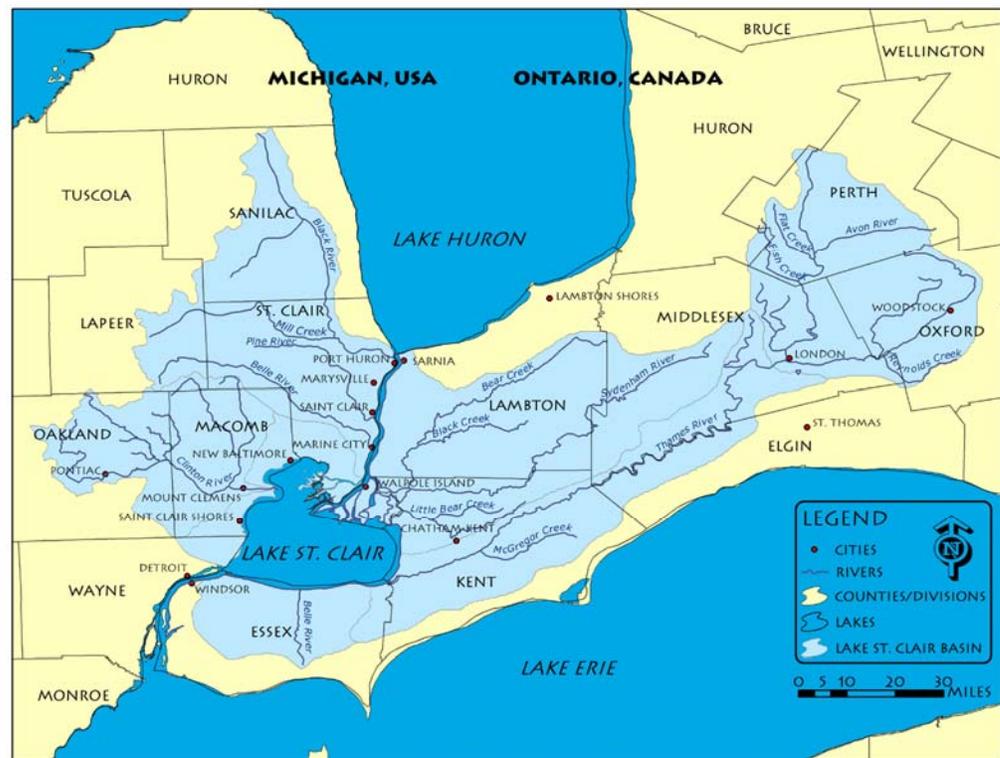
Approximately 98 percent of the water entering Lake St. Clair comes from the upper Great Lakes, which have a combined drainage basin of 56,603 sq mi (146,600 sq km). Water remains in the river only 21 hours before draining into Lake St. Clair. The annual average discharge is 182,000 cu ft/sec (5,150 cu m/sec) based on historical records. The flow is relatively consistent, although during extremes it has been as high as 232,000 cu ft/sec (6,570 cu m/sec) and as low as 106,000 cu ft/sec (3,000 cu

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m/sec) for a particular month. Extreme flows are usually caused by periods of abnormally high or low water supplies from lakes Superior, Michigan and Huron. Ice buildup in the lower river also causes flows to be significantly reduced for weeks at a time.

The flow of the St. Clair River has been studied extensively in the past and new hydrodynamic models have been developed to improve knowledge about the complexity of its circulation patterns. Current evidence indicates that there is little cross-channel mixing in the River south of the Black River confluence at Port Huron, Michigan. The majority of flow is contained within the center of the River. Flows near the U.S. shore on the west and the Canadian shore on the east, however, are influenced by tributary inflows and discharges. Contaminant plumes tend to hug the respective shorelines. Sediment samples have shown similar contaminant distribution. Further hydrodynamic modeling is warranted to substantiate these observations.

Figure 1-1: The Lake St. Clair Watershed



The St. Clair River slows suddenly as it enters the wide, shallow Lake St. Clair. This deceleration, combined with very high amounts of suspended sediment that the river brings from Lake Huron, has formed the St. Clair Delta, the only major river delta in the Great Lakes and one of the largest freshwater deltas in the world. The delta divides flow from the St. Clair River into three main channels and several secondary channels (Figure 1-1). The main channels are the North Channel, South Channel and Chenal Ecarte with most of the flow entering the lake through the St. Clair Cutoff and the North, Middle and South Channels in the lower delta. The split in flow between the channels is never constant and is strongly affected by discharges from Lake Huron,

ice buildup in the channels in winter, by plant growth in open-water periods, and by winds and other atmospheric factors.

The upstream part of the delta, specifically the northern halves of Harsens Island and Walpole Island, include residential areas, some of which are on land reclaimed by dikes and seawalls. Walpole Island, which is the largest island in the delta and home to First Nation people, features expansive lakeplain prairies and oak savannas. The southern part of the delta fans out into a complex shoreline of shallow bays and marshes. These land features, once common to the entire Lake St. Clair area, are now unique remnants that provide some of the most significant wildlife habitat in the Great Lakes.

Dredging in the St. Clair River and Lake St. Clair began as early as 1855. Further improvements were made incrementally to deepen navigation channels, with major deepening projects occurring in the 1930s and 1960s. In addition, sand mining occurred in the river from 1909 through 1926 to support local manufacturing. From 1880 to 1965, the combined effect of dredging and sand mining caused a permanent lowering of lakes Michigan and Huron by about 14 inches (35 cm). Dredging operations completed in 1962 to create the South Channel Cutoff permanently decreased the percentage of total river flow into the North Channel and subsequently into Anchor Bay. The Canadian part of the lake receives only eight percent of the river's outflow via Bassett Channel and Chenal Ecarte. Figure 1-2 shows the channels and the islands that form the St. Clair Delta.

## Lake St. Clair

Lake St. Clair has an area of 430 sq mi (1,115 sq km) with a shoreline length of 169 mi (272 km) plus the delta shoreline. Its average depth is only 12 ft (3.7 m) with a maximum natural depth of 21 ft (6.4 m). However, beginning in 1855, a commercial navigation channel was dug through the lake in a northeast-southwest direction from the St. Clair Delta to the Detroit River. Through 1965, this channel has been enlarged and deepened to accommodate larger ships. It is now maintained to a depth of 27.2 ft (8.3 m) and a width of 59 ft (18 m).

The average retention time for water in Lake St. Clair is nine days, based on lake volume and inflow from the St. Clair River. The retention time for water within individual channels and major tributaries can range from four days for the Middle Channel to more than 30 days for water from the Thames River. Wind speed and direction impact these retention times and surface current patterns. Studies indicate that Canadian tributary inflows primarily impact the eastern part of the lake while U.S. tributary inflows influence the western part of the lake. Water quality measurements made in Lake St. Clair show distinct variations in different areas.

### Did you know...

Because of the shallow depth of Lake St Clair, wind strength and direction strongly affect water level and circulation.

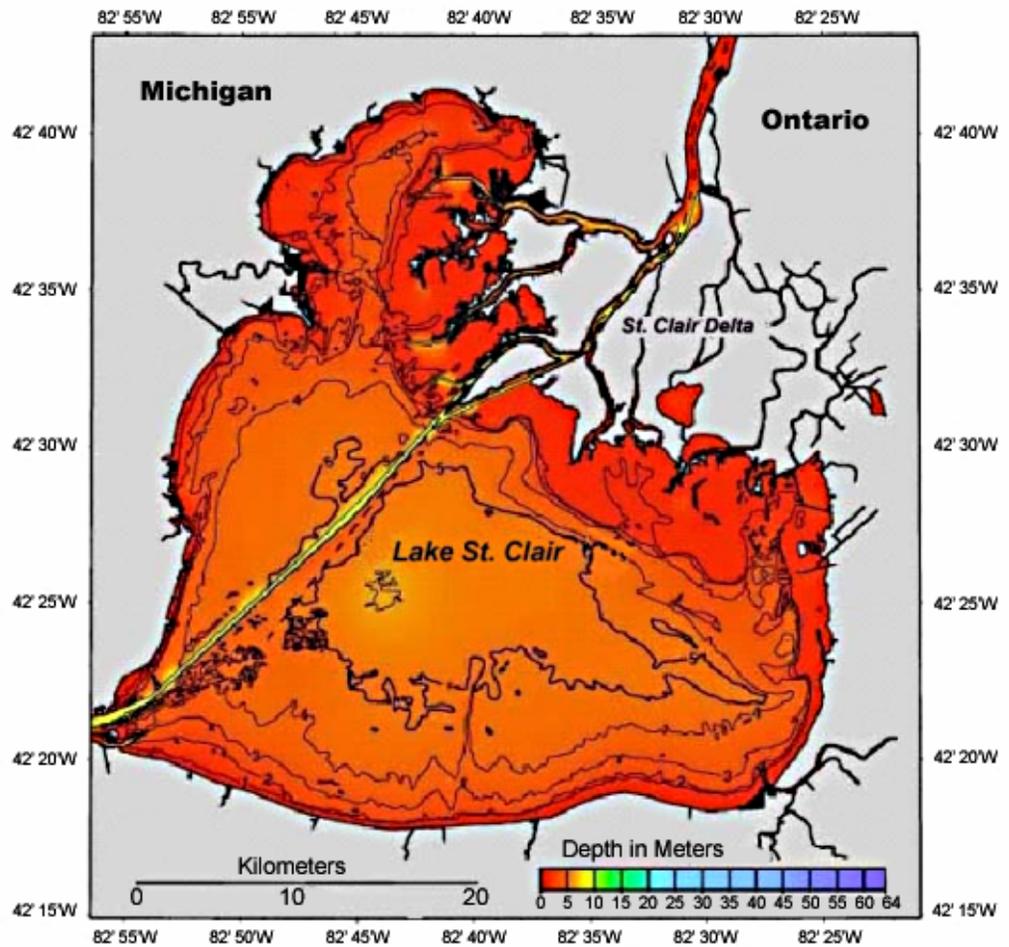
Because of the shallow depth of Lake St Clair, wind strength and direction strongly affect water level and circulation. Recent modeling has shown that under most wind conditions, the circulation patterns in the lake fall into three distinct regions. Waters on the western side and in Anchor Bay are fed by the North Channel, Middle Channel and the Clinton River, which frequently form a spiral flow pattern bounded by the shoreline and the navigation channel. Waters entering the lake through the South and Cutoff Channels usually remain in or adjacent to the shipping channel until they enter the Detroit River. Flows on the eastern side, through the channels of Walpole Island and from the Thames River, frequently form an easterly gyre. Because of the fast velocities and substantial water temperature differences for flows within the maintained

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shipping channel through the middle of the Lake, mixing between the west and east gyres is infrequent.

The western, U.S. shoreline of Lake St. Clair is highly urbanized. The eastern, Canadian shoreline is low-lying and characterized by agricultural and recreational land uses with diked and undiked marshes providing important wildlife habitat. The southern Canadian shoreline is largely agricultural with some urban development. The Thames and Sydenham rivers, together with several smaller tributaries, drain a large area of southwestern Ontario into the southeastern portion of the lake. The land drained by these tributaries is one of the most productive agricultural areas in Canada.

Figure 1-2: Lake St. Clair and St. Clair Delta



In 2000, the National Oceanic and Atmospheric Administration (NOAA) conducted a comprehensive bathymetric survey of the entire extent of the St. Clair and Detroit rivers, along with detailed soundings in the St. Clair Delta. These surveys were conducted for the Michigan Department of Environmental Quality (MDEQ) to provide data for a two-dimensional hydrodynamic model for the Source Water Assessment Program (SWAP). The hydrodynamic models for the St. Clair and Detroit rivers have been generated by the U.S. Geological Survey and calibrated to flows measured by the U.S. Army Corps of Engineers. The model will provide a basis for understanding the

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effects of dredging on flow and sediment transport; predicting the movement of discharges from tributaries, spills, treatment plants and sewer overflows; identifying source areas for public water supplies; and analyzing lake circulation patterns affecting critical habitats.

Lake St. Clair drains into the Detroit River and subsequently into Lake Erie. The Detroit River runs about 32 miles and drops nearly 3 ft (1 m). Ice build-up in the Detroit River in winter months occasionally can hold water back in Lake St. Clair. Like the St. Clair River, plant growth during the spring-autumn period can also materially reduce the Detroit River's outflow capacity, causing changes in circulation patterns on Lake St. Clair. In addition, during rare occasions of extreme storm surges toward the west end of Lake Erie, the Detroit River has been known to virtually stop and even reverse in direction for a few hours.

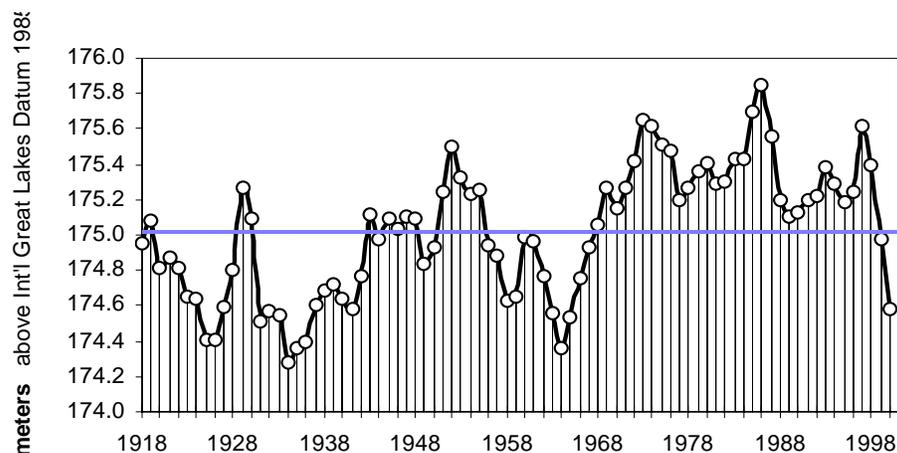
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## Water Levels

Water levels fluctuate significantly in Lake St. Clair as a consequence of climate variability upstream on the Lake Superior-Michigan-Huron basins and downstream on the Lake Erie watershed and short-term weather events across the region. Long-term changes in water levels on Lake St. Clair are usually the result of precipitation that is above or below average. Temperature and cloud cover, which drive evaporation, are also factors. Figure 1-3 shows that water levels in Lake St. Clair rise and fall regularly. Low water levels in the Great Lakes during the early 1960s were due to several years of below-normal precipitation. In contrast, heavy precipitation beginning in the late 1960s through the early 1970s and again in the mid-1980s, raised water levels to new record highs each decade. Short-term changes in water levels on Lake St. Clair also occur, usually within a few days when heavy rains fall on the Thames River watershed in Ontario and the Clinton River watershed in Michigan or when ice build-up occurs in the St. Clair and/or Detroit rivers.

Figure 1-3: Lake St. Clair Annual Mean Water Levels 1918-1999



#### Did you know...

Water levels have generally declined over the last five years. On average, the lake's water level varies about 1.6 ft (0.5 m) seasonally, with low levels typically occurring in February and high levels occurring in July of each year.

Lake levels on Lake St. Clair are also influenced by control of the Lake Superior outflows into the St. Marys River at Sault Ste. Marie, Michigan and Ontario. Nearly 30% of the water supply to Lake St. Clair originates from Lake Superior. These controls are managed by the International Joint Commission, in accordance with well-established criteria to minimize the extremes of levels that can occur on either Lake

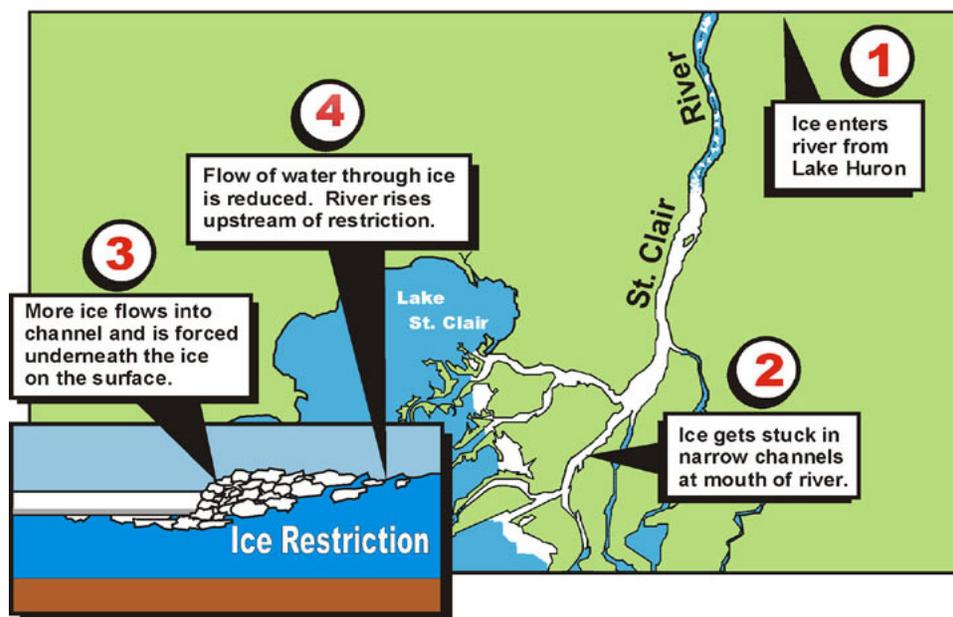
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Superior or the combined Lake Michigan-Huron. This control does affect the magnitude and timing of flows into Lake St. Clair, albeit to a minor degree in comparison to local climate.

Recent geologic studies indicate that the upper Great Lakes have exhibited regular intervals of high and low levels. Short-term fluctuations usually occur every 30-35 years with long-term fluctuations occurring about every 150-160 years.

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Figure 1-4: St. Clair River Ice Buildup



Ice buildup in the St. Clair River and St. Clair Delta usually occurs from late December through mid-March of most years. This phenomenon is shown graphically in Figure 1-4. If ice buildup is significant, it can reduce the inflow to Lake St. Clair, causing 1-2 ft (.3 -.6 m) drops in lake levels for up to two weeks. Ice buildup can also have significant scouring impacts within the channels and adjacent sensitive wetland areas.

**Did you know...**

Fluctuating water levels are an important part of coastal wetland development. Variable water levels create greater diversity among plants and animals that adapt to, and depend on, a highly changeable wetland environment.

Fluctuating water levels are an important part of coastal wetland development. Fluctuations can result in dramatic changes within Lake St. Clair's gently sloping marshes and lakeplain. Variable water levels create greater diversity among plants and animals that adapt to, and depend on, a highly changeable wetland environment.

Storm events during high water periods can cause coastal flooding and erosion. These storms events can have both positive and negative impacts on the environment. Established wetland complexes can be uprooted and destroyed. Meanwhile, new growth can lead to healthy changes in community composition and habitat growth.

Extremely low water levels can result in:

- Less frequent flooding along the shoreline from the Clinton River north to the Anchor Bay shoreline
- Less shoreline erosion
- Extended St. Clair and Clinton River deltas
- More exposed emergent shoreline wetlands and loss of submerged plant wetland habitat
- Changes to fish spawning, feeding, and nursery habitats
- Desire for increased dredging related dredged material disposal
- Increased pressure for cottage, marina development and conversion of lands to agriculture
- Increased pressure for diking to maintain water levels
- Increased pressure from invasive exotic plants such as purple loosestrife

## **Habitat and Biodiversity**

The Lake St. Clair watershed is a vibrant ecosystem with a variety of habitats and numerous plant and animal species. Wetlands, prairies, woodlands, rivers and riparian corridors in the Lake St. Clair watershed help support diverse communities of plants and wildlife and provide critical habitat for many rare and endangered species. The region is also an important site for hundreds of thousands of migrating waterfowl.

Over the years, the corridor has become heavily developed with agriculture, industry and residential development. This development has resulted in drained wetlands, loss of tallgrass prairie, fragmented forest habitats, increased sedimentation, nutrient loading, and dredged aquatic habitats, and has had severe impacts on the habitat and biodiversity in the region, dramatically reducing the overall quality of the ecosystem.

The remaining habitat, however, is still of great provincial, state, national and international importance. Due to the area's importance for waterfowl and fish populations, Lake St. Clair and the St. Clair River have increasingly been a focus of international efforts to protect and enhance existing habitats. Over the past several decades tremendous steps have been made in making the river cleaner and healthier. The river had been identified as an Area of Concern by U.S. and Canadian federal governments in cooperation with state and local governments and the International Joint Commission, and has been the focus of efforts to reduce point source pollution and clean up contaminated sediments. Lake St. Clair was identified as a Biodiversity Investment Area at the 2000 State of the Lakes Ecosystem Conference (SOLEC), sponsored by Environment Canada (EC) and the U.S. Environmental Protection Agency (U.S. EPA), as well as a priority "eco-reach" that provides critical habitat for numerous plant and animal species, especially in the region's coastal wetlands. An "eco-reach" is a term used to describe a stretch of Great Lakes shoreline that supports extensive use by birds for breeding habitat, and by fish for spawning and/or nursery habitat. A "Biodiversity Investment Area" is an area that contains high concentrations of rare species or high quality natural communities.

Chapter 4 provides a more detailed discussion 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.

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

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

## Uses of the Watershed

The Lake St. Clair watershed is an important binational resource, providing numerous benefits to millions of residents and tourists who enjoy recreational activities such as fishing, swimming, boating, hunting and bird-watching within the watershed.

### Did you know...

The excellent fishing and relatively clean waters has made Lake St. Clair one of the major recreational boating centers in North America. It is estimated that nearly 50 percent of all sport fish caught in the Great Lakes are caught in Lake St. Clair.

The excellent fishing and relatively clean waters has made Lake St. Clair one of the major recreational boating centers in North America. It is estimated that nearly 50 percent of all sport fish caught in the Great Lakes are caught in Lake St. Clair, and that recreational boating in the lake contributes over \$200 million a year to the economy of southeast Michigan. Abundant shoreline along the river and lake also provide many recreational opportunities for local residents and tourists. There are numerous beaches in both Michigan and Ontario where the water is generally good for swimming. However, intermittent beach closures due to elevated bacteria levels continue to be a problem.

The shallow waters in Lake St. Clair have not been conducive to the development of deep-water commercial harbors, but the lake and river form a vital link for commercial vessels that make up to 5,000 transits across the corridor each year.

The lake and river are used as drinking water sources for many residents, both locally and regionally in southeast Michigan and southwest Ontario. Local industries use the water for cooling and other industrial purposes.

Land use in the region has had a major impact on the Lake St. Clair and St. Clair River watershed. In 1782, the Moravians built the first settlement in what is now Clinton Township and began to alter the land for agricultural practices and residential development – activities that continue to impact the watershed today. Current land use practices, including agriculture, residential development, and industrial and commercial development have direct and major impacts on the health of the watershed. Much of the Canadian watershed is still agricultural while the U.S. portion of the watershed is dense residential development. Both the U.S. and Canadian sides of the St. Clair River have been industrialized, with the major industrialization occurring on the Canadian side.

The subsequent chapters provide a detailed review of the many uses of the watershed, along with key concerns associated with these uses and their impacts to public health and the health of the environment.

## Impacts to the Watershed

Numerous sources of environmental degradation require rehabilitative action if Lake St. Clair and the St. Clair River are to be improved. Canadian and U.S. pollution inputs to the lake are delivered primarily from the tributaries. There are very few discharges directly to the lake.

Traces of pesticides and elevated levels of nitrogen compounds in the raw water (source water that has not yet been treated) suggest that continued efforts are needed to prevent impacts from rural and urban sources of runoff. Fish consumption advisories continue due to excessive levels of mercury and polychlorinated biphenyls (PCBs) in fish. High levels of bacteria result beach closures due to the potential for

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adverse health effects. In addition to traditional pollutants, the water quality and overall environmental health of the area are influenced by many factors associated with human activities, such as changing land use and the introduction of invasive species.

Discharges into the St. Clair River from large Canadian chemical manufacturing and petrochemical processing complexes, together with other industries and municipalities on both sides of the river, have historically created major environmental problems. In 1973, the International Joint Commission's (IJC) Water Quality Board identified the St. Clair River as one of the "problem areas" in the Great Lakes basin. Since the 1970s, improvements have included a substantial reduction of mercury and organic chemicals and a decrease sediment contaminant levels.

**Did you know...**  
Studies within the St. Clair River and Lake St. Clair between 1980 and 1991 show that the health of organisms that live on or near a lake or river bottom has dramatically improved as a result pollution prevention programs implemented in the 1980s.

Today, the most heavily contaminated sediment areas in the St. Clair system occur in the depositional areas downstream from historic industrial dischargers, at specific sewer or combined sewer overflow (CSO) outfalls, and at storm sewer outlets in which illegal dumping has occurred. Sediments with detectable levels of Mercury are still occasionally found in Lake St. Clair along the main shipping channel. Both PCBs and bacteria often reach high levels in sediments near CSOs and at storm sewer outlets in the Clinton River and the Lake St. Clair coastal communities.

Studies within the St. Clair River and Lake St. Clair between 1980 and 1991 show that the health of organisms that live on or near the lake or river bottom has dramatically improved as a result of pollution prevention programs implemented in the 1980s. Unfortunately, natural habitat has also been negatively impacted by the introduction of invasive species, including carp, zebra mussels, and more than 150 others. These non-native species have forever altered these waterways.

Bioaccumulation of toxic chemicals, primarily mercury and PCBs, continues to be a significant problem in the St. Clair River and Lake St. Clair. These chemicals, consumed by bottom-feeding organisms, are passed on to species higher in the food chain and can reach concentrations in game fish and waterfowl that are above levels considered safe for human consumption. Mercury concentrations in fish have declined substantially since the 1970s, but some fish are still contaminated with mercury at levels that are considered unsafe.

Chapter 3 provides additional details regarding contaminants in the watershed and their impacts to the environment.

## **Resource Management**

Natural resources in the Lake St. Clair watershed are governed by a network of legal regimes, including international treaties and agreements, and federal, state/provincial and First Nation/tribal authorities' laws and regulations. This section describes those elements of the institutional system that have the most direct bearing on resource management in the Lake St. Clair watershed.

### ***International Treaties and Agreements***

The Boundary Waters Treaty of 1909 provides the primary legal framework for governing water management in the Great Lakes basin. The treaty is administered through the IJC and provides the structure and institutional framework to deal with

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boundary and transboundary issues, such as commercial navigation, environmental protection and resource management. The Great Lakes Water Quality Agreement (GLWQA), first signed in 1972 and renewed in 1987, expresses the commitment of the United States and Canada to “restore and maintain the chemical, physical and biological integrity of the Great Lakes basin ecosystem” and reaffirms the rights and obligations of each country under the International Boundary Waters Treaty of 1909.

In 1987 amendments to the agreement, the United States and Canada agreed to develop and implement remedial action plans (RAPs). This process identifies and implements localized pollution abatement measures for Areas of Concern (AOCs) and restores designated water uses deemed impaired in those areas. The St. Clair River was subsequently designated one of 43 AOCs in the Great Lakes basin. The AOC boundary includes important wetlands from St. Johns Marsh on the west (near Anchor Bay) to the north shore of Mitchell's Bay in Ontario.

The 1987 amendments also called on the United States and Canada to develop Lakewide Management Plans (LaMPs) for the open waters of the Great Lakes. LaMPs are intended to designate critical pollutants on a lakewide basis, identify remedial measures, develop surveillance and monitoring programs, and define threats to human and animal life from critical pollutants. Lake St. Clair is included under the Lake Erie Lamp. .

The Convention on the Great Lakes Fisheries, ratified by the United States and Canada in 1955, established the Great Lakes Fishery Commission (GLFC) to facilitate coordinated, binational fisheries management in the Great Lakes. The GLFC has defined draft fish community goals for Lake St. Clair and connecting waters that outlines fish community management principles and recommended objectives for the management of the St. Clair System fish community. At the time of this report, the GLFC was engaged in a public review process for the draft fish community goals and objectives. Because of the importance of recreational fishing on Lake St. Clair, the GLFC's binational process for fishery management is a vital component of the broader management regime for the lake.

The Great Lakes Binational Toxics Strategy provides a framework for actions to reduce or eliminate persistent toxic substances, especially those that bioaccumulate, from the Great Lakes basin. Environment Canada and the U.S. EPA, in consultation with other federal departments and agencies, Great Lakes states, the Province of Ontario, tribes and First Nations, are working toward a goal of virtual elimination of persistent toxic substances resulting from human activity. While this is the long-term objective, the current focus is on a framework that will achieve specific reduction actions over ten years, from 1997 through 2006. Information on the Strategy is available at [www.binational.net](http://www.binational.net).

The North American Migratory Bird Treaty Act of 1918 established the consultation process for federal regulations intended to manage and protect waterfowl and other bird populations shared by the United States and Canada.

Supplementing these formal treaties is a number of additional non-binding agreements and informal arrangements between the United States and Canada. One important non-binding agreement is the Four Agency Letter of Commitment. Through this agreement, the United States and Canada have pledged their cooperation to restore the shared upper connecting channel AOCs under the terms of the GLWQA. The Four

Agency Letter of Commitment was signed on April 17, 1998, by Environment Canada (EC), MDEQ, Ontario Ministry of the Environment (OMOE), and the U.S. EPA. The letter identifies roles and responsibilities of the four agencies for the three shared AOCs, details commitments and strategies and highlights the importance of leadership. In 2000 the four agencies approved a resolution that incorporated Lake St. Clair under the Four Agency process.

A more complete summary of the relevant agreements, policies and plans is available in a stakeholder inventory for Lake St. Clair prepared by the Great Lakes Commission as part of its research on potential management options for the lake. The inventory is available online at [www.glc.org/stclair/pdf/inventory.pdf](http://www.glc.org/stclair/pdf/inventory.pdf).

There are many federal, state, provincial and municipal agencies in both Canada and the United States that administer programs that impact the environmental quality of Lake St. Clair and the St. Clair River. The next section highlights the primary regulations, agencies, and roles within the watershed. It is not designed to be an exhaustive exploration of all facets of the regulatory structure. Additional information on these institutional arrangements can be found on the websites operated by the agencies and in the Lake St. Clair Stakeholder Inventory cited above.

## **United States**

In the United States, responsibilities for protection of water resources, public health, and the environment is complex. Responsibility is often shared among federal, state and local agencies. The following section describes the primary agencies and their roles and responsibilities in public health, environmental protection, and natural resource management.

### ***U.S. Federal Government***

The U.S. EPA is the primary environmental regulatory body in the United States. Its mission is to protect public health and to safeguard and improve the natural environment. U.S. EPA's purpose is to ensure that federal environmental laws are implemented and enforced fairly and effectively and that the public has full access to information in order to participate in environmental protection.

The U.S. Army Corps of Engineers (USACE) is the Federal government's largest water resources development and management agency representing Federal interests in commercial navigation, flood damage reduction, environmental stewardship (restoration, mitigation, wetland regulation, sediment remediation) and a variety of other resource needs. It's civil works mission provides local communities and sponsors with opportunities to meet waters resource needs where there is both a local and national interest. In addition, the USACE provides planning, engineering and technical assistance to address water resource problems and implementation of remedial action plans in Great Lakes Areas of Concern.

The U.S. Coast Guard (USCG) is charged with a broad scope of regulatory, law enforcement, humanitarian, and emergency response duties. The USCG uses its authority under the National Invasive Species Act (NISA) to require ballast water management practices to prevent the discharge of aquatic invasive species from ships entering the Great Lakes from the St. Lawrence Seaway. The USCG has primary

federal responsibility for spill response within the lake, river, and the nearshore area. Federal spill response jurisdiction is under the U.S. EPA for the inland area of the watershed.

The U.S. Department of Agriculture's (USDA) primary role is to oversee the production of agriculture, but it is also a leading conservation agency. Through its Natural Resources Conservation Service (NRCS), the USDA supports voluntary efforts to protect natural resources on private property through programs such as the Wetlands Reserve Program, Watershed Protection and Flood Prevention Operations, Conservation Technical Assistance, and many others.

The U.S. Fish and Wildlife Service (U.S. FWS) works to conserve, protect and enhance fish, wildlife, plants and their habitats. The Service's major areas of responsibility involve migratory birds, endangered species, certain marine mammals, and freshwater and anadromous fish, as well as people. Through its Coastal Program, the U.S. FWS focuses its efforts in bays, estuaries and watersheds around the U.S. coastline, including Lake St. Clair and the St. Clair River.

The U.S. Geological Survey (USGS) serves as an independent fact-finding agency that collects, monitors, analyzes, and provides scientific data about natural resources. The USGS has no regulatory or management mission. Through its National Water Quality Assessment Program (NAWQA), the USGS is conducting water quality investigations throughout the United States. The Lake Erie-Lake St. Clair basin is one of the NAWQA study areas. An assessment was conducted between 1996 and 1998 and findings were published in 2000 in the report *Water Quality in the Lake Erie-Lake St. Clair Drainages*.

### ***Key Federal Laws***

**The National Environmental Policy Act of 1969 (NEPA)** (42 U.S.C. 4321-4347) is the basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy.

**The Clean Water Act (CWA)** (33 U.S.C. ss/1251 et seq. 1977) as amended, the Federal Water Pollution Control Act of 1972, set the basic structure for regulating discharges of pollutants to waters of the United States. The CWA makes it unlawful to discharge any pollutant into navigable waters unless a permit (NPDES) is obtained under the Act.

**The Safe Drinking Water Act** (42 U.S.C. s/s 300f et seq. 1974) is designed to protect the quality of drinking water in the U.S. This law focuses on all water actually or potentially designated for drinking use.

**The Clean Air Act** (42 U.S.C. s/s 7401 et seq. (1970) regulates air emissions from area, stationary, and mobile sources. This law authorizes the U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.

**The Comprehensive Environmental Response and Liability Act (CERCLA)** (42 U.S.C. s/s 9601 et seq. (1980), commonly known as Superfund, was enacted by Congress on December 11, 1980. This law provides broad federal authority to respond

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directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. Superfund Amendments and Reauthorization Act amended the CERCLA in 1986 and made several important changes and additions to the program.

**The Toxic Substances Control Act (TSCA)**, (15 U.S.C. s/s 2601 et seq., 1976) gives EPA the ability to track the 75,000 industrial chemicals currently produced or imported into the United States. U.S. EPA repeatedly screens these chemicals and can require reporting or testing of those that may pose an environmental or human health hazard. U.S. EPA can ban the manufacture and import of those chemicals that pose an unreasonable risk. TSCA supplements other federal statutes and resources, including the Clean Air Act and the Toxic Release Inventory.

**The Oil Pollution Act** (33 U.S.C. 2702 to 2761) authorizes federal response mechanisms designed to prevent and respond to catastrophic oil spills. The act requires oil storage facilities and vessels to submit response plans to the U.S. Coast Guard and U.S. EPA.

**The Water Resources Development Act** (42 U.S.C. 1962d-20) provides for the conservation and development of water and related resources and authorizes the USACE to study and/or construct various projects for improvements to rivers and harbors of the United States and for other purposes including navigation, flood damage reduction, environmental dredging, ecosystem restoration and water supply.

**The Coastal Zone Management Act** (Public Law 104-150) provides assistance to coastal states to protect and manage coastal resources, including authorization of state Coastal Zone Management Plans and funding for a grants program.

**The National Aquatic Nuisance Prevention and Control Act (NANPCA)** (Public Law 101-646) NANPCA began the process of establishing a national program regarding the prevention, research, monitoring and control of invasive species in U.S. waters.

**The National Invasive Species Act** (Public Law 101-646) provides authority for the control of non-native species into waters of the United States, including the Great Lakes. This act reauthorized NANPCA.

**The Endangered Species Act** (1973) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found.

## ***U.S. State Government***

The CWA provides U.S. EPA the authority to delegate of many permitting, administrative, and enforcement aspects of the law to state governments. In Michigan, where the state has been delegated the authority to implement the CWA programs, U.S. EPA retains oversight responsibilities. MDEQ is the primary state regulatory agency in Michigan. It exercises delegated federal authority and direct state authority, under the Michigan Natural Resources and Environmental Protection Act (NREPA), to control sources of water pollution that impair protected water uses.

Through its water programs, MDEQ establishes water quality standards, assesses water quality, provides regulatory oversight for all public water supplies, issues permits to regulate the discharge of industrial and municipal wastewaters, and monitors state water resources for water quality, the quantity and quality of aquatic habitat, the health of aquatic communities, and compliance with state laws. The MDEQ shares responsibility for wetlands protection with the U.S. Army Corps of Engineers. The MDEQ is the lead spill response agency at the state level in all areas of the Lake St. Clair watershed.

The Michigan Department of Natural Resources (MDNR) is responsible for management and regulation of the Lake St. Clair and St. Clair River habitat in conjunction with the U.S. Fish and Wildlife Service and the U.S. EPA. The MDNR is also responsible for management and regulation of Michigan's other public trust resources, including fish and wildlife.

The Michigan Department of Community Health (MDCH) is responsible for health policy and management of the state's publicly funded health service systems. MDCH oversees the publication of the Michigan Fish Advisory, which describes which fish to avoid eating and gives guidelines on how often to eat others. MDCH works in conjunction with MDEQ to oversee beach monitoring and develop standards for waters used for swimming.

### ***Key Michigan Laws***

**The Natural Resources and Environmental Protection Act (NREPA)** (Act No. 451) regulates the use of certain lands, waters, and other natural resources of the state and is designed to protect the environment and natural resources of the state.

**The Michigan Environmental Protection Act (MEPA)** (Part 17 of Act 451 of 1994 formerly P.A. 127 of 1970) places a duty on all individuals and organizations, whether public or private, to prevent or minimize environmental degradation that is caused or likely to be caused by their activities.

**The Safe Drinking Water Act** (Act 399 of 1976), as amended, is designed to protect the public health and provide for supervision and control over public water supplies, and to provide for the submission of plans and specifications for waterworks systems and the issuance of construction permits.

**The Water Resources Protection Act** (Part 31 of Act 451 of 1994, formerly P.A. 167 of 1968) assesses the location and extent of floodplains, streambeds, stream discharge, and stage characteristics for the state's watercourses to minimize flood damage.

**The Shorelands Protection and Management Act** (Part 323 of Act 451 of 1994, formerly P.A. 245 of 1970) protects parts of the Great Lakes shoreline that are specifically designated by the Natural Resources Commission as high-risk erosion, flood risk, and environmental areas.

**The Soil Erosion and Sedimentation Control Act** (Part 91 of Act 451 of 1994, formerly P.A. 347 of 1972) is designed to protect the waters of the state from sedimentation caused by soil erosion.

**Subdivision Control** (P.A. 288 of 1968) requires the approval of the MDEQ for the preliminary plan of any subdivision containing lots within or affected by a floodplain, and any subdivision involving land adjoining a lake or stream where public rights may be affected.

**Michigan Endangered Species Act** (Part 365 of Act 451 of 1994, formerly P.A. 203 of 1974) requires a permit for activities that could adversely impact threatened and endangered plant and animal species or their habitat.

## ***U.S. Local Government***

Decisions made at the local level critically impact the quality of the St. Clair River and Lake St. Clair. On the U.S. side, all or parts of 153 county, township, and municipal governments are located within the St. Clair River or Lake St. Clair watersheds. These local governments are responsible for almost all land use decisions within their jurisdictions, including the location of residential, commercial, and industrial development; road improvements; and the planning and construction of water and sewer lines.

In addition, numerous special purpose jurisdictions, such as local school districts, water and sewer authorities, and waste disposal authorities, also possess autonomous authority to make land use decisions. Zoning and planning laws and laws that grant powers to special purpose jurisdictions generally do not impose specific environmental requirements on these local entities, although federal and/or state environmental permitting requirements may apply to particular projects.

Local municipalities have direct responsibility to implement water quality requirements in the areas of stormwater management, soil erosion control, flood control, and in operating municipal wastewater treatment systems.

Local governments may also engage in voluntary cooperative efforts. For example, the Macomb-St. Clair Intercounty Watershed Management Advisory Group has sponsored the Anchor Bay Watershed Management Initiative, a cooperative effort to develop a watershed management plan for the Anchor Bay subwatershed.

## **Canada**

In Canada, a combination of federal and provincial laws and policies together with controls exercised by local authorities provide protection of water resources, public health, and the environment. The division of responsibilities for water and other environmental issues is complex and responsibility is often shared.

By virtue of the Constitution Act, provinces own water resources and have the authority to legislate areas of water supply and pollution control. Water on federal lands and on the reserves of Canada's aboriginal peoples falls under federal jurisdiction. The National Parliament has specific responsibility for fisheries as well as navigation, international undertakings, and native affairs. Thus, there are interactions between several different areas of Canadian jurisdiction when dealing with international boundary waters, such as Lake St. Clair. Similarly, the administration of air and waste regulations involves both federal and provincial responsibilities. While the two levels of government cannot transfer any of their powers to each other, "administrative

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delegation” provides important flexibility to allow the administration of a federal or provincial act to be delegated.

## ***Canadian Federal Government***

Canada is a signatory to several treaties and agreements with the United States dealing with waters that flow along or across the common boundary. The federal government has a fiduciary responsibility to the First Nations within the Lake St. Clair watershed. These include Walpole Island First Nation (Bkwejwanong), Chippewas of Aamjiwnaang (Sarnia), Delaware Nation (Moravian of the Thames), Caldwell First Nation, Chippewa’s of the Thames, Oneida of the Thames, and Munsee Delaware Nation.

Environment Canada (EC) has a mandate under the Department of the Environment Act to preserve and enhance the natural environment, carry out objectives of the GLWQA, and coordinate federal environmental policies. The Canada Water Act provides for management of the water resources of Canada in cooperation with the provincial governments.

In 1978, Environment Canada was assigned responsibility for Section 36(3) of the Fisheries Act that prohibits the “deposit of a deleterious substance in water frequented by fish.” Enforcement of this section has led to several regulations, such as the Petroleum Refinery Liquid Effluent Regulations that, together with provincial regulations, provide environmental controls for Canadian refineries located on the St. Clair River.

Under the Canadian Environmental Protection Act (CEPA), Environment Canada and Health Canada share the task of managing risks associated with toxic substances and filling gaps for environmental protection when there is no coverage under other federal acts.

The Canadian Wildlife Service (CWS) is a branch of Environment Canada that handles federal wildlife issues, such as those arising from the Migratory Bird Convention Act that implements the 1916 treaty between Canada and the United States. The Canada Wildlife Act gives the federal government the authority to acquire habitat for migratory birds, including the St. Clair National Wildlife Area, which is managed by CWS. The Species at Risk Act (SARA) received Royal Assent in December 2002 and will come into force in 2003. Under SARA, there will be increased protection for endangered species and other species at risk. Environment Canada and the Department of Fisheries and Oceans Canada (DFO) will share responsibility for implementing the act with DFO being responsible for aquatic species and habitat.

Fisheries and Oceans Canada has legislative responsibility for administration and enforcement of the Fisheries Act. A Memorandum of Understanding between DFO and EC outlines the responsibilities of both departments. DFO manages the protection of fish habitat under Section 35 of the Fisheries Act that controls work done in or near water that could result in the alteration, disruption or destruction of fish habitat. Projects can range in size and complexity from the installation of a culvert for a road crossing to the development of a large mine. The DFO has developed working arrangements with many Ontario Conservation Authorities to undertake review of project proposals. Depending on the significance of the project, an environmental assessment under the Canadian Environmental Assessment Act (CEAA) may be

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required. The Canadian Environmental Assessment Agency, which administers the CEAA, and DFO conduct and coordinate the assessment review concurrent with the review process for authorization under the Fisheries Act.

The Canadian Coast Guard has primary responsibility for marine spills and boating safety.

Agriculture is a shared responsibility of the federal and provincial governments. In June 2002, Agriculture and Agri-Food Canada, in cooperation with the provinces, announced a new framework for agriculture in Canada. One goal of this new Agricultural Policy Framework (APF) is to minimize agricultural impacts on water, with special attention paid to the effects of nutrients, pathogens, and pesticides on aquatic ecosystems. These goals will be accomplished through federal-provincial negotiations that will set environmental targets and through federal-provincial programs that will address on-farm land use, nutrients, pesticides, and other substances.

### ***Province of Ontario***

The government of Ontario shares responsibility with the government of Canada to protect the environment and public health. In 1971, both governments signed the first Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem. The OMOE and EC are the lead agencies for the agreement. In 2002, Canada and Ontario signed an updated agreement with several annexes that address specific environmental issues in detail and set specific commitments by each government. The current annexes include Areas of Concern, Harmful Pollutants, Lakewide Management Plans and Monitoring and Information Management. New annexes can be added at any time to address emerging issues.

The OMOE has primary responsibility for pollution control for the provincial government. The major pieces of provincial legislation are the Ontario Water Resources Act, the Environmental Protection Act, the Environmental Assessment Act, the Environmental Bill of Rights, and the Pesticides Act. These acts provide general prohibitions or control over activities such as use of water resources; waste management; discharges to land, water and air; or the use of pesticides.

The Ontario Ministry of Agriculture and Food is involved with research and extension activities to support Ontario's agri-food industry. In July 2002 Ontario enacted the **Nutrient Management Act** to help protect rural water quality through the adoption of best management practices for Nutrients applied to agricultural lands. The Act went into effect on October 1, 2003. In support of this legislation, a new regulation applicable to new and expanding livestock operations became effective September 30, 2003. As part of the Ontario government's Clean Water Strategy, the Nutrient Management Act provides for province-wide standards to address the effects of agricultural practices on the environment such as the application of manure to land.

A number of acts and regulations govern the activities of resource users and are administered by the Ontario Ministry of Natural Resources (e.g. Lakes and Rivers Improvement Act, Public Lands Act). The Fish and Wildlife Conservation Act is the main provincial law regulating fishing, hunting and trapping. Both federal and provincial laws regulate fishing in Ontario (Fisheries Act and Ontario Fisheries Regulations) and the laws are enforced by OMNR conservation officers. The Ontario

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Endangered Species Act (1971) provides for the protection of endangered species and their habitat. This act, together with the Federal Species at Risk Act (2003), forms the network in Ontario for protecting species at risk.

The Ministry of Municipal Affairs and Housing (MMAH) manages four major areas: local government, land use planning, housing market and building regulation. Many of the actions and efforts of this ministry have direct or indirect impacts on the environment. For example, in 2001, the ministry introduced the Brownfields Statute Law Amendment Act to help remove obstacles to cleaning up former industrial sites. The Provincial Policy Statement of the Municipal Planning Act provides policy direction to municipalities on matters of provincial interest regarding land use planning. This includes land use in and adjacent to natural features such as wetlands.

### ***Canadian Municipal Government***

Canadian municipal governments have responsibility for many services, such as planning, public health, water supply, and sewage treatment, which have a direct bearing on the environmental well-being of a community. As directed and empowered by the Municipal Planning Act, municipalities develop official plans, zoning bylaws and other controls, such as stormwater management plans that lessen the environmental effects of human activities and community growth.

In Ontario, parts of nine counties and over thirty local municipal governments are located in the Lake St. Clair/St. Clair River watershed. Seven local Ontario municipalities share the Lake St. Clair and St. Clair River shoreline. There are also seven First Nation reserves located in the watershed.

In Lambton County, the Village of Point Edward, the City of Sarnia, and the Township of St. Clair (formerly Sombra and Moore Townships) stretch along the St. Clair River from Lake Huron to the beginning of the Chenal Ecarte. The Walpole Island First Nation is located on the St. Clair Delta. The Corporation of the Municipality of Chatham-Kent, which was formed by combining 23 local municipalities, reaches from the beginning of the Chenal Ecarte to the mouth of the Thames River at the southeastern corner of Lake St. Clair. In Essex County, there are now two local municipalities, the Town of Lakeshore (formerly Maidstone, Belle River, Rochester, Tilbury North and Tilbury West) and the Town of Tecumseh (formerly St. Clair Beach, Sandwich South and Tecumseh) on the south shore of the lake. The City of Windsor, which is not part of the County of Essex government structure, is located at the head of the Detroit River.

### ***Conservation Authorities***

The Province of Ontario enacted the Conservation Authorities Act in 1946. This allowed municipalities to establish local Conservation Authorities that could provide comprehensive watershed planning and management activities. The Conservation Authorities Act was based on the premises that the logical way to coordinate conservation work was on a watershed basis and that the initiative must come from the local people. Created through a partnership of municipalities – at least two-thirds of the municipalities in a watershed had to agree to form an authority – and governed by a municipally appointed Board of Directors, an authority could deal with watershed issues across all municipal boundaries.

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Four watershed-based Conservation Authorities deal with the tributaries of Lake St. Clair and the St. Clair River. The St. Clair Region Conservation Authority has jurisdiction over all watersheds of streams that drain into the St. Clair River, the Sydenham River, and Lake St. Clair north of the mouth of the Thames River. The Thames River, which is the largest tributary, is divided into two jurisdictions. The Lower Thames Valley Conservation Authority has responsibility for watersheds of all streams that drain into the Thames River from the Village of Delaware to Lake St. Clair. The Upper Thames River Conservation Authority has responsibility for all the watersheds of streams that drain into the Thames River above the Village of Delaware. The Essex Region Conservation Authority has jurisdiction over the watersheds of streams in Essex County draining directly into Lake St. Clair.

## **Conclusion**

Lake St. Clair and the St. Clair River are unique and vital resources within the broader Great Lakes system. They provide invaluable benefits in areas of recreation, drinking water, industrial development, commercial navigation, and fish and wildlife habitat and biodiversity. They have influenced the development of southeast Michigan and southwest Ontario and continue to be the defining natural features for the region.

Human development has, in turn, fundamentally altered the character of the lake and river. The collective efforts of U.S. and Canadian governments, First Nations, private citizens, business and industry, and others have produced substantial improvements over the past three decades in restoring and protecting the Lake St. Clair watershed and minimizing ongoing impacts. These efforts are undertaken through a dauntingly complex array of laws, institutions, and nongovernmental activities.

Perhaps the greatest challenge for effectively managing the future of Lake St. Clair and the St. Clair River will be to manage this complex institutional environment and to facilitate an efficient, credible and focused program for balancing our continued ability to benefit from the resources while preserving their chemical, physical and biological integrity for future generations.