LAKE ERIE

LAKEWIDE ACTION AND MANAGEMENT PLAN

2022 ANNUAL REPORT

Marblehead Lighthouse. Source: The Lakehouse Inn.

In this Issue

What is the Lake Erie LAMP?

Under the Great Lakes Water Quality Agreement (GLWQA), the governments of Canada and the United States have committed to restoring and maintaining 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 (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

In 2022, the Lake Erie Partnership agencies continued to implement the 2019-2023 Lake Erie LAMP. The plan includes implementation actions to protect and restore water quality in Lake Erie and St. Clair – Detroit River System. The Partnership also contributed the 2022 State of Lake Erie Conference, the 2022 State of the Great Lakes report, the 2022 Progress Report of the Parties, and the 2022 Great Lakes Public Forum. These collaborative activities identify and assess the most pressing issues in Lake Erie, recent accomplishments, and further actions needed to achieve the Great Lakes Water Quality Agreement's General Objectives.

The Partnership also contributed to the Lake Erie Cooperative Science and Monitoring Initiative (CSMI) workshop held in August 2022. This workshop convened 70 scientists from the U.S. and Canada to review current knowledge, data, and information needs, informing priorities for Lake Erie's 2024 CSMI field year.

Lake Erie is a good source of high-quality drinking water for millions in Canada and the United States. It supports the highest species diversity and fish production of the Great Lakes, and many toxic chemical concentrations

Erieau, Ontario. Source: US EPA.

continue to decline. Despite this, the Lake Erie basin ecosystem is in poor condition based on the assessment on nine State of the Great Lakes indicators, with a trend of unchanging. Harmful and nuisance algal blooms remain a problem, prey fish diversity and the proportion of native prey fish species have declined, and land-based stressors continue to impact nearshore water quality and critical habitat areas that support native species.

This Annual Report highlights some recent activities: reducing pollution, managing nutrients and algae, preventing and controlling invasive species, and restoring and protecting habitats and species.

REDUCING CHEMICAL CONTAMINATION

Significant progress has been made in reducing toxic chemicals. Still, some chemicals, including chemicals of mutual concern such as polychlorinated biphenyls (PCBs), mercury, and polybrominated diphenyl ethers (PDBEs), and emerging contaminants such as polycyclic aromatic hydrocarbons (PAHs) and per-and polyfluoroalkyl substances (PFAS) continue to pose a threat to human health and the environment. Significant work continues in Lake Erie Areas of Concern (AOCs) to reduce legacy chemical contamination.

Implementing Binational Chemical of Mutual Concern Strategies for the Great Lakes

Under commitments in the GLWQA, Canada and the United States have prepared and issued strategies for all designated Chemicals of Mutual Concern (CMCs). These strategies are comprised of risk mitigation, compliance and promotion, pollution prevention, and management actions aimed at reducing the release of these chemicals to the Great Lakes basin.

In Canada, the Prohibition of Certain Toxic Substances Regulations, 2012 (PCTSR) prohibits the manufacture, use, sale, offer for sale, and import of certain toxic substances and products containing them, with a limited number of exemptions. The CMCs HBCD, PBDEs, PFOS, PFOA, LC-PFCAs, and SCCPs, are regulated under the PCTSR. The strategies for these CMCs include actions for Canada to continue to promote and enforce compliance with the PCTSR. One example of action by the Government of Canada involves using web-based articles to raise awareness of products that may be more likely to contain a prohibited substance. Importers are not always aware if the products they are importing comply with the PCTSR, so by sharing this information, various sectors can be aware of these potential sources and modify their approaches to ensure promotion and compliance with the regulations to reduce potential sources to the Great Lakes. Examples of these products that may contain prohibited substances include:

- children's toys and electrical cables with components that were made with short-chain chlorinated alkanes (also known as chlorinated paraffins (SCCPs);
- carpets and fabrics that were treated with perfluorooctane sulfonate (PFOS), its salts, and precursors coatings to make them dirt, water, or grease resistant; and
- coatings containing polybrominated diphenyl ethers (PBDEs) used in electronic equipment.

In the U.S., a new EPA Council on PFAS (ECP) was created in 2021 and charged with building on the agency's ongoing work to understand better and ultimately reduce the potential risks caused by PFAS. ECP actions to date include:

- Issuance of EPA's *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024*, a multi-year strategy to deliver critical public health protections to the American public.
- Continued close interagency coordination on region-specific and cross-media issues to assist states, tribes, and local

communities faced with significant and complex PFAS challenges.

- Working with national program offices and regions to maximize the impact of EPA's funding and financing programs to support the cleanup of PFAS pollution, particularly in underserved communities.
- Expanding engagement opportunities with federal, state, and tribal partners to ensure consistent communications, exchange information, and identify collaborative solutions.

MANAGING NUTRIENTS AND ALGAE

Lake Erie beaches and nearshore areas provide good opportunities for swimming and recreational use. However, nutrient issues continue to be a challenge. Harmful algal blooms (HABs) occur annually in Lake St. Clair and the western basin and can extend into the central basin. Excessive growth of the nuisance algae, *Cladophora*, continues to be a problem in the eastern basin, and episodes of low dissolved oxygen, or hypoxia, are common in the bottom waters of the central basin.

Status of Lake Erie Phosphorus Loads and HABs

In 2016, to minimize HABs and hypoxia in Lake Erie, the United States and Canada committed to reducing phosphorus loads to the western and central basins by 40% from a 2008 baseline. In 2021, the total phosphorus load to the western and central basins was 6,464 metric tons, slightly higher than the desired target of 6,000 metric tons annually (MTA). As shown in Figure 1, this target has only been met twice since 2008. Loads are highly correlated with streamflow discharge, and the years 2010, 2016, and 2021 had drier conditions with less runoff from major tributaries. You can view phosphorus loads to the western and central basins and several priority tributaries in more detail on the ErieStat website.

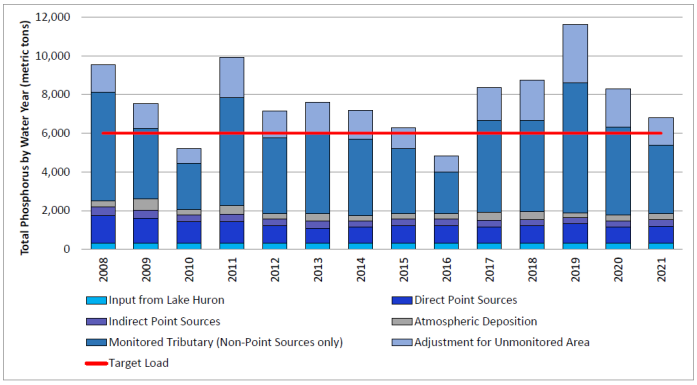

Figure 1: Total phosphorus loading to Lake Erie's western and central basins, 2008-2021. Source: EPA and ECCC.

The National Oceanic and Atmospheric Administration (NOAA) and its partners use remote sensing imagery, multiple models, and water quality monitoring data from the Maumee River to predict and track the formation and movement of HABs in the western basin of Lake Erie during the bloom season (typically June to October). The 2021 spring (March-July) total bioavailable phosphorus load from the Maumee was 310 metric tons and the corresponding bloom had a severity index of 6.0, considered moderately severe (Figure 2). The bloom peaked at 530 square miles (853 square kilometers).

The 2022 western Lake Erie cyanobacterial bloom had a severity index of 6.8. The 2022 spring (March-July) load from the Maumee River was 273 metric tons of total bioavailable phosphorus. At 416 square miles (1077 square kilometers), the 2022 bloom was less extensive than in 2021 but was more concentrated, which caused the 2022 bloom to be more severe. The 2022 bloom developed in mid-July and reached a peak from late August lasting through mid-September. In 2022, the bloom peak lasted for many weeks which increased overall bloom severity as compared to previous years when the bloom peak lasted for no more than two weeks. Elevated winds in September reduced surface scum concentrations but did not terminate the bloom. Unlike previous years, the bloom switched from *Microcystis* to *Dolichospermum* in early-October, with high cyanobacterial concentrations

persisting through early November, resulting in a much longer bloom than usual.

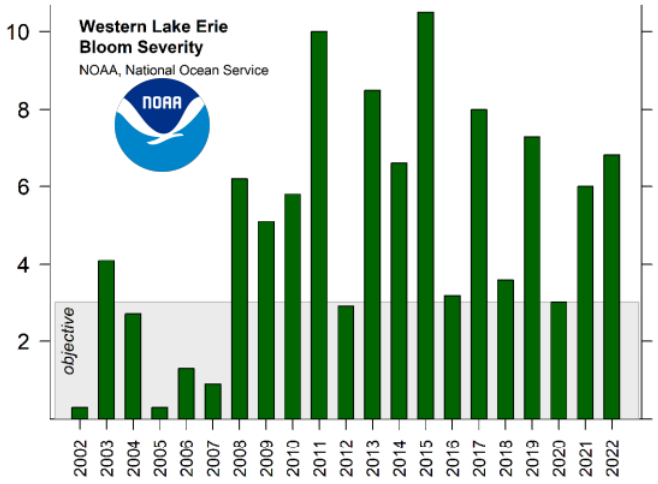

Figure 2: Bloom severity index (SI) for 2002-2022. The 2022 bloom had a severity of 6.8. The severity index is based on the amount of bloom biomass over the peak 30 days of the bloom on a scale from 1 to 10. Source: NOAA.

Living Labs Ontario

The Living Lab - Ontario (LL-ON) project is part of Agriculture and Agri-Food Canada's (AAFC) Living Laboratories Initiative. It is the fourth living lab established in Canada. The initiative uses a collaborative and iterative approach to test, evaluate and co-develop innovations to improve and better fit farmers' needs for accelerated adoption of best management practices. Supported by an investment from AAFC, the Living Lab-Ontario project was launched in the spring of 2021 with a focus on developing and evaluating best management practices that address persistent agri-environmental issues in the Canadian Lake Erie basin. Agriculture and Agri-Food Canada, together with their partner organizations, conduct research into four priorities: water quality, soil health, biodiversity, and watershed management. On-farm trials at six farms include rotational grazing with annual cropping, relay intercropping or double cropping, and annual and perennial cover crops in field crop and vegetable systems. Activities fall under four broad categories: on-farm research, watershed-scale research, socioeconomics, and knowledge transfer. The watershed component of LL-ON is leveraging the sub-watershed component of the ONFARM program. Learnings from the project were shared via an inter-conference webinar series in the winter of 2022, Country Guide magazine articles, online videos, partner field days, and newsletters. The Agricultural Climate Solutions – Living Labs program will see labs established in all Canadian provinces for the next nine years.

You can find more information about partners and the project at: https://agriculture.canada.ca/en/agricultural-science-and-innovation/living-laboratories-initiative/living-lab-ontario and https://www.osciaresearch.org/living-lab/.

Co-development field meeting at Wigle Creek farm. Source: AAFC.

Michigan Domestic Action Plan and Adaptive Management Plan

Michigan is making progress in reducing its nutrient contributions to Lake Erie by implementing the 2018 Domestic Action Plan (DAP), a joint plan developed by the state's Department of Agriculture and Rural Development; Environment, Great Lakes, and Energy; and Natural Resources; and other partners. Significant reductions in the phosphorus load from the Great Lakes Water Authority wastewater treatment plant helped Michigan achieve its Western Lake Erie Basin (WLEB) Collaborative Agreement aspiration goal of

20% total phosphorus reduction by 2020. In December 2021, the state's DAP Team released the Lake Erie Adaptive Management Plan (AMP), which provides a more structured way to learn about the impacts of actions to accelerate and reach the state's 40% total phosphorus reduction goals by 2025. As part of the AMP, Agricultural Inventory conservation programs are being implemented in priority subwatersheds to reduce nonpoint source contributions in the St. Joseph River, Bean Creek, and River Raisin. Michigan is also forming a WLEB stakeholder advisory group to guide the AMP process. It will continue to provide updates on the planning and implementation of Michigan's DAP and companion AMP via the Taking Action on Lake Erie website.

South Branch of the River Raisin, one of the priority Agricultural Inventory subwatersheds identified in the AMP. Source: Michigan Department of Agriculture and Rural Development.

PREVENTING AND CONTROLLING INVASIVE SPECIES

Invasive species, including the European Common Reed or invasive *Phragmites* (*Phragmites australis spp. Australis*), the invasive blue cattail (*Typha x glauca*), narrow-leaf cattail (*Typha angustifolia*), have significantly altered the habitat and food web in Lake Erie. Preventing additional invasive species from entering the Great Lakes is of high importance to resource management agencies in the Great Lakes.

Invasive Phragmites and Cattail Management at Point Pelee National Park

The marsh at Point Pelee National Park is one of the largest remaining in southern Ontario and a designated Ramsar Wetland of International Significance. This wetland is also the largest habitat of Canada's second-smallest national park, covering 1,000 hectares. The marsh supports 19 federally listed species at risk and is a critical stopover for migratory birds. Unfortunately, various threats have taken their toll on the health of the marsh ecosystem. One of the most concerning issues is the loss of open water habitat within the marsh, which has been reduced by 10 percent, or 247 acres (100 hectares), since the 1950s.

Parks Canada initiated a marsh restoration project in 2019 to address this decline in marsh health by removing invasive plant species. Invasive blue cattail (*Typha x glauca*), narrow-leaf cattail (*Typha angustifolia*), and European Common Reed or invasive *Phragmites* (*Phragmites australis spp. Australis*) grow aggressively, outcompeting native species and creating dense monocultures. Preliminary cutting of targeted *Phragmites* patches began in 2020, and the creation of channels and ponds through the cattails started in 2021, intending to restore the diversity of open water and edge-water habitats over approximately 20 acres (8 hectares) by 2023. A combination of management techniques is used, including applying herbicide, cutting under the water line, and mechanically

creating channels and ponds using an aquatic vegetation cutter and an aquatic weed harvester. A detailed overview of the project can be found here: https://www.pc.gc.ca/en/pn-np/on/pelee/nature/conservation/marais-marsh.

The battle against invasive species will not be won within the timeline of this project. However, it is a vital step in the right direction, which will benefit wildlife and visitors alike, and the knowledge gained will help guide the next steps for restoration. Visitors to the park can assist with the daunting job of monitoring the large marsh area by uploading their sightings of both native and invasive species to citizen science sites such as iNaturalist and eBird.

Parks Canada staff uses hedge trimmer to cut invasive Phragmites below the water level. Source: Parks Canada.

Searching for New Invasive Species

Aquatic invasive fish and invertebrate species have disrupted the Lake Erie ecosystem by altering food webs, degrading habitats, and competing for resources with native species. Each year, U.S. and Canadian federal, state, provincial, and academic partners join in searching for new invading species to mitigate their impacts and reduce their spread. This search begins by identifying those locations most likely to see non-native species introductions, like ports and population centers. Next, an assessment of invasion potential for species from around the world is determined to predict how likely they could enter and survive in Lake Erie waters. Guided by this information, field crews use traditional fishing gear, like nets and traps, to discover if any of these predicted invaders are present in Lake Erie. New techniques, like DNA collected from lake water samples (termed environmental DNA, or eDNA), allow scientists to compare genetic sequences against a growing library of DNA markers for native and potentially invasive species. When a new species is detected, management agencies guide the response, sometimes involving the rapid response of crews from around the region gathering to remove a few introduced invaders from the lake before a whole population can establish itself. In 2022, the U.S. Fish and Wildlife Service, along with state and other partners, used traditional fishing gear to conduct sampling from Buffalo Harbor (NY), to Erie (PA), and also in Cleveland, Sandusky, and Toledo (OH). No new invasive fish species were detected. eDNA sampling for invasive carp gave one positive result for Silver Carp in Presque Isle Bay in Erie, PA. In response to this detection, the state of Pennsylvania conducted targeted boat electrofishing sampling near the detection location. No Silver Carp were collected or observed. In addition, boat electrofishing sampling operations conducted in the same area of Presque Isle Bay, for another purpose prior to the positive eDNA findings, did not capture any invasive carp. Sometimes DNA from invasive species is simply introduced by boats traveling between waters. While no physical invasive carp specimens have been detected, the USFWS collected additional water samples in Fall 2022 for more eDNA analyses as a precaution. You can find more information on the USFWS Aquatic Invasive Species actions at: https://www.fws.gov/program/aquatic-invasive-species.

USFWS staff collecting larval fish and eDNA. Source: USFWS.

PROTECTING AND RESTORING HABITAT AND NATIVE SPECIES

Coastal wetlands have been impacted by development, water levels, and invasive species. Impaired habitat connectivity between tributaries and the lake is impacting some native species. However, some native fish species, such as Lake Sturgeon, show signs of recovery.

Collaboration for Coastal Resilience

The immense beaches, eroding dunes, and coastal wetlands along the Canadian shores of Lake Erie are an irresistible draw for people, fish, and wildlife. The western and central portions of the lake are dotted with quaint cottage communities, conservation areas, provincial parks, and Point Pelee National Park. The nearshore and coastal ecosystems are home to both provincial and national species at risk that relies on the unique climate and habitat in this region of Canada. Based on ECCC's nearshore assessment, major threats to ecosystem health and water quality exist due to impaired coastal processes.

Over millennia, the shoreline ecosystem has developed a natural rhythm in response to the wind and wave activity of the lake. Coastal processes transport sediment from eroding bluffs, carrying it along the coast, where it eventually settles on sand spits and barrier beaches protecting coastal wetlands. However, shoreline hardening, barriers to sediment transport (jetties and piers), and climate change exacerbate the erosion of beaches, dunes, and coastal wetlands. These impaired natural coastal processes are further impacted by the fragmented management of the coast in Canada; no one organization or agency has responsibility for coastal management in Canada.

In response, ECCC is leading engagement efforts with environmental non-governmental organizations, communities, First Nations, municipalities, and other levels of government to establish a shared vision for coastal resilience. Active engagement through sharing science, information, perspectives, and values will provide the backbone for developing collective and informed approaches and actions. Engagement is the first step towards an integrated coastal zone management approach, which is needed for the most at-risk coastal zones on the north shore of Lake Erie, Point Pelee, and Long Point. Go to the Lake Erie Canadian nearshore assessment: 2018 highlights report to learn more.

Lake Erie coastline near Port Burwell, Ontario. Source: Zuzek Inc.

Restoration and Management of Erie Marsh Preserve

In 2011, The Nature Conservancy started a large-scale, multi-phase project to restore 946 acres (383 hectares) of Erie Marsh, a degraded freshwater coastal wetland in North Maumee Bay. This 2200-acre (890 hectare) preserve represents 11% of the remaining freshwater coastal marshlands along Lake Erie. Located in the Mississippi Flyway, this preserve is an important stopover site for migratory birds such as waterfowl, shorebirds, wading birds, Neotropical songbirds, and raptors.

Implementing a project this size has involved creating a levee system that allows water to be exchanged between the coastal wetlands and Lake Erie. The capacity to help relocate water throughout the levee system has helped create a mosaic of wetland plant communities such as emergent marsh, lakeplain wet prairie, seasonally flooded moist soil wetlands, and deep-water marsh. Utilizing such a system to control water levels across the preserve has also created

beneficial habitats for native plants, reptiles, and amphibians.

The Erie Marsh Coastal Restoration project is almost complete, with the construction of the final levee taking place throughout 2022-2023. Restoration and improvement of this unique coastal wetland have been made possible with support from the Great Lakes Restoration Initiative and partners such as Ducks Unlimited, National Fish and Wildlife Foundation, U.S. Fish and Wildlife Service, and Michigan Department of Environment, Great Lakes and Energy and Erie Shooting and Fishing Club.

Lotus at dawn at Erie Marsh. Source: Ron Leonetti.

OUTREACH AND ENGAGEMENT

Citizen Engagement: Volunteers Making a Difference Across Lake Erie

Accomplishments related to the restoration and protection of Lake Erie's water quality are largely possible due to local communities, groups, and individuals acting as champions of environmental sustainability in their backyards and communities. For example, the Friends of the Detroit River host regular creek cleanups; volunteers are welcomed at Detroit River Canadian Cleanup activities like tree plantings and educational workshops; volunteers support the Buffalo Niagara Waterkeeper during the Spring Sweep, Great Lakes CleanUP, monitoring, and tree plantings; and, the Niagara Coastal Community Collaborative uses citizen scientists to monitor and be stewards of the Great Lakes.

The Lake Erie Partnership recognizes and appreciates the contributions of engaged citizens and volunteers around the lake. Together we can achieve our shared goal of restoring and protecting Lake Erie.

GLWQA Engagement Opportunities

You can keep up to date on GLWQA engagement opportunities in the Engagement section of Binational.net. You can find information on many of our partner organizations' upcoming outreach and engagement opportunities in the Great Lakes Commission's "Great Lakes Calendar."

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