LAKE ONTARIO LAKEWIDE ACTION AND MANAGEMENT PLAN Annual Report 2015

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What Is the Lake Ontario LAMP?

Under the Great Lakes Water Quality Agreement, the governments of Canada and the United States have committed to restore and maintain the physical, biological and chemical integrity of the waters of the Great Lakes.

The Lake Ontario Lakewide Action and Management Plan (LAMP) is a binational action plan for restoring and protecting the Lake Ontario ecosystem. The LAMP is developed and implemented by the Lake Ontario Partnership, which is led by the U.S. Environmental Protection Agency and Environment Canada and which facilitates information sharing, sets priorities, and assists in coordinating binational environmental protection and restoration activities. The next Lake Ontario LAMP will be issued in 2017; in the interim, the Lake Ontario Partnership will be assessing the state of the lake, measuring progress against existing LAMP goals and objectives, and promoting management actions to address identified problems.

This 2015 annual report highlights accomplishments and progress in achieving LAMP goals during the past year and identifies LAMP-related activities including outreach, monitoring, and protection and restoration actions.

Overview

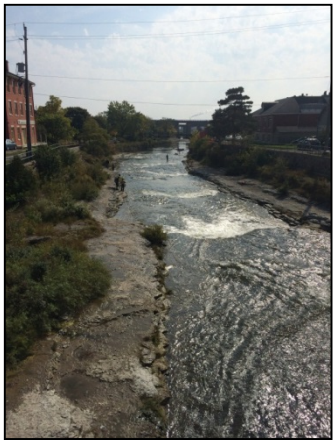
In 2015, the Lake Ontario Partnership continued its efforts to address important lakewide stressors and worked cooperatively to protect and restore water quality and ecosystem health. This was accomplished through a series of priority actions and programs, including the Binational Biodiversity Conservation Strategy (BBCS), the Cooperative Science and Monitoring Initiative (CSMI), reducing critical pollutants, restoring fish species and a productive food web, improving environmental quality of nearshore ecosystems and coastal wetlands, and undertaking outreach and communication activities.

Ontario Ministry of Natural Resources and Forestry (OMNRF) staff member interviewing tributary angler for the Lake Ontario Tributary Survey.
Credit: OMNRF.

Accomplishments

Fisheries Research and Monitoring in Lake Ontario

Lake Ontario is home to an exceptional and diverse salmon and trout fishery. Chinook Salmon, Rainbow Trout, Brown Trout and Coho Salmon are important species in both the open waters of Lake Ontario and its tributaries (as fish migrate up the tributaries to spawn). The Ontario Ministry of Natural Resources and Forestry (OMNRF) and New York State Department of Environmental Conservation (NYSDEC) have regularly surveyed the amount of fishing activity on the open waters of Lake Ontario for over 30 years. The NYSDEC surveyed the amount of fishing activity in New York's Lake Ontario tributaries from 2005–2007 and in 2011–2012. OMNRF just completed the first-ever comprehensive survey of the amount of fishing activity on Canadian tributaries to Lake Ontario. These surveys show that fishing activity on Lake Ontario's tributaries has increased, while fishing activity on Lake Ontario itself has decreased. In fact, the most recent NYSDEC survey showed that the amount of annual fishing activity on tributaries is two times greater than the amount of fishing activity on the lake itself. The Salmon River (Oswego County, N.Y.) is by far the largest fishery on the U.S. side of the lake, accounting for approximately 50% of the total fishing activity in New York tributary waters.




**Left: Anglers fishing the Ganaraska River, Port Hope, Ont.
Right: OMNRF staff member collecting biological information on harvested Chinook Salmon.
Credit: OMNRF.**

This past year, University of Windsor and OMNRF received a grant from the Great Lakes Fisheries Commission to tag Chinook Salmon, Rainbow Trout, Lake Trout and Atlantic Salmon with pop-off data storage tags (pDST). These tags store data on date, time, depth and water temperature of the fish every 5 seconds for 1 year, before detaching and floating to the surface. The aim of the project is to improve understanding of how these species are distributed in the offshore ecosystem. Preliminary results have shown that one Rainbow Trout travelled 270 kilometres in just 3 weeks! You can help: any tags found or retrieved from fish should be returned to Dr. Aaron Fisk (afisk@uwindsor.ca, 519-253-3000 ext 4740).

**Brown Trout released back to Lake Ontario after successful pDST surgery.
Credit: OMNRF.**

2013 Cooperative Science and Monitoring Initiative Results

Autonomous Underwater Glider Explores the Deep Chlorophyll Layer

During the 2013 CSMI effort, the Cooperative Institute for Limnology and Ecosystems Research at the University of Michigan, U.S. Geological Survey (USGS), and Cornell University scientists used a new technology to explore Lake Ontario. An autonomous underwater glider was released near Oswego, N.Y. and travelled to Olcott, N.Y. more than 100 miles away. During its 30-day journey, the glider changed buoyancy to move up and down in the water column, and fins guided it in a zig-zag path while its sensors gathered data to map the deep chlorophyll layer (DCL).

The DCL is important because the concentrations of algae growing in the deep waters of the lake may be an important energy source for the offshore food web, from zooplankton all the way to big sport fish. The information collected by the glider, in combination with that gathered by other techniques, found that a strong DCL developed in the lake during the summer of 2013 at the thermocline (the depth where warm surface waters change to cold deep waters), and that dissolved oxygen and particulate concentrations strongly suggest the importance of the DCL as a productivity and biomass feature in the lake.

Better understanding the dynamics of the DCL will build upon recent work on nearshore-offshore gradients by USGS, Environment Canada (EC), OMNRF and University of Windsor. Since the invasion of zebra and quagga mussels, aquatic food webs in Lake Ontario are becoming more dependent on ecological processes in offshore deep waters and in the nearshore zone rather than in the offshore surface waters.

**Launching the CILER glider in Lake Ontario, July 31, 2013, near Oswego, N.Y.
Credit: Brian Weidel, USGS Great Lakes Science Center, Lake Ontario Biological Station.**

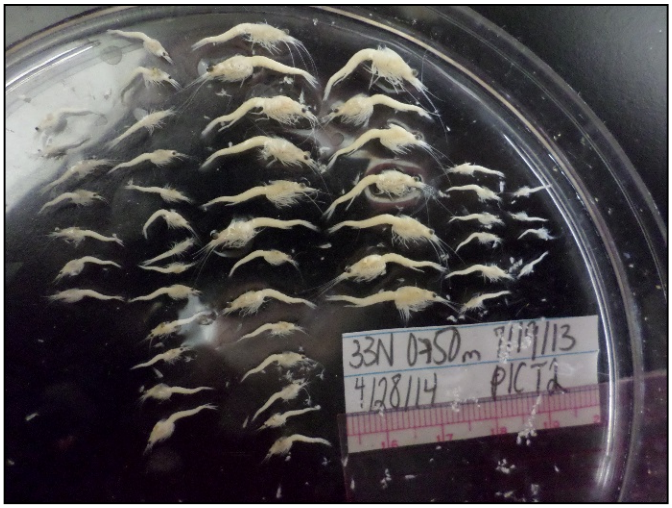
Meet the Mysis

You probably have heard of the breathtaking mass migrations of monarch butterflies across North America, and the legendary hunting dives of the sperm whale to the dark depths of the ocean. Yet you may not know the tale of a local creature that possesses elements of both mass migration and watery deeps.

Each day, trillions of tiny opossum shrimp (*Mysis diluviana*) hide from predators in the darkness of Lake Ontario's depths. Just after sunset, these 1–3 cm crustaceans (related to pillbugs and krill) swim hundreds

of metres towards the surface to hunt planktonic prey. The Mysis gather in a layer spanning nearly the entire area of Lake Ontario. Despite the darkness, many Mysis are eaten by the small fish they compete with for food, giving Mysis an important place in the food web. When the sky begins to brighten, the Mysis retreat to the depths.

During the 2013 CSMI, scientists found that Mysis continue to use light levels and temperature to choose their nightly feeding depth. Estimates suggest there are 7,000 metric tons of Mysis within the lake during the summer sampling, representing an enormous conversion of plankton resources into high-energy biomass available to small fish, which feed larger fish such as Lake Trout and Salmon.



Tray of *M. diluviana* from a sample taken on July 19, 2013. Credit: Annalee Tweitmann.

Addressing Challenges

Nutrients Assessment and Management

EC's Great Lakes Surveillance shows that concentrations of phosphorus in Lake Ontario have declined over time in offshore waters and are now well below targets of 10 µg/L. At the same time, there has been a resurgence of nearshore nutrient enrichment in many areas. In 2013, the Ontario Ministry of the Environment and Climate Change (OMECC) launched the Multi-Watershed Nutrient Study (MWNS) to examine the relationship between agricultural land use and management on nutrient loadings to streams in the Great Lakes Basin. Work done under the MWNS will examine several agricultural watersheds that have been the subject of previous comprehensive studies of nutrient loading, land use and land management in such a way that our findings can be compared to generate a "then-and-now" analysis. EC is also working with partners including the OMECC and the Toronto Region Conservation Authority in the Western Durham Nearshore Monitoring Program to establish consistent methodologies, share expertise/data on nearshore water quality and explore linkages to the lake's offshore waters.

In 2011, the U.S. Environmental Protection Agency (EPA) began a program with the USGS to monitor, evaluate and interpret data from major tributaries of Lake Ontario to determine nutrient loads. The sites include the Genesee, Salmon, Black and Oswego rivers, and Allen, Oak Orchard (two sites), Eighteen-mile, Irondequoit and Honeoye creeks. Annual loads of total phosphorous and orthophosphate were computed to assess the relative contributions from each basin, and allow direct comparison between the monitored basins. High total suspended solids at some sites were attributed to agricultural land use in highly erodible soils. These data will support the Great Lakes Water Quality Agreement's Nutrient Annex priorities for nutrient management, and will provide valuable comparisons between major drainage basins to Lake Ontario in New York State.

Niagara River Update

In addition to ongoing monitoring in support of the Niagara River Toxics Management Plan (NRTMP), EC and USGS continue to collaborate on several monitoring initiatives in the Niagara River. The USGS started a year-long (pilot) monitoring program at 2 sites, one near Ft. Erie, Ont. (upstream), and another near Lewiston, N.Y. (downstream). The U.S. sampling is funded through EPA's GLRI and will measure 209 legacy chemicals, dioxins/furans, polycyclic aromatic hydrocarbons, a suite of emerging contaminants and hormones, major ions, nutrients, total dissolved solids, total suspended solids, mercury, dissolved organic carbon and microplastics. These data will complement recent analyses by EC of long-term trends in major ions and nutrients, such as chloride, which has increased by 12–13% since 1995, and total phosphorus, which still frequently exceeds the interim Provincial Water Quality Objective of 30 ug/L set by the OMECC to prevent excessive plant growth. EC is continuing to monitor dioxins/furans in both water and suspended sediment to better understand the temporal trends since the 1980s. In 2015–16, EC is planning to conduct a cross-sectional survey of the Niagara River to validate nutrient and major ion concentrations in addition to deploying passive samplers to investigate possible intermittent releases of legacy contaminants and the presence of other bioavailable pollutants in the water.

Habitat Restoration Efforts

Great progress in the Credit River Estuary wetlands!

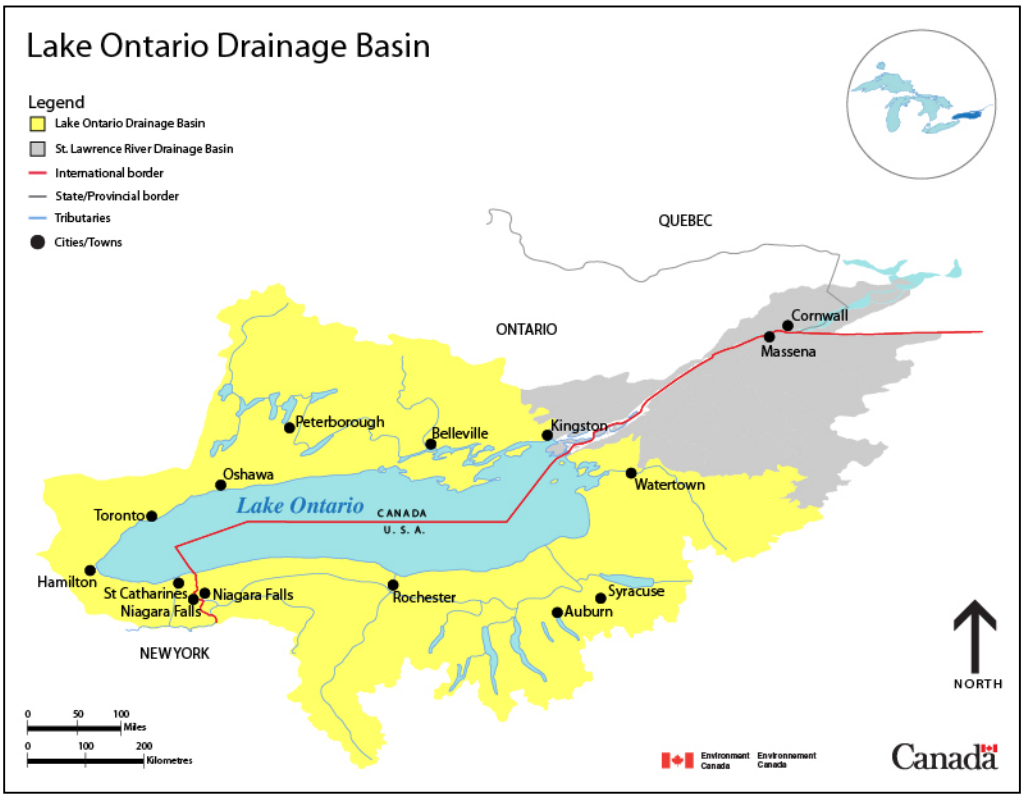
Credit River Estuary in Mississauga, Ontario, contains 22 hectares of coastal marsh wetland complex. It is an

important corridor connecting Lake Ontario to the Niagara Escarpment and Oak Ridges Moraine. This area is the terminus of the 9,300-hectare Credit River watershed, and a Priority Action Site (PAS) in the BBCS. One of the largest ongoing threats to the estuary is the invasion of non-native species. The Credit Valley Conservation Authority developed a short list of essential habitats for biodiversity restoration, and proposed an approach to restoration of coastal wetland biodiversity by engaging local residents and non-governmental organizations. This project aligns with the Credit River Watershed Restoration and Lake Ontario Integrated Shoreline Strategies.

Big things are happening in Braddock Bay!

Braddock Bay and 4 coastal ponds are located just east of Rochester, N.Y. in the Rochester Embayment Area of Concern. This is the largest coastal wetland complex along Lake Ontario's south shore and is identified as a PAS in the BBCS. It provides vital migratory, feeding and nesting habitat for diverse bird species, and extensive submerged aquatic vegetation beds supporting many fish species such as Northern Pike. US$10 million is now being invested in coastal wetlands restoration work in the area. The 6 projects, including construction of a 2,000-foot headland beach structure to replace the lost barrier beach across the mouth of the bay, will restore or enhance over 590 acres of coastal wetlands. Enhancements include opening 15 acres of pools and 28,000 feet of connecting channels in wetlands impacted by dense stands of cattails; and 485 acres of surrounding riparian buffer lands have been protected through acquisition or conservation easements. With 2,450 acres of public land in or adjacent to the wetlands, this area is a resource treasured by people across the region.

Lake Ontario Basin Map



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What is the Lake Ontario LAMP?

Under the Great Lakes Water Quality Agreement, the governments of Canada and the United States are obligated to protect the physical, biological and chemical integrity of the waters of the Great Lakes.

The Lake Ontario Lakewide Action and Management Plan (LAMP) is a binational plan to restore and protect the health of Lake Ontario by reducing chemical pollutants entering the lake and addressing the biological and physical factors impacting the lake. The LAMP's activities are coordinated by Canadian and U.S. federal, state and provincial government agencies. Many actions are implemented through the Canada-Ontario Agreement (COA) on Great Lakes Water Quality and Ecosystem Health, 2014 and the United States Great Lakes Restoration Initiative (GLRI).

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Overview

Over the past year, the Lake Ontario LAMP Partnership agencies have continued working cooperatively to protect and restore the lake's water quality and ecosystem health through actions and programs, including implementing the Binational Biodiversity Conservation Strategy (BBCS), conducting field sampling for the Cooperative Science and Monitoring Initiative (CSMI) study, reducing critical pollutants, restoring fish species and the food web, improving coastal wetland ecosystem and nearshore water-quality, as well as outreach and communication.

This 2014 annual report summarizes the following information:

- accomplishments in coastal wetland restoration, improvements to the lake fishery, and preliminary results of the 2013 CSMI sampling,
- challenges for protecting bald eagle habitat and managing aquatic invasive species,
- updates on the Niagara and St. Lawrence Rivers, and
- next steps for an integrated nearshore framework and updates to the BBCS.

In 2014, the LAMP partners continued their focus on addressing priority stressors that influence Lake Ontario's ecosystem and water quality.

Canada-U.S. Great Lakes Water Quality Agreement (GLWQA) of 2012

Continual improvements to lakewide management are being made. Current areas of focus are lake ecosystem objectives, outreach and engagement plans, LAMPs, and management of the nearshore waters. More information can be found at *www.binational.net.*

This chinook salmon was caught in Lake Ontario near Oswego. The abundance and condition of Lake Ontario's top predatory fish indicate a functional ecosystem, but food web disruption caused by aquatic invasive species remains a cause for concern. Photo: Captain Ernie Lantiegne, Fish Doctor Charters.

Accomplishments

Coastal Wetlands Restoration

Coastal wetlands provide a critical link between the land and water – they improve water quality in the lake by filtering sediment and contaminants from runoff and tributary flows, and support biodiversity by providing vital habitat for many species. Since 2011, over $5 Million has been invested in coastal wetland restoration, and additional work is underway. Recently, two important coastal wetland restoration and monitoring projects have been undertaken in Priority Action Areas on the southeast and northwest shorelines of Lake Ontario.

The 17-mile (27 km) long Eastern Lake Ontario dunes and wetlands system in New York State is the largest freshwater dunes system in the eastern Great Lakes. With grants totaling over US$1 million from the GLRI, the Nature Conservancy (TNC) has partnered with Ducks Unlimited and New York State Department of Environmental Conservation (NYSDEC) to restore wetlands, control invasive plant species, and improve natural flows in this priority area.

In Ontario, Rattray Marsh is one of the last remaining coastal wetlands along the western end of Lake Ontario, and provides habitat for multiple species at risk and species of conservation concern. Ontario Ministry of Natural Resources and Forestry (OMNRF), Credit Valley Conservation Authority and Environment Canada (EC) are collaborating to restore the Rattray Marsh. With a total investment to date of CAD$1.7 million, contaminated wetland soil has been restored through dredging contaminated soils, and barriers have been installed to control invasive fish species. Additional work will help to conserve, rehabilitate and monitor biodiversity and habitat in the marsh and other coastal wetlands at the western end of Lake Ontario.

Together, these coastal wetland restoration projects on opposite shores of the lake have demonstrated the collaborative work being accomplished by government agencies and stakeholders through the LAMP partnership.

Lake Ontario Fishery Update

Lake Ontario supports a large and thriving recreational fishery for native (lake trout, smallmouth bass, and walleye) and introduced species (chinook and coho salmon, brown trout and rainbow trout). Each year, scientists monitor and assess the lake's food web from bottom to top (including water quality, zooplankton, prey fish and their predators) to ensure that the fisheries of Lake Ontario continue to provide economic, social and environmental benefits. Management of the fishery by Ontario and New York is guided by shared Fish Community Objectives for the lake.

In the offshore waters of Lake Ontario, salmon and trout are the top predators and provide anglers an opportunity to catch trophy-sized fish. Angler surveys conducted by NYSDEC and OMNRF provide estimates of angler effort, catch, harvest, and fishing success. In general, survey data indicate excellent salmon and trout catch rates over the last 10 years, and many trophy-size fish have been caught. The 2013 NYSDEC survey showed that anglers experienced the fourth highest trout and salmon fishing success rate in nearly 30 years, and the OMNRF survey also showed trout and salmon fishing remained above average in 2013.

An overall balance between predators and their prey are indicative of a well-functioning ecosystem. However, food web disruption caused largely by aquatic invasive species continues to hinder native fish species restoration and remains a cause for concern.

Cooperative Science and Monitoring Initiative

Lake Ontario's 2013 CSMI partners have successfully collected water and biological samples from tributaries, coastal, and offshore waters. The binational effort expanded on CSMI partnerships formed in 2003 and 2008 and provided the most comprehensive assessment conducted to date. Agencies that contributed in 2013 included: EC, United States Environmental Protection Agency, OMNRF, United States Geological Survey, Fisheries and Oceans Canada, and NYSDEC.

The 2013 CSMI monitoring was designed to inform management options and drive research on key LAMP science priorities including nutrient loadings, invasive species impact on energy dynamics, nearshore to offshore nutrient transport, and the ability of the ecosystem to sustain fisheries as the food web changes. Traditional approaches were used, as well as emerging technologies such as hydroacoustics, laser plankton counters, automat underwater vehicles, buoy-mounted sensors, and satellite imagery.

Staff from NYSDEC and Environment Canada work together to collect samples of lake bottom organisms for CSMI. Credit: NYSDEC.

The studies completed through CSMI build on decades of binational work to routinely monitor the water quality, ecosystem health, and fisheries of Lake Ontario. CSMI also provides an opportunity to investigate emerging issues and changes in the lake's ecosystem. Information gathered through CSMI and annual monitoring programs provide the scientific basis to guide management actions around the lake. Results allow LAMP partners, researchers, stakeholders, and citizens to identify management actions and focus them on issues that are most critical to the lake.

Data interpretation and synthesis from the 2013 CSMI are underway, and an initial report is expected in 2015.

Addressing Challenges

Protecting Habitat for Bald Eagles

Bald eagles are making an impressive recovery throughout the Great Lakes region and have established at least 12 successful nesting territories along the shoreline of Lake Ontario and the Upper St. Lawrence River, with many additional territories further back in the watershed.

The return of the bald eagle to the Lake Ontario shoreline demonstrates the progress made to restore the lake's ecosystem and to reduce bioaccumulative contaminants. To continue their recovery, the conservation of remaining shoreline nesting and foraging habitats is extremely important. Between 2002 and 2008, US and Canadian bald eagle experts worked with LAMP partners to identify and prioritize valuable bald eagle habitats in the eastern Lake Ontario and Upper St. Lawrence River area. Twenty-one priority habitat sites were identified in the US, and 18 in Canada. Today at least half of these are fully or partially protected through public ownership or conservation easements.

Two young bald eagles in their nest. Credit: Bird Studies Canada.

The challenge remains to retain momentum for ongoing protection of bald eagles and their habitat. You can help by reporting nesting bald eagle pairs or unusual bald eagle activity to your local NYSDEC or OMNRF office, and by being a "good neighbor" to eagles in your area by not disturbing them. Although bald eagles can often be seen near residential areas and roads, they prefer to nest in quiet areas away from human activities, buildings, and boat and vehicle traffic.

Managing Aquatic Invasive Species

Reducing the impact of Aquatic Invasive Species (AIS) is an ongoing challenge for LAMP partners. Managing AIS within Lake Ontario and its watersheds is critical to maintaining a healthy, stable lake ecosystem and to protect social, economic, and environmental resources.

One method of managing AIS is Early Detection/Rapid Response (ED/RR), which establishes prevention zones in areas of high ecological value. Seasonal monitoring for early detection is done at nearby sites where invasions are most likely to occur. If an AIS is detected, rapid response and immediate control efforts are implemented to help prevent the AIS from becoming established in the prevention zone. This method is currently being used in several coastal wetland and embayment areas around Lake Ontario.

A trained network of citizen volunteers is key to successful monitoring and early detection. You can help by learning how to identify and report AIS, and by working with the groups that implement ED/RR and other AIS control measures in the Lake Ontario Basin. These groups include TNC, Nature Conservancy of Canada, New York State Partnerships for Regional Invasive Species Management, and many others.

Connecting Channels Lake Sturgeon Update

Multi-agency efforts to monitor and restore remnant Lake Sturgeon populations have been ongoing on both the Niagara and St. Lawrence Rivers over the last 15 years.

In the lower Niagara River, U.S. Fish and Wildlife Service has been working with partners to monitor the recovery of Lake Sturgeon. First discovered in 2003, a small, young remnant population in the lower Niagara River was re-assessed in 2010. The population was estimated at about 2800 fish and was increasing faster than expected, likely through successful natural reproduction.

On the St Lawrence River near Massena, NY, the New York Power Authority, NYSDEC, U.S. Fish and Wildlife Service, USGS and the St. Regis Mohawk Tribe are working to restore spawning habitats near hydropower and water diversion projects. Evidence of spawning and reproduction was observed in 2008 and 2009 and since then, the habitats have remained stable and clear of sediments. Researchers at Queens University at Kingston are currently studying Lake Sturgeon in the area.

Addressing Nearshore Water Issues

There is a growing focus on the nearshore areas of the Great Lakes, where water quality is often affected by tributary inflows and where people have the most direct contact with the lakes. The Lakewide Management Annex of the 2012 GLWQA calls for the development of an integrated Nearshore Framework to be implemented collaboratively through the lakewide management process. The Nearshore Framework will assess the condition of nearshore waters, identify factors and cumulative effects causing stress to the nearshore, and establish priorities and collaborative partnerships for improving water quality and ecosystem health in nearshore areas. The intensive Lake Ontario CSMI nearshore research conducted in 2008 and 2013, together with the BBCS, will contribute to our understanding of the Lake Ontario nearshore.

Conserving Biodiversity

The binational biodiversity conservation strategy was developed by a project team consisting of over 300 people from over 50 different agencies, including First Nations, government, and non-governmental organizations. The BBCS was released in 2009 and an implementation plan was released in 2011. The strategy identified 24 action sites and 5 program focus areas that are key to conserving and restoring biodiversity in Lake Ontario. Dozens of projects are currently being implemented in the priority action sites to meet the objectives of the BBCS.

Lake Ontario Watershed Map

Lake Ontario is the last of the chain of Great Lakes that straddle the Canada/United States border. Its shoreline is bordered by the Province of Ontario on the Canadian side and New York State on the U.S. side. Lake Ontario is the smallest of the Great Lakes, with a surface area of 18,960 km^2 (7,340 square miles), but it has the highest ratio of watershed area to lake surface area.

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What is the Lake Ontario LAMP?

The Lake Ontario Lakewide Action and Management Plan (LAMP) is a binational plan under the Great Lakes Water Quality Agreement (GLWQA) directed at restoring and protecting Lake Ontario by reducing the amount of pollutants entering the lake and addressing the chemical, biological and physical stressors impacting the lake. The LAMP guides activities of the participating U.S. and Canadian federal, state and provincial government agencies and other partners.

The LAMP includes ecosystem goals, objectives and indicators. Ecosystem objectives have been identified for aquatic communities, wildlife, human health, habitat, and stewardship. The twelve indicators track progress toward achieving the lake ecosystem objectives.

In 2012, a new GLWQA expanded the scope of the Lake Ontario LAMP to include both the Niagara and St. Lawrence rivers.

Overview

In 2012, the Lake Ontario LAMP partners continued working to restore and protect the lake's ecosystem through actions and programs that include: implementing the Lake Ontario Binational Biodiversity Conservation Strategy; planning for the 2013 binational Cooperative Science and Monitoring Initiative study; restoring fish species; and implementing programs to reduce nutrient runoff, which impacts nearshore water quality.

This 2013 annual report focuses on the following key activities:

- implementing the Biodiversity Conservation Strategy
- the 2013 binational Cooperative Science and Monitoring Initiative study
- understanding nutrient cycling in the lake and reducing nutrient runoff

In 2013, the LAMP agencies will also continue tracking stressors affecting the Lake Ontario ecosystem, such as newly recognized chemicals, invasive species, potential effects of climate change, and water level regulation.

Great Lakes Water Quality Agreement

On February 12, 2013, the governments of Canada and the United States ratified the Great Lakes Water Quality Agreement of 2012. The Agreement facilitates binational action on threats to water quality and ecosystem health. More information on the Agreement can be found on the following websites: http://www.epa.gov/glnpo/glwqa or www.ec.gc.ca/grandslacs-greatlakes/.

Accomplishments

Restoring Native Cisco Populations

Ciscos were stocked into Irondequoit Bay in December 2012. Image credit: USGS.

After years of international collaboration, a new program to restore native prey fish to Lake Ontario began in 2012. Until the mid-1950s, native fish including Lake Whitefish, Ciscos (formerly called Lake Herring) and Deepwater Ciscos (including Bloater) were an abundant and important food source for large sportfish (e.g. Lake Trout) in Lake Ontario. Since the decline of these native prey fish, sportfish have fed primarily on Alewife, an invasive species that is less nutritious and has led to reproductive failure from vitamin B deficiencies.

Re-establishing self-sustaining populations of Bloaters and Ciscos in Lake Ontario has been the focus of a binational effort involving the New York State Department of Environmental Conservation, Ontario Ministry of Natural Resources, U.S. Geological Survey, U.S. Fish and Wildlife Service, and Great Lakes Fishery Commission. In November 2012, Bloaters were re-introduced to Lake Ontario with the stocking of 1,200 yearlings near Oswego, NY. Ciscos were stocked into Irondequoit Bay (near Rochester, NY) in December 2012. Re-established populations of Bloaters and Ciscos will restore biodiversity in Lake Ontario, provide a quality food source for sportfish and contribute to a more stable and resilient fish community.

2008 Cooperative Science and Monitoring Results

Each year, one of the Great Lakes is the focus of an intensive U.S. and Canadian assessment called the Cooperative Science and Monitoring Initiative (CSMI). CSMI last came to Lake Ontario in 2008 and returns in 2013.

The 2008 study showed that phosphorus levels remained below the GLWQA's target of 10 parts per billion. Diatoms and phytoplankton, vital components of the aquatic food web, appear to be stable or increasing.

Invasive Quagga Mussels continued to be the dominant lake bottom organism in Lake Ontario in 2008, although their densities declined in the 30-90 meter depth range. Lake Ontario's former native dominant lake bottom species, the tiny shrimp-like crustacean *Diporeia*, was nearly eliminated from the lake following the arrival of Zebra and Quagga Mussels and continues to be very rare.

Natural reproduction of Lake Trout was confirmed again in 2008 and continued through 2012 for the 18th consecutive year. Naturally reproducing Lake Trout are in good physical condition, but populations remain low. The number of Sea Lamprey wounds on large Lake Trout is under the LAMP's target of two wounds per 100 large Lake Trout. Restoring native prey fish (e.g. Ciscos), a priority of the Lake Ontario Biodiversity Conservation Strategy, may be the key to restoring self-sustaining populations of Lake Trout and Atlantic Salmon.

EPA's research vessel, the Lake Guardian, is participating in the 2013 CSMI study of Lake Ontario. Image credit: USEPA.

Implementing the Lake Ontario Binational Biodiversity Conservation Strategy 2012-2013

The Lake Ontario Binational Biodiversity Conservation Strategy is being implemented by LAMP partners in Canada and the United States.

- **Restoring Connections and Natural Hydrology:** With Great Lakes Restoration Initiative funding through the National Oceanic and Atmospheric Administration, Ducks Unlimited partnered with U.S. federal and state agencies to restore coastal wetlands at French Creek and Vivian Marsh in New York. These wetlands had been overtaken by dense stands of cattails, decreasing their ability to serve as habitat for plants and animals. This project opened over a mile of channels for fish passage, created seven acres of pools for waterbird and amphibian habitat, and installed water level control structures (including fish passage devices) that will help diversify vegetation in over 100 acres of wetlands. Now that the restoration work is complete, the monitoring and outreach phase of the project will begin. Wetland restoration work is also planned for the Braddocks Bay area in New York.
- **Restoring Native Fish Communities and Native Fish Species:** Lake Trout and Atlantic Salmon continue to be stocked into the lake and its tributaries in Ontario and New York. Populations of these native fish species are monitored annually by federal, state, and provincial agencies. The Toronto and Region Conservation Authority and Ontario Ministry of Natural Resources, with funding from the Great Lakes Fishery Commission, are installing a resistance weir to count salmon on Duffin's Creek in Ajax, Ontario. Work to restore Lake Sturgeon achieved success in 2012: Improvements in egg collection techniques and hatchery technology led to the successful raising of sturgeon fingerlings for the first time in nine years, and the young sturgeon were released in November 2012 in a New York tributary of the St. Lawrence River. Female Sturgeon carrying eggs were found in the Oneida Lake system in New York for the first time in nearly twenty years.
- **Restoring the Quality of Nearshore Waters:** In the Duffin's Creek watershed in Ontario, the Ontario Ministry of the Environment and the Toronto and Region Conservation Authority started a social marketing program to educate landowners about land-management practices that protect and improve water quality. In New York, the Department of Environmental Conservation's *Be Green in the Great Lakes* program kicked off in 2012 with outreach to landowners about environmentally friendly yard-care practices and the new statewide restriction on phosphorus lawn fertilizer use.

Challenges

Reducing the Impact of Aquatic Invasive Species

Because the Great Lakes ecosystem has about 180 different invasive species, reducing their impact remains a challenge for the LAMP partners.

During the summer of 2012, NY Sea Grant, Paul Smith's College and The Finger Lakes Institute placed Boat Launch Stewards at waterbodies in New York's Lake Ontario watershed to remove plant and animal material from boats and trailers, document invasive species, and educate people about preventing the spread of invasive species. Ongoing work by The Nature Conservancy is aimed at developing and implementing an early detection and rapid response protocol to prevent new infestations of aquatic invasive species in coastal wetlands and at developing models and using targeted surveys to predict and prevent the spread of the invasive weed *Hydrilla*.

Managing Nutrients to Improve Nearshore Water Quality

The LAMP partners are working to understand nutrient cycling (particularly phosphorus) in Lake Ontario in order to better manage nutrient inputs. Nutrients are vital to the food webs of the lake, but nutrient levels that are too high can lead to excessive algae, including nuisance algae and potentially toxic blue-green algae.

Since the mid-1980s, phosphorus levels in the offshore waters of the lake have remained at, or below, the target level of 10 parts per billion set in the GLWQA. Phosphorus levels less than 10 parts per billion contribute to lower productivity in the offshore water waters.

In the nearshore area of the lake, which is naturally more productive and is the part of the lake that people have the most contact with, phosphorus levels are much higher. The 2003 and 2008 CSMI studies began to uncover the complexity of nearshore nutrient cycling and the interactions between tributary inflows, lake currents, seasonal changes, waves, and invasive Quagga and Zebra Mussels. This work will continue with the 2013 CSMI study.

As the LAMP partners work to understand nutrients in nearshore areas, efforts are underway on both sides of the lake to reduce the amount of nutrients entering the lake through its tributaries. Projects include implementation of agricultural best management practices in the Genesee River watershed in New York and the Duffin's Creek watershed in Ontario; implementation of the New York State Dishwasher Detergent and Nutrient Runoff Law; and stormwater runoff monitoring in the Ajax-Pickering area in Ontario.

Next Steps

Moving the Binational Biodiversity Conservation Strategy Forward

Support for long-term monitoring programs is a key piece of the Binational Biodiversity Conservation Strategy. Information gathered by monitoring serves as an early warning for changes in the ecosystem, guides management actions and establishes baselines for parts of the ecosystem, such as coastal wetlands, that have not been consistently monitored. The Nature Conservancy and Nature Conservancy Canada are developing a monitoring program and establishing baselines for coastal wetlands on both sides of the lake by tracking changes in plant communities and muskrat populations.

Government and non-government organizations will continue working to achieve the goals and objectives of the Binational Biodiversity Conservation Strategy and the LAMP partners will continue to promote these actions, report on progress, identify resource needs, and recommend additional actions to conserve Lake Ontario's biodiversity.

Connecting 2008 CSMI Results to 2013 CSMI Priorities

The 2013 CSMI study expands on partnerships developed in 2003 and 2008 to improve understanding of nutrient loading, transport and cycling in Lake Ontario. Coastal wetland monitoring will support an adaptive management approach to water level regulation, recognized by the LAMP partners as the most significant stressor on coastal wetlands. The Great Lakes Water Quality Agreement of 2012 calls for the development of a plan to manage nutrients in nearshore areas and the reconsideration of nutrient water quality criteria. The 2013 CSMI study will help the LAMP partners meet these requirements.

The Canadian Coast Guard Ship Limnos is participating in the 2013 CSMI study of Lake Ontario. Image credit: Fisheries & Oceans Canada.

Niagara River Update

The Niagara River is the connection between Lake Erie and Lake Ontario. Historically, the Niagara River and its watershed have been polluted by human activities. Remediation efforts are completed or underway at known hazardous waste sites in both the U.S. and Canadian Areas of Concern. In addition, the agencies participating in the binational Niagara River Toxics Management Plan continue to monitor contaminant levels in the river.

On the U.S. side, the New York State Department of Environmental Conservation is reassessing cumulative inputs of toxic substances from historical sources along the Niagara River. This assessment of groundwater and surface water discharging to the river will also indicate if more work to identify pollution sources is necessary.

On the Canadian side, no further action is required under the Canadian Niagara River Remedial Action Plan (RAP) to identify or remediate contaminants in the Canadian AOC. The known point sources to the Niagara River were addressed through other programs in the early 1990s. Areas of contaminated sediment in the Canadian AOC were assessed and management actions taken. The Canadian RAP is entering its final phase and is working to delist the AOC. Future contaminant issues will be addressed through routine federal, provincial and municipal abatement and enforcement programs.

Lake Ontario Basin

Lake Ontario is the lowermost of the five Great Lakes that straddle the Canada/U.S. border and is bordered by the Province of Ontario to the north and New York State to the south. With a surface area of 7,340 square miles (18,960 square kilometers), Lake Ontario is the smallest of the Great Lakes, but has the highest ratio of watershed area to lake surface area.

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LAKE ONTARIO LAKEWIDE MANAGEMENT PLAN (LaMP)

Annual Report 2012

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What is the Lake Ontario LaMP?

The Lake Ontario Lakewide Management Plan (LaMP) is a binational plan to restore and protect the health of Lake Ontario by reducing chemical pollutants entering the lake and addressing the biological and physical factors impacting the lake. The LaMP's activities are coordinated by Canadian and U.S. federal, state and provincial government agencies.

The Lake Ontario LaMP includes ecosystem goals, objectives and indicators. Ecosystem objectives have been identified for aquatic communities, wildlife, human health and stewardship. The twelve indicators are designed to track progress towards achieving the ecosystem objectives.

Overview

In 2011, the Lake Ontario LaMP participating agencies continued their efforts to restore and protect the lake's ecosystem through a number of actions and initiatives including: implementation of the Lake Ontario Binational Biodiversity Conservation Strategy; development of the next binational intensive study of the lake; and implementation of programs that promote the reduction of toxic chemicals and sediments impacting the nearshore.

This 2012 annual report focuses on the following key activities:

- Fisheries management plans are being updated,
- The Biodiversity Conservation Strategy is being implemented,
- A binational monitoring program for coastal wetlands is being developed.

In the upcoming year, the LaMP participating agencies will also continue to track new and emerging issues such as newly recognized chemicals of concern, invasive species, potential effects of climate change and water level regulation.

Canada-U.S. Great Lakes Water Quality Agreement (GLWQA) Amendments

Negotiations to amend the 1987 GLWQA were launched in early 2010. The Governments of Canada and the United States held the final negotiation session in early 2012 and the amended GLWQA is now in the process of being finalized and approved. It is anticipated that the amended Agreement will be signed in 2012.

Coastal wetland indicators have been chosen for Lake Ontario, and will be used to develop a new binational monitoring program for Lake Ontario wetlands. Credit: Environment Canada.

Accomplishments

Updated Fish Community Objectives

In 2012, the fish community objectives (FCOs) for Lake Ontario (excluding the St. Lawrence River), were updated to provide more current targets for the management of the Lake Ontario fish community. These objectives guide management agencies, interest groups and the general public as they develop more specific fisheries, habitat, and watershed management plans. The new objectives are more relevant to modern fisheries management, and take into account: ecosystem changes, aquatic invasive species, changes in fish populations, and existing government policies and legislation. In addition, these objectives will contribute to other management planning initiatives such as Remedial Action Plans for Areas of Concern. FCOs for Lake Ontario were last published in 1991 and 1999, and are closely linked to the lake ecosystem objectives in the LaMP.

FCOs for the Lake Ontario fisheries are established by the Great Lakes Fishery Commission's (GLFC) Lake Ontario Committee. The committee is chaired by the New York State Department of Environmental Conservation (NYSDEC) and the Ontario Ministry of Natural Resources (OMNR), who are agencies responsible for fisheries management within Lake Ontario and active LaMP participants. For more information please visit the GLFC web site at *www.glfc.org*.

Fisheries Assessment: Update on Lake Trout Populations

Recent assessments show that lake trout abundance has improved from low levels observed in the mid 2000s. That abundance is expected to remain at current levels because of stocking programs and sea lamprey control efforts. Naturally spawned one- and two–year-old lake trout have been found in assessment surveys, along with mature, naturally reproducing lake trout. In order to continue efforts towards the LaMP participants' objective of a self-sustaining lake trout population, annual lakewide lake trout assessments will continue in selected regions of Lake Ontario. This monitoring will be conducted by the U.S. Geological Service (USGS), NYSDEC, and OMNR.

Binational Collaboration Benefits Lake Ontario Fish

With funding from the U.S. National Fish and Wildlife Foundation (NFWF), the Credit River Anglers Association (CRAA) and OMNR collaborated to construct a fish ladder at the Norval dam, on the Credit River northwest of Toronto. The project received US$60,000 from U.S. sources and CDN$190,000 from Canadian sources. In addition the project was supported by the efforts of many volunteers and agency staff.

The Norval Dam was built in the 1830s and has been an obstruction to fish passage ever since. To remedy this, a fish ladder was built at the site in early 2011 and opened in June. Native Lake Ontario fish species now have direct access to over 39 miles (60 kilometres) of stream and 310 acres (125 hectares) of upstream coldwater habitat in the middle and upper Credit River. This benefits many fish species, including: trout, Atlantic salmon, American eel, basses and minnows.

In its first season of operation, 20 species have successfully used the ladder, including adult Atlantic salmon (once extinct in Ontario), juvenile smallmouth bass and a juvenile American eel (an endangered species in Ontario). This project promotes progress towards FCOs.

A fisheries biologist releases a fish at the Norval fish ladder. Credit: Credit Valley Conservation.

Implementing the Biodiversity Conservation Strategy

The *2011 Lake Ontario Binational Biodiversity Conservation Strategy* (BBCS) implementation report highlights a new focus on conserving and restoring the species and habitats of Lake Ontario.

The BBCS was completed in 2009 and it is now being implemented in both Canada and the United States. Progress is already being made. For example:

- **Research is underway on the restoration of native prey fish.** The GLFC is actively pursuing research and studies needed to re-introduce native deepwater ciscoes. Current research focuses on bloater chub. Restoration of native prey fish, including chubs, is an important step towards restoring naturally reproducing populations of lake trout and salmon.
- **Actions are underway to conserve American eel**. Recovery actions include banning fishing, improving eel ladders to encourage upstream migration of young eels at the Moses-Saunders Dam and transporting both young and mature eels around dams. American eels are one of the most unique fishes in the Great Lakes, and are listed as an endangered species in Ontario.
- **Coastal habitats are being protected and restored**. The U.S. Great Lakes Restoration Initiative is funding the restoration of agricultural land back to native sedge/grass meadow along West Creek, near Rochester, New York. Indicators are also being developed to monitor wetland health.
- **Atlantic salmon are starting to reproduce**. The NYSDEC has been stocking Atlantic salmon in Lake Ontario since 1983. In Ontario, the 'Bring Back the Salmon' initiative was launched in 2006 by the Ontario Federation of Anglers and Hunters and OMNR, along with more than 50 partners to help restore a self-sustaining Atlantic salmon population. (see *http://www.bringbackthesalmon.ca/*)

Challenges

Restoring Deepwater Cisco Populations

Until the mid 1950s, Lake Ontario was home to four deepwater cisco fish species which were the primary prey fish. All four species, including bloater chub, eventually disappeared from the lake and were replaced by non-native prey species. These non-native prey species contain an enzyme that has led to reproductive declines in key predator fish such as salmon and trout, leading to an overall negative impact on the aquatic food web.

The GLFC's Lake Ontario Committee is committed to re-establishing a self-sustaining population of deepwater ciscoes in Lake Ontario within the next 25 years. Lake Ontario LaMP participants are commited to restoring and enhancing self-sustaining diverse biological communities, including native prey fish species. Potential benefits include: improving reproduction of predator fish, increasing the diversity and resilience of the food web, and restoring its historical structure and function.

To explore the feasibility of re-introducing deepwater ciscoes to Lake Ontario, the NYSDEC, OMNR, USGS and U.S. Fish and Wildlife Service have been working to collect bloater chub eggs from the upper Great Lakes for culturing.

To address the unique challenges of collecting these eggs, 2012 efforts experimented with revised spawning techniques and successfully transferred approximately 300,000 eggs to newly dedicated quarantine facilities in Ontario and New York state. Plans call for continued culture experiments and eventual reintroduction of these important fish to Lake Ontario.

Next Steps

Building an Adaptive Management Approach to Conserve Coastal Wetlands

Since 1960, water levels and flows of Lake Ontario and the St. Lawrence River have been regulated to allow for power generation, commercial navigation, and protection of coastal property. As a consequence, the natural pattern of water flows was altered, significantly reducing the natural variation of lake levels, as well as the seasonal occurrence and durations of levels that are essential for maintaining the biodiversity of coastal wetlands, beaches and dunes. Many of these areas are vital habitat for native fish and wildlife species.

The International Joint Commission (IJC) recognizes these problems and is developing a new plan for Lake Ontario that will restore more natural flows to benefit the environment, while considering other uses of the lake. The IJC and the Lake Ontario LaMP participants support the use of an adaptive management approach that would evaluate the new plan's performance and possibly make changes based on environmental performance indicators. A final decision on a new plan is expected later this year.

One key requirement for the success of this approach is the establishment of an effective monitoring protocol. The Nature Conservancy and the Canadian Wildlife Service are working to develop a binational approach to coastal wetland monitoring to support the IJC's adaptive management monitoring needs. Field studies and aerial photography are being used to monitor meadow marsh cover and the extent of rare and sensitive plants and mammals. The protocol will allow the IJC to evaluate the effectiveness of a new regulation plan and measure potential benefits to Lake Ontario and St. Lawrence River coastal wetlands.

Niagara River Update

The Niagara River and its watersheds are located adjacent to and upstream of Lake Ontario. Historically, these areas, including the infamous Love Canal, have been polluted by human activities. Current remediation efforts are underway on both sides of the River in the U.S. and Canadian Areas of Concern. In addition, the binational Niagara River Toxics Management Plan (NRTMP) continues to monitor and report on contaminant levels in the Niagara River itself.

On the U.S. side, NYSDEC has begun a study to reassess loadings of priority toxic substances from legacy sources along the Niagara River, including significant public and industrial permitted point sources and remediated hazardous waste sites. The study will also assess water quality from primary tributaries to the Niagara River outside of the U.S. Area of Concern to determine the potential need for further source trackdown.

On the Canadian side, there are no further actions required under the Canadian Niagara River Remedial Action Plan (RAP) to identify or remediate contaminants in the Canadian AOC. The known point sources to the Niagara River were addressed in the early 1990s through other programs. All 14 areas of contaminated sediment in the Canadian AOC have now been assessed and management action has been taken. The Canadian RAP is entering its final phase and working toward delisting of the AOC. Future contaminant issues will be addressed through routine federal, provincial and municipal abatement and enforcement programs.

Advancing the Biodiversity Conservation Strategy

While knowledge and stewardship of Lake Ontario has improved in recent decades, there are still challenges to conserving and protecting the biodiversity of Lake Ontario. Ongoing implementation of the BBCS will help to address these challenges. The most significant problems facing Lake Ontario are new and evolving ecosystem conditions, such as: the arrival of invasive species, changes in nutrient cycling and the food web, and increasing temperatures. Today, Lake Ontario supports a multi-million dollar recreational fishery, but the long-term consequences of new and evolving ecosystem conditions to aquatic communities are unknown. In conjunction with routine fisheries assessments and monitoring, implementation of the BBCS will remain a high priority for Lake Ontario.

Lake Ontario Basin

Lake Ontario is the lowermost in the chain of Great Lakes that straddle the Canada/United States border, and is bordered by the Province of Ontario and New York State. Lake Ontario is the smallest of the Great Lakes, with a surface area of 18,960 km2 (7,340 square miles), but it has the highest ratio of watershed area to lake surface area.

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LAKE ONTARIO LAKEWIDE MANAGEMENT PLAN (LaMP)

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The Lake Ontario LaMP includes ecosystem goals, objectives and indicators. Ecosystem objectives have been identified for aquatic communities, wildlife, human health and stewardship. The twelve indicators are designed to track progress towards achieving the ecosystem objectives.

Overview

The Lake Ontario LaMP Committee is continuing its efforts to restore and protect the lake's ecosystem. The LaMP continues to work on the implementation of the *Lake Ontario Binational Biodiversity Conservation Strategy*, establishing monitoring programs for coastal wetlands indicators, determining the research and monitoring needs for the next binational cooperative intensive study of the lake, and undertaking programs that lead to the reduction of toxic chemicals and sediments impacting the nearshore.

This annual report focuses on the following key challenges and activities taking place on the lake:

- The reduction of critical pollutants such as PCBs to the lake through on-going trackdown efforts in both Canada and the United States;
- Updates on lake trout, Atlantic salmon and American eel restoration programs;
- Fisheries and Oceans Canada's Ecosystem Research Initiative;
- The challenge of increased urbanization on the Canadian side of the western end of Lake Ontario;
- An update of next steps to be taken by government agencies on both sides of the border to address lake priorities;
- The use of funds through the Great Lakes Restoration Initiative and Canada-Ontario Agreement to support LaMP priorities and goals.

The LaMP Committee will also continue to track issues such as newly recognized chemicals of concern, invasive species, climate change and water level regulation.

Recently commissioned fisheries assessment vessel *Ontario Explorer* brings new capacity to Ontario Ministry of Natural Resources and its partners to monitor the Lake Ontario ecosystem. Photo credit: Ontario Ministry of Natural Resources.

Accomplishments

Tracking Down PCBs in the Lake Ontario Watershed

The LaMP continues to stress the importance of reducing concentrations and loads of six critical pollutants through its *Sources and Loadings Strategy*. This Strategy provides the framework and governments' commitment to implementing source trackdown and pollution prevention and reduction from in-basin, upstream and transboundary sources. The six critical pollutants are: PCBs, dioxins/furans, DDT and metabolites, dieldrin, mirex and mercury. Four of these are the chief causes for restrictions on eating fish from Lake Ontario.

On the U.S. side, the U.S. Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (DEC) continue to track down and remediate PCBs and other contaminant sources. A remedial alternatives assessment is now underway for a section of the Black River (near Watertown N.Y.) containing elevated levels of PCBs and dioxins and furans in sediments. Sediment on the bottom of the river and along the banks, primarily downstream of the historical and present locations of paper mills and other industrial facilities, was found to be highly contaminated.

The EPA and DEC, in conjunction with Niagara County, are also conducting an extensive track down and site characterization of contaminated sediments in Eighteenmile Creek, an Area of Concern along the south shore of Lake Ontario. One major source area of PCBs and heavy metal contamination, a former industrial complex in the upper reaches of the creek within the City of Lockport, has been evaluated and remedial alternatives are being formulated for this site.

On the Canadian side, one of the sources of PCB in the Beaverdams Creek subwatershed (near Thorold, Ontario) was cleaned-up in the fall of 2010 (coordinated by the Ontario Ministry of Environment). In the second phase of this remediation project (see the 2010 Annual Report for details of Phase 1) approximately 6,000 cubic metres (7848 cubic yards) of PCB contaminated sediment was excavated from a 700-metre (765-yard) section of the creek's channel. The PCB contamination dates back to the 1960s, when a local paper recycling company recycled carbonless copy paper containing the once-ubiquitous PCB chemical compounds. The area of PCB contamination is part of the Twelve Mile Creek watershed, a western Lake Ontario tributary. Work is continuing to address other sources of PCBs and persistent contaminants within the Twelve Mile Creek watershed.

USEPA consultants collecting contaminated sediment samples in Eighteenmile Creek. Photo Credit: Victor DiGiacomo, provided by U.S. EPA.

Fishery Assessment Update

Lake trout abundance in Lake Ontario is now at the lowest level that has been observed since modern restoration efforts began in the 1970s. While the continued observations of small numbers of naturally spawned juveniles, as well as suspected naturally produced adults is encouraging, the low abundance of the stocked population is not. Lake trout assessments will continue through annual monitoring in selected regions of the lake. For more information go to: *http://www.dec.ny.gov/outdoor/27068.html*.

Ontario celebrated stocking the 2 millionth Atlantic salmon, in the 5th year of a partnership co-led by the Ontario Ministry of Natural Resources and the Ontario Federation of Anglers and Hunters. The groups are encouraged by the positive signs of progress towards restoring self-sustaining populations of this heritage species to Lake Ontario and its tributaries with almost 100 habitat enhancement projects having been completed on the Credit River, Duffins Creek, and Cobourg Brook. To learn more, visit *www.bringbackthesalmon.ca*.

For the 2nd consecutive year, the New York State DEC reported that Atlantic salmon catches in the lake were the highest observed since the mid-1990s. Anglers continued to enjoy a growing summer fishery on New York's Salmon River. Wild juveniles were recovered during assessment surveys again this year.

The American eel is an important part of the diversity of life in Lake Ontario – St. Lawrence River and offers valuable clues about the health of the ecosystem. The numbers of American eel returning to Lake Ontario from the sea are less than 3% of levels seen before the mid-1990s and these fish are in danger of extinction in the Lake Ontario – Upper St. Lawrence River part of its range. The decline of the eel is due mostly to human activity. The eel harvest reduced the eel population, dams block upstream migration routes, while hydro generation turbines kill eels during their downstream migration. Progress on the restoration of eel numbers is being made through binational government and hydro generation company efforts. For more info go to: *http://www.mnr.gov.on.ca/en/Business/SORR/2ColumnSubPage/EELPAGE.html*.

Ecosystem Research Initiative Provides Science Support for Management of Lake Ontario LaMP

Initiated in 2008, the Lake Ontario Ecosystem Research Initiative (LO-ERI) was designed as a Fisheries & Oceans Canada (DFO) pilot project to provide science support for integrated management in Lake Ontario. The LO-ERI focuses on the nearshore and builds on partnerships to address three goals related to the coastal zone including: contributing to the function of the lake ecosystem; sensitivity to cumulative effects of multiple stressors; and projected responses to future conditions. Research to address these goals is ongoing. The project is relevant to ongoing multi-agency discussions of the need for integrated coastal zone management in the Great Lakes, and is part of an ecosystem-based approach to the management of current and emerging issues.

Students from Belfountain Public School help stock Atlantic salmon fry into Credit River. Photo Credit: M. Daniels, Ontario Ministry of Natural Resources.

Challenges

Increased Urbanization at the Western End of Lake Ontario

Lake Ontario continues to experience rapid growth and urban development in the Canadian portion of the western end of the lake. This area, known as the Greater Golden Horseshoe, from Niagara-on-the-Lake to Oshawa, is one of the fastest-growing regions in North America. The population is expected to grow by almost 50% by 2031, from 7.7 million to 11.5 million people. The City of Toronto and the Greater Toronto Area (GTA) is anticipated to be home to close to 8 million people. While there are benefits that come with growth, there is also the need to understand how to accommodate this growth in a manner that doesn't further stress water quality in the western end of Lake Ontario, especially its nearshore. To help address the forecasted growth, the Ontario Government has developed the Growth Plan for the Great Golden Horseshoe area. For information on this growth plan see *https://www.placestogrow.ca/index.php?option=com_content&task=view&id=9&Itemid=14*.

Next Steps

Agencies Taking Action in Both Canada and the U.S.

Canada

Federal and provincial agency staff from Environment Canada and the Ontario Ministry of Environment, plus St. Lawrence River Restoration Council partners, have been consulting with the local community (municipalities, conservation authority, public and First Nations) to obtain their position on re-designating the St. Lawrence River (Cornwall) AOC, either by delisting the AOC, or identifying it as an Area in Recovery. The responses received will help inform the two levels of governments' decision on the status for this AOC, which is expected in the summer of 2011.

U.S.

The EPA and New York State DEC are looking at restoring water quality through the development of Total Maximum Daily Loads (TMDLs) to reduce phosphorus loads going into the waters of the Lake Ontario basin. For example, in Port Bay along the south shore, phosphorus buildup in sediments associated with wastewater treatment plant discharges and non-point sources, has contributed to heavy algae blooms, cyanobacteria and poor water quality.

Programs Providing Funds to Take Action on Great Lakes

Through the Great Lakes Restoration Initiative (GLRI), EPA Region 2 awarded 28 grants totaling over US$20M to state, local governments, tribes, academia and non-profits for projects ranging from improving nearshore water quality, contaminant reduction, beach monitoring and other Lake Ontario LaMP goals. For more information on GLRI go to: *http://www.epa.gov/greatlakes/glri/*.

In Canada, LaMP objectives are supported through projects delivered under the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA). For an overview of recent successes and accomplishments that have taken place, as well as challenges that are being faced under COA, *http://www.ec.gc.ca/greatlakes*, click on Canada-Ontario Agreement, and then *Keeping the Great Lakes Great* under 2007-2010 COA.

Lake Ontario Basin including Areas of Concern

Lake Ontario is the last of the chain of Great Lakes that straddle the Canada/United States border. Its shoreline is bordered by the Province of Ontario on the Canadian side and New York State on the U.S. side. Lake Ontario is the smallest of the Great Lakes, with a surface area of 18,960 km^2 (7,340 square miles), but it has the highest ratio of watershed area to lake surface area.

Special Events

Great Lakes & St. Lawrence Cities Initiative Conference

Niagara Falls, ON - June 15-17, 2011

For more information go to:
www.glslcities.org.

State of the Lakes Ecosystem Conference
Erie, PA – October 26-27, 2011

For more information go to
www.solecregistration.ca.

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The Lake Ontario Lakewide Management Plan is a binational partnership of Environment Canada, Fisheries and Oceans Canada, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Ontario Ministry of Environment, Ontario Ministry of Natural Resources and New York State Department of Environmental Conservation.

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