

Lake Michigan

2025-2029 Lakewide Action and Management Plan



Recommended Citation:

Recommended Citation: Environmental Protection Agency. 2026. Lake Michigan Lakewide Action and Management Plan, 2025-2029.

EPA 905-R-xx-xxx

Acknowledgements

The 2025-2029 Lake Michigan Lakewide Action and Management Plan (LAMP) was developed by member agencies of the Lake Michigan Partnership. This LAMP reflects the input of many resource management agencies, scientists, non-governmental organizations, and Indian Nations, committed to restoring and protecting Lake Michigan.

We gratefully acknowledge members of the Lake Michigan Partnership for their review and input in the development of the LAMP. Valuable input was provided by other organizations, stakeholders and interested members of the public.

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Little River Band of Ottawa Indians (LRBOI)
Little Traverse Bay Bands of Odawa Indians (LTBB)
Indiana Dept of Environmental Management (IDEM)
Indiana Department of Natural Resources (INDNR)
Illinois Dept of Natural Resources (IDNR)
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Oneida Nation
Pokagon Band of Potawatomi (PBPI)
Sault Ste. Marie Tribe of Chippewa Indians
U.S. Department of Commerce – National Oceanic and Atmospheric Administration (NOAA)
U.S. Army Corps of Engineers (USACE)
U.S. Bureau of Indian Affairs (BIA)
U.S. Environmental Protection Agency (EPA)
U.S. Fish & Wildlife Service (USFWS)
U.S. Geological Survey (USGS)
U.S. National Park Service (NPS)
USDA Forest Service (USFS)
USDA Natural Resources Conservation Service (USDA-NRCS)
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Executive Summary

Lake Michigan is the only Great Lake located entirely in the United States. The Lake Michigan watershed covers 118,000 km² (45,600 mi²), the third largest watershed of the Great Lakes. It embodies a wide array of land use types, from forests in the north to highly urbanized areas in the south and agricultural and recreation area in between. Lake Michigan surface waters are utilized by community water systems that provide drinking water to more than 9.5 million people. Lake Michigan's fisheries — both commercial and recreational — are a major economic driver for the Great Lakes region, generating over \$5.1 billion annually when combined with the other Great Lakes. Home to one-fifth of the entire population of the Great Lakes Basin, the health of the watershed influences the water quality of Lake Michigan.

This 2025-2029 Lake Michigan Lakewide Action and Management Plan (LAMP) is a five-year ecosystem-based strategy to restore and protect Lake Michigan water quality. The Lake Michigan LAMP fulfills the U.S. commitment under the 2012 Great Lakes Water Quality Agreement between the United States and Canada (the Agreement) to assess Great Lakes ecosystem conditions, identify environmental threats and appropriate actions to address these threats to Great Lakes water quality, set research and monitoring priorities, and determine further actions for governments and the public. These commitments include integrating nearshore assessment information into lakewide management.

The implementation of this LAMP is designed to:

- Reduce risks from legacy toxic chemicals and support progress in Areas of Concern;
- Maintain good conditions for drinking water and beaches;
- Improve conditions for key habitats and native species where restoration projects are focused;
- Reduce the impacts and spread of invasive species through prevention and control; and
- Strengthen shoreline resilience.

The Lake Michigan Partnership will track and report on progress annually, adjust actions based on new science and Indigenous Knowledge, and continue to invite participation from communities across the basin.

The LAMP emphasizes that every sector of society has a role to play in safeguarding Lake Michigan. Partnership agencies have committed to integrating LAMP actions into their programs and investments, and to tracking progress transparently to ensure accountability and continuous improvement. Beyond this institutional leadership, the plan recognizes the impact of grassroots and individual action. Residents, students, community groups, and advocates can support local conservation, reduce pollution, and champion stewardship in tangible ways.

Protecting Lake Michigan requires the combined energy of governments, Indigenous partners, scientists, and public alike. Everyone has a role to play. Whether by restoring natural vegetation along streams, reducing road salt and plastic waste, participating in shoreline cleanups, or supporting local conservation and stewardship organizations, individual and community actions can have a positive impact. **The LAMP's actions to restore and protect ecosystems will ensure that water quality and economic prosperity go hand in hand.**

1.0 Introduction

The 2025-2029 Lake Michigan Lakewide Action and Management Plan (LAMP) is a five-year ecosystem-based strategy to restore and protect Lake Michigan water quality. It follows the successful implementation of previous LAMPs, through which government agencies undertook actions in cooperation with other organizations, businesses, communities, and academic institutions.

The Lake Michigan LAMP fulfills the United States of America (U.S.) commitments under the 2012 Great Lakes Water Quality Agreement (GLWQA, 2012) by assessing ecosystem conditions, identifying environmental threats, setting research and monitoring priorities, and determining further actions for governments and the public. These commitments include integrating nearshore assessment information into lakewide management.

The LAMP is a model for cooperation among governmental jurisdictions and their management agencies. As illustrated in Figure 1, the geographic scope of this LAMP includes activities in the waters of Lake Michigan and in its tributaries and watersheds, as they impact the waters of Lake Michigan. The LAMP is a resource for anyone interested in the Lake Michigan basin ecosystem, its water quality, and actions to protect this extraordinary Great Lake.

The geographic scope of this LAMP includes Lake Michigan and its watershed, islands, bays, and tributaries (Figure 1).



Figure 1. Lake Michigan and its watershed.
Source: Michigan Sea Grant.

1.1 Lake Michigan Partnership

The Lake Michigan Partnership is a collaborative team of agencies and organizations working to protect and restore the lake. It is led by the U.S. Environmental Protection Agency (EPA), in cooperation with other federal agencies, state governments, Indian Nations, municipal governments, watershed management agencies, and other local public agencies (see page ii for a list of members).

The Partnership is guided by a Management Committee of senior leaders from U.S. agencies with decision-making authority for Great Lakes programs and investments. The Management Committee sets the overall direction for the Lake Michigan Lakewide Action and Management Plan (LAMP) and endorses priorities.

Coordination is undertaken by a Working Group focused on key themes such as water quality, habitat and species, coastal resilience, and public engagement. This team coordinates efforts and engages stakeholders and the public to identify research, monitoring, and other science priorities for the assessment of current and future potential threats to water quality, and for the identification of priorities to support actions.

1.2 Engagement in LAMP Development

Engagement, collaboration, and active participation by all levels of government, Indian Nations, and members of the public are essential to the development and implementation of the Lake Michigan LAMP. Partnership member agencies funded or collaborated with more than 100 communities, organizations, and institutions to implement previous LAMPs, and the results of these efforts inform this LAMP.

For the 2025–2029 LAMP, the Lake Michigan Partnership coordinated a 2023 workshop to identify science priorities. Under the 2012 GLWQA, U.S. and Canadian Governments conducted a review of the operation and effectiveness of the Agreement in 2024 and identified the development and publication of LAMP documents as an area for improvement. A shortened LAMP format is a result of those efforts. A public review of the draft 2025–2029 LAMP provided further opportunity for feedback and helped shape the final LAMP.

1.3 State of the Great Lakes Reporting

The State of the Great Lakes (SOGL) report uses nine ecosystem indicators and 40 sub-indicators to assess the Great Lakes and is updated every three years with input from hundreds of scientists and experts. For Lake Michigan, the 2022 SOGL report concluded that the overall status of the lake was **Fair**, with a trend of **Unchanging**. In relation to the nine General Objectives of the GLWQA, most ecosystem indicators are assessed as **Good to Fair** status. Lake Michigan remains a **Good** source of high-quality drinking water, monitored beaches typically support **Good** conditions for swimming and recreation, and groundwater quality is assessed as **Good** based on nitrate and chloride concentrations. Fish consumption, toxic chemicals, habitat and species, nutrients and algae are assessed as **Fair**, reflecting ongoing issues such as legacy contaminants, altered food webs, nutrient imbalances, and coastal habitat loss. Invasive species are assessed as **Poor**, indicating continued significant impacts on habitats and the food web.

Detailed lakewide and indicator-specific results, including sub-indicator data and trends, are available on binational.net.

1.4 Indigenous Peoples

The Lake Michigan basin is the traditional homeland of the Anishinaabek—the Three Fires Confederacy—comprising the Ojibwe (Chippewa), Odawa (Ottawa), and Potawatomi. The lake and its tributaries have sustained communities with food, medicines, transportation routes, and places for ceremony, governance, and trade. Lake Michigan's name is derived from the Anishinaabemowin (Ojibwe/Chippewa) word Mishigami or Michigama, which translates to "big lake" or "large water", describing the vastness of the lake.

Today, the Lake Michigan basin is home to federally recognized tribes in Michigan, Wisconsin, and Indiana. Tribes with judicially affirmed treaty rights in the Lake Michigan basin consist of the 1836 Treaty of Washington signatories in Michigan, including the Bay Mills Indian Community, Grand Traverse Band of Ottawa and Chippewa Indians, Little Traverse Bay Bands of Odawa Indians, Little River Band of Ottawa Indians, and Sault Ste. Marie Tribe of Chippewa Indians; as well as the Ojibwe (Chippewa) bands and the Potawatomi tribes in Wisconsin and the Pokagon Band of Potawatomi in Michigan and Indiana. Access to healthy waters, wetlands, fisheries, and shorelines is vital for cultural continuity, harvesting, ceremony, and community well-being.

Indigenous knowledge—complex, place-based knowledge systems rooted in the worldviews and laws of Indian Nations—plays an essential role in understanding and caring for Lake Michigan. Traditional Ecological Knowledge (TEK), as one expression of these systems, offers detailed insights into environmental change, species, and relationships among water, land, and all beings. TEK is an independent and sovereign knowledge system that may only be shared at the discretion of Indigenous knowledge holders and in accordance with their protocols.

The Lake Michigan Partnership recognizes the importance of Indigenous-led stewardship and co-development of science and actions under the LAMP. Indigenous governments and organizations help assess lake status, identify priorities, and shape management actions, including through ongoing work under the GLWQA to support better and respectful engagement of TEK and Indigenous knowledge in Great Lakes research, monitoring, and decision-making.

2.0 Lakewide Action Plan

The actions included in the LAMP respond to, and are categorized by, the significant threats that are affecting one or more of the Agreement's General Objectives, specifically: chemical contaminant pollution; nutrient and bacterial pollution; invasive species; loss of habitat and species; and other potential threats. Government agencies, Indigenous peoples, stakeholders, and the public all play an important role in implementing the actions identified in the LAMP.

2.1 Chemical Contaminant Pollution

This section summarizes scientific information about Lake Michigan water quality related to chemical concentrations, current chemical contaminant threats, and corresponding actions to be taken by Lake Michigan Partnership agencies in the 2025-2029 timeframe, and actions everyone can take. Information is aligned to assess the related General Objectives of the GLWQA, specifically drinking water, human consumption of fish and wildlife, pollutants that could harm people and wildlife, and the impacts of contaminated groundwater.

Decades of government action, remediation of contaminated sites and Areas of Concern, and changes in industrial practices have led to significant declines in many legacy toxic chemicals in air, water, sediment, fish, and wildlife. However, challenges remain, including legacy contaminants that persist in sediments and food webs, chemicals of mutual concern (CMCs), and contaminants of emerging concern (CECs). Chemical contaminants in water, fish, wildlife, and sediments pose risks to Indian Nations, whose rights, cultures, and ways of life are closely tied to harvesting from the land and waters. Contamination can affect not only physical health but also cultural continuity, language, and spiritual practices. There is no complete cultural or nutritional substitute for traditional foods, and fish consumption advisories cannot fully address these impacts.

Also, sensitive populations at risk of exposure to chemical contaminants, including pregnant people, nursing mothers, women of childbearing age, and young children who are more vulnerable to contamination need clear and accessible communication about fish consumption advisories.

2.1.1 Objectives and Condition Overview

Four of the nine GLWQA General Objectives apply to the management of chemical contaminant pollution such that the Waters of Lake Michigan should:

- i. be a source of safe, high-quality drinking water.*
- iii. allow for human consumption of fish and wildlife, unrestricted by concerns due to harmful pollutants.*
- iv. be free from pollutants in quantities or concentrations that could be harmful to human health, wildlife, or aquatic organisms, through direct exposure or indirect exposure through the food chain.*
- viii. be free from the harmful impact of contaminated groundwater.*

2022 SOGL assessments for Lake Michigan indicate that:

- Treated drinking water and groundwater quality are in **Good** condition.

- Contaminants in edible fish, sediment, open water, whole fish, and atmospheric deposition are in **Fair** condition.
- Most sub-indicators show **Unchanging** or **Improving** trends.
- Lake Michigan continues to be a reliable source of high-quality treated drinking water, and fish remain a nutritious and safe food source when eaten in accordance with advisories.

2.1.2 Drinking Water

Municipal drinking water facilities in the U.S. routinely monitor source and treated water for a wide range of inorganic, organic, microbial, and radiological contaminants. Authorities such as the [U.S. Safe Drinking Water Act](#) set the basis for health-based limits and require corrective action when those limits are exceeded.

According to the 2022 SOGL assessment, treated drinking water from Lake Michigan is assessed as **Good**. There are 356 community water systems that source from the surface waters of Lake Michigan, which serve a population of 9,552,028 people. Potential threats include over-application of fertilizers and pesticides, runoff and combined sewer overflows during heavy rain events, malfunctioning septic systems, spills of industrial or hazardous materials, and atmospheric deposition.

2.1.3 Fish and Wildlife Consumption

Partners monitor persistent, bioaccumulative, and toxic substances in fish and wildlife to assess risks to people who consume them. Consumption advisories are issued to protect human health.

Contaminants in edible fish are assessed as **Fair** with **Improving** trends in 2022 SOGL. PCBs and mercury, the primary pollutants driving consumption advisories, have declined markedly since the 1970s. However, contaminants in fish tissue still warrant fish consumption advisories for some species and locations. Lake Michigan fish remain a valuable food source when consumed in accordance with the appropriate advisories.

The contaminants in fish and wildlife can disproportionately affect Indigenous communities and other subsistence fishers who rely on these resources for cultural, spiritual, and nutritional reasons, as well as sensitive populations. However, Lake Michigan fish remain a valuable food source when consumed in accordance with the appropriate advisories.

2.1.4 Chemical Contaminants

Long-term monitoring supporting SOGL 2022 shows that the overall status for chemical contaminants in air, water, sediments, whole fish, and wildlife in Lake Michigan is **Fair**.

Key sources and pathways of chemical contaminants include:

- Un-remediated contaminated sediments in AOCs and other depositional areas.
- Atmospheric deposition.
- Urban and industrial runoff delivering PAHs, metals, and other contaminants.
- Nonpoint sources such as agricultural runoff, road dust, and stormwater.

2.1.5 Contaminated Groundwater

Groundwater monitoring programs in Michigan, Wisconsin and Indiana track groundwater quality in monitoring wells throughout the basin. Groundwater quality in the Lake Michigan basin, as measured by chloride and nitrate concentrations, is assessed as **Good**, with trends currently **Undetermined** in SOGL 2022. Of the 2,968

wells that were assessed, the groundwater quality is assessed as **Good** in 1,582 (53%), **Fair** in 735 (25%), and **Poor** in 651 (22%). Leaking septic systems, landfills, and other sources are pathways for nutrients, salts, metals, pesticides to contaminate groundwater. Given groundwater connections to streams, wetlands, and nearshore areas, the contamination of groundwater is a potential pathway for pollutant loadings over long periods, which can mask improvements from surface-water management efforts.

2.1.6 Action Table

In consideration of the trends, the main sources, and the impacts of chemical contaminants in the Lake Michigan basin, member agencies of the Lake Michigan Partnership have developed the following actions to address chemical contaminant pollution (Table 1).

Table 1: Actions to Prevent and Reduce Chemical Contaminant Pollution and Track Progress.

Note: Bulleted items under the main actions in this table are not necessarily inclusive of all actions that the Lake Michigan Partnership could implement. Partner agencies are listed in alphabetical order.

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved ¹	General Objective
1	Point Source Chemical Contaminant Management • Monitor and ensure compliance with clean water laws and regulations. • Support remediation and restoration of areas contaminated by arsenic at Keweenaw Marsh.	EGLE, EPA, IDEM, IEPA, WDNR WDNR	iv
2	Nonpoint Source Chemical Contaminant Management • Address PFAS chemicals under the Resource Conservation and Recovery Act (RCRA) and implement actions identified in the PFAS Strategic Roadmap and other authorities. • Monitor air/land/water for PFAS chemicals, conduct priority site investigations and remediation, and improve interagency coordination.	EPA EGLE, WDNR	iv
3	Sediment Chemical Contaminant Remediation • Implement priority Superfund actions in harbors, rivers, and other areas of the Lake Michigan Basin. • Implement approved sediment clean up management actions at the following AOCs: Grand Calumet River AOC, Milwaukee Estuary AOC, and Kalamazoo River AOC.	EGLE, EPA, IDEM ² , IEPA, WDNR EGLE, EPA, IDEM ³ , USACE, WDNR	iv
4	Science, Surveillance, and Monitoring • Continue monitoring of atmospheric pollutant deposition to the Great Lakes.	EPA	iv

¹ Acronyms for agencies not listed on page ii: Great Lakes Commission (GLC); Great Lakes Fisheries Commission (GLFC); Illinois Department of Public Health (IDPH) Illinois Environmental Protection Agency (IEPA); Michigan Department of Agriculture and Rural Development (MDARD); Michigan Department of Health and Human Services (MDHHS); Michigan Department of Natural Resources (MDNR); U.S. Coast Guard (USCG); USDA-ARS (United States Department of Agriculture - Agricultural Research Service).

² Note that all Superfund removal or remedial actions in Indiana are EPA-led; however, IDEM plays a significant role in the process.

³ While IDEM is not currently a partner in any Great Lakes Legacy Act projects, it has significant stakeholder and regulatory roles in these projects.

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved ¹	General Objective
	- Continue long-term monitoring of Lake Michigan sediment contaminants to examine legacy organics, PAHs, trace metals, Hg, and selected new and emerging compounds. - Continue contaminant monitoring in fish, wildlife, and harvestable plant resources. - Conduct post-management action monitoring to assess ecosystem recovery in support of BUI removal and Lake Michigan AOCs. - Continue research and pilot testing of remediation techniques for contaminant clean-up.	EPA, NOAA, USGS, WDNR CORA, EGLE, EPA, IDNR, IDEM⁴, LRBOI, LTBB, PBPI, USFWS, WDNR EGLE, IDEM, IDNR, USACE, USGS, WDNR USFS	
5	Engagement and Education - Continue to issue and update fish, wildlife, and harvestable plant resource consumption guidance. - Meaningfully engage stakeholders in efforts to restore and revitalize Lake Michigan AOCs. - Ensure communication and engagement efforts and informational resources are accessible in multiple modes (e.g., electronic, written, audio) and are translated as needed. - Provide public engagement opportunities to learn about ‘Health of Lake Michigan’, individual behaviors to support lake stewardship and ways to get involved.	CORA, GTB, IDEM⁵, IDPH, LRBOI, LTBB, MDHHS, PBPI, WDNR EGLE, EPA, IDEM, IDNR, WDNR LTBB, WDNR LTBB, WDNR	iv, iii

⁴ IDEM conducts fish contaminant monitoring in partnership with the INDNR and the Indiana Department of Health.

⁵ While the Indiana Department of Health develops and issues fish consumption guidance in Indiana, it does so in coordination with IDEM and IN DNR. As a Lake Michigan Partnership agency, IDEM will serve as the point of contact for this action.

2.1.7 Actions everyone can take

Everyone is encouraged to do their part to prevent chemical contaminants from entering Lake Michigan, its watershed streams, lakes, wetlands, and groundwater by undertaking the following actions:

- Take household hazardous materials to hazardous waste collection depots;
- Don't burn garbage in barrels, open pits, or outdoor fireplaces, to prevent the release of toxic compounds including dioxins, mercury, and lead;
- Properly dispose of unwanted or expired medication through take-back programs;
- Choose products and practices that use fewer harmful chemicals.

To reduce risks to human health from Great Lakes fish consumption while maximizing the health benefits of making fish a part of your diet, always follow the recommendations found in the State guides/ advisories to eating sportfish.

These collective actions, alongside the regulatory and program commitments of governments and partners, will help to reduce chemical contaminants further and protect Lake Michigan as a source of safe drinking water, healthy fish and wildlife, and vibrant communities.

2.2 Nutrient and Bacterial Pollution

This section summarizes scientific information on Lake Michigan's nutrient and bacterial pollution, current threats, and actions to be taken by Lake Michigan Partnership agencies within the 2025-2029 timeframe, as well as actions everyone can take. Information is aligned to assess the two related GLWQA General Objectives.

Nutrients, particularly phosphorus, are essential to the lake's food web. They support the growth of algae and aquatic plants that feed zooplankton, benthic invertebrates, and fish. However, too many nutrients, particularly in nearshore areas, can fuel nuisance and harmful algal growth, while too few nutrients can limit productivity offshore and affect the fishery. Likewise, bacterial contamination can temporarily restrict public use of beaches and shorelines, even when long-term conditions are generally good.

2.2.1 Objectives and Condition Overview

Two of the nine GLWQA General Objectives are addressed in this section. These objectives state that the waters of Lake Michigan should:

ii. allow for swimming and other recreational use, unrestricted by environmental quality concerns.
vi. be free from nutrients that directly or indirectly enter the water as a result of human activity, in amounts that promote growth of algae and cyanobacteria that interfere with aquatic ecosystem health, or human use of the ecosystem; and

2022 SOGL indicators for nutrients and in lakes harmful and nuisance algae, and beach advisories show a range of conditions for Lake Michigan. Offshore phosphorus concentrations are below objectives. Low phosphorus concentrations may negatively affect lake productivity. Cyanobacteria blooms are reported in many of the river mouths along the western shore of Lake Michigan and eutrophic embayments such as Green Bay and Muskegon Bay. *Cladophora* nuisance algae grows over large areas of the Lake Michigan nearshore zone. From 2018 to 2019, monitored Lake Michigan beaches were assessed as **Good** because

beaches were open and safe for swimming for an average of 96% of the swimming season.

2.2.2 Nutrient Pollution

The waters of the Great Lakes should be free of excess nutrients that enter the water, directly or indirectly, from human activity, in amounts that promote the growth of algae and cyanobacteria that interfere with aquatic ecosystem health or human use.

Agency monitoring programs track nutrient conditions in offshore, nearshore, and tributary waters. The U.S. Environmental Protection Agency (EPA) monitors offshore total phosphorus (TP), State agencies and the U.S. Geological Survey (USGS) monitor tributaries and nearshore waters; and modelling tools such as SPARROW help attribute loads to sources across the watershed and from upstream Great Lakes.

SOGI 2022 assessments classify Nutrients in Lake Michigan as **Fair** with an **Unchanging** 10-year trend. Offshore phosphorus concentrations are below objectives and have stabilized, with no signal of recovery. Low phosphorus concentrations may be negatively affecting lake productivity. As a result of this long-term decrease in phosphorus, there has been a reduction in phytoplankton abundances in the lake, especially in the springtime. With this decline in the spring phytoplankton bloom, maximum chlorophyll concentrations in the offshore waters of Lake Michigan are now observed in the late summer to early fall. In some nearshore areas, elevated phosphorus is observed and may be supporting nuisance algae growth. Data from Green Bay indicate eutrophic conditions.

The presence of Zebra and Quagga Mussels has altered nutrient cycling and water clarity, shunting nutrients to the nearshore and the lake bottom, where they fuel benthic macroalgae such as *Cladophora*. The **Cladophora** 2022 SOGI sub-indicator is assessed as **Poor** due to widespread nuisance growth of *Cladophora* over large areas of the Lake Michigan nearshore zone; trends are **Unchanging**.

The **Harmful Algal Blooms** sub-indicator is assessed as **Fair** with an **Unchanging** trend in SOGI 2022. Cyanobacteria blooms are reported in many of the river mouths along the western shore of Lake Michigan and eutrophic embayments such as Green Bay and Muskegon Bay.

Key drivers of nutrient pressures on Lake Michigan include:

- **Urban stormwater and wastewater:** discharges from wastewater treatment plants, storm sewers, and combined sewer overflows in highly urbanized areas, particularly at the southern end of the lake.
- **Agricultural runoff:** excess application of fertilizers and manure, soil erosion, and tile drainage that deliver phosphorus and nitrogen to tributaries.
- **Septic systems:** poorly sited, aging, or poorly maintained systems that leach nutrients into groundwater and nearshore waters.
- **Invasive dreissenid mussels:** increased water clarity, nutrient retention, and recycling in the nearshore, which promote *Cladophora* growth and can help create conditions for localized cyanobacterial blooms.
- **Shifts in weather and runoff patterns:** more frequent and intense rain and storm events that increase runoff and erosion, along with longer warm-water seasons that extend the growing period for algae.

Together, these pressures create a dual challenge for Lake Michigan managers: reducing nutrient enrichment and nuisance algal growth in nearshore hotspots and embayments, while understanding and addressing low

nutrient conditions and altered productivity in the offshore.

2.2.3 Bacterial Pollution

Bacterial pollution in Lake Michigan is managed so that most monitored beaches are open and safe for swimming most of the season. However, localized advisories or beach closures can occur after heavy rain or in areas with chronic pollution sources. The GLWQA objective is that water should allow swimming and other recreation, without being restricted by environmental quality concerns. State, local and tribal agencies sample recreational beaches for indicator bacteria, such as *E. coli* and enterococci, and issue advisories or closures when results exceed health-based thresholds.

As summarized in the 2022 SOGL **Beach Advisories** sub-indicator, conditions for Lake Michigan are rated **Good** with an **Unchanging** trend: monitored beaches were open and safe for swimming for an average of 96% of the swimming season.

Key sources of bacterial contamination include failing or poorly maintained septic systems in rural and shoreline areas; agricultural runoff from fields treated with manure or fertilizers; combined sewer overflows and stormwater discharges in urban and suburban centers; and direct inputs from wildlife such as gulls and geese at popular beaches. Decaying algal mats, vegetation, and debris accumulating along the shore can also harbor *E. coli* and other pathogens, contributing to elevated bacterial levels in beach sand and nearshore waters.

While long-term trends show improvement, actions targeting management of runoff from intense rain events are needed to reduce the frequency and duration of bacterial exceedances in some locations. Continued infrastructure upgrades, green stormwater solutions, better septic system management, and targeted local actions should protect beach water quality and recreational use.

2.2.4 Action Table

In consideration of the trends, the main sources, and the impacts of impaired water quality and beach health in the Lake Michigan basin, the member agencies of the Lake Michigan Partnership have developed the following actions to address nutrient-driven water quality and protect beach health (Table 2).

Table 2: Actions to Prevent and Reduce Nutrient-driven Water Quality Impacts in Lake Michigan and Protect Beach Health

Note: Bulleted items under the main actions in this table are not necessarily inclusive of all actions that the Lake Michigan Partnership could implement. Partner agencies are listed in alphabetical order.

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
6	Point Source Pollution - Enforce permitted discharges to ensure receiving waters meet Water Quality Standards. - Enhance the use of green infrastructure in context of NPDES permits. - Implement infrastructure upgrades to prioritize combined sewer separation projects and wastewater treatment plant upgrades.	EGLE, EPA, IEPA, IDEM, USACE, WDNR EGLE, EPA, IEPA, IDEM, WDNR, EGLE, EPA, IEPA, IDEM, USACE, WDNR,	vi
7	Nonpoint Source Pollution - Identify priority watersheds and implement systems of conservation practices and agroforestry on farms and in streams to reduce and treat runoff. Pair upland source control BMPs with downstream treatment BMPs and/or innovative practices to create regional “water treatment trains” - Increase volunteer adoption of enhanced nutrient management practices to reduce risk of nutrient losses from farmland. - Implement conservation easements to reduce non-point source nutrient runoff. - Support Green Bay watershed-wide management planning and implementation to address eutrophication, legacy phosphorus, and issues caused by excess nutrients throughout the bay. - Implement projects that treat, slow, or capture untreated stormwater runoff, including green infrastructure practices, urban forestry, increased green space in urban areas, structural practices in agricultural areas, and enhance stormwater capture on vacant properties.	EGLE, NOAA (Sea Grant), Soil and Water Conservation Districts, USDA-NRCS, USFS, WDNR MDARD, Soil and Water Conservation Districts, USDA-NRCS, WDNR GTB, USDA-NRCS, USDA-NRCS, USFWS, WDNR EGLE, EPA, GTB, IDEM, IDNR, IEPA, LTBB, NOAA, PBPI, USACE, USDA-NRCS, USFS, WDNR	vi

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	- Develop watershed management plans and implement the nonpoint source pollution control efforts identified. This includes, but is not limited to, Section 319 Nonpoint Source Management Program of the U.S. Clean Water Act, National Coastal Management Zone Program, urban non-point program guidance, and other agency developed plans. - Increase the number of certified Clean Marinas in the Great Lakes Clean Marina Network. - Implement watershed planning and green stormwater infrastructure projects identified in Northwest Indiana and Grand Rapids Urban Waters Federal Partnership Work Plans. - Support the restoration and revitalization of Ox Creek, a tributary of the Paw Paw/St. Joseph River at Benton Harbor, Michigan, through installation of green infrastructure, riparian and stream channel restoration, and related corridor improvements. - Collaborate with water utilities on Lake Michigan source water protection through planning, outreach, and implementing land protection and riparian restoration	EGLE, EPA, GTB, IDEM, IEPA, IDNR, LTBB, PBPI, Soil and Water Conservation Districts, USDA-NRCS, IDEM, IDNR EGLE, EPA, IDEM, MDNR, MDHHS, NPS, USACE, USDA-NRCS, USFS, USFWS, USGS EGLE, EPA, NOAA, PBPI EGLE, USFS	
8	Science, Surveillance, and Monitoring Agricultural Areas: - Continue edge-of-field water quality monitoring in targeted Lake Michigan watersheds to assess effectiveness of best management practices and coordinate routine data sharing between agency partners on agricultural BMP implementation to improve effectiveness evaluations. - Use Buffering America's Waterways Tool to identify riparian environments for restoration and Conservation Effects Assessment Project (CEAP) findings to guide USDA conservation policy and program development by quantifying the environmental effects of conservation practices and programs and developing the science base for managing the agricultural landscape for environmental quality.	EPA, USDA-ARS, USDA-NRCS, USFS, USGS USDA-NRCS, USFS	vi

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	Lake Michigan and Tributaries: • Continue to administer the Great Lakes Tributary Monitoring Program to track changes and identify long-term trends in nutrient and sediment loads to the Great Lakes. • Continue to assess stream water quality under Section 305(b) of the U.S. Clean Water Act. • Monitor nearshore sentinel sites established in Lake Michigan to improve understanding of factors driving nuisance <i>Cladophora</i> growth. • Assess groundwater delivery of nutrients to streambeds in the Lake Michigan basin to improve estimates of long-term response to nutrient management actions. • Continue to assess the drivers and barriers to adoption of on-farm conservation and agroforestry practices, to effectively support landowners in implementing practices that reduce nutrient runoff • Evaluate success of focused implementation on field, edge-of-field, and downstream structural practices in smaller subwatershed catchments. Coordinate routine data sharing between agency partners on agricultural BMP implementation on a finer scale than HUC12 to improve evaluation of implementation as well as citing of additional practices, such as those focused on feasible and effective treatment BMPs that further reduce TP, DRP and/or TSS loads	USGS EGLE, EPA, IDEM, IDNR, LTBB, WDNR NPS, USGS USGS LTBB, USFS WDNR	

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
9	Beach Monitoring and Notification: • Coordinate with local partners to conduct source tracking and beach water quality monitoring, to inform issuance of swimming advisories to protect public health. • Develop and assist local health departments and other partners to implement rapid response methods for <i>E. coli</i> monitoring and public notification at beaches, including improvements to predictive modeling. • Design and implement projects at beaches with known impairments (e.g., bacterial contaminants, pathogens, toxins, nuisance algae) to mitigate those impairments and increase resiliency of beaches. • Monitor and assess factors driving Green Bay nearshore cyanobacterial blooms using satellite and field data.	EGLE, EPA, IDEM, IDNR, USGS, WDNR EGLE, EPA, IDEM, IDNR, USGS, WDNR EGLE, IDEM, WDNR NOAA, WDNR	ii, vi, ix
10	Engagement and Education • Foster collaboration between partner organizations (e.g. farmer-led groups, NGOs, industry associations, agencies) to escalate implementation of effective nutrient management activities and watershed-based plans that reduce agricultural pollutant loads and educate agricultural producers about manure and fertilizer application restrictions, fertilizer certification requirements, and nutrient management plans. • Develop, share, and implement engagement and education strategies to encourage private property owners to increase maintenance and inspections of onsite disposal systems. • Encourage adoption of green infrastructure practices for new and existing development. • Continue support for farmer-led groups and Demonstration Farm Networks and promote use of new strategies or technologies amongst agriculture producers. • Participate in the Great Lakes HABs Collaborative, a regional forum for collaboration and communication about HABs, connecting current research results with decision-makers.	IDEM, MDARD, Soil and Water Conservation Districts, WDNR EGLE, NOAA EGLE, EPA, IDNR, IEPA, LTBB, PBPI, WDNR MDARD, USDA-NRCS, WDNR EGLE, NOAA, USACE, USGS, WDNR	vi

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	Conduct outreach to beach managers and beach goers on best practices to reduce the risk of swim-related illness	IDEM, IDNR, WDNR	

2.2.5 Actions everyone can take

Landowners and the public are encouraged to do their part to prevent nutrient and bacterial pollutants from entering groundwater, streams, lakes, wetlands, and Lake Michigan through a variety of actions, including:

Prevent Water Contamination & Manage Waste:

- Avoid using cleaners containing phosphates (note that all four Lake Michigan states have a ban on phosphates for laundry and dish detergent).
- Avoid using lawn fertilizers containing phosphorus, unless establishing a new lawn or a soil test shows that your lawn does not have enough phosphorus. Follow recommendations for application provided by manufacturer and apply in accordance with any guidelines or regulations that exist within your jurisdiction (note that Illinois, Michigan, and Wisconsin have enacted various statewide restrictions on the sale and use of phosphorous-containing fertilizers).
- Always pick up pet waste and dispose of it in trash cans.
- Install a rain barrel and reuse the water for beneficial purposes, such as watering a lawn or garden.
- Plant a rain garden with native shrubs and herbaceous plants to capture and store rainwater and snow melt.
- Reduce the amount of impervious surface in an area by increasing natural areas and choosing permeable pavers over more-traditional paving materials, such as concrete.
- Incorporate agricultural best management practices, such as grassed swales, filter and/or buffer strips, and cover crops to control, reduce, and store stormwater runoff; keep cattle and other animals out of streams; and plant a shelter belt.
- Conserve water to reduce the amount of wastewater that must be treated and sent to combined and sanitary sewers to prevent overflows.
- Properly maintain septic systems.
- Implement improved septic technologies, including conversion of septic systems to municipal or communal sewage systems, where available;
- Dispose of boat sewage in onshore sanitary facilities or at pump out stations. Reference the state Clean Boater Tip Sheets for [Illinois](#), [Indiana](#), [Michigan](#), and [Wisconsin](#).
- Never feed shorebirds or other wildlife and keep food in covered containers to prevent birds and animals from eating it.
- Keep oils, solvents, and other hazardous fluids covered and away from street and storm drains, and practice other ways to reduce or stop pollution.
- [Report any spills](#) of chemicals that you see as soon as possible.
- Properly maintain vehicles to avoid leaking chemicals that may contaminate surface water or groundwater.
- Bring old paints, cleaners, fluorescent lightbulbs, and other [household hazardous waste](#) to your local hazardous waste collection site.
- Drop off unwanted medicines at an [unwanted medicine collection](#) program site.
- Reduce waste, reuse products, and recycle used material.
- Pick up litter, join cleanup events, and [learn more about protecting beaches in your community](#)

By combining these individual actions with the coordinated efforts of governments, Indigenous partners, municipalities, community groups, and scientists, the Lake Michigan Partnership will continue to protect and improve water quality for swimming, fishing, and the health of the lake's ecosystems.

2.3 Loss of Habitat and Species

Lake Michigan water quality depends on the health of the basin’s ecosystem. This section summarizes the scientific information about Lake Michigan’s habitat and species, current threats, and corresponding actions to be taken by Lake Michigan Partnership agencies in the 2025-2029 timeframe, as well as actions that everyone can take. Information is aligned in response to the habitat and species General Objective of the GLWQA.

Lake Michigan supports a mosaic of habitats—dunes, coastal wetlands, barrier beach complexes, cobble and bedrock shores, coastal forests, islands, tributaries, nearshore waters, and deep offshore areas. These diverse environments provide breeding, feeding, and migratory habitat for fish, birds, amphibians, reptiles, invertebrates, and plants, and underpin important recreational, cultural, and economic activities around the lake.



Figure 2. Hiawatha National Forest. Source: USFS.

2.3.1 Objective and Condition Overview

One of the nine General Objectives of the GLWQA is addressed in this section. This objective states that the waters of Lake Michigan should:

v. support healthy and productive wetlands and other habitats to sustain resilient populations of native species.

The Habitat and Species indicator in the 2022 SOGL report combines information on coastal wetlands, tributaries (aquatic habitat connectivity), and the aquatic food web, with a focus on native species.

2022 SOGL assessments for Lake Michigan show that:

- **Coastal wetlands:** fish, amphibians, and birds are **Fair** and **Unchanging**; plants are **Fair** and **Unchanging**.
- **Tributaries (aquatic habitat connectivity):** are **Poor** and **Improving**, as less than one-fifth of the tributaries that were historically connected to Lake Michigan remain accessible to migratory fishes. There are continued efforts to restore aquatic habitat connectivity in the Lake Michigan basin.
- **Aquatic food web:** phytoplankton are **Fair** and **Deteriorating**; zooplankton and benthos are Good and Unchanging; Diporeia is **Poor** and **Deteriorating**; native prey fish diversity is **Fair** and **Unchanging**; Lake Trout is Fair and Improving; Walleye is **Good** and **Unchanging**; Lake Sturgeon is

Poor and Improving.

Overall, Lake Michigan supports many healthy native communities. Still, habitats and species are under stress from land-use change, shoreline alteration, invasive species, extreme fluctuations in water levels, changes in nutrient cycling, contamination, and changing physical conditions of the lake. Protecting what remains in good condition while restoring degraded areas is essential to maintaining a resilient ecosystem. More detailed information on indicator methods, status, and trends for Lake Michigan is available in the 2022 SOGL assessment.

2.3.2 Loss of Habitat and Species

The waters of the Great Lakes should support healthy and productive wetlands and other habitats to sustain resilient populations of native species.

Across the Lake Michigan basin, habitat and species monitoring is carried out by federal, Indian Nation, state, and local agencies, as well as academic and community partners. Together, these programs track the condition of coastal wetlands, tributaries, and the aquatic food web, and provide the foundation for the Lake Michigan Partnership's priorities and actions.

Key guidance and monitoring efforts include:

- Lake Michigan Biodiversity Conservation Strategy (LM BBCS, 2009): identifies critical threats to biodiversity and strategies to restore badly degraded conservation targets at priority areas within the basin.
- Great Lakes Fishery Commission (GLFC) – Lake Michigan Committee (LMC): sets Fish Community Objectives, identifies fish habitat priorities (e.g., spawning and nursery areas, tributary connectivity, coastal wetland function), and guides lakewide fisheries management and restoration.
- Coastal wetland and coastal habitat surveys: EPA's Great Lakes Coastal Wetlands Monitoring Program uses standardized methods to assess fish, birds, amphibians, vegetation, macroinvertebrates, and water quality at coastal wetlands around the lake.
- Aquatic food web monitoring: long-term surveillance of phytoplankton, zooplankton, benthos, prey fish, and top predators such as Lake Trout, Walleye, and Lake Sturgeon.

These coordinated efforts reveal a basin that still supports many healthy native communities, but where critical habitats remain fragmented or degraded, and several key species are vulnerable.

Coastal Wetlands

Great Lakes coastal wetlands are some of the most biologically diverse ecosystems in the Great Lakes basin and they are crucial to the health of the Great Lakes. Coastal wetlands serve as spawning and nesting habitat for a variety of animals, help maintain water quality throughout the basin, aid in preventing erosion along exposed shorelines and offer recreational and tourism opportunities. Based on the [Great Lakes Coastal Wetland Monitoring Program](#) inventory of coastal wetlands, Lake Michigan has approximately 120,000 acres of Great Lakes coastal wetlands. Lake Michigan contains a variety of coastal wetland types, many of which are located at or near the mouth of large river systems where a sand barrier has created an area of protection from waves and storms (called "barred drowned river mouth" wetlands). Other wetland types found along the Lake Michigan shoreline include coastal fen, northern fen, interdunal wetland, and other types of Great Lakes marsh. Coastal wetlands are experiencing continued losses in some parts of the basin due to human development, fragmentation, drainage and, to some extent, changing water levels. Stressors such as invasive species and point and nonpoint pollution may cause further degradation and loss.

Based on scores of three plant community measures that incorporate information on the presence, abundance, and diversity of aquatic macrophytes in the Great Lakes from the Coastal Wetland Monitoring Program between 2011 and 2019, the status of Lake Michigan coastal wetland plants was assessed as **Fair** and **Unchanging** in 2022 SOGL, although Green Bay has experienced wetland degradation. Generally, higher quality wetlands are found in the less developed northern portion of the lake. Expansion of non-native wetland plants during the past 20 years, particularly non- native invasive common reed (*Phragmites australis australis*) has caused a significant reduction of both native wetland plant species diversity and percentage cover. Fluctuating water levels in recent years have also influenced the extent and composition of coastal wetlands.

The health of Lake Michigan coastal wetland birds, as evaluated by measurements of composition and abundance of wetland breeding birds between 2011 and 2019, was assessed as **Fair** and the trend was **Undetermined** in 2022 SOGL. The species composition, diversity and relative abundance of breeding frogs in coastal wetlands measured between 2010 and 2020 in Lake Michigan was also assessed as **Fair** with an **Undetermined** trend in 2022 SOGL.

Tributaries and Aquatic Connectivity

Lake Michigan's approximately 294 tributaries range from small, first-order streams with catchments of just 3 km² (1 mi²) to sixth-order rivers with catchments as large as 16,000 km² (61,78 mi²) (Mooney et al. 2020). These tributaries provide important spawning habitat for fish and other aquatic species and can influence nearshore water quality and coastal habitat condition.

Less than one-fifth of the tributaries that were historically connected to Lake Michigan remain accessible to migratory fishes. Dams, weirs, perched culverts, and other in-stream structures fragment river networks and limit access to spawning, nursery, and rearing habitats. There are continued efforts to restore aquatic habitat connectivity in the Michigan basin that range in scale from replacing under-sized culverts on rivers to removal of dams on the Boardman River that re-connected more than 250 km (160 miles) of tributary habitat back to Lake Michigan. The sturgeon elevator on the Menominee River that has operated since 2015 is an example of the innovative approaches that are being applied to improve aquatic habitat connectivity. Efforts to restore connectivity must carefully balance re-opening migration routes for native and desirable species while maintaining structures that limit upstream spread of invasive Sea Lamprey and other unwanted species. Strategic barrier management, removing, modifying, or replacing some structures and retaining others for biosecurity, will be essential to recovering native fish populations while preventing new ecological damage.



Figure 3. Upper Wolf River Fishery Area. Source: WDNR.

Aquatic Food Web Condition

Open Water Species

Phytoplankton and zooplankton communities are the main source of food for prey fish and are essential to sustaining a healthy food web. Phytoplankton in Lake Michigan is assessed as **Fair** and **Deteriorating** in SOGL 2022 to reflect impacts from invasive, filter-feeding mussels and possibly longer-term water temperature changes. SOGL 2022 assessed Lake Michigan zooplankton as **Good** with a **Deteriorating** trend, as the lake continues to trend towards levels historically comparable to oligotrophic Lake Superior.

The 2022 SOGL status for Lake Trout, native to the deep waters of Lake Michigan, is **Fair** and the trend for 2011-2020 is **Improving**. Wild fish continue to be observed but at low levels and mostly in the southern portion of the lake where mortality is low and adult stocks are more developed. Mortality from fishing and sea lamprey remains high in the northern area. The Lake Trout population in Lake Michigan is still in the early stages of recovery, which suggests that management actions to promote rehabilitation should be maintained.

Native Migratory Fish

The Lake Sturgeon population in Lake Michigan continues to be well below historical levels. Only eight rivers (Fox, Oconto, Peshtigo, Manistee, Menominee, Muskegon, Grand, and Kalamazoo) provide measurable natural recruitment to the lakewide population. Stocking at streamside facilities is necessary to augment the remaining wild recruitment. Dams and other barriers to sturgeon passage is an ongoing challenge. For these reasons, the Lake Sturgeon population is assessed as **Poor** in SOGL 2022; however, catch rates have improved in some areas and improvements in fish passage suggest an **Improving** trend in Lake Michigan.

The health of Walleye populations in Lake Michigan is assessed as **Good** and **Unchanging** between 2010 and 2019 in SOGL 2022. Green Bay provides over 95% of the Lake Michigan's walleye harvest. Walleye fisheries in the main basin of Lake Michigan are relatively small and with limited contributions of naturally reproduced fish.

Aquatic habitat connectivity refers to connections between the Great Lakes and waterways that are used by migratory fish species. These connections provide unobstructed routes to fulfill life history requirements of migratory fish, including access to tributary spawning habitats and opportunities for genetic exchange. For Lake Michigan, aquatic habitat connectivity is assessed in SOGL 2022 as **Poor** as approximately only 19% of the tributaries that were historically connected to Lake Michigan remain accessible to migratory fishes. Dams and barriers are ranked as a moderate threat to migratory fishes (Pearsall *et al.* 2012). Several dam removal and mitigation projects have been initiated in recent years, causing the SOGL 2022 trend to be **Improving** for Lake Michigan. Note that dam and barrier removal/modification is not always straightforward, since barriers can serve as flood control protection and provide certain ecological benefits, namely by limiting the movement of sea lamprey into tributaries to spawn.

Lake Michigan's aquatic food web has undergone significant restructuring over recent decades due to changing nutrient conditions, invasive species, contaminants, and habitat pressures. On the lake bottom, native benthic communities have been transformed by dense dreissenid mussel populations, which now dominate biomass in many areas. While some measures of benthic condition are stable, Diporeia, formerly a key native prey item,

remains at very low densities. This loss has reduced the energy available to many native fish and altered pathways by which nutrients move through the ecosystem.

Among fish, there are encouraging signs and ongoing concerns. Lake Trout and Walleye have responded to decades of coordinated management, including stocking, harvest controls, and habitat improvements. Wild adult Lake Trout continue to be observed at low levels, mostly in southern Lake Michigan where mortality is low and adult stocks are more developed. Mortality from fishing and sea lamprey remains high in northern Lake Michigan. Walleye trends in Lake Michigan are largely driven by populations in the Wisconsin and Michigan waters of Green Bay, which constitute over 95% of the lake-wide harvest.

Native prey fish biomass, based on fall bottom trawl surveys, remains at a historical low, and has been dominated by one native species, Bloater, since 2015. Wild populations of Lake Sturgeon spawn annually and recruitment can be detected in eight tributaries to Lake Michigan. Stocking appears to be reestablishing populations associated with several rivers, and ongoing supplementation continues to enhance recruitment for two wild populations. Access to spawning and rearing habitat has increased with removal of several dams on some rivers, creation of spawning habitat on others, and continued passage of sturgeon around the lower two dams on the Menominee River. Catch rates of both wild and stocked juvenile Lake Sturgeon have increased in assessment gill nets in several areas over the past 10 years, suggesting increasing recruitment.

Key threats to habitat and species

Drawing on the Lake Michigan Biodiversity Conservation Strategy and long-term monitoring, the main stressors affecting habitats and species in Lake Michigan include:

- Incompatible development and shoreline alteration: loss and fragmentation of wetlands, coastal forests, and natural shorelines; increased hardening that simplifies habitat and disrupts sediment dynamics.
- Aquatic and terrestrial invasive species that transform habitat structure, displace native species, and alter nutrient and energy flows.
- Dams and barriers: reduced tributary connectivity, blocked migration routes, and altered flow patterns that limit access to critical spawning and nursery areas.
- Nonpoint source pollution: nutrient and sediment inputs that degrade coastal wetlands, tributaries, and nearshore habitats and exacerbate other stressors.
- Large-scale environmental change: shifting temperature and precipitation patterns, more frequent and intense storms, and synergistic effects with land-use pressures.

Addressing these threats will require a combination of protection, restoration, and management of remaining high-value areas.

2.3.3 Action Table

In consideration of the current condition of aquatic habitat and native species, as well as the geographic scope of threats and extent of localized impacts, member agencies of the Lake Michigan Partnership have developed monitoring and management actions to protect, improve, and restore Lake Michigan habitats and native species (Table 3).

Table 3: Actions to Protect and Restore Habitat and Species and Track Progress.

Note: Bulleted items under the main actions in this table are not necessarily inclusive of all actions that the Lake Michigan Partnership could implement. Partner agencies are listed in alphabetical order.

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
11	Wetlands - Improve habitat connectivity, protect, and restore access to spawning and nursery habitat for Lake Sturgeon, Northern Pike, suckers, and other native fish species at Big Bay de Noc and Little Bay de Noc (LMC environmental priority areas), Green Bay, and at other wetland/nearshore sites identified as important for supporting life stages of fish species. - Improve the resolution and accuracy of wetland maps and identify potentially restorable wetlands in the Lake Michigan watershed. - Support monitoring and research of coastal wetland systems to improve the understanding of these rare habitats and how they respond to changes, development pressure, and pollution, and encourage the use of science-based management. - Implement activities to protect and restore populations of wetland-dependent taxa, including birds, amphibians and others.	LTBB, MDNR, NOAA, USFWS, WDNR USFS, WDNR EGLE, EPA, LTBB, NOAA, WDNR LTBB, MDNR, PBPI, USFS, USFWS, WDNR	v
12	Spawning Reefs Utilize best available science to protect and restore reefs to increase functional spawning habitat for Lake Whitefish, Cisco, Lake Trout, Yellow Perch and other native fish species at Saugatuck, Bay de Noc Charlevoix/Harbor Springs, (LMC environmental priority areas) and other priority areas.	GTB, IDNR, LTBB, MDNR, NOAA, USFWS, USGS, WDNR	v
13	Tributary Connectivity and Tributary Habitat Support creation of comprehensive basin-wide aquatic connectivity barrier inventories.	INDNR, LTBB, MDNR, USFS, USFWS, WDNR	v

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	- Complete dam removal projects in the Boardman/Ottaway River and explore removal options in the Peshtigo River and Oconto River (LMC environmental priority areas), and other priority areas to allow access by fishes to spawning and nursery habitat. - Improve in-stream habitat for Lake Whitefish, Lake Sturgeon, and other native fish species in Grand River, Michigan below the Sixth Street Dam (LMC environmental priority area) and other priority areas. - Implement priority aquatic connectivity, habitat, and riparian restoration projects in the Peshtigo River, Oconto River, Paint River, Bigelow Creek (Muskegon River), White River (MI), and other priority watersheds to restore and connect habitat for brook trout and other native species. - Prioritize projects that protect and restore areas where groundwater resources benefit resiliency of cool and coldwater aquatic species.	GLFC, GTB, MDNR, NOAA, USACE, USDA-NRCS, USFWS, WDNR MDNR, USFWS, WDNR GTB, MDNR, NOAA, USFS, USFWS, WDNR LTBB, MDNR, NOAA, PBPI, USFS, USGS, WDNR	
14	Other Nearshore and Coastal Habitats - Protect and restore nearshore habitats that support all life history stages for Smallmouth Bass, Lake Whitefish, Walleye, Yellow Perch, Muskellunge, and other native fish species along the western shoreline of Green Bay, the eastern shoreline of Green Bay and the southern basin nearshore of Lake Michigan (LMC environmental priority areas), as well as habitats for other priority wildlife. - Improve mapping resolution and accuracy of nearshore habitat and coastal maps to improve the understanding of critical spawning and habitat areas that would benefit from protection and/or restoration.	IDNR, MDNR, NOAA, USACE, USFWS, WDNR IDNR, INDNR, NOAA, NPS, USACE, USFS, USGS, WDNR	v

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	- Implement habitat and species protection and restoration at Indiana Dunes National Park, Sleeping Bear Dunes National Lakeshore, Kenosha Dunes, other priority dune systems. - Support protection and restoration of the Beaver Island Archipelago, Cat Island, Longtail Point, and other islands that support rare, endemic or other important species and habitats. - Assess the efficacy of shoreline protection structures and capping as habitat for nearshore fish communities and other biota. - Protect and restore Lake Michigan's drowned river mouth lakes and other estuaries through research and management.	IDNR, MDNR, NPS, PBPI, WDNR EGLE, LTBB, MDNR, USACE, USFWS, WDNR IDNR, WDNR INDNR, LRBOI, LTBB, MDNR, WDNR	
15	Forests - Restore and enhance oak savanna habitat and oak species recovery across the urban to rural spectrum in the southern Lake Michigan basin. - Increase riparian forest cover and improve resilience of existing riparian forests to pests and other stressors. - Protect and restore forested lands through forest pest detection and rapid response, invasive species management, native plantings, assisted migrations, and reintroducing natural processes (e.g. prescribed burning). - Protect and manage forested lands and improve connectivity to improve migratory and resident bird habitat, especially in flyway areas.	INDNR, MDNR, PBPI, USACE, USFS, WDNR INDNR, LTBB, MDNR, PBPI, USFS, WDNR LTBB, MDNR, NPS, PBPI, USFS, WDNR LTBB, PBPI, USFS, WDNR	v

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	Maintain and enhance urban and community forests through actions that increase tree canopy cover and diversity, promote native species with wildlife benefits, increase climate resilience, improve management of urban trees and woodlots, build community capacity and stewardship, and conserve greenways and wildlife travel corridors.	LTBB, MDNR, USFS, WDNR	
16	Species Recovery - Protect and restore priority habitats and populations for wildlife in the Lake Michigan basin identified in state Wildlife Action Plans, state and federal recovery plans, and other management plans. - Support streamside rearing facilities for lake sturgeon. - Support rehabilitation of Lake Michigan cisco populations following established interjurisdictional fisheries management processes (Lake Michigan Committee) and the Great Lakes Coregonine Restoration Framework. - Support piping plover monitoring, research, and restoration at priority sites along Lake Michigan. - Improve populations of native freshwater mussel species through assessment, habitat enhancement, propagation and stocking. - Protect and restore manoomin/mnomen (wild rice) through monitoring, research, education, collaboration, and other activities.	IDNR, INDNR, MDNR, WDNR GTB, LRBOI, LTBB, USFWS IDNR, LTBB, NOAA, USFWS, USGS IDNR, LTBB, MDNR, NOAA, NPS, USACE, USFWS, WDNR IDEM, NPS, PBPI, USFWS, WDNR EGLE, LTBB, LRBOI, MDNR, NOAA, PBPI, USFS, WDNR	v

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	- Support reintroduction of Arctic Grayling via Michigan’s Arctic Grayling Initiative, including habitat work, monitoring, and other studies in the Manistee River, Boardman/Ottaway River, and other suitable river systems. - Implement priority actions identified in the regional Pollinator Strategy and Action Plan and state-level pollinator plans. - Conduct monitoring and site restoration activities for amphibians and reptiles at priority sites. - Utilize data generated via the Great Lakes Tag and Recovery Program to evaluate performance of hatchery-produced fish in the wild and understand effects of stocked fish on the aquatic ecosystem.	GTB, LRBOI, LTBB, MDNR, NPS, USDA-NRCS, USFS, USFWS, USGS MDNR, PBPI, USFWS, WDNR IDNR, MDNR, PBPI LTBB, MDNR, USFWS, WDNR	
17	Other Priority Geographies and Taxa - Implement projects to conserve tier 1 and tier 2 priority species identified in the US Fish & Wildlife Service’s Green Bay Fish and Wildlife Conservation Office (GBFWCO) Lake Michigan Strategic Habitat Plan 2024 – 2028 - Implement fish and wildlife habitat restoration and protection actions identified in approved watershed management plans and AOC Remedial Action Plans (RAPs). - Coordinate and implement actions to conserve priority species/ taxa in the following watersheds identified by GBFWCO Lake Michigan Strategic Habitat Plan (2024-2028): - Muskegon – Pere Marquette - Grand – Maple – Thornapple - Menominee – Peshtigo – Oconto - St. Joseph – Kalamazoo – Black - Escanaba – Cedar – Sturgeon	USFWS EGLE, IDEM, IDNR, MDNR, WDNR USFWS, MDNR, WDNR	v

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	- Implement priority projects to help meet habitat targets outlined in the USFWS Midwest Region Coastal Program Strategic Work Plan 2022-2027, particularly in the Lake Michigan focus areas: - Green Bay - Straits of Mackinac - Southwestern Lake Michigan Urban Opportunity Area - Implement projects in urban waterways that integrate habitat enhancement with additional project elements including a) better connecting residents to nearby outdoor experiences, b) greater recreational and educational opportunities at project sites, or c) workforce development. - Survey and monitor Illinois ravines to better characterize their physical structure, water quality, and habitat to prioritize restoration and protection strategies that stabilize streambanks and ravine slopes to reduce erosion, protect property and infrastructure, and improve water quality and habitat. - Implement Environmental Priorities identified by the Lake Michigan Committee of the Great Lakes Fishery Commission - Improve understanding of spawning, seasonal movement, and habitat use of priority native (e.g., Lake Trout, Yellow Perch, Lake Whitefish, Smallmouth Bass), introduced salmonid, and invasive fish species (e.g., grass carp, round goby) in the southern Lake Michigan basin through acoustic telemetry tracking and other mechanisms	LTBB, MDNR, USFWS, WDNR EPA, GTB, IDNR, NOAA IDNR IDNR, INDNR, LTBB, MDNR, NOAA, USFWS, USGS, WDNR IDNR, IDEM, INDNR, MDNR, NOAA, USFWS, USGS, WDNR	

2.3.4 Actions everyone can take

Protecting and restoring habitats and species involves the coordination of many different government and non-governmental organizations, and the implementation of actions by various partners and the public. Here are some ways that you can do your part:

- Maintain natural vegetation and woody debris along the coast, streams, and wetlands;
- Plant native trees and shrubs on your property;
- Get involved with shoreline clean up events, such as the Alliance for the Great Lakes Adopt-a-Beach Program (<https://adopt.greatlakes.org/>);
- Consider working with neighbors, local stakeholders, and municipalities to restore beach dune health by installing sand fencing and planting dune grasses;
- Stay on constructed beach and dune paths and avoid trampling the sparse and fragile vegetation in these areas;
- Support and/or volunteer with state or local conservation authorities, stewardship councils, and non-governmental environmental organizations;
- Share your knowledge about the rarity and ecological importance of each of the special shoreline types with all who live, work, and recreate in the Lake Michigan basin watershed.

Collectively, these actions help maintain and restore the habitats and species that make Lake Michigan a healthy, resilient ecosystem and support the water quality, recreation, and cultural values that communities depend on.

2.4 Invasive Species

This section summarizes the scientific information about Lake Michigan's invasive species, current threats, and corresponding actions to be taken by Lake Michigan Partnership agencies in the 2025-2029 timeframe, as well as actions that everyone can take. Information is aligned to address the General Objective on invasive species of the GLWQA.

Lake Michigan's ecosystem has been reshaped by nonindigenous plants, animals, and pathogens introduced over the past century. Some of these non-native species have become invasive, spreading rapidly, displacing native species, altering food webs, and imposing significant economic and cultural costs.

2.4.1 Objective and Condition Overview

One of the nine General Objectives of the GLWQA is addressed in this section. This objective states that the waters of Lake Michigan should:

vii. be free from the introduction and spread of aquatic invasive species and free from the introduction and spread of terrestrial invasive species that adversely impact the quality of the Waters of the Great Lakes.

The 2022 SOGL assessment uses several sub-indicators to assess invasive species status and trends in Lake Michigan:

- Rate of New Aquatic Invasive Species (AIS) Establishment – **Fair** and **Improving**: new establishments from outside the Great Lakes basin have declined markedly compared with the pre-1950 period, primarily due

to strengthened ballast water management. However, some species continue to spread among the lakes and within the Lake Michigan basin.

- Impacts of AIS – **Poor and Deteriorating**: the cumulative ecological and economic consequences of AIS continue to grow as existing invaders expand their range and affect more habitats, even though the rate of new introductions has slowed.
- Sea Lamprey – **Good and Improving**: long-term binational control programs have reduced Sea Lamprey to target levels, significantly decreasing parasitic pressure on Lake Trout and other hosts, provided control efforts are sustained.
- Dreissenid mussels – **Poor and Deteriorating**: Zebra and especially Quagga Mussels remain dominant in much of the benthic zone, with deep-water populations still increasing in density and biomass and continuing to reshape nutrient and energy pathways.
- Terrestrial invasive species – **Undetermined**: data are insufficient for an integrated status assessment, but several terrestrial invaders—such as Emerald Ash Borer, Phragmites, and Japanese Knotweed—are affecting coastal and watershed ecosystems.

Overall, the rate of new introductions has improved. Still, the ecological footprint and impacts of established invaders continue to grow, underscoring the importance of prevention, early detection, and rapid response, and long-term control. More detailed information on indicator methods, status, and trends for Lake Michigan is available in the 2022 SOGL assessment.

Delivering on this GLWQA objective in an extensive, complex system like Lake Michigan requires coordinated efforts in prevention, early detection, rapid response, and long-term control. Detecting and managing invasive species relies on a network of binational and local programs that together build a picture of status, trends, and emerging risks, including:

Aquatic invasive species (AIS):

- Long-term surveillance and early detection programs.
- Targeted monitoring for Sea Lamprey (adult abundance, lamprey marking rates on Lake Trout) and Dreissenid mussels (density and biomass in nearshore and offshore areas).
- Binational Early Detection and Rapid Response Initiative under GLWQA Annex 6, using both traditional sampling and environmental DNA (eDNA) at high-risk areas.
- Invasive carp surveillance coordinated through the Invasive Carp Regional Coordinating Committee (ICRCC), combining netting, electrofishing, and eDNA to detect Grass Carp and other carp species.

Data and reporting tools:

- Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS).
- USGS Nonindigenous Aquatic Species (NAS) database.
- Citizen-science reporting through EDDMapS and iMapInvasives.

Terrestrial invasive species:

- State strategies and partnerships.
- Online reporting platforms and apps, and local rapid response and management projects. These monitoring efforts support risk assessments, response plans, and prioritization of control efforts, while recognizing that complete coverage of the basin is not feasible and data gaps remain.

As of 2020, 140 aquatic nonindigenous species were established in Lake Michigan, and 188 in the Great Lakes as a whole. Not all nonindigenous species are invasive, but many have significant ecological or economic impacts.

Rate of new introduction

- From outside the Great Lakes, the current establishment rate for aquatic species is approximately 0.1 species per year, much lower than the pre-1950 average.
- Spread within the basin remains more active: several species have colonized new watersheds or moved down from the upper lakes into Lake Michigan over the last decade.
- Strengthened ballast water regulations are the main driver of the decline in new introductions; other pathways (organisms in trade, canal connections, recreational boating, bait, and aquarium releases) exist.

Benthic invaders and invertebrates

- Dreissenid mussels (Zebra and Quagga): dominant components of the benthos, especially Quagga Mussels in deeper waters. They filter vast quantities of water, alter nutrient and energy pathways, reduce phytoplankton available to native zooplankton, and promote nearshore algal growth by shunting nutrients to the lake bottom.
- Spiny Water Flea and Bloody Red Shrimp: alter zooplankton communities via predation and competition, with implications for larval fish and nearshore productivity.

Fish and pathogens

- Sea Lamprey: a long-established parasitic fish whose populations are now well controlled at a lakewide target level, owing to binational lampricide treatments, barriers, and trapping.
- Round Goby, Alewife, Rainbow Smelt: widespread invaders that prey on eggs and juveniles of native species and alter food-web dynamics; also serve as prey for some sport fish, transmitting contaminants up the food chain.
- Grass Carp: To date, there is no evidence of a self-sustaining population, but the risk to aquatic vegetation and habitat structure is significant.
- Viral hemorrhagic septicemia (VHS): a fish pathogen affecting multiple species, with ongoing management measures to limit spread via bait, stocking, and fish movement.

Aquatic and riparian plants

- Species such as Water Chestnut, Eurasian Watermilfoil, European Frogbit, Hydrilla, and Curly Leaf Pondweed can form dense mats, displace native vegetation, and alter habitat and water quality.

Terrestrial invasive species

- Trees and shrubs such as Buckthorn, and Knotweed, as well as herbaceous invaders like Garlic Mustard and tall emergent plants such as Phragmites, degrade riparian and wetland habitats, increase erosion risk, and affect cultural practices and traditional livelihoods.
- Emerald Ash Borer infestations have resulted in the loss of millions of ash trees throughout the basin. The loss of native ash trees, which are an important component of riparian habitats, can result in impacts on the food web, physical habitat and water quality of the Lake Michigan ecosystem.
- Mute Swan, introduced for ornamental purposes, impacts submerged aquatic vegetation and can displace native waterfowl.

Perspectives on invasive species vary among communities. Some Indigenous partners may describe these organisms as “non-local beings”, emphasizing the need for respectful, relationship-based approaches to management and recognizing that complete eradication is often neither feasible nor desirable.

Despite progress, Lake Michigan remains under significant pressure from invasive species:

- Ongoing spread of established invaders within the lake and into new tributaries and wetlands.

- Multiple pathways for introduction and spread, including commercial shipping, canals, trade in live organisms, recreational boating and fishing, and the movement of firewood and soil.
- Synergies with other stressors, such as altered nutrient regimes, shoreline development, and extreme water-level and storm events, which can enable invaders to establish and outcompete native species.
- Economic and cultural impacts, including infrastructure fouling, increased management costs, reduced recreational quality, and impacts on traditional food systems and practices.
- Prevention remains the most effective and cost-efficient strategy, supported by early detection, rapid response, and long-term control where invasive species are already established.

2.4.2 Action Table

In consideration of the pathways, distribution, and ecosystem impacts of invasive species, member agencies of the Lake Michigan Partnership have developed the following actions and projects to address this invasive species (Table 4).

Table 4: Actions to Prevent and Control Invasive Species and Track Progress.

Note: Bulleted items under the main actions in this table are not necessarily inclusive of all actions that the Lake Michigan Partnership could implement. Partner agencies are listed in alphabetical order.

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
18	Prevention of Invasive Species • Support prevention efforts for AIS and TIS on state Watch Lists and other rules and/or regulations. • Implement strategic prevention actions identified in state and tribal AIS and TIS management plans. • Establish and implement measures that protect the Great Lakes basin ecosystem from the discharge of AIS in ballast water, consistent with state and federal authorities and commitments made by the Parties through Discharges from Vessels Annex of the GLWQA. • Prevent the introduction of invasive species through management and trade (e.g. bait, aquaculture, horticulture, internet, pet shops) by improving and implementing laws and rules, using science-based risk assessment to inform prohibited/restricted species lists, and coordinating efforts across jurisdictions. • Through the Invasive Carp Regional Coordinating Committee, prevent the establishment and spread of invasive carps in the Great Lakes, with emphasis on the Chicago Area Waterway. • Prevent the introduction and spread of invasive species via the Recreational Boating pathway (e.g., hitchhikers, live well/bilge water, bait release) by improving and	EGLE, IDNR, LTBB, MDARD, MDNR, NOAA, PBPI, USFS, WDNR EGLE, IDNR, MDARD, MDNR, PBPI, SSMTCI, WDNR EGLE, EPA, USCG, WDNR EGLE, IDNR, LTBB, MDARD, MDNR, WDNR EPA, IDNR, MDNR, NOAA, USACE, USFWS, WDNR EGLE, IDNR, INDNR, LTBB, MDNR, PBPI,	vii

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	implementing applicable laws and rules, and creating and maintaining AIS removal stations at boat ramps and other waterway access points.	USFS, USFWS, WDNR	
19	Preventative Public Engagement - Develop/deploy materials and tools to reach key industries and natural resource user groups regarding prevention and control best practices; where appropriate, leverage existing campaigns such as Stop Aquatic Hitchhikers, Clean Boats, Clean Waters, PlayCleanGo, Be A Hero: Transport Zero, NotMISpecies, Reduce Invasive Pet and Plant Escapes (RIPPLE), Go Beyond Beauty, Snapshot Day, Don't Let It Loose, and Don't Move Firewood. - Support and participate in Invasive Species Awareness Week, including AIS Landing Blitzes. - Conduct education campaigns for priority species, including but not limited to mountain pine beetle, Asian long horned beetle, and spotted lanternfly.	CORA, EGLE, IDNR, LRBOI, LTBB, MDARD, MDNR, NOAA, PBPI, USFS, USFWS, WDNR EGLE, INDNR, MDNR, USFS, WDNR EGLE, MDARD, MDNR, USFS	vii
20	Control of New Invaders - Implement rapid response actions identified in state and tribal AIS and TIS management plans. - Red Swamp Crayfish: use collaborative measures between jurisdictions, AIS managers, and law enforcement to implement and evaluate response/control actions for new or high-risk invaders at infested locations. Conduct inspections at known sources of introduction (e.g., live food markets, biological supply, etc.) in states within the basin where the species is prohibited. - European Frog-bit, hydrilla, mile-a-minute weed, and spotted lanternfly: support response activities to priority locations in the Lake Michigan basin to eradicate or contain the species.	EGLE, IDNR, INDNR, LTBB, MDARD, MDNR, WDNR MDNR, USFWS, WDNR EGLE, MDARD, MDNR, NOAA, USFWS, WDNR	vii

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	• Hemlock woolly adelgid (HWA) and hydrilla: Continue statewide coordination with affected counties to detect, survey and treat HWA and hydrilla in Michigan and conduct education and outreach to prevent spread to un-infested areas. • Continue monitoring and coordinating statewide action to use early detection and rapid response methods to survey and treat Jackpine budworm and beech bark disease on north shore of Lake Michigan.	MDARD, MDNR, USFS, WDNR USFS	
21	Sea Lamprey Control • Enhance control efforts for larval Sea Lamprey population in regular producing tributaries in Lake Michigan with selective lampricides. • Continue operation and maintenance of existing barriers. • Utilize decision support tools to identify and prioritize barrier removal projects. • Implement and assess the FishPass project on the Boardman/ Ottaway River and other selective fish passage projects.	GLFC Sea Lamprey Control Program (with USACE, USFWS as partners) GLFC Sea Lamprey Control Program (with USACE, USFWS, as partners) GLFC, GTB, MDNR, USACE, USFWS, USGS	vii

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	• Advance Sea Lamprey management through development and implementation of new control techniques.	GLFC, GTB, MDNR, NOAA, USACE, USFWS GLFC Sea Lamprey Control Program (with USACE, USFWS, as partners), USGS	
22	Control of Other Established Invasive Species • Maintain terrestrial, coastal and nearshore aquatic habitat diversity and function through appropriate control of invasive species (e.g. invasive Phragmites, buckthorn, purple loosestrife, invasive knotweeds, kudzu, oak wilt, invasive swallow-worts, Eurasian watermilfoil, spongy moth) including monitoring, mapping, and control efforts guided by BMPs.	EGLE, EPA, GTB, IDNR, INDNR, LRBOI, LTBB, MDARD, MDNR, PBPI, USACE, USDA-NRCS, USFS, USFWS, USGS, WDNR	vii
23	Science, Surveillance, and Monitoring • Maintain an index time series that tracks the response of Lake Trout population abundance to Sea Lamprey control. • Conduct lake wide benthic surveys of dreissenid mussels and continue to assess their impact on nutrient transfer and food web health. • Continue to implement dreissenid mussel control demonstration projects.	GLFC, USFWS EPA, NOAA Invasive Mussel Collaborative (led by GLC,	vii

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	• Enhance assessment methods to better understand round goby population density/distribution and impacts to the food web. • Assess long-term efficacy of existing invasive species control strategies and develop new tools and strategies for prevention, control, and mitigation. • Mitigate impacts from emerald ash borer, beech bark disease, hemlock woolly adelgid, and other pests by supporting identification and breeding of pest-resistant trees. • Support the development and application of environmental DNA, unmanned vehicles, and other technologies to detect and monitor invasive species. • Implement pathways-based monitoring approaches, such as aquatic plant surveys of harbors/ports which could be locations for ballast water introductions or monitoring of pet and live food industries for presence of invasive species in trade. • Multi-species actions: identify the suite of terrestrial invasive species that pose the greatest threats to Lake Michigan and encourage the development and application of consistent area wide monitoring and metrics for said species.	GLFC, NOAA, USACE, USFWS, USGS), NPS IDNR, MDNR, NOAA, NPS, USGS EGLE, MDARD, MDNR, USFS, USGS, WDNR MDARD, MDNR, USFS, WDNR EGLE, LTBB, MDARD, MDNR, NOAA, PBPI, USFS, USFWS, USGS, WDNR WDNR WDNR	
24	Collaboration and Tools		

#	2025 2029 Lake Michigan Partnership Management Actions	Agencies Involved	General Objective
	- Utilize existing and establish new Cooperative Weed Management Areas (CWMA), Cooperative Invasive Species Management Areas (CISMA) or similar locally-lead groups to address invasive species issues. - Participate in regional invasive species collaboratives across the Great Lakes region to advance invasive species control, management, policy, and research. - Maintain and use invasive species databases and mapping tools to support invasive species prioritizations, management, surveillance, and outreach efforts. - Support efforts to make research results widely available and provide trainings and demonstrations about novel methods to manage invasive species.	EGLE, GTB, LTBB, MDARD, MDNR, PBPI, USACE, USFS, USFWS, USGS, WDNR EGLE, EPA, GLC, IDNR, INDNR, LTBB, MDARD, MDNR, NOAA, PBPI, USFS, USGS, WDNR EGLE, EPA, IDNR, INDNR, LTBB, MDARD, MDNR, NOAA, PBPI, USFWS, USGS, WDNR WDNR	

2.4.3 Actions everyone can take

Everyone in the Lake Michigan basin can help reduce the risk and impacts of invasive species. Practical actions include:

- Learn how to identify, report, and stop the spread of terrestrial and aquatic invasive species;
- Plant native plants and ornamental plants that do not become invasive;
- Clean your boots before you hike in a new area to prevent the spread of weeds, seeds, and pathogens;
- Drain, clean, and disinfect your boat or other watercraft before using it on a different body of water;
- Only move firewood in accordance with applicable regulations, as some firewood can harbor forest pests;
- Do not release aquarium fish and plants, live bait, or other exotic animals into the wild;
- Volunteer at a local park and nature areas to help remove invasive species and educate others about the threat posed by invasive species.

If you think you have discovered an invasive species, please consult the following resources to report your findings: the invasive species websites for the U.S. Department of Agriculture, the states of Indiana, Michigan, and Wisconsin, or email the state of Illinois aquatic non-native species contact.

Taken together, these actions help protect Lake Michigan from new invasions and limit the spread and impact of existing invasive species, supporting healthier, more resilient ecosystems and communities.

2.5 Other Threats

Microplastics, land-use change across the watershed, increasingly variable temperature and water-level patterns, and cumulative stress in the nearshore all interact with the lake's chemical, physical, and biological integrity.

This section summarizes scientific information on other threats specific to Lake Michigan and the corresponding actions to be taken by Lake Michigan Partnership agencies in the 2025-2029 timeframe, as well as actions everyone can take. This section responds to the other substances, materials, or conditions-related General Objective of the GLWQA.

2.5.1 Objective and Condition Overview

One of the nine General Objectives of the GLWQA is addressed in this section. It states that the waters of Lake Michigan should:

ix. Be free from other substances, materials or conditions that may negatively impact the chemical, physical or biological integrity of the Waters of the Great Lakes.

Other substances, materials and conditions that may impact Lake Michigan include plastic and microplastic pollution, watershed impacts from land use and shoreline alteration, changes in physical conditions including temperature, precipitation, ice cover, and water levels.

Most threats described here are already considered under existing GLWQA Annexes, the binational State of the Great Lakes (SOGL) indicators, and other sections of the LAMP (e.g., nutrients, habitat and species, contaminants). The 2022 SOGL characterizes these threats as:

- land cover in the basin is assessed as **Fair** and **Unchanging**,
- hardened shorelines as **Good** and **Deteriorating**,
- forest cover as **Fair** and **Unchanging**, and

- the human population is *Increasing*.

The [U.S. National Coastal Condition Assessment](#) indicates stressors are negatively affecting localized areas and that there are areas of high ecological value which warrant protection. Together, these findings reflect a range of conditions.

2.5.2 Other Threats

Multiple pressures are impacting how Lake Michigan functions. Plastic and microplastic particles have been detected in tributaries, nearshore sediments, and fish. At the same time, expanding urban areas, intensive agriculture, and increasing shoreline armoring affect how water, sediments, and pollutants move through the basin, reducing natural filtration and buffering capacity by wetlands, riparian zones, and coastal areas.

Shifts in temperature, precipitation, ice cover, and water-level patterns interact with these land-based and in-lake pressures. Heavier downpours and more variable runoff can increase erosion, nutrient and chloride pulses. At the same time, changes in ice cover and water levels affect shoreline stability, coastal wetland extent, and habitat availability. In many places, these shifts coincide with already hardened shorelines and fragmented habitats, leaving fewer natural features available to absorb and adapt to rapidly changing conditions. Understanding how these pressures interact is essential to designing actions, as outlined in Section 2.5.3.

2.5.3 Actions to Address Other Threats

The Lake Michigan Partnership agencies will implement the 2025-2029 LAMP within the context of existing laws and regulations. There is other federal and state legislation that addresses other threats including the [United States' Protecting our Infrastructure of Pipelines and Enhancing Safety Act \(2016\)](#). Spill prevention and contingency plans are in place in Michigan, Wisconsin, Illinois and Indiana, where applicable. In addition, the [Canada-United States Joint Inland Pollution Contingency Plan](#) is in place, should there be a significant accidental and unauthorized release of pollutants along the Canada-U.S. border. The [Joint Marine Pollution Contingency Plan](#) is a mechanism for Canada and the U.S. to coordinate planning and response to spills in shared waters. This plan covers all potential sources of marine pollution in contiguous waters (i.e., ships, offshore platforms, mystery spills).

3.0 Lakewide Management

Achieving the General Objectives of the Great Lakes Water Quality Agreement (GLWQA) for Lake Michigan requires collective action by many partners throughout the basin. The 2025–2029 Lake Michigan Lakewide Action and Management Plan (LAMP) presents current ecosystem conditions and threats, sets research and monitoring priorities, and identifies actions for governments and the public. The LAMP is a resource for anyone interested in the Lake Michigan basin ecosystem, its water quality, and the actions necessary to help protect this Great Lake.

Lakewide management is an adaptive, long-term effort. As new information emerges and conditions change, the Lake Michigan Partnership will refine priorities and actions.

3.1 Engagement and Reporting

The Lake Michigan Partnership will report on progress through concise annual updates to the public in addition to reporting on the actions listed above.

Indigenous governments and organizations are essential partners. The Partnership will continue to seek respectful, distinctions-based engagement that recognizes Indigenous rights, responsibilities, and knowledge systems, including opportunities to co-develop priorities, contribute Indigenous Knowledge alongside western

science where appropriate, and participate directly in LAMP actions.

The public also has a crucial role. The LAMP will point to opportunities for residents and communities to participate in shoreline clean-ups, tree planting and wetland restoration, community-based monitoring, invasive species reporting, and responsible recreation.

Together, these engagement and reporting measures meet GLWQA Annex 2 expectations for regular reporting and public involvement.

3.2 Collective Action for a Healthy Lake Michigan

Protecting Lake Michigan requires the combined energy of governments, Indigenous partners, scientists, and public alike. Everyone has a role to play. Whether by restoring natural vegetation along streams, reducing road salt and plastic waste, participating in shoreline cleanups, or supporting local conservation and stewardship organizations, individual and community actions. **The LAMP's actions to restore and protect ecosystems will ensure that water quality and economic prosperity go hand in hand.**