

A photograph of a sunset over a beach. The sun is low on the horizon, casting a golden glow across the sky and reflecting on the water. The waves are gently lapping onto the sand in the foreground.

MICHIGAN

State of the Great Lakes

2019 REPORT



MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Contents

Governor Whitmer's Message: Collaboration is Key	3
EGLE Director Clark's Message: New Advocates for the Great Lakes Community	4
New Standards Ensure Safe Drinking Water in the 21st Century	5
Public Trust Doctrine and Water Withdrawals Aim to Protect the Great Lakes	8
High Water Levels Put State on Alert to Help Property Owners and Municipalities	11
Asian Carp Threat from Chicago Area Looms Over Health of Lakes and Aquatic Life.....	13
EGLE Collaborates on Research into Harmful Algal Blooms and Response Measures	15
Initiatives Foster Stewardship, Raise Water Literacy for All Ages.....	18
Michigan Communities Empowered to Take Action for Great Lakes Protection.....	22
EGLE Strengthens Michigan's Sister State Relationship With Japan's Shiga Prefecture	24
Soo Locks Project Finally Underway with 2027 Target Date for Opening.....	25
Great Lakes Cruises Make Bigger Waves in State's Travel Industry.....	26

MICHIGAN.GOV/EGLE | 800-662-9278

Collaboration is Key

Throughout the Great Lakes region, the health of our communities and the strength of our economies depend on protecting our shared waters. The Great Lakes region encompasses 84 percent of the country's fresh surface water, represents a thriving, \$6 trillion regional economy supporting more than 51 million jobs, and supplies the drinking water for more than 48 million people. Our economy, heritage, and quality of life depend on the health of our Great Lakes.

Protecting our Great Lakes and the communities that rely on them requires us to confront familiar but pressing threats like shoreline erosion, chemical contamination, failing infrastructure, algal blooms, and dangerous invasive species such as Asian carp. We cannot sit back and wait while these problems get worse. The ecological, economic, and health risks are too high. 2019 brought many challenges to Michigan and the states surrounding the Great Lakes Basin. Still, with these challenges, the region has an opportunity to show what protecting public health and our resources look like if we take aggressive, collective action.



The Great Lakes states understand the importance of collaboration on issues facing our waters, and that's why I've prioritized teamwork. Michigan has led the way on fighting for coordination at every opportunity. We launched a Great Lakes 2020 agenda for all Presidential hopefuls to adopt. We've sent letters to Congress and the President highlighting what the region needs to protect our communities and resources. We've adopted resolutions as a region to coordinate and share best practices on our joint priorities such as protecting our communities from per- and polyfluoroalkyl (PFAS) substances. We've used the power of this region and our combined voices to make sure that our resources have a national spotlight.

Michigan is truly a leader in the region, and we've proven that by the work we've been able to accomplish in our state. For example, our work on PFAS and the coordinated approach that we established through the Michigan PFAS Action Response Team has been adopted across the country.

But we still have more work to do, and I'm excited for what opportunities the future will bring if we all work together. ♦

Thank you,

A handwritten signature in blue ink that reads "Gretchen Whitmer".

Governor Gretchen Whitmer



New Advocates for the Great Lakes Community

There are more than 3,800 miles of Great Lakes shoreline in Michigan; and it would be difficult to find anyone in the state who has not been touched in some way by the serenity, beauty, and power of one of the world's great wonders.

As residents of the Great Lakes state, we have the obligation to be passionate stewards of this extremely valuable resource. The lakes have been our state's lifeblood for centuries, and decisions on how we interact with the lakes and capitalize on their potential will set the stage for their health and accessibility for years to come.

We haven't always treated the lakes in the best way possible; and for years now countless efforts by the state, community groups, and advocates have worked to restore the lakes so that they are fishable, swimmable, and drinkable. We must never rest from that duty, and it's imperative that we make stewardship our legacy so we can continue on the path to significant improvements for generations to come.

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) is committed to our stewardship role – after all, “Great Lakes” is our middle name. Our Office of the Great Lakes works to protect and restore our state's waters and works with partners to support sustainable communities, restore degraded waters, manage water quality and quantity, prevent aquatic invasive species, and engage in emerging policy issues.



EGLE is also home to the Office of the Clean Water Public Advocate, which serves as a conduit to connect resources at the state and local level to ensure that Michigan is more responsive to drinking water quality concerns. The Great Lakes provide drinking water to approximately 40 million people, so issues that affect the lakes also have an impact on the availability of clean, healthy drinking water.

Looming over the stressors on the Great Lakes ecosystem is climate change. Governor Gretchen Whitmer, recognizing the impacts of coastal flooding and water level fluctuations on coastal communities and ecosystems, has called for smart, coordinated state action to mitigate the future impacts of climate change. The Governor has created the Office of Climate and Energy, housed in EGLE, to coordinate the activities of state departments and agencies on climate response and provide guidance on reducing greenhouse gas emissions and improving climate adaptation and resiliency.

Finally, our Office of the Environmental Justice Public Advocate was created to ensure that everyone in the state benefits equitably from our environmental laws and regulations and can have meaningful involvement and access to participate in state decision-making. Working collaboratively both externally and within state government, the Environmental Justice Public Advocate prioritizes protecting the Great Lakes, cleaning up drinking water, and combating the impacts of climate change through a lens that includes equity and environmental justice communities.

These new initiatives support our mission of protecting Michigan's environment and public health by managing air, water, land, and energy resources. We have more than 1,200 scientists, engineers, geologists, toxicologists, inspectors, technicians, managers, biologists, and support staff across the state whose jobs include assuring Michiganders have safe drinking water and monitoring surface water quality.

We have a strong body of work to build upon, and there will always be more work to do. But our goal is, and always will be, clean and healthy Great Lakes that our children and their children will be able to enjoy. We're making progress. With our legacy initiatives and our new offices, we can accelerate Michigan's cooperative efforts to reach that laudable goal. ♦

Sincerely,

A handwritten signature in blue ink, appearing to read "Liesl Eichler Clark".

Liesl Eichler Clark, Director
Michigan Department of Environment, Great Lakes, and Energy



New Standards Ensure Safe Drinking Water in the 21st Century

By James Clift, Deputy Director
Michigan Department of Environment,
Great Lakes, and Energy

The Great Lakes and the waters play an important role in the lives of the people who reside within the basin. Most residents of Michigan have access to high quality drinking water sources. More than half get their drinking water from public water supplies that pull their raw water from the Great Lakes or connecting rivers. Throughout the Great Lakes Basin – which includes all of Michigan and parts of Illinois, Indiana, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin as well as the province of Ontario in Canada – more than 35 million people rely on the Great Lakes for their drinking water supply.

The largest public water system in Michigan is operated by the Great Lakes Water Authority (GLWA), which supplies water to 128 communities in Southeast Michigan and serves 3.5 million residents. The water authority has intakes in Lake Huron, Lake St. Clair, and the Detroit River. Most other Michigan residents get their water from groundwater sources, about half through a public water supply and the other half through private wells. A small number of communities rely on rivers or streams as the source of some or all of their drinking water.

Governor Gretchen Whitmer has been clear about the high value and utmost priority she places on ensuring safe drinking water for the people of the state of Michigan. In response, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) has also made protecting drinking water a core tenet of its mission and vision. As part of this effort, EGLE recognizes the need to proactively anticipate and address drinking water threats in the Great Lakes. As the Great Lakes state, Michigan has a responsibility to set an example by upholding the highest standards of Great Lakes protection.

Communities across the state are facing new challenges when it comes to ensuring clean, healthy drinking water. In some cases, water infrastructure has been neglected for too long and needs to be upgraded. In other cases, there is a lack of attention to addressing legacy problems related to properties contaminated with hazardous substances, or impairments due to nutrient pollution that is challenging the current capacity of systems to continue delivering drinking water to their customer. EGLE is dedicated to finding strategic, science-based solutions to these and other emerging issues, in collaboration with partners and stakeholders.

CHALLENGE: PFAS/PFOA

Several communities in Michigan, including the cities of Parchment, Rockford, and Ann Arbor, have been dealing with PFAS chemicals and their byproducts at levels high enough to impact public health. The PFAS class of chemicals are used for a wide variety of consumer products and industrial processes including fabric protectors, cookware, waterproof fabrics, and firefighting foam, and they are extremely difficult to eliminate from the environment.

To ensure drinking water was not tainted by PFAS, EGLE became the first state department in the nation to implement a statewide program to test all public water supplies across several phases of sampling. The effort initially included

RESOURCES FOR USERS

All residents who get their water from a public water supply should receive a Consumer Confidence Report (CCR) each summer. A CCR identifies where each water user's water comes from. If residents notice that the taste or smell of their water changes, they can check with their local water utility, or their county health department if they have a private well, to find out what steps they should take.

PLANNING FOR THE UNEXPECTED

Communities can avoid the extra costs associated with having to take emergency measures by exploring alternative water sources early. Developing a Wellhead Protection Program is a good way to accomplish this for communities that rely on groundwater.

MONITORING FOR SAFETY

Risks to drinking water are present in many parts of the water delivery system, anywhere from the original source of the water to residents' faucets. Minimizing these risks requires communities to closely monitor water quality throughout their water systems.

community water supplies, schools on their own well(s), and water supplies for Michigan's federally recognized tribes who chose to participate in the survey. The sampling was later expanded to also include childcare providers and Michigan Head Start programs on their own well(s). Testing was ultimately done for the following supplies:

- 1,115 community water supplies
- 460 schools on their own well(s)
- 165 child care providers/Michigan Head Start programs on their own well(s)
- 17 tribal water systems
- Approximately 526 additional non-community supplies serving sensitive populations (child camps, medical care facilities, adult foster care providers, motels/resorts, offices, industrial locations, parks/recreation, and roadside parks)

Approximately 7.7 million of Michigan's 10 million residents have had their drinking water tested for PFAS to date. The results of this testing are detailed in an interactive table at the [Michigan PFAS Action Response Team \(MPART\) website](#).

The next phase of statewide PFAS surveillance testing ran from May 2019 through October 2019. This effort sampled non-community public water supplies that were not part of the first phase of sampling to assess the potential for PFAS impact in drinking water for expanded at-risk populations, such as foster care providers, children's camps, medical care facilities, and businesses. Results from this effort can be found on the [MPART website](#).

Additionally, testing in Great Lakes sediments has shown some elevated levels of the PFAS/PFOA class of chemicals, mostly in close proximity to urban areas where these chemicals were used in manufacturing processes. However, drinking water from the lakes themselves appear to have PFAS/PFOA levels below the new proposed drinking water standards.

RESPONSE: SETTING A NEW DRINKING WATER STANDARD

The efforts described above ensured that the State of Michigan had the data, knowledge, and resources to effectively combat the emerging threat of PFAS. In October 2019 on the recommendation of MPART, EGLE provided draft rules to Governor Whitmer to establish maximum contaminant levels (MCLs) for seven PFAS compounds in approximately 2,700 water supplies in Michigan. Those rules have been through the public hearing process and could be finalized in the summer of 2020.

SPECIFIC PFAS	DRINKING WATER MCL (Maximum Contaminant Levels)
PFNA	6 ng/L (ppt)
PFOA	8 ng/L (ppt)
PFHxA	400,000 ng/L (ppt)
PFOS	16 ng/L (ppt)
PFHxS	51 ng/L (ppt)
PFBS	420 ng/L (ppt)
GenX	370 ng/L (ppt)

The United States Environmental Protection Agency (USEPA) set a Lifetime Health Advisory level for two PFAS in drinking water: perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). The health advisory is 70 parts per trillion (ppt) for PFOA and PFOS combined, or individually if only levels for other PFAS chemicals. The State of Michigan had been using 70 ppt for decision-making purposes, but extensive testing led Michigan's toxicology experts to propose a series of more protective standards.

CHALLENGE: LEAD SERVICE LINES

Aging infrastructure, particularly the dense network of lead service lines that delivers drinking water to communities around the state and across the country, has emerged as one of the key challenges of the decade. These pipes ensured delivery of clean, safe drinking water to Michigan's residents for many years, but constant contact with flowing water has increased the risk of corrosion of plumbing materials such as lead and copper into the water supply. As large portions of Michigan's drinking water infrastructure exceed their life expectancy at the same time, large-scale action is becoming



Lead service line replacement (Photo courtesy of EGLE)

necessary. The State of Michigan adopted a more stringent, statewide Lead and Copper Rule in 2018 to enhance protection of public health. The rule supports this goal by minimizing lead and copper drinking water exposure pathways.

RESPONSE: SETTING A NEW LEAD AND COPPER RULE

The new rule includes requirements for community water systems to:

- Inventory their distribution systems.
- Notify residents within 30 days if they live in a house with a lead service line.
- Replace all lead service lines by 2041.
- Prioritize sampling at buildings with lead service lines.
- Collect additional samples from lead service line homes.
- Form local Water System Advisory Councils to advise on community needs (if serving more than 50,000 customers).

The rule also lowered the lead action level from 15 parts per billion to 12 and created a State Water System Advisory Council. More information on the new rule can be found on the [EGLE website](#).

Communities around Michigan are now working to identify all of their lead service lines. Over the next 20 years, they are required to remove those lines and replace them with safer material. Communities that have exceeded the allowable amount of lead in drinking water will need to act sooner. The rule allows the replacement over time, to keep the costs as low as possible.

The rule also allows the utility to perform any other required maintenance on a scheduled basis. In communities that have exceeded the allowable levels, the State of Michigan and many

communities are offering point-of-use filters as an added level of precaution for homes with children or pregnant women.

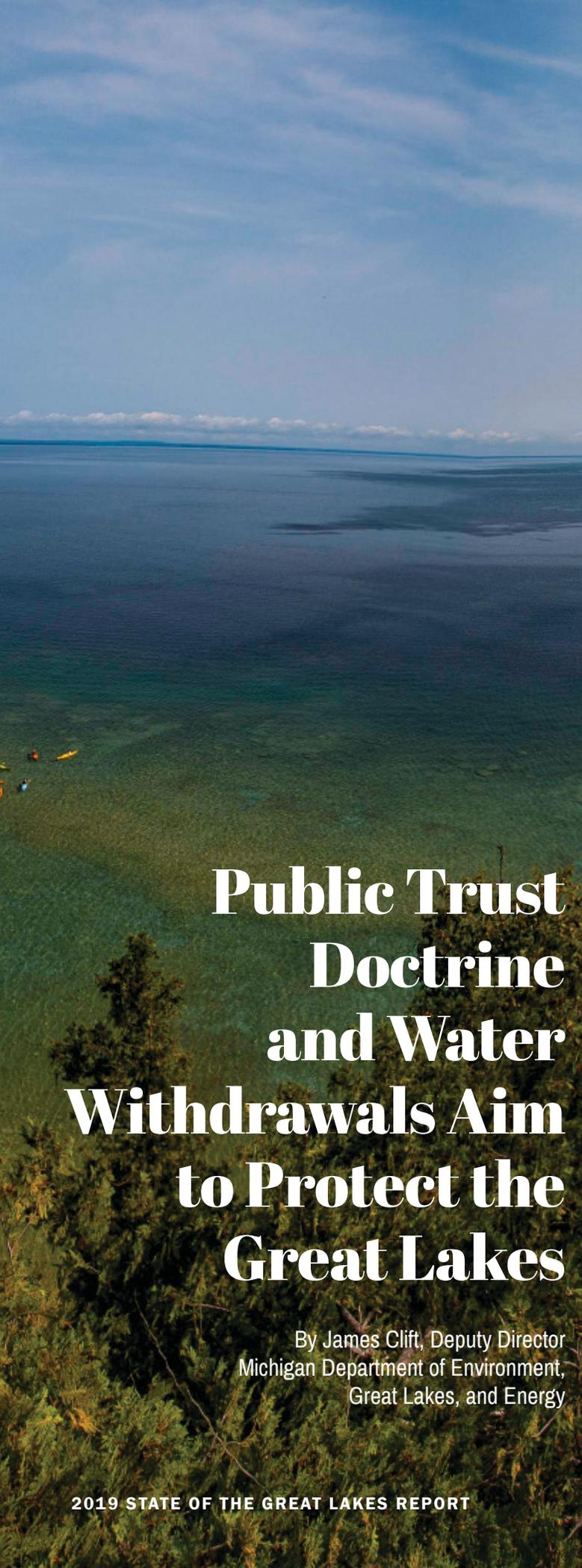
ONGOING CHALLENGES: FAILING ON-SITE SEPTIC SYSTEMS

About 25 percent of Michigan residents get their water from a private well. Those homes also commonly use on-site septic systems to manage wastewater. Michigan's laws on the regulation of septic systems are among the weakest in the country. Only nine counties have enacted local ordinances that require the periodic inspections of septic systems. Data from those counties show that 10-20 percent of the 1.3 million septic systems in Michigan are probably failing. In some cases, the sewage from the home is being piped directly into a local river or stream. Efforts to develop legislation that would better regulate these systems are ongoing, but on-site septic systems remain a significant challenge for the state and an important focus area for EGLE.

PROTECTING MICHIGAN FROM CHALLENGES OLD AND NEW

Drinking water in Michigan faces a number of challenges, some of which are the legacy of past decisions and some of which are the still evolving complications of recent activities. EGLE is committed to protecting, preserving, and restoring these resources for the residents of the state of Michigan. This work is guided by the department's core values:

- EGLE strives to make reasoned, science-based decisions when confronting new drinking water challenges.
- EGLE searches for collaborative solutions that account for the needs of different water users and stakeholders.
- EGLE develops strategic approaches that ensure the drinking water needs of today are met while also considering the needs of future generations. ♦



Public Trust Doctrine and Water Withdrawals Aim to Protect the Great Lakes

By James Clift, Deputy Director
Michigan Department of Environment,
Great Lakes, and Energy

The Great Lakes have undergone some significant changes in the past few years. Lake levels rebounded in Lakes Michigan and Huron more than six feet from their levels in 2013, and groundwater tables rose several feet in some places. Major investments were made in infrastructure, and new science and technology has emerged. What hasn't changed is that Great Lakes regional leadership remains steadfast about working collaboratively to sustainably manage Great Lakes water resources.

Michigan's Great Lakes water resource management policy is shaped by a complicated network of legal protections, regional agreements, and science-driven decision-making processes. At a time when so much seems to be in flux, it's more important than ever to understand what these rules and regulations can and cannot do. Though there are many places to enter this conversation, perhaps the best starting point is the foundational concept that underlies the system—the public trust doctrine.

PUBLIC TRUST DOCTRINE AND PROTECTING THE GREAT LAKES

The basic premise behind much of the Great Lakes legal protection is the idea that surface water itself is not property of the state, but a public good. Over the years, a number of court cases have firmly established this legal principle, known as the 'public trust doctrine.' The public trust doctrine means protecting public water resources for the use and enjoyment of all.

Under the public trust doctrine, the state acts as a trustee who is empowered to protect the water. In Michigan, that responsibility lies with the Michigan Department of Environment, Great Lakes, and Energy (EGLE), which protects, preserves, and restores the Great Lakes through regulatory oversight and water stewardship programs.

Regulatory protection of clean and abundant water resources in Michigan involves establishing water quality standards, overseeing public water supplies, regulating the discharge of industrial and municipal wastewaters, monitoring water quality and the health of aquatic communities, developing policy, and fostering stewardship.

According to the U.S. Supreme Court, the state holds title to the land below public waters but would not be allowed to use or dispose of those resources if there is "substantial impairment of the interest of the public in the waters." The state may grant leases to private owners, but only with conditions that they protect the public use of the waters themselves.

The public trust doctrine protects the public's right to use the waters of the Great Lakes for purposes such as navigation, hunting, and fishing. It also ensures that people have the ability to walk along the shorelines of the Great Lakes, even as water levels fluctuate—in 2005 the Michigan Supreme Court found that walking along the lake was part of the doctrine's traditionally protected rights.

The concepts behind public trust are so important to the people of the state of Michigan, they were included in the Michigan Constitution, which states:

The conservation and development of the natural resources of the state are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people. The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment and destruction. (Article IV, section 52)

THE GREAT LAKES COMPACT

The Great Lakes states have added protections through the Great Lakes St. Lawrence River Basin Water Resources Compact, which Michigan joined in 2008, and the Great Lakes-St. Lawrence River Basin Sustainable Water Resource Agreement. These accords, developed through the Conference of Great Lakes and St. Lawrence Governors and Premiers, detail how the states and provinces will manage and protect the waters of the basin. The agreements also provide a framework for each state and province to enact its own protection measures.

A compact is an agreement among states (passed by each state's Legislature) that is ratified by the U.S. Congress and thereby has the force of a federal law. The Great Lakes St. Lawrence River Basin Water Resources Compact is an agreement between states to regulate large quantity water users (in excess of 100,000 gallons a day) in a similar manner. The compact prohibits new or increased diversions of water from the Great Lakes to areas outside the Great Lakes-St. Lawrence River Basin with provisions for the small number of straddling communities and those within straddling counties, which must first meet strict criteria to obtain approval.

Based on these conditions, each state is charged with developing and enforcing its own water use program. Michigan viewed this charge as an opportunity and responded by creating a science-driven, ecosystem-based approach to regulation of large quantity water withdrawals. The program, described below, represents a forward-thinking approach designed to ensure that the needs of today are met without compromising the ability of future water users to meet their own needs.

REGULATING LARGE WATER WITHDRAWALS IN MICHIGAN

Michigan is in the unique position of being the only state which lies virtually entirely within the Great Lakes Basin. That means that every drop of rain and flake of snow will eventually end up in our lakes, rivers, or streams. The state has passed a law (Part 327, Great Lakes Preservation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended) to

regulate large water users that is also unique, the basic premise of which is that if we preserve healthy flows of water in our rivers and streams, we will preserve healthy water ecosystems.

Different types of rivers and streams support different unique habitats. The law recognizes that not all rivers and streams are the same. For example, cold water in streams is needed as habitat for species, such as rainbow trout. Water temperature in rivers and streams is regulated by groundwater, which in Michigan has a temperature of approximately 55 degrees Fahrenheit. The more groundwater that feeds into a river or stream, the colder it is. If the amount of groundwater is reduced, a cold-water stream will start to warm up and eventually will not

be able to sustain a healthy trout population. Drilling new wells can deplete the supply of groundwater. The law is careful to estimate the impact of each new well and limits how many new wells can be placed near each other to avoid drastic changes in stream conditions.

Under the same law, new water users are allowed to drill wells that would reduce the flow of the river or stream by between 5 percent and 25 percent, depending on the type of river or stream. The limits are designed to be permanent lifetime restrictions. The decision about how much flow reduction is acceptable

is driven by science. A larger warm water river will not change significantly if a quarter of the flow is removed. However, if 25 percent of a cold-transitional stream is removed, it will likely cease being able to support cold-water species, such as rainbow trout; therefore, tighter limits are placed around them.

PROGRAM BUILT UPON SCIENCE, COLLABORATION, AND CONTINUOUS IMPROVEMENT

The same law that regulates large water withdrawals in Michigan also established the Michigan Water Use Program, which launched in 2008. The Water Use Program works with new large water users to assess the impact of their proposed withdrawals. Under this program, new large water users are required to register their withdrawals. That process begins online. The proposed well location is entered on a map along with the type of withdrawal and the amount of water being withdrawn. A computer model then estimates the potential impact a well has on the flow of nearby rivers and streams. If there is plenty of water, the owner receives approval to register their well online. If there is not enough, the owner is required to submit a site-specific review under which program staff will vet all the required registration information and determine whether sufficient water is available.

Michigan's Water Use Program has been operating for 11 years and has issued more than 4,000 permits for high-capacity wells. Of those, about 90 percent are irrigation wells for agricultural crops. In some localized areas, all the available water has been authorized for use. In Michigan, every landowner has the right to put water resources flowing next to or below their property

Michigan viewed this charge as an opportunity and responded by creating a science-driven, ecosystem-based approach to regulation of large quantity water withdrawals.

to reasonable use. In locations where all the allowable permits have been issued, the law tries to facilitate discussion among local water users on the best way to share the available water.

The program was designed with a focus on collaboration and developed with a tremendous amount of input from the various water users and interested parties and through some form of a water use advisory body. The group in one form or another has operated and provided oversight and advice to the departments involved for more than 15 years. The latest version, the [Water Use Advisory Council \(WUAC\)](#), was created by the Legislature in 2018. The WUAC provides a forum for discussion of technical issues, water conservation, stream monitoring, and a host of other issues. They will issue their first report at the end of 2020 outlining their recommendation for program improvements moving forward.

In addition, the program was designed with recognition for the need for continuous investment in new science, technology, and research to improve water management systems and decision-making. Michigan is developing science, technology, and research through the efforts of various projects by state, federal, and academic institutions. Significant investments have been made as funding is available to further these developments.

PROGRAM IS ADAPTIVE TO PROTECT RESOURCES DURING TIMES OF HIGH OR LOW WATER LEVELS

As we were particularly aware in 2019, lake levels sometimes change very rapidly. Michigan's program is designed to protect water during low flows. Overdrawing water when water levels are low presents the greatest danger to Great Lakes ecosystems—in many cases once harm is done, it cannot be reversed. Today with record high water levels, the risk of harm is obviously low. However, only six years ago, the Great Lakes were at record low levels and emergency measures were taken just to keep harbors and marinas open. The law must protect our waters under both circumstances.

Prior to passage of Michigan's water withdrawal and Compact enabling legislation, large water users did not have to seek any permit or permission from the state to put in a large quantity withdrawal. Stories of wells drying up a neighbor's well were becoming increasingly common when the legislation passed. The Water Use Program has greatly improved the ability of state and local government to sustainably manage water use.

LOOKING BACK AND LOOKING FORWARD

The past year provided an opportunity to look back over the past five years of implementation of the Great Lakes Compact, the Sustainable Water Resources Agreement, and Michigan's Water Use Program. Under the Compact, each jurisdiction is required to conduct a program review to assess its Water Management and Water Conservation and Efficiency Program every five years.



Child fishing (Photo courtesy of EGLE)

Michigan has multiple initiatives underway to support an improved scientific understanding of the surface water and groundwater interactions and the role of groundwater in Michigan and Great Lakes Basin water resource management. The glacial geology of Michigan is quite complex and varied, and it is one of the major challenges in gaining a better understanding of Michigan's groundwater resources. Research is continually ongoing by state, federal, and academic institutions. Examples of current research include a joint project with EGLE and Michigan State University's Department of Civil and Environmental Engineering to develop innovative ways of using technology to process and analyze existing information in Michigan's extensive groundwater database. In addition to these data collection and monitoring efforts, the Michigan Geological Survey (MGS) and United States Geological Survey (USGS) perform surveys and sample collections to map Michigan's glacial geology in three dimensions on a county-by-county basis. At the end of 2019, MGS and USGS completed 19 three-dimensional glacial geology maps and two county bedrock geology maps. Approximately eight percent of the glacial geology in Michigan has also been mapped in three dimensions.

Looking back over the implementation of Michigan's Water Management Program to date, one area that continues to require attention is the ongoing need to educate residents and decision-makers to increase awareness and understanding about the Great Lakes Compact and Michigan's water use laws, policies, and programs.

Looking to the future, the Compact Council and Regional Body updated and adopted a new Science Strategy in 2019, which lays out a variety of needs and challenges related to:

- The need for improved water quantity data collection.
- The need for improved tools for management decisions regarding water use consumption, conservation, and efficient use.
- Challenges associated with overarching issues, such as climate change, indigenous engagement, and outreach.

Michigan's participation in regional efforts to advance scientific understanding of these important areas will also improve Michigan's ability to sustainably manage water resources. ♦



A tree fell into Lake Michigan as a nearby home and outdoor area is threatened by shoreline erosion. (Photo courtesy of EGLE)

High Water Levels Put State on Alert to Help Property Owners and Municipalities

By Nick Assendelft
Michigan Department of Environment, Great Lakes, and Energy

Go back seven years and shoreline communities and property owners were wondering where all the water in the Great Lakes had gone. Water levels had dropped significantly. Great Lakes shippers had to lighten loads so their ships could float higher in the water. Marinas and shoreline homeowners extended docks to accommodate boats that previously tied up closer to shore. Communities appealed to the state for help in dredging ports to keep commerce, recreation, and tourism afloat.

The water levels in Lakes Michigan and Huron reached historic lows.

Today, many wonder where all the water has come from. Michigan is in the middle of the wettest one-year, three-year, and five-year periods since records started to be compiled 125 years ago. According to the U.S. Army Corps of Engineers, the Great Lakes recently had their largest 24-month rise in the period on record.

The high water levels have taken a toll across Michigan. Battered by waves and storms, bluffs in west Michigan have been eroded to such an extent – often dozens of feet overnight – that homes, decks, and docks are being destroyed. On picturesque Mackinac Island, a road for horses and bicyclists has been washed out. Canals, backyards, and municipal infrastructure are experiencing flooding along the eastern shore of the state.

It's the role of the Michigan Department of Environment, Great Lakes, and Energy to protect public trust resources and practice regulatory oversight over most projects intended to safeguard the state's shorelines from erosion. That oversight includes permitting of the materials and construction methods that will limit negative impacts on neighbors, the Great Lakes, and in many cases critical dunes.

Installing shoreline protections incorrectly can actually cause more problems than they solve. Waves can destroy barriers and spread debris into the lake. Protection for one property may exacerbate erosion on neighboring properties. Haphazard and uncoordinated efforts to gird our shorelines can add to the erosion problem many are experiencing.

OVERSIGHT IS IMPORTANT

Those wishing to perform shoreline protection work must first file a joint permit application through EGLE's MiWaters portal (Michigan.gov/MiWaters). The online permit application process allows Michigan to fulfill federal electronic reporting requirements and provides for access to public information. By using MiWaters, a requester submits the same application to both EGLE and the U.S. Army Corps of Engineers. The joint application process covers permit requirements derived from state and federal rules and regulations for construction activities where the land meets the water.

For property owners who find themselves in situations where their homes or infrastructure, such as wells or septic systems are threatened, EGLE is speeding up the permitting process. A completed permit application can be approved in a few days. And in truly critical situations, EGLE has worked with contractors and homeowners, allowing them to submit a permit application after they have started the shoreline protection work. EGLE will work with homeowners to find timely solutions that benefit everyone and that create the least impact on the shore or the state's globally significant freshwater dune system.

INLAND WATERWAYS AFFECTED

In addition to shoreline issues, many others are impacted by high water levels, flooding, and saturated soils. Throughout Michigan, more than 900,000 acres of farmland didn't get planted in the spring of 2019 because of persistent rain that flooded fields. Agriculture is one of Michigan's top economic drivers, valued at more than \$100 billion annually, according to the Michigan Department of Agriculture and Rural Development.

High waters have a profound impact inland, as well. Lakes, rivers, and streams are at capacity; and the near-term forecast by the National Weather Service is that many in Michigan are vulnerable to spring river flooding, depending on fall and winter weather, winter snowpack, Great Lakes levels, and anticipated spring weather. With the National Weather Service saying Michigan had the wettest September through December period on record, the soil around the state is holding much more water than typical at this point and ground absorption will be severely affected.

Water levels are so high, and the ground is so saturated, that even typical Great Lakes storms will have an impact on municipal infrastructure. Already, waves have washed away boat docks, boardwalks, and steps to beaches. Increasingly, flooding and waves are undermining roadways, inundating septic fields, contaminating drinking water wells, filling storm sewers, and requiring wastewater treatment plants to take measures to avoid sanitary sewer overflows.



Erosion has led to the collapse of two decks along Lake Michigan, scattering debris along the shore. (Photo courtesy of EGLE)

EGLE's Water Resources Division has asked National Pollutant Discharge Elimination System (NPDES) permit holders to perform vulnerability analyses of their facilities to minimize potential impacts of high water levels. The analyses should incorporate any necessary planning, preparation, and response activities aimed at addressing the identified potential impacts. Among the areas that are to be reviewed are storm water facilities, industrial permits, wastewater treatment plants, combined sewer overflow outlets, and aquatic nuisance control programs.

UNIFIED ACTION AT STATE, LOCAL LEVELS

As the statewide impact of high water levels is clearly being felt in all sectors, EGLE organized a Michigan High Water Coordinating Summit to allow state, federal, and local officials to collaborate closely on how to respond to public health and safety challenges created by high water levels. The summit, convened by Gov. Gretchen Whitmer, ensures "state agencies lead the way with a highly coordinated and cooperative response to high water impacts. With our local and federal partners, our team will do everything we can with the resources at our disposal to help Michigan families and communities living through extraordinarily difficult circumstances."

Coming out of the summit, an ad hoc, multi-agency Michigan High Water Action Team was formed to identify assets that are available in response to high water incidents. The team will also coordinate communications across agencies and levels of government to ensure residents receive information in a timely, accurate, and consistent fashion, including through town halls around the state.

Flooding, erosion, and high water levels are unlikely to go away soon. But, EGLE and other state agencies can help municipal governments, property owners, and contractors develop timely and smart solutions. ♦

Asian Carp Threat from Chicago Area Looms Over Health of Lakes and Aquatic Life

By Dr. Tammy J. Newcomb
Michigan Department of Natural Resources

While no live bighead, silver, or black carp have been found in the Great Lakes, they are close enough to be considered an imminent threat. There is no question, given their current spread through the Mississippi River basin, that these fish would thrive in the Great Lakes region, particularly in places such as Saginaw Bay and Lake Erie. Michigan is working diligently to partner with Illinois to prevent bighead, silver, and black carp from entering the Great Lakes.

A binational risk assessment by the United States, Canada, and the Great Lakes Fishery Commission concluded that the Chicago Area Waterway System poses the greatest risk for Asian carp being introduced into the Great Lakes. The report noted that as few as 10 males and 10 females in the Great Lakes could provide a reproducing population.

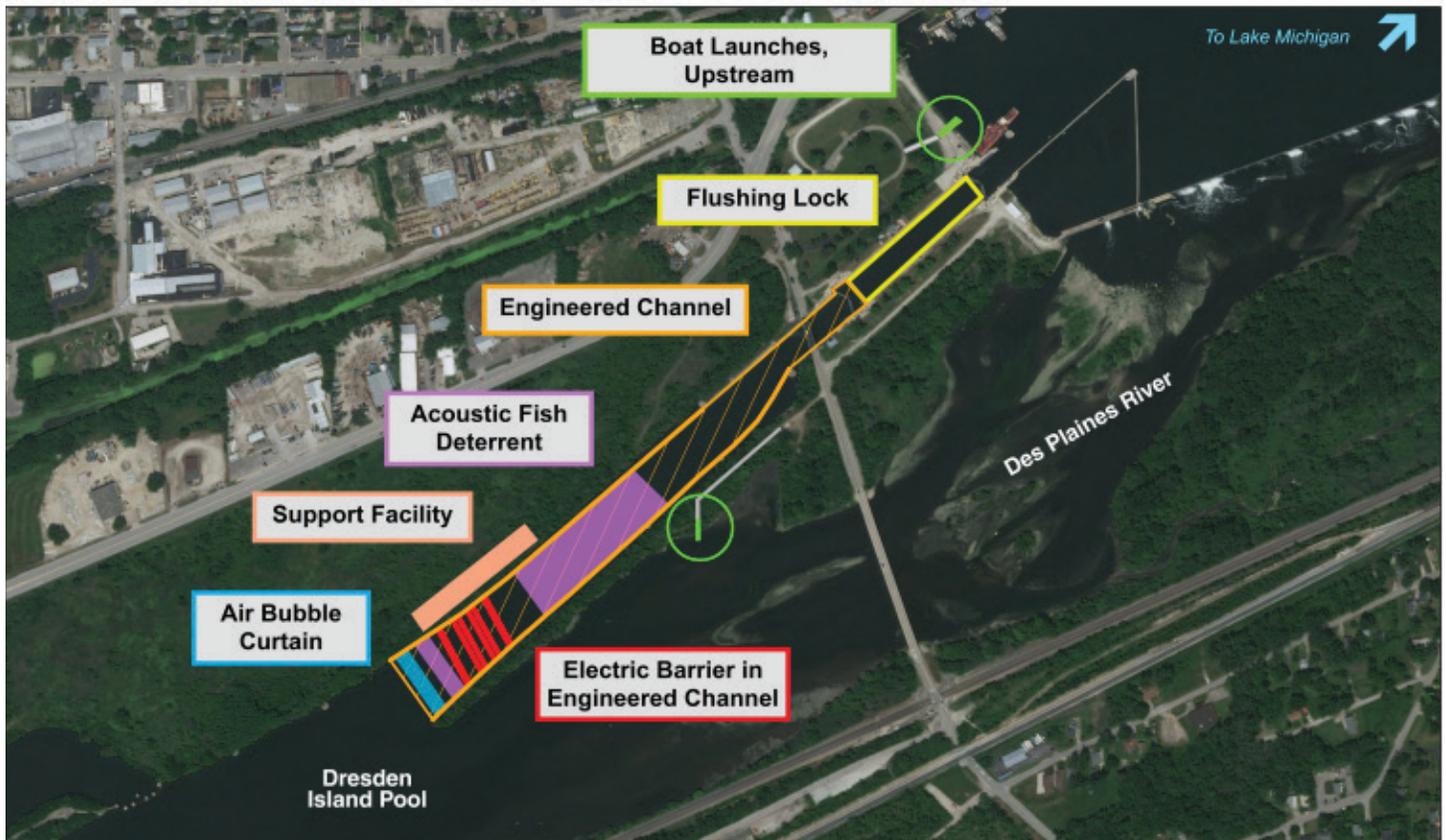
Bighead and silver carp have expanded rapidly up the Mississippi, Missouri, Ohio, and Illinois rivers, and continue

to colonize other waterways in new locations. These are long-lived fish that reproduce prolifically and can become very large, sometimes nearing 100 pounds. Bighead and silver carp are filter feeders, filtering plankton out of the water column. Due to their size and abundance, bighead and silver carp can consume a great volume of plankton, competing directly with native species, particularly at young life stages.

In places where bighead and silver carp have invaded and are at high abundance, the local fish communities and recreational opportunities have suffered. Invasive bighead, silver, and black carp could significantly alter the Great Lakes ecosystem, affecting the \$7 billion fishery and \$16 billion boating industry as well as other tourism-based industries, property owners, outdoor enthusiasts, and others dependent on the Great Lakes and its tributaries. Because of their feeding habits, carp are not a viable recreational species, but commercial fishing has been used in efforts to reduce their numbers in places where they are present.

A silver carp leaps out of the water. Silver carp is one of three Asian carp species that experts fear could devastate the Great Lakes aquatic ecosystem if they gain a foothold. (Photo courtesy of EGLE)





Brandon Road Lock and Dam Preferred Plan (Photo courtesy of U.S. Army Corps of Engineers)

BLOCKING ASIAN CARP

A series of three electric barriers in the Chicago Area Waterway System are the last line of defense between the current population and the Great Lakes. A long-term, layered technical solution has been identified for implementation to protect the Great Lakes.

The U.S. Army Corps of Engineers has developed a system of structural and non-structural control measures at the Brandon Road Lock and Dam near Joliet, Illinois. Brandon Road is a critical pinch point for keeping bighead, silver, and black carp out of the Great Lakes.

The project recommends additional technologies – including an electric barrier, underwater sound, an air bubble curtain, and a flushing lock – in a newly engineered channel designed to prevent invasive carp movement while allowing shipping into and out of the Great Lakes.

OTHER PATHWAYS STUDIED

While the Chicago Area Waterway provides the greatest risk for invasive carp to enter the Great Lakes, the U.S. Army Corps of Engineers has also investigated 18 locations in New York, Indiana, Ohio, Minnesota, and Wisconsin for the possibility of Asian carp crossing into the Great Lakes, especially during periods of high water.

Only one was found to be of moderate risk, Eagle Marsh in Indiana. Through the work of partnerships, a dike was added to the marsh and the pathway of risk for carp to the Great Lakes was removed. Two locations in Ohio, Little Killbuck Creek and the Ohio-Erie Canal, are being closed, further protecting the Great Lakes Basin. No other locations were determined to provide a risk pathway to the lakes.

WHAT'S AT STAKE?

Protecting the Great Lakes is a top priority for Michigan. With more than 3,000 miles of Great Lakes coastline, 11,000 inland lakes, and 36,000 miles of rivers and streams, Michigan faces the greatest risk and has the most at stake if invasive carp infest the Great Lakes Basin.

The Department of Natural Resources (DNR) and Department of Environment, Great Lakes, and Energy call upon Michigan citizens to be vigilant and help in the prevention to keep bighead, silver, and black carp out of Michigan. Report unusual fish and know your bait species. Materials are available to assist in identification, and an online reporting system is available on the DNR website. Michigan's experiences with zebra/quagga mussels, round gobies, and sea lampreys prove that prevention is far more effective and less costly than trying to manage invasive species in the Great Lakes. ♦



Lake Erie algal bloom, Pelee Island, Ontario, CA (Photo courtesy of Tom Archer, Michigan Sea Grant)

EGLE Collaborates on Research into Harmful Algal Blooms in Lakes; Possible Control Measures

By Gary Kohlhepp
Michigan Department of Environment, Great Lakes, and Energy

The Great Lakes and other waters of the basin are part of a complex, ever-changing ecosystem. While this often produces unique and wonderful landscapes and organisms, it can also give rise to unexpected hazards and scientific uncertainties. EGLE’s mission – to protect Michigan’s environment and public health by managing air, water, land, and energy resources – includes a responsibility to address these uncertainties through research and adaptive management.

Cyanobacteria, also known as blue-green algae, is one such hazard. Cyanobacteria are a natural part of lakes, rivers, and ponds. However, when conditions are right, these organisms can rapidly increase to form blooms, often referred to as harmful algal blooms (HABs). A bloom can start small and become very large in size and may give off a foul odor. Blooms might last a few days, weeks, or longer and are considered harmful because some species can produce cyanotoxins that may make humans and animals sick. Cyanotoxins are known to cause nausea, skin rashes, gastrointestinal distress, numbness, liver toxicity, and fatigue and have been associated with human illnesses and pet deaths.

There is still some uncertainty about the causes and characteristics of HABs, but Michigan has been working collaboratively for a number of years to study HABs and to learn best practices for controlling or eliminating blooms. From work in the western basin of Lake Erie to studying inland lake impacts, experts from the state and academia hope to work with stakeholders to mitigate the causes of HABs, as well as develop focused efforts for treatment that are protective of the environment and public health.

WESTERN LAKE ERIE FOCUS

The most noteworthy example of an HAB impact occurred in August 2014, when severe cyanobacteria blooms were observed in the western basin of Lake Erie. The city of Toledo, Ohio, which draws water from Lake Erie, found cyanotoxins in their treated drinking water, resulting in a “Do not drink” order for approximately 400,000 people for two days.

Following the Toledo drinking water incident, the number of reports about the occurrence of HABs and concern over

the possible presence of toxins have increased in Michigan. In large part, increased reports may be due to more public awareness of the issue, combined with EGLE establishing a formal way to report such blooms and concerns by email at AlgaeBloom@Michigan.gov.

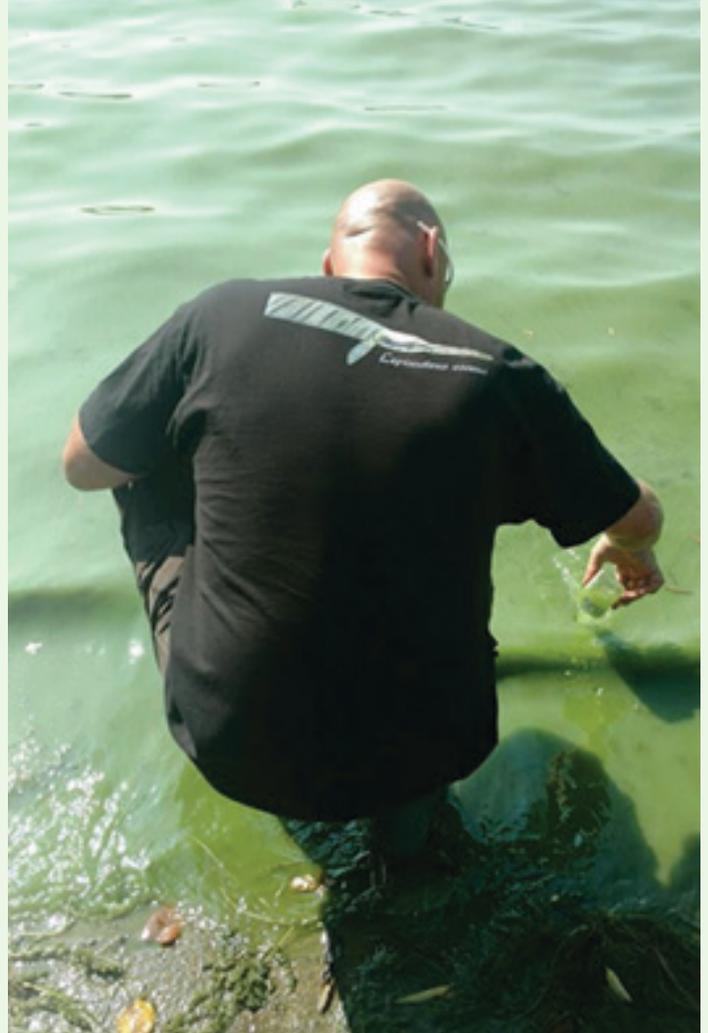
In 2019, Gov. Gretchen Whitmer issued Executive Directive 2019-14 that reaffirmed the state's commitment under the Western Basin of Lake Erie Collaborative Agreement to reduce nutrient inputs by 40 percent by 2025 to combat HABs. The goal was established by the governors of Michigan and Ohio and the premier of Ontario, Canada, when they signed the agreement in 2015 to set expectations in addressing nutrient inputs to the western portion of the lake. Those inputs were understood to be a leading cause of the widespread HABs in the lake.

Once the Collaborative Agreement was signed, each regional government began developing a Domestic Action Plan to guide their actions toward nutrient reduction; Michigan's was completed in 2018. Michigan's Domestic Action Plan established specific phosphorus reduction goals for point sources and nonpoint sources to western Lake Erie. These goals included an interim phosphorus reduction goal of 20 percent by 2020. The State of Michigan has achieved that goal primarily through reductions from regulated point source contributions.

Given that the next phase of these efforts, achieving reductions from unregulated nonpoint source contributions, will be much more difficult, Michigan's Quality of Life departments (the Departments of Agriculture and Rural Development; Environment, Great Lakes, and Energy; and Natural Resources) started drafting an Adaptive Management Plan in 2019 as part of the Domestic Action Plan. The AMP is a "learn by doing" plan that will help the Quality of Life departments better track progress, establish strategies, and adjust those strategies needed to meet the 40 percent reduction targets. More information about the progress being made toward meeting these goals, the Domestic Action Plan, and the Adaptive Management Plan can be found at Michigan.gov/LakeErieDAP.

INLAND LAKE TREATMENT STUDY

In addition to the work being conducted in Western Lake Erie, EGLE staff regularly work with riparian owners on some of Michigan's inland lakes to study or treat algal blooms. Using algaecides is one approach stakeholders and aquatic plant managers typically consider when deciding how to manage a cyanobacteria bloom. This management strategy may have adverse impacts on other local wildlife, so only algaecides that are approved for aquatic use in the state of Michigan by the United States Environmental Protection Agency, EGLE, and the Department of Agriculture and Rural Development can be used. With few exceptions, an Aquatic Nuisance Control permit is required to apply algaecides to waters of the state. EGLE staff give extensive review to each of these permit applications. Most that have been issued include approvals to treat areas for native and non-native algae and macroalgae species.



(Top) Aaron Parker, an aquatic biologist with EGLE, takes a sample of water that contains cyanobacteria from Mona Lake in Muskegon County; (Bottom) Water near a Mona Lake beach in Muskegon County is affected by a blue-green algae algal bloom. (Photos courtesy of EGLE)



An EGLE boat docked at Ford Lake in Washtenaw County. EGLE has been working with partners to study harmful algal blooms and develop strategies to control or eliminate them. (Photo courtesy of EGLE)

EGLE is also working to further develop best practices for treating HABs through research and interdisciplinary partnerships. In 2019, EGLE, the Department of Health and Human Services, aquatic plant managers, and a chemical applicator collaborated to document HAB locations at an inland lake. The effort included modification of the existing Aquatic Nuisance Control permit to approve the treatment areas, treatment of specific locations impacted by HABs, and monitoring the treatment of the algae blooms. EGLE staff conducted sampling and monitoring for algae and cyanotoxins at multiple locations for efficacy of the treatment. The monitoring results are pending.

UNIVERSITIES PARTNERSHIPS

Because of the scientific uncertainty about how best to prevent, mitigate, and manage HABs, EGLE has engaged in several activities to not only work toward the reduction of

HABs, but also advance research and understanding of HABs throughout Michigan.

In 2017, grants were awarded to Grand Valley State University and Oakland University to investigate how technology could be used to improve HAB monitoring, tracking, and control efforts. Grand Valley State University conducted development research on two DNA-based methods to rapidly evaluate blooms for the presence of genes associated with algal toxin production. Their evaluation of analytical methods identified potential cross reactivity issues with one, and resulted in a standardized procedure developed for the methods and the recommendation that other laboratories investigate the applicability of the method in other HAB lakes.

Oakland University partnered with Wayne State University, Lake Superior State University, and Northern Kentucky University to study 32 different inland lakes throughout Michigan's Lower Peninsula. The lakes ranged from those with no known history of cyanobacteria blooms, to some with known blooms. For two years, monthly samples were collected from June to October for nutrients, chemical/physical parameters, cyanotoxins, toxin-producing genes, and cyanobacteria identification. Passive samplers were used for *Dreissena* mussel collection and long-term toxin absorption, and land use was analyzed for each lake.

WORK CONTINUES

Finally, EGLE participates in the Great Lakes HABs Collaborative, which is a "collective laboratory" seeking to improve communication among scientists, and between scientists and decision-makers, on issues related to HABs in the Great Lakes.

Established in 2015 by the Great Lakes Commission and in partnership with U.S. Geological Survey–Great Lakes Science Center, the collaborative produces a regular newsletter and hosts webinars and periodic meetings, such as the upcoming 5th annual Understanding Algal Blooms: State of the Science conference in Toledo in September.

The network helps to establish a common knowledge base of the current HABs science and future needs. It also works on strategies for transmitting key information to managers and getting feedback on science-based decision support needs and how the region can work together to better prevent and manage HABs.

HABs continue to pose one of the greatest threats to Great Lakes water quality. However, EGLE recognizes the importance of addressing this issue and is committed to providing the resources to improve the understanding of the causes of HABs. EGLE strives to continue building successful collaborations to address causes of HABs and develop better ways to alleviate their risks in Michigan's Great Lakes and inland lakes.◆



Lake Superior State University Wildlife Club Class (Photo courtesy of EGLE)

Initiatives Foster Stewardship, Raise Water Literacy for All Ages

By Emily Finnell and Christina Pastoria
Michigan Department of Environment, Great Lakes, and Energy

In Michigan, our memories tend to be tinged with blue. In the background of summers with our families, outdoor adventures with friends, and even solitary moments of serenity and meditation, there is always a shimmer of that never-ending blue. Water, from our inland lakes, rivers, and streams to the Great Lakes themselves, is foundational to the people of the state of Michigan. Telling our Great Lakes stories—about lazy days on the lake or fishing with our favorite relatives—is a way for us to connect with each other and with the natural world.

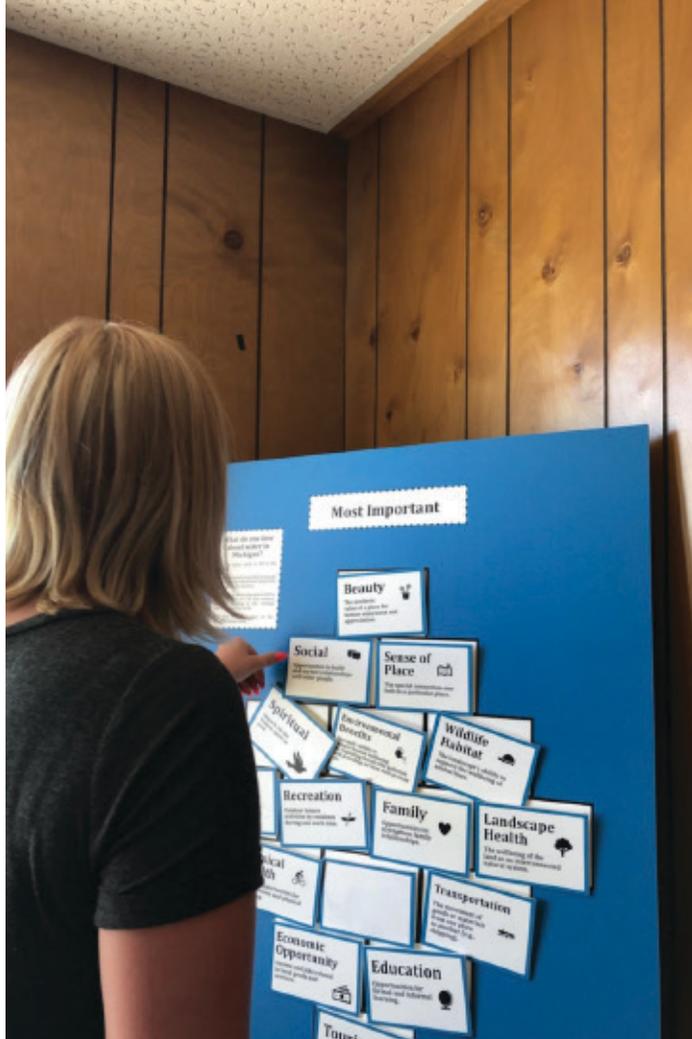
Effective stewardship of the Great Lakes is built on a combination of deep, personal connections to water resources and strong scientific understanding of water, watersheds, and how water resources are directly affected by the actions of people. As people become more disconnected from nature and government decision-making, engaging with communities and educating people of all ages about the Great Lakes and the waters they love is key. The Michigan Department of Environment, Great Lakes, and Energy's (EGLE) Office of

the Great Lakes (OGL) is committed to improving people's knowledge about water and Michigan's water heritage, as a way to help reconnect people with decision-making. This will help ensure that natural resource management decisions reflect how people value water in their daily lives.

The OGL recently launched a number of new initiatives dedicated to fostering stewardship, improving community and individual engagement, and increasing water literacy of residents.

THE MICHIGAN WATER HERITAGE PROJECT

Launched in June 2018, the Michigan Water Heritage Project is a traveling museum exhibit that visited seven communities throughout Michigan and actively engaged individuals through facilitated conversation and water-themed exhibits. The project used a place-based community engagement method known as the 'conversation model' to connect with a broad array of Michigan's population in Beaver Island, Big Rapids,



Attendee of the Michigan Water Heritage Project (Photo courtesy of EGLE)

East Jordan, Harrisville, Niles, Owosso, and the Detroit Science Center in the city of Detroit.

The ‘conversation model’ approach utilized a water-themed museum setting to capture people’s stories and connection to Michigan’s waters. In doing so, it educated citizens about Michigan’s water history while simultaneously allowing researchers to study and learn about people’s individual experiences.

Through hands-on museum-based learning and facilitated conversations, the Water Heritage Project actively engaged individuals to tell their stories about why water matters to them personally and to influence their knowledge about, perceptions of, and behaviors toward water resources. By improving water literacy and encouraging a culture of stewardship, we can empower the individual as an agent of change to engage, inform, and influence water policy and stewardship within their community.

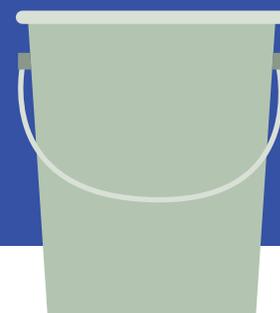
The data the project collected will allow communities to better understand their citizens’ knowledge and perceptions of local water resources. This will help them identify local priorities, educate stakeholders, and engage individuals, businesses, and governments in strategies to improve their communities.

Visitors to the Michigan Water Heritage Exhibit and the Smithsonian Museum on Mainstreet Waterways Exhibition were asked to identify one way they would fill a Bucket of Care to steward the Great Lakes. Some of the more than 400 responses:

I COMMIT TO...



- Purchase rain barrels for gardening.
- Use less plastic including not using plastic straws.
- Recycle my bottles and anything else that is recyclable.
- Put water saving appliances in the house.
- Pick up 10 pieces of trash every time I go to the beach or trails.
- Practice responsible landscaping to protect lakes, streams, and ponds.
- Make sure we dispose of oil properly.
- Appropriately treat phragmites and protect plants along the water from chemicals.
- Join a volunteer organization that protects our Great Lakes.
- Join clean up days with my friends and family on the beach.
- Be aware of what goes down my drain and be more mindful of how much water I am using in daily routine.
- Never pollute and make it a healthy environment for all Michigan inhabitants even the tiny, furry ones.





Saginaw Bay Watershed Lake Sturgeon Release (Photo courtesy of Michigan Sea Grant)

Additionally, the project worked to highlight the ways people use and enjoy water, in order to emphasize the values that connect us. Of these, the following six values were predominant:

- 1. WATER AS REFUGE:** A non-consumptive appreciation of water. Being around and experiencing water brings a sense of awe or feeling of belonging.
- 2. WATER HAS INTRINSIC VALUE:** Clean, healthy water is important in and of itself and for all life on Earth (i.e., not simply for the benefit of humans).
- 3. WATER FOR USE:** Water as a resource to be used and shared by humans and wildlife.
- 4. WATER AS A BASIC NEED:** Water plays a central role in meeting our daily needs, and it is important for people to understand this.
- 5. WATER AS A SERVICE PROVIDER:** Water is necessary for life on Earth.
- 6. WATER AS MEDICINE:** The impact of water on one's health and well-being.

Participants were also asked the question: who is responsible for stewarding and protecting Michigan's Great Lakes and other water bodies? In the seven participating communities across the state of Michigan, the answer was clear: we all are. Respondents overwhelmingly agreed that governments at all levels, community residents, citizen groups, and they themselves shared a nearly equal responsibility for Great Lakes stewardship. Local businesses and tribal governments were also identified as having a role in stewarding the Great Lakes and our water resources. Not only did the Michigan Water Heritage Project find that Michigan's communities feel a responsibility to protect the Great Lakes, it also demonstrated that citizens have a strong desire to uphold this duty.

The Water Heritage Project was made possible through a collaboration among EGLE's OGL, Cranbrook Science Institute Freshwater Forum, Michigan Humanities Council, the Smithsonian Water/Ways Exhibit, and Michigan State University. Funding for the Michigan Water Heritage Project was provided by the Erb Family Foundation. The project supports the Michigan Water Strategy goals to inspire stewardship for water resources and increase knowledge of our water system.

Results of this project will be used to inform future education and outreach efforts around the state and toward efforts to expand the use of the conversation model as an effective engagement method. In addition, the project team hopes to expand upon the Water Heritage exhibit for use in additional communities around the state.

FROM STUDENTS TO STEWARDS INITIATIVE

Most recently, the OGL partnered with the MISTEM Network and the Michigan Department of Education (MDE) and the Michigan Department of Labor and Economic Opportunity to launch an initiative called From Students to Stewards. The initiative is intended to enhance school performance and improve water literacy in students from kindergarten through grade 12. The initiative will support the integration of Great Lakes and freshwater literacy principles into standards-based school curricula and continuous improvement plans using place-based approaches. The focus of the effort is to engage schools to reimagine their systems to support this pedagogical approach for learning with a Great Lakes focus. From Students to Stewards is intended to make progress toward closing the water literacy gap in Michigan and growing the next generation of water stewards, leaders, skilled workers, and decision-makers. Through this initiative, students will learn about water through exposure to real world, close-to-home water issues and gain experiences that will help prepare them for high-quality, water-focused STEM careers.

The program includes a field test grant opportunity for the 2020-2021 school year for participating entities to demonstrate strategies and best practices for grounding learning in the context of freshwater access and incorporating Great Lakes and water literacy principles into the whole child, school, and community models. To help schools accomplish these goals,

EGLE's OGL, MDE, and the MiSTEM Network have curated a toolkit of resources, information, and real-world opportunities for students and educators. Evidence from the field tests will be used to support future integration of this and similar instructional strategies into the Michigan Integrated Continuous Improvement Process.

THE MICHIGAN WATER SCHOOL

Other collaborative educational and outreach efforts have been focused on targeting local and elected officials whose decisions have an impact on local water resources, including the [Michigan Water School](#), a program developed by Michigan State University Extension, MSU Institute for Water Resources, and Michigan Sea Grant. The Water School offers a two-day program targeted to local decision-makers, appointed and elected officials, and municipal staff who are positioned to make an impact on water resources. Topics include water quantity and groundwater availability, water quality issues, integrating water into community and economic development, infrastructure and finance, and water policy. Hydrologic knowledge and understanding are critical to making sound water management decisions.

Recent funding through the Erb Family Foundation supported expansion and evaluation of the Water School. This evaluation is important to understand opportunities to improve and more

strategically focus the program and content on the target audience. The evaluation used all pre- and post-surveys to evaluate participants on their understanding of water quality issues. After attending a session, participants reported feeling more confident in their own abilities to make sound decisions about water-related issues and influence the solutions to water quality issues. In 2019, three Water School sessions were held in southeast Michigan, and several more are planned for 2020.

The unique species, incredible landscapes, and stunning waters of the Great Lakes are all part of a deeply interconnected ecosystem that supports and sustains them. The people who live, work, and play in the state of Michigan are part of that ecosystem, too, and it is our responsibility to understand how the decisions we make affect the living things around us and act accordingly.

The Michigan Water Heritage Project, From Students to Stewards Initiative, and the Michigan Water School are among many programs designed to help people understand that we live in a hydrologically connected system and our decisions and actions have an impact on the larger Great Lakes water community. EGLE is committed to cultivating current and future generations of water stewards, leaders, and decision-makers needed to solve complex water issues in a changing world. As Conservationist Aldo Leopold once said, "When we see land as a community to which we belong, we may begin to use it with love and respect." ♦

4-H Great Lakes Natural Resources Camp, 2018 (Photo courtesy of EGLE)





Alpena's North Point Peninsula, site of a collaborative effort among Huron Pines, The Nature Conservancy, and Friends of the Thunder Bay Marine Sanctuary to permanently protect 4 miles of Lake Huron Shoreline. (Photo courtesy of EGLE)

Michigan Communities Empowered to Take Action for Great Lakes Protection

By Huron Pines

Places such as Rogers City, Alpena, and East Tawas, on the northern coast of Michigan, aren't just on Lake Huron — they ARE Lake Huron. The Great Lakes are built into their community identities. It's no different across the lake in Ontario, on the Bruce Peninsula and along the shores of Georgian Bay, where fresh water and natural resources define the landscape and shape the way of life.

That's why leaders on both sides of the lake are coming together to prioritize healthy water and a sustainable future for Lake Huron with the Lake Huron Forever program.

With support and leadership from the Community Foundation Grey Bruce, Bay Area Community Foundation, Community Foundation for Northeast Michigan, and local conservation partners, Lake Huron Forever aims to create a unified voice and vision that inspires communities to put Lake Huron first in their resource allocation and city-planning, regardless of what side of the lake they live on.

Ontario and Michigan residents and First Nations partners can share expertise and work alongside community foundations and conservation partners to develop and implement green infrastructure projects and nature-based solutions — such as rain barrels and rain gardens — that will help keep Lake Huron healthy. The goal is for each community to be empowered to take the lead in Lake Huron protection with solutions that are customized for their own unique needs.

Facilitated by Huron Pines, a non-governmental, not-for-profit organization experienced in bringing people together for community and conservation, the Lake Huron Forever Campaign is designed to build relationships between people and water, between coastal and inland communities, and between the U.S. and Canada.

“The community-first approach to healthy water means decisions will be driven by the communities themselves and supported by their Lake Huron Forever partners,” Brad Jensen, Executive Director of Huron Pines, explained. “It's our hope that the effort will raise awareness for the need to care for Lake Huron and invest in its health.”

Stuart Reid of Community Foundation Grey Bruce in Ontario said: “People are surprised to learn that freshwater resources in the Great Lakes are not renewable. We need to work together to ensure the sustainability of our shared waters for the generations to come. Nature-based solutions for water management utilize both the latest technologies but also traditional knowledge from Indigenous peoples who have stewarded these waters from time immemorial.”

STORM WATER FOCUS

Outreach and education to increase the readiness of Lake Huron communities to collaborate and implement clean water action through storm water management is the first step to



Samantha Nellis (Huron Pines Watershed Planner), Scott McLennan (Rogers City Mayor), Kim Margherio (event coordinator and DDA volunteer), and a community member discuss storm water management plans for Rogers City, a community in the northeast lower peninsula.

ensure water quality protection for Lake Huron. Storm water management reduces pollution in Lake Huron and increases the amount of naturally filtered water flowing into the groundwater supply.

Lake Huron Forever started with partners from Canada and the U.S. looking at existing Lake Huron data and research, listening to public input, and discussing water quality challenges faced by communities on both sides of the lake. The pollution, erosion, and flooding caused by excessive runoff from storm water was the issue that rose to the top. Improving storm water management across local communities creates a clear path to achieving water quality goals and strengthening community leadership and involvement in Great Lakes protection.

Using nature-based design to develop and implement green infrastructure projects provides communities with more green and recreational space, while reducing the burden of excess water flowing into aging sewer systems, improving water quality, and increasing resilience for communities struggling with high water levels and flooding.

The projects supported by the Lake Huron Forever program can kickstart community conversation and action to design and complete on-the-ground work to strengthen the health and well-being of residents, as well as our natural resources. Green infrastructure planning is an accessible platform for incorporating broad community perspective, experience, and abilities. By focusing on the residents and the resources, Lake Huron Forever aims to integrate Great Lakes stewardship into all aspects of coastal community life.

COLLABORATIVE EFFORT

The Lake Huron partners are one of six regional teams around the Great Lakes in the United States and Canada in the Great Lakes One Water Partnership.

Other key partners in the Lake Huron region include the Grey Bruce Sustainability Network, Grey Sauble Conservation Authority, the Lake Huron Coastal Conservation Centre, Michigan Department of Environment, Great Lakes, and Energy, Saginaw Basin Land Conservancy, and The Conservation Fund-Saginaw Bay Watershed Initiative Network.

The Great Lakes One Water Partnership, which was officially launched in 2017, is shepherded by the Council of Michigan Foundations and is designed to help communities around the Great Lakes region develop and implement projects that will secure the region's water future. Support and funding has come from the Great Lakes Protection Fund, the Ralph C. Wilson, Jr. Foundation, and the Kresge Foundation. Huron Pines' action agenda under the partnership covers a time period of 2019-2022.

Huron Pines is a nonprofit organization established in 1973 to conserve and enhance Northern Michigan's natural resources to ensure healthy water, protected places, and vibrant communities. ♦

EGLE Strengthens Michigan's Sister State Relationship With Japan's Shiga Prefecture

By Nick Assendelft
Michigan Department of Environment, Great Lakes, and Energy

For more than 50 years, the State of Michigan and Japan's Shiga Prefecture have enjoyed a sister state relationship. That connection was strengthened recently when Michigan Department of Environment, Great Lakes, and Energy (EGLE) Director Liesl Clark and Shiga's Department of Lake Biwa Director General Ishikawa Yasuhisa signed a memorandum of understanding to agree to share knowledge and expertise to protect some of the world's largest bodies of fresh water and advocate for lake conservation efforts around the world.

"Thousands of miles may physically separate us, but our interests are closely intertwined: preserving water and environmental resources, development opportunities tied to lake economies, and even invasive species," noted Director Clark at the signing ceremony.

"Water is an important identity for the citizens of Shiga and Michigan, and they are what make us unique. We're excited to continue to work together to show the world the value of freshwater resources and act as a unified example that other states, provinces, or countries can emulate," she added.

Under the Memorandum of Understanding, both parties will:

- Facilitate dialogue and partnership to promote conservation and restoration of lake environments.
- Pursue opportunities for collaboration through mutual exchange of program staff, information, and expertise for sustainable lake management.
- Affirm the significance of promoting the value of lakes and reservoirs and the importance of the conservation of these environments to the world.

At the ceremony, Director General Ishikawa cited the wisdom of joining forces to tell the world how important lakes and reservoirs are and help advance their conservation. Lake Biwa is the largest freshwater lake in Japan.

The formal Michigan-Shiga relationship was established in 1968 to promote friendship and goodwill through economic and cultural exchanges and the conservation and preservation of both state's distinctive lake environments. Over the past 50 years, the program has expanded and deepened to include teacher and student exchange programs and various cultural exchange programs. In 1984, the partnership led to the initiation of the



EGLE Director Liesl Clark and Shiga Director General Ishikawa Yasuhisa (Photo courtesy of EGLE)

Management of World Lake Environments Conference in Shiga. The second conference was held in 1986 on Mackinac Island. The conference takes place every two to three years.

Emily Finnell of EGLE's Office of the Great Lakes notes that the Michigan-Shiga partnership is an important institution for the global conversation about freshwater and lake environments. "We have an opportunity to leverage this relationship to demonstrate global leadership on one of the most pressing issues of the 21st Century."

The visit by Japanese officials marks the latest international visit to EGLE. Other recent visits include:

- A delegation from Jiangxi Province in China (home to the largest freshwater lake in China) visited EGLE to learn about Great Lakes challenges.
- A group of representatives from the province of Zeeland in the Netherlands visited EGLE to learn about ways to engage students in water-focused careers.
- A group of scientists from Central Asia visited EGLE to learn about air emissions monitoring in Michigan. ♦

Soo Locks Project Finally Underway with 2027 Target Date for Opening

By Larry Karnes* and Elisha Wulff
Michigan Department of Transportation

After many years of false starts and lack of funding, construction is underway on a new large lock that will provide the necessary capacity and redundancy for Michigan's Soo Locks to continue accommodating marine traffic vital to the North American Economy.

The need for a second lock at Sault Ste. Marie to accommodate ships up to 1,000 feet in length has long been identified for the maritime complex, which is a critical component of the entire Great Lakes-St. Lawrence Seaway navigation system. Construction was originally authorized by Congress in 1986. But a lack of Congressional funding and related bureaucratic issues kept the project from moving forward, except for some preliminary construction and continued planning activities.

More than 75 million tons of cargo and 3,000 cargo vessels pass through the locks annually. Owned and operated by the U.S. Army Corps of Engineers, the lock system raises and lowers vessels approximately 21 feet to overcome the difference in elevation between Lake Superior and Lake Huron.

There are two operational locks – the MacArthur and the Poe. The MacArthur was built during World War II and can accommodate vessels up to 730 feet long and 76 feet wide. The Poe was opened in 1968 and can accommodate vessels up to 1,000 feet in length and 105 feet in width. There are two additional locks – the Davis and the Sabin – which were constructed during World War I and are functionally obsolete and permanently closed.

Since the Poe's construction, Great Lakes fleets in the United States and Canada have replaced many of their older vessels with newer, larger vessels, most of which can only use the Poe because of their size. As a result, 89 percent of all the cargo passing through the locks is restricted to using the Poe. This critical dependency on the Poe presents a significant risk not only to Great Lakes shipping, but to the nation's overall economy. Should the Poe become inoperable due to mechanical failures or other causes, impacts will be felt throughout North America.

A U.S. Department of Homeland Security study found that a six-month closure of the Poe would result in a complete shutdown



Soo Locks (Photo courtesy of MDOT)

of Great Lakes steel production. This would lead to 75 percent of U.S. integrated steel production ceasing, as well as 80 percent of U.S. iron ore mining. Automobile and transportation equipment production would essentially end in North America, with 11 million jobs lost and a \$1.1 trillion decrease in Gross Domestic Product. Every state in the country would be adversely affected.

In 2018, a new economic validation study was completed, which resulted in an updated benefit/cost ratio, allowing the project to move forward toward Congressional funding. Congress reauthorized construction of the new lock in October 2018 with an estimated project cost of \$922.4 million (including \$32 million spent prior to 2019).

The State of Michigan provided \$52 million in December 2018 to help advance the project and allow it to rank more highly among national infrastructure needs. The U.S. Army Corps of Engineers also received \$32.4 million in federal funds for fiscal year 2019, and fiscal year 2020 budget included an additional \$75.3 million.

The new lock will replace the closed Davis and Sabin locks, but will have the same dimensions as the Poe and will provide much needed redundancy for the aging Poe. The construction project consists of three main phases:

- Deepening the upstream approach channel (2020-2021).
- Rebuilding the upstream approach walls (2020-2022).
- Construction of the lock chamber (2022-2027).

This schedule assumes Congress will continue to provide efficient funding for the project. ♦

*retired



A Great Lakes cruise ship makes its way to the dock in Muskegon. (Photo courtesy of EGLE)

Great Lakes Cruises Make Bigger Waves in State's Travel Industry

By Travel Michigan

For centuries, mariners have plied the waters of the Great Lakes in search of new opportunities and adventure. Freighters still share these waters with pleasure craft as an affordable and effective way to transport materials used to fuel the regional economy. More recently, some Michigan port cities have also hosted a handful of small cruise ships operated by visionaries who saw the value of a Great Lakes cruising experience.

In part, due to the work of Cruise the Great Lakes, interest in visiting the region for leisure by ship is growing. The organization was created in 2018 by the Conference of Great Lakes and St. Lawrence Governors and Premiers, an international consortium of states and provinces. When they created the group, their goal was twofold:

- to collaborate with cruise ship operators and other partners to help them grow their business; and
- to increase awareness of the regional opportunity by those who like to travel by cruise ship.

Dave Lorenz, vice president of Travel Michigan, is the chairman of the 24-member group made up of states, provinces, port communities, operators, and others. In 2019, the initiative's three cruise lines offered 51 cruises along the Great Lakes and St. Lawrence River, up from 45 in 2018. He expects at least

two additional new members this year will join the initiative, which generated more than 100,000 port visits last year.

To help market the program, the group hired Stevens Advertising of Grand Rapids to manage the effort. So far, promotional materials have been developed and distributed, a [website](#) has been launched, print advertising has run in travel magazines, social and digital campaigns have run, and several news conferences at key ports of call have been held. The effort has generated many earned media stories, including having Great Lakes cruise travel be named to the recent Travel & Leisure Magazine's "50 Best Places to Travel in 2020" list (the Great Lakes even got a mention during a recent Today Show segment on the magazine's list). Travel Michigan is also promoting lakes cruising through its [website](#).

Lorenz says that the Great Lakes region features a unique blend of big city and small-town ports of call that will be a draw for cruisers. "The fact that they can travel in a small ship offering a more intimate experience than can be found on large cruise ships is another selling point for cruising here."

The best news, according to organizers, is that visitors who first come to the region via a cruise ship will likely come back after discovering the interesting collection of cities and the natural beauty, values, and ease of travel options that are available.

Michigan's ports in particular have begun to host an increasing number of cruise ships bringing visitors from around the world to experience the Great Lakes and the culture we have built around them. The State of Michigan has periodically been approached by either Great Lakes-based cruising coalitions or cruise line representatives asking about a Michigan-specific port's ability to host a cruise ship and the area's attractions and related questions.

In addition, community leaders are asking how they can make their harbors more cruise ship accessible. Although this is an exciting new opportunity for port and harbor communities, it also presents a need for proactive community planning and capacity building to prepare for cruise ships in order to best accommodate the needs of the ship, passengers, and crew.

In response to the growing interest, the Office of the Great Lakes convened an interagency work group to determine how best to support and assist communities in becoming Great Lakes cruising destinations based on community and cruise line feedback. In 2019, the OGL, in collaboration with Michigan Economic Development Corporation and other agency partners, conducted community outreach and meetings to assist communities in understanding the opportunities presented by becoming a Great Lakes cruising destination, preparing for the rapidly growing Great Lakes cruising industry, and to learn more about their port's ability to accommodate cruise ships and the area's attractions that could be of interest to cruise ship lines and passengers. Five communities expressed an interest and participated as part of a larger community outreach effort, including Grand Haven, Ludington, Traverse City, Alpena, and Houghton-Hancock. ♦



(Bottom) Portage Lift Bridge connects the cruise ship ready cities of Houghton and Hancock in Michigan's Keweenaw Peninsula (Photo courtesy of MDOT)



Big Sable Point Lighthouse, near Ludington, a potential new destination for Great Lakes cruising (Photo courtesy of MDOT)



(Bottom) Great Sand Bay, in the Keweenaw Peninsula, is close to cruise ship ready Houghton-Hancock (Photo courtesy of MDOT)



Holland Tulip Festival (Photo courtesy of MDOT)

Thank you.

Many thanks to the experts, contributors, partners, and editors who contributed their time and efforts to this 2019 State of the Great Lakes Report.

The stories reflect the dedication of our region's natural resource stewards and community voices within our state who all share a passion for Michigan's Great Lakes water resources.

Images in this report were sourced from the Michigan Department of Environment, Great Lakes, and Energy staff unless otherwise noted.

This report is available digitally at the Michigan Office of the Great Lakes webpage, Michigan.gov/OGL.

The Michigan Department of Environment, Great Lakes, and Energy does not discriminate on the basis of race, sex, religion, age, national origin, color, marital status, disability, political beliefs, height, weight, genetic information, or sexual orientation in the administration of any of its programs or activities, and prohibits intimidation and retaliation, as required by applicable laws and regulations. Questions or concerns should be directed to the Nondiscrimination Compliance Coordinator at EGLE-nondiscriminationCC@michigan.gov or 517-249-0906.

Gretchen Whitmer, Governor
Liesl Eichler Clark, Director, EGLE

The views and opinions expressed within this publication are those of the individual authors and do not necessarily reflect the official policy or position of the Michigan Office of the Great Lakes, the Michigan Department of Environment, Great Lakes, and Energy, or their partners.

Design by Lisa Twenter of the Michigan Department of Environment, Great Lakes, and Energy.



MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

[MICHIGAN.GOV/EGLE](https://Michigan.gov/EGLE) | 800-662-9278