LAKE ONTARIO

LAKEWIDE ACTION AND MANAGEMENT PLAN

2019 Annual Report

Eastern Lake Ontario Dune. Source: NY Sea Grant.

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 an ecosystem-based 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 Lake Ontario Partnership led by the U.S. Environmental Protection Agency (U.S. EPA) and Environment and Climate Change Canada (ECCC), develops and implements the LAMP and facilitates information sharing, priority setting and coordination of multinational protection and restoration activities. This 2019 Annual Report provides an update on the state of Lake Ontario, recent activities, and explains how challenges to the Lake environment continue to be addressed.

OVERVIEW

Lake Ontario is the easternmost Great Lake. It is situated between the Niagara River in the west and the St. Lawrence River in the east. 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. 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.

Over the past year, the Lake Ontario Partnership agencies cooperated to protect and restore the Lake's water quality and ecosystem health through various actions and programs. This table summarizes overall Lake Ontario conditions in relation to the Great Lakes Water Quality Agreement General Objectives, based on information from the State of the Great Lakes 2019 Highlights Report and other sources.

GLWQA GENERAL OBJECTIVES	STATUS FOR LAKE ONTARIO
Drinking water	Good
Swimming	Good
Fish and wildlife consumption	Fair
Chemical pollutants	Fair
Habitats and native species	Fair
Nutrients and algae	Fair
Invasive species	Poor
Groundwater impacts	Fair
Other	Fair

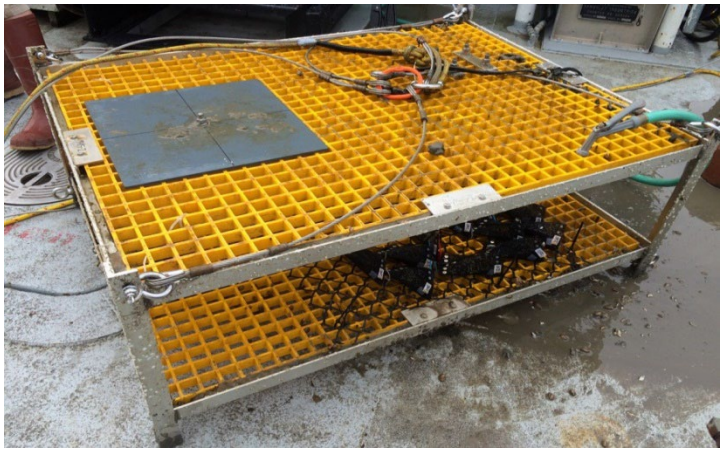
ACCOMPLISHMENTS

The 2018 - 2022 Lake Ontario LAMP

Under the 2012 GLWQA, the Lake Ontario Partnership developed the draft Lakewide Action and Management Plan (LAMP) for the years 2018-2022. In 2019, the LAMP went through extensive review by Partnership and other agencies, non-governmental organizations and the public. It is intended to guide and support the work of natural resource managers, decision-makers, Lake Ontario partners, and the public from 2018-2022.

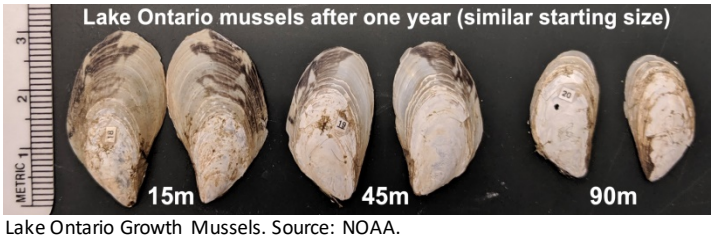
Binational Cooperation on Science and Monitoring – Improved Understanding of Quagga Mussel Growth Dynamics

Under the bi-national Cooperative Science and Monitoring Initiative (CSMI) partner agencies conducted field work in 2018. In 2019 CSMI work continued with data analysis capped by a June 2019 Data Synthesis Workshop at Buffalo State College. More than 40 researchers from the U.S. and Canada gathered to share preliminary findings and plan reports and publications based on 2018 water quality monitoring, food web and wetlands investigations.



Mussel Growth Mooring. Source: NOAA.

One such CSMI investigation improved our understanding of quagga mussel growth at different depth, temperature and food levels. The draft Lake Ontario LAMP identifies four specific issue areas with one of those being Invasive Species. Understanding the behaviour and dynamics of invasive species in the Lake ecosystem is important for effective management. In 2018 U.S. National Oceanic and Atmospheric Administration (NOAA) and U.S. Geological Survey (USGS) scientists deployed three instrumented moorings containing caged quagga mussels. The moorings near Oswego, NY sat on the lake bottom at depths of 15, 45, and 90 m (49, 148 and 295 ft) for nearly a year. The highest growth rates occurred at 15 m, however, more mussels died in the 15 m and 45 m cages.



Lake Ontario Growth Mussels. Source: NOAA.

Favorable conditions for growth did not translate to higher numbers of mussels at these depths. Analysis of results alongside historical field data from Lake Ontario may help explain the depth-specific shifts in quagga mussel density over time. Quagga mussels at 45 m and 15 m in Lake Ontario had higher growth and mortality rates at similar depths than mussels in Lakes Michigan and Huron. The low growth observed at 90 m was similar across all three Lakes. Improving our ability to describe quagga mussel population dynamics is important for anticipating current and future changes caused by this highly impactful invasive species.

Restoration of the Rochester Embayment Area of Concern

Rochester Embayment AOC. Source: USACE.

2018 marked the completion of all management actions required to remove beneficial use impairments (BUIs) and delist the Rochester Embayment Area of Concern (AOC). This was the culmination of three decades of effort by U.S. federal, state, and local partners to develop and implement a staged Remedial Action Plan, or RAP, for the AOC.

In recent years, an influx of Great Lakes Restoration Initiative (GLRI) funding allowed the New York State Department of Environmental Conservation (NYSDEC), Monroe County, U.S. Army Corps of Engineers (USACE), U.S. EPA, U.S. Fish & Wildlife Service (USFWS), State University of New York (SUNY) Brockport, Ducks Unlimited, and other partners to make significant progress to address BUIs in the Rochester Embayment, particularly in the areas of protecting and restoring fish and wildlife habitat, and beach improvements. The projected delisting date for the Rochester Embayment AOC is 2022-2023 following a

monitoring program to ensure restoration and protection goals have been met.

Restoration and Protection of Aquatic Shoreline Habitat

In 2010, Credit Valley Conservation (CVC), the Region of Peel, and the Toronto and Region Conservation Authority began to transform an ecologically impaired industrial shoreline to a shoreline park using waste rubble and clean fill. Still under construction in 2019, the Jim Tovey Lakeview Conservation Area is taking shape in south-eastern Mississauga. The Park will eventually be 26 hectares (ha) or 64 acres (ac) of new wildlife habitat: 11.8 ha (29 ac) of meadow, 1 ha (3 ac) of cobble beach, 4.6 ha (11 ac) of forest, 7.7 ha (19 ac) of coastal wetland and 0.8 ha (2 ac) of rocky islands. Once completed the Conservation Area will address multiple goals in CVC's *Living by the Lake* shoreline management plan such as: increased habitat for both migratory and resident wildlife, rocky islands to mitigate shoreline erosion and support fish spawning, and enhanced shoreline accessibility for people and wildlife.

Jim Tovey Lakeview Conservation Area. Source: CVC.

In Braddock Bay, New York, erosion had washed away emergent wetlands and invasive species dominated the shoreline marshes. In 2017, USACE along with U.S. EPA, NYSDEC, and the town of Greece, began a project to restore the Braddock Bay ecosystem. Today the completed restoration project protects 340 ac (136 ha) coastal embayment, restored 13.5 ac (5.4 ha) of emergent marsh and 4.75 ac (1.9 ha) of sedge-grass meadow, created 2 ac (0.8 ha) of new emergent marsh, and created a barrier beach system with 4 ac (1.6 ha) of sand beach habitat. Initial monitoring demonstrates increased vegetative diversity and northern pike spawning in the restored wetlands, as well as extensive shorebird and migratory bird utilization of the beach habitat including visits by the Black-bellied plover, Baird's sandpiper, and the federally endangered piping plover.

Braddock Bay barrier beach in Greece, NY, October 16, 2016. Source: USACE.

ADDRESSING CHALLENGES

Excessive Growth of the Filamentous Green Algae Cladophora

The 2012 GLWQA commits the U.S. and Canada to review targets and loadings for nutrients in the Great Lakes. Although Lake Erie has been the recent focus of attention for nutrient reduction, Lake Ontario is also challenged by nutrients and eutrophication, particularly nearshore nuisance benthic algae.

In 2018, Canadian and U.S. scientists (ECCC, Ontario Ministry of the Environment, Conservation, and Parks (MECP), USGS, and U.S. EPA) used a common approach to monitor the status and drivers of nuisance benthic algae growth along Lake Ontario's shorelines. SCUBA divers collected water, *Cladophora* and dreissenid mussel samples and analyzed them at selected 'sentinel sites' during the growing season. A suite of stationary sensors measured light availability, water currents, and other physical factors that affect water quality. Data generated will be used to better understand nearshore ecological processes, particularly the relationship between the growth of *Cladophora* and dreissenid mussels, the biological cycling of the nutrient phosphorus, and the influence of tributary phosphorus on *Cladophora* growth.

Results will be used to calibrate and validate models to guide future management actions. Preliminary results in Canadian waters indicate a positive correlation between the number of dreissenid mussels and *Cladophora* production (Howell, 2018).

Restoration of Native Fish Populations

Bloater (*Coregonus hoyi*) are a pelagic fish species native to Lake Ontario that inhabits deep, offshore habitats. While records are sparse, commercial fishery catch data suggest the species was historically abundant in Lake Ontario, but by the 1970s, was rare. U.S. and Canadian researchers from the USFWS, USGS, NYSDEC, and Ontario Ministry of Natural Resources and Forestry (MNRF) have worked collaboratively since 2012 to assess status and bolster Bloater populations through experimental stocking.

In 2018, scientists stocked 88,000 fall fingerlings and 19,000 yearlings in U.S. waters of Lake Ontario. In the period 2012 – 2017, researchers captured just two Bloater in annual bottom trawl surveys but in 2018, Agency scientists captured three individuals during the April survey and another in the October survey (Weidel et al., 2019). Adult Bloater stocked in U.S. waters are batch marked with calcein, a chemical compound that produces a visible mark on fish scales and bones (Chalupnicki et al., 2016). Initial examinations of calcein marks link the April 2018 caught fish to a 2017 stocking near Oswego, NY. These fish moved at least 114 and 203 kilometers (71 and 126 miles) from the stocking site in fall of 2017 to their capture locations in April 2018 (Niagara River, Hamlin Beach). Capture of four Bloater in one year and evidence of calcein marks indicates stocked fish are surviving and growing in number, suggesting current trawl surveys may be a good indicator of restoration success (Weidel et al., 2019).

Bloater. Source: USGS.

In Canadian waters of Lake Ontario, in 2018 MNRF stocked approximately 91,000 Bloater at various locations throughout the Lake including 9,000 yearlings, 1,100 age-2 fish near Main Duck Island, another 79,000 south of Cobourg and an additional 3,000 in the lower Bay of Quinte to support ongoing research studies (Holden, 2019).

Plastics and Microplastics in Lake Ontario

Public shoreline cleanups and studies on microplastics (small pieces of plastic less than 5 mm, about 3/16 inch, in diameter) indicate that plastic and microplastic pollution is an issue for the Great Lakes. In recent years the MECP, with partners at the University of Western Ontario and the University of Toronto, sampled surface waters, wastewater, sediments, and fish in Lake Ontario for microplastics to assess their occurrence and understand their sources.

In 2015 MECP found the greatest abundance of microplastics measured in the Great Lakes to date in the Toronto Harbour/Humber Bay area of Lake Ontario, with up to 20 million microplastic particles per square kilometer.

The shape and character of the plastic particles found in water and sediment point to a variety of sources that contribute to microplastics present. These include fragments of plastic from disintegrating larger plastic litter, building materials, plastic product production, recycling activities, and foam from packaging and insulation. These findings will provide direction and emphasis for activities to reduce the amount of microplastics entering the Lake. Additional samples collected in 2018 at Lake Ontario Index stations will provide more information as these are analyzed and interpreted. MECP is currently investigating the effects microplastics have on freshwater fish, and whether ingested plastics move from the stomach to the edible tissues of sportfish.

Resource managers and ecologists in the U.S. are increasingly concerned about microplastics, specifically microfibers. In 2014-15 and 2017-18, USGS evaluated 15 streams in New York that flow into Lake Ontario for microplastic contamination. Sampling locations represented a range of hydrologic and land-use settings. Data showed the presence of plastic particles in all hydrologic and land-use settings for whole water, sediment, and atmospheric samples. Plastic fibers were the dominant particle types in the atmospheric samples.

Microplastics. Source: MECP.

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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