



LAKE MICHIGAN LAKEWIDE ACTION AND MANAGEMENT PLAN

2018 Annual Report

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What is the Lake Michigan 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 Michigan Lakewide Action and Management Plan (LAMP) is an ecosystem-based management strategy for protecting and restoring Lake Michigan's water quality. The LAMP is coordinated by the Lake Michigan Partnership, which is led by the U.S. Environmental Protection Agency (U.S. EPA) with participation from federal, state, tribal and local governments or agencies, and with input from non-governmental stakeholders and the public. The next LAMP will be issued in 2020 and in the coming years, the Lake Michigan Partnership will be working to assess the state of the lake, measure progress towards LAMP goals and objectives, and promote management actions to address identified problems.

This 2018 Annual Report highlights accomplishments and progress in achieving LAMP goals and objectives.

Overview

The Lake Michigan basin is home to the world's fifth largest lake and contains the world's largest collection of freshwater sand dunes. It also hosts many wetlands, prairies, forests, and savannas that provide essential habitat to a diverse array of plant and animal species. The Lake Michigan coastline has 25 harbors, hundreds of marinas, and serves as a key North American migratory bird flyway.

The Lake Michigan Partnership's 2018 Annual Report provides information and updates on habitat and species restoration; fishery management; and shoreline management research. ♦

Accomplishments

Lake Sturgeon Recovery Efforts

The Lake Sturgeon was an important member of the Lake Michigan native benthic fish community, but suffered drastic population declines by the early 1900s. Barriers to essential river spawning habitat (e.g., tributary dams), landscape changes, and overfishing are thought to have contributed to the sturgeon's decline. Current restoration efforts for this long-lived migratory species involve protecting known populations, improving habitat, providing fish passage, and stocking fish, all guided by continued research and evaluation. Projects typically involve coordinated efforts among state, tribal and federal agencies, with assistance from local governments, non-governmental organizations and volunteer groups.



Juvenile Lake Sturgeon. Photo: R. Elliott, U.S. Fish and Wildlife Service.



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Wild populations of Lake Sturgeon currently reproduce in at least 8 Lake Michigan tributaries (Menominee, Peshtigo, Fox, Oconto, Manistee, Muskegon, Grand, and Kalamazoo rivers), and several of these populations appear to be slowly increasing. Stocking programs using streamside hatcheries are reintroducing sturgeon in 4 other rivers (Whitefish, Cedar, Keweenaw and Milwaukee rivers), and supplementing wild populations in the Manistee and Kalamazoo rivers. Stocking objectives are to build self-sustaining populations of at least 750 spawning adults in each river over the next 20-25 years by rearing fish in water from the river in which they will be stocked to facilitate imprinting, and using appropriate donor sources to maximize genetic diversity. To date, over 40,000 juveniles have been stocked in Lake Michigan tributaries since 2006, and post-stocking assessments show they are surviving and growing well.

Other recent efforts contributing to sturgeon recovery include: removing or providing fish passage at 5 lower dams on the Milwaukee River; construction of an upstream lift and downstream bypasses to move sturgeon around 2 lower dams on the Menominee River; creating new spawning habitat on the Kalamazoo River; improving flow conditions during spawning periods on most Lake Michigan sturgeon rivers; and protecting juvenile sturgeon from mortality that can occur during Sea Lamprey treatments in some rivers (e.g., high alkalinity rivers) by collecting and temporarily moving juveniles to holding tanks during treatments.

Lake Michigan Coastal Management Milestones

The Coastal Management Programs in the States of Michigan and Wisconsin both celebrated 40-year anniversaries in 2018. Together, these 2 states represent roughly 93% of Lake Michigan's shoreline length. The 2 state programs have provided significant technical and financial support for coastal habitat, water quality, public access, community development, and other projects.

Habitat Restoration at Areas of Concern (AOCs)

Lower Menominee AOC (Michigan and Wisconsin)

In 2018, the *Restrictions on Fish and Wildlife Consumption* Beneficial Use Impairment was removed. Within this AOC, concerns related to consuming contaminants have been limited to eating fish, not wildlife. Sources of polychlorinated biphenyls, mercury, and dioxins within the AOC have been controlled, and remaining fish consumption advisories are caused by sources outside of the AOC. To address the impairment, polluted sediments were removed or remediated from the bottom of the river and the Bay of Green Bay. The projects are being monitored for remedial effectiveness according to their approved plans.

Milwaukee Estuary AOC (Wisconsin)

Fish passage was restored above the Estabrook Dam on the Milwaukee River at the end of 2018. A fish passage project is also in progress at Klettsch Dam. These dams are the furthest downstream and represent the last remaining fish and aquatic life passage barriers on the Milwaukee River. Klettsch Dam is located 10 miles (16 kilometres) upstream of the confluence with Lake Michigan, and Estabrook Dam is located 7 miles (11 kilometres) upstream. Removing these barriers will restore natural movement of native fish species such as Lake Sturgeon, Walleye, Northern Pike, and other important fish and aquatic life between Lake Michigan, the Milwaukee River Estuary, and the 25 miles (40 kilometres) of river and 2,400 acres (971 hectares) of wetlands upstream. These projects will provide vital access to spawning and nursery habitats in the upstream portions of the Milwaukee River—habitats that are lacking between these dams and Lake Michigan. These projects are part of a larger group of AOC habitat improvements that Wisconsin Department of Natural Resources (WI DNR) is working on with landowners and partners, including the City of Milwaukee, Milwaukee County, and the Milwaukee Metropolitan Sewerage District. ♦



View of Estabrook Dam. Photo: S. Hron, WI DNR.

Addressing Challenges

Decline in Lake Whitefish Recruitment and Growth

Strong and consistent reproduction and subsequent growth of Lake Whitefish to sizes large enough to be taken by Lake Michigan commercial fishers occurred from the late 1970s through the early 2000s. This successful population growth increased commercial yields in tribal and state-licensed fisheries to near historic levels. However, Lake Whitefish reproduction and growth rates have declined substantially during the past decade, resulting in a precipitous decline in commercial harvests in many areas of the lake. Declines in the Lake Whitefish

population coincided with the arrival and proliferation of Zebra and Quagga Mussels, as well as the collapse of the amphipod *Diporeia*. Reduced growth rates have nearly doubled the time it takes for an individual Lake Whitefish to grow large enough to contribute to the fishery.

Efforts to better understand the causes for the declines in Lake Whitefish populations were initiated by the Chippewa Ottawa Resource Authority in early 2017. The near-term objective was to build a collaboration of researchers and agency managers that would help direct management activities and research funding toward identifying the forces impeding whitefish reproduction and growth. The Great Lakes Fishery Trust, a major research funding entity on Lake Michigan, established a theme for Lake Whitefish research in 2017, with emphasis on population bottlenecks. Similarly, the Great Lakes Fishery Commission indicated its support for targeted Lake Whitefish research. These 2 entities agreed to co-sponsor a workshop in early 2018 to develop research priorities, which in turn, will be used to guide specific research projects.



Lake Whitefish. Credit: T. Gorenflo, Chippewa Ottawa Resource Authority.

The precipitous decline in the abundance of the bottom-dwelling amphipod, *Diporeia*, remains a priority concern with respect to the food web and ecosystem function in Lake Michigan. A 20+ year sampling program conducted by National Oceanic and Atmospheric Administration (NOAA) and U.S. EPA shows current *Diporeia* abundances at a fraction of historic levels. This valuable native species historically provided an energy-rich food supply for many native fish species, including Lake Whitefish, but is now absent in most areas of Lake Michigan (where it once numbered over 10,000 per square meter/929 per square foot). While the exact mechanism is undetermined, the collapse of *Diporeia* closely coincided with the invasion and proliferation of Zebra and Quagga Mussels. Given the already observed collapse of *Diporeia*, and the continued proliferation of non-native mussels, the future of *Diporeia* in Lake Michigan is uncertain at best.

Solution-Oriented Research for Shoreline Management

Lake Michigan's shoreline is dynamic. Wind, waves, storms, and fluctuating lake levels combine to create an ever-changing littoral system. The basin's many highly urbanized areas and existing hardened shore protection structures, like revetments and jetties, add to the system's complexity. Some areas of Lake Michigan lose dozens of feet of sandy beaches and coastal habitat, including critical wetlands, every year; others accumulate sand, which can clog harbors and bury wetlands. Coastal managers around the basin have invested in collaborative federal, state, and local partnerships to better understand these complex coastal processes and improve shoreline management decision making.

On a lake-wide scale, U.S. Army Corps of Engineers (USACE) partners on shoreline management through its Regional Sediment Management (RSM) program. RSM focuses on cost-effective and adaptive regional sediment approaches that increase environmental and social benefits. USACE leads several Lake Michigan research projects with state and university partners. The 3 USACE Great Lakes districts—Buffalo, Chicago, and Detroit—are working with researchers on a Great Lakes Restoration Initiative (GLRI)-funded project that develops sediment budgets for all 5 Great Lakes. Improved understanding of the sediment transport system will allow USACE and local partners to better address eroding coastlines and restore lost nearshore habitat. In Illinois and Indiana, USACE also monitors the effectiveness of nearshore sediment placement for shoreline protection. Results will inform Lake Michigan practices related to beach nourishment and beneficial use of dredged material.



Researchers collect wave and current data at Ogden Dunes, Indiana, as part of a study to monitor movement of dredged material placed in the nearshore littoral zone. Photo: USACE.



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At the state level, the Illinois Department of Natural Resources Coastal Management Program (CMP) partners with the Illinois State Geological Survey (ISGS) to determine the drivers of shoreline change on Lake Michigan's southwest coast. At a more local scale, these efforts provide detailed temporal and spatial information on erosion's impacts on important coastal ecosystems. These data can also help refine broader scale studies, like those of USACE. As part of this effort, ISGS is coordinating a NOAA-funded project with 2 wave and current-measuring buoys. Data collected will inform lake current and sediment transport models, a critical aid in understanding Illinois shoreline erosion and accretion. One of the many tools gaining popularity for shoreline research is the small unmanned aerial system, or drone. ISGS, with funding from CMP, tests the effectiveness of drones in mapping shoreline change. The survey is also developing protocols for inexpensive and rapid long-term coastal monitoring, allowing for more frequent data collection. Through a GLRI-funded project, ISGS integrates this data into a vulnerability model to assess habitat loss at Illinois Beach State Park, located near the Illinois-Wisconsin border. By quantifying the threats to coastal habitats and their value, state park and regional managers can prioritize and adapt land use decision making. Through these numerous partnerships and projects, the CMP and partners are supporting informed and sustainable shoreline management.

Science Priorities

Each year, one of the Great Lakes is the focus of a cooperative science effort under the GLWQA called the Cooperative Science and Monitoring Initiative (CSMI). The last CSMI field year on Lake Michigan occurred in 2015, and focused on several critical concerns in Lake Michigan: the lower food web, which may be depleted by invasive

Zebra and Quagga Mussels; the location and movement of food sources for fish in nearshore and offshore waters; and, the impact of contaminants on water quality and the food web. Results of the 2015 CSMI research were presented at the 2017 State of Lake Michigan Conference and are summarized in an Illinois-Indiana Sea Grant report (<http://www.iiseagrant.org/catalog/gh/csmi2015.php>). Science priorities for the next Lake Michigan CSMI in 2020 will be finalized by the Lake Michigan Partnership in early 2019.

2020-2024 LAMP in Development

The Lake Michigan Partnership will be spending the next year developing the 2020-2024 Lake Michigan LAMP (see *What is the Lake Michigan LAMP?* on page 1). Opportunities for interested agencies, organizations, and individuals to: 1) provide their perspectives on the environmental conditions or issues that should be considered during the Lake Michigan LAMP drafting process; and, 2) to offer suggestions on approaches for addressing those issues, will be posted on Binational.net and the Great Lakes Commission's GLIN-Announce e-mail subscription forum.

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](http://GreatLakesCalendar). ♦



ISGS Coastal Geologist preparing to fly a drone as part of a study to map and measure erosion and accretion at Illinois Beach State Park, IL. Photo: ISGS.

Contact Information

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