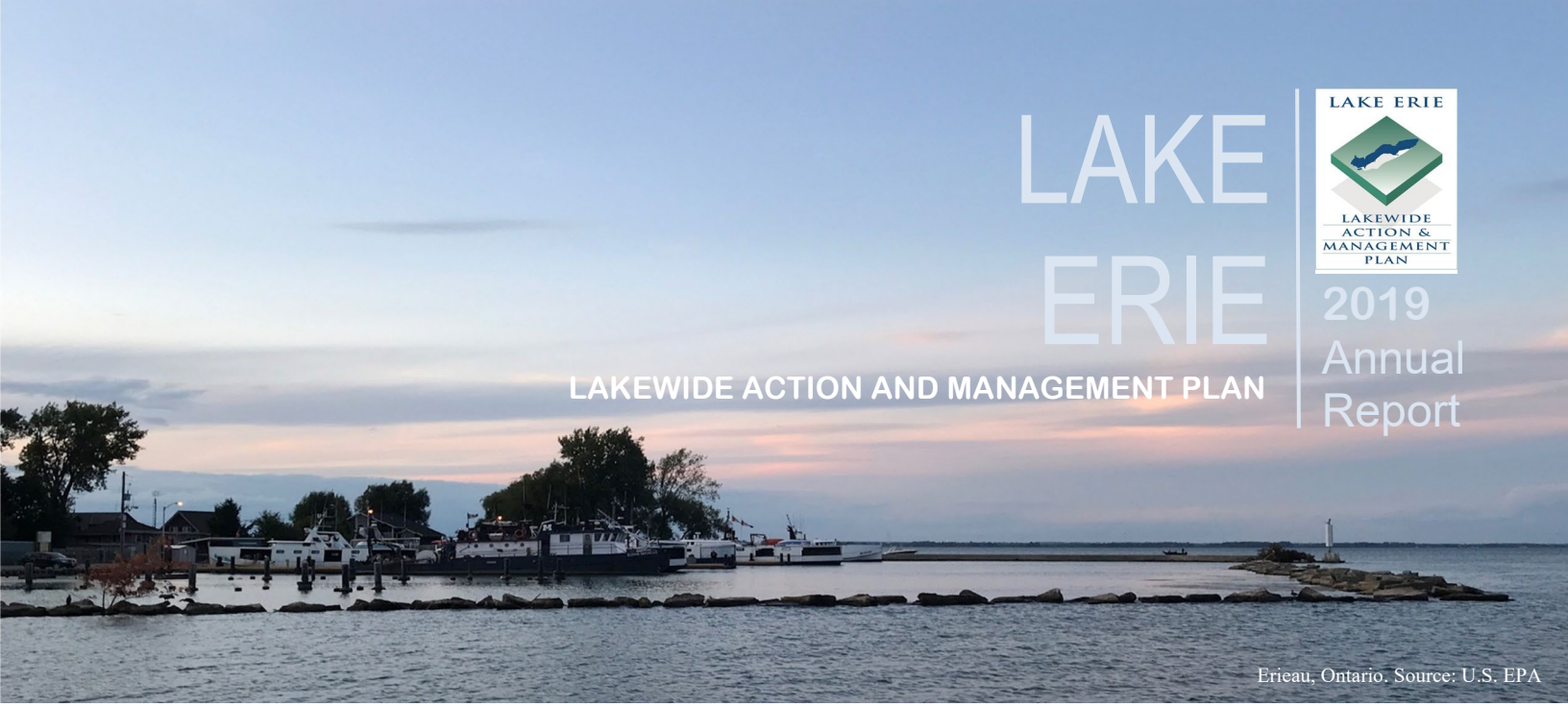

Erieau, Ontario. Source: U.S. EPA

In this issue

What is the Lake Erie 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 Erie Lakewide Action and Management Plan (LAMP) is an ecosystem-based strategy for protecting and restoring the water quality of Lake Erie, the St. Clair River, Lake St. Clair and the Detroit River. The LAMP is developed and implemented by the Lake Erie Partnership, which is led by the U.S. Environmental Protection Agency (U.S. EPA) and Environment and Climate Change Canada (ECCC) and includes other federal, state, provincial, tribal, First Nation and local watershed management authorities. The Partnership facilitates information sharing, sets priorities, and assists in coordinating environmental protection and restoration activities.

OVERVIEW

Lake Erie provides drinking water and recreational opportunities for over 12 million people in Canada and the United States, and its shallow, productive waters support the highest species diversity and fish production of all the Great Lakes. This highly valuable resource has, over the years, suffered from nutrient and bacterial pollution, chemical contamination, and watershed impacts to critical habitats and species. Despite these threats, Lake Erie continues to be a source of high-quality drinking water, its beaches have shown increases in the number of days open and safe for swimming, and increased aquatic habitat connectivity due to dam removal and mitigation projects supports fish populations in the lake. Binational and domestic strategies and actions are being implemented to combat harmful algal blooms and to protect and conserve the native biodiversity of Lake Erie. This 2019 Lake Erie LAMP Annual Report provides information and updates on recent actions taken to restore Lake Erie, including watershed nutrient management initiatives; coastal habitats and species protection efforts; Lake Erie science and monitoring; and other Lake Erie Partnership activities.

This table summarizes overall Lake Erie 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 ERIE
Drinking water	Good
Swimming	Fair
Fish and wildlife consumption	Fair
Chemical pollutants	Fair
Habitats and native species	Poor
Nutrients and algae	Poor
Invasive species	Fair to Poor
Groundwater impacts	Fair

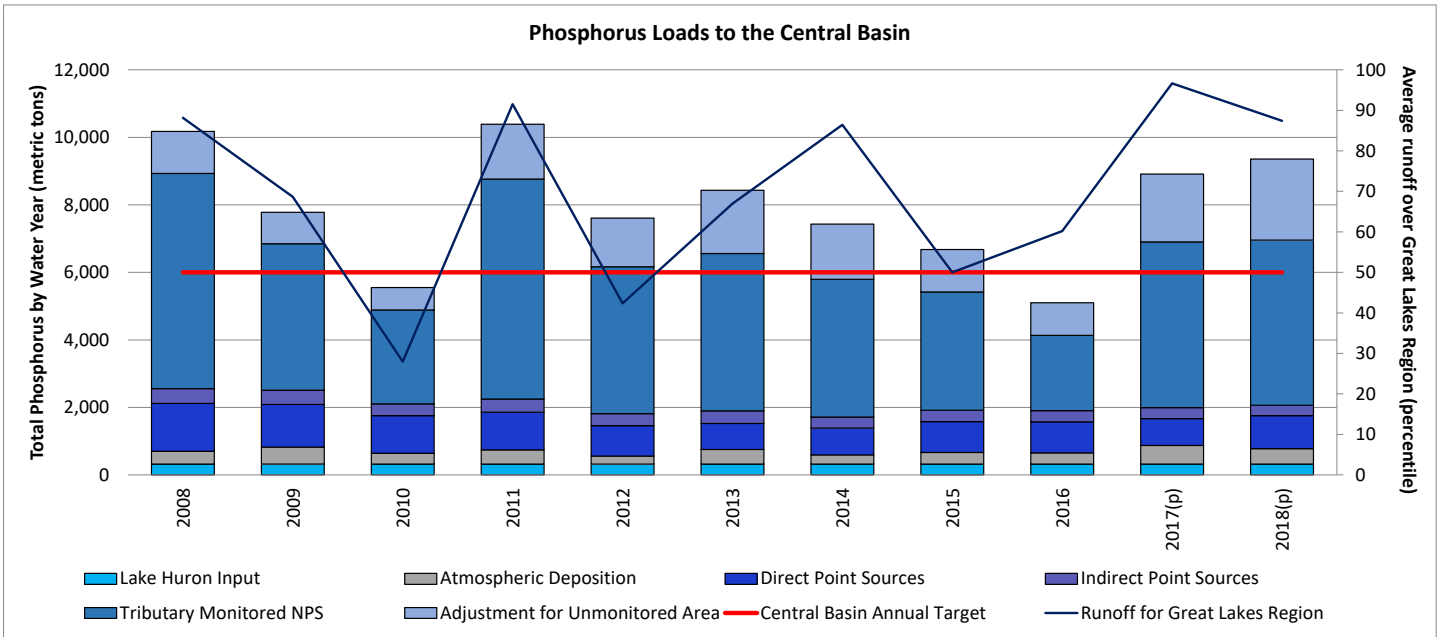

Figure 1. Total phosphorus loads (metric tons per water year) to the central basin of Lake Erie by source type (2008–2018). Red line indicates central basin total phosphorus load target of 6,000 metric tons. Black line indicates average runoff for entire Great Lakes basin (percentile; normalized to a scale ranging from 0 [lowest value] to 100 [highest value]), (p) indicates data are considered provisional. Source: U.S. EPA.

STATUS OF LAKE ERIE NUTRIENTS AND ALGAL BLOOMS

Phosphorous Loads

The historic record of annual phosphorus loads since 1967 shows that the total amount of phosphorus entering Lake Erie varies significantly each year, largely due to the variability in nonpoint source runoff. The amount of nonpoint source runoff is directly related to the amount, timing and intensity of precipitation. The GLWQA central basin target load of 6,000 metric tons total phosphorus was not met in 2018 (Figure 1). Maumee River and other primary tributary spring phosphorus load targets, which drive the western basin algae bloom, were also not met in 2018.

Harmful Algal Bloom Seasonal Assessment

The National Oceanic and Atmospheric Administration (NOAA) and its partners use remote sensing, multiple models and daily monitoring of the Maumee River to predict and track the formation and movement of harmful algal blooms in the western basin during the summer months. The *Microcystis* cyanobacteria bloom in 2019 had a severity index of 7.3, indicating a relatively severe bloom (Figure 2). The severity index is based on a bloom's biomass – the amount of its harmful algae – over a sustained period and is on a scale of 1 to 10.5. The largest blooms, 2011 and 2015, had severities of 10 and 10.5, respectively.

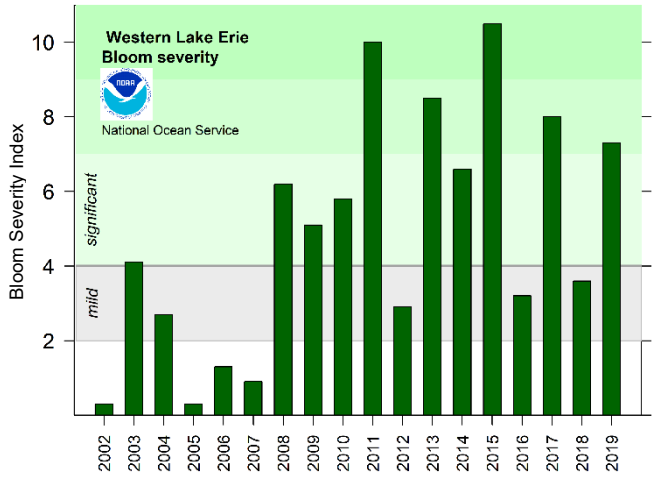

Figure 2. Western basin bloom severity index for 2002-2019. Source: NOAA.

2019-2023 LAKE ERIE LAMP

The draft 2019-2023 Lake Erie Lakewide Action and Management Plan fulfills a United States and Canadian commitment of the Great Lakes Water Quality Agreement to assess ecosystem condition, identify environmental threats, set priorities for research and monitoring, and identify further actions to be taken by governments and the public to protect and restore the waters of Lake Erie and the St. Clair – Detroit River System (SCDRS). The Lake Erie Partnership has identified five priority threats to the waters of Lake Erie and the SCDRS, including: Nutrients and bacterial pollution; Chemical contaminant pollution; Loss of habitat and native species; Invasive species; and Climate change impacts.

Strategies and Actions

During 2019-2023, members of the Lake Erie Partnership will undertake 41 actions to address the priority environmental threats to the water quality and ecosystem health of Lake Erie and the SCDRS as outlined in the draft 5-year LAMP. Partnership members will work with watershed management agencies, local public agencies, the public and indigenous people to implement the management actions.

Coordination of efforts will be assisted by regular communication, tracking and reporting by the Lake Erie Partnership agencies.

ACCOMPLISHMENTS

Taking Action to Reduce Nuisance and Harmful Algal Blooms

Reducing Nonpoint Nutrient Sources in the Thames River

The Lower Thames Valley Conservation Authority launched the McGregor and Jeannette's Creek Phosphorus Reduction Program in 2019. The primary objective of the project is to work with agricultural producers to improve soil health and reduce the amount of agriculturally sourced phosphorus entering the Thames River, Lake St. Clair and ultimately Lake Erie. Incentives and technical support are available to farmers to implement targeted Agricultural Best Management Practices (BMPs) within each sub watershed. Reductions achieved will be quantified through sub watershed monitoring and modeling activities to assist Ontario and Canada in meeting the Thames River 40% reduction target for total and soluble reactive phosphorus loads entering Lake St. Clair and Lake Erie. The program will be available from 2019 to 2022.

On-farm research continues in the Medway Creek subwatershed near London, Ontario to monitor the benefits of wide-spread cover crop adoption on water quality. Source: Upper Thames River Conservation Authority.

New York State Efforts

New York State has committed to a tributary monitoring program and Soil and Water Assessment Tool (SWAT) model development that will support a Nine-Element watershed management plan for its portion of Lake Erie. Under contract to New York State Department of Environmental Conservation (NYSDEC), the U. S. Geological Survey (USGS) began the monitoring and modeling effort in late 2017; the work continues and is scheduled for completion in 2021. The Lake Erie Watershed Protection Alliance, a coalition of municipal agency representatives and stakeholders, continues to leverage state funding to develop the Nine-Element Plan, which will be finalized after the final tributary monitoring data and SWAT models are available.

Grand River and Thames River Water Management Plans

In Ontario, Water Management Plans are now in place for the two largest Canadian sub-watersheds in the Lake Erie basin. The Thames River (Deshkan Ziibi) Shared Waters Approach to Water Quality and Quantity was completed in 2019 and will be posted in early 2020. The 20-year plan was developed by the partners in the Thames River Clear Water Revival and addresses key actions to improve the Thames and reduce its impact on Lake St. Clair and Lake Erie. The Grand River Water Management Plan was completed in 2014 and has now undergone 5 years of implementation. Considerable work has been done toward the Plan goal of improving water quality to improve river health and reduce the Grand's impact on Lake Erie, including wastewater treatment plant upgrades and optimizations, watershed characterization studies, implementation of rural water quality BMPs, and stormwater management planning.

Conserving Lake Erie Habitat

Increasing Tributary Connectivity

The Dunnville Dam on the Grand River in Ontario was built in 1829 to allow river water to be diverted east through a feeder canal during the development of the first Welland Canal. With the completion of the third Welland Canal in 1887, the Grand River was no longer needed as a source of water, but the dam has remained in place. Located just 4.3 miles (7 km) upstream of Lake Erie within the Grand River estuary, the dam has significantly impacted native migratory fish species such as walleye and lake sturgeon and has cut off coastal wetlands from the lake. In 2019 a multi-partner initiative completed a study to determine priority actions for restoring the lower Grand River's connection with the lake, with a focus on migratory fish and reconnecting coastal wetlands.

The Ballville Dam on the Sandusky River in Ohio was built in 1913 for hydroelectric power generation and was approximately 124 m (407 feet) long and 10.5 m (34 feet) high. The City of Fremont purchased the land and facilities in 1959 and re-purposed the dam to provide the City's water supply. Progressive deterioration of the dam and associated sea wall was noted in successive inspections beginning in 1980. The city constructed a new drinking water source in 2013 and the dam was successfully breached in 2018. With the channel restored to a free- flowing condition, the river was reopened for fish to run upstream to spawn and a mature sturgeon was caught (and released) in the spring of 2019 only months after the dam was removed. The Ballville Dam Project was funded by the Great Lakes Restoration Initiative through the Great Lakes Fish and Wildlife Restoration Act.

Ballville Dam site before (top) and after removal (bottom). Source: An Aerial Viewpoint.

Howard Marsh Metropark

Coastal wetlands are critically important to a healthy Lake Erie. A recent significant coastal wetland restoration project in Ohio is the 1,000-acre (405-hectarce) Howard Marsh Metropark. The park was previously a working farm operation and showcases six miles of water trails for canoeing and kayaking; five miles of walking trails, including a 1,300-foot (396-meter) boardwalk; and two overlooks for fishing and observation.

Howard Marsh, along with the nearby Metzger Marsh State Wildlife Area, Maumee Bay State Park, Magee Marsh State Wildlife Area, and the Ottawa National Wildlife Refuge are recognized for their concentration of songbirds during spring migration. There have been 267 different species of birds verified in just the first year since the park opened.

Howard Marsh. Source: Metroparks of the Toledo.

Upper Niagara River Habitat Projects

With funding from U.S. EPA, New York State Parks, in partnership with NYSDEC, is undertaking four significant habitat restoration projects in the upper Niagara River that will benefit fish and wildlife. The projects include creating channels in densely vegetated sections of coastal wetland areas; protecting important habitat areas from waves and ice, allowing submerged and emergent vegetation to grow; improving fish spawning habitat, especially for muskellunge; and protecting and expanding important stands of aquatic vegetation in the Grass Island section of the river, an important area that provides cover for fish as well as protected nesting, roosting and feeding sites for birds and waterfowl.

Five newly constructed rock reefs offshore of Grand Island in the Niagara River. Source: NYS Parks.

ADDRESSING CHALLENGES

Prevention of Cyanobacteria Bloom Formation Using Cyanophages

Environmental health scientists at The Ohio State University are searching for a more environmentally friendly way to reduce microcystins in lake water and drinking water treatment plants. Cyanophages are viruses prevalent in water that infect only cyanobacteria; they may be a solution but they have not been well-studied in freshwater lake systems. A pioneering project has identified the first type of cyanophage from Lake Erie that can destroy *Microcystis* by interfering with growth and pigment production. This interference turns the algae from bright green to yellowish green, disrupts photosynthesis, and structurally ruins cyanobacteria cells. Current research is looking to discover a way to use these viruses to both limit cyanobacteria in targeted locations and to use them in water treatment plants in place of chemicals like chlorine and ozone.

Cooperative Science and Monitoring

The 2019 Cooperative Science and Monitoring Initiative (CSMI) field year on Lake Erie was a success due to the high degree of collaboration among the U.S. and Canadian federal, state, and provincial agencies and universities conducting research and monitoring activities. Significant efforts were made toward addressing the Lake Erie Partnership's overarching science and monitoring themes: watershed-based eutrophication, in-lake eutrophication, changing food web, and chemical contaminants.

Citizen Science

The challenges facing the Great Lakes are complex and broad in scope and scale. Citizen Science – the collection and analysis of data by volunteers, often in collaboration with government scientists or university researchers – is one way to increase collaboration and efficiency, improve and complement existing reporting, engage citizens, increase public awareness of environmental issues, and fill data gaps. There is growing awareness of the value that citizen science can bring to research by expanding the human and financial resources required for tackling large-scale research questions.

NYSDEC has launched an online reporting tool (https://www.dec.ny.gov/lands/117838.html) that the public can to use to submit observations of nuisance algae along the New York shorelines of Lake Erie, Lake Ontario, and the Niagara and Saint Lawrence Rivers. The information collected will complement ongoing monitoring and modeling efforts under the GLWQA to provide a better understanding of where, when, and the extent to which *Cladophora* is accumulating along the Great Lakes shorelines.

Along the Ontario shore of the eastern basin of Lake Erie, a community-based recreational water quality monitoring project was initiated in spring 2019. A partnership between Swim Drink Fish Canada, Niagara College and the Niagara Coastal Community Collaborative, with funding from Environment and Climate Change Canada, the recreational water quality data collected by citizen scientists are made available to the public via www.theswimguide.org.

Ecosystem Restoration students analyzing recreational water quality samples for *E. coli* at the Swim Drink Fish lab space at Niagara College, Niagara-on-the-Lake Campus. Source: Swim Drink Fish.

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".

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