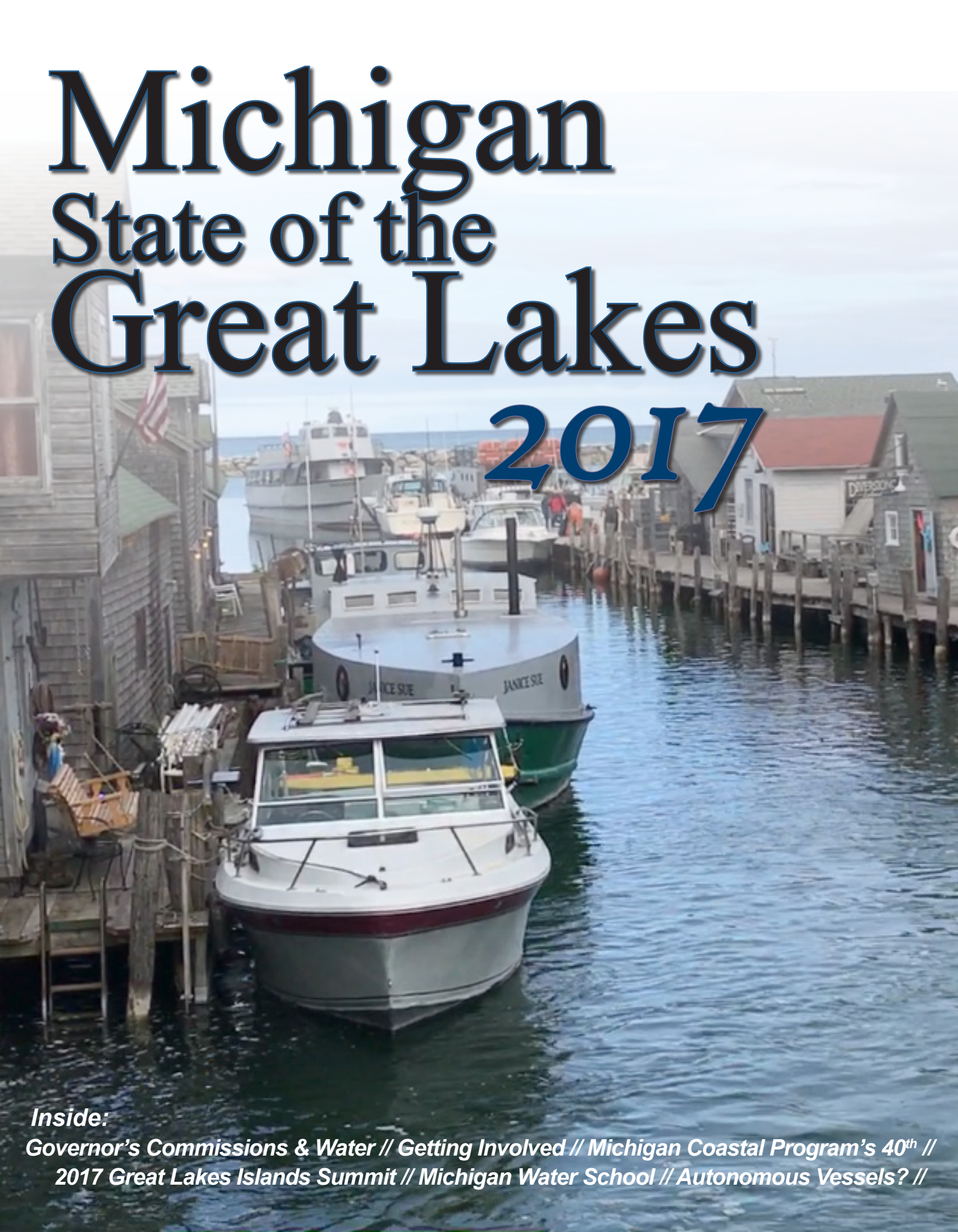
Michigan State of the Great Lakes 2017



Inside:

Governor's Commissions & Water // Getting Involved // Michigan Coastal Program's 40th // 2017 Great Lakes Islands Summit // Michigan Water School // Autonomous Vessels? //

Cover Image: Weston Hillier, OGL Coastal Management Program

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

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MICHIGAN OFFICE OF THE GREAT LAKES

Table of Contents

Governor's Message

Each New Year, the State of the Great Lakes Report provides an opportunity to reflect on the numerous ways the Great Lakes influence our lives in Michigan. They contribute to Michigan's natural beauty, economic prosperity, and rich heritage, truly defining the Michigan way of life.

In 2017, initiatives and partnerships across the state and the Great Lakes Basin made progress in restoring environmentally impacted waters, protecting critical areas like dunes and wetlands, and connecting people to their natural resources through trails, parks, and revitalized waterfronts. This progress was driven by collaboration, sustainable developments in water management, and investments in public access, green infrastructure, and wildlife habitat.

State agencies, industry professionals, universities, and local leaders are working to position Michigan as the nation's water leader in sustainability, technology, recreation, business, and healthy ecosystems. Many of their advancements were featured topics at the Governor's Leadership Summit attended by regional state and provincial officials in October. The Summit highlighted new tools and innovations in the fight against aquatic invasive species, progress in efforts to protect Great Lakes waters from pollution, and an exciting future in autonomous vessel technology.

Other successes include the more than 100 recommendations created for Michigan's water infrastructure by the 21st Century Infrastructure Commission, and a future of stronger connections between the newly joined Michigan Office of the Great Lakes and the Department of Natural Resources.

Looking to 2018, the Governor's Office will collaborate with the Office of the Great Lakes and state agencies in continuing the essential work called for in the Michigan Water Strategy to ensure clean and safe waters, promote a culture of water stewardship, and forge stronger connections to Michigan's water heritage.

Thank you,

Governor Rick Snyder

Director's Message

I hope you read these pages with both a sense of excitement and impatience.

Our collective progress towards reestablishing ecological integrity and community vitality in the Great Lakes is both impressive and, at times, painstakingly slow.

It is impressive in the dogged, unrelenting work of the communities and organizations that strive to create a future better than the past.
It is impressive in the time and commitment of so many volunteers and engaged citizens.
It is impressive because we are undaunted by the scope and breadth of the work before us.

In this volume of the State of the Great Lakes Report, we have tried to capture a glimpse of the work that is underway in the State and region to restore, recreate, and reinvigorate our Great Lakes waters.

Within this volume is a sampling of what progress in the Great Lakes looks like through the lens of shared governance. Michigan alone does not manage or maintain this vast system. We work through a complex set of relationships with federal, state, local, and regional institutions. The Great Lakes Commission, International Joint Commission, Great Lakes Fisheries Commission, Great Lakes Protection Fund, and so many others are leading initiatives in this essential work.

We look to manage the lakes through a set of treaties, compacts, agreements, business and trade relationships, and informal networks. We do this through regulatory obligations (like the Clean Water Act), incentive programs, philanthropic gifts, grants and loans, community fundraising, and other mechanisms.

It can be frustrating because it is never fast enough. In a time when the loss of shoreline and habitat took a single generation to occur, we are impatient that it can take several to restore that shoreline so it supports healthy fisheries and clean beaches.

Although we have supported progress with our partners who have labored to reconnect their cities with their waterways, there is still more to be done.

We can learn much by adopting a point of view like that of the Anishinaabe. Michigan's Native American tribes take a long perspective, gauging the effects of actions with a seven-generation view. We, like they, need be mindful of the sweep of time behind us that brought us to this point – for good and for ill, and see clearly in front of us as we seek to rebuild the healthy Great Lakes system we envision.

For those of us who remember the burning rivers of the mid-20th century – the Cuyahoga, the Chicago, the Buffalo, and the Rouge; the oil soaked shorelines; the rivers devoid of fish; rotting alewives on the beaches; lamprey devastating our fisheries; and sewers running directly into the rivers and lakes; today's Great Lakes are far improved. We have tackled, under a complex and important array of regulatory mechanisms and investments, these issues and invested tens of billions in improving sewer and water systems, industrial discharge, and air emissions.

Looking to the future, there is more work to be done, and the threats facing us today are less obvious than those of the past. Diffuse, distributed, non-point threats like nutrient enrichment of Lake Erie, PFAS in groundwater, stormwater management, and the like are the next challenges in restoring our shared waters.

I have confidence that we will confront these new threats as we did those of the mid-century, with passion and commitment. We all agree that the Great Lakes are worth investment and effort. Our future rests in a healthy Great Lakes – a future where we work together toward a vision we can be proud to pass on.

Jon W. Allan
Director, Michigan Office of the Great Lakes

Governor's Commissions and the Role of Water

By: Angela Ayers & Sarah Dickinson
Office of the Governor

R. Coale, Beaver Island, MI

21st Century Infrastructure | **21st Century Education** | **21st Century Economy**

Water defines our great state in many ways: recreationally, economically, technologically, and fundamentally in our everyday lives. Michigan's unequalled water system is woven into the foundation of how our state operates, from use in manufacturing, to thousands of recreational opportunities that help attract talent from all over the world. As we look to enhancing our communities and quality of life to build a 21st century Michigan, we find that water plays a significant role.

In Governor Snyder's 2016 State of the State Address, he called for the creation of three commissions: 1) the 21st Century Infrastructure Commission, 2) the 21st Century Education Commission and 3) the Building the 21st Century Economy Commission. He gathered bipartisan, visionary leaders from across the state to study what Michigan's needs are in these areas and tasked them with delivering a set of bold recommendations to create strong communities and increased quality of life for Michigan's future. The convergence of these major initiatives, along with the state's first ever Water Strategy, creates a fundamental framework needed to maximize the health and well-being of the people of Michigan and support our growing economy. And water, our state's greatest natural asset, is a critical component that can be found intertwined throughout each of these initiatives.

The 21st Century Infrastructure Commission recognized the importance and uniqueness of Michigan's unparalleled water network, as well as the great responsibility we have to ensure Michiganders have the healthiest water system in the world.

Michigan's water system provides drinking water to millions of people, sustains unique and pristine habitats, and offers world-class recreation opportunities.

The Commission delivered more than 100 recommendations to improve the infrastructure systems that underpin this vast network and highlighted a startling fact: information does not exist on the location or condition of Michigan's public water infrastructure assets. This lack of information on water infrastructure conditions jeopardizes the service quality, safety, health, and reliability of Michigan's water infrastructure. In addition, infrastructure management is too-often "siloed" in our state. There are 1,390 drinking water systems, 1,080 wastewater systems, 619 separate road agencies, 79 transit agencies, 116 electric utilities, 10 natural gas utilities, and 43 broadband providers.

Coordinated infrastructure planning and management is a necessary foundation to a successful future system.

The Commission found that Michigan must implement an integrated asset management database system, create a council to oversee long-term coordination and strategy, invest in our infrastructure systems in a sustainable way, and remain committed to embracing emerging technologies. Achieving these overarching goals, in addition to the sector-specific recommendations put forth in the report, will help to ensure reliable, safe, efficient, and cost-effective water infrastructure systems.

Michigan's future depends on our ability to attract and retain talent. Michigan will not succeed in the 21st century global marketplace unless we are able to attract highly educated people and enhance the education levels of existing residents to meet the talent demands of the future. The Governor's 21st Century Education Commission developed recommendations that outlined the provision of job opportunities for Michigan's workforce, including engineers, skilled construction trades, and other skilled infrastructure occupations.

A skilled and proficient workforce in the water profession is critically needed in Michigan to help prepare for the technological advances and complex coordination required in today's water infrastructure and industrial fields. This is manifesting itself in initiatives such as the Michigan Water Academy, hosted by the American Water Works Association's Michigan branch, as well as the Great Lakes Water Authority's apprenticeship program. Training tomorrow's leaders to be innovative with technology and create solutions to complex water issues is a critical component to Michigan's future success.

The role of the Governor's Commission on Building the 21st Century Economy was to aggregate and build upon the recommendations of the first two commissions to ensure the success of Michigan's future economy. It analyzed four areas: infrastructure, talent, business climate, and quality of life and focused on the reality that having healthy ecosystems and functioning water systems is crucial for attracting and retaining talent and increasing the livability of our communities.

Our economy was built on strong public infrastructure that put the world on wheels and was a global birthplace of innovation and industry. As such, the 21st Century Economy Commission recognized the need for water infrastructure investments, strengthening asset management, investing in our water systems, and assisting with cleanup efforts of contaminated properties that threaten public health and drinking water supplies to enable a future-oriented strength-based economy.

In addition, Michigan's natural resources provide a unique differentiator, particularly its access to fresh water and rural recreation opportunities. The Commission noted that these natural assets should be advertised to people and businesses to build Michigan's attractiveness and grow the state's population. This is especially important since untapped natural resources and quality of life opportunities may attract new talent to Michigan's non-urban areas.

The Commission also recommended support of and access to our many natural resource areas, an increased emphasis on our recreation and tourism industries, as well as using these assets as economic development and placemaking tools to increase livability in Michigan's communities.

It is clear that the quality of Michigan's natural resources matters to our economy, our workforce, and our infrastructure.

Residents, communities, and businesses rely on our unique and unparalleled water system for public health, environmental, recreational, and economic benefits. Whether large or small, urban or rural, having attractive and compelling communities that leverage their natural assets is critical. The trend toward people choosing where they live based on quality of life as opposed to job considerations will continue to accelerate. Our job is to ensure that we are positioned for success.

A Year in the Office of the Great Lakes

A year goes by fast.

2017 has been a constant stream of news on the exciting progress and partnerships happening to protect and restore our Great Lakes waters.

Strong relationships are the foundation of our work in the OGL. Through an active Great Lakes network, our relatively small team is making a positive impact across the watershed.

Through 2017, the OGL shared multiple announcements on the continued progress in cleaning up Great Lakes Areas of Concern, Michigan's "underwater brownfields" recovering from a toxic legacy. Restoration gives these places new life and renews people's relationships with their lakes and rivers.

The OGL supported vibrant Great Lakes communities by encouraging resiliency planning in coastal towns and partnering with Sea Grant to spark new vision with the award-winning Small Harbors Project.

In September, the OGL helped to facilitate the very first Great Lakes Islands Summit (p16), the beginning of many exciting new relationships.

The OGL continues to spread the Great Lakes message to build a culture of care and stewardship for the places we love.

Ideas seeded in the Water Strategy (mi.gov/waterstrategy) have bloomed into the MSU Water School (p14) to educate our leaders to protect our waterways and public health.

The upcoming Water Heritage Project will encourage people to share their Great Lakes story and connect with their water resources in new ways.

By the Numbers

5 historically impaired beneficial uses restored in Michigan's Areas of Concern

353 entries from **27** different countries were received as part of the the Invasive Carp Contest to win a prize and combat aquatic invasive species

6 Communities selected to host the upcoming Great Lakes Water Heritage Exhibit in partnership with the Smithsonian's Water/Ways

The OGL is celebrating **40** years of positive community impact by Michigan's Coastal Program in 2018

12 Island communities joined the first Great Lakes Islands Summit held on Beaver Island, MI

Looking to future, the OGL continues to work toward the vision created in the Water Strategy.

In 2018, we will focus on the future of our state's maritime heritage, aim for continued success in restoring our waters, celebrate 40 years of work to protect our coasts (p24), and forge deeper relationships to continue our mission to sustain our Great Lakes resources.

Rachel Coale
Outreach Coordinator, OGL

R. Coale, Beaver Island, MI

Great Lakes Community

Local Actions, Statewide Impact

Community Foundations Improve Water Resources

By: Robert Collier
President & CEO, Council of Michigan Foundations

Water is vital to the shared vision of Michigan's community foundations to achieve vibrant communities with great opportunities for all. As grantmakers, community conveners, and partners with businesses and local governments in problem solving, community foundations serve all 83 counties.

Whether they are focusing on health, economic development, education, or other human service needs, community foundation leaders share the realization that water – especially the priority for safe drinking water for all Michiganders – is a unifying theme for innovative community action.

From Marquette to Alpena to Petoskey to Grand Rapids, Kalamazoo, Port Huron and Detroit, community foundations have a long history of being trusted by Michiganders to engage in public-private partnerships with local units of government and charitable nonprofits in tackling both immediate and long-term needs. For example, the Petoskey Harbor Springs Area Community Foundation provided a grant last year to the Tip of the Mitt Watershed Council to support the construction of 13 rain gardens in the city of Petoskey to protect Little Traverse Bay from nutrients, sediments, and other pollutants.

The Community Foundation for Southeast Michigan supported the Detroit Riverfront Conservancy in leveraging federal funds for the development of trails and a water capture system in Milliken State Park, along with educational information along the trails to show how water flows and why protecting natural systems is critical for clean water. This was the first green infrastructure project in Detroit and illustrates how community foundations are playing the role of helping their communities form new collaborations to tackle important issues.

Receiving support from Michigan and around the world, the Community Foundation for Greater Flint formed the Flint Child and Health Development Fund to help address long-term issues facing Flint kids from the Flint water crisis. The community foundation's Youth Advisory Committee has supported the development of lesson plans by Flint teachers on water quality, disaster relief, advocacy skills, and compassion that are now available globally for teachers to use with students through Learning to Give.

Although the water challenges may differ across the state, community foundations provide the most flexible form of organized philanthropy. They are uniquely qualified as boundary spanners to convene residents across generations, across government boundaries, and across watersheds. Community foundations can facilitate and support new ways of both preserving the health of the Great Lakes and pursuing economic opportunities to achieve their shared vision of vibrant communities, providing great opportunities for all Michiganders.

To find contact information for the community foundation serving your community, visit the Council of Michigan Foundations.

Image: A Detroit rain garden provides opportunities for learning and water stewardship. *R. Coale, OGL.*

Getting Involved: How community members can help improve Michigan's waters

By: Mary Bohling
Michigan State University Extension, Sea Grant; AOC Program Statewide Pubic Advisory Council Chair

"Average citizens" often wonder if it is possible to make a real change in our communities. What can just one person do that will really change things for the better? The answer is, there are many ways individuals can get involved in making changes to improve local water quality.

As someone who has been active with the Great Lakes Areas of Concern Program and their associated Public Advisory Councils, I have seen firsthand how individuals have brought positive changes to their local water bodies.

The Great Lakes Areas of Concern Program is a federal-state-local partnership that brings together state and federal scientists with community members to improve "Areas of Concern." Areas of Concern are water bodies affected by environmental impacts from legacy pollution caused by human activities. Those impacts mean that communities often can't eat the fish they catch, swim at their beaches, or drink the water from their local water body. Public Advisory Councils made up of everyday citizens are an integral part of the Areas of Concern program. Residents help government partners learn about their community, create strategies for success, and provide a vision for their waters. Michigan started with 14 Areas of Concern sites, and has completely restored two thanks to the dedication of local Public Advisory Councils. Twelve more sites are in various stages of restoration.

Council members are "average citizens" who decided to learn about the problems of the local water bodies and work with federal and state scientists to create strategies to correct those problems. They also contribute to the improvement of their water bodies through contacting their legislators to educate them and advocate for solutions. Many volunteer for various clean-up efforts, manage PAC projects, and show leadership as water stewards.

Are you someone who cares about your local waters? There are many ways to get involved:

- Write and contact your legislators
- Join a "friends of the watershed" group or public advisory council
- Volunteer with adopt-a-beach or adopt-a-stream
- Run for local or state elected offices
- Make simple changes at home:
  - Make a rain garden
  - Install a rain barrel
  - Don't toss waste (like plastics, yard waste, or paint) into storm drains
- Learn about impacts affecting your local watershed
- Send before and after photos of cleanup projects to your local media

Community members have a unique and powerful voice that can make a local difference in managing and protecting water resources for the future. The benefits of their passionate work can be found across Michigan's communities.

**This article reprinted with permission from Michigan State University Extension*

R. Grant, River Raisin

Michigan Water School: Essential Resources for Local Officials Makes Successful Debut

By: Terry Gibb, Senior Extension Educator, Natural Resources/Government & Public Policy
Bindu Bhakta, Natural Resources Educator
Greening Michigan Institute, Michigan State University Extension

While the Great Lakes state is endowed with abundant ground and surface water resources, local water issues from diverse land uses, changing climate patterns, and nonpoint source pollution has shown a need for stronger governance to protect these resources. Lack of available information, public support, and resources have been identified as barriers to implementing community water management improvements.

Michigan State University Extension and Michigan Sea Grant are addressing these challenges through a new policy-neutral, fact-based program: **Michigan Water School: Essential Resources for Local Officials.**

The objective of the two day program is to provide local decision makers with critical, relevant information needed to understand Michigan's water resources, including the fundamentals of water science, in order to support sound water management decisions and increase awareness of current and future local and state water issues. It supports recommendations in the Michigan Water Strategy to improve statewide water literacy and understanding of water management at the local level.

This interactive program, piloted in May 2017 in partnership with Lawrence Technological University (LTU) featured in-class presentations, interactive learning demonstrations, and a field experience. Sessions featured water quantity; water quality; economics, finance, and planning; and water policy.

The Water School Policy Toolbox provides general information about how federal, state, tribal, and local laws and rules provide the basis for water policy in Michigan and is organized into three sections:

1. Water-related issues for which some type of water policy exists are listed. Keywords are provided to assist the user with locating information about a particular topic of interest.

2. Summaries of key pieces of federal, state and/or local law are summarized.

3. Additional sources of information about federal, state and/or local laws and the implementation of those laws are provided.

Participants learned about innovative green infrastructure and low impact development practices implemented at the LTU campus in Southfield and around Southeast Michigan. Tour stops included rain gardens/bioswales, aquatic ecosystem restoration, and wastewater treatment innovations.

The pilot program drew 28 participants from seven counties, with a mix of local elected and appointed officials, municipal staff, and environmental organization staff.

Based on the pre- and post-surveys, participants gained new attitudes, knowledge, and confidence in their ability to make decisions. They expressed more focused understanding of the role of local government in providing leadership in water management.

After completing the Water School program, participants identified specific activities that they could do at the local level to reduce the risk of contamination of water supplies including:

- Educate the public about steps individuals can take like proper auto maintenance and reduction of fertilizer.
- Proper zoning ordinances, public awareness campaigns, community outreach.
- Wellhead protection programs, regulating land use in delineation zones, inspecting septic systems.
- Street sweeping, picking up trash in parking lots, installing rain gardens, practicing safe chemical storage, reducing road salt and adding pervious pavement.

One Water School participant said,

"I would love to attend another class if possible. I learned a lot and I'm ready to inform my community."

Michigan Water School: Essential Resources for Elected Officials will be offered in spring 2018 in Kalamazoo.

Before	After
Before the workshop, 50% of participants agreed with the statement "I am confident that I can make a sound decision regarding hydrology issues."	After the workshop, all participants expressed agreement.
Before the workshop, 50% of respondents agreed that their individual actions have an impact on water quality.	After the workshop all participants expressed this belief.
Before the workshop, 20% of participants disagreed that "the economic stability of their community depends on water quality"	After the workshop, none of the respondents disagreed with the statement.
Before the workshop, 20% of respondents expressed disagreement about wanting to implement low impact development plans in their community.	After the workshop, none expressed disagreement with this approach.

Images: Opposite- Dr. Don Carpenter discusses porous pavers on the LTU Campus. *Lois Wolfson, MSU*
Above- Participants tour the George Kuhn Drain to see wastewater innovations in practice. *Bindu Bhakta, MSUE*

Members from 12 island communities gathered on remote Beaver Island off the Northern Michigan coast September 25-26 for the first-ever Great Lakes Islands Summit.

The two-day summit, held at Central Michigan University's Biological Station, brought together islanders to connect, discuss challenges unique to islands, and plan for future initiatives.

Islanders including local government officials, business owners, school administrators, and local leaders traveled to the summit from three states and the Canadian province of Ontario.

Michigan: Beaver, Drummond, Harsens, Les Cheneaux, Mackinac, Neebish
Ohio: Middle Bass, South Bass
Wisconsin: Madeline, Washington
Ontario, Canada: Manitoulin, Pelee

"These coastal communities are the truest expression of Great Lakes culture and way of life,"

said Jon W. Allan, Director of the Michigan Office of the Great Lakes.

The Michigan Office of the Great Lakes, Northland College's Center for Rural Communities, and the Island Institute of Maine partnered to help islanders explore forming a network of island communities at the summit.

A Great Lakes islands coalition could be a powerful tool for islanders to share solutions and best practices and create ideas to address challenges unique to these coastal communities. These include natural resources, transportation, healthcare, sustainability, demographics, education, and energy. A unified Great Lakes Islands voice has the potential to help islanders support and advocate for each other.

After two days of sharing and brainstorming, participants agreed that there is value in partnering to create a sustainable, healthy future for island communities. They looked forward to inviting additional island communities to the network and supported making the Islands Summit an annual event.

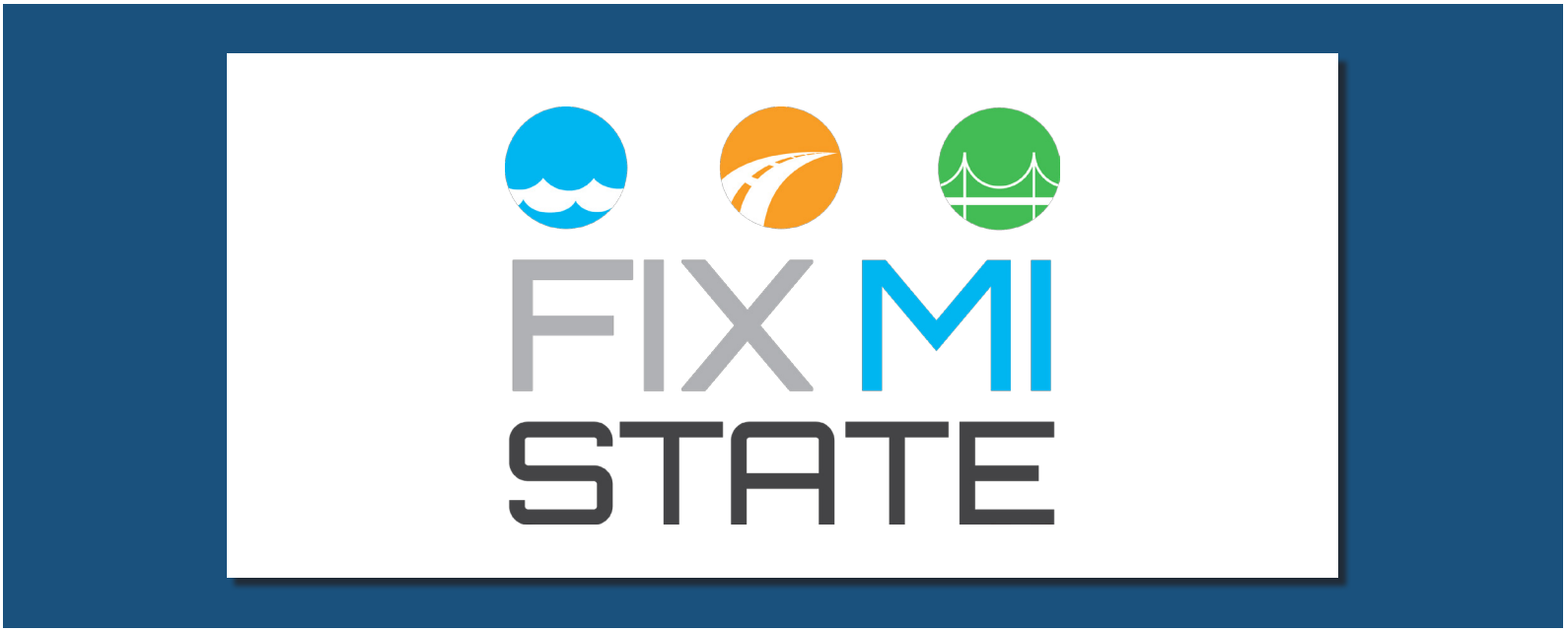
Learn more about the Islands Initiative from the Michigan Office of the Great Lakes by contacting Matt Preisser at preisserm@michigan.gov.

**A version of this article was originally published as a Great Lakes Note by the Michigan Office of the Great Lakes.*

Lessons Learned

- Every island is unique, but participants found they shared some common challenges.
- Solutions or best practices developed on one island may be readily transferable to another.
- New ideas were shared and brought back to be implemented in communities.
- We live in a data-rich world, however: there are few data sets specific to Great Lakes island communities by which to understand current conditions and forecast future trends.
- Improved data sets can inform management decisions and actions.
- A peer-to-peer network of island communities can be used to share information, leverage resources, and help elevate awareness about island living.

Mackinac Town Crier



Fix MI State Campaign calls for Investments in Infrastructure

Says public health and economic sustainability are at stake

By: Mike Nystrom
Executive Vice President of the Michigan Infrastructure & Transportation Association

People who know Michigan know water is especially important here. Water is our childhood summer memories. Water is swimming, fishing, boating, canoeing, kayaking and camping at Michigan lakes and rivers. Water is important for business, playing the lead role in Michigan's $22.8 billion tourism economy.

Water is our way of life.

Reliable infrastructure keeps Michigan's water safe and clean. Unfortunately, all around our beautiful state, aging, failing, and overwhelmed infrastructure is threatening our water resources.

Many of our stormwater and wastewater sewer systems, drinking water systems, and dams are 50 to 100 years old. In older Michigan cities, some infrastructure systems date back to the late 1800s.

When these systems fail or are overwhelmed because they were not designed to handle current capacities, it can cause damage and delays, ruin vacations, and in the worst cases, endanger public health.

In December 2016, the Michigan Infrastructure & Transportation Association launched the Fix MI State public education campaign. Phase one of the campaign will focus on educating Michigan citizens and leaders about the state's massive unmet infrastructure needs. Phase two will involve work with the state's elected leaders to craft long-term solutions to fix Michigan's infrastructure.

The consequences of failing infrastructure

Examples of failing infrastructure are found in lakes, rivers and drinking water systems across Michigan.

Beach closings

Dozens of Michigan beaches and stretches of rivers are closed to swimming and fishing each summer to protect public health. Many closings are the product of aging and antiquated wastewater and stormwater systems that fail or can't handle capacity.

In 2016, 26 beaches closed due to stormwater runoff or sanitary sewer overflow for a total of 53 days from June through August, according to the Michigan Department of Environmental Quality's 2016 Annual Beach Monitoring Report. This is Michigan's prime summer beach season.

This is happening at some of Michigan's most popular beaches. Last summer, Traverse City officials closed several beaches after a sewer overflow sent more than 3,000 gallons of untreated sewage down a street and into West Grand Traverse Bay.

Flooding

Michigan residents see the consequences of disinvestment when heavy rains overwhelm aging sewer systems and pump houses, flooding communities and closing roads and freeways.

In September 2016 in Metro Detroit, heavy rain combined with outdated infrastructure caused sewage to spill onto roads, flooding and closing major highways and halting traffic across the region. Similar flooding happened in the area this year, too, in August.

This past June (2017), heavy rain across Mid-Michigan caused historic flooding and widespread damage to public infrastructure and private property totaling more than $100 million.

Sewage overflows

Every year, raw or partially-treated sewage spills occur across Michigan.

2.3 billion gallons of sewage overflowed into Lake St. Clair in 2016. That's more than 40 million bathtubs. In April of this year, flooding in Grand Rapids after weeks of heavy rains led to a backup in the treatment system plant, causing 38 million gallons of partially-treated sewage to overflow into the Grand River.

Fixing the problems

Three recent independent studies of Michigan's infrastructure needs agree that fixing the problems will be expensive.

A December 2016 report from the Governor's 21st Century Infrastructure Commission indicates that the state would need to invest $4 billion a year over the next 20 years to meet infrastructure needs.

In January of 2017, a Business Leaders for Michigan study also concluded $4 billion a year in additional investment is needed to fix the state's infrastructure.

In September 2017, the Great Lakes Commission concluded that $271 billion is needed just to upgrade wastewater treatment plants, stormwater pipes, and drinking water filtration systems in the eight Great Lakes states. The commission released its study noting the recent drinking water crises in Flint and Toledo and the billions of gallons of sewage and untreated stormwater released into the Great Lakes because of outdated infrastructure systems.

It's time to fix Michigan's infrastructure to protect our most vital resource — water.

Bringing attention to investments in water infrastructure is uniquely challenging because it is primarily underground and "out of sight, out of mind." By sharing stories from Michigan communities about how infrastructure affects daily life, the Fix MI State campaign is raising the attention, awareness, and understanding of the real impacts of failing infrastructure on people, communities, and Michigan's economy.

These stories help build a connection to the benefits that well-maintained water infrastructure provides for communities in terms of what people value: clean water, recreational opportunities, community development and investment opportunities, and a high quality of life.

To learn more and to stay informed about efforts to fix Michigan's infrastructure, visit www.FixMIState.org.

Preserving a Legacy: Alpena's Besser Museum captures Great Lakes fishing heritage

By: Christine Witulski
Executive Director, Besser Museum of Art, History, and Science

From 1928, when built and launched on the shores of northern Lake Huron until retirement in 1970, the wooden fish tug christened the Katherine V weathered both environmental and economic storms. Her forty-two year career serving a once thriving Great Lakes commercial fishing business holds the story of one of Michigan's oldest industries.

Authors Frank and Nancy Prothero coined the Katherine V as the "Lone Survivor," and claim she is the last remaining example of the large, wooden fish tugs that once plied the waters of Lake Huron.

The Katherine V was donated and brought to the Besser Museum in 2003. Continuous efforts have gone into conserving the vessel and building an educational exhibit about northeast Michigan's fisheries heritage. Progress toward this goal has occurred thanks to the help of dedicated volunteers who share a heritage and passion for the Great Lakes fishery and the Katherine V.

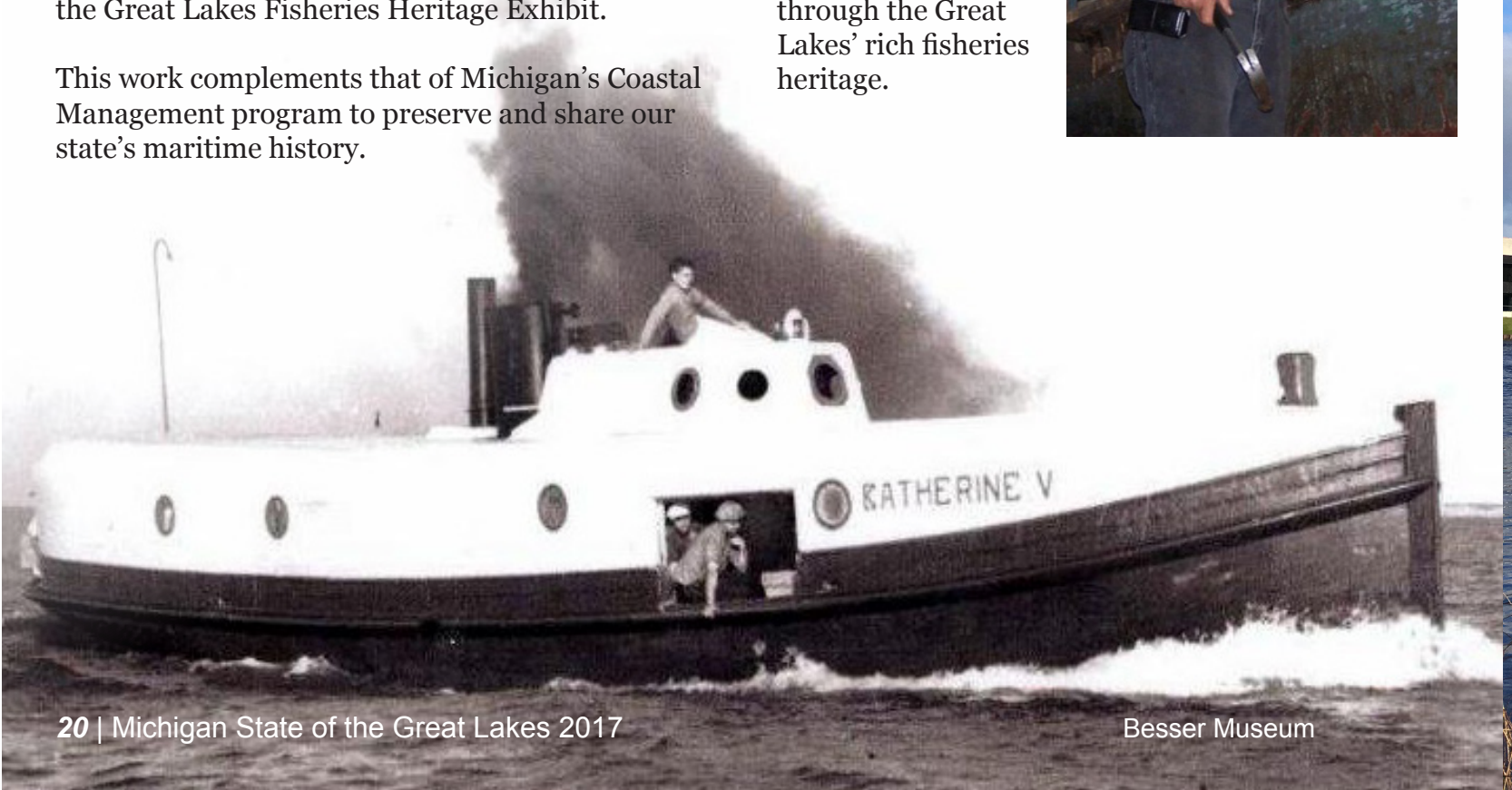
The Besser Museum, a flagship destination on the Michigan Great Lakes Fisheries Heritage Trail, continues to develop and seek funding to complete the Great Lakes Fisheries Heritage Exhibit.

This work complements that of Michigan's Coastal Management program to preserve and share our state's maritime history.

More than 3000 hours of community work restored the fading legacy of the Katherine V.

Much of the project's success is owed to Clarence "Tuffy" Cross. Tuffy is the chair of the Katherine V restoration project and co-chair of the Besser Museum's Great Lakes Fisheries Heritage Exhibit. Tuffy is one of a long line of commercial fishermen and served as the captain of the DNR Chinook Research Vessel.

The recently retired Chinook will join the Katherine V at the Besser Museum, where they will carry people on educational journeys through the Great Lakes' rich fisheries heritage.



Besser Museum

R. Coale, Alpena, MI

Great Lakes Environment

Fisheries Managers Work to Build Lake Huron's Atlantic Salmon Fishery

By: Randall M. Claramunt
MDNR Fisheries Lake Huron Basin Coordinator

One of the most prized game fish in the world, Atlantic salmon, are heralded for their leaping and fighting ability. Although they were once native to Lake Ontario, they were extirpated from the Great Lakes before 1900. Over-exploitation, habitat destruction, and poor water quality were all major factors driving down Atlantic salmon stocks.

Named for their home range in the North Atlantic Ocean, these fish have been transplanted into the upper Great Lakes. As with many salmon species, Atlantic salmon are good indicator species of water quality and healthy lakes and streams.

On the tail of water quality improvements in the lake, along with changes in the predator-prey levels from ecosystem changes, MDNR aimed to capitalize on a unique opportunity to diversify the fishery with Atlantic salmon stocking.

A world-class fishery for Atlantic salmon has developed in the St. Marys River through a long-standing program at the Lake Superior State University Aquatic Research Laboratory (LSSU-ARL). The Michigan Department of Natural Resources has been working with LSSU-ARL to expand that program to other areas of Lake Huron.

Initial stockings of Atlantic salmon have produced exciting results as the fish are starting to show up in good numbers in the fishery. Since 2010, MDNR increased stocking levels from 10,000 to over 100,000 Atlantic salmon per year at three additional locations across Lake Huron.

Atlantic salmon are being caught by boat and shore anglers throughout the year. Anglers have been vital to the evaluation of the program as hundreds of anglers per year report catching Atlantic salmon; their reports help to build an exciting, diverse Lake Huron fishery.

DNR Fisheries, Au Sable River, MI

Celebrating 40 Years

Michigan's Coastal Management Program reflects on 4 decades of work supporting communities in Michigan's 3,000+ miles of coast

By: Ronda Wuycheck, OGL Coastal Program Manager, and Rachel Coale, OGL Outreach Coordinator

The jewel of Michigan is, indisputably, its 3,288 miles of sparkling freshwater coastline– the longest in the world.

Our coast has a long history. It has transformed, much like the corals of an ancient sea formed our state stone, the Petoskey stone. For the last forty years of Michigan's coastal history, small, unobtrusive signs have been appearing as Michigan's coastal communities and natural places undergo their own exciting transformations.

Historic lighthouses, stunning beaches, pristine wetlands, bustling harbors, and serene parks all boast the sign: "Michigan Coastal Management Program."

So, what do they mean?

Michigan's Coastal Management Program was established in 1978, supported, in part, by the National Oceanic and Atmospheric Administration. It is part of a nationwide network of coastal management programs addressing the important resources and unique way of life on America's fresh and saltwater coasts.

For 40 years, staff in Michigan's Coastal Management Program have forged partnerships to protect coastal ecosystems and help coastal communities thrive.

The program offers vital grant funding, provides expert technical assistance, and promotes stewardship of our state's coastal resources.

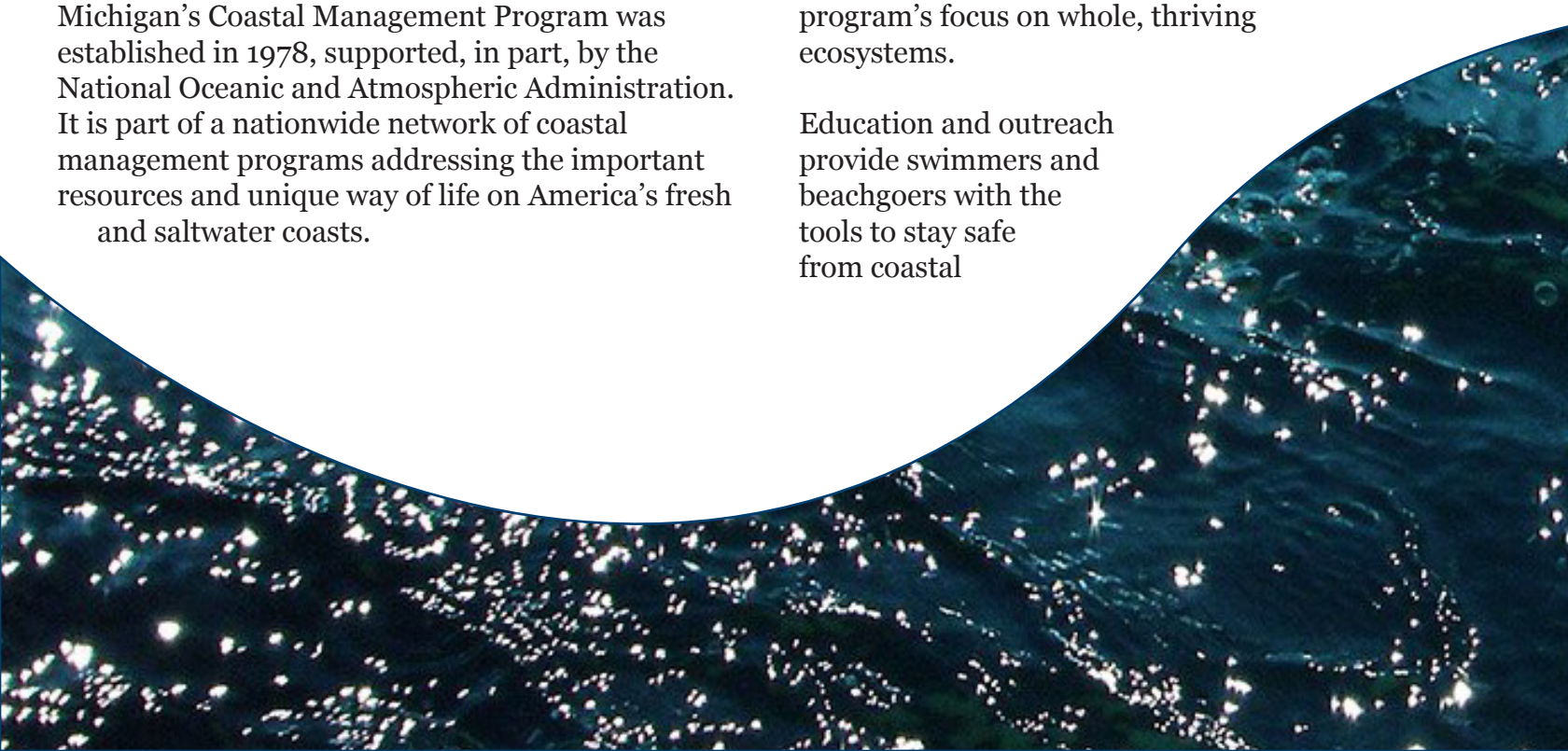
This work has real impact.

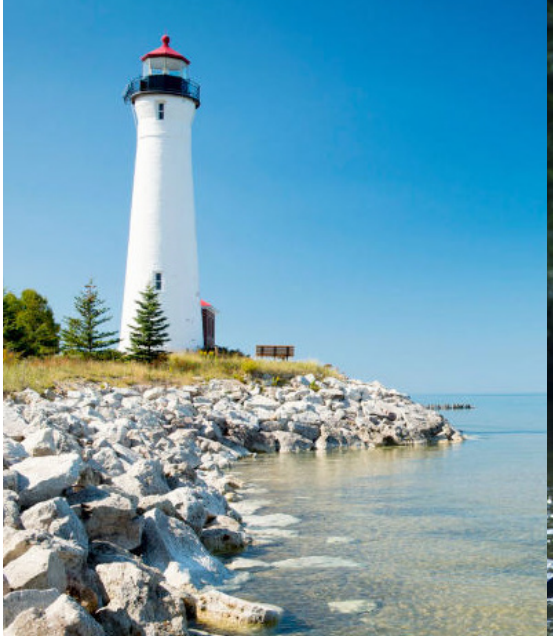
It connects communities to the water through public access to historic sites, beaches, and water trails.

It helps keep the Great Lakes clean by supporting water quality projects and volunteer beach cleanups.

Ecologically unique coastal habitat, home to rare plants and animals, is protected through the program's focus on whole, thriving ecosystems.

Education and outreach provide swimmers and beachgoers with the tools to stay safe from coastal





hazards like rip currents, storms, erosion, and flooding.

Sustainable approaches to community development leverage coastal waters as an asset that needs careful management for the future.

A Coastal Management Program sign means that a local community partnered with the program to invest in its coastal resources and to create something better than there was before.

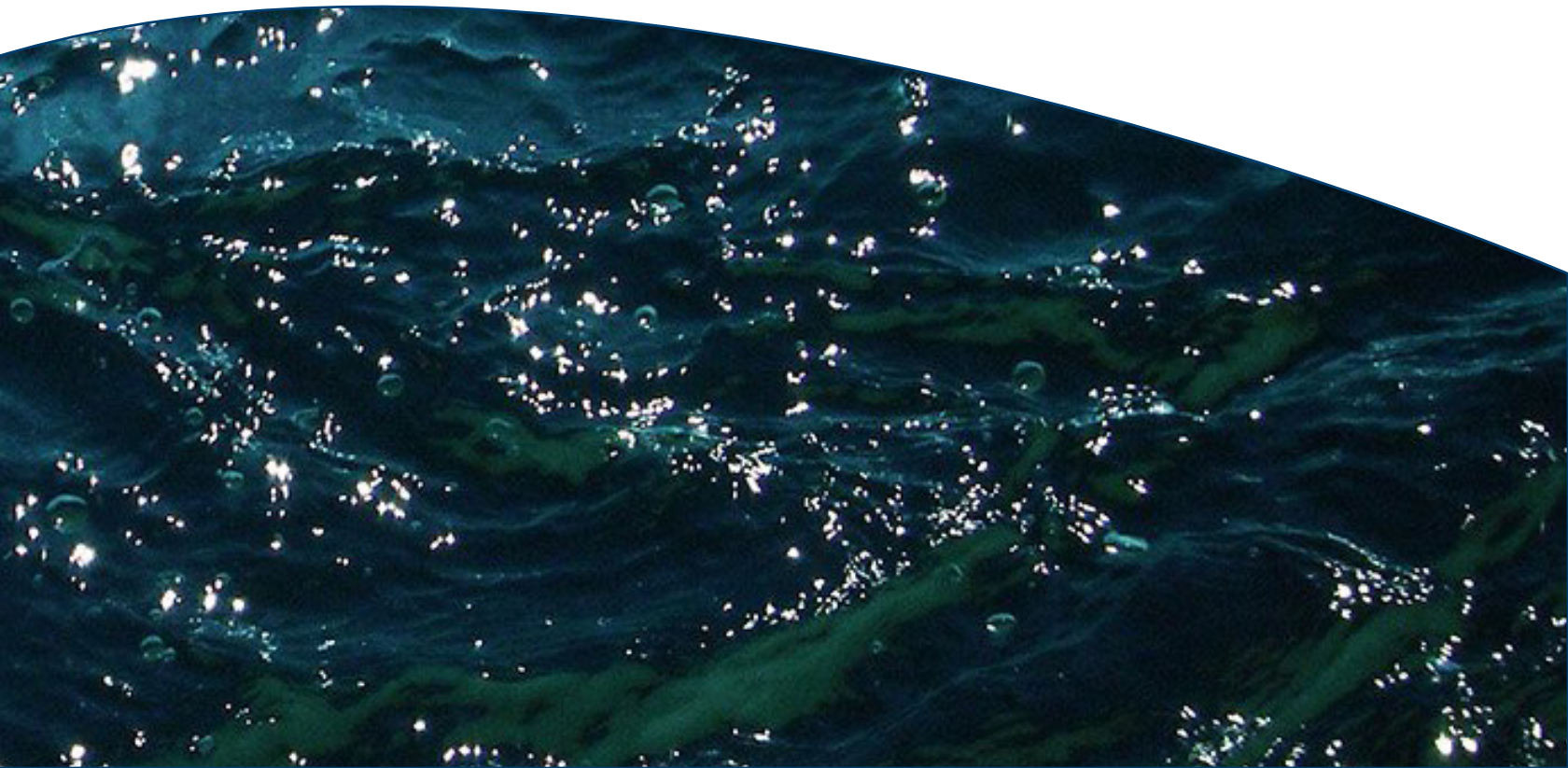
Looking to the future, the program will focus on community resiliency, water stewardship, and the importance of the coast to the Michigan way of life.

Water is central to our future, and the Coastal Management Program will continue to share its mission to protect, restore, and enhance our waters for communities and the environment.

We're calling attention to Michigan's stunning Great Lakes resources and the work of our state's Coastal Management Program by naming 2018 The Year of the Coast. Follow our journey online with:

#YearoftheCoast2018.

Images: MDOT, MDNR, OGL Coastal Program



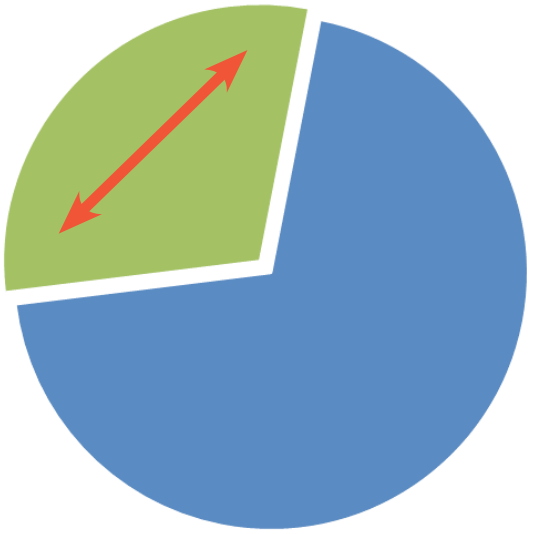
Sanitary Codes in the State of Michigan

By: Kristine Rendon, R.E.H.S.
Environmental Quality Analyst, Onsite Wastewater

Michigan has an estimated 1.3 million onsite wastewater treatment systems, known as septic systems. That's about a third of all homes and businesses. Looking forward, roughly 50% of new homes built in Michigan are expected to use individual or small community septic systems.

Properly working septic systems safely disperse waste into the environment; failing or leaking systems threaten environmental and public health with the potential to contaminate drinking water systems with harmful bacteria.

Although Michigan is served by a high percentage of septic systems, **the State of Michigan is unique from the rest of the United States in that we do not have a uniform statewide sanitary code** for residential and small commercial systems.



A third of homes in Michigan utilize septic systems, and that number is predicted to grow larger with trends in home building.

Michigan's 44 local and district health departments are responsible for local public health administration and governance in cooperation with rules set by federal, state, and local governments[1]. Instead of implementing a uniform standard, the job of creating septic regulations falls with these health departments. However, there is no mandate requiring them to update or approve those regulations. This has resulted in a hodgepodge of rules that often do not include any requirements for system operation and maintenance after installation.

Eleven counties and five townships in Michigan have taken the steps to establish Point-of-Sale Regulations for septic systems. These places have rules that require inspection of the septic system when a home or small business is sold. The counties that implemented these regulations have reported about 10-23% of onsite wastewater systems are found to be failing or in need of corrective action at the time of sale inspection.

Since not all local health departments have these Point-of-Sale Regulations requiring system inspection at the time sale, many systems, potentially in failure status, are allowing untreated sewage to contaminate groundwater or surface water through illicit connections or seepage.

These wastewater failures could go unidentified across the state, potentially impacting surface and groundwater that people use for swimming, drinking, bathing, and fishing.

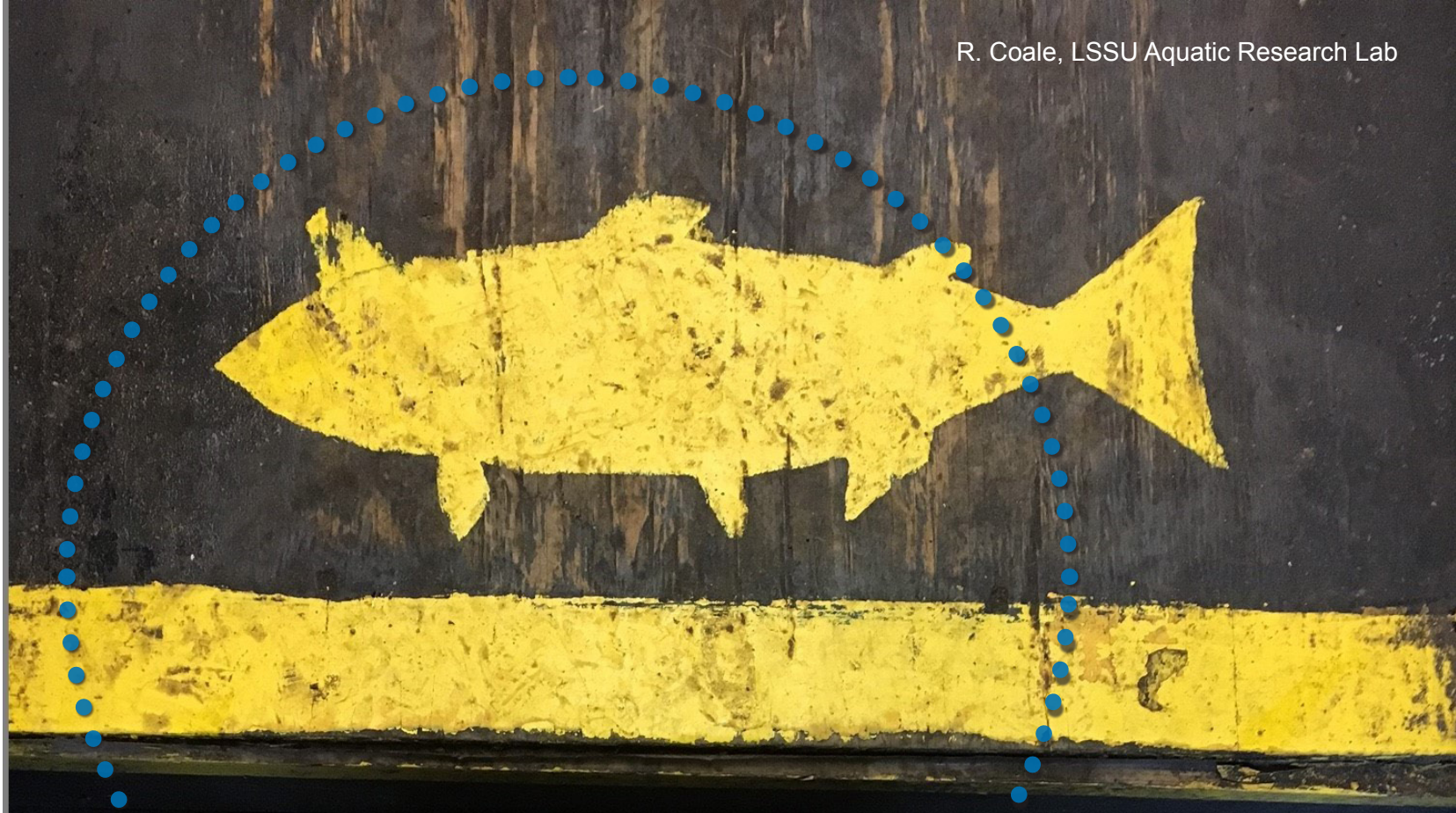
The Michigan Water Strategy[2], created by state agencies[3] with input from the public, universities, business leaders, and tribal governments, calls for Michigan to "Ensure Clean and Safe Water." A specific recommendation, with the knowledge that a significant percentage of our state's septic systems are potentially failing, is to establish a uniform statewide sanitary code. A statewide septic code would protect public and environmental health by supporting local health departments in keeping our waters safe with a single, uniform standard.

This year, Governor Snyder proclaimed the week of September 18-22 "Septic Smart Week," promoting the link between responsible system maintenance and healthy water resources. Department of Environmental Quality staff have begun the process of meeting with stakeholders to discuss and draft statewide sanitary code legislation.

Michigan's waters are a vast, interconnected system. It is important to pursue smart water management including sensible, uniform standards to ensure clean, safe, and healthy waters for communities and the environment.

Footnotes:

1. Through the Michigan Public Health Code, Public Act 368 of 1978.
2. www.michigan.gov/waterstrategy
3. Including the Michigan Office of the Great Lakes, Michigan Economic Development Corporation, and Departments of Natural Resources, Environmental Quality, Transportation, and Agriculture & Rural Development.



R. Coale, LSSU Aquatic Research Lab

Great Lakes Economy

Do Autonomous Vessels Have a Future in the Great Lakes?

AUV Technology Presents Opportunities to Accelerate Science & Commerce

By: Guy Meadows, Michigan Technological University
Michael Beaulac, Michigan Office of the Great Lakes

It's almost impossible to go a day without hearing about the latest developments in autonomous technology. Airborne and autonomous drones have been in the news for years, especially due to military applications. They are now commodities that anyone can purchase, and it seems as if most of us know someone with the latest camera-equipped quadcopter.

With Detroit, the Motor City, in our backyard, many of us in the Great Lakes region see autonomous vehicles as the obvious next phase in the overland transportation sector. In Ypsilanti, the American Center for Mobility is moving ahead with development of a technology park adjacent to automated vehicle proving grounds. Next steps require technological innovation including sensors, collision avoidance, "deep learning," cyber security, and the development of standards as ongoing initiatives. Pedestrian and driver safety are key issues.

What's not well publicized at present is autonomy in the maritime environment. Driven by competitiveness, safety, and sustainability challenges, tomorrow's autonomous ships will include next-generation control systems and communications technology that will enable wireless monitoring and control. Industry experts agree that various sensor systems will be needed to detect unexpected objects in the sea and respond to dangerous weather conditions to prevent accidents.

Some countries, such as Norway, are moving ahead with commercial applications. The vessel YARA Birkeland will be the world's first fully electric, zero emission autonomous container ship. The ship will sail within 12 nautical miles of the coast. Loading and unloading will be done automatically, linked to the Norwegian Coastal Administrations' vessel traffic service. Three centers will handle all aspects of operation including emergency and exception handling, condition monitoring, operational monitoring, decision support, surveillance of the autonomous ship and its surroundings, and all other aspects of safety. The late 2018 launch of the vessel will include a year of testing with a full crew and remote with autonomous testing expected in 2020.

In contrast, we don't expect commercial autonomous shipping in the Great Lakes any time soon. Federal Coast Guard regulations, liability, insurance, and existing port infrastructure are significant impediments. However, the Great Lakes region is making significant use of small (<10 meters) research and survey-grade autonomous vessels for scientific research purposes.

If properly executed, autonomous vessels could reduce the need for human resources and improve performance and safety.

Scientists in the upper Great Lakes, and Lake Superior in particular, currently lack the capabilities for real-time science observations during early- and late-winter periods, a large and critical portion of the annual thermal cycle.

The onset of harsh, hurricane-like conditions in the late fall ("Gales of November"), ultimately leading to ice development and break-up precludes conventional scientific observations, normally conducted using manned expeditions by boat. These research and survey activities can now be enabled by deploying autonomous vessels to fulfill unmet science needs along the often harsh, ice-bound coasts of the Great Lakes.

The upper Great Lakes represent an ideal scientific and operational proving ground for autonomous vessel integration into Great Lakes and ocean science. Our geographic area provides an environment characterized by a low volume of marine traffic and often harsh, "arctic-like" conditions. Only one National Science Foundation research vessel currently supports all of the Great Lakes, which like most conventional Great Lakes vessels, is "laid up" for safety reasons in these critical cold weather times of the year.

To help solve these needs, Michigan Technological University collaborated with the Michigan Office of the Great Lakes to officially launch the regional Smart Ships Coalition this past summer.

The recent technological advances in the automotive industry's autonomous vehicles and Michigan's American Center for Mobility provide an incentive to facilitate the exchange of ideas and sharing of technical developments. Additional ties to the European-based International Network of Autonomous Ships will also add value.

As scientists, policy makers, resource managers, innovators, and navigators, Smart Ships Coalition members seek to change the state of autonomous technologies and operations in marine applications.

With proper testing and execution, autonomous vessel technology has the potential to change the face of Great Lakes science and maritime industry, opening new avenues for research, discovery, and progress.

Images: Artistic renderings of potential aquatic autonomous vessel uses. *ASV Global.*

Environment, Economics, and Michigan's Waters

By: Christina Pastoria
Economic Analyst, Michigan Office of the Great Lakes

It's safe to say that most people in Michigan understand that our water resources are valuable. This value is expressed in a variety of ways. Lakes and rivers conjure images of incredible natural beauty and summon visceral memories of family and community for the people of this state. They also support Michigan's top industries including shipping, agriculture, technology, manufacturing, recreation, and tourism. The Great Lakes represent a $3 trillion economic powerhouse for the region.

Often, there is unnecessary tension between the cultural, environmental, and economic values of water. It is important to recognize the social, community, and ecological benefits we derive from our natural landscapes; it is also important to recognize economic value as an important piece of a healthy system.

Clean and healthy waters can be a massive driver of economic development and quality of life.

People want to live, work, and play in places that are vibrant and beautiful. In many cases, we can see that commitment to maintaining a clean environment that people enjoy is not a barrier, but a driver of local economies.

Consider, for example, the value of recreation activities. Economic data collected through a large-scale community engagement process by the Huron River Watershed Council indicates that the recreational amenities of the river draw more than $29 million in direct spending to the region annually. Local businesses benefit from the increased patronage, which leads to higher local employment. Another example can be found in a 2015 study of the effects of changes in water quality on Lake Erie beachfront property. The study found that improving water clarity increased individual housing values by $21.54/centimeter.

Aggregated, this led to benefits of $221-$2,379 per beach. This increased value represents more than just an economic gain; it also shows how environmental restoration can turn a region into a more desirable place to live.

On a broader scale, the National Oceanic and Atmospheric Administration's coastal accounting program estimates that Michigan's maritime economy accounts for 59,000 jobs and $2.5 billion in revenue each year. Sectors range from marine transportation and construction to recreation and tourism. This thriving economy depends on the quality of the state's water resources. Protecting, restoring, and enhancing these resources can open new opportunities for growth and preserve those that already exist.

In fact, a 2007 Brookings Institute report estimated that full implementation of the Great Lakes Regional Collaboration Strategy, a multi-state effort that generated a comprehensive plan to restore the Great Lakes ecosystem, would generate $80-$100 billion in benefits. These benefits would derive from wide variety of sectors, including augmentation of commercial fishing, recreation, tourism and property values, as well as avoidance of pollution and flood related damages. Furthermore, these gains are inherently place-based. Investing in our natural resources produces real economic returns, and these returns accrue to the individuals and areas that made the investment.

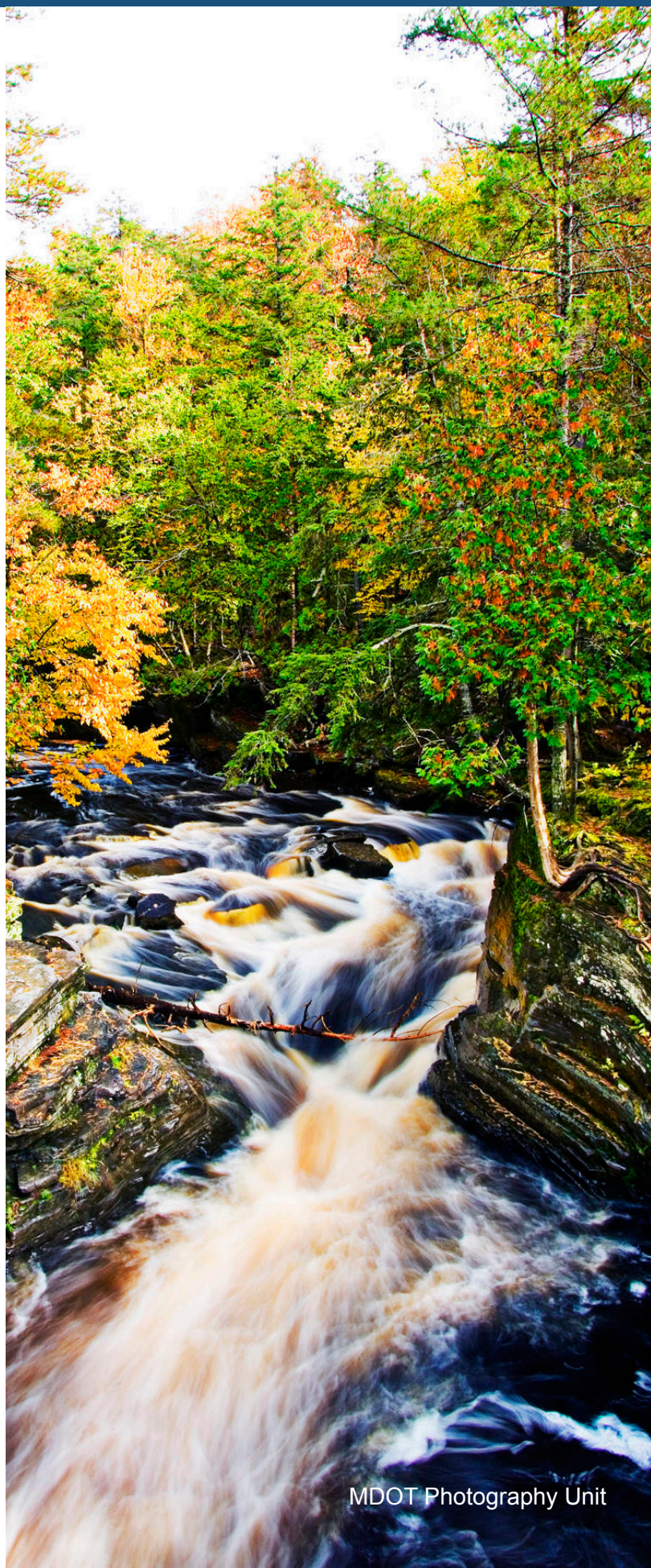
This kind of upward momentum can set off a chain reaction; people flow into the region, drawn by its vibrant waterfronts, and soon a connection between person and place begins to grow. The influx of people creates demand, which launches new business and creates new jobs.

Increasing economic opportunity encourages the people already enchanted by the region's stunning water resources to make their homes there, and the area develops a self-propagating pull that attracts both young and old.

Michigan's water-based economy already supports and sustains thousands of residents, but it is still full of untapped potential. The state enjoys a booming tourism industry and facilitates 7.6% of U.S. trade with Canada (revenue from transporting and processing goods amounts to $71.8 billion for the country each year). Studies suggest that further investments in coastal wetlands and dunes could attract thousands more tourists.

Michigan is a hub of manufacturing and shipping expertise, and new technological skills could sustainably enhance this industry. Its water-rich location could also make Michigan a hub for innovative water technology.

The lakes and rivers that make Michigan great are also part of a vibrant economy. As Michigan looks ahead to a new economic climate and changing global economy, the Great Lakes represent an opportunity to grow by looking to our roots. Michigan's future is still blue.


MDOT Photography Unit

Blue Business: Michigan Companies are Making Strides in Water Sustainability

By: Madeleine Gorman
Student Assistant, Michigan Office of the Great Lakes

Michigan-based companies are showing increasing interest in sustainable business models and incorporating stewardship into everyday decision making. Water using industries have always been attracted to the Great Lakes region for its plentiful surface and groundwater resources so readily available, but now they are beginning to recognize the long term benefits of investing in sustainable water management practices.

Michigan businesses in a variety of industries are showing leadership in creating innovative and mutually beneficial sustainable water management plans. Below are several examples of resourceful companies in major water-using industries and how they are addressing water quality and quantity:

Ford Motor Company

As a part of the UN Global Compact CEO Water Mandate, Ford Motor Company and 140 other global companies have pledged to a corporate water strategy that includes six areas; direct operations, supply chain and watershed management, collective action, public policy, community engagement, and transparency. Between 2000 and 2016, they have reduced 62% of water used for every vehicle produced. Ford also offers a voluntary sustainability program for its suppliers; Partnership for A Cleaner Environment or PACE program is projected to save approximately 550 million gallons of water in the next five years.[1]

Bell's Brewing, Inc.

Many brewing companies are also becoming conscious of their impacts on water resources. Bell's Brewing, Inc. sees sustainability and sustainable practices as "the capacity for our business to thrive in future generations through the practices of environmental stewardship, economic robustness and social integrity." Bell's has adopted several water efficient practices that include water use monitoring through meters and a cellar CIP, or Clean in Place system, which reduces the amount of water used to clean brew tanks by approximately 60%.[2]

Consumers Energy

As a large company in the largest water using sector in Michigan, the actions of Consumers Energy have the potential to make a large impact on Michigan's water resources.[3] Consumers has begun investing in renewable and sustainable energy methods that require much less water to produce a unit of energy compared to coal-fired generation units.[4] Their annual sustainability reports increase the transparency of their operations and sustainability efforts, setting up an accountability system to continue its promised conservation and efficiency goals. Consumers met its 17% water use reduction goal a year early (in 2016) and aims to reduce its water use by another 20% by 2018, a full two years before original projections.[5]

MSU Extension

A Michigan State University Extension program is promoting sustainability by providing technical assistance to farmers with new agricultural technologies, farming practices, and water management plans across Michigan. Because the need for water varies greatly based on the need of the crop, MSU Extension focuses on the needs of individual crops and overall water management practices for farming operations. Informational videos and documents are provided on their website, http://msue.anr.msu.edu/, on required technologies and practices such as a "how to" video that instructs farmers how to use the Water Withdrawal Assessment Tool, which is required by the state for all large quantity water withdrawals over 10,000 gallons per day from the same well. There are also subscriptions available for farmers to receive regular weather and climate predictions to support farmers in making smart, sustainable water-use decisions.[6]

Footnotes:

1. https://corporate.ford.com/microsites/sustainability-report-2016-17/operations/water.html
2. https://www.bellsbeer.com/sustainability
3. "Water Use Statistics." MDEQ, 2017, doi:http://www.michigan.gov/documents/deq/Water_Use_Statistics_557539_7.pdf.
4. "Water & Energy Efficiency by Sectors: Thermoelectric Power." U.S. EPA, www3.epa.gov/region9/waterinfrastructure/thermoelectric.html.
5. "Consumers Energy 2017 Sustainability Report."
6. http://msue.anr.msu.edu/

Great Lakes Culture

Weston Hillier,
St. Clair River

Anishinabe Perspectives on Water and the Great Lakes

By: Ben (Kingfisher) Hinmon
Cultural representative, Elijah Elk Cultural Center, Seventh Generation Program

To the Anishinabe, the Great Lakes represent the wellspring of all life, the life-giving blood of Aki (Mother Earth). Handed down among our people is the teaching of the great migration to "the land where food grows on the water," as it was foretold by Winaboozho, a teacher and prophet.

The land, we were told, would be recognizable because like the great turtle it is surrounded by water and suitable for a new beginning of our people.

Because we share a symbiotic relationship with the land and the all of creation, our relationship to Aki was that of a child to his mother. No better words express this connection than those of Chief Sealth (Seattle), Dwamish in 1854 when he was addressing President Franklin Pierce who sought to settle his people on a reservation:

> *"When the last red man has vanished from the face of the earth, and his memory is only the shadow of a cloud moving across the prairie, these shores and forest will still hold the spirits of my people. For they love this earth as a newborn loves its mother's heartbeat.*

When our people look at the forest we do not see the value of its resources, we recognize the wonderful gift that Creator bestowed upon us and our responsibility to protect and care for it. When we look at the water we do not see the value of the land adjacent to it, we see its natural beauty and its life-giving properties.

Our women are charged with its care and make offerings and prayers on behalf of the people, they are its caretakers. Just as water is life-giving, women too are gifted with the ability to give life, and so they have accepted the responsibility to be caretakers.

It has long been our responsibility as stewards of the land to do all that we can to protect Aki; today we are faced with constant debates over wildlife protection, and more importantly protection of the water and all life it represents.

There are so few natural beds left of Mahnomin (wild rice) the food that grows on the water, that those remaining beds have become an ongoing struggle to preserve and protect. Mahnomin feeds so many of our relatives, the birds, the four-legged, and all aquatic wildlife of the Great Lakes.

It is this sacred balance between man and nature that must be maintained and understood to keep Aki healthy, if not for our sake then for our children and theirs.

We do not inherit the earth from our parents; we borrow it from our children.

Lacey Mandoka, 7th Gen. Program


LSSU ARL

Lake Superior State University

Strengthening outreach and science in the heart of the upper Great Lakes

By: Ashley Moerke, Professor of Biology and Co-director of the Aquatic Research Laboratory
Kevin Kapuscinski, Assistant Professor of Biology and Co-director of the Aquatic Research Laboratory

Lake Superior State University (LSSU), a small public university nestled in the eastern Upper Peninsula of Michigan and the heart of the upper Great Lakes, possesses a unique facility—the Aquatic Research Laboratory (ARL)—which has been training undergraduate students in fisheries and aquatic science for over three decades. The ARL is located directly on the St. Marys River, an international border, within an hour's drive of three Great Lakes.

The ARL has enabled undergraduate students to work alongside faculty to conduct research in collaboration with other universities and state, tribal, and federal agencies across the US and Canada. In addition, the ARL enhances courses taken by students majoring in areas such as Fisheries and Wildlife Management, Conservation Biology, and Environmental Science. The ARL also houses a student-run Atlantic Salmon hatchery, which is one of a handful of such facilities used to train undergraduate students. The hatchery operates in collaboration with the Michigan Department of Natural Resources. It has created a world-class recreational fishery in the St. Marys River and nurtured successful placement of professionals in natural resource agencies; over two-thirds of staff in Michigan's hatchery system are LSSU alumni.
In 2016, LSSU was awarded state capital outlay funding to assist with a $12-million project to create a new Center for Freshwater Research and Education (Freshwater Center). This project will relocate and expand LSSU's ARL to a new facility. The Freshwater Center will be situated in the heart of the upper Great Lakes, an ideal location to be a key player in Great Lakes education and research, attracting students and visiting scientists to the region. Upon completion, Freshwater Center will provide vast opportunities for interdisciplinary research and training to solve and effectively manage complex ecological problems in the upper Great Lakes (e.g., invasive species, fish disease outbreaks, aquaculture, water quality concerns.)

The Freshwater Center will house state-of-the-art classrooms and innovative laboratories, including a fish disease testing facility, molecular laboratories, experimental mesocosms, and an aquaculture training facility. The Freshwater Center will promote Great Lakes literacy, community engagement, and stewardship through a Great Lakes Visitor Center open to the public, and a Discovery Center that will provide a hands-on classroom for Great Lakes-based education to regional K-12 teachers and students. Groundbreaking for the Freshwater Center is expected in late 2018.

Getting the Facts

Sources of Great Lakes Information

By: Beth Wanamaker, Communications Manager at the Great Lakes Commission

Hundreds of different organizations in the United States and Canada produce information about the Great Lakes. From educational materials to news articles to scientific studies, the sheer amount of information on the world's largest surface freshwater system can be confusing to navigate.

Bringing all of this information together in one place online was the Great Lakes Commission's (www.glc.org) goal in creating the Great Lakes Information Network (GLIN), which came online in 1994 – three years before Google.com was even registered as a domain name! In the years following its launch, GLIN became a trusted and reliable source of information for those who live, work, or have an interest in the Great Lakes.

Changing technology and easier access to information online has made some of GLIN's original functions obsolete, but its legacy lives on in three services: the GLIN-Announce email group, Great Lakes Daily News and the Great Lakes Calendar. GLIN-Announce allows subscribers to share news releases, announcements, and more. Great Lakes Daily News is a daily email digest of Great Lakes news articles. The Great Lakes Calendar shares upcoming events from across the basin.

Subscribing to GLIN-Announce, Great Lakes Daily News, and the Great Lakes Regional Calendar provides up-to-date information on Great Lakes issues; however, there are other places to find trusted Great Lakes information.

A critical source is the International Association for Great Lakes Research (IAGLR), which publishes the Journal of Great Lakes Research and holds an annual Conference on Great Lakes Research. Both the journal and the conference allow scientists, researchers, and managers to share peer-reviewed data and other information.

Starting in 2017, IAGLR will also host rotating conferences on issues relevant to each Great Lake. The series is beginning with Lake Michigan in 2017, and will continue with a State of Lake Superior Conference in 2018.

Great Lakes Today, Great Lakes Now, and Great Lakes Echo are media outlets focused on reporting Great Lakes news. They're also active on social media, especially Twitter, where readers can find other news outlets, activists, scientists, and decision-makers sharing information under the hashtag #GreatLakes.

The Healing Our Waters-Great Lakes Coalition hosts the annual Great Lakes Restoration Conference in the fall and co-hosts Great Lakes Day events in Washington, D.C. in the spring, alongside the Great Lakes Commission and the Northeast-Midwest Institute. At Great Lakes Day events, attendees are briefed on critical issues facing the Great Lakes, attend training sessions to become more effective advocates, and lobby members of Congress to support the Great Lakes.

Providing perspective from the Great Lakes State, the Michigan Office of the Great Lakes has produced an annual State of the Great Lakes Report since its inception in 1985, reporting on a variety of topics affecting Michigan's water resources.

Finally, there is a new basin-wide effort underway to provide cutting-edge information services about the Great Lakes never before available in one place. Blue Accounting is an initiative developed following a call by the Great Lakes governors and premiers for better management of Great Lakes resources, and will provide a better, more complete understanding of how the Great Lakes and St. Lawrence River are doing for both policymakers and the public. Follow www.BlueAccounting.org and @blueaccounting on Twitter to learn more about this exciting initiative.


WATER
Exploring the Blue Planet
MARKUS EISL
GERALD MANSBERGER
PAUL SCHREILECHNER
WATER IN PLAIN SIGHT
HOPE FOR A THIRSTY WORLD
JUDITH D. SCHWARTZ
THE DEATH AND LIFE OF THE GREAT LAKES
DAN EGAN
FINALIST FOR THE PULITZER PRIZE
Water 4.0
The Past, Present, and Future of the World's Most Vital Resource
David Sedlak
The Once and Future Ocean
NOTES TOWARD A NEW HYDRAULIC SOCIETY
BY PETER NEILL
WHERE THE WATER GOES
LIFE AND DEATH ALONG THE COLORADO RIVER
DAVID OWEN
THE FOURTH PHASE OF WATER
BEYOND SOLID
LIQUID
VAPOR
ISRAEL'S SOLUTION FOR A WATER-STARVED WORLD
LET THERE BE WATER
SETH M. SIEGEL
WATER WARS
PRIVATIZATION, POLLUTION, AND PRO
VANDANA SHIVA
HOW TO READ WATER
Clues and Patterns from Puddles to the Sea
TRISTAN GOOLEY
THIRST FOR POWER
Energy, Water, and Human Survival

Trust in Trails

By: Bob Wilson
Executive Director, Michigan Trails and Greenways Alliance

Michigan's current state flag adopted in 1911 contains three Latin mottos:

"E Pluribus Unum" (Out of many, one),
"Tuebor," ("I will defend") and
"Si Quæris Peninsulam Amœnam Circumspice,"
("If you seek a pleasant peninsula, look about you.")

Taken together, they embrace an enduring commitment to preserve and celebrate the natural grandeur of the state, its history, and its people. Michigan is home to globally-unique natural resources including freshwater dune systems, scenic trails, and the unparalleled Great Lakes. The state has a responsibility to protect those resources and support public health through access to the resources. This responsibility is embedded in our Constitution.

In 1962, Constitutional Convention Delegates gathered in Lansing. The delegates specifically recognized that it was the legislature's duty to protect the public health, welfare, and natural resource base for the benefit of the people of the state. The result was the eventual adoption of Article IV, sections 51 and 52 of the Michigan Constitution of 1963:

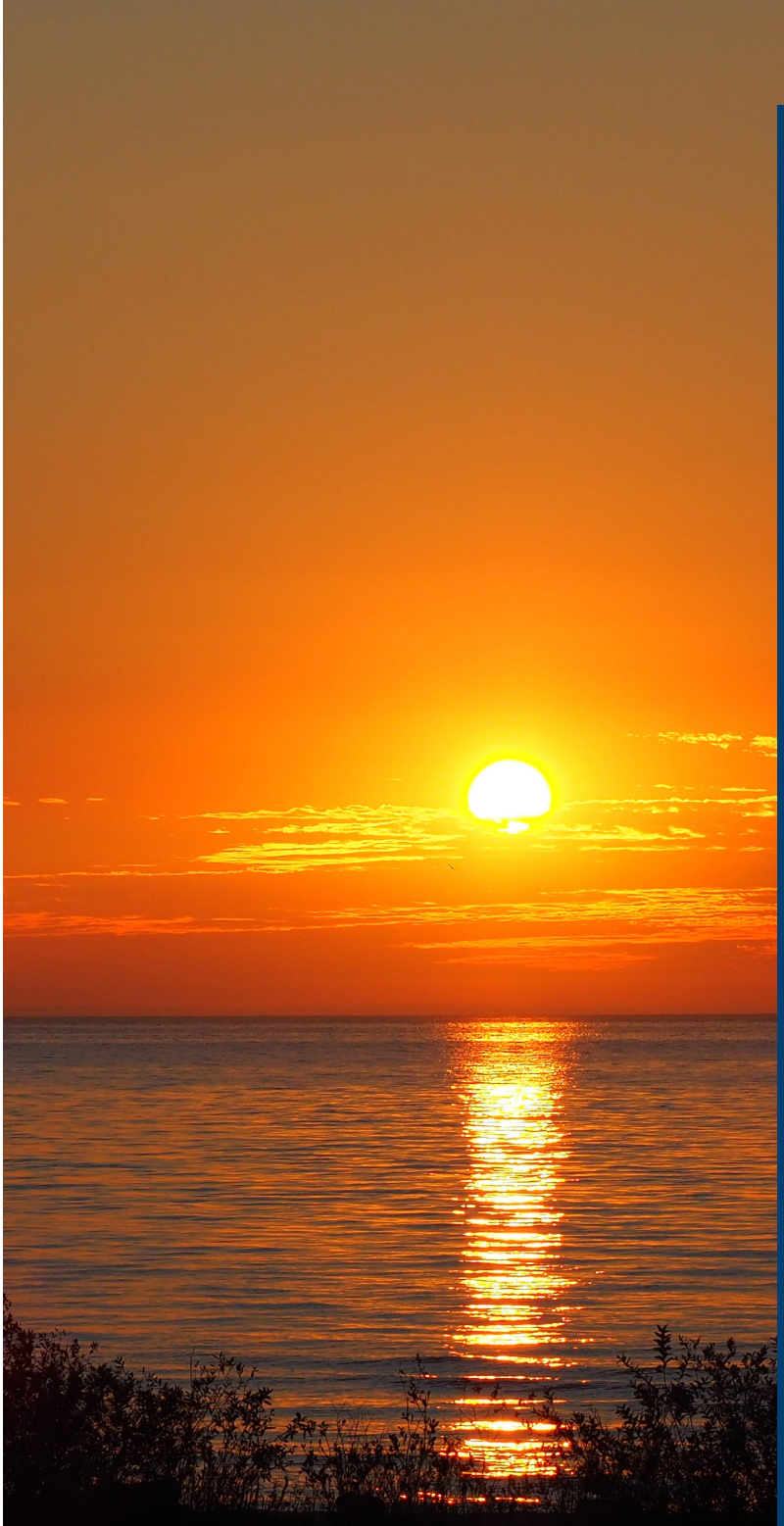
> ***"The public health and general welfare of the people of the state are hereby declared to be matters of primary public concern. The legislature shall pass suitable laws for the protection and promotion of the public health."***

> ***"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."***

Both provisions contain language consistent with the Public Trust Doctrine, first developed as a Roman Code to protect access to navigable waters and later developed in both English and Colonial law. Common law in the United States has consistently maintained that the Public Trust Doctrine exists to protect the public's long-term access to a healthy and sustainable resource base. The responsibility to protect access rests with the government and has been applied to surface water, bottomlands, scenic lands, and historical resources.

There is a role for everyone to play as we increase access to public trust resources. Land and water trail systems offer a diversity of outdoor experiences that are catalysts for improved recreational opportunities, healthy lifestyles, and local prosperity. Building and maintaining trails for public health, greenways, and open space, and preserving our sense of place, history, and culture are all benefits of this multi-faceted effort. Community support is an essential element to the success of these initiatives.

It is important to maintain the special place that we call Michigan. By creating more diverse opportunities for experiencing natural resources, we increase community connection and a sense of sterwardship. We can all take part in protecting the future of nature and recreation by supporting access, through land and water trails, to the spectacular public trust resources that define our state and the citizens who call it home.



Many thanks to the experts, contributors, partners, and editors who contributed their time and effort to this 2017 State of the Great Lakes Report. The stories within reflect the diverse voices of our state and express a shared love for Michigan's Great Lakes water resources.

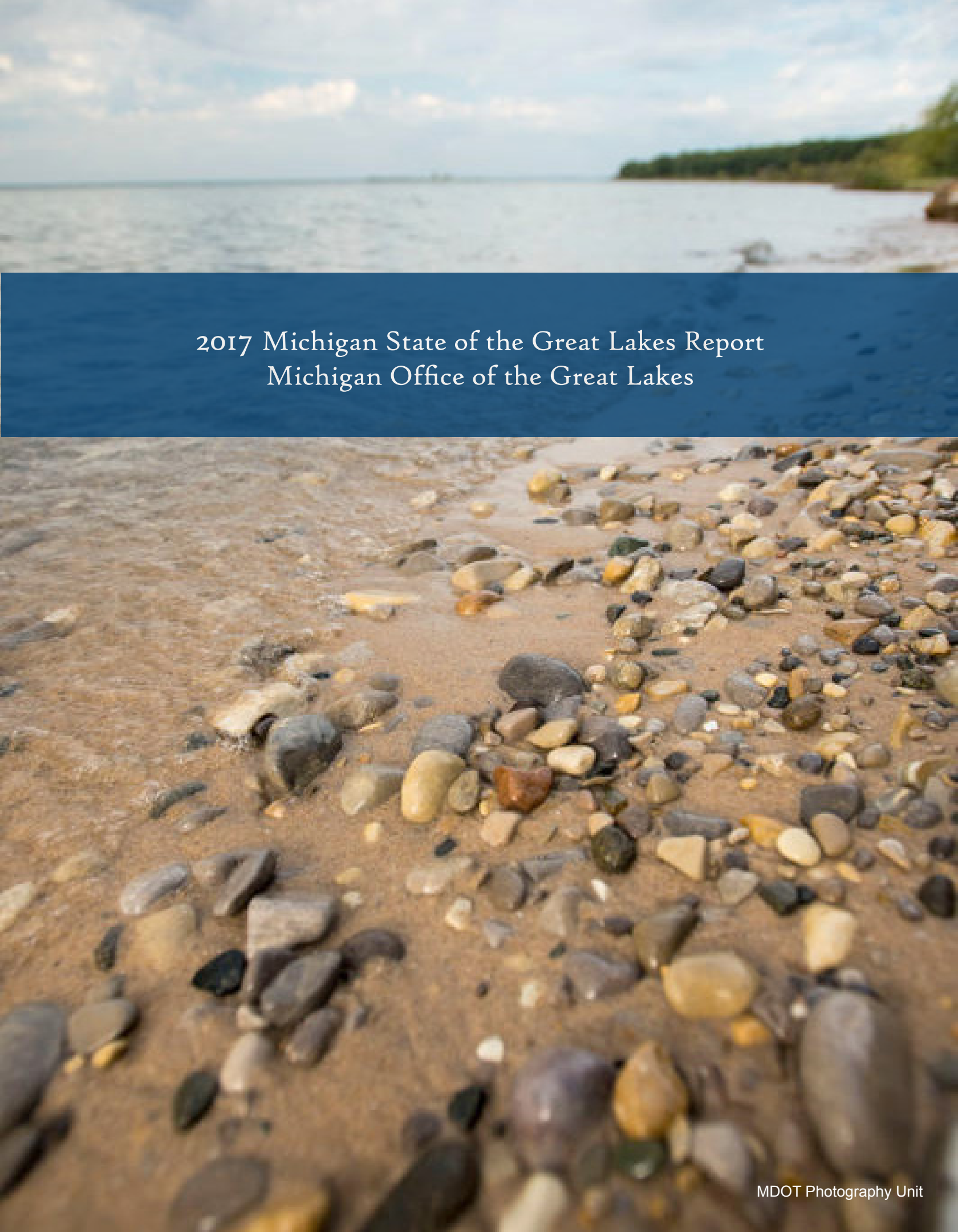
This report is available digitally at the Michigan Office of the Great Lakes webpage, www.michigan.gov/deqogl.

Rick Snyder, Governor
Jon W. Allan, Director, OGL

Design and editing by Rachel Coale for the Michigan Office of the Great Lakes.

Michigan Office of the Great Lakes
www.michigan.gov/deqogl
517-284-5035

2017 Michigan State of the Great Lakes Report
Michigan Office of the Great Lakes



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