



# Michigan **BLUE ECONOMY**

Making Michigan the World's Freshwater &

Freshwater Innovation Capital

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# Water Past - Water Future

## Water surrounds and cradles us.

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Water opened the region to trade. Water powered the rise of our mighty industry. Water defines our Pure Michigan culture and lifestyle. Water innovation positions us for leadership in the coming Blue Economy.

Michigan is the Great Lakes state. Surrounded by four of the five Great Lakes, 3,400 miles of our 10,000 miles of Great Lakes coastline, cradled by 20 percent of world's surface freshwater. Dotted with 11,000 inland lakes, riven with thousands of miles of rivers, streams and wetlands. A traveler can't go more than six miles in Michigan without meeting water. Water opened the region to trade. Water powered the rise of our mighty industrial economy. Water defines our Pure Michigan culture and lifestyle. Water positions us for leadership in the emerging and sustainable water-innovation economy of the future.

"The simple truth is that Michigan has always been and will always be a 'quality of life' state... the quality of human life in Michigan depends on nature. The natural beauty of Michigan is much more than a source of pleasure and recreation. It shapes our values, molds our attitudes, feeds our spirits." –**Michigan Governor William Milliken**

At the center of this quality of life and culture is our freshwater. Michigan citizens consistently identify the Great Lakes, our waters and outdoors as Michigan's defining feature. The state's Pure Michigan advertising campaign stirs our emotions because the images of our glorious Great Lakes and life on these splendid peninsulas speak to who we are, and how we live — enjoying the outdoors with our family, escaping to that special lake cottage or trout stream, living the Michigan Dream.

An equal measure of the Michigan Dream is our identification with hard work, the value we place on education at great colleges and universities, and our pride in our industry and history of innovations that created good jobs and economic opportunity for generations.

Our water and other natural resources propelled our economy. Industries and communities rose because of our water and water locations: first to transport our food and goods by ship and barge to hungry markets. Then by exploiting our water and other natural resource assets, placing the mills and great factories along our rivers and lakefronts, churning out the paper, chemicals, cars, and steel, while at the same time fouling and compromising for years much of that very same water.

Today, we are cleaning and reconnecting to our waterways, and looking toward a new round of innovation and economic opportunity, not from the dirty factories of yesteryear, but in the emerging clean, healthy and sustainable “Blue and Green economy” of the future – as pioneers in clean energy, smart water use, new food and mobility systems.

The late Ned Gramlich, University of Michigan Provost and Federal Reserve Board Governor, was once asked to sum up the economic opportunities for Michigan and the Great Lakes looking forward. He put it simply:

“The opportunity for the Great Lakes States to thrive economically, as a center of innovation, and as an environmentally sustainable, clean-green playground for our nation’s people to live and work is unrivaled.”

Michigan can be that unrivaled playground if the water is clean and our communities reconnect to it. It’s our “blue” alongside our “green.” And innovation in water makes us *the* world center of education, research, invention and new “smart water” technologies and business development, the World’s Freshwater and Freshwater Innovation Capital. It can propel a new era of economic growth and job creation.



## WATER PAST

### Splendor and “delightful prospects”

Water defines us. Michigan’s story is a history of water exploration, innovation, use and enjoyment. For 10,000 years, tens of thousands of native peoples called the Lakes and Michigan home. They lived, traveled and traded along its waterways, in scattered villages, growing what food they needed for themselves and to trade, bountiful fish providing plenty to eat. These tribes lived in respect and awe of these inland seas they called: “Gichigami,” the Ojibwe word for “big water”; “Erielhonan,” Iroquoian for “long tail”; “Mishigami,” Ojibwe for “large lake.”

The first Europeans were awed too. While searching for the Northwest Passage, they met native peoples to the east and heard of lakes hundreds of miles in size. So awesome was the scope of these inland seas, it's not surprising that the earliest explorers like Samuel de Champlain assumed they'd reached the Pacific Ocean, closing in on the riches of China and the Orient. In 1634, Jean Nicollet famously donned his Chinese silk robes to meet the Chinese upon arrival on Lake Michigan's west side. He met the Winnebago Indians instead. Henry Wadsworth Longfellow's poem "The Song of Hiawatha" beautifully captures the timeless power and beauty of the water. Later visitors like Herman Melville were similarly wowed, noting in *Moby Dick* that the Great Lakes possess "an ocean-like expansiveness, with many of the ocean's noblest traits."

Nested among these Great Lakes, the peninsulas of Michigan offered a "delightful prospect." That was Baron LaHontan's description riding up the St. Clair River in 1688: "It is difficult to imagine a more delightful prospect than is presented by this strait and the little Lake St. Clair." One hundred fifty years later, according to David Dempsey's book *Ruin and Recovery*, Henry Rowe Schoolcraft described the same shore as "rich, and handsomely exposed to the sun ... Indeed the succession of interesting views, has afforded us a continued theme of admiration." Naturalist Bela Hubbard rhapsodized about the Lake Superior shore near Pictured Rocks. "The lake coast presents a succession of bold and rocky cliffs, with leaping streams and dunes of sand, which give many strange and wild features to the scenery of that wonderful region."

And the many rivers that drain into the lakes are beautiful and equally perceived in romantic and even spiritual terms. Writer Dr. John Hartig quoted the International Rivers Network in his book *Burning Rivers*: "The River is a thing of grace and beauty, a mystery and a metaphor, a living organism ... shaping our landscapes into works of art greater than those found in any museum."

## Exploration and Trade

Surrounded by the Great Lakes and riven with rivers and streams, Michigan's waterways were the first economic engine, serving as the conduits for shipping goods and raw materials out to a waiting and buying world. The region's water-borne fur trade made Sault Ste. Marie one of the oldest permanent settlements in North America. The passage of fur traders brought European settlements to Detroit, Mackinac Island, and Chicago, and opened up the Lakes and connecting rivers for settlement. Control of these waterways and their strategic trade routes and choke points were hotly contested. The waterways were the site of key naval battles that helped win the Revolutionary War and War of 1812.

Michigan territory and the whole Great Lakes region grew slowly as part of the new independent America (to the south, more direct water routes, such as the Ohio and Mississippi Rivers, better connected settlers to eastern and European markets). But with the opening of the Erie Canal, and the advent of steam travel, settlement of the region exploded. Between 1830 and 1840, Michigan's population grew seven-fold, from 31,000 to 212,000 residents, according to Dempsey's book *Ruin and Recovery*, and the agriculture and natural resources bounty flowed out.

Michigan held more than water. It held vast riches. Michigan's fisheries were so plentiful as to seem limitless; farmland was so fertile that, as quoted in *Ruin and Recovery*, "the soil was as rich as a barnyard, as level as a house floor and no stones in the way"; hardwood forests in the south gave way to the straight, tall white pines of the North; copper, iron ores, and other minerals dotted the

northern peninsula and the U.P. With waves of settlement came exports of this natural bounty, sending out food and timber in raw form to feed and shelter the rest of the country. Traffic and trade coming and going on the waters surrounding Michigan was so intense that for a time the town of Alpena became one of the busiest port cities in the country.

## **Conversion**

Then came the great industrial revolution in which water played a starring role. The conversion of crops, timber and minerals to processed food and manufactured goods fueled a dynamic of agricultural industrialization. River and lakefront location drove industrial and community development. Water was the critical resource: water turned the mills, cooled the machines, and was the key input to the growth of the great processed goods and manufacturing industries that powered the state: cereal in Battle Creek; chemicals in Midland; paper in Muskegon and Kalamazoo; cars in Flint and Detroit; and furniture in Grand Rapids.

## **Innovation**

Water powered and lubricated it all, and set off a cycle of rapid innovation and industrialization. Skilled labor and new migrants poured into the region. Fortunes grew making investment capital available. These developments, combined with the water and new rail transportation routes, nurtured the cycle of innovation and industrial development. Flour milling, brewing, distilling and logging gave rise to farm equipment manufacturing, boiler and steam engine production. They in turn nurtured metalworking and machine-making, which led to machine tool, carriage and tractor manufacturing, furniture making, and then the world-changing development of the automobile and assembly line.

Water also enabled Henry Ford's village manufacturing system where small communities on waterways turned out parts for his new auto plants. Water made possible his second great innovation after the assembly line, which was the first vertically integrated production complex, the mighty Rouge Factory. There, 100,000 workers took raw materials (wood, iron ore, coke and sand, shipped from around the Great Lakes) to its yawning entrance at the Rouge and Detroit Rivers. Powered and cooled by waters, iron and steel and glass were forged, and fully assembled automobiles emerged two days later.

## **Research and Education**

The creation of great public universities, and the Morrill Act, which launched the national land-grant university system right here in Michigan (MSU was the first), gave birth to institutions specifically designed to support this great agricultural and industrial advance. Our universities trained the managers and technical talent to grow these great enterprises, and were directly responsible for innovations like the "green revolution" that sparked global agricultural self-sufficiency. Our Michigan schools and community colleges educated at scale the line workers and technicians to staff and run the farms and factories.

## We Turn Our Backs to the Water

This industrial juggernaut of Michigan, fueled by water, chugged through the better part of the 20th century, creating great wealth, and good jobs, but it fouled our waters in the process. It turned our lakes and waterfronts into a riot of factories, slag heaps, rail and ship yards. Communities and downtowns, from Marquette to Monroe, were oriented away from the water. Many of our waterfronts became afterthoughts and dumping grounds. The glorious harbor and lakefront of Muskegon was not visible, and not seen as part of the community, obscured as it was by the paper mills, chemical plants and heavy industry that dotted the shore. A beautiful natural river such as the Kalamazoo was literally so noxious with paper-making waste that the notion of enjoying it, walking, or living alongside it, was inconceivable – a notion that lingers in parts of the community to this day. The water “necklace” in Southeast Michigan, from Monroe to Port Huron was lined with factories, refineries, slag heaps and warehouses.

These peninsulas of grandeur that inspired reverence in the native peoples, awe and rhapsodies among the first Europeans, were used and abused for years by the factory economy that dominated our water landscapes, and our psyche. Ironically, the great wealth and plentiful jobs enabled by this industry allowed working men and women to afford getaways to the unspoiled parts of Michigan – to find refuge in our great outdoors, lakes and streams. But while marveling, just like those first explorers, at the splendor of our Great Lakes coastline, and making family pilgrimages to beautiful lake or stream spots “Up North,” our economic identity has been elsewhere. When we think about jobs and the Michigan economy we first conjure the Big 3 auto makers and assembly plants, the parts makers, along with other great companies and their “plants” – the Dow’s and Kellogg’s, Whirlpools and Steelcases that put people to work at scale. For most of the last century we have been oriented inward, to the great factories, assembly lines, and machine shops that defined Michigan’s work, life and culture; not outward to our lakes, streams and outdoors.



## WATER FUTURE

Today our economic rebirth can be built on our special history, our place, and our innovative genius with water at its center.

Decades ago when the fish died out, the birds disappeared and our rivers caught fire (including the Rouge in Michigan, the Buffalo River in New York, and most famously the Cuyahoga in Cleveland), it was clear the excesses of one age needed to be reversed. And over more recent decades our ability to rely on the factory economy as a jobs engine has waned as our signature industries have undergone massive restructuring in a new global economy.

In the 19th and early 20th centuries, Michigan was the hub of industrial reinvention that powered U.S. global leadership and made us the arsenal of democracy for World War II. In the 21st century, our unique opportunity is to become the “Blue-Green” center of research and innovation, entrepreneurship in the emerging sustainable economy, and a clean “blue and green” playground and attractive home for us and our children, and as a magnet and destination for others.

## **Our Role in Trade**

Our role in trade is still enabled by our strategic location astride the Great Lakes and at the center of the highly integrated North American economy. The Great Lakes states and Canadian Provinces together account for almost 40 percent of U.S.-Canada trade with the world, and Southeast Michigan, with its Detroit and Port Huron gateways, is the largest international trade gateway by value on the planet, and ranks 8th among all U.S. metros in total trade volume, according to a Brookings Institution report “Mapping U.S. Goods Trade by Freight.” We need to better connect Michigan, our people, products and ideas to the bi-national and global economy by building out our waterborne and water-crossing: truck, train, plane and fiber optic cable. We must extend the strategic infrastructures to support this trade – like a 21st century bridge crossing at Detroit-Windsor; new rail, ferry and freight hubs and connections, enhanced port facilities in Detroit, Muskegon, Monroe, and other communities to help Michigan grow and reclaim our place as a world center of traffic, trade and logistics.

## **Our Job in Conversion**

Our job in conversion is to transform the industries and competencies that made us great and rich, to become the world’s “smart water stewards, users and innovators.” One hundred years after launching the industrial revolution, we look to a new green-blue revolution consisting of sustainable communities, products, and enterprises. This transition is underway as evidenced by the retrofit of the mighty Rouge plant with one of the world’s largest green roofs and Ford Motor becoming heralded as one of the world’s greenest companies; Whirlpool looks to its future in making appliances that are hyper-efficient in water use; Dow Chemical claims worldwide water technology innovation as its sweet spot, including tools to help manufacturers save energy and water; auto parts maker Cascade Engineering produces new green plastics and inexpensive water filtering systems to bring drinking water to a water-starved world; our wastewater infrastructure moves to green infrastructure; and our engineering firms expand from cleaning up the Great Lakes to water restoration projects in China and India.

## **Our Role in Education & Research**

Our role in education and research is to re-orient our great education and research institutions, that served so well the industrial era, to be the world center of water research, education and innovation, tackling the challenges of managing a more sustainable planet – and becoming a magnet and mecca for the talent to do this work. Michigan can become the global center of the Blue Economy, solving local and world water problems, discovering and inventing new water products, services and technologies, exploiting global markets, and training the water stewardship talent, which is so needed both domestically and internationally.



## **Our Magical Water Rich-Place Can Be Remade**

The magical place that is Michigan and Great Lakes can turn and face the water, embrace our history, and reconnect water to our lives, and in so doing revitalize our communities and make them among the most attractive places in the world to live, work, and do business. We can turn from “rust to blue,” honoring our history while remaking our waterfronts for a new economic era. It starts with cleaning and creating access to our lakes and riverfronts. The mills, factories and warehouses along our rivers, repurposed – like the mighty Rouge plant itself, the Stroh Brewery in Detroit (now holding offices and apartments), or Muskegon’s Heritage Landing (a former foundry remade as park and festival site), can serve as nods to our storied past, as well as cradles to the birth of the new Blue Economy.



# The Blue Economy

## How water and water innovation creates jobs.

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Legacy Uses for shipping and fishing. Big water using manufacturing, farming and energy industries. New Water Technology Business; Water Education, Research and Innovation Centers; Communities reconnecting to water to make Blue Places.

Many are embracing the language and seeking to organize around this new Blue Economy, but what do we really mean? How exactly does water and water innovation contribute to jobs, businesses and new community development?

There are five major ways water and water innovation have mattered, continue to matter, and will matter to our future economy.

### **Legacy Uses: Transportation, Ports, Shipping, Commercial Fishing**

The historic and traditional uses of Michigan's blue water for commercial transportation and fishing are not insignificant, and are taking new shapes and forms. The lion's share of Great Lakes shipping passes through the four Great lakes surrounding Michigan. Shipping, freight and commercial traffic and warehousing are responsible for more than 65,000 Michigan jobs and \$3.3 billion in annual wages, according to a report by Michigan Sea Grant. Michigan's commercial fisheries business, while much smaller than it once was, is almost entirely devoted to table fare such as whitefish, yellow perch and channel catfish for restaurants here and across the country. The gross dockside value of Michigan state-licensed and tribal commercial fishing operations is \$10 to 12 million annually. As fish is processed and moves through retail outlets, the gross value to the economy is estimated to be \$50 million a year.

The evolving and new economic opportunities around water transportation are seen in ports like Muskegon, where new expansion and development plans put it at the center of West Michigan regional economic development efforts. Muskegon is the only major deep-water port on Lake Michigan, and could be an important outlet for growing agricultural goods trade. A public-private planning process is underway to expand the deep-water port facility for commercial use, and redevelop significant parcels. The port is also at the intersection of a number of lake, water and land trails, and boating services such as the Lake Express ferry service to Milwaukee. Detroit's newly renovated ferry terminal, and boat launches provide opportunity to add ferry service, accommodate increased pleasure boats, kayaks and canoes, along five and a half newly renovated miles of Detroit Riverfront. An expanded Detroit/Wayne County Port and enhanced truck and rail connections could service the trade moving on new super container vessels through the Panama Canal to New York, Halifax, Montreal, and on to Detroit.

Michigan has 36 other ports across its two peninsulas to build out. Saugatuck led a coalition, which included successful lobbying for dredging and efforts to keep these working harbors open. And many small harbors such as Manistique and Ontonagon in the Upper Peninsula see new opportunities to expand economic activity by expanding port facilities to accommodate larger vessels and cruise ships.

## **Big Water Users: Agriculture, Manufacturing, Energy, Beverages**

Historically and currently, the largest set of water-based business are the big water-using sectors which originated, grew, and flourished in Michigan – due to access to water. These include: agriculture, manufacturing, autos, chemicals, paper, cereal, durable goods manufacturers (like refrigerators and furniture) along with the sizable energy, utilities, water/beverage industry (including a growing craft beer industry!), which all use prodigious quantities of water in their processes.

Michigan Sea Grant in 2010 estimated 660,000 jobs and \$49 billion in annual wages in Michigan were linked to the large scale, water-dependent farming, manufacturing, mining, and energy production sectors.

Anderson Economic Group (AEG) more recently estimated the size of Michigan's water-enabled sector, including big water users in agriculture, manufacturing, and mining at 581,000 employees, putting Michigan 8<sup>th</sup> in the nation today in share of water-enabled employment. Increasingly, these industries are seeking dramatic increases in water efficiency for bottom-line reasons. Using water at scale in agriculture or manufacturing takes a lot of energy, and making energy involves lots of water. Cleaning and purifying water, both as input into many manufacturing and other processes and as a discharge, is very costly. Many of the strong growth sectors in terms of emerging water technology products and services involve finding ways to help these big water users do their work more efficiently and sustainably, resulting in cost savings and reduced environmental impact. New green infrastructure solutions can turn high-energy, and costly water movement and distribution systems, into energy producers. Increasing renewable energy sources from wind, solar, geothermal and hydropower also massively reduces water usage.

As large water users move to more sustainable and less environmentally damaging practices, it creates another comparative advantage for Michigan. Michigan remains one of the few places on

the planet that can accommodate large freshwater users – as, unlike fossil fuels, water is a natural resource that can be smartly used and reused.

## The Emerging Blue Economy Growth Sectors

New and growing Blue Economy opportunities for Michigan are in three emerging areas which, taken together with the traditional, fishing, transportation and big-water using industries, make up the Blue Economy. These emerging sectors of the Blue Economy are the main focus of this report.

## Water Technology Products and Services

Including new water cleaning, measuring, monitoring tools and devices; water and wastewater infrastructure design and building, including new “green” infrastructure; water efficiency tools and technologies for saving water (and energy costs) in communities, homes and industrial processes; and water and water-ecosystem management and services, from cleaning and restoration, to valuing water risks.

## Water Education, Research, & Innovation Centers

Pioneering solutions to local, Great Lakes regional, and global freshwater problems: from innovating and leading local water ecosystem restoration efforts, to making freshwater cheaply available for a water-starved developing world; removing pollutants; and adapting to climate change. These institutions are also educating and training the water “talent” of tomorrow, from entry-level wastewater technicians, to engineers managing ecosystem restoration projects, to the scientists finding ways to reduce pollutants from water, and turn it into clean energy.

## Water Placemaking

Including the economic impact of water and waterfront restoration, access, and use; real estate and private development; new recreation and hospitality businesses; and the economic return from the message our communities send by being leaders in sustainability, sustainable water use, and a lifestyle with water enjoyment at its center – which can make Michigan a choice location to live, work and play.

**Collectively (and conservatively) our Michigan “Blue Economy” already provides roughly 1 in 5, or nearly one million Michigan jobs, and \$60 billion in annual economic impact for the citizens of our state according to research by the Anderson Economic Group for the University Research Corridor (URC), and the Michigan Economic Center.**

Given our unique water and innovation advantages, we have an opportunity to be the center of water work and seize more than our fair share of the growing global water solutions business.





# Blue Business

## Growing water technology products and services.

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Michigan firms are becoming the smart water stewards, users and innovators – beginning to exploit huge global markets for water cleaning, conservation, monitoring, component-making, infrastructure, engineering, ecosystem management, risk-analysis products and services.

Several years ago, the Michigan Economic Development Corporation (MEDC) cataloged more than 350 emerging water-related companies in Michigan that were beginning to exploit broad markets for water cleaning, conservation, monitoring, component-making (filters, cleaners, bio-digesters etc.), infrastructure and engineering, including green infrastructure, and ecosystem management work. The URC's 2014 assessment by AEG of Michigan's employment in what it defined as core water products and services found 138,000 employees, putting Michigan 10th in the country already in terms of share of employment. Estimates of the size of the global market in this emerging segment range widely, from \$74 billion to \$500 billion. And "smart money" from the venture capital (VC) community is shopping for new technologies and firms in which to invest in this globally significant sector, including \$50 billion in water-technology funds globally, \$370 million in water VC in the U.S., and a new \$100 million Michigan-based Oakland Energy and Water Venture Fund, dedicated to investing in new energy and water innovations.

Emerging water technology product and service firms in Michigan range widely, and include such exciting developments among household names as: [Whirlpool Corporation](#) developing hyper water-efficient appliances, and water- and energy-saving home systems, which include ultimately taking potable water out of the loop of non-drinking uses, like flushing toilets; and [Dow Corporation](#), which is one of the world's leading



### Go Deeper

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[Whirlpool Corporation](#) [22]

[Dow Corporation](#) [16]

manufacturers of water technology components for filtering and cleaning water, and reducing the energy used and costs of pumping and using water in manufacturing and energy facilities. Alongside startups like [Somnio Global](#), whose new ozone water treatment technology, to be manufactured in Michigan, can remove bio-hazards from hospital waste, as well as metals and hazardous materials from manufacturing processes, without using additional toxic chemicals – water technology innovation can spur new business and job creation.



## Go Deeper

[Somnio Global](#) [18]

## Water Technologies Help Big Water Users Adapt

Much of the action among firms developing new water products and services is in service to the big water users and their transformation to be more efficient and “green”, helping them:

- Reduce water use, like Ford Motor, which has made significant reductions in water use globally based on the new Environmental Management systems in its facilities; and Steelcase Corporation, a company reducing water use globally in its own operations, and among customers and suppliers by developing and sharing innovative product lifecycle assessment data.
- Use less energy, like Dow’s water filters that require less energy in large-scale manufacturing, or Moore and Bruggink, a West Michigan construction and engineering firm specializing in water and water treatment – they reengineered Greenville, Michigan’s wastewater treatment facility to incorporate anaerobic digesters, making power and heat for buildings, and reducing costs and energy consumption by 34 percent!
- Clean water, like Algal Scientific’s advanced micro algal bio-digester technology that removes pollutants and organic compounds from wastewater, and reduces lake algal blooms. Or Plymouth Technologies, a company that treats and cleans water used in large-scale manufacturing and industrial processes.
- Or accomplish all three, like Sustainable Water Solutions, a company that helps big manufacturers save money, and operate more sustainably through water treatment, cleaning, efficiency improvements and solutions for environmental compliance.

## Specialized Water Products

There are also lesser known, more specialized emerging water technology products:

- Cripionic Energy is developing a technology to make electrical power from the movement of sewage and stormwater.
- Parjana Distribution Inc. has developed an infiltration technology for removing standing stormwater by injecting it back into the ground.

- [Cascade Engineering](#), and its social enterprise partner, [Triple Quest](#), are developing and deploying life-saving technologies such as simple plastic water-purifying products for the developing world, to afford safe drinking water and meet the scourge of water borne disease. Super-clean water made by Serve-A-Pure, used to make high-tech products like semiconductors.
- Keweenaw Geothermal Research Group is investigating technology to use heat from water in abandoned mines in the Upper Peninsula to heat hospitals and community facilities.

## Water Services Firms

Another growth segment includes engineering, and ecosystem service businesses such as:

- Environmental Consulting and Technology (ECT), a company that provides water ecosystem management services and planning; and [LimnoTech](#), a global leader in water-related environmental and ecosystem design and consulting services.

Michigan has significant capacity among its infrastructure design, engineering, and builders: both in traditional water and sewer systems, and in service of the growing demand for new “green infrastructure” that reduces runoff, saves energy, and re-uses water resources.

- Firms such as Prein and Newhof support local municipalities in innovative and sustainable water infrastructure, transportation, and facility design and treatments. Mannik Smith Engineering and Architectural Firm is a long-established company, and now a leader in green infrastructure, sustainable urban design and water-management systems. Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) is a civil engineering, architectural, environmental, and construction services consulting firm specializing in water and wastewater system design and green buildings. Becket and Raeder is a firm whose architects, planners and engineers design and build environmentally sensitive waterfront redevelopment projects.

There are also emerging businesses exploring very new water-services models, including water information systems, and water financial businesses (such as water-risk management products and services). These include such companies as:

- Water Risk Analytics (an emerging Michigan firm, newly spun out from LimnoTech); and MSCI (headquartered in New York, but satellite office in Ann Arbor).
- H2Bid provides e-procurement services for the worldwide wastewater utility procurement processes.



### Go Deeper

[Triple Quest/ Cascade Engineering](#) [24]

[LimnoTech](#) [20]

# Dow Chemical

## At the Intersection of Water and Industry

*Because of the importance of water to Michigan's economy we are natural leaders for developing technologies that use it economically and sustainably.*

Any child can tell you that without water, there would be no life. But less obvious is the role of water in just about every convenience of our modern existence.

Because without water, there would be no industry.

As Growth Technologies Director for Dow Water and Process Solutions, Tracy Young spends her days at the intersection of water and all of the industrial processes that give us things like heat, tap water, and medicine. Young is responsible for helping develop and improve technologies that integrate water into industrial applications as varied and diverse as pharmaceuticals, food production, energy production, municipal use, and chemical and manufacturing processes.

"It can be anything from power plants to bottled water," Young says. "If you think of bottled water, they generally will treat the water using reverse osmosis before it gets bottled. In a power application, you have a lot of heating and cooling, so they need to soften the water to remove hardness from it, similar to your home-softened water, so they don't get scale formation in their heat-transfer equipment. If you look at a mining application, they have water they need to treat for the operations, as well as water that comes from acid mine drainage. We can treat that and remove any metals to support the ability to either reuse it or discharge it to the environment."

Industrial water applications are a growth industry, and the two things that are driving that growth, according to Young, are cost and scarcity. "Innovations to reduce the cost to treat water and in being able to operate manufacturing processes with less water and energy are very important," she says.

Take reverse osmosis as an example. It's a pressure-driven process, so you have to use a pump, and it takes a fair amount of energy to pump across the membrane. Young's job is to figure out how to pump that water ever more efficiently, losing less water and decreasing energy consumption in the process.

"We have new innovations where we have been getting higher performance and enabling higher recovery of treated water at a lower pressure, which translates to being able to use less energy and water overall," she says. "Higher performance and lower costs are driving trends that supports adoption of these new applications, so that it's more economical to treat the water."

And having more efficient ways to treat water translates into a valuable resource for areas facing water shortages.



“When you look at water scarcity, people are looking at more options around using impaired water, and treating that water so it can be reused,” Young says.

Being able to reuse water in scarce-water environments and water-intensive industries presents major competitive advantages. For example, water-intensive industries such as the chemical, petrochemical, pulp and paper, textile, steel, food and beverage industries often reuse municipal wastewater to power their operations. Young’s group not only develops the technology to make that possible, but also develops unique partnerships that make outside-of-the-box, sustainable solutions possible.

“I’m really looking at who plays a different role in the overall water-value chain, and how you look at enabling adoption of solutions,” Young says. “In a public-private partnership, you’re looking at how to bring together a municipality, a technology provider, and perhaps an engineering firm that’s doing the design, with an industrial firm. Sometimes when you only have one player, the hurdle to adopt new technology is too high. How do you look at all of the players together to help solve a water challenge?”

Young sees Michigan as an ideal testing ground for these applications.

“We definitely have a Blue Economy, but how can we capitalize on that as a state?” she asks. “We should be able to attract industry to Michigan that has a heavy-footprint need for water because of the abundance, and I believe we should be able to be more cost-effective in doing so than, for example, Texas.”

And because of the importance of water to Michigan’s economy, Young says, we are natural leaders for developing technologies that use it economically and sustainably.

“At the end of the day, how do we enable products to advance and access to water, so that we all can be good stewards of our world’s water footprint?” For more info, go to ***dow.com***.

## Somnio Global

A shared Vision that Includes Energy, Environment, Education, and Even Empathy.

*This technology has the potential for great social consequence in communities around the world.*

Among the exciting new technologies created everyday in Michigan, water purification systems aren't usually the first to come to mind. Somnio Global, an innovation accelerator based in Novi, Michigan, is changing that with recent developments in water treatment technology. Somnio is part of a growing, innovation-based economy in Southeast Michigan, with groups such as the New Economy Initiative and the Michigan Economic Development Corporation (MEDC) investing millions in entrepreneurial organizations and startups.

Somnio's founders, Dr. Pravansu Mohanty and Carl Le Souef, launched the business in 2013 having met while pursuing a joint interest in an innovative energy storage technology. They realized their shared passion for supporting the development and commercialization of environmentally friendly and socially significant technologies in a profit focused business model. Somnio's operating structure bridges the gap between the creative environment needed to facilitate innovation, and the disciplined approach that is required to commercialize technologies. The company's vision is based on four pillars of innovation: energy, environment, education and empathy.

The Somnio team of researchers, in partnership with local universities, has developed everything from technology that facilitates the recycling of plastics to a revolutionary nanotechnology that improves battery efficiency. They are a privately funded business, with some assistance from the government, including a recent grant from the MEDC to develop unique additive manufacturing technologies.

Steve Annear, Somnio's vice president of operations, was recruited from Australia. "I was amazed at the ambitious nature of the company and what it was setting out to do," Annear says. His background is in corporate management for large industrial companies, but he was excited by the entrepreneurial nature of the work at Somnio. He joined in August 2014, moving himself and his family across the world from Australia to Michigan.

Somnio is currently focused on commercializing its newest innovation – an ozone generation system called AiR2O3, which Annear describes as a game-changer for the water-purification industry. This technology helps treat water through a distinctive chemical-free process. It can be used in a strikingly broad range of applications, but its water-based uses have significant importance to the Michigan economy. They include the treatment of ballast water from the Great Lakes, water that often carries harmful invasive species, the treatment of medical waste fluids,

purification of industrial waste and municipal water supplies, and the pre-treatment of water in desalination plants.

“Ozone has been known for a long time to be a wonderful purifier of water,” Annear says. “The challenge has always been doing that in a way that is cost effective and reliable in the field.”

Somnio has addressed those challenges with its new system, which has been in development for more than five years. Somnio’s engineers have found a way to eliminate the internal dielectric barrier present in traditional ozone generation systems, thus allowing for much more efficient generation of ozone.

Another huge benefit of AiR2O3 is that it is able to take oxygen from ambient air and convert it to ozone, which eliminates the need for a controlled oxygen supply thereby reducing the cost and complexity of the system.

Somnio is planning to pilot units in the field during the first half of 2015, and aims to manufacture and commercialize these systems through the second half of the year.

“It’s incredibly exciting for us because Michigan is a state surrounded by water,” Annear says. “The condition of that water is extremely important to our health and quality of life.”

Ultimately, this technology also touches upon a universal human right – access to clean drinking water for all. Not only can it be used for a myriad of purposes in the Great Lakes region, but it can help bring clean drinking water to water-scarce areas around the world.

“This is really about helping people,” says Annear, driving home the fourth pillar of Somnio’s mission – empathy. “This technology has the potential for great social consequence in communities around the world.” For more info, go to ***somnioglobal.com***.

## LimnoTech

### Company CEO Paul Freedman Talks Lake Protection and Restoration

*As a company, and as a nation, we drew pride from how quickly Lake Erie and other areas recovered, and we gained a sense that environmental problems were not only scientifically understandable, but could actually be solved as well.*

The Great Lakes, that scarily dynamic system of lakes, rivers and streams, spans more than 750 miles from west to east. Consider that. Now consider the myriad interconnected ecosystems of fish, plants, humans and animals that depend on those waters. Any shock to the ecological health of these Great Lakes and two provinces, eight states and 30 million people would be directly affected. We might take for granted a clean shoreline, and swimming in Sleeping Bear Dunes or kayaking Pictured Rocks, but it takes more than a magic wand to make this happen.

“Even though the Great Lakes are enormous, holding 20 percent of the world’s surface freshwater, they are at the same time vulnerable, even fragile, and subject to ongoing change,” Paul Freedman says. He should know. He’s the former President of the Water Environment Federation who has also been granted “Fellow” status by the American Society of Civil Engineers. He’s also the CEO of one of the country’s leading water science and environmental engineering firms, LimnoTech, which specializes in the use of cutting-edge technology and sound science to unpack water complexities and environmental issues.

Headquartered in Ann Arbor, Michigan, LimnoTech has been in the business of science-based decision-making since the mid-’70s, not long after the implementation of the Clean Water Act. In short, the company provides critical support to major global corporations and non-government organizations, including food and beverage companies, as well as traditional industries such as cement, pulp and paper, oil refining, and energy. They’ve been at the forefront of large-scale ecosystem restoration strategies related to the Gulf of Mexico, the Great Lakes, the Florida Everglades, and Chesapeake Bay. They now have offices in California, Minnesota, Washington D.C., and conduct business in more than three dozen countries. They’re in partnership with global environmental nonprofits, international agencies and banks, and their projects have covered 49 of the 50 United States.

In the company’s early phase, the staff helped to develop “sophisticated models” to show how inputs of organic and inorganic matter were absorbed into the Great Lakes ecosystem.

But like layers of an onion, over time, when one issue of pollution appears solved another more hidden one will inevitably emerge – one more costly and challenging to understand.



“Over the last half-century,” Freedman says, “we have seen what was once perceived by the public as a near boundless expanse of blue water to be threatened and harmed by a series of evolving problems.”

As the public began to confront sewage treatment, and the legacy of industrial pollution, here come invasive species, stormwater flooding from urban sprawl, and climate change. With so many variables in an ever-changing environment, LimnoTech has responded to the needs of the Great Lakes.

For instance, in 2014 LimnoTech helped the City of Toledo understand, and monitor, its Lake Erie water supply after toxic algal blooms caused a crisis that saw 500,000 city residents without water. The company played a big role in Lake Erie’s recovery.

“As a company and as a nation, we drew pride from how quickly Lake Erie and other areas recovered, and we gained a sense that environmental problems were not only scientifically understandable, but could actually be solved as well,” Freedman says.

Doing this kind of work isn’t exactly easy, and for the average person it might sound like quantum physics.

The company uses “integrated analysis” to consider the full range of processes that combine biological, chemical and physical aspects. Integrated analysis incorporates different types of data into one comprehensive “ecosystem model.” Think: if pollution goes up, and water levels go down, with more ice, what will happen to fish? Now multiply that by 20 factors or so. Ecosystem modeling monitors the health of the Great Lakes as one system, rather than a separate set of rivers, lakes and streams frozen in time. When you couple ecosystem modeling with informative graphics, Freedman says, “individuals, companies, and agencies can better understand how changes in their actions, even small ones, can collectively create or solve problems.”

Another example: LimnoTech created a model for both the upper and lower Great Lakes to examine how changes in lake levels, different lake-level management practices, shoreline management, and climate change will impact everything from fish to amphibians and birds. What resulted is what Freedman describes as a “shared vision” for the U.S. and Canada for good stewardship of ecology, recreation, commercial navigation, and other important societal and economic uses. He maintains that commonly shared information like this can help overcome other challenges like the lack of motivation to change, or a business-as-usual attitude.

LimnoTech’s sound science is critical in fostering greater efficiency in public and private spending within and around the Great Lakes. We spend \$250 million annually to combat the problems created by zebra mussels, and billions in cleanup from contaminated sediments. Investments in Michigan’s shorelines work to advance a \$17-billion tourism economy in Michigan, not to mention the invaluable peace of mind of clean drinking or swimming water.

While Michigan’s Great Lakes have benefited from cutting-edge water management technology, thanks to groups such as LimnoTech, there are no magic wands at play. Quite the contrary. LimnoTech’s skilled scientists, engineers and technicians work to protect and restore our valuable water environment, worldwide. Period. For more info, go to [\*limno.com\*](http://limno.com).

# Whirlpool Corporation

Water is a Major Theme Here

*People don't understand the individual product implications of their choices, and how much watering their lawn is actually costing them. Now is the time to educate the consumer.*

Whirlpool has been innovating since 1911 and is now the largest home appliance maker in the world, with 59 technology and manufacturing centers globally. That's not hyperbole. Not when you consider that eight out of 10 homes in the U.S. have a product from one of the company's 12 brands. And beyond its growing brand portfolio, its name is almost synonymous with energy-efficient product design and the federal Environmental Protection Agency's Energy Star program. Everything about the company these days is eco-friendly, right down to its LEED Platinum-certified headquarters built on a revitalized brownfield site in Benton Harbor, Michigan. (LEED, by the way, is Leadership in Energy and Environmental Design, a green building certification program formed by the U.S. Green Building Council.)

Ronald Voglewede is Whirlpool's global sustainability director. He leads the company's sustainable product development across all of their brands. He has a background in mechanical engineering and began working in water-product development at Whirlpool in the early 2000s. He knows his H<sub>2</sub>O.

"Water is one of the major themes for Whirlpool in the next 20 years," Voglewede says. "It is a huge issue and will only continue to be of greater importance as it becomes harder to access and more expensive."

Indeed, Whirlpool is currently addressing the three issue areas in its product design – end-of-life product recycling, material substitutions, and energy and water efficiency. The overarching question of these issues, explains Voglewede, is how to improve performance while reducing environmental footprints.

The company recently introduced the KitchenAid AquaSense dishwasher to the U.S. after a successful launch in Europe. The AquaSense technology holds the water from the last rinse of the dishwasher and reuses this same water for the first, pre-wash rinse. This not only reduces the total amount of water used by 30 percent (it uses just 1.6 gallons per wash), but also shortens rinse cycle time. The dishwasher is the first of its kind and has won multiple awards, including the PCBC Parade of Products recognition in June 2014, which is a prestigious nod in the world of art, science and housing.

Whirlpool is now looking at how to increase water efficiency in the home from a more holistic perspective. "There's only so much water you can save in an individual appliance," Voglewede says. "We want to start rethinking water usage as a complete system in the home."

In 2014, Whirlpool launched ReNEWW (Retrofitted Net-Zero Energy, Water and Waste) House, the world's first live-in research lab, in collaboration with Purdue University. The three-year project is a collaborative innovation space where engineers from Whirlpool and masters students from Purdue live and work together to develop net-zero energy and water systems throughout a house in Indiana. ("Net-zero energy" means the energy production equals the energy consumption.) "This project is essentially about taking an old home and teaching it new tricks," Voglewede says. "We think it's a fantastic experiment."

The ultimate goal is to accelerate the development of innovative home appliances. As part of the retrofit process, they have installed solar and geothermal technologies and are now in the process of setting up a "gray" water system throughout the house. Gray water is household wastewater from all plumbing fixtures except the toilet and garbage disposal.

This type of system allows for recycling of wastewater, which can then be used for various purposes such as irrigating landscapes.

One major challenge Voglewede has encountered in developing water-conserving products is that there's no national average for water efficiency in the same way there is for energy efficiency. "People don't understand the individual product implications of their choices, and how much watering their lawn is actually costing them," Voglewede says. "Now is the time to educate the consumer."

According to a recent study cited by Voglewede, water bills will exceed energy bills in every major city by 2025. To address this, Whirlpool is continuing to work on advanced filtration technologies, and not just how to reuse water within their products, but how to return the water back to its source, i.e. through gray-water systems.

Whirlpool's global success is built not only on innovative products, but on a longstanding, community-minded approach. Through its philanthropic arm, the Whirlpool Foundation, the company has invested \$10 million in Benton Harbor, a city whose population hovers around 10,000. The investment helped launch the Harbor Shores Community Redevelopment project, which aims to revitalize and transform downtown Benton Harbor through a 530-acre, mixed-use development, formed in partnership with Cornerstone Alliance, a local economic development organization. By redeveloping an old brownfield site, they have also brought new businesses, jobs, and residential units to the area.

"Whirlpool's founders had a distinct vision," Voglewede says. "You can't separate your products and the impacts of your products from the communities in which they operate."

Nowhere does this resonate more than where the company was first founded, at its headquarters overlooking Lake Michigan. For more info, go to ***whirlpool.com***.

# Triple Quest/Cascade Engineering

## Engineering Clean Water for the Dry and Developing World

*At more than 300 pounds when empty, they were killing his donkeys when he tried to take them into the rural hillsides.*

Nearly 4 million people across the developing world die each year from unsafe drinking water. Almost half of those are children. Lack of access to safe drinking water is the number one cause of death for children in the developing world.

These communities are in dire need of an affordable, low-tech method for cleaning their water that can easily be transported across rugged landscapes with poor transportation infrastructure.

That's why Grand Rapids, Michigan-based Cascade Engineering, a large-scale plastic injection molding company, joined the Triple Quest partnership. Founded by The Windquest Group, a West Michigan-based private investment fund, the Triple Quest partnership is a sustainable enterprise that provides products to at-risk families in developing countries to meet their essential needs. It does this by bringing together the resources of multiple non-governmental organizations, corporations and other partners.

This partnership approached Cascade Engineering for help in designing and manufacturing a plastic version of the concrete BioSand water filtration system that is currently in use today in the developing world.

"A foreign missionary stopped by Cascade's Container Plant in Grand Rapids, Michigan after seeing our all-plastic waste carts, looking for a way to get a plastic version of the concrete filters," recalls Triple Quest President and CEO Brian Mucci. "The concrete ones worked OK, but they were too heavy. At more than 300 pounds when empty, they were killing his donkeys when he tried to take them into the rural hillsides."

So Cascade Engineers got to work redesigning the filter, partnering with Michigan-based International Aid, a non-profit that provides used medical equipment to third world disaster areas.

The nonprofit worked with a Canadian engineer, Dr. David Manz, who designed the model, and returned to Cascade for help in bringing the product from design to reality. Fred Keller, Cascade's founder, agreed to have the firm take the lead on financing and coordinating the engineering, tooling and production for the nonprofit.

An eight-pound (when empty) plastic slider called Hydraulid was the result. The filter is a simple, lightweight unit with no moving parts. Users can reduce biological contaminants by pouring surface or groundwater through the filter to obtain water that is safe for drinking, food preparation, personal hygiene and sanitation. Powered by gravity and with no parts to replace, the Hydraulid BioSand Water Filter is extremely durable. It lasts beyond 10 years, serves the needs of 8-10 people daily, making it the most sustainable filter available today.

The product was extensively tested with several design revisions before being deployed to developing countries.

“Cascade Engineering employees traveled to these regions to install and test the product first-hand, which included helping with sourcing the various sand and gravel materials used in the filters as filtration media,” Mucci says.

The first set of filters were deployed to Haiti in 2010. To date, more than 65,000 Hydrad filters have been sent to Central American, African, and Asian areas in great need of clean water.

“Each filter is capable of meeting the drinking, cooking, cleaning, and bathing needs of a family, so 400,000 people have benefitted from Hydrad filtered water, greatly reducing sickness and death from waterborne parasites and bacteria among the users,” Mucci says.

Triple Quest is working with an innovative carbon financing model to support an even wider deployment.

“Carbon financing allows us to quantify the reductions in carbon pollution, or greenhouse gas pollution, that result from using Hydrad filters rather than using boiling as a method of disinfecting drinking water,” Mucci explains. “By quantifying these reductions, and by having our projects registered and validated by The Gold Standard, we are able to produce a tradable commodity, the carbon credit, that can be sold on the voluntary market. ... We have also used carbon credit sales as a way to fund new Hydrad filter projects. This is possible when the credits are used as the payback for an investor who is willing to provide upfront project financing in return for the credits that will be produced over the next 10 years.”

And Michigan’s position as a state rich in water resources puts it in a unique position for this kind of innovation.

“It’s remarkable and fitting that Michigan, surrounded by the greatest fresh-water bodies in the world, would have so many companies and individuals who, at great expense in time, money, and resources, would dedicate themselves to this great cause,” Mucci says. For more info, to ***hydrad.org***.





# Blue Education & Innovation

## Centers of water learning and discovery.

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Michigan's Growing Water Education, Research and Innovation Centers – Universities, Colleges and Research Centers pioneering solutions to local, Great Lakes, and global freshwater problems – growing as magnets for talent and centers of excellence in educating the water problem solvers and stewards the world needs tomorrow.

One of the key sectors in Michigan's emerging Blue Economy is the water-related research, education, and science at institutions of higher education. Michigan's higher-education institutions can be focal points that attract top talent, engage and train students, create innovative curriculum, and win research dollars – and in return, produce new inventions and businesses, a new workforce trained to address the emerging issues facing water resources in the 21st century, and the intellectual capital to make Michigan that go-to location for fresh water-related activity.

Michigan has education and research institutions that are now engaging in water research and pioneering solutions that address freshwater problems at the local, Great Lakes regional, and global scales, and range in scope from local water ecosystem restoration to providing potable drinking water for a water-starved developing world. These institutions are educating and training the water “talent” of tomorrow, and serve as an economic engine in and of themselves. They attract outside investment, keep and draw top talent to Michigan, and create “spillovers” in the form of new technologies, firms and enterprises. Developing water centers of excellence is a huge economic opportunity that is just starting to be exploited by Michigan education and research centers, which include more than our share of the world's top-ranked schools. Michigan's universities and colleges are expanding their programs in water research and ecosystem management, and growing their enrollments in popular water-related courses.

These institutions have a significant economic footprint, and account for an outsized economic impact. AEG's report notes the three [University Research Corridor](#) Universities (Michigan State University, Wayne State University, University of Michigan) alone received \$299 million in water research awards over the past 5 years (representing as much research as they did during a similar period of time for the auto sector, Michigan's leading industry), and awarded over 3,400 degrees to "talent" linked to water. [Grand Valley State University's Annis Water Resources Institute \(AWRI\)](#) contributions to the local economy in Muskegon are worth \$3 million annually, according to study by economist Paul Isely. Add up the nine Michigan University Water research centers including: The Great Lakes Storm Water Management Institute at Lawrence Technological University, The Urban Watershed Environmental Research Group at Wayne State University, Michigan Technological University's Great Lakes Research Center, Lake Superior State University's Aquatic Research Lab, Central Michigan University's Institute for Great Lakes Research, Michigan State University's Center for Water Sciences, University of Michigan's Water Center, AWRI at Grand Valley State University – and the dozens of community college water programs – and you have significant economic impact in the form of new students and top talent, millions in research dollars, and contributions to new business creation and local economic development.

We inventoried these institutions and found a total of 190 water-related programs at Michigan community colleges, colleges and universities, not including the three URC universities. These non-URC institutions confer hundreds of water-related undergraduate and graduate degrees per year.

And these impressive figures don't capture additional water-related talent growth sectors – the many water related non-profit organizations, and the significant contributions to their work from Michigan's multi-billion dollar philanthropic community. Research by Public Sector Consultants showed that among Michigan's non-profit community, 2,700 direct jobs and more than \$80 million dollars a year in income were generated by those focused on the environment. These numbers, already large, are growing. These are organizations that are attracting bright, motivated, and engaged individuals, many of whom are Michigan's younger generations, and who are increasingly interested in centering their lives and livelihoods around purposeful work that is focused on sustainability, environmental stewardship, and entrepreneurship.

Michigan's higher-ed institutions are engaged in exciting new research and discovery around water issues with global and local import, and educating water talent and workers in a host of fields:

## Solving Global Fresh Water Challenges

Water, access to it, and smarter use of it has zoomed to the top of the list of global issues and challenges. Michigan's globally engaged universities, scientists and educators, are active participants in helping understand and solve global water challenges. These projects include Grand Valley State University's AWRI optimizing the performance of portable water filtration systems in collaboration with Cascade Engineering, for developing countries such as Haiti; Western Michigan University's work on water management and pollution remediation approaches



### Go Deeper

[University Research Corridor \[35\]](#)

[Grand Valley State University Annis Water Resources Institute \[40\]](#)

in China; Michigan State University's leading role in understanding and preventing water-borne disease outbreaks in the developing world; Lake Superior State University's students working on scrubbing petroleum hydrocarbons from soil and groundwater; Eastern Michigan University's research on the assessment of PCB bioaccumulation and its effects on metabolism of freshwater invertebrates; University of Michigan Water Center's engagement of researchers, practitioners, policymakers, and nonprofit groups to support, integrate, and improve current and future freshwater restoration and protection efforts; and Wayne State University's development of new tools for detecting and tracking the source of fecal contamination in urban water systems—including microbial source tracking.

To understand our blue planet, including our oceans and large freshwater bodies, which are less well mapped than the surface of the moon, Oakland University's new Robotic and Artificial Intelligence (AI) systems are being developed for both unmanned ground and underwater exploration vehicles. University of Michigan's Naval architecture and engineering school is developing robotic remote sensing, and mapping technologies for the world's waterways, while U of M engineers work to pioneer cheap, low-tech solar water purification technology for the developing world, and its geologists are developing better tracking systems to understand the movement of chemicals in the world's oceans.

The new challenges and opportunities of the increasingly navigable Arctic passage, from how to more safely exploit raw materials and new energy sources, to mapping and monitoring changes in air and water temperatures – can best be modeled and solved in the test bed of the Great Lakes, through collaborations with the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory (GLERL). And U-M's Department of Atmospheric, Oceanic and Space Sciences is even working beyond the globe, studying space, climate and planet atmospheres, while creating space systems and instrumentation.

## Stewardship of the Great Lakes

An ongoing area of focus and expertise among Michigan's education and research institutions is our own inland seas, the Great Lakes; these efforts extend beyond the cataloging of the stressors facing the Great Lakes, with more and more emphasis being placed on solutions to these problems. Many of these solutions will be transferable to other freshwater systems around the world. [Central Michigan University](#) is monitoring for the presence of invasive Asian Carp with the use of environmental DNA. University of Michigan researchers are helping develop the appropriate policy and management strategies to stem the causes of harmful Lake Erie algal blooms. U-M and MSU's researchers are also forecasting lake level changes driven by climate change, with the goal of informing a variety of potential adaptations to water-climate change related impacts. Lake Superior State University – working together with other partners under the leadership of Central Michigan University and its Institute for Great Lakes Research, that manages the bi-national, basin-wide Great Lakes coastal wetland monitoring network and system. Michigan Technological University runs the Great Lakes Coastal Forecasting System modeling the effects of changes in temperature, water circulation and their impact on biology and the ecosystem. Michigan Sea Grant, a joint federally and state-funded program co-hosted by the University of Michigan and Michigan State



### Go Deeper

Central Michigan University  
[42]

University, runs a “Green Marina” program, which helps reduce pollution from boating and marina activities in Michigan, Ohio and Wisconsin.

## **Monitoring and Restoring Local Water Ecosystems**

Another active family of work for Michigan’s higher education institutions is supporting and sometimes leading the numerous local and regional water restoration efforts. These include local ecosystem and habitat restoration projects that are site-specific, involve large multi-stakeholder teams of ecologists, engineers, community leaders and local land owners, and include significant public engagement and input. University researchers are doing this work around a number of Michigan’s Areas of Concern – the federally designated most toxic aquatic “hotspots,” providing the scientifically defensible data as to whether restoration is sufficient to justify “de-listing” as an Area of Concern. Examples of university involvement in these key public-private partnerships, often involving millions of dollars, include Grand Valley State University-Annis Water Resources Institute on Muskegon Lake and White Lake; Lake Superior State University on the St. Marys River; and Michigan Technological University on Torch Lake.

Elsewhere, researchers and practitioners at Wayne State University are leading Great Lakes coastal marshland restoration projects. Ferris State University and GVSU-AWRI staff are working on the Muskegon River watershed restoration through the Muskegon River Watershed Assembly; Kirtland Community College is active on the upper Au Sable River, involved in watershed monitoring projects with a variety of community based organizations; and GVSU-AWRI are assisting in the restoration of the Lake Macatawa Watershed as part of Project Clarity. These and many other ecosystem restoration projects restore and improve not only habitat and water quality, but also increase property values as communities reconnect to the water, and in turn, rebuild community morale and self-image.

## **Developing and Commercializing New Water Technologies, Products and Services**

Michigan’s institutions of higher education are discovering and commercializing a variety of cutting-edge technologies and new management practices. For example, Wayne State University is tackling the huge challenge of monitoring and improving the performance of current wastewater systems and developing green infrastructure that removes heavy metals like copper, cadmium and lead from stormwater. Nearby Lawrence Technological University is home to the Great Lakes Stormwater Management Institute, developing new practical infrastructure approaches to stormwater management to support low impact development.

Grand Valley State University researchers developed a genetic screening bioassay that is in the process of being spun off as a new business – Aqua Gen; the bioassay differentiates between the invasive and native forms of the aquatic plant Eurasian watermilfoil, which will help lake managers and riparian homeowners treat these plants in a more economically efficient and ecologically sensitive manner. University of Michigan-Dearborn faculty are the principals behind the emerging non-chemical water-cleaning technology business, Somnio Global. Water Risk Analytics was created by the U-M business school faculty, emerged from research into the water-

related risk associated with owning stock in water sensitive sectors, like utilities, mining, and steel.

Michigan's leading water technology companies see tremendous need and benefit in harnessing the research and innovation horsepower in our colleges, labs and universities and applying that expertise toward discovering needed water solutions. Michigan institutions are already developing technologies with tremendous possibilities for commercial exploitation: Wayne State University is developing software to help utilities achieve optimal and sustainable water transmission, energy reduction and pumping efficiencies, while Western Michigan University is developing new tools for assessing underground features for application in energy, oil, gas exploration, and developing new GIS mapping technologies for the USDA to assist producers with increased crop protection and resilience, as well as reduce the impact of volatile weather on profitable crop production. Saginaw Valley State University is working on science-based nutrient management practices that can bring new models for agriculture practice. Oakland University is developing biogeochemical tracking tools for monitoring and managing industrial processes.

Public-private partnerships can accelerate commercialization and new business development around these and other thorny topics such as: developing the water conservation technologies and policies to balance the competing demands for water from agriculture, utilities, ecosystems, and humans; finding the water treatment technologies to address waterborne pathogens or emerging microconstituents and pharmaceutical products; and putting the tools of synthetic biology to work for genetic manipulation that can create more lipid-rich algae for making biofuels, or control invasive species.

## Educating the Freshwater Talent and Workers of Tomorrow

Michigan's colleges and universities are preparing the next generation of needed scientists, environmental engineers, and other "water workers" in programs ranging from marine technology at [Northwestern Michigan College](#) to a dual M.S./M.S.E. degree in Engineering Sustainable Systems at the University of Michigan.

Northwestern Michigan College's Great Lakes Water Studies Institute (GLWSI) was the first community college to offer an associate degree in Freshwater Studies with emphases in the areas of science and technology; global policy and sustainability; and economy and society. In addition, GLWSI partners with Ferris State University, Grand Valley State University, and Western Michigan University to allow its students to obtain a bachelor's degree after the completion of an ASA-bachelors program. Its associate degrees include a B.S. in Marine Technology, a new specialty under their Engineering Technology program, and a B.S. degree preparing students to become merchant marine officers and business professionals for the global maritime industry. Curricula range from seamanship, navigation and piloting to steam and diesel engineering, along with 276 days of commercial sea time. NMC maritime alumni sail with fleets of the Great Lakes and oceans, with many serving as masters or chief engineers. Some of the professional development/certification offerings include: radar operations; electronic chart display and information system (ECDIS); able seaman; search and recovery sonar training course; and underwater archeology.



### Go Deeper

Northwestern Michigan  
College [33]



- Bay College's (Escanaba) Water Technology Program provides specialized training in water and wastewater treatment theory and application both to entry-level personnel and those already in the field. Graduates earn an associate degree in Applied Science in Water Resource Management and are immediately eligible for certification and entrance into the water/wastewater treatment industry – where technicians are sorely needed. Their Certificate in Water Technology trains entry-level maintenance operators and lab technicians for jobs with municipalities and industries involved with control and prevention of water pollution.
- At [Delta College's \(Bay City\)](#) program in Water Environment Technology, students obtain an associate in Applied Science or an advanced certificate and are ready to take the Wastewater Class "D" Operator Certification examination and the entry-level waterworks certification examinations.
- St. Clair Community College offers a Freshwater Systems – Water Monitoring and Assessment Degree. Kalamazoo Valley Community College is developing a new Water Technology program. Other Michigan higher education institutions offer water-focused programs as part of environmental studies degree and certificate programs; and train students through applied water conservation, restoration, fieldwork, and service-learning programs. Such schools include Muskegon Community College, University of Michigan-Flint, North Central Michigan College, Schoolcraft College, Jackson, Kellogg, Washtenaw, and Westshore Community Colleges.

Our Michigan and Great Lakes waters are also a great learning laboratory to help a range of disciplines come to life, encourage young people to get into fields dealing with water, the environment, and science, and to inspire understanding and appreciation for the place of water in our lives, economy and society. Some examples of this include:

- The HEART Freshwater Center is an alliance of Wayne State University, Macomb Community College, and local governments in southeast Michigan to use the Lake Erie to Huron water corridor as a training ground for water scientists, engineers, and technicians of the future, where real-world water projects can be conducted, providing critical information in the process for the restoration of a vitally important connecting channel in the Great Lakes.
- Saginaw Valley State University and Central Michigan University with support from the National Science Foundation, are working on ways to improve undergraduate and graduate STEM (science, technology, engineering, mathematics) education; students in biology and chemistry are pioneering new techniques through an engaging watershed-based laboratory experience.

And these water education activities extend to our colleges and universities supporting K-12 students to use our water-rich environment to build skills, master content, and to understand and connect to water's role.

- AWRI's Water Resources Outreach Program has used the institution's research vessels to provide on-board water and science hands-on learning programs for more than 155,000 students and community members since 1986.



## Go Deeper

Delta College [38]



- Alpena Community College hosts a remote underwater exploration vehicle competition for high school and college students from across Michigan and the country.
- Michigan Sea Grant, in partnership with other Universities, serve as organizers and hubs for the Great Lakes Stewardship Initiative, to champion “place-based education,” to motivate students to learn by leveraging and strengthening their connection to the places they know, including the waters and watersheds of their own communities, and to build these learning experiences into the ongoing K-12 curriculum.

## **Understanding and Celebrating our Water History and Culture**

Given the role of the Great Lakes and our water in our history and culture, our education institutions also provide a diverse array of courses dedicated to the place of water in society, and our history. A few examples include:

- Northern Michigan University offers courses in nautical archaeology, environmental history, and the traditional Native American use and appreciation of water and landscape.
- Western Michigan University is active in developing new Heritage water trails, and using them to foster an interactive historical educational experience for visitors: integrating bike, kayak and driving routes and creating “tri-modal” recreation corridors.
- Macomb Community College has developed a Water Science and Society course, as part of that region’s reconnection to water as central to the community’s history, life and lifestyle.
- Alpena is home to the country’s only freshwater marine sanctuary, as well as the Great Lakes Marine Heritage Center. It’s where local higher education institutions, such as Alpena Community College, develop exhibits and programming on aspects of marine history and technology, shipwreck research and exploration.

## Northwestern Michigan College

Where the Great Lakes Water Studies Institute Shapes A New Generation of Water Stewards

*The opportunity to know a global drop of water, by putting perspective and what we can do to it, treating it, ignoring, using or misusing, is the perspective of the grassroots of what students study.*

Imagine a dark sandy bottom of a lake, smoothed and shaped by thousands of years of glacial movement. Sonar pulses bounce signals off the bottom, searching for the smallest interference or disruption to shape the acoustic landscape. This is hardly lunar exploration; this is the Grand Traverse Bay, and the work of Hans VanSumeren, Director of the Great Lakes Water Studies Institute. Using the institute's search and recovery sonar or ROV (Remotely Operated Vehicle), VanSumeren and Freshwater Studies students explore the features of the lake bottom, searching for ships wrecked, undiscovered, and undocumented.

VanSumeren explains the mind-expanding survey, a process called hydrographic: "We plan the mission, the approach, get on site, and 'mow the lawn' using acoustics, overlapping the coverage really well. We go over standard operating procedures of the technical equipment with students. We run over the feature, and map the bottom."

If the team finds something with their multi-beam sonar, they'll use a remotely operated sub to "fly over" the found object with video monitoring, to measure and identify it. His excitement in talking about the Grand Traverse Bay, and the technical skills through which students gain the expertise is infectious, "it's like watching *National Geographic*."

The Great Lakes Maritime Academy (GLMA) and the Great Lakes Water Studies Institute (GLWSI) -- part of Northwestern College in Traverse City -- is on the cutting edge of shaping an entire generation of water workers and water stewards. Since 1969 the GLMA has been one of only seven nationally authorized and state designated maritime academies (with the US merchant marine academy). In 2004, under the leadership of Northwestern President Timothy J. Nelson, the GLWSI was borne, becoming the first institution in the nation to award an associates degree in Freshwater Sciences. Today, and each year Northwestern's programs train hundreds of full and part-time students in disciplines ranging from Marine Engineering and Nautical Archaeology to Water Policy and Spanish for Environmental Management. Northwestern's programs merge Traverse City's love for water, and location on Lake Michigan, with the expertise of the staff and faculty, creating a place for people of different ideas and visions to explore careers as well as visions for Grand Traverse Bay and the Great Lakes, and the waters of the world, in a wonderful setting.

‘We can sit down and talk things out’

Hans VanSumeren joined GLWSI during a multi-year dialogue to restore the Boardman River Watershed to its original state. At the time it was the largest river restoration project in the United States. “I would convene groups and ask: ‘how is this the best plan’.” VanSumeren, who grew up in the Traverse Bay, says that with the local knowledge of the Bay and a long history of working with water helped to quell the fears of residents who were at risk of losing waterfront property, those with a fear about loss of energy from dam removal, and potential ecological loss.

“I had been on the rivers, and people knew I was a local entity, and as an engineer without an agenda. And I try to maintain the integrity of the school,” he says. After years of input and assessment about whether to remove aging dams on the river, three dams are now slated for removal – Boardman, Brown Bridge and Sabin – at an expected cost of \$8 million.

Although the Institute is a small staff of three, it plays a collaborative role within the College and beyond to other water institutes, and water researchers across Michigan. Michigan Tech, Grand Valley State University, and Western Michigan University are just a few who have collaborated to streamline student programs, curriculum, and conduct research. Partnerships extend to industry players such as the Marine Advanced Technology Education Center (MATE), which seeks to improve technological education through applied experiences, or C & C Technologies, an international surveying and mapping company that specializes in deepwater services, and more. These partnerships advance curricula to adapt and adjust to the skills needed and technology utilized within the private sector. The trifecta of directed training, applied research and a strong resource pipeline makes the Water Studies Institute ahead of the curve in the United States. So much so that scholars and researchers local to Michigan come to the Grand Traverse Bay to retire as adjuncts for the College, and new job postings lure global applicants. Think brain gain, rather than brain drain.

VanSumeren sees growth for the Great Lakes Water Studies Institute in Traverse City, and it has global implications. “The opportunity to know a global drop of water, by putting perspective and what we can do to it, treating it, ignoring, using or misusing, is the perspective of the grassroots of what students study.” For more info, go to [\*\*nmc.edu/resources/water-studies\*\*](http://nmc.edu/resources/water-studies).

## The University Research Corridor

Maize and Blue, Green and White, Gold and Green— All Create a Blue Economy

*Many have likened water as the new oil, but unlike oil and other energy resources, water is critical for sustaining life on Earth.*

When the roar of the stadiums calm at our major universities, and the rivalries are put aside, the University of Michigan, Michigan State University and Wayne State University are partners in one of the most exciting endeavors this century, the University Research Corridor (URC). You don't need a Masters in Engineering to understand that together these juggernauts of innovation received \$299 million over five years for water-related research, innovation and outreach. The funds came from governments, private companies and foundations. Yes, Michigan universities are performing water-related research on a mighty large scale.

A report prepared by Anderson Economic Group (AEG), a research and consulting firm located in East Lansing, published the accomplishments of the URC in water technology and innovation. In total, 341 different researchers were principal investigators on water-related projects at URC universities. Nearly 3,400 students graduate from the URC institutions annually, prepared to work in water-related fields. The three universities offer 68 undergraduate and graduate degree programs in water-related areas such as engineering, agriculture, public health, natural resources and business. A dizzying array of programs, partnerships, and professional profiles make the URC universities global leaders in water research and innovation.

OK, that's a lot of info to take in. So we asked URC Program Manager, Britany Affolter-Caine, to help break it down, and offer up insights on the roots of URC's vision. With such academic firepower it just makes sense to look at the role of the URC institutions in the Blue Economy.

"In Michigan," she says, "we are fortunate to have three Carnegie-classified public research universities that attract and conduct several billion dollars of academic research and development activity." She also says that researchers at the three universities have for years worked collaboratively, creating networks of study across multiple disciplines and academic fields. For example, Michigan State University and the University of Michigan jointly administer the Michigan Sea Grant, a part of the National Sea Grant College Program, which is charged with identifying environmental challenges, developing solutions, and supporting research to protect and restore the bodies of water that are so critical to the region.

Through the URC, researchers and their work are receiving greater attention, and meaningful relationships are being established across an expanding network within the URC, in and around the Great Lakes, and even across the nation. The URC works with key faculty and administrators to identify and pursue opportunities, and they support collaborative work of researchers from a variety of fields.

Here's an example of the collective expertise of URC: A working group of leading researchers was sent to study a severe and toxic bloom of algae in Lake Erie. This was the largest algae bloom in history, impacting water quality, drinking supply, fisheries and more. The International Joint Commission, a binational organization created by the U.S. and Canada to cooperate in offering scientific advice to better manage the lakes, turned to experts at URC universities to join a team of 60 scientists, engineers, planners and technical experts.

The result – a 2014 report delivered to decision-makers offering key strategies to help restore the lake's ecosystem. This kind of partnership is right up Dr. Affolter-Caine's alley. She's been working for more than a decade to advance higher-education goals of innovation and opportunity for the Great Lakes region. She served as senior research associate for the Great Lakes Economic Initiative with the Brookings Institution's Metropolitan Policy Program. During that time she focused on developing a federal-state agenda to address the challenges facing the Great Lakes region. A graduate of the University of Michigan herself, she highlights water's critical role. "Many have likened water as the new oil, but unlike oil and other energy resources, water is critical for sustaining life on Earth," she says. "Access to quality freshwater is unavailable in some places, and at serious risk in other areas."

That kind of access, or lack of, is a yearly question for residents near Lake St. Clair's Metropark Beach in Macomb County. Contamination of its waters limits swimming, fishing and contact for those seeking respite from hot days. Program advancements from URC partner Wayne State University seek to offer research solutions in hopes to change that. The university and its own partners, Macomb Community College, Huron-Clinton Metropark Authority and Macomb County, have established an interagency partnership on Lake St. Clair. The collaborative, called the Huron to Erie Alliance for Research and Training (HEART) Freshwater Center, aims to create learning opportunities at Metropark and at Detroit's Belle Isle. HEART wants to develop their research laboratories and study causes and consequences of pollution, from stormwater runoff and beach health to invasive species and marsh restoration. Interagency partnerships such as this have the potential to bring new lessons about how we manage the lake's ecosystem. HEART will support workshops, seminars and host visiting faculty and scientists who will impact about four million people along the waterway. HEART will also inform watershed managers and policy makers from a variety of urban freshwater environments.

Affolter-Caine reiterates, "Innovation through water-related research is important for the development of new technologies and processes." Usable and measurable research can enable industries that depend on water resources to better manage them. Just about any Michigan job you can imagine either directly or indirectly depends on water as a resource. In their report, AEG took a deep dive into the different water-dependent employment sectors. To estimate Blue Economy employment, industries that would both benefit from, and have a role in, implementation of water-related technology innovations were selected and categorized as either Core Water Services and Products or Water-Enabled industries. Industries in Core Water Services and Products include engineering, and other professional, technical and scientific services, utilities such as wastewater management and treatment. Water-Enabled industries span from biological services like agriculture and commercial fishing, to automotive manufacturing and food processing. Total Blue Economy employment in Michigan is greater than 718,000. In other words, one of every five jobs depends on water for its existence. That ranks Michigan fourth in the nation in employment in water-intensive industries. This is not even including what the AEG report calls "downstream industries" like the state's tourism, much of which is dependent on water.

Michigan's entire economic history has been dependent on the water of the Great Lakes system and its inland lakes and streams – from shipping and fishing, to manufacturing and agriculture. That's not news, but sustaining and growing Michigan's Blue Economy requires focus and innovation.

"Sustaining the Blue Economy requires continued and expanded research and development as well as outreach activity, which is dependent on funding support," Affolter-Caine says. There's a rising demand in national and international markets for water-related investment and innovation. The research needed to develop new technologies centers around the efficient uses of water and the access to clean water for drinking, heating, cooling and sanitation. Researchers estimate that the demand for freshwater technology is about \$400 billion annually around the world, \$100 billion in the United States alone.

The U.S. Environmental Protection Agency estimates that the nation's drinking water infrastructure will need \$384 billion in investments by 2030. "We face big water problems in our region and abroad that require complex solutions – solutions that can be developed through partnerships and collaboration in research," Affolter-Caine says. "This is our big opportunity to positively impact the economy and environment."

***Read the AEG report,*** "Innovating for the Blue Economy: Water Research at the URC," here: [tinyurl.com/lojjqfa](https://tinyurl.com/lojjqfa)



## Delta College

### Michigan School Secures Future of Clean Water Operations

*We cover the entire gamut of what one might be expected to do if they worked in a water or wastewater plant, so they know the terminology and the lingo that people speak.*

Clean water doesn't just happen.

Water treatment facilities and wastewater treatment plants – and those who operate them – provide towns and cities a critical defense against polluted waterways and waterborne illness.

Should those operations fail, communities suffer the human health, environmental and economic consequences of losing access to clean drinking and pollution of local lakes and rivers.

So keeping those systems in working order is paramount. But the job requires a unique set of skills. Water treatment operators must possess a broad educational background and a high degree of technical knowledge in subjects as diverse as electrical equipment maintenance, water chemistry, and management and budgeting. They must also be adept at adopting new ways of doing things as technologies and regulatory requirements advance. Finding qualified candidates is not easy.

“Once upon a time, you didn't need to be very technically qualified to do this work, but with all of the requirements at the state and national level for water quality, this is a pretty sophisticated field now, and the men and women that work in the field have to have a broad-based knowledge of math, science, and the environment,” says Ronald Sharp, Professor of Chemistry and Coordinator of the Water Environment at Technology (WET) Program Delta College in Saginaw, Michigan. “It takes talent to do all those things.”

Cultivating that talent is the aim of Delta's WET program, which offers both an Associate's Degree and an Advanced Certificate in Water Environment Technology. Participants study water treatment processes for drinking water, wastewater treatment, water chemistry, hydraulics, biological processes, pollution prevention, and utility management and maintenance. Coursework is supplemented with two practicums; students work for one month in a water treatment plant and a second month in a wastewater treatment plant.

“We're preparing the next generation of persons to be involved in the water industry, usually in the State of Michigan,” Sharp says. “When they come out, they are technically qualified to step right in, because they've done those jobs under the supervision of people in a water and a waste water plant.”

Graduates of the program are eligible to sit for the Michigan Department of Environmental Quality's entry-level water and wastewater certification examinations, which qualifies them to

work as municipal water and wastewater facility operators. Delta is one of only two colleges in the state offering such a program; the other is at Bay de Noc Community College in Escanaba.

The program launched in the early '90s, when Delta's president tapped Sharp to look into building a water treatment and wastewater certification program out of the Chemistry department, in response to industry need.

"The mayor of Midland reached out to our president, because he was having a hard time getting qualified people to work in the city's water and waste water plants," Sharp recalls. "So I sat down with some of the local plant operators, and we devised this program way back in 1990, and it's been going ever since."

Sharp oversees the program and serves as liaison between faculty, who are people that work in various capacities within the water treatment industry.

"They are all superintendents of the plants, or lab supervisors, or maintenance supervisors," Sharp says. "These are all people who actually work in the field, so we have had an almost 100 percent pass rate for all of our students when they sit for the state exams."

Most of the students have families and full-time jobs, Sharp says. Classes are held at night, and typically 3-4 students graduate per year on average. Many are older students looking for a second career. Others are looking for a path into a knowledge-based career after years spent working service jobs. Many students end up working in municipal treatment, while others work in private industry. The program's strength, according to Sharp, is its strong emphasis on developing practical skills.

"We developed our program to meet the needs of the Michigan community," Sharp explains. "We cover the entire gamut of what one might be expected to do if they worked in a water or wastewater plant, so they know the terminology and the lingo that people speak." For more info, go to ***Delta.edu***.

# Grand Valley State University - The Annis Water Resources Institute

Building a Blue Economy Via Science and Community

*The Annis Water Resources Institute has been a boon for the community, from providing regular public education opportunities for residents and tourists aboard its research vessels, to serving as an advocate for the restoration of Muskegon Lake.*

Like so many historic Michigan towns, Muskegon was built on water, and water fueled its industry and prosperity for many years. First as a lumber town in the 1800s and then as a diverse industry town with foundries, paper mills and manufacturing, the city helped to build the American economy and fuel the war efforts. But that industry came with a cost, and much of it was borne by the very thing that created the town in the first place: the local waterways.

“Muskegon Lake has always been the basis of the economic health of Muskegon,” says Alan Steinman, Director of the Annis Water Resources Institute at Grand Valley State University. “You can go back to the early first settlers of this region, and they used Muskegon River and Muskegon Lake. Fur traders were settling into this area, and they used the Great Lakes as their navigation system for commerce. That was replaced in the 1800s by the lumber industry. We had 47 active sawmills on Muskegon Lake, if you can imagine that. The upside, of course, was the economic growth of Muskegon, the downside was they basically destroyed the Eastern White Pine Forest in the Muskegon River watershed.”

After logging, industry came and further damaged the watershed.

“When logging died off in the late 1800s, industry came into this area,” Steinman says. “They used the lake, for all intents and purposes, as a sewer. The economy thrived as the factories came in, but all the industrial effluent went into Muskegon Lake.”

Now that much of that industry has declined, Muskegonites began looking for ways to revitalize their economy. And once again, they turned to the water, seeing in it a potential to not only attract tourism, but also to provide the quality of life amenities important to workers in the new knowledge economy.

But the water needed some help.

“By the mid- to late- 20th century, people realized that the lake has another purpose besides just serving as a cesspool and a sewer,” Steinman says. “They realized there were opportunities to be had by cleaning it up. Instead of turning their backs to the water and using it as a sewer, they turned towards the lake.”

Part of turning toward the lake was the relocation of the Annis Water Resources Institute from GVSU's main campus in Allendale to the Muskegon Lake shoreline. Originally established in 1986 (later renamed after Robert B. Annis, an Indianapolis-based inventor and donor with connections to west Michigan) with a mission to "integrate research, education, and outreach to enhance and preserve freshwater resources" it operates as a research enterprise within the College of Liberal Arts and Sciences at GVSU. Its lakefront location affords its researchers and students access to plenty of wetlands, streams, and inland lakes, and Lake Michigan.

The Institute carries on multiple research and education projects related to freshwater resources, and owns and operates its own research vessels. But it also placed a priority on connecting with the local community and has been a major catalyst for the restoration of Muskegon Lake, which is on the U.S. Environmental Protection Agency's list of Great Lakes Areas of Concern –bodies of water with high levels of ecological degradation.

"The latest period of Muskegon Lake is recognition of its value in terms of water quality, recreation, and in terms of being a tourist destination for this region," Steinman says. "That's one of the reasons why Muskegon wanted the Annis Water Resources Institute to come from the campus in Allendale to Muskegon in 2001. In fact the community paid for the bricks and mortar of the building that we sit in. It was the largest capital campaign that Muskegon had ever done."

And in return, the Institute has been a boon for the community, from providing regular public education opportunities for residents and tourists aboard its research vessels, to serving as a research arm and an advocate for the restoration of Muskegon Lake. The Institute, in partnership with local community philanthropy groups, helped raise \$250,000 in local funds to create an endowment fund for monitoring of the health of Muskegon Lake. Since the lake had undergone extensive restoration, it was very important to monitor things like water clarity and chemistry, to ensure the restoration was working. The Institute was able to leverage additional millions in research funds.

"That gives you an idea of the kind of generosity and interest in this region in doing this kind of work," Steinman says. "They recognize the importance of research. They understand the importance of monitoring to identify what's going on with the system, and these dollars can be used to leverage additional money." For more info, go to [gvsu.edu/wri](http://gvsu.edu/wri).

## Central Michigan University

Measuring the ecosystem health of more than 1000 Great Lakes Wetlands

*We are at a point in time where it makes sense to talk to politicians and the public about what a healthy ecosystem means for our economy.*

After the economic recession of 2008, many universities were slashing budgets, but Central Michigan University (CMU) chose to increase funding to one particular area – Great Lakes research.

So it is that the Institute for Great Lakes Research (IGLR) at CMU presents a multi-disciplinary approach to the study of the Great Lakes, with 24 faculty members in four different departments, including biology, chemistry, earth and atmospheric sciences, and geography.

Donald Uzarski is the director of the IGLR. He joined the university back in 2007 after stints at Grand Valley State University and Michigan State University. He earned his Ph.D. at MSU in limnology, so he's a specialist in aquatic ecology, particularly that of the Great Lakes coastal wetlands. He is currently leading the Great Lakes Coastal Wetlands Monitoring program, which is a five-year study that measures the ecosystem health of more than 1,000 coastal wetlands across the Great Lakes basin.

The program involves the eight states and two Canadian provinces bordering the Great Lakes. In 2010, the federal Environmental Protection Agency (EPA) announced the Great Lakes Restoration Initiative, the largest investment in the Great Lakes in two decades. IGLR was awarded \$10 million in federal funds for the five-year study, which, at the time of writing, is in its final year.

By sampling every aspect of the coastal wetland – from its water quality, fish, plants, birds, amphibians, and more – Uzarski and his team have been able to develop a standardized system for quantifying ecosystem health. (And they've been measuring the majority of coastal wetlands in the Great Lakes basin.) Such wetlands provide many ecosystem services such as flood control, removing toxins from water runoff before it enters the Great Lakes, providing a habitat for fish and wildlife, and recreational benefits such as birding, hunting and fishing.

But IGLR discovered that such wetlands provide ecosystem services that are much bigger and greater than previously imagined. Even though coastal wetlands make up only one percent of the area of the Great Lakes, they are hotspots for biology and productivity. "They provide the energy that feeds the entire Great Lakes ecosystem," Uzarski says. "We have already destroyed 50 percent of our coastal wetlands, and we are just now realizing how important they are."

The monitoring process will ultimately help inform restoration efforts. The next phase of the Great Lakes Restoration Initiative is to restore 60,000 acres of coastal wetlands between 2015-2019, and they are using IGLR's database to determine where restoration should occur and exactly what type of restoration. "We are finding that you can't put one label on an entire coastal

wetland,” Uzarski says. “You have to compartmentalize that ecosystem in order to best focus your efforts, whether it’s looking at the water quality or vegetation or invasive species.”

In a separate research project, the IGLR has been measuring the fixed carbon found in fish in the open water of the Great Lakes – first they examine the ear bones, which reveal daily growth rings, and they are then able to use chemical forensics to track where that fish was gaining energy at any given time. They’ve found that a whopping 90 percent of all fish species in the Great Lakes use the coastal wetlands as an energy source.

They have also come across a few unintended benefits of their research. “Because we are sampling so many places,” Uzarski says, “we are getting a much better picture of where invasive species populations are growing.” They have helped inform the U.S. Geological Survey’s NAS (nonindigenous aquatic species) database, as well as those of endangered and threatened species.

Uzarski is also the director of the CMU Biological Station located on Beaver Island, 32 miles northwest of Charlevoix. The classes offered at the Bio-station are immersive and allow students to experience field studies at a very early stage in their academic career.

“Everyone that grew up around the Great Lakes has some appreciation for the ecosystem, but its not until you start diving into the science that you can truly understand their importance,” he says.

As IGLR continues to grow, it is rounding out its expertise by implementing a position for an environmental economist. “We are at a point in time where it makes sense to talk to politicians and the public about what a healthy ecosystem means for our economy,” Uzarski says. “When we can talk in those terms, people will listen.” For more info, go to [\*\*cmich.edu\*\*](http://cmich.edu).





# Blue Places

## Reconnecting to our magical waters.

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Communities restoring and reconnecting to their waterfronts and waterways; turning to face the water, placing water access, use and enjoyment at the center of community life and development visions, making magical places to live, work and play.

Leveraging Michigan's abundant natural water assets: coasts, harbors, rivers, lakes, wetlands and streams, through restoration, enhancing access, and organizing community development around them – water placemaking – contributes powerfully to an improved quality of life for Michigan's residents and a healthy environment. This also can translate into tremendous economic development benefits, with jobs flowing from new water-related access, use, supporting infrastructure, and amenities.

In a global economy where educated talented people, professionals and entrepreneurs can choose where they want to live and work, factors such as quality of life, amenities, and lifestyle have grown in their importance. Access to, and enjoyment of, water is a key locational asset. There is only so much waterfront real estate, and Michigan's 3,000-plus miles of Great Lakes freshwater coast; 11,000 inland lakes; hundreds of rivers; and numerous coastal and inland wetlands make it a beautiful, magical place to live and work: if the water is clean, and the lakes and beaches, are accessible. People like to live, work, and play near water; to sit at a restaurant, watch birds, fish, swim, boat, enjoy a sunrise, or sunset over water. This is all possible if there is public access, if the water is clean, if we remove the slag piles, and rusting factories, and allow for beaches, parks and wetlands to be protected, improved and expanded; and if we facilitate the development of walkways, marinas, and new commercial and residential development.

The Michigan communities such as Traverse City, which realized first that the industrial uses of their waterfront were growing redundant, and that a higher calling would be to restore their health, and provide access to the water for enjoyment, recreation and community identity – have reaped significant long-term economic benefits from this transformation. Traverse City wiped

away their cherry canneries on the lakefront decades ago, and has consistently, and evermore systematically, reconnected to their water, redeveloping its waterfront for use and enjoyment. Many other Michigan communities, from, [Petoskey](#), to Marquette and Grand Rapids, have been at similar work for years. At the other end of the continuum, such communities as Kalamazoo and Flint, and Benton Harbor and St. Joseph, are only now looking at their water and rivers as potential fulcrums for community revitalization, and working to take the first steps to reconnect to their water, and helping to revitalize their communities.

We are only recently beginning to turn our communities and our psyches to literally face the water, to reconnect our communities to our waterfronts, understanding the old real estate adage: “location, location, location”; waterfront real estate has unique economic value. And we do occupy a special piece of waterfront real estate in Michigan. No matter where you are in our state, you are only six miles from a natural body of water. This gives Michigan the opportunity to make both the imagery and reality of “Pure Michigan” the centerpiece of our economic story.

The starting points for any reuse are water-quality restoration and access. Studies show a 3:1 to 6.6:1 return on investment, in the form of increased property values and local economic development from restoring water quality and shoreline habitat. Another more recent study commissioned by the U.S. Fish and Wildlife Service found that every \$1 invested in local restoration projects leveraged \$6.86 dollars from local and private partners, which collectively created \$12.78 dollars in economic returns.

In addition to long-term benefits of healthy waters, we know today these waters contribute to increased community attractiveness and economic vitality, accelerate community population growth and tourism, and generate new economic activity. Residents pay more to live in areas with parks and open spaces, lakes, rivers, wetlands, and other environmental amenities. At the same time, residents drawn to environmentally attractive places help communities create more wealth and jobs, and enjoy higher wages. A 2012 study by the Michigan Land Policy Institute found a strong correlation in Michigan communities between natural features like access to wetlands, waterways, and shoreline and measures of economic performance including incomes and jobs.

Waterfront reclamation, beach and riverfront access and preservation, water-based development trails, including walkways, parks, marinas, residential and commercial developments (restaurants, lodging, office units, canoe, bike, and boat rentals), access to water for healthy, outdoor lifestyles, and water sports and activities from fishing, boating, to birding – all provide direct economic benefits. For example:

- A recent Great Lakes Commission Study showed Michigan recreational boaters’ direct and indirect spending is \$3.9 billion in Michigan, contributing to more 50,000 jobs.
- According to state rankings compiled by Michigan’s Department of Natural Resources, Michigan anglers contribute \$2 billion annually to the state.
- Coastal tourism, from birding to beach visits, is responsible for 57,000 jobs and \$955 million in earnings every year, as reported by Michigan Sea Grant and



## Go Deeper

Petoskey [70]

Michigan's Great Lakes Jobs.

- Michigan's inland lakes attract residents and visitors, with property values worth over \$200 billion, and contribute \$3.5 billion in annual tax revenues, according to a report by Progressive AE.
- A Great Lakes Commission study shows that the small, but growing Michigan canoe and kayaking industry already contributes \$140 million a year to the economy.
- And the Great Lakes Commission reports more than \$163 million dollars has been spent in Michigan on Great Lakes Restoration projects, leading to a conservative estimated economic impact of \$500 million, using the conservative estimate by the Brookings Institution.

## Communities “Reconnect” to Water

Communities across Michigan are participating in significant water cleanup and restoration activities, and are advancing new community development visions around their water assets. Starting at very different places, catalyzed by varied stakeholders, with many exciting strategies, communities are taking many paths to reach the water.

Michigan communities are at varied points, but almost all are moving on a continuum from treating their water as a dumping ground, to seeing water as a new community “main street” and meeting place. Traverse City was among the first Michigan communities to remake their lakefront, and have one of the strongest community engagements and identifications with the water. Today they are working with counties/ townships and other partners on a broader Bay Front waterfront plan that includes such interesting features as a new Waterfront Development District, including a Freshwater Campus for both commercial and non-profits and museums. [Grand Rapids](#) began more 20 years ago – encouraged by strong public desire to “reconnect to the river,” to deliberately remake their downtown plans and zoning to repurpose parcels along the Grand River and stitch public water access into new developments. Port Huron, now joined by adjacent communities, got started a bit later, but is today advancing a comprehensive “Blue Meets Green” agenda, reconnecting the community to Lake Huron and the St. Clair River. [South Haven](#) has advanced a string of projects to increase access and purposefully tie together the downtown and its impressive beach and beachfront. The Detroit Riverfront, from Belle Isle to the Ambassador Bridge, has been fundamentally transformed over the past dozen years. Smaller Michigan communities such as Portland created a second storefront and “main street” with a new boardwalk overlooking the Grand River, and businesses opening their doors, storefronts and restaurants along this walkway and community gathering place. [Chesaning](#) removed a dam, reanimated river rapids, and reconnected their historic downtown to the Shiawassee River.



### Go Deeper

[Grand Rapids](#) [55]

[South Haven](#) [73]

[Chesaning](#) [67]

## Catalysts Come from Many Quarters

**Macomb County's Blue Economy Initiative** began when county economic development officials and chamber of commerce leaders saw the power of organizing around water in similar communities, and the newly elected County Executive Mark Hackel seized the agenda to help redefine Macomb County's identity and brand as a choice lifestyle location. In Marquette and Allegan, the city government has been the catalyst. In the Saginaw Bay Region, Dow Chemical and other corporate partners came together twenty years ago to form a corporate and philanthropic watershed-wide pool of resources to regrant for strategic investments. The Saginaw Bay Watershed Initiative, a unique collaborative of communities, conservationists, foundations and businesses, was created to identify issues, set priorities and develop projects that steward natural resources, strengthen local economies, and nurture agriculture and nature-based tourism in Saginaw Bay. "Water towns" along the Clinton River, and the **Huron River "RiverUP!"** initiative work to increase access and connection in communities along their respective rivers, and were organized by philanthropy working closely with watershed organizations.

## Many Paths to Reach the Water

**Manistee County's Explore the Shores** initiative was catalyzed by an Easter Seals foundation grant to provide disabled populations access to water – and today is working to attract 1 million visitors to use and enjoy 50 or more universally accessible sites. These sites are developed to provide unique and superior access opportunities for all – and are marketed to serve the growing numbers of disabled, veterans, seniors, parents with very young children and strollers, who benefit by easy access, use and enjoyment of the county's bounty of water resources. Along the Clinton River, the Erb Foundation supported the "Water Towns" initiative, managed by the **Clinton River Watershed Council**; communities as diverse as Rochester, Rochester Hills, Auburn Hills, Mt Clemens, Macomb Township and Utica newly identify themselves as "Water Towns" – building elements of water-based development into their master plans.

In Sault Ste. Marie, the waterfront is dominated by the historic Sault Locks. But with 50 documented historical sites in the city including 12 National Register Sites and a number of waterfront parks – the community is trying to tie together this "string of pearls" more systematically along the waterfront. The **Alpena** region's unique history also plays a key role, with the Thunder Bay National Marine Sanctuary – the only freshwater marine sanctuary in the country – providing unique access to Great Lakes shipwrecks; a museum of Great Lakes maritime history helps the area serve as a center of research and education activities, in an effort to better understand and protect the recreational, historical and archeological value of the region's maritime heritage resources. Saugatuck, already blessed with some of the nicest Great Lakes beaches, worked hard to manage development, keep views to the water open, and added an arts-and-culture theme to make them a prime destination and choice location for residence on the water.



### Go Deeper

Macomb County —  
Southeast Michigan [60]

Huron River "RiverUP!" —  
Southeast Michigan [59]

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## Public Access Leverages Private Market

**Marquette's** cycle of repurposing redundant industrial and harbor front facilities for public and private development demonstrates the power of a multi-faceted public-private access strategy. With several major sites repurposed during the '70s and '80s, then guided by a 1996 city master plan, there emerged a pattern: The city purchases lands not used for industrial purpose. Then it repurposes them for public access, which allows private development and private dollars to come in. A great example is Founders Landing in the 1990s, an old rail yard – the city purchased it, helped clean it and put in infrastructure – which results in the private sector bringing \$5 million in investment in neighboring properties to those publically owned.

Charlevoix, already a popular scenic and historic summering ground on Lake Michigan for affluent residents, is working to enhance tourism and amenity-driven businesses, by expanding access for visitors with expanded docks and marinas, and ferry services.



### Go Deeper

Marquette [51]

Tawas City [65]

## It Starts with the Cleanup

The starting point for many of the Michigan communities has been the imperative of water cleanup and water restoration. Driven by the need to cleanup and de-list our Areas of Concern and severely polluted waters, the port communities of Monroe and Muskegon, have evolved from a “cleanup” strategy to more purposeful waterfront redevelopment and leveraging efforts. In Muskegon, early major cleanup projects like the Ruddiman Creek cleanup in 2006, and the Hartshorn Marina cleanup, showed the community visible progress. More comprehensive planning has been done, and strings of projects followed, including a \$10 million dollar project to restore the shoreline of Muskegon Lake, which both created vital habitat and opened up the lake for public access, via a newly constructed bike trail. In Monroe, cleanup and reclamation of industrial zones around the power plant and wetlands areas is now extending up the Monroe River: building fishways, improving kayak and canoe usage, tying in their history with the National battlefield. The National Park service is now working to develop a Maritime Heritage Area along the Monroe River.

## The Power of Public Engagement

A key ingredient in successful water placemaking strategies has been meaningful public input in visioning and planning. Communities like Traverse City took a deliberately constructed, community-informed vision (“Your Bay – Your Say”) and started to implement it piece by piece, achieving significant results. The City of Allegan, sitting on an oxbow in the Kalamazoo River, began reconnecting with their water 30 years ago with a bridge modernization project; subsequent future city plans and visioning processes began to focus on people’s needs, the water and enjoyment – and reconnecting to waterfront. After some riverfront access-building work in the '80s and '90s, a state placemaking-funded effort in recent years included broader community-visioning work, which developed a plan for more comprehensive riverfront development. In Nov. 2013, the community asked for, and won, a local vote for a sinking fund millage of \$0.5 million to finance elements of the plan. In 2007, **Tawas City** officials invited residents to help shape a vision

for this Lake Huron community. The major goal that emerged was to redevelop and transform the U.S. 23 commercial corridor between the Lakefront and Tawas River – which they did by stitching together river-walk trails, a redeveloped lakefront, and connections to historic public buildings and new mixed-use development.

**Port Huron's** city-led efforts never took shape until a more deliberate, consultative process took hold. A key catalyst came when the Community Foundation formed a broad coalition of public and private partners and stakeholders, including St. Clair County, to create the Blue Water River Walk. Now a \$6 million effort, the River Walk has allowed the community to reclaim its waterfront and has helped focus public attention and regional strategy on a broader effort to redefine local economic prosperity under the umbrella of the Blue Economy. Now, a broader coalition of public and private stakeholders from throughout St. Clair County follow the region's master economic plan called "Blue Meets Green," which outlines a path towards economic growth and prosperity.



## Go Deeper

Port Huron — Southeast Michigan [60]

Southeast Michigan [57]

## Connecting Communities - Regional Approaches

In addition to community-based efforts, water can tie together whole regions and can be the fulcrum for remaking a region's economy and identify towards the Blue Economy. That is what's happening in Manistee County, with the "Lakes to Land Regional Initiative" – an unprecedented collaborative effort where 18 units of government are working to update their master plans and develop a collaborative plan with action strategies for the region, running from Manistee to Frankfort and inland around Crystal Lake. Another major regional Blue Economy initiative is underway nearby, along the Boardman River. A Boardman River Watershed Prosperity Plan has recently been completed which provides an entirely new template for watershed planning. The purpose of the "Prosperity Plan" is to protect and preserve the natural and environmental features of the Boardman River Watershed and identify how the unique attributes of the watershed can be leveraged for economic development.

The chamber of commerce and business leaders in Bay County (which historically has provided little access to Saginaw Bay) have developed a new Bay County Economic Roadmap, which includes a regional priority to grow the Blue Economy – including enhancing waterfront public access, and water amenity developments. These leaders realized that to attract and keep top professional talent, they needed to develop and market the quality of life and lifestyle of the region. They have rebranded the region from Tri-Cities to the Great Lakes Bay region – and are promoting the image, and working to make a real selling point real of water and bay access.

In **Southeast Michigan**, the necklace of water running from Monroe to Port Huron is being restitched and linked to the inland parks and greenways, enhancing public access and use. The Detroit International Wildlife Refuge, connects to the Detroit Heritage River Water Trail, new access points along the refurbished Detroit Riverfront, and Belle Isle, which is now a state park undergoing a makeover. Restoration and water reconnection work extends along Lake St. Clair to Macomb County, whose Blue Economy Initiative includes a new shoreline paddling trail and the \$1.5 million dollar restoration of Lake St. Clair Metropark, all the way to Port Huron and its brand new Blue Water River Walk.



And in the northeastern quadrant of Michigan, leaders and organizations are coming together to ask the question: what's the economic future of Northeast Michigan? Its natural and water assets may be its most salient economic feature. There the conservation organization Huron Pines is helping convene stakeholders to press toward a vision.

# Marquette, MI

## A Working Waterfront Builds a Blue Economy

*Marquette's waterfront today features physical connections to its historic downtown and reclaimed public space for the community, alongside an active port.*

A city's waterfront can be many things. It can be a quiet place to reflect, or a place to gather with friends and family. It can provide a source of recreation for fishing, paddling and boating. It can be an engine of tourism, drawing people from near and far to bask in its splendor and perhaps dip a toe. And it can be center of industry, providing water for manufacturing and a port where raw materials can be delivered from water to land, and finished goods from land to water.

Over the past two centuries, the City of Marquette's waterfront in Michigan's Upper Peninsula has been all of these things for the community it serves. Marquette Harbor is a federally authorized deep-draft commercial, cargo and recreational harbor with more than 4,500 feet of maintained breakwater structure and a half-mile long, 27-foot deep navigation channel. It is a true working waterfront, where activities integrate people, history and business into an authentic place unlike any other.

But that integration did not happen on its own; the Marquette waterfront of today is the result of decades of careful planning on the part of the City of Marquette.

"Over the course of time, the city, because it was an industrial city, had turned its back on Lake Superior," says Dennis Stachewicz, Director of Planning and Community Development for the City of Marquette. "When you were at the waterfront, you were looking at the backs of buildings. One of the most important aspects of our community planning was recognizing that. And that allowed us to refocus our efforts towards reclaiming people space on the waterfront."

But part of the process of doing that, Stachewicz says, was respecting the history and significance of being an historic city with a real working waterfront, and capitalizing on that uniqueness to drive new people-oriented developments without losing sight of what makes a working waterfront special in the first place.

"It's very easy for people to forget that industry is part of a working waterfront, and it's very easy for people to want to make it all a park," Stachewicz says. Engaging people often, and early, is critical to creating community that people can feel invested in while making sure all voices are heard.

"There's a very fine line that makes you be able to permit people-oriented activities on a working waterfront, without over-managing the expectations of your community," he says. "It's very important to ensure that the entire community is informed and educated, and try to get them to participate as much as possible. That was one of the things we did with our waterfront planning process."

Marquette's waterfront today features physical connections to its historic downtown and reclaimed public space for the community, alongside an active port.

"We've also mixed that with significant investment in terms of residential development," Stachewicz says. "We've seen a lot of new bedrooms close to the downtown. From a planning perspective, the more bedrooms that you put adjacent to the downtown, the more that the downtown becomes viable."

The Lower Harbor waterfront district has also been transformed through strategic multi-use, public-private developments. Parcels were purchased by the city and re-purposed for redevelopment. These public-private developments have made the community increasingly attractive, with new condominiums, which initially sold for \$300,000, now worth \$500,000. The city estimates that public purchase and bonding to pay for these efforts has leveraged tens of millions of private dollars for brownfield reclamation and private redevelopment.

And for the first time in decades, the 2010 census showed an increase in population, at a time when the Upper Peninsula of Michigan continues to lose population. Those transplants are not all retirees and college students, but include millennials who may be working remotely at jobs that would never have afforded them the opportunity to live in a pristine northern town before the Internet, or who find employment in the tourism sector or with anchor institutions like Northern Michigan University and Marquette General Health.

"Not only are we seeing an increase in people, we're seeing an increase in the age cohort of 24-35," Stachewicz says. "It's not just retirement people moving up here. It's young people that are looking for jobs. They move to a place they want to live, and then they find work later." ***For more info, go to [tinyurl.com/oj3qqr9](https://tinyurl.com/oj3qqr9).***

# Manistee County

Exploring the Shores in the Fishing Capitol of the Midwest

*In Michigan there has never been a concerted effort on this scale to leverage our water resources ...*

Manistee County is known as the fishing capitol of the Midwest, which is hardly a surprise given that a striking 52 percent of the area's 1,281 square miles is made up of water. In 2008 the Manistee Community Foundation launched Explore the Shores (ETS), an initiative designed to leverage the area's abundant water assets to attract more people to the county and improve access for its residents.

ETS was first formed after the Easter Seals Michigan identified Manistee as one of two rural areas in the nation (the other was in Georgia) for a project funded by the USDA Office of Rural Development. The goal was to develop an action plan considering the needs and inclusion of people with disabilities countywide. The timing was perfect as Manistee County had just completed its first visioning effort and improving access to the area's rivers, streams, inland lakes, Great Lakes shoreline and wetlands was an integral part of the master plan.

The goal of ETS is to bring 1 million visitors to Manistee County by the year 2020. Its mission is to develop 50 sites with universal access and design, which means folks of all ages, means, and abilities can access and use the county's water resources in multiple ways.

Tim Ervin, a trustee of the Manistee Community Foundation and a consultant for the Alliance for Economic Success, leads fundraising for the initiative. "We started with the goal of making water a real driver of Manistee County's economy, and also a point of differentiation for us," he says. "In Michigan there has never been a concerted effort on this scale to leverage our water resources through universal design."

The initiative has leveraged more than \$4 million in funding from 22 sources, including governments, corporate and private foundations, and individual philanthropy. More than 70 partners are involved including federal, state and local agencies, the Little River Band of Ottawa Indians, Fishing organizations, schools and tourism and business groups along with the Grand Traverse Regional Land Conservancy.

ETS offers a public nomination process to encourage communities to identify their own sites to be a part of the program. Anyone can nominate an ETS site and a team will then assess the nomination based on a number of factors including diversity of use, the site's existing facilities, development needs, and ease of access. This last factor is a cornerstone of the program because by 2020, it is projected that 52 percent of Manistee's population will be 65 or older, with 37 percent considered disabled.

“Water is the one thing I enjoy more than anything else,” says Ervin, who is an experienced fisherman and visited Manistee for many years before he decided to retire there in 2007. “Seeing people who have never experienced the value of our waters or gone fishing in the Great Lakes have the opportunity to do so is the best part of my work.”

Ervin has a background in fundraising and has observed how the initiative has enabled a greater interest in community-based philanthropy. “It’s changed people’s understanding of philanthropy by providing a focus for charitable giving in people’s own backyards,” he says. For example, the township of Arcadia, with a population of just over 600 people, upgraded their fishing pier and developed the county’s first universally accessible kayak and canoe launch on Arcadia Lake, which has proven to be a huge draw for individuals from communities throughout Northern Michigan.

Other important sites that have been developed as part of ETS is Bear Creek at Spirit of the Woods, a prime tributary for natural reproduction of salmon and trout and the Department of Natural Resources (DNR) viewing station for observing migrating fish on the Little Manistee River. Manistee County is the birthplace of Pacific salmon in the Great Lakes basin and every fall, thousands of salmon return to the area to spawn. ETS has developed a universally accessible angler’s trail on Bear Creek for fishermen to fish down the river. They have received many grateful letters from disabled military veterans saying they never thought they’d have the opportunity to enjoy their passion again.

The program has had overwhelming success and was recognized by the U.S. Forest Service as one of the five outstanding collaborative efforts in the U.S. The DNR has also spent time studying the program in terms of its transferability, and other counties are in the process of implementing similar programs with the help of ETS supporters.

“This could be a huge rainmaker for the entire state,” Ervin says. “If you think about it, 20 percent of all the freshwater in the world is in Michigan. The program has had a demonstrable economic impact and a demonstrable quality of life impact. Everybody wins.” For more info, go to ***exploreshores.com***.

## Grand Rapids

### The Return of the Rapids

*I get the spiritualness the Native Americans had to this place. Restoring the rapids will be century-forming impacts for the next hundred years.*

Not unlike other rust belt cities, abandoned buildings fettered the riverfront of the Grand River, Michigan's longest river. Spanning from Jackson to Grand Haven, it bends and falls 18 feet in Grand Rapids, giving the city its namesake. Although few would know its rapids; in fact, European settlers built dams to control the flow and stability of the Grand River to aid the furniture industry. Grand Rapids, or "Furniture City," was a leader in furniture production, boasting more than 50 furniture companies by 1900. The river also received manufacturing waste, flushed in its waters for decades, leaving a legacy of pollution in its wake beyond the decline of furniture manufacturing. Today the Grand River defines the downtown and the Grand Rapids quality of life – planners might freely use walkability or connectivity to describe its place in the public landscape.

Here enters Rick Chapla, a self-proclaimed "citizen" of western Michigan, who has seen the transformation of the area first hand. "The work that I did and do is very personal, and get flashbacks of places I have been when I was a kid." As the Vice President of Business Development at The Right Place, a regional non-profit economic development organization, Chapla's no stranger to transformation. A side note: his previous work experience includes 16 years with the City of Muskegon, where he served in a variety of positions including Director of Planning and Economic Development. A planner and preservationist, Chapla says he would walk "the banks of the Grand River and wonder why, literally, landfills and dumps were located along the Grand River, tires set on fire and burning and pushed into the River, landfill debris." The imagery left a deep impression on him.

In 1996, the City of Grand Rapids set out to redefine the Grand River through a process called Vision and Voices. The initiative included an investment of \$200,000 to bring in the stakeholders into a multi-year process. What resulted: the capitulation of a new direction for the usage of the Grand River from a industrial utility to a pedestrian asset, not only owned, but defined by residents and business owners in the area. The process, just as important as its outcome, devoted and centralized "citizen engagement." Chapla recalls the process "an environmental awakening." This transformational moment of post-Earth Day politic in the 1990s brought the community to ask critical questions. Chapla equates the moment to another sort of awakening, where "Vision and Voices was the Earth Day recognition of the Grand Rapids value."

Value is nothing to scoff at, studies show a 3:1 to 6:1 return on investment, in the form of increased property values and local economic development from restoring water quality and shoreline habitat. Another more recent study commissioned by the U.S. Fish and Wildlife

Service found that every \$1 invested in local restoration projects leveraged \$6.86 dollars from local and private partners, which collectively created \$12.78 dollars in economic returns.

Vision and Voices process of 1996 played a role in ushering private investment today – an ambitious project to restore the whitewater rapids known before the construction of dams for the furniture industry. Grand Rapids Whitewater, a non-profit, commissioned a report estimating an expanded recreational use of the river and riverfront will stimulate net new economic impact of \$15.9 million to \$19.1 million per year. Tourism generated from kayaking, fishing, rafting and other forms of water and riverfront recreation would comprise new visitor spending and new earnings for the city.

Chapla, who had also served on the Board of the Michigan Historic Preservation Network, equates the initiative not only to ecological restoration or economic impact, but historical preservation. “If we go back to the time, when we look at the River as a resource like Native Americans who populated the shore, removal of the dams is the equivalent to a historical preservation initiative, rather than a neighborhood of buildings and structures. There is a recognition of a higher and better value, restored to its natural flows.”

Chapla, encouraged that public-private partnerships make for success, suggests that public dollars invested in the mid-’90s ushered a pathway for a grander vision of restoring the rapids of the Grand River. Private dollars invested today are brought through all the checks and balances of federal regulation and permitting, to comply with the National Environmental Protection Act. Chapla maintains, “these processes are not controversial, because there is a true commitment to civic engagement from the beginning – people get it.” He cites Grand Valley State University, which took on a foundry property, some of the most “nasty, despoiled property” and transformed it along with the Grand River and its edge. “The way GVSU has built their downtown campus, they could have done it cheaper, and very differently, but they’re driven by a value and connectedness to that river, and I get it.” Chapla adds, “I get the spiritualness the Native Americans had to this place. Restoring the rapids will be century-forming impacts for the next hundred years. People get it.” For more info, go to [\*\*rightplace.org\*\*](http://rightplace.org).



# Southeast Michigan

## Jewels Along the Waterways

*Conservatively, we can say Lake St. Clair brings in at least \$1 billion to the local economy annually. We believe freshwater is our key to our sustainability*

Since Michigan's earliest days, the state's sparkling blue streams, rivers and lakes have served as a gathering point, attracting settlement and industry along their riverbanks and shorelines.

In fact, the name Detroit is French for "the strait," referring to the massive waterway connecting Lakes Huron and Erie, where early French settlers, led by sieur de Cadillac, founded Fort Pontchartrain du Détroit in 1701. Michigan's oldest inland towns, hungry for power to fuel their mills, settled on the banks of rivers – Rochester was settled along the Clinton River in 1817, Milford was settled along the Huron River in 1834, and Northville was settled along the Rouge River in 1825.

By the twentieth century, Michigan's waterways were symbols of industry. Unfortunately, they suffered the neglect and pollution that was a byproduct of that industry.

As industry declined and urban development progressed, communities often turned their backs on their waterways, relegating riverbanks and shorelines to back-alley status. New development was oriented away from water, and public access to lakes and streams cut off. Relics of heavy industry came to dominate the Detroit River's shoreline, and new suburbs were built with little attention to the often-polluted waterways that flowed through them.

But now, as efforts to clean up those waterways have begun to pay off, communities are rediscovering their waterfronts and recognizing them for the potential they have to create authentic connections between people and their natural and cultural histories. These communities are looking to their waterways to help to build a sense of place.

Here are some of their stories:

## A Refuge for Wildlife – and Humans: The Detroit River International Wildlife Refuge

Gazing at cobalt blue waters from the shore of the Detroit River at Humbug Marsh, one might forget they are in a major metropolitan area, just 20 miles south of Detroit and 50 miles north of Toledo.

“This refuge is vital to the region,” says Anita Twardesky, Downriver Linked Greenways Initiative co-chair and community outreach coordinator for Riverside Kayak Connection. “It not only protects our natural resources, but improves public access for local residents and visitors alike.”

Humbug Marsh was the last mile of undeveloped shoreline along the Detroit River in 2004 when it became the first piece of the Detroit River International Wildlife Refuge. The Refuge, created through a unique, binational public-private partnership in 2001, now contains 6,000 acres of unique habitat, including islands, coastal wetlands, marshes, shoals, and 48 miles of pristine shoreline. For more info, go to [fws.gov/refuge/detroit\\_river](https://fws.gov/refuge/detroit_river).

## Paddling Through Industry and Nature: The Detroit Heritage River Water Trail

To sit in a kayak in the Detroit River is to know the power of moving water. Flowing deep and blue past Belle Isle, the river unites two nations as it moves past downtown Detroit and downtown Windsor, slides beneath the Ambassador Bridge and past the hulking metal structures of the Ford Rouge Factory, and widens alongside natural shorelines before draining into Lake Erie.

As early as a decade ago, only the most intrepid souls dared to make this trek by paddle. Today, school children board canoes to paddle the Detroit Heritage Water Trail, which connects 21 downriver communities along a paddler’s paradise. Catalyzed by Riverside Connection LLC and Michigan Sea Grant, the trail attracts enthusiasts from near and far to embark on an adventure that is at once beautiful and breathtaking.

“Paddling on the Detroit River is something people of all ages and abilities can enjoy,” Twardesky says. “It’s a way to connect to people to their heritage and natural resources. And, as paddlers seek out restaurants, lodging and goods, it brings economic development opportunities to downriver communities.” For more info, go to [downrivergreenways.org](https://downrivergreenways.org).

## Belle Isle: Detroit’s Diamond in the Rough

An oasis of green with blue vistas at every turn, Belle Isle is clearly the City of Detroit’s greatest natural asset. Not long ago, the historic park, designed by Frederick Law Olmsted, suffered from the neglect of a bankrupt city that could no longer afford to maintain it. Today, a strong Belle Isle Conservancy and an agreement with the Michigan Department of Natural Resources to manage the park is polishing the jewel of the Detroit River.

“Belle Isle is a place for the community to gather and celebrate and mark life’s milestones,” says Michelle Hodges, President of the Belle Isle Conservancy. “Any Detroiter who has lived here for

any period of time will almost certainly have a Belle Isle story to tell, and will likely break into a smile as they tell it.”

The Conservancy is actively developing programs to help engage the community with the park, such as programming at the once-defunct Belle Isle Aquarium, while the MDNR is rebuilding infrastructure, planting trees and restoring habitat. For more info, go to [\*\*belleisleconservancy.org\*\*](http://belleisleconservancy.org).

## **From Bridge to Bridge: Reconnecting the Detroit Riverfront**

While Detroit has always been a riverfront city, until recently it was very difficult to actually access that shoreline. That is no longer the case. Today, visitors can rent a made-in-Detroit bicycle at the Wheelhouse Detroit and cycle on the Detroit RiverWalk past a string of historic and cultural landmarks on one side, with the shining Detroit River on the other. This was made possible by the Detroit RiverFront Conservancy, Inc., a nonprofit with a mission to develop access on the Detroit International Riverfront. Much of that vision is now a reality.

“We are working to see that Detroit has an identity as a Great Lakes city,” Hodges says.

When completed, the riverfront will connect 5 and a half miles of property, from the Ambassador Bridge to Gabriel Richard Park, just east of the Belle Isle Bridge, with a continuous RiverWalk dotted with plazas, pavilions and green spaces. For more info, go to [\*\*detroitriverfront.org\*\*](http://detroitriverfront.org).

## **A Huron River Renaissance: RiverUP!**

The cool, clear waters of the Huron River connect some of southeast Michigan's most vibrant communities: Milford, Dexter, Ann Arbor, Ypsilanti, and Flat Rock. But connecting those communities to their riverfront, and to each other, hasn't always been obvious. The Huron River Watershed Council's RiverUp! effort is changing that.

“We call RiverUp! a ‘renaissance’ for the river,” says Elizabeth Riggs, Deputy Director at HRWC. “We are striving to build a sense of place not only by cleaning up the river, but by fostering river recreation and creating a destination with vibrant towns connected by the Huron River Water Trail.”

The Council's efforts have resulted in improved safety and access to paddling along the river, including launch, dam and portage improvements, and improved information resources for paddlers looking to plan trips. The Council also works closely with the five trail towns along the river (Milford, Dexter, Ann Arbor, Ypsilanti, and Flint) to develop assets and amenities for paddlers that contribute to local economic development. For more info, go to [\*\*www.riveruphuron.com\*\*](http://www.riveruphuron.com).

## **Connecting People With Their River: WaterTowns**

The Clinton River is Michigan's most populated waterway – more than 1.4 million people live in the watershed. But access to and enjoyment of the river has historically been limited, as rapid suburban development treated the river more as an afterthought than as an amenity.

“The Clinton River Watershed Council’s WaterTowns program is working to change,” says Anne Vaara, Executive Director of the Council. “We are helping local communities identify their underutilized waterfront assets and find ways to transform those areas into places where people can connect with their waterways.”

From quaint downtown Clarkston to Rochester to the cities of Utica and Mount Clements, the Council is working to launch programs like “Crafts on the Clinton,” a craft beer event featuring beer brewed in the watershed and build infrastructure to allow people to launch kayaks, cast a fishing line, or just find a quiet place to reflect and enjoy the sound of moving water. For more info, go to [crc.org](http://crc.org).

## Macomb County: From Blue Collar to Blue Economy

Even as Macomb County’s manufacturing economy has declined, the aquamarine waters of Lake St. Clair continue to rival places like Florida, drawing anglers from all over the world for its premier bass fishing.

“In terms of boats per square mile, Lake St. Clair is one of the busiest places in the nation,” says Gerry Santoro, Program Manager of Land and Water Resources at Macomb County’s Planning and Economic Development Department. Under the direction of county executive Mark Hackel, Macomb’s Blue Economy Initiative is working to leverage those blue assets as a platform for new economic development.

“We are realizing our recreational boating and fishing industries,” Santoro says. “Conservatively, we can say Lake St. Clair brings in at least \$1 billion to the local economy annually. We believe freshwater is our key to our sustainability.” For more info, go to [makemacombyourhome.com](http://makemacombyourhome.com).

## Revitalizing the Rouge River

Once upon a time, the Rouge River was so polluted it caught on fire. Today, it is a model for urban waterway restoration. Since 1992, Rouge communities have received more than \$300 million in federal funds to clean up combined sewers, reduce runoff and restore habitat in Michigan’s most urbanized watershed. Today, efforts by Friends of the Rouge, the Southeast Michigan Land Conservancy, and multiple community partners are looking to take the next step beyond cleanup by turning the river into a community asset and destination.

“We want to bring people closer to the river,” says Sally Petrella, Volunteer Program Manager at Friends of the Rouge. “We are changing perceptions of the Rouge. For so long, people considered it a sewer, something they should stay away from. We are helping people to realize the river is a place to enjoy.”

Projects to revitalize the Rouge include the Rouge Water Trail Committee and the Fort/Rouge Gateway Partnership that are working together to develop a water trail and parkland along the lower Rouge. For more info, go to [therouge.org](http://therouge.org).

## Blue Water, Blue Economy

Visit the St. Clair River near Port Huron, where the great volume of Lake Huron concentrates into a single channel, and you will at once know why the area is referred to as a Blue Water paradise. Here, the river reflects every color of blue on the spectrum, depending on the quality of light — from an almost iridescent blue cobalt on a sunny day to a subdued, steely azure when the sky is filled with clouds.

Until now, that beauty was juxtaposed with an industrial landscape and little public access. That changed in 2011 with a donation of nearly a mile of shoreline to the Community Foundation of St. Clair County. The Foundation leveraged private, public and other philanthropic funds to invest more than \$6 million in developing the Blue Water River Walk, a beautiful riverfront promenade complete with a ferry dock, habitat and shoreline restoration, outdoor classroom, pedestrian trail and public art.

“It’s been an amazing rallying point for the community, to turn our attention back to the waterfront, says Randy Maiers, President of the Foundation. “This stretch of shoreline was an industrial wasteland for last 70 years, and is now it is positioned for future economic development.” For more info, go to [\*\*stclairfoundation.org/riverwalk\*\*](http://stclairfoundation.org/riverwalk).

# Alpena, Michigan

## A Marine Sanctuary and Shipwreck Tours Spell Reinvention

*The Thunder Bay Sanctuary is one of 14 national marine sanctuaries and the only one in the Great Lakes. “It has a huge impact on Alpena ...*

Seemingly lost to history, hundreds of ships lay at the bottom of Thunder Bay near Alpena, Mich., victims of a lake that too often became a thrashing sea. But those destructive waters have also worked to preserve their prey. Today, shipwrecks spanning from the 1840s to the 1960s are protected as part of the Thunder Bay National Marine Sanctuary. “It’s really like a national park spanning 450 square miles in Lake Huron, where we are working to preserve and protect a spectacular collection of shipwrecks,” says Jeff Gray, the superintendent of the Thunder Bay National Marine Sanctuary.

The Thunder Bay Sanctuary is one of 14 national marine sanctuaries and the only one in the Great Lakes. “It has a huge impact on Alpena,” says Alpena’s Mayor Carol Shafto. “It’s a unique draw. There is not another sanctuary like it anywhere. It’s the only national fresh water sanctuary and it’s the only one dedicated to preserving a collection of shipwrecks. It draws visitors from the state, the nation, and even internationally.” First established in 2000, the sanctuary and its visitor facility, the Great Lakes Maritime Heritage Center, attract approximately 70,000 visitors a year.

Deb Pardike, executive director of the Alpena Area Convention and Visitors Bureau, says the sanctuary is at the center of its efforts to promote Alpena as a maritime heritage destination. “We’re able to promote the sanctuary and at the same time, promote our lighthouses and our community,” Pardike says.

## Shipping Heritage

Thunder Bay boasts a 200-year-old shipping industry, which was often tragic in the days before modern sonar navigation. Ships collided in foggy conditions or were sunk by nasty weather. “Several circumstances came together to cause so many ships to sink,” Gray explains. “In the 19th century, ship trade on Lake Huron fueled the whole nation, so there was a lot of traffic, there are also reefs and islands to navigate and two different weather patterns come together in the area.”

The area was so prolific in its ability to claim the ships traversing its waters that it became known as “Shipwreck Alley.” More than 200 ships are thought to rest at the bottom of the bay, but only a little more than half of those have been located. “We have a unique range of shipwrecks ... some are in shallow water and some are very deep,” Gray says. “There are ships that are very early and there are more modern craft, well-preserved at the bottom of the lake.”

Because of Lake Huron’s cold, fresh water, the shipwrecks found on its floor have escaped the corrosive elements that have eaten away at ships resting in warm and salty waters. Lake Huron’s

waters also have great visibility, making shipwrecks in shallow depths visible to those in kayaks on the lake's surface.

While avid divers knew of the historical treasures at the bottom of Thunder Bay, it was less known with the general public. "Getting the area established as a National Marine Sanctuary has really raised awareness across the country and even the world," Gray says. "We've had visitors from all over including Europe and Asia."

## Attractions for Everyone

The sanctuary has also been a draw for researchers, including Robert Ballard who is famous for discovering the wreckage of the R.M.S. Titanic, and Jean-Michel Cousteau, son of Jacques Cousteau. Researchers have come to look for wrecks, to perform sonar and mapping the shipwrecks and to study the lake's fisheries and the invasive species affecting Lake Huron. While not everyone can scuba dive to the bottom of the lake to get a first-hand look at the ships, the Great Lakes Maritime Heritage Center offers landlubbers a taste of life on the water. "Families are pretty surprised when they come to visit because there really is something for everyone," Gray says.

Among the favorites is an exhibit featuring a life-size section of a schooner where people can relive what it would have been like to be tossed on Lake Huron's stormy waves. "It gives people a chance to experience a particular culture," Pardike says. "They can hop on board the schooner and see what it was like to be aboard a ship. A visitor can grab the wheel and pretend to captain the ship through a violent Lake Huron Storm." The experience is quite convincing; Gray says they've even had a few people become seasick.

"We also have what we call 'dive tubes' that the kids can crawl through, they are clear and they simulate what it is like to dive over a shipwreck," he says. "I say kids, but we had a 93-year old crawl through them. They are fun for everyone."

In addition, Alpena Shipwreck Tours offers various glass-bottom boat tours. The tours give an even wider audience a chance to experience the historical treasures found on the lake floor. "Not everyone is a diver—I'm not a diver," Shafto says. "This gives visitors one more way to experience the shallow wrecks."

## Economic Draw

The Great Lakes have long been one of Michigan's greatest resources, but the ships the lakes claimed are growing in their importance too. "The sanctuary has definitely spurred economic growth," Pardike says. "We wouldn't have our shipwreck tour if it weren't for the existence of the Thunder Bay National Marine Sanctuary. It's a big attraction unto itself, and it will only draw more visitors and entrepreneurs."

While much of the sanctuary's job is about the past—highlighting and preserving it, Gray sees it playing an important role in Alpena's future, too. "Shipping is still so critical to a state," he says. "It still is playing an important role culturally and commercially and I hope that the sanctuary brings that to people's attention."



“The Edmund Fitzgerald sinking in 1975 [in Lake Superior] is a reminder that men and women leave dock everyday and just because ships sinking are infrequent today, doesn’t lessen the inherent danger there.”

The sanctuary also conducts a variety of research in an effort to better understand and protect the recreational, historical and archeological value of the region’s maritime heritage resources. The sanctuary also promotes and assists research aimed at better understanding the environmental and natural aspects of Lake Huron, including unusual cyanobacterial mats associated with sinkholes spewing ancient groundwater. These organisms are thought to be related to some of the first life on this planet, and may be indicative of life on other planets. As a consequence, scientists at the University of Michigan and Grant Valley State University are researching their biology with funding from the National Science Foundation and NASA.

There are challenges among the many Alpena Blue Economy opportunities. For one, the lack of city ownership of a deep-water port is a barrier to attracting new businesses. The city is invested in the area’s economic development and there is potential future use of the Lafarge Dock and the currently underutilized West Dock. There’s the potential for increased shipping to the area, among which passenger ships are a possibility. There’s also potential for products such as wood pellet production. For more info, go to ***thunderbay.noaa.gov***.

## Tawas City, Michigan

Where Waterfront Transformation Created a Future

*The project was a total facelift of the city, revitalizing the blighted and contaminated downtown area into something the citizens of Tawas City can be proud of.*

Tawas City sits on the shoreline of Lake Huron and is symbolic of a small town steeped in Michigan's rich history. It is surrounded by many natural resources, including Tawas Bay, Tawas River, and Huron National Forest. Tawas City is proud of its many beautiful parks, beaches, and a newly completed fishing pier at Gateway Park — all in all, the city contains nearly 1,500 linear feet of uninterrupted shoreline. There is a variety of motels, unique resort cabins, and nearby camping. In the summer season, the population nearly doubles.

Not everything in the city was idyllic, however. An area of the old downtown district had four vacant buildings that were deteriorated and considered blighted. There was an abandoned gas station with contaminated soil from leaking underground storage tanks, as well as contamination from a former dry cleaner. Since there was no stormwater collection system, the Tawas River, running behind all of these buildings, was receiving runoff whenever it rained.

In January 2007, city officials invited residents to participate in a visioning session to discuss the future plans of Tawas City. The number one goal was to redevelop the downtown district on U.S. 23 — the main commercial corridor of the community. First things first — City Councilman Dave Dickman led the council in forming a Brownfield Redevelopment Authority, and City Manager Mark Moers applied for (and received) a \$60,000 Waterfront Redevelopment Grant. The city purchased the old gas station from the state of Michigan in a tax foreclosure sale and also purchased the dry cleaner and an abandoned house. The grant provided the funds for the demolition of the buildings and the cleanup of the property. A new paved parking facility was put in, along with decorative lighting. Councilman Dickman says that The Department of Environmental Quality “led the way for us to form the Brownfield Redevelopment Authority and to apply for a grant that fit our needs.”

At the riverbank, a 100-foot walkway with a pedestrian walkout into the river was installed. The walkway also serves as a kayak/canoe launch. To protect the environment, natural river rock was placed to stabilize the shore and a stormwater collection system was installed. This eliminates the possibility of contaminated surface water runoff into the river. A Veteran's Memorial Park area was established, and the next stage of the development will include a recognition plaza for all veterans of Iosco County.

The city is very proud of the fact it tapped talent from its own backyard to transform the waterfront. A local developer, Town Square LLC, purchased the block across the street and demolished the vacant buildings. A mixed-use development was constructed, consisting of four commercial units on the first floor and eight residential units on the second and third floor. Again

using a local contractor — Schaaf and Associates Construction — the city contributed an additional \$1.5 million to purchase a third of an acre in the block to construct a new city hall. Believe it or not, the city council had been meeting in the city's library, and city hall was conducting business in a former railroad office building. The new facility features traditional architectural design, incorporating a clock tower and observation room that overlooks Tawas Bay. A 100-foot river-walk trail was built on the bank of the Tawas River behind city hall, which connects to a new 400-foot trail behind the Towne Square development.

The city's fire station, which sits behind the new city hall, was a very small facility that left only inches between the parked fire trucks and was considered a safety hazard. City Manager Moers knew that there was material for a steel manufactured building that had been purchased years before and never used. The city again had local contractor Schaaf and Associates redesign the building materials and construct a new building connecting it to the existing firehouse, nearly doubling its size. Steve Masich, Tawas City Fire Chief, says, "Now the fire equipment and trucks have space to maneuver and there is room for future growth." There was even room to bring back an old 1939 International fire truck that had been part of Tawas City's fire department years ago.

The city has also been able to make major improvements to Gateway Park with a new handicap accessible fishing pier and boat launch. In addition, the park has new sidewalks, lighting, benches, two viewing scopes, and an extended parking area. This was made possible through a \$134,000 grant from the Michigan Natural Resources Trust Fund and \$110,000 from the city. Mayor Duane Walters says, "It has been a challenge but a privilege to keep the city moving in a positive direction."

Demolition of blighted structures, a stormwater collection system, and Tawas River access has been a vast aesthetic and environmental improvement for the city. Construction of a new city hall, Veterans Memorial Park, and the mixed-use development in the downtown area of Tawas City is a focal point for future businesses and has brought a vibrant new beginning to the once dilapidated downtown area.

City Manager Moers notes that "the project was a total facelift of the city, revitalizing the blighted and contaminated downtown area into something the citizens of Tawas City can be proud of. The transformation of the waterfront area for recreational use will have long-term benefits for Tawas City. This merging of public and private investments in our city is a rare opportunity that we have taken full advantage of. The city was proud that it was able to use local companies to work on these redevelopment projects. We felt it was important to our local economy to support local businesses." For more info, go to ***tawascity.org***.

## Chesaning, Michigan

Key Grants and Community Enthusiasm Helped Save the Town's 'Hometown' Feel

*We are strengthening the connection between our downtown and the large amount of river frontage we have.'*

While the village of Chesaning's population has remained near 2,500 for decades, the Shiawassee River upstream of the village is teeming with new inhabitants. Following the removal of a local dam in 2009, residents have welcomed the steady return of walleye and other fish species to their natural habitat along the river. Man-made rapids, created after the dam removal to enable fish passage into 37 miles of historic habitat for spawning, have become a focal point for the community, bringing eco-tourism, recreational, and environmental benefits.

Built in 1863 to power the village's grist mill, the Chesaning Dam had deteriorated almost to the point of failure. Faced with increasing urgency to resolve the issue, the village hired Wade Trim, a surveying and engineering firm, to evaluate its options and investigate available funding alternatives. The evaluation looked at the costs and benefits of dam rehabilitation, as well as the feasibility of dam removal in conjunction with restoration of the river. When the village learned that funding might be available for removing the dam and improving the Shiawassee River in the process by restoring the natural river ecosystem, the community recognized the benefit of this alternative.

### Community Enthusiasm

Positioning itself to pursue the funding support needed to bring this project to life, the village demonstrated their community's enthusiasm and willingness to invest in this river restoration by proactively funding the planning and design of the project. The village also created conceptual graphics and a presentation that effectively illustrated the end result to garner support. Once word got out that the community was looking to remove the dam and restore the Shiawassee River to allow fish passage, several regulatory agencies and private organizations endorsed this plan and demonstrated their financial commitment to achieving this shared goal. The village's considerable efforts garnered support from many entities including a \$900,000 grant from the Michigan Department of Environmental Quality's Clean Michigan Initiative, a \$99,400 stimulus grant through the U.S. Fish and Wildlife Service, a \$50,000 grant from the Saginaw Bay Watershed Initiative Network, a \$10,000 grant from Partners for Fish and Wildlife through the Shiawassee National Wildlife Refuge, and a \$5,000 grant from the Saginaw Community Foundation. Local pledges from residents, including rock and boulder donations, totaled \$346,000.

Designed by Ellen River Partners in collaboration with the village and Wade Trim, the 10-year effort to remove the failing dam resulted in a 300-foot-long, man-made rock ramp with boulder

arch weirs, just north of the M-57 bridge, that reestablished the river's unencumbered connection with the Saginaw River and Lake Huron. Not only did this design remove the current hazards caused by the dam, it also helped to stabilize the river channel and restore a nearly 150-year-old natural habitat. Furthermore, the project met the needs and desires of the community and environmental and wildlife protection agencies by restoring fish passage, creating a natural river habitat, and eliminating the long-term liabilities associated with a failing dam.

## **Return of Walleye**

A recent Michigan Department of Natural Resources (MDNR) survey captured 87 walleye upstream of the Chesaning rock ramp in 45 minutes of sampling, their most positive result to date. "We have proof that there is a high density of walleye downstream of Chesaning, probably in the 10,000 to 30,000 range in the spring," says Joe Leonardi, an MDNR Fisheries biologist. "Our upstream results indicate walleye are passing the rock ramp into new habitat for spawning that was not available when the dam was present."

"Fishing in the area has increased tremendously," says Village President Joseph Sedlar. "We are even thinking about starting a walleye fishing contest in town."

While buzz about the walleye continues to travel through the region, the village is looking at additional opportunities to leverage their river investment to increase quality of life for residents and attract visitors. "We are strengthening the connection between our downtown and the large amount of river frontage we have," Sedlar continues. "A new, four-day River Days Festival will be held this summer and we will be starting a downtown farmers market with daily events."

## **Enjoying the Riverside**

Making the riverfront more accessible to local users is key. The village is adding a new pedestrian bridge over the river this year to provide an alternate route to M-57 and to tie both sides of the river together. The bridge will feature a rapids overlook area with ADA accessibility. Since the dam was removed, a sandy beach has been naturally deposited by the river on its east side, making the river more approachable for people who want to wade in or fish. Canoeing and kayaking through the rapids has also become popular. The Riverfront Grille, a local restaurant and event center that opened along the river when the dam was removed, is making the most of their riverside location by enhancing outdoor dining space and holding outdoor activities such as volleyball tournaments.

## **Future Trail System Expansion**

Improving regional connections to the river is also a focus. Saginaw County's Recreation Plan identifies expansion of their rail trail system to Chesaning as a major objective to improve non-motorized connectivity in the region and capitalize on the riverfront and accessible, "hometown" feel of the community. The village has created a nature trail and planted trees along the riverbank to enhance usability and the future connection to the rail trail. River quality improvements have also been made upstream of the rapids, including tree revetments and natural plantings to help stabilize the riverbank.

The M-57 bridge over the Shiawassee River, slated for reconstruction by the Michigan Department of Transportation (MDOT) in 2016, offers clear views of the rock ramp and village parks for the 9,600 vehicles that pass through each day. The village is looking forward to working with MDOT to ensure this critical site for advertising its eight-tiered water rapids is a pedestrian-friendly and aesthetically pleasing gateway to the community. The village's continued investment in its river's health and use will be a draw for visitors and residents for years to come. For more info, go to ***[villageofchesaning.org](http://villageofchesaning.org)***.

# Petoskey, Michigan

Its Land and Water Still Boast the ‘Million Dollar Sunset’

*Petoskey’s waterfront has evolved from an industrial center to a regional tourism and recreation gateway ...*

In the 1870s, a Grand Rapids reporter stepped from a rail passenger car and proclaimed Petoskey the land of the “Million Dollar Sunset.” Since then, recognition of the value of water resources has been a consistent theme in the city’s history.

Petoskey, like most coastal cities, was settled due to proximity to natural resources and navigable water. By 1840, Native American Indians had settled the Little Traverse Bay region; Western settlement occurred shortly thereafter. The waterfront and Bear River were initially developed to facilitate timber harvesting, and natural limestone attracted mining operations to the city. However, as early as the 1870s, rail and shipping lines brought tourists to the area, and water resources established Petoskey’s future as a regional tourism center. Adjacent to the east, one of the country’s first planned developments, Bay View Methodist Camp, further capitalized on water resources and facilitated tourism in the area.

As the area grew, industrial use of water resources defined the shoreline and the lower Bear River. Paper mills, power plants, boat builders, commercial fishing, and tanneries populated the waterfront and river. However, early recreational improvements such as Mineral Well Springs drew upon water resources for tourism and recreation. The Little Traverse Wheelway, a regional trail running along the shoreline through Petoskey, was one of the earliest established bicycle trails in the country and first developed in the early 1900s.

Other industries subsequently populated the waterfront. By 1950, a diecasting manufacturer and a gasification plant existed along the city’s shoreline, operating until the 1960s. Concurrently, as tourism continued to increase in Northern Michigan, the state completed U.S. 31 through Petoskey, which facilitated regional tourism, but placed a physical barrier between downtown and the waterfront. As remaining waterfront industries dwindled, the city began movement toward eventual reclamation and redevelopment of the waterfront. Implementation began with environmental remediation, repurposing of historic industrial buildings, residential development, and what would ultimately become Petoskey’s Bayfront Park.

## Bayfront Park

City leaders and citizens recognized the potential of the waterfront to provide enhanced access to Lake Michigan and if developed properly, to increase local tourism and economic development. In the early 1980s, the city received a Michigan Coastal Zone Management Grant to prepare a master



plan for development of the waterfront, and began planning for waterfront redevelopment and what is now Bayfront Park.

The master plan recommended redevelopment of Petoskey's public waterfront to improve access, to provide leisure and recreational opportunities for residents and visitors, and to re-establish a pedestrian link between the waterfront and downtown "Gaslight" shopping district. The plan proposed and organized a variety of recreational uses of the park, all related to a central promenade that would connect the Gaslight shopping district to the historic city pier via a pedestrian tunnel under U.S. 31. Other plan elements included marina expansion and enhancements, a tournament softball stadium, a rivermouth boardwalk, adaptive restoration of historic structures to house city hall and public services functions, a waterfront playground, a central green, improved links to the Little Traverse Wheelway, and passive and active open space.

Next, the city established a Waterfront. Construction of the 25-acre Bayfront Park project was accomplished in five phases, beginning in 1985, and completed in 1995. The city chose a phased approach to spread cost impact, but also recognized that it had one waterfront to work with, and that phasing allowed the necessary budgets for high-quality improvements vital for success in a region where virtually every waterfront city shares the same aspirations as Petoskey does.

## **Completion and Economic Benefits**

Work began with shoreline protection and culminated with the pedestrian tunnel linking pedestrians to downtown Petoskey. Additionally, the train depot in the park was reborn as the Little Traverse Bay History Museum. Since completion of Bayfront Park, the city has added 44 slips to the marina, providing a 35-percent increase in marina revenues (the marina was financed with separate state funding). Additionally, the Waterfront TIFA district has applied for funding for the Bates Softball Field relocation, museum roof replacement, and in 2011, development of the Bear River Valley Recreation Area. This project represents a critical piece in Petoskey's Recreation Master Plan, linking local and regional non-motorized trail systems and city recreational facilities with Bayfront Park and the waterfront. The completed project extends over one mile upstream from the waterfront, and includes a paved, accessible trail connecting the residential district to downtown, as well as picnic facilities, rustic trails, overlooks, bridges, and whitewater kayaking features.

Petoskey's waterfront has evolved from an industrial center to a regional tourism and recreation gateway, with its links to city and regional recreational facilities and its close relationship with downtown. As Petoskey continues to benefit economically, city officials continue to consider future investment, including possible improvements at Magnus Park, a city-owned shoreline campground; further development of pedestrian links to the waterfront; and future improvements in the Bear River Valley Recreation Area.

To plan for future improvements, the city continues to monitor the economic impact of its waterfront redevelopment. Certainly, capture of funds to help develop waterfront improvements that otherwise may never have been completed is a sign of success in itself. Bayfront Park continues to host at least two annual events per summer: the Fourth of July fireworks and Festival on the Bay, which results in Petoskey's busiest weekend. The softball field is used throughout the year for league and tournament play, attracting additional visitors. The Bear River Valley

Recreation Area also hosts two annual events — spring kayaking and a midsummer run. Perhaps most revealing, from 2000 to 2014, the areas abutting the Waterfront TIFA district increased in value by 53 percent, compared to a 20-percent increase for the city overall. Other indicators, such as subsequent residential development and increased park use, demonstrate the benefits of waterfront protection.

But the most apparent sign of the benefits of Petoskey's water resources can be seen on any warm evening in Sunset Park, where visitors and locals gather to watch the million-dollar sunsets. For more info, go to ***petoskey.us***.

## South Haven, Michigan

### Blue Beauty, Safety and Sensible Incorporation of a Water Plant

*In the past, the South Beach was not a barrier-free area. The improvements make the facility easily accessible to everyone.*

Like a number of communities located along the shores of Lake Michigan, South Haven sees a significant annual boost in its population during the summer months.

Since its 5,000 year-round residents are joined by an estimated 15,000 boaters, swimmers, and tourists looking to enjoy South Haven's seven lakefront beaches and four public marinas, city officials decided to pursue a number of water-based municipal improvements designed to capitalize on the influx and reinvigorate the downtown area.

Improvements included the construction of a new water filtration plant, a BMX bike track, parking lots, playground equipment, and sidewalks at the North and South beaches, the installation of safety devices at both beaches, and a reconstruction of the main road that leads from downtown to the lake. "The city of South Haven has been very aggressive with capital updates to our aging infrastructure," says City Manager Brian Dissette.

It all started with the construction of the new \$20 million water filtration plant, which was built on the same site as the previous facility, only with a larger capacity. Located near the South Beach, one of the most popular waterfront locations in southwest Michigan, it provides clean drinking water to the city, the South Haven/Casco Township Water and Sewer Authority, and neighboring Covert Township.

In 2012, the Michigan Chapter of the American Public Works Association (APWA) gave it the Project of the Year Award in the "Structures \$5 to \$25 million" category. That also meant the project was forwarded to the APWA national office to compete at the national level.

"The filtration plant project was an exercise in compromise," Dissette says. "We needed to build the plant at the South Beach in order to use the city's existing water intake and underground drinking water storage tank. "To ensure the filtration plant was acceptable to residents and visitors, the city council opted to incorporate the plant design and location into a larger park planning process.

"The plant was constructed using general obligation debt," he continues. "The park improvements were built using MDNR (Michigan Department of Natural Resources) grant funds and city capital project funds. We were able to construct the improvements at the same time, which allowed for a timely project and opening."

## Waterfront Gateway Improvements

Meanwhile, the Phoenix Street project added another \$3 million of infrastructure improvements, with help from a \$750,000 grant from the State of Michigan, and included replacing underground water, sewage, and storm drainage systems; street repaving; and new sidewalks. Other additions, such as outdoor seating, street furniture, a public wireless internet system, and rain gardens, are intended to make the downtown more pedestrian and tourist friendly.

The Downtown Development Authority proposed rain gardens to capture the runoff from city hall and reduce the amount of stormwater entering the sewer system. Now rainwater will infiltrate the soil to recharge the groundwater. The two rain gardens will be located on the west and south sides of city hall.

The city also already has reached license agreements with a pair of downtown restaurants for outdoor dining areas that will include alcohol sales.

Dissette says the community is excited about the WiFi system, which will provide service throughout downtown, at the public marinas, along the riverfront and at both the North and South beaches. “The WiFi system will allow users to sit on the piers and still have a connection.”

The city wrapped up the final work on Phoenix Street in May. When the area’s population is set to quadruple, South Haven will be ready to accommodate the surge in people.

The project also provides a gateway to the waterfront, where all of the improvements have been met with approval. “The city is prepared to construct all-new road surfaces, all-new sidewalks, playground equipment, and just try to make the beach as fine as possible,” Dissette says. “South Haven has an incredible amount of access to the water.”

“In the past,” Dissette continues, “the South Beach was not a barrier-free area. The improvements make the facility easily accessible to everyone. Moreover, the project greatly improved pedestrian safety for our visitors.”

The BMX “Pump Track,” a feature that is growing in popularity nationwide, will be more than 1,000 feet long on a 1.28-acre site located near downtown and a skate park. A pump track is a progressive bike course that uses an up and down “pumping” motion to propel the bicycle forward instead of pedaling. It will serve as yet another attraction for the both local residents and the visitors who regularly flock to the area.

## New Beach Safety Measures

One of the other notable upgrades that received extensive media coverage was the addition of emergency help points at both the North and South beaches. City officials agreed to enact a variety of beach and pier safety efforts as part of the settlement that stemmed from a federal lawsuit filed by the family of a 45-year-old Illinois man who had drowned in Lake Michigan in the summer of 2009. The resulting security project saw a pair of blue light pedestals installed with emergency speakerphones from Code Blue Corporation, a manufacturer of emergency communication solutions located in nearby Holland.

“The intent of the call boxes is to provide our beach goers with safe and efficient contact to the city’s first responders,” Dissette says. “It is our expectation that having the call boxes onsite will make the process of seeking help easier for the beachgoers, as they will not have to rely on landmarks to guide first responders to their location.

“Further, during special events in South Haven, we routinely will lose mobile phone service due to the volume of users accessing the mobile phone networks. With having the call boxes onsite, we anticipate the public will always be able to reach first responders. For more info, go to ***southhaven.com***.



# Blue Economy Accelerants

## How we grow our Blue Economy

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Recommendations for strategic actions by state and local public officials, business, non-profits, education and philanthropic leaders that can accelerate Michigan's already impressive Blue Economy growth and leadership.

While the Blue Economy in Michigan is already big, we can extend it further as part of an exciting economic transformation and revival. In painting this uplifting portrait of Michigan's existing Blue Economy we asked folks: what moved your efforts along? What could help you do more? What are the sweet spots for Michigan around leveraging our water and water know-how? Here are some of the ideas we discussed and developed with stakeholders across Michigan around how we "accelerate" understanding and growth of our new Blue Economy.



## WATER BUSINESS DEVELOPMENT

### Create A Business-led "Blue Economy" Council to Champion the Blue Economy

Given its current and absolute importance to Michigan's economy, and the opportunity for economic growth and new jobs that Michigan's water and water technology businesses represent, a business-led "Blue Business Council" of Michigan water technology product and service firms (akin to similar organizations in the state of California, and Milwaukee, Wisconsin) could provide important Blue Economy growing functions:

- Champion the size, scope and future importance of Michigan’s Blue Economy, and market both Michigan’s firms and our education institutions.
- Promote and advocate for the state, philanthropic, corporate, and institutional support and investments in water placemaking, water research and education centers, and water business development, financing and marketing support.
- Provide a forum in which firms – or consortia of firms and organizations dealing with water technology issues (e.g. utilities, sustainability managers at major manufacturers; agricultural businesses, wastewater managers, those entities dealing with new EPA regulations) could join with water technology providers, users, and customers to identify water technology needs and problems to be solved. And joining with university research partners, these consortia can organize public-private research partnerships around key water issues and potential needed technologies and solutions, driving innovation and supporting the development and commercialization of water technology/prototypes here in Michigan.
- Identify and advise the Michigan Economic Development Corporation (MEDC), the Department of Environmental Quality (DEQ), and water regulatory and financing agencies and bodies on ways to support water technology firms, business development and innovation. Identify and promote changes in policy, regulation, and financing that support growth of water technology product and service firms and industry, attending to such issues as:
  - Standard setting for water efficiency, sustainable use, and, pricing regimes that could drive new technology developments and markets.
  - Improvements to regulations and financing around wastewater use requirements, green infrastructure development, and other areas that would encourage the marketplace for sustainable water innovation and new enterprise.

## **Office of Water Innovation – Innovation-Friendly Water Regulation and Financing**

A newly created Office of Water Innovation, working with the Blue Business Council, other water-business innovators, and state and regional water financing and regulatory bodies (such as the new Detroit Regional Water Authority) can refashion Michigan water-sustainable use standards, regulations, and financing tools in order to encourage new sustainable water technology development, deployment and business growth. Brookings Institution’s Hamilton Project’s water innovation report recommends starting this process with a statewide review of regulatory practices along key criteria, guided by the new State Office of Water Innovation, to inform recommendations for policy, regulatory and financing changes that support water innovation statewide, and through regional water authorities.



## **“Pure Michigan” Water Technology Innovation Fund and Catalytic Organization**

Modeled on the most effective early stage financing and commercialization catalyst organizations, Michigan can create a new Blue Economy catalyst organization similar in purpose to what Milwaukee has developed through its Water Council to commercialize new water technology products, and develop new firms (the Global Freshwater Seed Accelerator Program). Milwaukee’s success, from what they acknowledge as a less robust academic, technical and business foundation than exists in Michigan, provides strong encouragement to Michigan concerning our ability to innovate, create and sell new water products and services.

Such an organization can be catalyzed with resources from leading private sector firms, MEDC innovation support funds, philanthropy, and potentially a water usage surcharge (or public benefit charge [PBC]) as proposed by the Brookings Institution. The resources and catalytic organization would support private and public water-sector technology research and development funding, business seed funding, accelerator-style support, and reduce the cost of developing new technologies by providing early stage capital for prototyping and proof of concept. It would also attract additional outside capital for commercialization by helping broker investment deals between new technologies and outside investors. In doing so, it would expand the pool of Michigan water clean-tech investment by helping out-of-state investors spot good deals in Michigan.

## **Water Trade and Logistics Infrastructure**

Michigan businesses can grow as we develop the multi-modal infrastructure that consolidates Michigan as the hub of the Great Lakes trade corridor. As envisioned in plans for the Great Lakes International Trade and Transport Hub (GLITTH), expanded port facilities in Detroit, improved bi-national rail connections, and a multi-modal freight hub in Michigan would create an estimated 66,000 new jobs, and enhance our role as a global trade and logistics center. Foreign freight traffic flowing from the deep-water seaport in Halifax, Canada, and the already huge volume of traffic flowing across the Detroit and Port Huron international borders, would be processed and managed in Michigan.

A new 21<sup>st</sup> Century international bridge crossing the Detroit River – as iconic as the Mighty Mac Bridge up north – will symbolize the global importance of the largest international point of trade, rail, truck and shipping in North America, and the re-emergence of Michigan and Detroit as the hub of the Great Lakes. Development and deployment of the latest smart border management technology for security, goods tracking, and customs, and their embedded information systems, will foster innovation in these sectors locally.

Enhanced and integrated port, rail and road facilities around Michigan’s waterways in Muskegon, Monroe, and our additional 36 deep-water harbors can expand trade and logistics jobs in short-sea shipping, freight and commercial traffic and warehousing, as well as serve increased recreation and tourism. Development of these facilities and services would be aided by creation of additional port authorities to help with financing, and pursuit of changes in federal Harbor Maintenance Tax treatment of cargos to incent additional shipping in the Great Lakes. Additional financing for needed infrastructure can be raised through public-private partnerships (P3’s). Outside private

investment can be attracted through innovative models like the Great Lakes regional infrastructure exchanges, which are being developed by the Council of the Great Lakes Region (in partnership with the Brookings Institution). They're modeled on successful public-private infrastructure development efforts in similar bi-national regions, such as the West Coast Infrastructure Exchange (WCX), which connects U.S. and Canadian west coast states and provinces.



## **WATER EDUCATION, RESEARCH CENTER OF EXCELLENCE BUILDING**

### **Market Michigan as the Center of Water Education and Research**

Michigan Community Colleges, Michigan Independent Colleges and Universities, joined by the MEDC and its Pure Michigan campaign, can market Michigan as a significant home and destination for top quality education, research, and innovation in emerging water and sustainability fields.

### **Work Jointly with Blue Business Council to Identify and Support Public-Private Research and Development Partnerships**

Organize and fund directed research around key public-private water problems and technology solutions, e.g. difficult treatment and cleaning challenges like removing pathogens/ pharmaceuticals in water; wastewater as heat source, and energy source; agricultural bio-products as power source and bio-digesters; more efficiently cleaning and filtering water and by products like gas, bio gas, etc; reducing nutrient and contaminant flows; creating new water monitoring, measuring and information technologies for detecting invasive species and to serve growing demand for efficiency and risk management; and assessing the feasibility of synthetic biology tools to improve resource management.

### **Grow Centers of Excellence**

Expand footprint of Michigan's water education and research centers. As documented in this report, Michigan has nine university water research and education centers, and 18 community colleges with significant programming in water education. The footprint and growth of these programs could be expanded by:

- Creation of a “water consortium” of higher education institutions, supported by private and public entities, to a) develop a coordinated curriculum around water that takes advantage of geographic location and, b) develop a network of research practitioners to solve key problems based on interaction with the Blue Business Council.
- Inclusion of water topics in state research and STEM/priority workforce performance funding.
- State subsidy match for research dollars won.
- Public-private philanthropic partnerships to expand water research centers.

## **Develop World’s Freshwater Innovation Center in Detroit**

To claim Michigan’s rightful leadership role in local, Great Lakes, and global freshwater innovation; contribute to the economic rebirth of Michigan’s leading city, and make tangible the commitment of Michigan universities, companies, and philanthropy to the Motor City’s revitalization:

- Create a Michigan “Scripps Institute” for freshwater innovation - a center for water research, education, development and commercialization of new ideas and technologies. This water innovation hub could be organized with one of Michigan’s research universities in the lead, joined by corporate and philanthropic partners to provide seed funding. Such an innovation hub would drive Michigan’s 21<sup>st</sup> Century round of innovation with water at its core. This initiative can be supported by Michigan and Detroit focused philanthropy, and corporate leaders interested in benefitting from the public-private innovation opportunities. It will also attract major federal water research and innovation funding. It can be developed as a consortium with co-location and satellite sites among the state’s leading higher education institutions with water research horsepower: including University of Michigan, Michigan State, Wayne State, GVSU, CMU, Michigan Tech, and others.
- Support this Innovation Hub with the Pure Michigan Water Technology Accelerator/ Catalytic organization: to support commercialization of new technologies – as described above.



## WATER PLACEMAKING

### Forge Blue Economy Community Compacts

Challenge multi-sector leaders in every Michigan community to organize around Blue Economy building as an economic development vision and mission. Just as many Michigan communities responded to the challenge of the Cherry Commission on Higher Education and Economic Growth to support higher education as a core economic development strategy (including Kalamazoo, which launched the Kalamazoo Promise), many Michigan communities can benefit from organizing around water and the Blue Economy as a driver of growth. Community foundations, and other local business, civic and philanthropic organizations can play a key role in catalyzing and supporting this Blue Economy-building activity at the local level (as they have supported the growth of the Michigan College Access Network to improve higher educational attainment).

### Catalyze Blue Economy Building with Blue Economy “Prize”

Companies and philanthropy could join to fund an annual competition among communities for the most creative, effective, and public/citizen engaging water-related development initiatives. The Great Lakes Funders (a philanthropy group dedicated to Great Lakes issues) are already exploring the potential power to catalyze innovative water-related infrastructure and community development initiatives with such an effort. Akin to the “Art Prize”-style competition in Grand Rapids, such a Blue Economy innovation “Prize” could catalyze and reward a range of water restoration, reconnection and innovative business and community practices, and provide an exciting forum for sharing innovative practices.

### Prioritize Regional Water Placemaking

Put “water placemaking,” the celebration of our water-related history, and reconnection to our waters, at the center of regional and community economic strategy. Water and other natural, place and historical assets can serve as the new economic foundation for community and regional economic development. Philanthropy, business, non-profit and local governmental leaders can further regional water placemaking efforts, linking and connecting existing initiatives.

For Example: along the Southeast Michigan Water Corridor, from Port Huron to Monroe, fill in the “holes” in water access and restoration, and connect with a Great Lakes Heritage Trail. Further develop and extend west Michigan communities’ regional river and water connections and trails and the link out to Lake Michigan corridor. Support the Northeast Michigan, Great Lakes Bay region, and Northwest Michigan regional water (and watershed development) initiatives to tie together their work and extend their efforts.

The governor and administration, in advancing regional reinvention initiatives and regional prosperity plans, can make a priority in these plans for catalytic water access and redevelopment initiatives that tie water and waterfronts into the fabric of communities, putting water-based development at the center of economic development vision and action plans. This would include actions that promote public access, wise use, and conservation of water resources and historical assets.

## **Integrate State and Local Public Resources to Meet Integrated Opportunity of Water Placemaking**

Water placemaking and water-based development can involve an array of different activities (from cleanup and restoration, to new infrastructure, commercial and residential development, finance, marketing, and promotion activities). Water placemaking can be supported by an array of public programs and financing activities, including but not limited to: the Natural Resources Trust Fund, Housing Development Agency, MDOT, MEDQ, federal EPA and GLRI funding and programs. Too often these public resources, which can match and leverage private and philanthropic dollars, are siloed. Water placemaking activities will be served by greater flexibility and integration among various silos and programs at the state and local level. To serve this goal, the state and local government, and the economic development entities and other stakeholders, can enhance their collaboration and provide greater interagency collaboration and flexible financing of water placemaking.

- **Extend and Make More Flexible the Natural Resources Trust Fund (NRTF) to be a true Pure Michigan Fund.** The NTRF cap on the allowable spending on water and conservation-related activities can be lifted, and the range of recipients expanded to non-profits and all forms of organizations engaged in water restoration, reconnection and placemaking activities.

## **Public Education and Organizing in Support of the Blue Economy**

Michigan philanthropy partners and key helping organizations can promote the understanding and action agenda in this report on an ongoing basis. They can encourage more communities and stakeholders to join in this work – hosting and convening local and regional multi-sector stakeholder education and activities to spur Blue Economy – building around Michigan. This could include a series of Blue Economy symposia/work sessions for citizens, and community and regional practitioners to share the vision, identify key strategies, issues, and obstacles, develop and share effective tools and strategies for Blue Economy building, and generally support the growth of the field.

This work could be organized with the help of key state economic catalytic organizations invested in Blue Economy-building (Prima Civitas, MML, Michigan Sea-Grant, Great Lakes Commission, Michigan State Land Policy Center and Extension). A lead or consortium of organizations can work with university/community college partners such as GVSU, CMU, and the URC; state agencies with resources, programs and commitment (Office of the Great Lakes, DEQ, DNR, CMZ, MSHDA, MEDC,

MDOT, MDARD etc.), and the philanthropic affinity groups such as CMF, Community Foundations, Great Lakes and Michigan Land Use Funders Collaborative, Green and Blue Funders network, and interested regional business and civic organizations, including chambers of commerce, and Rotary International. These activities will also serve to expand the constituency for water placemaking and such key enablers as Great Lakes Restoration. An animated multi-stakeholder constituency engaged in water placemaking can be a key force for sustaining important Blue Economy enablers like Great Lakes Restoration Initiative funding.

## **Michigan's Blue Economy Opportunity**

With our rich water history, fantastic real estate astride so much water, and the tremendous innovation horsepower among our companies, colleges, and our people – the Blue Economy is Michigan's economic sweet spot. There is a lot to do to build out this economy, with roles for everyone: business leaders, elected officials, non-profit managers and philanthropists, scientists, citizens, and teachers. An even more robust, and magical Pure Michigan, is there to build if we follow the paths and listen to the advice of pioneers in Michigan who have cleaned and reconnected to their waters, and opened the doors of their labs, classroom, and companies to water talent, ideas and technologies.

By becoming the world's center of water education, research, smart and sustainable use – and bringing the magic water and its “blue” into our special Michigan “clean-green” playground – we send a message to the world that this is the most attractive place to live, work and play. A place where we care for our water and our planet, celebrate its history and place in our lives, and will make our living showing the way to use it smartly and well. Our water becomes an engine for creating new jobs and our Pure Michigan a magnet for people to re-populate our state. Let's all create and catch the Blue Economy wave.

# About This Report

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## A STORY DESIGNED TO INSPIRE

Many of us, including all those involved in developing this Blue Economy portrait of Michigan, have been nurturing the understanding and the growth of this Blue Economy for years. We've noted and encouraged what many in Michigan and around the Great Lakes region were doing. From Milwaukee, Cincinnati, and Ontario beyond our borders, to Marquette, Macomb County, and Muskegon within, Great Lakes leaders are working to rebrand our identity around water, clean and reconnect to our waterfronts, and to leverage the incredible public and private education, research and innovation horsepower of our companies, colleges and universities. All geared to seize and grow leadership in this Blue Economy of the future by solving problems and creating new business and technologies around water.

Before turning to ideas of how to build out this Blue Economy for the future, we wanted to better understand the Michigan Blue Economy of today. To see how communities, educators, researchers and business leaders are already organizing around water as an economic opportunity – and what we can learn from their efforts.

To do so we looked at how water defined us and drove our economy historically. We assessed the scope and impact of the different ways water contributes to community economic development and business growth today. We gathered existing economic analysis, reports, and case studies. We reached out to the “ringleaders” of Blue Economy work across Michigan –public, private and non-profit – listened to, and documented their stories. We asked them where Michigan’s opportunities and comparative advantages are in the emerging water “work,” and how to best support and accelerate water re-connection, placemaking, education, and technology innovation.

This portrait of Michigan’s water-based “Blue Economy,” past, present, and future, is designed to:

- Help Michigander’s understand the blue economy, appreciate its current scope and influence, as well as the tremendous opportunity for future growth.
- Provide exciting, infectious examples and illustrations of how to build out the Blue Economy. What our people, firms, educational institutions, and communities are already doing, and how they are going about it – to inspire and inform more activity, and help many to be newly motivated and inspired to participate.

Finally, provide specific recommendations for strategic actions by state and local public leaders and government, business, non-profits, education and philanthropic leaders to accelerate Michigan’s Blue Economy growth and leadership.





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## ABOUT THE ORGANIZATIONS



### Michigan Economic Center at Prima Civitas

The Michigan Economic Center is a center for ideas and a network of state and local leaders and citizens working to:

- Advance a vision for Michigan's economic renewal;

- Provide policy ideas and solutions that realize the vision; and

- Engage and support a diverse network of citizens, leaders, and organizations in advancing the vision and making ideas for a more competitive, innovative, and global Michigan a reality. More information is available at [www.MiEconomicCenter.org](http://www.MiEconomicCenter.org).

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### The GVSU Annis Water Resources Institute

The Robert B. Annis Water Resources Institute (AWRI) is a multidisciplinary research organization committed to the study of freshwater resources. The mission of the institute is to integrate research, education, and outreach to enhance and preserve freshwater resources. More information is available online at [gvsu.edu/wri](http://gvsu.edu/wri).

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CHARLES STEWART  
MOTT FOUNDATION®

### The Charles Stewart Mott Foundation

The Charles Stewart Mott Foundation, established in 1926 in Flint, Michigan, by an automotive pioneer, is a private philanthropy committed to supporting projects that promote a just, equitable and sustainable society. Grantmaking is focused in four programs: Civil Society, Environment, Flint Area and Pathways to Opportunity. For more information go to [www.mott.org](http://www.mott.org).



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## GET IN CONTACT

For more information, to share your own Blue Economy story, or to get engaged in growing Michigan's Blue Economy, contact us at: ***miblueeconomy@gmail.com***.

# Appendix

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## WATER TECHNOLOGY PRODUCTS & SERVICE BUSINESSES – DESCRIPTIONS

### Motor Company

*1 American Road, Dearborn, MI 48126*

Ford Motor Company, a global transportation company headquartered in Dearborn, Michigan, was recently rated No. 1 on Interbrand's list of the 50 Best Global Green Brands. Ford claimed the top spot for its forward-thinking approach to environmentally responsible and sustainable manufacturing, greater transparency about its business operations, and for its disclosure of information, particularly in the area of manufacturing. Ford's sustainability efforts focus on water.

Ford began their Global Water Management Initiative back in 2000. They set a target of three percent year-over-year water reductions. The target was upped in 2011 – when Ford announced a goal of reducing the amount of water used to make each vehicle by 30 percent globally, from 2009 to 2015. They hit this goal two years ahead of schedule. Between 2000 and 2013, Ford reduced their total global water use by a whopping 61 percent, or more than 10 billion gallons. (That's equivalent to the water used for one billion five-minute showers, based on figures from the U.S. Environmental Protection Agency, or enough to fill more than 15,000 Olympic-sized pools.) They did this by cutting the water used in everything from cooling towers to paint operations. Ford decreased the total amount of water used around global facilities from 64 million cubic meters per year to 25 million cubic meters. For more info, go to [Ford.com](http://Ford.com).

### Fishbeck, Thompson, Carr & Huber, Inc.

*1515 Arboretum Drive, S.E., Grand Rapids, MI 49546*

Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) is a Grand Rapids-based professional civil engineering, architectural/engineering, environmental, and construction services consulting firm. FTCH provides comprehensive engineering consulting and design services for municipal, industrial, educational, and commercial clients, including innovative environmental engineering and management services for groundwater, soils, water system design and wastewater remediation projects.

FTCH is also a leader in designing green and LEED certified buildings, with more than 37 Leadership in Energy and Environmental Design Accredited Professionals (LEED® APs)

experienced in applying sustainability principles to buildings, interiors, and water efficient landscapes. Established in 1956, FTCH has grown to a global firm of over 340 people, with six offices in Michigan and neighboring states. For more info, go to [\*\*ftch.com/\*\*](http://ftch.com/)

## **Steelcase Inc.**

*Grand Rapids  
901 44th Street SE, Grand Rapids, MI 49508*

Steelcase Inc. is a leading office systems company, headquartered in Grand Rapids. It boasts more than \$3 billion in revenues with more than 10,000 employees around the world. Steelcase is also a business leader in sustainable business practices and innovation; showing impressive results, reducing water use by 70 percent since 2001, deploying new green infrastructure – stormwater collection and retention systems to manage water flow from their sites and irrigate their campuses. Steelcase is also working with its suppliers and customers to reduce the water footprint of their products, pioneering the development of a water footprint database for product lifecycle assessment practitioners worldwide to drive more efficient water use. For more info, go to [\*\*steelcase.com\*\*](http://steelcase.com).

## **H2bid, Inc**

*407 E. Fort St., Detroit, MI 48226*

H2bid connects water utilities with vendors around the world. The Detroit firm, which has been featured in everything from Fortune Magazine to The Wall Street Journal, provides cloud-based e-procurement services that simply make the water industry smarter. For example, 85 percent of the world's water utilities are publicly owned and are required to engage in public bidding (or tendering) for infrastructure contracts. H2bid provides a central clearinghouse for advertising all water infrastructure bids (and tenders) and has launched a free, user-friendly, e-bidding service that will make the bidding process more efficient, more environmentally friendly, while reducing contracting costs for both utilities and vendors. The e-bidding service also helps water utilities enhance local economic development by making it easier for local businesses to participate in subcontracting opportunities. The company also has the largest database of industry vendors – which helps ensure that water utilities are getting the best solutions for the most competitive prices. H2bid gives vendors access to the largest database of water/wastewater utility bid opportunities. They currently have bid opportunities from all 50 United States and Canada, expanding to other countries soon.

H2bid is currently adding additional “smart services” for water utilities and vendors to provide business insights. The firm has an online community for contractors and subcontractors ([h2find.com](http://h2find.com)), and maintains a popular blog containing original articles and information about new solutions to problems facing the global water industry ([\*\*worldwaterblog.com\*\*](http://worldwaterblog.com)). Companies with news and product announcements can have their articles and press releases posted on the blog at no charge, helping spread the word about new solutions in the water industry. (Articles and press releases can be sent to [\*\*info@h2bid.com\*\*](mailto:info@h2bid.com)).

## Plymouth Technology Inc.

*2925 Waterview Dr., Rochester Hills, MI 48309*

Plymouth Technology specializes in innovative solutions for industrial wastewater treatment. The company provides water treatment chemicals, feed equipment and services for industrial manufacturers. They design and manufacture wastewater, boiler, cooling and reverse osmosis specialty water treatment chemicals, and are a source for proprietary metals removal systems. Plymouth also provides consulting services to support efficient water re-use and conservation. They recently launched a spin-off company, Valkyrie Environmental Water, which works with large companies to solve mining, power and groundwater issues. For more info, go to [\*\*plymouthtechnology.com\*\*](http://plymouthtechnology.com).

## Moore and Bruggink

*2020 Monroe Ave. NW, Grand Rapids, MI 49505*

Moore and Bruggink is a full-service municipal design, construction and engineering services firm based in Grand Rapids, Michigan. They serve regional municipal and industrial clients and specialize in water and water treatment, transportation, and sustainable site and facility designs. Projects feature innovative technology, such as the anaerobic digester that was incorporated into the City of Greenville's wastewater treatment plant. It creates power from wastewater byproducts and it cut the town's municipal energy bill by 34 percent. The company sees growing markets and opportunities in cogeneration facilities, which would help clients on financing of infrastructure. They see a host of other business opportunities, from using wastewater effluent as a heat source to digestion technology for dairy farms. They see the need for policy and regulatory changes to support development of new technologies, and the need to utilize university research to find solutions to emerging water issues such as micropollutants. For more info, go to [\*\*mbce.com\*\*](http://mbce.com).

## Parjana Distribution

*1274 Liberty St. Suite 600, Detroit, MI 48226*

Detroit's Parjana Distribution has been solving water problems since 2004. For example, the corporation invented a water technology to help solve the world's most disruptive and deadly problems caused by standing surface and sub-surface waters. It's a patented device called the Energy Passive Groundwater Recharge (EGRP). It actually harnesses gravity, vacuum pressures, and the expansion-contraction properties of the earth to facilitate the process of natural water drainage without the need for electricity. The product is based on a very simple tubular technology, which, when placed in the ground, pulls water off the surface down into the ground, underneath the clay, and into the nearby aquifers. The EGRP is a solution for many problems. It waterproofs structures by managing water runoff, eliminates standing water, and maintains constant moisture content in the soil. This innovative green infrastructure technology can play a significant role in avoiding expensive gray stormwater infrastructure, save energy costs from managing stormwater, and reduce and eliminate costly and dangerous water overflows and pollution. For more info, go to [\*\*parjana.com\*\*](http://parjana.com).

## Prein & Newhof

*3355 Evergreen Dr. NE, Grand Rapids, MI 49525*

Grand Rapids-based Prein & Newhof is a civil engineering firm that designs water and wastewater treatment plants, municipal infrastructure, and provides environmental engineering and testing services. P&N's leadership is bullish on Michigan's potential to grow a Blue Economy – noting Michigan borders the most abundant and cleanest source of fresh water in the United States. As engineers, P&N takes great pride in designing systems that clean up dirty water and keep clean water clean. From an economic standpoint, water soon will be the “new” oil, and it will be Michigan's No. 1 economic development advantage – attracting businesses to relocate here – so long as it's used sustainably.

P&N's support services include surveying, drafting and GIS. For 40 years they have worked with state and local governments and private clients to design sustainable systems that clean water, move people, reduce energy use and support Michigan's quality of life. Some examples of P&N's “green” designs include stormwater systems that protect local rivers and streams; drinking water wells that provide long-term supply without impacting other environmental resources; no-dig technologies (like directional drilling and pipe relining) that decrease erosion, fuel use, traffic delays, and construction-related waste; bio-filtration systems that eliminate toxic chemicals; trails and sidewalks that help reduce vehicle-based pollution and improve public health; and roads, pipes, and buildings made from recycled materials.

They also design low-maintenance water and sewer systems that use gravity whenever possible, reducing the number of energy-consuming pumps. Some of P&N's projects reduce energy use enough to pay for themselves within a few years.

Challenges ahead include community financing issues — how can they pay for infrastructure maintenance and replacement? P&N's engineers are using asset management principles to help clients manage their infrastructure systems better and more efficiently while helping them produce an income stream sufficient to keep them operating and protecting our environment. For more info, go to [\*preinnewhof.com\*](http://preinnewhof.com).

## Mannik Smith Engineering Group

*65 Cadillac Square, Suite 3311, Detroit, MI 48226*

This longstanding firm based in Southeast Michigan provides consulting services for both the public and private sectors. These include civil/structural engineering, construction, cultural resources, environmental, geotechnical, landscape architecture. Mannik Smith has been a leader in developing and deploying green infrastructure projects and systems. Mannik Smith has directed hundreds of projects to completion on a wide range of environmental issues, including environmental investigations, brownfield redevelopment, ecological resources, site remediation and historic reconnaissance for federal, state and municipal clients, as well as private commercial and industrial clients. For more info, go to [\*manniksmithgroup.com\*](http://manniksmithgroup.com).



## Algal Scientific

*47050 5 Mile Rd., Northville, MI 48168*

Algal Scientific was founded in 2009 with the mission of using algae to treat high-strength wastewater from a variety of industries, such as food and beverage production. A primary focus was developing and deploying patented technology that reduced customer costs for water treatment while providing a secondary benefit, a source of algal biomass that could be used for organic fertilizer and animal protein. Their Algal Scientific Hypertrophic Water Treatment Process uses a single-step process to remove soluble organics, nitrogen and phosphorus from medium to high-strength wastewaters, using microalgae to simultaneously remove the water contaminants. Rather than allowing an algal bloom to occur in nature, where it causes significant environmental and economic damage, the system creates a controlled algal bloom in compact growth troughs. Then the system separates the algae from the water, producing clean water to meet the regulatory requirements of customers or reduce the surcharges they pay, and creates a biomass resource to process and market, thus reducing costs to customers. For more info, go to [\*\*algalscientific.com\*\*](http://algalscientific.com).

## Environmental Consulting and Technologies (ECT)

*2200 Commonwealth Bl. Suite 300, Ann Arbor, MI 48105*

Environmental Consulting & Technology, Inc. (ECT) is an employee-owned, multidisciplinary water resources and environmental engineering consulting firm offering a broad range of planning, management, scientific and engineering services. ECT's staff includes professional engineers, environmental scientists, fisheries biologists, ecologists, oceanographers, hydrologists, and geologists providing services and expertise in all disciplines of natural resource management.

Since its 1988 inception, ECT has grown to a staff of couple hundred with 19 offices in eight states. ECT's services have been commissioned by hundreds of state and local government agencies, federal government, school districts, colleges and universities, professional associations, hospitals, foundations, and private corporations.

Clients from both the private and public sectors use the firm's scientific research, analytical, and advisory capacities to develop and implement policies and strategic plans. Many of the firm's reports have attracted national and regional attention, and have shaped public policies and attitudes. For example, ECT identified the process and developed targets for the removal of beneficial use impairments (BUIs) for ten areas of concern (AOC) in five states, including Michigan (Clinton River, Rouge River, Detroit River, St Clair River, and Raisin River), Wisconsin (Sheboygan River, and Milwaukee River), Wisconsin/Minnesota (St. Louis River), Indiana (Grand Calumet River), and Illinois (Waukegan Harbor). For more info, go to [\*\*ectinc.com\*\*](http://ectinc.com).

## Serv-A-Pure

*1101 Columbus Ave., Bay City, MI 48708*

Serv-A-Pure was founded in 1946 by Howard H. Herzberger in Bay City, Michigan under the name of Herzberger's Water Conditioning. Initially the business sold basic water treatment systems such as water softeners, water conditioners, carbon filtration systems and ultraviolet light units. In November 1959, Dow Chemical Company asked for Serv-A-Pure to produce "deionized water," or ultra pure water. Through a proprietary process, Serv-A-Pure developed the super-pure water necessary for industrial and high-tech uses. The business grew as the company designed, manufactured and sold reverse osmosis systems for larger and more complex industrial uses. As the demand for ultra pure water increased, the company developed water systems to meet (and exceed) the demands of a competitive ultra-pure water-treatment market. Today the market for super-pure water includes the precision manufacturing of semi-conductors, and similar high-tech products. For more info, go to [servapure.com](http://servapure.com).

## Keweenaw Geothermal Research Group (KGRG)

*Mohawk, MI*

The Keweenaw Geothermal Research Group is a privately owned research and development company focused on Upper Peninsula geothermal assets. Their own assets include the original 40-acre parcel in Mohawk, Michigan, land that contains two Ahmeek copper mineshaft openings into the 6.1 mile-long Kearsarge Amygdaloid Lode. Today, at 80 feet from the surface, the underground workings are filled with geothermally heated water. Reservoir calculations estimate the total amount of water at 17 billion gallons. The National Renewable Energy Laboratory estimates the worth of such a thermal reservoir between \$4 million and \$32 million for space heating, direct use (hydroponics), or "direct to electric." The company is working to raise resources to deploy geothermal heating at a large scale for key parts of Hancock, Mich. and potentially other communities.

## Sustainable Water Solutions (SWS)

*Headquartered: 4464 Lone Tree Way  
Antioch CA 94531 – Michigan Operations*

Sustainable Water Solutions provides integrated water treatment and re-use solutions. Its offerings significantly decrease operating costs and increases plant safety, while facilitating environmental compliance. The company helps Michigan's water dependent industries run more sustainably – both economically and environmentally – providing a competitive advantage for a strong and diversified economy. SWS serves industrial, manufacturing, food processing, utilities, mining and petrochemical clients.

SWS optimizes client water-use management, enabling cost savings and increased focus on core manufacturing and production competencies. The company implements commercially proven technology and material surveillance systems. SWS tracks water and fluid management before entering the plant, during use, and before entering the sewer or discharge location. This translates into reduced chemical, gas, and water use with secondary savings throughout the plant. Typical

results include an increase in equipment capacity and life, forgoing the need for additional waste water treatment ponds, boilers, and cooling towers or condensers. Their motto is: “If you can’t measure it, you can’t manage it.”

SWS protects existing equipment installations, including boilers, cooling towers/condensers, waste water treatment lagoons, and processing equipment. SWS also improves facility compliance and sustainability.

SWS’s comprehensive water security, surveillance and monitoring suite is called Nereus. Nereus enables a complete and user-friendly overview of plant operation. It puts water, chemical and energy use at your fingertips. It’s easily accessed by computer or iPhone and can be fully customized to suit specific needs. Nereus helps you control costs, maintain very specific equipment parameters, and maximize production inputs better than ever before. For more info, go to [sustainablewatersolutionsllc.com](http://sustainablewatersolutionsllc.com).

## **Beckett & Raeder, Inc.**

*535 West William St. Suite 101, Ann Arbor, MI 48103*

Beckett & Raeder, Inc. is a corporation founded in 1966 and headquartered in Ann Arbor, with additional offices in Petoskey and Traverse City. The firm has a full-time staff of 20, including landscape architects, planners, civil engineers, LEED accredited professionals, and a certified Main Street Manager. Services including sustainable design, land-use programming and analysis, master planning, campus planning, placemaking, site planning and civil engineering, stormwater management, downtown revitalization and redevelopment, community planning and urban design, economic development and ecological and environmental sciences. Beckett & Raeder’s impressive work in Petoskey’s waterfront redevelopment was featured in the The Review magazine’s “Blue Economy” issue. For more info, go to [bria2.com](http://bria2.com).

## **Criptonic Energy, Inc. (CES)**

*2843 Orange Grove Rd. , Waterford, MI 48329*

Criptonic Energy Solutions was formed in August 2005 to function as an independent power provider of renewable energy. They’re working to implement the use of a patented design that utilizes sewage/wastewater as an energy/electrical power source. CES is on course to introduce a new way to produce electricity to the renewable power generating industry. The patented solution utilizes sewer waste material to operate hybrid turbines and waterwheels. The turbines and waterwheels drive electric generators to make electricity. This process can operate at up to 90 percent efficiency without releasing by-products into the environment.

Unlike coal burning and nuclear facilities, there are no dangers to the environment or hazardous waste that require safe and costly disposal. The technology has the potential of stabilizing power grid infrastructure as well as end-user cost. The power facilities are located underground and are non-critical with zero emissions. The power that is produced is cost-effective with low operating and maintenance costs. For more info, go to [criptonicenergy.com](http://criptonicenergy.com).



## WATER EDUCATION, RESEARCH & INNOVATION CENTERS – DESCRIPTIONS

### Northwestern Michigan College

*1701 E Front St., Traverse City, MI 49686*

Northwestern Michigan College (NMC) has programs and degrees in Freshwater Studies with three specialty streams: science and technology; global freshwater policy; and sustainability, economy and society. NMC also offers a new marine technology program. Students in these fields find course offerings as diverse as underwater archaeology – meteorology and climatology – oceanography, watershed science, underwater acoustics and sonar, marine GIS and data processing, water policy, ROV (Remotely Operated Vehicle) systems and operations and seaplane flight.

NMC also offers a maritime technology program offering various degrees and certificate programs. Students are able to become merchant marine officers and business professionals in a global marketplace. Curricula range from seamanship, navigation and piloting to steam and diesel engineering, along with 276 days of actual commercial sea time. NMC maritime alumni sail with fleets of the Great Lakes and oceans, with many serving as masters or chief engineers. Additional professional certification offerings including: radar that incorporates radar fundamentals, radar plotting and collision avoidance, radar theory, observation, operation and use, and navigational exercises.

An “able seaman” program trains the mariner in both practical use in survival craft and the theory of survival craft. The successful student receives a certificate, which satisfies survival craft training requirements. Advanced course students can receive a certificate from the Great Lakes Maritime Academy, which is recognized by the United States Coast Guard.

Marine technology offers a search and recovery sonar course that trains first responders, law enforcement, homeland security and surveillance agencies techniques in underwater acoustic imaging. NMC also has an underwater archaeology certificate program that introduces nautical archaeology to divers and non-divers.

The college is also engaged in a number of water research and development initiatives, including hydrographic surveying and subsurface robotics in the Great Lakes. It provides high-resolution bathymetric investigations of waters in support of ongoing research in strategies for predicting Avian Botulism outbreaks. There is also ROV support of underwater imaging for early detection of invasive wildlife and fish species.

NMC also maintains the Great Lakes Online Water Library (OWL), a free, online, digital repository housed at NMC’s Osterlin Library for use by local and regional associations (lake, river, watershed) for long-term archiving of information accessible by anyone.

Another initiative at NMC is the Tribal Voices of the Watershed, a unique freshwater studies student project. It has organized a significant collection of stories from the Grand Traverse Band of Ottawa and Chippewa Indians who have lived for more than three generations near Grand Traverse Bay. All recordings of personal histories about living in our watershed and all documents reviewed are part of the Online Water Library (OWL) at NMC and are available to researchers and the general public. For more info, go to [nmu.edu](http://nmu.edu).

## **Grand Valley State University – Annis Water Resources Institute**

*740 W. Shoreline Drive, Muskegon MI 49441*

The Robert B. Annis Water Resources Institute (AWRI) at Grand Valley State University is a multidisciplinary research organization committed to the study of freshwater resources. Major research and education areas (of many) include:

**Aquatic Ecosystem Restoration and Monitoring.** This involves work in the Muskegon Lake Area of Concern (AOC), and the Lake Macatawa Project Clarity, a 10-year, \$12 million initiative to restore ecological health of Lake Macatawa.

**Aquatic Ecosystem Monitoring.** Includes managing the Muskegon Lake Observatory – a real-time monitoring buoy in Muskegon Lake.

**Aquatic Research and Development.** A study to better understand the dynamics and potential consequences of potentially toxic cyanobacterium (*Gloeotrichia*) blooms in Silver Lake.

AWRI is also tracking Au Sable River brown trout and monitoring walleye reproductive and recruitment success in the Muskegon River. They're investigating the stock identity of suspected migratory yellow perch, which potentially represent a unique life-history type, moving between Lake Michigan and drowned river mouth lakes.

**Herbicide Resistance.** Several projects focus on herbicide resistance in invasive milfoil populations.

AWRI is also studying the long-term field performance of the bio-sand water filter in Haiti - assessing the sustainability and efficacy of drinking water purification filters installed there.

AWRI operates its own research and education vessels, and offers the Water Resources Outreach Education Program for schools and community groups. More than 155,000 students and passengers have experienced the Great Lakes and adjoining waters through this hands-on science program that features vessel cruises. For more info, go to [gvsu.edu/wri](http://gvsu.edu/wri).

## Central Michigan University

*1200 S. Franklin, Mount Pleasant, MI 48859*

Central Michigan University hosts a broad spectrum of water education and research activity, including coordinating the multi-institutional Institute for Great Lakes Research (IGLR), and the Center for Geographic Information Science.

Major projects and initiatives: A basin-wide Great Lakes coastal wetland-monitoring program; a aquatic invasive species (AIS) monitoring and management plan development; a project linking energy transfer from coastal wetlands to the \$7.5 billion Great Lakes sport and commercial fishery; managing an unmanned aerial vehicle hyperspectral remote sensing platform for wetland ecosystem analysis; assessing Erie Canal Corridor invasion risk using environmental DNA; the development of an environmental metagenetics approach for monitoring aquatic biodiversity; estimating Asian carp abundance using environmental DNA; and Programs coordinated for the National Science Foundation with other colleges and universities to enhance STEM Education with research-based environmental experiments. For more info, go to [cmu.edu](http://cmu.edu).

## University of Michigan

*500 S State St. , Ann Arbor, MI 48109*

The University of Michigan (U-M) has a diverse array of water education and research disciplines and institutes, working water issues on a global, Great Lakes-regional and local basis. Major institutional elements include:

The U-M Water Center was established in October 2012 to bolster freshwater ecosystem restoration and protection efforts. The Center engages researchers, practitioners, policymakers, and nonprofit groups to support, integrate, and improve current and future freshwater restoration and protection efforts. The Center just received a \$20 million federal grant to manage the investigation and find solutions to the toxic algae in Lake Erie that shut down Toledo's water system.

The Michigan Sea Grant is a cooperative program of the University of Michigan and Michigan State University, and is part of the National Sea Grant College Program. Michigan Sea Grant supports research teams that study an array of issues affecting the Great Lakes and Michigan's coastal areas. These projects focus on complex environmental challenges, meeting and anticipating changing needs of stakeholders and decision-makers. The goal of the MSG research program is to provide science-based information for real-life situations.

The College of Engineering operates a number of major water-based research and education efforts. Its Department of Atmospheric, Oceanic, and Space Sciences (AOSS) bridges engineering and science – AOSS studies space, climate and the atmospheres of planets while creating relevant space systems and instrumentation.

The Civil and Environmental Engineering division (CEE) strives to establish a balance between human activities and the environment as it develops and strengthens civil infrastructure.

The Naval Architecture and Marine Engineering (NAME) faculty and students conduct cutting-edge research in robotic remote sensing and mapping of our world's waterways using autonomous, unmanned vehicles.

The School of Natural Resources and Environment is engaged in a variety of Aquatic ecosystem monitoring, conservation, restoration and education efforts.

Highlights of projects and initiatives at the University of Michigan include:

- Water quality assessment of Lake Erie coastal wetlands; identifying the environmental controls of algal pathogen epidemics and their influence on harmful algal blooms in Lake Erie.
- The study of microplastics to establish a long-term multidisciplinary research platform to assess their impact on ecosystem health in the Great Lakes.
- The Restoration of the fish habitat in the St. Clair River. New underwater reefs are being constructed in order to encourage native fish reproduction, like lake whitefish, walleye and lake sturgeon.
- Forecasting for the Great Lakes, monitoring of changes in water levels; using a Great Lakes fleet of AUVs and ROVs.
- Clean Marina programs in Michigan, Ohio and Wisconsin are focused on reducing pollution from marina activities throughout the region.
- Climate and water quality: Projects to enhance understanding of expected impacts of climate-change-induced extreme events, within the Great Lakes, using Lake Erie as a case study.

For more info, go to [\*\*umich.edu\*\*](http://umich.edu).

## Michigan State University

*220 Trowbridge Rd., East Lansing, MI 48824*

Michigan State University (MSU) is home to major water research and education centers, including:

MSU Center for Water Sciences. The mission of the Center for Water Sciences (CWS) is to advance scientific research and knowledge for understanding, protecting, and restoring water resources and their sustainable use by humans and ecosystems around the Great Lakes and the world. CWS projects include the study of the historical record of pollution using molecular tools and Great Lakes cores and determining how to better manage these watersheds in order to improve public health. And the Saginaw Bay Coastal Initiative, which is an investigation of potential public health risks associated with pathogens in Saginaw Bay.

The Institute of Water Research (IWR) provides timely information for addressing contemporary land and water resource issues through multidisciplinary efforts using advanced information and networking systems. IWR projects include The Great Lakes Clean Communities Network (GLCCN). GLCCN is a multi-partner effort funded by the Great Lakes Protection Fund, which helps connect watershed groups, sustainability managers, environmental organizations, local governments,

universities and others to share knowledge, methods, and tools to address environmental issues specific to their area.

The W.K Kellogg Biological Station (KBS) is an MSU research field station with a focus on fundamental and applied research in ecology and agriculture. KBS is home to a National Science Foundation long-term ecological research site, as well as a Department of Energy Great Lakes Bioenergy Research Center field experiment site. KBS projects include *Michigan wetland ecology and biogeochemistry*, which includes examining how the hydrology of southern Michigan wetlands controls their biogeochemical and ecological characteristics, and how hydrological changes resulting from our changing climate may alter these ecosystems. Analyzing *zebra mussel invasions of Michigan lakes*, and the ecological impacts of zebra mussels, an invasive species presently spreading into our inland lakes, with particular interest in the possible link between the mussels and the recent occurrence of noxious blue-green algal blooms.

Department of Fisheries and Wildlife: Partnership for Ecosystem Research and Management (PERM) coordinates ecosystem-level applied research, provides outreach services to water management agencies and serves as a liaison between management agencies and other MSU entities that conduct research, education and outreach on high priority problems. PERM projects include quantitative analysis of fisheries evaluation of stock assessment methods and use of simulation models to evaluate different harvest policies and other management choices. Another project is the study of the effects of natural toxins such as mycotoxins, and environmental contaminants such as PCBs on animals. For more info, go to [msu.edu](http://msu.edu).

## Wayne State University

42 W Warren Ave., Detroit, MI 48202

Wayne State University (WSU) hosts major water research and collaborative education initiatives including:

The HEART Freshwater Center. HEART is a unique alliance of agencies (WSU, MCC, Huron-Clinton Metropolitan Authority, and Macomb County) working together to study the Huron to Erie Corridor through research, education and training. The focus of this center is the St. Clair River, Lake St. Clair, the Detroit River and western Lake Erie. The alliance is engaged in aquatic ecosystem restoration work. It provides a home base from which field studies can be launched in nearby wetlands and laboratory analysis of their chemical and biological composition can be most conveniently initiated. HEART is facilitating two Great Lakes coastal marshland restoration projects to restore 486 acres of Great Lakes marsh infested with the invasive *Phragmites*.

WSU's Urban Watershed Environmental Research Group conducts a host of high-impact research investigations including:

Real-time system optimization for sustainable water transmission and distribution — pioneering information tools to improve water and wastewater infrastructure performance, more sustainable water transmission and distribution. WSU is developing software that will integrate with existing water utility operating systems to achieve energy reduction by improving pumping efficiency throughout entire water systems.

Developing a digital library for complex environment analyses of the St. Clair watershed.



Water monitoring technology and pathogen detection – the system under development will eventually be able to detect a broad variety of biological and chemical contaminants in real-time or by remote monitoring.

Ballast water verification and development of automated ballast water verification systems.

**Improving beach monitoring in urban waters for fecal contamination.** WSU is developing rapid, reliable, accurate, simple and cost effective methods for water quality monitoring for fecal contamination, and to apply fecal marker technologies – such as microbial source tracking – for identifying the sources of fecal contamination.

WSU's College of Engineering is conducting a critical evaluation of waterborne bridge scouring and impact on the condition of bridge infrastructure. For more info, go to [msu.edu](http://msu.edu).

## Great Lakes Environmental Research Laboratory

*4840 S. State Rd., Ann Arbor, MI 48108*

Established in 1974 in Ann Arbor, Michigan, the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory (GLERL) conducts high-quality research and provides scientific leadership on important issues in both Great Lakes and marine coastal environments leading to new understanding, tools, approaches, awareness, and services. GLERL is a federal laboratory that provides coastal constituents and federal, state, and international decision- and policy-makers with scientific understanding of natural hazards such as severe waves, storm surges, and ice. Also harmful algal blooms, ecosystem and food web interactions including threat and impact of aquatic invasive species, changes in lake water levels, and regional effects related to global climate change. For more info, go to [glerl.noaa.gov](http://glerl.noaa.gov).

## Michigan Technological University

*1400 Townsend Dr., Houghton, MI 49931*

Michigan Technological University (MTU), through its Great Lakes Research Center (GLRC), coordinates a range of applied research and water initiatives, involving:

Water ecosystem monitoring. The Great Lakes Observing System, which involves deploying a series of coastal buoys in Lake Superior to gather information on water temperatures, the frequency and intensity of storms associated with global climate change.

The Great Lakes Coastal Forecasting System involves numerical modeling of three-dimensional lake-scale circulation, thermal structure, and biological-physical interactions.

MTU is also a leader in using GIS (Geographical Information Techniques) and remote sensing techniques in answering questions related to aquatic ecosystems, including mapping and analyzing the movement and intrusion of mine tailings into fish habitats.

Michigan Tech is also engineering approaches to lake and river management. This involves mathematical modeling of surface water quality and studies of fish feeding, reproduction, habitat and survival studies. Also monitoring the behavior of metal contaminated sediments in the Lake

Superior basin, and changes in ecosystem function with sand accumulation in the salmon and trout rivers. For more info, go to [mtu.edu](http://mtu.edu).

## Northern Michigan University

*1401 Presque Isle Ave., Marquette, MI 49855*

Northern Michigan University (NMU) programs include:

**Water Ecosystem Restoration:** A project for understanding wetland bird use in Michigan's coastal wetlands and creating large-scale conservation plans that help to establish priorities for stewardship and conservation programs for conservation organizations. Special projects include restoration of coaster brook trout, a migratory strain, to Lake Superior tributaries and a piping plover protection program including a captive rearing program for abandoned eggs; nest and chick protection from predators and human disturbances; and critical habitat protection.

**Aquatic Ecosystem Monitoring:** Assessing the impacts of climate variability and change on Great Lakes evaporation, and implications for water levels.

**Geoarchaeology and environmental history:** Examining traditional Native American use of the landscape with a regional specialization in the Upper Peninsula of Michigan and the northern Great Lakes; cultural resource surveys using geoscience techniques including soil stratigraphic analyses, remote sensing, and geomorphology.

**Geomorphology of the U.P.:** Understanding the glacial history and glacial landforms; groundwater hydrology in bedrock terrain, and Lake Superior shoreline processes. The studies use remote sensing techniques, including LiDAR and Multispectral Scanner (MSS) data from various satellite and aircraft instruments to map landforms and quantify natural processes at work. For more info, go to [nmu.edu](http://nmu.edu).

## Saginaw Valley State University

*7400 Bay Rd., University Center, MI 48710*

Saginaw Valley State University (SVSU) and its Saginaw Bay Environmental Institute are active in the following: **Water Ecosystem Monitoring:** Developing and implementing rapid bacterial testing for local fresh waterways, especially beaches, and utilizing cutting edge instrumentation to determine population levels of fecal indicator bacteria. The method provides results in as little as four hours versus the 24 hours required in current testing methods, thus reducing human contact time with contaminated water and providing more effective beach monitoring.

**Aquatic Research and Development:** Assessing ecosystem health and pollution in Saginaw County, Michigan using parasite-host relationships in frogs to understand the roles parasites play in our environment, and how their sensitivity to certain pollutants may help gauge the overall health of the environment.

Other projects include DNA fingerprinting of zebra mussels in Saginaw Bay; determining the potential ecological impact of these populations; and a system-wide integrated framework for understanding impacts on Saginaw Bay to help guide investments in nutrient management

practices and restoration projects, and how to strategically allocate resources and conservation practices to accomplish multiple ecological and economic goals.

National Science Foundation (NSF) STEM Watershed Educational Research: Provides watershed-based laboratory experiences for students in specific biology and chemistry coursework at SVSU and partner institutions. It's a unique project because a junior college, an undergraduate university and a graduate university all work together. Their aims are to increase interest, real-world relevancy and skills of students in chemistry and biology, determine the effects of the curricula and cross-discipline design on student outcomes, and provide a transferable model for other institutions wishing to similarly transform their curricula. For more info, go to [svsu.edu](http://svsu.edu).

## Lake Superior State University

*50 W Easterday Ave., Sault Ste. Marie, MI 49783*

Lake Superior State University (LSSU) has water related programs that involve:

**Ecosystem Restoration:** Studying the effects of development and impervious surfaces in the Ashmun Creek Watershed, Sault Ste. Marie, to aid the Soo Watershed Association, and the Army Corps of Engineers in their assessment of the watershed and how to rehabilitate it.

Developing a watershed management plan for the Waishkey River watershed through a 10-step program of assessment, monitoring and improvement of the water quality in the Waishkey River watershed.

Assessing fish populations in the St. Marys River to determine restoration needs and how to support salmon and sport fish populations and increased tourism and economic activity in the twin Saults.

**Ecosystem Monitoring:** LSSU and its Aquatic Research Lab is also a partner in the Great Lakes Coastal Wetland Monitoring (GLCWM) a collaborative of nine universities and three U.S. and Canadian agencies, and led by Dr. Don Uzarski at Central Michigan University. The goal of the project is to implement a comprehensive bi-national standardized wetland-monitoring program across the entire Great Lakes basin. Data collected will be used to develop and test metrics using fish, macroinvertebrate, vegetation, birds, and amphibians. Over a five-year project period, the GLCWM program will sample 10 percent of Great Lakes coastal wetlands and identify trends across space and through time at a subset of wetlands.

**Water Research and Development:** A study understanding the linkages between tributaries and Whitefish Bay and their significance for lake whitefish stocks, and the commercial fishery in Whitefish Bay.

Other studies examine the embattled Lake Sturgeon and Atlantic Salmon in the St. Marys River and its tributaries, and the interactions between sea lamprey and lake whitefish. The effects of introducing non-indigenous brown trout into a native brook trout stream and the effectiveness of a filtration system in Sault Sainte Marie, which is designed to reduce disease on Atlantic salmon stocks.

**Product Development:** LSSU business school faculty are supporting the development of a new commercial product for Superior AquaSystems. They're designing a sustainable, eco-friendly

system to grow fish and organic produce for human consumption. The business school is engineering a cost-effective, recirculating aquaculture system using renewable energy and biologically sound water purification systems.

Researchers are also exploring a method of scrubbing petroleum hydrocarbons from soil and groundwater, and synthesizing and deploying new biodegradable organic materials that would isolate insoluble soil contaminants near the groundwater layer for rapid and safe removal. For more info, go to [lssu.edu](http://lssu.edu).

## Oakland University

*2200 N Squirrel Rd, Rochester, MI 48309*

Oakland University is leading research in:

Robotics, intelligent systems, complex autonomous systems, unmanned ground vehicles, unmanned underwater vehicles, and unmanned aerial vehicles.

Studies of complex mixtures, water treatment processes, remedial investigations of contaminated sediments and fate and transport of chemicals in the environment.

Biogeochemical cycling of trace elements to determine the processes controlling trace elements absorption, transfer and redistribution in the environment in order to evaluate soil, water, and living organism contamination risks.

How agricultural and other pollutants affect local pond communities, including altered dynamics of parasites that can affect people and human health. For more info, go to ***Oakland.edu***.

## Western Michigan University

*1903 W Michigan Ave., Kalamazoo, MI 49008*

Western Michigan University (WMU)'s water "work" includes:

**Developing Michigan Heritage Water Trails:** routes on navigable waterways designed to foster an interactive historical educational experience. Current efforts focus on developing a leisure corridor that integrates bike, sea kayak, and driving routes.

Using geospatial technologies to better hunt fossils. National Science Foundation-funded research is using geospatial technologies (satellite image analysis, geographic information systems, and the global positioning system) to improve the likelihood of finding productive Eocene mammalian fossils in the Great Divide Basin, Wyoming.

Using GIS (Geographical Information Techniques) to reduce the impact of sensitive weather on profitable crop production in the US. A USDA-funded multi-million dollar project to use GIS to develop methods for multi-scale, multi-crop, multi-regional crop disease forecasting system and web-based delivery system. Research will benefit a variety of cropping systems throughout the U.S. including peanuts in Georgia and northern Florida, barley in the northern Great Plains and potato-growers in Michigan.

An initiative to understand water resources management, water hydrology and nonpoint source pollution in the U.S. and China, answering questions such as: How much freshwater is available to support the multiple demands for water for domestic supplies, industrial development, agricultural irrigation and hydropower generation while satisfying the needs for ecosystem maintenance? How does land use/cover change resulting from human-environmental interactions affect the watershed over space and time? How can hydrologic models and spatial technologies be incorporated in planning processes to support watershed management and ecosystem protection? How can new computing, modeling, tracing, mapping and remote-sensing technologies better observe, analyze, and visualize the dynamics of water resources?

Environmental risk assessments include examining how industrial contaminants and pesticides found in the Great Lakes Basin alter ecosystem health. And studies include examining the interactions of trace metals and their effect on natural compounds in the environment, and the transformation and removal of pollutants by river wetlands.

WMU energy-related projects also improve the understanding of geology, in support of oil and gas exploration. WMU also offers a Freshwater Studies major for undergraduates. For more info, go to [\*\*wmich.edu\*\*](http://wmich.edu).

## **University of Michigan-Dearborn**

*4901 Evergreen Rd., Dearborn, MI 48128*

University of Michigan-Dearborn (UM-Dearborn) is examining sources of pollution to the Great Lakes. They're tracking suspended and contaminated sediments within Michigan's Lower Rouge River to understand the amount of heavy metals that are mobilized as discharge increases. This has a profound impact on remediation efforts and on aquatic and near-shore habitats. The school is also monitoring fish community responses to restoration activities in the Rouge River watershed to understand the ways in which restoration efforts impact the population.

UM-Dearborn operates an Environmental Interpretive Center to foster student and community awareness of our natural environment. Its goals are to protect and promote the conservation of ecosystems in the densely populated region of southeastern Michigan and to provide "hands-on" experiential education and discovery opportunities about the environment for young children and students of all ages. For more info, go to [\*\*umdearborn.edu\*\*](http://umdearborn.edu).

## **Eastern Michigan University**

*900 Oakwood St., Ypsilanti, MI 48197*

Eastern Michigan University (EMU) researchers are active in understanding bioaccumulation and metabolism of PCBs in freshwater invertebrates. They're also studying the effects of flood disturbance on algal biomass and community composition, and investigating the influence of algal photosynthesis on bacterial activity. They're looking at the linkages between terrestrial and aquatic ecosystems and the watershed scale processes that control the export of carbon and nutrients from land to water, and how the biotic and abiotic environments shape the ecology and evolution of fish populations. They're studying invasive fish species and their management in the Great Lakes Region. They're examining the impact of historic climate variability on stream flow

and precipitation in the Allegheny River watershed, and the timing and impact of snowmelt flooding on Great Lakes ice break-up. The research includes estimating aquifer parameters, and the relationship between lakes, rivers, wetlands and groundwater. For more info, go to [emich.edu](http://emich.edu).

## Ferris State University

*201 S State St., Big Rapids Township, MI 49307*

Ferris State University (FSU) is active in the Muskegon River Watershed Assembly. They're dedicated to the preservation, protection, restoration and sustainable use of the Muskegon River, as well as the land it drains and the life it supports, through educational, scientific and conservation initiative. The school is working with partners in wild rice restoration and preservation programs. For more info, go to [ferris.edu](http://ferris.edu).

## Lawrence Tech University

*21000 W 10 Mile Rd., Southfield, MI 48075*

Lawrence Tech University (LTU) is home to the Great Lakes Stormwater Management Institute, whose mission is to effect positive environmental change in the Great Lakes region through research, education, and practical application of Low Impact Development (LID) and stormwater management techniques. The institute is involved in a number of projects. Those include the following:

Low Impact Development throughout the SE Michigan region.

Restoring natural flows in the Clinton River (MI) watershed.

Assessment of green roof performances.

The WaterTowns program, which is a community-based initiative designed to help towns and cities in the watershed leverage the assets of Clinton River and Lake St. Clair for water-oriented community development.

The Small Harbors Study, which is examining how Michigan communities with small, shallow-draft harbors can plan for economic sustainability in response to the long-term trend of lower water levels in the Great Lakes.

The Great Lakes Shoreline Cities Green Infrastructure Project – Near East Side initiative will deploy green infrastructure to manage and retain stormwater in areas outlined by Lower East Side Action Plan (LEAP), a Detroit community organization, and RecoveryPark, an economic development agency. For more info, go to [ltu.edu/water](http://ltu.edu/water).

## Alpena Community College

*665 Johnson St., Alpena, MI 49707*

Alpena Community College (ACC) offers an Associate of Applied Science degree in Marine Technology program. Students engaged in this program have assisted with research on projects as diverse as investigating submerged tree stumps in Lake Huron (indicating historic low levels of lake water) and mounds located at the bottom of Thunder Bay; assisted Grand Valley State University with shipwreck research for the Western Michigan Underwater Preserve; and translated documents recovered from the MV Nordmeer, which ran aground in 1966 in Lake Huron near Alpena.

ACC is also working with the Thunder Bay National Marine Sanctuary in a grant program from National Oceanic and Atmospheric Administration's Preserve America Initiative to create an exhibit for the Great Lakes Maritime Heritage Center focusing on marine technology. The centerpiece will be an ROV simulator promoting sanctuary stewardship, STEM education, and Alpena Community College's Marine Technology degree.

Also, every spring the Thunder Bay Marine Sanctuary hosts an ROV competition for students in upper elementary, junior high, and high school grades, as well as college and university students from all over America and several foreign countries. The competition is conducted with the assistance of marine tech faculty and student volunteers from ACC.

In the summer of 2014, the International MATE ROV competition took place in Alpena. ACC's marine tech faculty and students helped plan and execute the event, which attracted 800 competitors from around the world. For more info, go to [\*\*alpenacc.edu\*\*](http://alpenacc.edu).

## Kirtland Community College

*10775 N St Helen Rd., Roscommon, MI 48653*

Monitors the health of the watershed by sampling sites on six major tributaries of the Au Sable River for physical and biological parameters focusing on macroinvertebrate diversity. KCC and the Kirtland Foundation also work with four different Trout Unlimited Chapters, the Anglers of the Au Sable and the Au Sable River Watershed Restoration Committee to fulfill all aspects of this monitoring project, using Kirtland's Roscommon facility for training, testing and identification procedures. For more info, go to [\*\*kirtland.edu\*\*](http://kirtland.edu).

## Macomb Community College

*14500 E 12 Mile Rd., Warren, MI 48088*

Currently, Macomb Community College (MCC) is collaborating with Wayne State University (WSU) to develop transfer plans for students interested in pursuing water-based science and engineering studies. These programs will allow students to complete introductory science courses and elective courses at MCC before transferring to WSU to complete their undergraduate studies. The program will include a directed study research project for each participating student.

The faculty is also developing a surface water quality class to teach students water testing methods in the classroom and in the field. This is based on a previous experimental course entitled Great Lakes Source Waters Quality Studies that allowed students to adopt numerous local streams for monitoring and directed research activities.

Another experimental course currently under development is called Water Science and Society. It will explore the physical, cultural, and economic issues related to water supply and include a student project involving the installation of water monitoring wells in the Nature Centers at its campuses. In the future, these wells will be outdoor labs for water quality testing and understanding ground water flow.

Macomb Environmental Science faculty received a Clinton River Watershed Venture Grant in 2007 to study environmental impacts to the Clinton River tributary that runs through one of the school's campuses. The project has been incorporated into the Environmental Science classes at the college.

The Environmental Science Water Quality Monitoring Program at Macomb Community College also allows Environmental Science instructors to participate with their classes as volunteers working with the Clinton River Watershed Council to perform water quality monitoring activities in local waters. For more info, go to ***macomb.edu***.

## **Bay College (Escanaba)**

*2001 N Lincoln Rd. , Escanaba, MI 49829*

Bay College (Escanaba) operates a Water Technology Program including courses and degrees in Water Resource Management designed to provide specialized training in water and wastewater treatment theory and application to both entry-level personnel and those already in the field.

The school also offers:

A Water Resource Management 1+1 program. After completing a basic freshman year curriculum in science at Bay de Noc CC, students may transfer to Bay College for specialized courses in Water Technology. Upon graduation, students are awarded an Associate in Applied Science in Water Resource Management degree and are immediately eligible for certification and entrance into the water/wastewater treatment industry.

Certificate in Water Technology. This certificate program trains entry-level maintenance operators and lab technicians for jobs with municipalities and industries involved with control and prevention of water pollution.

Student projects and internships as part of these programs have included the following: a private well fluoride study of Delta, Menominee, Schoolcraft and Dickenson counties; a water quality study for Tacoosh, Days, Rapid and Whitefish Rivers, a phosphorus and nitrate study on the Escanaba River, and watershed surveys for nitrogen, phosphorus and chlorophyll over the east and west ends of the Hiawatha National Forest. For more info, go to ***baycollege.edu***.



## Kellogg Community College

*450 North Ave., Battle Creek, MI 49017*

Has no degree program currently, but includes watershed management in courses in collaboration with Battle Creek Area Clean Water Partnership. The school is also a partner in numerous community projects through the Battle Creek Area Clean Water Partnership, Recycle Rama, and Children's Water Festival. For more info, go to ***kellogg.edu***.

## Kalamazoo Valley Community College

*6767 W O Ave., Kalamazoo, MI 49009*

Kalamazoo Valley Community College (KVCC) is exploring a Water Technology program as a part of new campus offerings. For more info, go to ***kvcc.edu***.

## Schoolcraft College

*18600 Haggerty Rd., Livonia, MI 48135*

Schoolcraft College (SC) offers an environmental studies associate degree and environmental science technician certificate program. Its geography department has also worked with the Friends of the Rouge (FOTR) for more than 10 years; participating in the fall and spring bug hunt, and the January stonefly hunt. They send data to the FOTR to include on the Rouge Watershed Data. For more info, go to ***schoolcraft.edu***.

## North Central Michigan College

*1515 Howard St., Petoskey, MI 49770*

North Central Michigan College (NCMC) tests three sites in the college natural area for fecal coliform contamination, and conducts a diversity and abundance exercise with the data. Students also collect macroinvertebrates from the Russian Creek and do a sequential comparison index with the specimens. NCMC also works collaboratively with Tip Of The Mitt Watershed Council on educational programs. The school participates in the Great Lakes Alliance Annual Beach Survey, where they clean up the beach at Petoskey Harbor, and also conduct many water-related measurements, such as bacterial counts, algae, turbidity, etc. For more info, go to ***ncmich.edu***.

## Jackson Community College

*2111 Emmons Rd., Jackson, MI 49201*

Jackson Community College (JCC) students do a service-learning project with the Jackson Soil Conservation District where they sample insects and water. They also do water quality assessments on the rivers and creeks in the area, looking for nitrates, phosphates, and dissolved oxygen.

The College's environmental science program sees students work on local ecological hypotheses drawn from both terrestrial and aqueous environments. In one experiment, a group of students is biomining and trying to determine the kind of extremophiles that they will find in the salt marshes of Michigan along the Maple River estuary. These small ecosystems are found in few places throughout Lower Michigan and offer the students a science laboratory setting in nature. The students are comparing their findings to work that students did on the Great Salt Lake microbial life at Utah State University. For more info, go to [jccmi.edu](http://jccmi.edu).

## West Shore Community College

*3000 N Stiles Rd., Scottville, MI 49454*

West Shore Community College (WSCC) does not have a water-based degree, but does offer a variety of water-based courses on a reoccurring basis. Those include: aquaculture science, introduction to lake biology, water analysis, and fish biology.

WSCC also participates in the watershed monitoring of the Big South Branch of the *Pere Marquette River*. This project includes water analysis, macroinvertebrate sampling, and fish electroshocking. They do sampling twice a year, (spring and fall). The goal is to monitor possible pollution or other changes in the river. And WSCC works with the Little Manistee Watershed Conservation Council, monitoring the Little Manistee River once a year, and conducts water monitoring for the Hackert Lake Improvement Board, studying the lake for potential ecological problems.

WSCC also used Water as an interdisciplinary theme in its winter 2014 semester. More than 20 courses across all the college's departments focused on water and water issues as part of the curriculum, including sharing *The Living Great Lakes: Searching for the Heart of the Inland Seas* by Jerry Dennis as a common read. For more info, go to [westshore.edu](http://westshore.edu).

## Washtenaw Community College

*4800 E Huron River Dr., Ann Arbor, MI 48105*

Washtenaw Community College (WCC) does not have any "water-based" programs, however they offer two programs in environmental science that include a strong water quality component. The Environmental Science Associates in Science degree is a two-year program based on physical science, which prepares students to transfer to a four-year institution to complete their Bachelors in Environmental Science. It is ultimately preparing students for careers in resource management, waste management, sustainability, environmental consultation and the like. The Environmental and Society Certificate is a five-semester program emphasizing the social science perspective. Both tracks integrate biology, chemistry and geology.

In other initiatives: Digital Media Arts faculty member Matthew Zacharias has gotten his students involved in creating public service videos for the Huron River Watershed Council. And WCC has been active with the Sustainability Literacy Task Force, in a series of events to create a greater understanding of environmental issues on campus and beyond, including activities focused on Michigan's waterways. The school hosted a "Year of Water." The task force organized a number of water-related events, including a college-wide book read of *The Windward Shore* by Jerry Dennis, a visit to Rolling Hills Water Park, hosting talks by Laura Rubin of the Huron River Watershed Council and Marc Smith of the National Wildlife Federation, and a water clean-up day at Gallup Park in Ann Arbor. For more info, go to [wccnet.edu](http://wccnet.edu).

## **Muskegon Community College**

*221 Quarterline Rd., Muskegon Township, MI 49442*

Muskegon Community College is working on undergraduate student-centered research projects related to biology and biofuel and has a chemistry professor working on biofuels, bioenergy, and student-centered research. For more info, go to [muskegoncc.edu](http://muskegoncc.edu).

## **University of Michigan-Flint**

*303 E Kearsley St., Flint, MI 48502*

The University of Michigan-Flint (UM-Flint) is active in projects examining invasive species ecology, aquatic invasive species management, fisheries management, fish population dynamics, and simulation modeling. They also are involved with partners in work on the Flint River Watershed plan and its management. For more info, go to [umflint.edu](http://umflint.edu).

## **St. Clair County Community College**

*23 Erie St., Port Huron, MI 48060*

Offers a Freshwater Systems-Water Monitoring and Assessment Degree. For more info, go to [sc4.edu](http://sc4.edu).



## WATER PLACEMAKING -- DESCRIPTIONS

### Bay County

Led by its chamber of commerce, community foundation, county leadership, and with support from Saginaw Valley State University, Bay County has developed an “economic roadmap.” Its priorities include developing a robust and diversified economy and a strong sense of place, and an initiative to rebrand the region from “Tri-Cities” to “Great Lakes Bay Region.” Its strategy includes building a Blue Economy to use water in smart and sustainable ways, and leveraging natural water assets for community economic development. Their goal is to have a clean and accessible waterfront by 2024.

In the 1980s, Bay County did a good deal of waterfront development and repurposing of land along the Saginaw River through Bay City. With Environmental Protection Agency “brownfield” funding, sites were cleaned up, electrical power systems installed under the river, and hotel and office development was accommodated along the river. But Bay County has historically provided little access to the bay itself, except at the state park. Now, as part of the roadmap implementation, leaders are looking to purposefully enhance public access to waterfronts, and implement water amenities and developments. They’re also looking for projects and ways to grant and steer dollars to provide “mass use” of the waterfront. The community is also working to develop access points and connect to the “Blueways Trail,” which is being developed along the Michigan’s northeast coast, and extend the Saginaw River Rail Trail, and build connections to the marina. There are challenges to overcome, including restrictions on land use, but things are moving. For more info, go to [bayfoundation.org](http://bayfoundation.org).

### Portland, Michigan

As reported in Michigan Municipal League’s *Review* magazine: Portland, Michigan’s updated boardwalk has created new life for downtown businesses. The Riverfront redevelopment simply reinvented the town, which had been fading for years. Portland was one of the first cities to be recognized as a Michigan “Cool City” and a Michigan Main Street Community. In 2004, the city of around 4,000 people was awarded the Cool Cities Catalyst Grant (\$100,000). It also received a \$625,000 grant from the Michigan State Housing Development Authority to develop loft apartments above downtown buildings.

The Cool City designation paved the way for further reinvestment. Portland then worked with Grand Rapids-based Fleis & VandenBrink Engineering, Inc. on the multi-phase Downtown Waterfront Development Project. The company provided design concepts and grant administration for the redevelopment, which consisted of a system of paved paths, boardwalk riverfront façade improvements, a new pedestrian bridge, band shell, and landscape improvements. The city of Portland, the Portland Downtown Development Authority, and local business owners provided critical input.

The project had challenges, including access problems for the construction, strict state permit requirements and protection of the historic buildings. But the improvements were dramatic and beautiful upon the project's 2007 completion. The effort is testament to the city's commitment to its future, while simultaneously honoring its past. For more info, go to [portland-michigan.org](http://portland-michigan.org).

## Saginaw Bay

Saginaw Bay Watershed Initiative Network (WIN) is a unique collaborative of communities, conservationists, foundations and businesses. The group came together to identify issues, set priorities and develop projects in Saginaw Bay. Its aim is to steward natural resources, strengthen local economies, nurture agriculture and bolster nature-based tourism. It started 20 years ago when the Dow Chemical Company and other corporate partners came together to form a corporate and philanthropic pool of resources for strategic investments. They engaged the Conservation Fund, a national conservation organization to manage efforts, run by Mike Kelly, locally.

The Saginaw Bay Watershed Initiative Network provides funding support for myriad key water-related initiatives, from river access to waterfront restoration to birding habitat. The initiative has been engaged in Rifle River restoration, shoreline amenity/feature development, and marketing/promotion by seeding and funding multiple partners, and efforts.

Independently in the city of Saginaw there has been private sector-led redevelopments of property and projects in the downtown area along the river. Those include condos, theater conversion, and a Central Michigan University medical school building along the riverfront. But there are many needs and challenges, such as showing investors the economic benefit of the waterfront, and the role of beach/bay development and placemaking. For more info, go to [saginawbaywin.org](http://saginawbaywin.org).

## Flint, Michigan

Efforts to transform the Flint River corridor from a distressed waterway to a natural resource are underway. The work will be a huge community asset and provide a national example of urban river restoration. Some brief history: early convergence of key leadership groups/institutions (including Kettering University, University of Michigan-Flint, Hurley Hospital, Mott Community College, Genesee Chamber of Commerce) led to a "turn to face" the river effort, and the planning for a riverfront housing and community development. The Flint Rivers Corridor Alliance was created. It moved some projects forward in fits and starts. The Charles Stewart Mott Foundation supported strategic planning.

Local surveying and engineering firm Wade Trim developed a riverfront plan, which is, in part, a working blueprint for river redevelopment that's currently integrated with Flint's new master plan. Now the Flint River Watershed Council is the lead agency to move efforts forward. Focused on the first phase of Flint's Hamilton Dam and riverfront restoration, they're currently organizing resources to complete this as a signature project. Significant work has gone on around green cap, and tree planting around Chevy in the Hole industrial sites – as part of U.S. Environmental Protection Agency cleanup. For more info, go to [flintriver.org](http://flintriver.org).

## Northeast Michigan

The not-for-profit organization Huron Pines is facilitating broader multi-stakeholder discussions around how to build on natural assets, including water, for community development and economic growth in northern Michigan. Huron Pines and other partners have been engaged in a variety of localized water place-making initiatives. The Gaylord, Mich.-based Huron Pines is striving to integrate the economic benefits of natural resources into land conservation projects in order to better support habitat restoration projects and benefit local communities. For more info, go to [\*\*\*huronpines.org\*\*\*](http://huronpines.org).

## Manistique, Michigan

Manistique, Michigan developed in the late 1800s as a lumber and fishing community at the mouth of the Manistique River on Lake Michigan. The community was accessible by steamship before there were roads into the city. Manistique has approximately eight miles of frontage on the Manistique River and Lake Michigan. The town's two-mile long boardwalk is a popular destination for both residents and visitors. Surrounding natural resources also attract tourists to the region.

Blue Economy opportunities for Manistique include expanding the marina to accommodate larger vessels and the construction of a broadside dock, as well as the opportunity to accommodate cruise ships. There are city plans to acquire additional waterfront property along Lake Michigan for a campground and a park, as well as acquiring right-of-way along the Manistique River. The city plans to install a Kayak ramp. For more info, go to [\*\*\*tinyurl.com/15cjl9\*\*\*](https://tinyurl.com/15cjl9).

## Ontonagon, Michigan

The Ontonagon River is the longest river in the Upper Peninsula, and it provides ample recreational prospects. The historic village of Ontonagon has identified the opportunity to develop a water trail along that river as well as its lovely Lake Superior shore, aiming to collaborate with the U.S. Forest Service to identify put-in and take-out points. The village's future waterfront plans include increasing accessibility to the lighthouse and developing a water trail on the river. The lighthouse is currently accessible only by crossing private property. Because of this, access is limited to visitors who join a guided tour run by Ontonagon's historical museum. One potential option is to increase public accessibility to this historical resource by transporting visitors across the river from downtown by boat. Ontonagon sees many other Blue Economy opportunities. Those include the redevelopment of the paper mill property, as well as a re-envisioning of the character of the waterfront and riverfront boardwalk. The village needs to enhance its role as transportation hub, with water-road-rail access. It needs to develop a new transient slip boat basin on the east side of the river, with walking access to shopping, entertainment and gathering spaces. For more info, go to [\*\*\*villageofontonagon.org\*\*\*](http://villageofontonagon.org).

## Sault Ste. Marie, Michigan –

The Soo Locks and corridor dominate Sault Ste. Marie's beautiful waterfront. Land use along said waterfront evolved as older industrial areas have moved or closed. The stretch is dotted with historical and tourism-related sites and developments. In fact, there are more than 50 documented historical places in the city of about 14,000 people, including 12 on National Register of Historic Places (including The St. Marys Falls Ship Canal-Soo Locks, Old Fort Brady, and Steamship Valley Camp) and an additional 16 historically significant sites in the downtown area. The city has a number of waterfront parks – a “string of pearls” that provide access to the upper and lower river – that the community is trying to tie together more systematically. Each year approximately 500,000 people visit the Soo Locks Visitor Center and park. Sault Ste. Marie has two beautiful ports that are also harbors of refuge, the Charles T. Harvey Marina and the George Kemp Marina.

To date, the community has yet to implement a plan for comprehensive waterfront access and redevelopment. There was a recent grant-funded plan for an ambitious waterfront walkway, at an estimated cost of \$3 million, but it never advanced. New waterfront access and use elements have been developed when projects and funding emerged. Last summer, the community dedicated interpretive panels along its length. There's a stormwater retrofit project and streetscape improvements. Rotary Park, a waterfront city park, got a face lift.

An old tannery/superfund site on the town's west side has been cleaned up and delisted. The St. Marys River is an Area of Concern (AOC) and the remedial action plan includes changes to the water-flow configuration that will open it up under a causeway. The community is part of the Eastern Upper Peninsula Regional Planning & Development plan to tie together and promote a water trail along Lake Michigan. The community also participated in a recent state placemaking project (MIplace), but used that to plan neighborhood developments and tie-ins off the water.

The needs and challenges are many. There have been budget cuts, which have resulted in low prioritization for waterfront planning. Upgrades are needed at several waterfront parks, like Ashman Bay. There's an outdated master plan and a lack of integration of planning across local and federal jurisdictions. There are many sites that could be targets for waterfront redevelopment, such as the city's west dock (or the Reiss Coal Dock), which is the only deep water dock in the region and has the capacity to accommodate a fully loaded 1000-footer. The city's vision includes evaluating and developing the Reiss Coal Dock as a port facility that will alleviate the need to off-load materials at the downtown Carbide Dock. For more info, go to [tinyurl.com/phs8x6z](http://tinyurl.com/phs8x6z).

## Charlevoix, Michigan

Situated between Lake Michigan and the western side of Lake Charlevoix, this alluring historic town named after a French explorer sees many Blue Economy opportunities. Those include the potential for a larger dock at East Park on Round Lake in downtown Charlevoix. A goal would be to accommodate more boaters visiting with ferries, or other transit services from marinas on Lake Charlevoix. The challenges center on Round Lake where the waterfront is already heavily developed, with homes and private clubs occupying a large portion of it. The marine commercial district on the south side of Round Lake is dominated by condos and the demand for the marina can exceed capacity. East Park provides the only major public access to Round Lake. For more info, go to [tinyurl.com/ljnxu45](http://tinyurl.com/ljnxu45).

## **‘Traverse City, Mich./Grand Traverse County**

Traverse City has for some decades been engaged in visioning, planning, and supporting implementation of a citywide waterfront plan for enhanced public access, amenities, and feature development. Work began in earnest when a well-done community visioning process led to the “Your Bay – Your Say” plan. The plan has been dusted off and used as springboard for moving ahead with implementation of key elements.

Those elements include a broader Bayfront planning effort involving access and restoration.

There’s a water quality plan, which includes new waterfront development districts, a freshwater campus for non-profits/attractions (such as museums etc.), and public access clearing in Acme and Elmwood Township, along the bay.

The community leadership is also involved in a major multi-jurisdictional Blue Economy water leveraging/economic development plan along Boardman River, extending south and east from Traverse City all the way to the village of Kalkaska. The Boardman River Prosperity Plan includes the state’s largest dam removal efforts, its largest wetlands restoration, and a comprehensive water-leveraging economic development plan linking both the richest and poorest counties.

There are many lessons learned and identified challenges. For example, community foundations can play key roles in supporting collaborative vision and planning, raising needed match for state resource flows, and building capacity in local government to establish relationships with funding entities. A major point of emphasis is that purposeful public access expansion can include both non-profit and for-profit businesses and features (such as marinas and museums). For more info, go to ***traversecitymi.gov***.

## **Muskegon, Michigan**

Muskegon has had a heavily polluted and industrialized waterfront. “Growing up you did not know there was a lake,” says Kathy Evans of the West Michigan Shoreline Regional Development Commission. Efforts to clean and open up the waterfront to new uses and enhance public access have ensued after waves of factory abandonment and water pollution. Clean up of Muskegon Lake began in the ’60s with a grant from the U.S. Environmental Protection Agency. The ’70s and ’80s saw lots of plant closures on the waterfronts. Brownfield redevelopment funds, backed by the city and county, were used to clean up a number of factory and industrial parcels.

During this time a “Save Our Shoreline Lake Shore Plan” was developed but the actual cleanup/redevelopment pattern has been more episodic, driven by opportunity, and need, than the execution of a master plan. An Area of Concern (AOC) designation and remediation plan focused many of these efforts.

The Muskegon Lake Watershed Partnership emerged as a public-private convener and vehicle for ongoing project focus. One of the major projects included the extensive Hartshorn Marina cleanup, a place that now offers abundant recreational facilities.



Such projects showed the community tangible progress. Strings of projects followed, including the Heritage Landing park along the shore of Muskegon Lake, which is open to the community for recreational purposes.

Another significant effort is around the Port of Muskegon, its use and facility expansion. Muskegon Lake is the only major deep-water port on Lake Michigan and a robust public-private planning process is underway to keep and expand the deep-water port facility for commercial use, and redevelop significant parcels. Major plans and activities include the redevelopment of closed industrial sites, such as the Sappi paper plant complex and Consumer Energy's B.C. Cobb facility, and plans for how best to stitch them into evolving waterfront plans for public access and recreation. There's the development of Fisherman's Landing and campground, and development of shopping docks. There's the integration of a number of intersecting lake, water and land trails, amenities (such as the USS Silversides Submarine Museum, Milwaukee Clipper, USS LST 393 Museum) and boating services such as the Lake Express ferry service.

The Port Planning process has put Muskegon in the center of West Michigan regional economic development planning with strong inter-agency involvement from the state of Michigan.

There are community challenges. There needs to be more collaboration among local partners and jurisdictions, public and private sector. The City of Muskegon has been relatively hands-off, not really making or moving a master plan with community ownership for its waterfront. Lakefront Property owners act on their own, and fit within, a relatively uncoordinated redevelopment landscape. No comprehensive public access strategy exists – complicated by numerous private owners of waterfront. For more info, go to [tinyurl.com/n6ewo8r](http://tinyurl.com/n6ewo8r).

## Saugatuck, Michigan

Led by their Convention and Visitors Bureau, Saugatuck has, for some time, looked to combine their unique water assets – iconic beaches, lakefront property, state parks, and marina and harbor – with a distinctive arts theme to promote a tourism-driven economy. The plan worked.

A focus on a walkable, livable waterfront community development has added to the area's quality and economic vitality. Public access to water and the lakefront (and keeping the water views unspoiled by development) have been central tenets of the community development strategy. A tri-community development plan from decades ago, which is being updated now, sought to preserve views and limit condominiums and other developments. A Michigan Cool Cities grant in early 2000 helped launch a film festival, convert a redundant pie factory to an arts center, and develop Saugatuck's waterside park. It continued to enhance public access to water with additional community amenities. Saugatuck is a partner in West Michigan Water Trail network development for kayakers, canoeists and kiteboarders, and has a distinctive National Trust for Historic Preservation designation for its beautiful Oval Beach on Lake Michigan. For more info, go to [saugatuck.com/welcome/welcome.asp](http://saugatuck.com/welcome/welcome.asp).

## Allegan, Michigan

The city of Allegan sits on a bend in the Kalamazoo River with a natural lagoon adjacent to the downtown. For years the Kalamazoo River was a dumping ground. Over recent decades, the community has begun to turn, face, and reconnect to its riverfront as a new “main street” of the community.

The work started 30 years ago with a bridge modernization project, when the community rejected a new, more modern bridge and decided to keep an historic structure. Additional waterfront redevelopment projects came in the '80s, including the connection of the waterfront to the historic district. The '90s brought a dam renovation, a new walkable waterfront with public access improvements. Increasingly, Allegan's plans, and plans for the future, began to focus on the citizens' desires to reconnect to, and fully enjoy, the waterfront.

In recent years, with support from the Michigan State Housing Authority and the Michigan Municipal League, and grants from the state's placemaking efforts, additional community-visioning activities developed a plan for an even more comprehensive riverfront development. In Nov. '13 the community asked for and won a local vote for sinking fund millage of \$500,000 to finance elements of the plan. For more info, go to [tinyurl.com/l64df92](http://tinyurl.com/l64df92).

## Kalamazoo, Michigan

The Kalamazoo River was so polluted for so long by paper mills, it has been difficult to undo the community attitude of turning away from river. The river is a major PCB-Superfund site. It has been so noxious for so many years that much of the riverfront property in the suburbs remains undeveloped; and in the urban core, the river was buried. People migrated to local lakes in Portage and Gull Lake, as well as other nearby communities as the spots for recreation, with trails and water enjoyment.

There has not been the development of a community vision nor a comprehensive plan for riverfront redevelopment. (There was a consultant-driven plan developed for the city in 2003, with little public input -- some elements of it have been developed). But Kalamazoo's nascent water placemaking efforts are just beginning. The activities around water-based development that are moving forward include downtown Acadia and Portage Creek where they are opening up public access. And Kalamazoo Valley Community College is developing a major campus center along spurs of the river in downtown.

Local civic and conservation groups are developing what's called A Heritage Water Trail. They're trying to stitch together parcels for a trail along the river, and connect into a broader hiking trail system as well as the Kalamazoo River Valley Trail – a rail-to-trail system. (Getting access across parcels, and through the city has been challenging.)

The Kalamazoo Land Bank is developing a six-acre Riverview Launch project, a mixed-use development for river access, gardens, and an interpretive cultural center. A \$2 million Capital Campaign is underway to fund this project.

Kalamazoo Nature Center: The River extends through its property, largely wild and undisturbed given the historic pollution. The Nature Center has now built access platforms, and hiking trails, as a purposeful effort to re-connect the community and its citizens to the water and to build a new

relationship with the river. The Nature Center is also developing and testing a stormwater pollution prevention education program for priority communities in the Lake Allegan Watershed, and partnering with the Office of Great Lakes, and its director Jon Allan, on the state's water outreach strategy.

Kalamazoo very much needs, and wants, an organized effort to lead water placemaking. The city is looking for support to bring together disparate efforts into a community-wide vision and plan. For more info, go to [\*kalamazooriver.org\*](http://kalamazooriver.org).

## **Benton Harbor – St. Joseph, Michigan**

Community leadership is eager to engage in Blue Economy-building and identify ways to further develop a comprehensive local effort, and incorporate into placemaking opportunities. Key leaders asked for Blue Economy briefings and assistance for community. They're already engaged in Kayak Water Trail, and Bike Route development along the lakeshore. For more info, go to [\*bentonharborcity.com\*](http://bentonharborcity.com).

## **Monroe, Michigan**

Monroe's port area, designated an Area of Concern by the federal Environmental Protection Agency, has been the starting point and focus of water work in and around this city of about 20,000 people. That includes nine de-listing activities, with habitat improvements highlighted by a series of fishways, which are designed to reconnect 23 miles of the River Raisin to Lake Erie. Other activities include a major wastewater facility upgrade, improvements to the asphalt storage facility, and cleanup of the Ford Motor site. Monroe is the only major port on Lake Erie in Michigan. Monroe's port commission and city council have been major drivers of activity, with funding from the Great Lakes Restoration Initiative, the Michigan Department of Environmental Quality, and the EPA.

The cleanup and reclamation of industrial zones around the power plant and wetlands is now extending to water-rebuilding efforts, such as the construction of fishways, the improvement of kayak and canoe usage, and expanding the River Raisin National Battlefield Park. The National Park Service is working to develop a Maritime Heritage Area.

Monroe is also home to Resilient Monroe, a land-use planning and community design project sponsored by the City of Monroe, Frenchtown Charter Township, and Monroe Charter Township, with support from Monroe County, and the Land Information Access Association.

Placemaking efforts need to take water-based restoration and development to the next phase, with a broader geographic approach. Dan Stefanski, a leader of some of these efforts, believes time is right for organizing a water-river development plan for the entire region and engaging a broader stakeholder coalition. For more info, go to [\*tinyurl.com/kubzku5\*](http://tinyurl.com/kubzku5).