LAKE ONTARIO LAKEWIDE ACTION AND MANAGEMENT PLAN

2018 Annual Report

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What is the Lake Ontario LAMP?

Under the Great Lakes Water Quality Agreement (GLWQA), 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 ecosystem- based management strategy for protecting and restoring the water quality of Lake Ontario including the connecting Niagara River and St. Lawrence River to the international boundary. The LAMP is developed and implemented by the Lake Ontario Partnership, which is 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 Lake Ontario LAMP will be issued in 2019 for the period of 2018-2022.

The 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

Lake Ontario is the easternmost Great Lake and it is situated between the Niagara River at the west end and the St. Lawrence River at the east end. Overall, although much effort has gone into the protection and restoration of the lake, chemical contaminants, nutrient imbalances, loss of habitat and native species, and the spread of non-native invasive species limit the health, productivity, and use of Lake Ontario and its connecting river systems. Lakewide management is guided by a shared vision of a healthy, prosperous, and sustainable Lake Ontario in which the waters are used and enjoyed by present and future generations. Lakewide management acknowledges that the Lake Ontario basin is important in many respects. The basin holds traditional significance to Indigenous Peoples of the area, provides ecosystem goods and services, is home to various habitat and species, and provides valuable migratory pathways. The lake is also valuable to the regional and national economies due to its natural resources, transportation capabilities, recreational and tourism opportunities and provides drinking water to millions of people in Canada and the U.S. Over the past year, the Lake Ontario Partnership agencies have continued working cooperatively to protect and restore the lake's water quality and ecosystem health through various actions and programs. This 2018 Annual Report provides an update on recent actions taken and explains how some challenges continue to be addressed.

Accomplishments

Lake Ontario Lakewide Action and Management Plan: 2018-2022

Under the GLWQA, the Lake Ontario Partnership is developing the draft LAMP for the years 2018-2022. The LAMP uses an integrated management approach that recognizes the interaction of human and natural influences on Lake Ontario habitats, species, and physical processes. It is intended to guide and support the work of natural resource managers, decision-makers, Lake Ontario partners, and the public over the next 5 years. The draft Lake Ontario LAMP will be released for public input in early 2019.

The Return of Deepwater Sculpin

Deepwater Sculpin, a native Lake Ontario benthic prey fish, were once considered abundant and were likely a food source of bottom-dwelling predator fish such as Lake Trout. Declines in the mid-1900s led some to suggest the species had been locally extirpated, and the species' rarity led both Canadian and U.S. agencies to elevate its conservation status. Catches during prey fish surveys in the early 2000s indicated that Deepwater Sculpin were present in Lake Ontario and that the population may have begun to recover. In 2017, Deepwater Sculpin were the most abundant benthic prey fish by weight captured in the cooperative surveys conducted by the United States Geological Survey (USGS), New York State Department of Environmental Conservation (NYSDEC) and Ontario Ministry of Natural Resources and Forestry. Bottom trawl observations suggest the Lake Ontario Deepwater Sculpin population

has recovered and current densities may now be similar to the other Great Lakes. The reappearance of Deepwater Sculpin contributes to meeting targets identified in Lake Ontario's Biodiversity Conservation Strategy (2011).

A standard and a blue-tinted Deepwater Sculpin from Lake Ontario. Photo: USGS.

Application of Traditional Ecological Knowledge in the St. Lawrence River Area of Concern (AOC)

In Haudenosaunee (aka Iroquois) culture, plants serve an important role in the creation story, philosophies and teachings, ceremonies, medicines, food, utility, and decorations. Historic knowledge about plants that serve these functions and ways to harvest and use them come from generational teachings passed down from elders with specialized knowledge. This knowledge is commonly referred to today as "Traditional Ecological Knowledge (TEK)". In the Mohawk Territory of Akwesasne along the St. Lawrence River and its connecting tributaries, some of this knowledge also exists in Mohawk language (i.e., Kannien'kéha), including plant names and traditional uses. The use of scientific methods alone (or Scientific Ecological Knowledge (SEK)) to identify plant species in the watershed, can be a challenge when communicating solutions for management of traditional and/or culturally significant plant species amongst the resource agencies, scientists, and cultural use harvesters.

In 2017, the Saint Regis Mohawk Tribe's (SRMT) Environment Division undertook a unique blend of expertise between TEK and SEK survey techniques in the lower Grasse River (i.e. Indian Meadows) in the St. Lawrence River AOC at Massena/Akwesasne. This project successfully used a collaborative and cooperative approach between a State and a Tribe to identify Mohawk traditional use plant species in the AOC for future remedy mitigation and/or restoration. This project was funded by the SRMT, New York Power Authority's St. Lawrence River Research and Education Fund and supported by the NYSDEC. Blended projects like this could function to improve shared resource management goals and restore beneficial uses of significant cultural species by Indigenous communities in the Lake Ontario watershed.

Knowledge sharing of scientific methods and TEK between SRMT staff and botanist. Photo: SRMT.

Addressing Challenges

2018 Cooperative Science and Monitoring (CSMI) Activities

In 2018, Lake Ontario was the focus of an extensive bi-national CSMI effort involving many partnership agencies, academic institutions, as well as environmental and ecological organizations. The CSMI is a commitment under the GLWQA where each of the 5 Great Lakes is intensively monitored on a five-year rotational cycle. In 2018, a key issue for Lake Ontario included efforts to understand the complex relationship between nutrient cycling and the growth of nuisance *Cladophora* on the lakebed. It is anticipated that these comprehensive multi-partner monitoring efforts will enhance the understanding of nutrient inputs from tributaries, the transformation and uptake of the nutrients by *Cladophora* and the circulation of nutrients in Lake Ontario. Other areas of binational, collaborative research and monitoring in 2018 included:

- Diver led surveys in priority nearshore areas to monitor water quality, *Cladophora*, and Dreissenid Mussels;
- Lake Ontario Lower Aquatic Food Web Surveys to assess lakewide phytoplankton, zooplankton, mysids and larval fish through coordinated use of large vessels; and,
- A lakewide assessment of prey fish habitat used to support native prey fish restoration.

CSMI Outreach & Education

The Lake Ontario Partnership Outreach and Engagement Subcommittee developed and delivered a communications strategy that utilized news media interviews, press availability and press conferences near or on research vessels, including outreach products and social media activities during the spring and summer 2018. The Subcommittee provides the public

with up to date information regarding monitoring and other Partnership outreach activities.

Understanding Nearshore Nutrient Dynamics

The 2012 GLWQA calls on the United States and Canada to review and update loading and concentration targets for each of the Great Lakes. As already described, a key component of Lake Ontario's 2018 CSMI was to collect the information needed to better understand nutrient cycling to assist this binational reassessment of nutrient targets. Computer models are being developed to examine water quality and biologic responses to a variety of nutrient loadings scenarios. Collection of data is an essential component to viable model development. Understanding factors that can drive excessive growth of native species of benthic algae such as *Cladophora* will be critical. U.S. and Canadian teams consisting of ECCC, Ontario Ministry of Environment, Conservation and Parks (MECP), U.S. EPA, and USGS divers have conducted coordinated benthos surveys, using a common sampling approach, in order to understand the seasonal growth patterns of benthic algae. Continuous monitoring of water quality and benthic conditions through the use of Lake Bottom sensors will contribute to the analysis.

Lake Ontario benthos survey diver collecting algae and mussels for nutrient analysis. Photo: USGS.

Understanding nutrient loadings from tributaries and point sources is another important part of the puzzle needed to assist decision making. Major tributaries draining watersheds of various land uses into the Lake Ontario nearshore will be monitored. The information gathered through in-place monitoring at key tributaries, combined with in lake instrumented monitoring and vessel surveys will be complemented with hydrodynamic modeling. This modeling will help to provide a region-wide understanding of nutrient dynamics in the nearshore of Lake Ontario.

Although these regional scale monitoring efforts are essential, more detailed nutrient surveys improve the understanding of the cause and effect relationships in complex nearshore settings, such as highly-urbanized areas which can place stress on Lake Ontario's water quality. For example, the multi-partner Toronto Waterfront 2018 Nearshore Water Quality Reference Study is providing the information and insights needed to manage nutrient impacts related to a growing metropolitan area. Significant infrastructure has been planned to improve water quality along the Toronto waterfront, while at the same time urban growth is projected to increase. Baseline water quality conditions will be measured as a benchmark for assessing changing conditions and intended future improvements to water quality.

Toronto's Don River Mouth naturalization project will change loading conditions into Toronto Harbour. Image: MECP.

Connecting Rivers Update

Flow measurements in the Niagara and St. Lawrence Rivers are critical to calculate accurate harmful chemicals and nutrient and sediment loadings entering and leaving Lake Ontario. These measurements also help to compute a mass-balance water budget for the lake. In 2017, the USGS and the U.S. Army Corps of Engineers began a cooperative effort to establish state-of-the-art acoustic Doppler flow measurement stations on the lower Niagara River and the upper St. Lawrence River. Acoustic Doppler velocity meter (ADVM) technology is being used to measure water current velocities using the Doppler effect of sound waves scattered back from particles within the water column. Deploying ADVM at these two stations will provide more accurate measurements of flow into the lake from the Niagara River, and leaving the lake through the St. Lawrence River. It will also allow more exact sediment and nutrient loading estimates to be computed.

This, and all of the other initiatives mentioned above, contributes to the ongoing binational efforts of the Lake Ontario Partnership and other stakeholders to restore and protect Lake Ontario.

Locations of acoustic Doppler flow measurement stations. Image: USGS.

Outreach and Engagement

You can keep up to date on GLWQA engagement opportunities in the *Engagement* section of Binational.net. Information on many of our partner organizations' upcoming outreach and engagement opportunities can also be found at the Great Lakes Commission's *Great Lakes Calendar*.

Contact Information

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