In This Issue

What is the Lake Ontario LAMP?

Under the 2012 Great Lakes Water Quality Agreement (GLWQA), the governments of Canada and the United States 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, led by the U.S. Environmental Protection Agency (U.S. EPA) and Environment and Climate Change Canada (ECCC). The Partnership 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: assess the state of the lake, measure progress, and promote management actions to address identified problems.

This 2016 annual report highlights accomplishments and progress during the past year and identifies LAMP-related activities including outreach, monitoring, and protection and restoration actions.

Overview

In 2016, the Lake Ontario Partnership continued to address key lakewide management issues, and cooperatively protected and restored water quality and ecosystem health across the lake basin. Priorities included:

- Implementing the Binational Biodiversity Conservation Strategy (BBCS);
- Advancing the Cooperative Science and Monitoring Initiative (CSMI);
- Improving coastal wetland and nearshore ecosystems;
- Assessing and managing nutrients;
- Restoring fish and wildlife species and habitat; and
- Minimizing the impact of aquatic invasive species.

Researchers caught an American Eel at Wolfe Island during research into downstream migration. Credit: Alastair Mathers, Ontario Ministry of Natural Resources and Forestry.

Accomplishments

Cooperative Science and Monitoring Initiative: Key Findings

The binational CSMI promotes and coordinates science programs implemented by federal, provincial, state, tribal, First Nations, academic, and non-governmental agencies. It addresses key information needs identified through the LAMP process and includes enhanced research and monitoring activities in one Great Lake per year on a five-year rotation. The 2013 Lake Ontario CSMI is the most recent and focused on fish community dynamics, nutrient levels and fate, abundance of microscopic organisms in water and sediment, and the Lake Ontario food web. The results of the 2013 CSMI have

recently become available. One aspect of the Lake Ontario food web studied in 2013 was the interaction between native and invasive bottom-dwelling fishes. Slimy and Deepwater Sculpins are native to Lake Ontario. Deepwater Sculpin were thought to have been lost from Lake Ontario by the mid-20th century. However, in 1996, they re-appeared, and have been regularly caught since 2005. At the same time, another bottom-dwelling fish, the Round Goby, invaded and became common in Lake Ontario.

Isotope and gut content analysis of sculpins and Round Goby suggested that sculpins tended to feed more on offshore prey (e.g., Mysids), while Round Goby feed more on nearshore prey (e.g., Quagga Mussels). Overall, native sculpins had similar diets and there was little overlap with Round Goby. Since native sculpins and invasive Round Goby feed in different areas of Lake Ontario, this may help to reduce direct competition for food.

Other findings of the 2013 CSMI were:

- Total phosphorus concentrations in open lake water have remained stable at 6 – 8 micrograms per litre for the past 15 years. These levels are low and could affect productivity of the lower food web.
- Lakewide Quagga Mussel biomass was similar to that of 2003 with a shift towards larger mussels and increased numbers of mussels in waters deeper than 90 metres (295 feet).
- Round Goby may play an important role in transferring nutrients from the offshore to the nearshore zone by consuming offshore mussels, and travelling to the nearshore where they can be consumed by nearshore fish such as Yellow Perch and Smallmouth Bass.
- Alewife continue to dominate salmon and trout diets; however, Round Goby are also a significant prey species for some salmonid species.
- *Diporeia*, a benthic organism once a valuable source of food for fish, is near extirpation. Only one individual was collected in 2013 CSMI sampling.

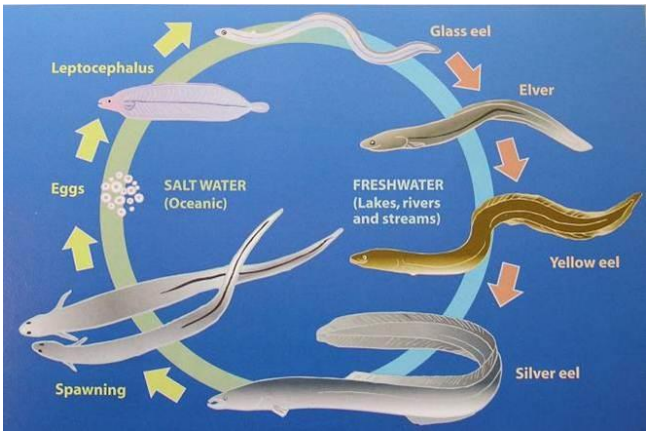
The 2013 CSMI reports have been published in scientific journals and more will be completed in the near future. To learn more, visit: http://www.dec.ny.gov/lands/95533.html.

American Eel Passage Research

American Eel have a migratory life cycle. They spawn in the North Atlantic Ocean and mature in fresh waters from Greenland to South America, including Lake Ontario. This complex life cycle and wide geographic range is a challenge for conservation and protection.

For eel in Lake Ontario, two hydroelectric dams in the St. Lawrence River pose a challenge for upstream and downstream migration. Hydroelectric companies have taken action to improve upstream eel passage around their facilities.

Upstream passage for juvenile eel is relatively straightforward, since eel ladders have been installed at both locations to provide a safe route to Lake Ontario. Finding a way to allow adult eel migrating downstream to safely pass the dams is a real challenge. Adult eel must travel through the turbines and many do not survive. The river is too large to install and maintain barrier screens.



Life cycle of the American Eel. Credit: Toronto Zoo.

The Eel Passage Research Center was established in 2013 to address this problem with funding from the Ontario Power Generation, Hydro Québec, New York Power Authority and Duke Power. The research goal is to identify a suitable method to guide eels to a safe collection point, so they could then be captured, transported and released downstream of both dams. Studies have focused on possible methods for guiding the eels to the collection point, including use of light, electricity, sound and vibration, electromagnetic fields and water velocity gradients.

Lake Sturgeon Restoration and Research

Lake Sturgeon is a unique species once abundant in the Great Lakes. Sturgeon can grow up to 7 feet long and weigh over 300 pounds (136 kg), and take from 15 to 33 years to reach reproductive maturity. Overfishing and the impacts of dams and dredging nearly drove them to local extinction by 1900. They are currently identified as "Threatened" in New York and Ontario under endangered species legislation.

In the past 25 years, collaborative work has focused on protecting remnant populations and restoring Lake Sturgeon in Lake Ontario, the Niagara and St. Lawrence Rivers, and their tributaries. Contributors have included: federal, tribal, state and provincial agencies; academic and non-government organizations; local volunteers and school children in the United States and Canada. Their efforts involved collecting eggs, raising and stocking young sturgeon, identifying suitable

habitat, constructing spawning beds, and studying their behavior and biology.

Young Lake Sturgeon about to be stocked in the Salmon River by Mohawk children from the Akwesasne Freedom School. Credit: Doug Carlson, New York State Department of Environmental Conservation (NYSDEC).

The success of these efforts is now being observed across the Lake Ontario basin. Fish stocked in the 1990s are now reproducing, and remnant wild populations continue to reproduce as well.

Here are some ways you can support the effort:

- Don't fish in spawning areas in late spring;
- Avoid bottom fishing with worms in sturgeon habitat;
- If a sturgeon is accidentally caught, release it immediately without removing it from the water. If you must remove it, hold it horizontally to avoid damaging its organs; and
- If a sturgeon is tagged, record the date, location, and tag number and phone number on the tag, then release it. In New York State, report the catch by phoning the number on the tag or emailing Fwfish@dec.ny.gov. In Ontario, report it to (705) 755-2159 or to NHICrequests@ontario.ca.

Breeding Piping Plover Return to Lake Ontario Shores

Piping plover is a small shorebird recognized as an endangered species under legislation in the U.S., Canada, Ontario and New York. Plover can be found on Great Lakes beaches, where they nest in shallow depressions on the sand. The nests are well-camouflaged and difficult to see, but vulnerable to disturbance from waves, weather, people, and animals.

In 2015, for the first time in over 30 years, a pair of Piping Plover successfully nested on the southeastern shores of Lake Ontario. They nested on public land and fledged one chick in late July. Their first nest failed after a heavy rainstorm. The second nest, with two eggs, was threatened by another storm. An adult bird sat on the nest throughout, and NYSDEC staff placed sandbags around the nest for extra protection. Two days later, two chicks hatched but one disappeared a few weeks later. The surviving chick was seen flying over the water's edge with one of the adults.

Protecting the nesting birds was a collaborative effort of federal, state, and local organizations, as well as volunteers.

Here are ways that you can help protect Piping Plover:

- Leave your dog at home, or use a leash at the beach;
- Stay out of bird sanctuaries and signed areas; and
- Pick up litter to avoid attracting predators.

Three adult Piping Plovers on an eastern Lake Ontario beach, 2015. Credit: Elizabeth Truskowski, NYSDEC.

Addressing Challenges

Preparing for Lake Specific Nutrient Targets

Nutrients continue to pose a challenge to the lake's ecosystem. In the nearshore, excess nutrients contribute to blooms of nuisance and harmful algae such as *Cladophora*. In the offshore, a decline of total phosphorus concentrations below the GLWQA target of 10 micrograms per litre potentially limits lower food web productivity.

Although the GLWQA Nutrients Annex Subcomittee continues to focus on Lake Erie, in 2015 it formed a Lake Ontario Nutrient Targets Task Team to initiate steps required to develop nutrient targets. In 2016, the Task Team drafted a proposal to review historical nutrient trends and identify gaps in research, monitoring and modeling.

The relationship between nutrient loadings and excessive *Cladophora* blooms is complex. In 2016, a workshop was held to develop a path forward for each of the Great Lakes affected by excessive *Cladophora* blooms.

Recommendations from both the workshop and the Task Team proposal will be used to establish and implement research, monitoring, and modeling priorities to support the development of nutrient loading targets for Lake Ontario.

Grass Carp in the Lake Ontario Ecosystem

An aquatic invasive species (AIS) is any non-native plant or animal that is newly introduced into an aquatic ecosystem and causes, or could cause, damage to the local ecology,

economy and/or society. Bighead, Silver, Grass and Black Carp species, collectively referred to as Asian Carps, are examples of a costly group of AIS that have invaded waterways in the United States and imminently threaten to invade the Great Lakes ecosystem.

In 2012, the Government of Canada initiated a five-year Asian Carp Program to protect the integrity of the Great Lakes basin by preventing the introduction and establishment of Asian carps. The program is led by Fisheries and Oceans Canada staff in Burlington, Ontario. It uses a multi-disciplinary approach with four pillars: prevention, early warning, response, and management. The prevention pillar includes outreach, research and risk assessment. Under the early warning pillar, the staff visit 34 high risk locations around the Canadian Great Lakes basin to look for Asian carps using traditional sampling gear. Under the response pillar, they work closely with the Government of Ontario to respond to Asian Carp captures in Canadian waters by conducting a thorough search for additional fish and removing them from waterways.

Since 2012, 12 Grass Carp have been captured. Between July and September 2015, eight were discovered in four locations around Lake Ontario: Toronto, Bay of Quinte, Jordan Harbour, and Lower Niagara River. They included five fertile males, one fertile female, one sterile male, and one male of unknown fertility. No evidence of recent spawning behaviour or activity was apparent in any of the fertile males. The female had eggs that were being reabsorbed. The fish ranged from approximately 9 to 24 years old. There have been no recent reports of Grass Carp from New York's Lake Ontario waters, but they have been collected infrequently elsewhere in the state.

This Grass carp was caught near Toronto in 2015. Credit: Toronto and Region Conservation Authority.

In Canada, a new National AIS Regulation came into force in the summer of 2015. Plans are well underway to continue fighting Asian carps and protecting the Great Lakes ecosystem for the upcoming 2016 field season. Companion efforts to combat Asian carps in New York State waters are being developed in a draft Asian Carp Action Plan expected to be released later this year.

You can report an Asian carp capture by calling 1-877-STOP-ANS (786-7267) in the United States, or 1-800-563-7711 in Ontario, Canada.

Connecting Channels Update: Niagara River

Given that the Niagara River contributes 85% of Lake Ontario's water by volume, managing nutrients delivered by the river is important for loadings to the lake. The status and long-term trends of nutrients and major ions in the Niagara River are a major focus of work being conducted by ECCC. In 2015, efforts focused on ensuring that water samples and analytical methods provide accurate and effective measures of river water quality. To do this, ECCC compared samples from the Fort Erie (upstream) and Niagara-on-the-Lake (downstream) sites to adjacent transects. The analysis showed that both sites reasonably represent nutrient and major ion concentrations. A collaborative comparison to evaluate sampling and analytical methods was initiated by ECCC and the United States Geological Survey. Preliminary results show that both agency methods produce comparable results and further comparisons are planned for the 2016 field season. Analysis of ECCC's long-term nutrient data reveals that total phosphorus concentrations in the Niagara River have not increased significantly, but have been more variable since about 1990. Phosphorus loading to Lake Ontario at Niagara-on-the-Lake has increased by approximately 1% per year when evaluated over the entire 1976-2015 time period, and median phosphorus loading to Lake Ontario has been just over 5700 metric tons per year for the past 25 years.

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