

# Water Quality Concerns on the South Shore of Lake Superior

What Might They Tell Us About the Future of the Great Lakes Water Quality Agreement?



A "1,000-year-storm event" in 2016 inundated U.S. Highway 2 and the Bad River Indian Reservation east of Ashland, Wis.

September 25, 2019

**Mary Griggs Burke Center  
for Freshwater Innovation**  
NORTHLAND COLLEGE





Despite its immense size, Lake Superior is showing new vulnerability to the complex impacts of a shifting climate.

## Highlights from the International Joint Commission's Visit to Northland College

September 25, 2019  
Ashland, Wisconsin

Lake Superior is the largest lake in the world by surface area, holding 10 percent of all the fresh water on the face of the planet. Superior's volume is equivalent to that of the other four Great Lakes combined — plus three additional Lake Eries. Despite such immensity, the lake is susceptible to such threats as industrial pollution, agricultural runoff, deforestation and a cascade of invasive species, many of which arrived in the ballast of ocean-going ships.

Today, the lake is showing signs of new vulnerability to the complex impacts of a shifting climate, such as increases in the ferocity and frequency of major storm events, accelerating sedimentation rates, rising water temperatures, escalating infrastructure damage and — most surprising of all — a growing threat from blue-green algal blooms, which can sometimes be toxic, and are more typically associated with Lake Erie. Superior still ranks among the world's coldest and most pristine lakes, but it is also one of the fastest warming lakes in the world.





On Sept. 25, 2019, more than 200 people attended an IJC public hearing in Ashland, Wis. focused on water quality in Lake Superior.

The [IJC was created in 1909](#) to help resolve transboundary water disputes all along the U.S./Canada border — from the [St. Croix River in the east](#), to the [Yukon River in the west](#). The IJC consists of three [commissioners](#) appointed by the federal government of the United States, three commissioners appointed by the federal government of Canada, as well as an extensive binational team of experts and support staff. During the first several decades of its history, the IJC focused primarily on water-quantity issues, but starting in the 1970s, it took a more proactive focus on water quality, particularly in the Great Lakes. The IJC's role is important, but advisory, leaving actual policymaking and regulatory action to the U.S. and Canadian federal governments.

The [Great Lakes Water Quality Agreement \(GLWQA\)](#) is the IJC's key water quality instrument in the Great Lakes region. It is a massive governance document first prepared in 1972, and updated several times since, to identify and track progress (or decline) on maintaining (or restoring) “the chemical, physical and biological integrity of the waters of the Great Lakes.” Water quality improvements that have occurred under the agreement are currently being assessed by the IJC, and it launched its 2019 Great Lakes listening tour as an opportunity for the public to “step in and speak out” about the state of the lakes and the health of shoreline communities.

While they were in Ashland, the commissioners and staff also received a series of expert briefings earlier in the day from scientists, resource managers, tribal leaders and public works officials. These briefings were arranged by the [Mary Griggs Burke Center for Freshwater Innovation](#) at Northland College to provide depth and historical context to some of the key water quality issues facing the south shore of Lake Superior — especially the beautiful stretch of Wisconsin shoreline spanning from Duluth, Minn., to the Upper Peninsula of Michigan. This section of

On Sept. 25, 2019, a delegation from the International Joint Commission (IJC) traveled to Ashland, Wis., on the shores of Lake Superior as part of a listening tour of U.S. and Canadian communities in the Great Lakes basin. In addition to Ashland, this leg of the IJC's journey also included stops in Thunder Bay, Ont., and Duluth, Minn. More than 200 people turned out for the public comment period at Northland College in Ashland, roughly half of them Northland students. During several hours of public comments that evening, dozens of students and local residents expressed concerns to the IJC commissioners about declining water quality in Lake Superior. “Lake Superior has been a draw for many people who inhabit this region,” Auggie Walheim, a freshman at Northland, told the commissioners. “[But] the destruction and alteration of shoreline and rivers that run into Lake Superior puts point and nonpoint pollution into the water ... I have done all that I can to protect the water, and it is my hope that all of you will do whatever you can in your power to protect the lake and make sure that it will still be clean, clear and beautiful seven generations from now.”





Frog Bay Tribal National Park on the Red Cliff Indian Reservation near Bayfield, Wis.

shoreline includes the shallow and productive waters of [Chequamegon Bay](#), the [Apostle Islands National Lakeshore](#), the [Frog Bay Tribal National Park](#) on the Red Cliff Indian Reservation and the [Bad River/Kakagon Slough](#), which is a globally recognized [Ramsar Wetland of International Importance](#) located on the Bad River Indian Reservation.

This white paper is designed to capture and highlight the key water quality concerns that the IJC delegation heard about during its day-long visit to the area. The idea is to provide a water quality snapshot-in-time, as the key water quality issues of today are very different from those of 20 years ago, and today's water quality concerns could end up being different from — or very similar to — the challenges to be faced in decades to come. This white paper is also designed to put Lake Superior's contemporary water quality concerns into the broader overall context of the Great Lakes Water Quality Agreement.

Some of the key regional water quality issues to be highlighted include:

- An apparent climate-change-driven increase in highly damaging storms in the Lake Superior watershed, which have produced massive and frequent sediment plumes in the lake
- A surprising recent emergence of potentially toxic algal blooms along Superior's south shore
- A persistent problem with contaminated storm-related overflows from the aging sewer system in Ashland, Wis.
- Concerns about agricultural runoff, especially from a recently proposed 26,000-hog concentrated animal feeding operation (CAFO) about eight miles from Lake Superior
- Recent discoveries that storm-related erosion has exposed formerly buried sections of the controversial Enbridge Line 5 oil pipeline that passes through the Bad River Indian Reservation
- Concerns about recently proposed mining activity in the headwaters of some Lake Superior tributary streams



Raging runoff from a 1,000-year storm in 2016 blew out numerous federal, state and county highways near Ashland, Wis.

- Inadequate long-term planning and a fragmented approach to water quality management

## Superior Storms

Lake Superior's violent weather — especially during the month of November — has been memorialized in books and song. But in recent years, the south shore of Lake Superior has experienced unprecedented, violent weather during the summer months. [In June 2012, Duluth, Minn., was hit by a "500-year storm"](#) that turned streets into rushing rivers and devastated the city's water infrastructure, as well as numerous farms and communities in nearby northwest Wisconsin. The storm's nutrient-rich runoff spilled into Lake Superior and led to the first documented widespread blue-green algal bloom along the south shore of the famously pristine lake.

[In July of 2016, an even bigger "1,000-year storm event"](#) struck wide swaths of land across east-central Minnesota and northwest Wisconsin, with the worst effects being felt near Ashland. The storm blew out numerous sections of federal, state and county highways, cutting off road access for 8,000 Ashland residents from all directions except the west.

The raging flood waters of 2016 caused several deaths in northern Wisconsin, destroyed a Lake Superior harbor, gutted fields, caused millions in damage and spawned yet another rare blue-green algal bloom in the lake. The storm pushed sediment plumes far out into Superior, with loads of fine clay sediments (along with other soils and a range of undesirable nutrients, both natural and human-caused). The runoff was a reminder that



Matt Hudson, Burke Center

the regional landscape is still recovering from the "cutover" period of more than a century ago when Lake Superior's old-growth forests were clear-cut from horizon-to-horizon, loosening topsoil and turning healthy river systems into gulches. The post-cutover ecosystem "remains unstable," Matt Hudson, associate director of the Burke Center,





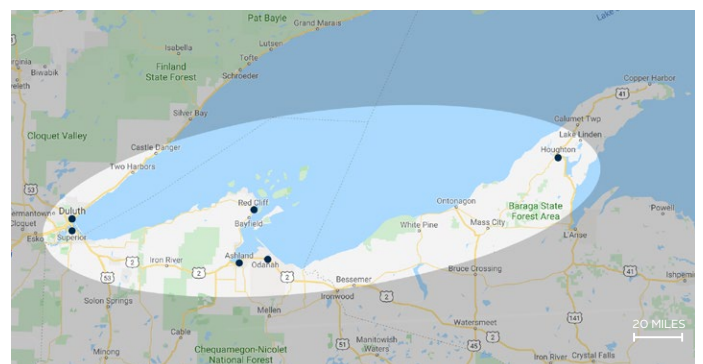
AirFoxPhotographyLLC

A 1,000-year storm in 2018 blew out this section of U.S. Highway 2 between Ashland, Wis., and Duluth, Minn. Precipitation data that highway engineers use to size bridges and culverts is rapidly becoming obsolete.

told the IJC. “And the excess sedimentation it produces is the largest nonpoint-source pollution issue in this region of the Great Lakes.”

[Then in June of 2018, yet another 1,000-year storm](#) swept through the same area, bringing similar devastation to the region for the third time in seven years, including millions of gallons of storm water overflows in Ashland, and [devastating damage to Houghton, Mich.](#), 150 miles to the east. The 2018 storm led to yet another blue-green algal bloom in Lake Superior, this time forcing the National Park Service to post water quality warnings for the Apostle Islands National Lakeshore near the Red Cliff Indian Reservation, attracting the attention of [The New York Times](#).

The south shore of Lake Superior — stretching eastward from Duluth to the Upper Peninsula of Michigan — has been hit by so many damaging downpours since 2012 that it has made a mockery of the term “1,000-year-storm event.” This new normal has brought transformative change to the region’s largely rural and indigenous communities, heavily taxing agricultural systems and indigenous food sources as well as road and water infrastructure. “Climate change is hitting us like a freight train,” Ashland resident Richard Ketring told the IJC commissioners at the hearing. “We can’t sit by and wait for action.” As Matt Hudson told the IJC, “Culverts under roadways were



A section of the south shore of Lake Superior stretching from Duluth, Minn., to the Upper Peninsula of Michigan was hit by three massive 500-to-1,000-year storms between 2012 and 2018, causing more than \$150 million in damage.

sized for rainfall intensities of the past, and thus are undersized for current and future conditions ... that [highway] engineers are running smack-dab into the problem of having all their culverts blown out is an example of the aging infrastructure problem that keeps hitting us in the face.”



billkellyphoto.com

Richard Ketring,  
Ashland resident





Three massive storms between 2012 and 2018 along the south shore of Lake Superior created sediment plumes so large that they were visible from space.

The National Oceanic and Atmospheric Administration (NOAA) says the Ashland region is a notable “hotspot” of rainfall patterns far outside historical norms. Estimates put the losses of public infrastructure from the three recent, massive storm events in the range of \$150 million, but the future cost will be much greater. NOAA estimates that intense rainfall amounts in the Ashland area are 37 percent higher than the mid-20th-century assumptions used by engineers and transportation planners to build much of the region’s transportation infrastructure, like bridges and culverts. What’s more, these new precipitation estimates don’t even factor in the large, intense storms since 2012. Still harder to gauge: long-term, reputational damage from these storms and their secondary effects on a regional tourism industry founded on Lake Superior’s pristine image as the cleanest of the Great Lakes.

### Have we entered the Algal Bloom Era on Lake Superior?

Scientists, natural resource managers and tribal leaders are becoming increasingly alarmed by the recent series of [unprecedented and potentially toxic blue-green algal blooms](#) on the south shore of Lake Superior. Superior is the largest, coldest and cleanest of the Great Lakes — characteristics not normally associated with algal blooms. But Superior is also one of the world’s fastest warming lakes, and higher water temperatures, combined with excess nutrients, are key drivers of algae outbreaks.



Brenda Moraska Lafrancois, National Park Service



Algal blooms on Lake Superior in 2018 received national attention.

Brenda Moraska Lafrancois, an aquatic ecologist for the Midwest Region of the National Park Service, told the IJC that until 2012, the only reports of algal blooms in western Lake Superior were few and anecdotal. A handful of small bloom reports in the 1960s were attributed to iron enrichment of lake water from mine tailings, and a few more undocumented blooms may have occurred in the waters around the Apostle Islands National Lakeshore in the 1980s.

The 2012 bloom was the first really noticeable, well-documented event, and it came during warm July weather, weeks after the 500-year storm centered on Duluth. The bloom lasted a couple of days and was followed in 2016 and 2017 by small blooms, noticed only by a few Apostle Islands staff.

The August 2018 bloom followed a 1,000-year event in some parts of the region that occurred earlier in the summer. The bloom stretched roughly 80 miles from Duluth's sister city of Superior, Wis., to parts of the Apostle Islands, including Long Island, just 10 miles from downtown Ashland. It lasted about five days, growing intensely enough for green water to reach the shoreline.

The drivers of the blooms since 2012 appear to include big storm events, with the blooms following after a lag of several weeks. Higher stream flows mean elevated delivery of nitrogen, phosphorus and other nutrients. The blooms appear in the warm-weather months, as is typical elsewhere, but also in years when cumulative temperatures, as measured in degree days, are elevated overall. Lafrancois told the IJC that lab tests subjecting the algae to different temperatures, nutrient concentrations and water types showed the blooms may originate from upland sources.

The particular strain of blue-green algae, or cyanobacteria, implicated in these blooms, is *Dolichospermum lemmermannii*. It can produce several serious toxins, though none have been detected at hazardous levels in the Superior blooms as yet. On the other hand, Lafrancois noted, the sample sizes were small, the list of toxins tested was short, and cyanobacteria produce many toxins for which no health standard has been established. At this point, more blooms are expected, most likely as recurring but unpredictable events. It's a lesson in Superior's vulnerability. "This is still a big, fabulous, gorgeous, immense lake," Lafrancois told the IJC. "But it's not immune to the types of environmental changes that are occurring elsewhere in the Great Lakes."

## Contaminated Flows into Lake Superior from the Ashland Sewer System

The City of Ashland's sanitary sewer system has struggled with storm water overflows for years. Public Works Director John Butler told the IJC that it's a matter of simple math: The city's wastewater treatment plant's capacity is 3.84 million gallons, nearly four times the average daily flow of just 1 million. It also has an 8.5 million-gallon overflow basin, for a total capacity of 12.3 million gallons. But storms routinely push the 24-hour flow



John Butler, City of Ashland, Wis.

above 20 million gallons. When this happens, the system experiences "sanitary sewer overflow" – a technical term for mixing storm water with toilet flushings, and discharges from dishwashers, laundry, showers, etc., all of which enter Chequamegon Bay without required treatments.

In 2018, the [Ashland Daily Press](#) used a Freedom of Information Act request to access records showing that at least 19 discharges of untreated sewage, totaling more than 75 million gallons, flowed into the bay in recent years. That's illegal, and earned the city's wastewater utility three violation notices from the state. Those discharges prompted concerns from area residents that the overflows were leading to beach closures and other water quality problems, which have yet to be verified. Much of the problem with the overflow issue involves the city's aging sanitary and storm sewer infrastructure. The city has about 60 miles of sewer line, a quarter of which is over 100 years old. Many sections are made of leaky, vitrified clay, and long past its serviceable life.

The cost to excavate and replace old pipe, of course, is sobering and many other communities across the country face the same problem. City officials have repeatedly expressed concerns that Ashland simply does not have the resources to undertake a major overhaul, and that the city might even have trouble coming up with the matching funds required to qualify for government aid.

## Controlling Agricultural Runoff Amid a Trend Toward Larger Farms

Soils throughout much of the Ashland region have a heavy clay content, whose relative impermeability to rainfall makes for bigger, faster runoff flows — even before the recent trend of increasing rainfall and intensifying storm events. These soil conditions also pose a challenge to traditional agricultural cultivation and — along with unfavorably cold temperatures relative to other regions — have tended to keep farm sizes somewhat smaller and "a little lighter on the landscape," Jason Fischbach, agricultural agent for



Jason Fischbach, UW Extension

the University of Wisconsin-Madison Division of Extension, told the IJC.

Compared to three ag-heavy Wisconsin counties on Lake Michigan, the four counties along the south shore of Lake Superior have about one-twentieth the number of cows, pastured on about five times as much acreage per animal — basically the opposite of the modern, concentrated

livestock operation. The landscape also retains more woodland and pastured acreage, with less conversion to the row-cropping of annual small grains, corn and



soybeans. Still, existing runoff patterns have degraded water quality with sediment and nutrients, especially phosphorus and nitrogen — which promote algae growth — not to mention the potential threat posed by contamination from *E. coli* bacteria from livestock operations.

Now the area's difficult, labor-intensive farming conditions are combining with slumping land values to drive a sharp decline in small farming operations generally, and dairy especially. Bayfield County, west of Ashland, had well over 100 dairy farms in 1992; today it has around 20. Iron County, east of Ashland, has one. Mostly this is happening as local farmers buy out neighbors and expand their acreage. But the situation is also a magnet to outside corporations who see opportunities for assembling massive, concentrated livestock operations on a scale the south shore of Lake Superior has not yet seen.



Tom Fitz,  
Northland College

For example, [in 2015 Reicks View Farms of Iowa proposed to raise 26,000 hogs in a CAFO](#)

in the Fish Creek watershed, about eight miles from Lake Superior's Chequamegon Bay. The proposed "Badgerwood" project wouldn't raise an eyebrow in Iowa, but it would have been the largest hog operation in Wisconsin and one of the first CAFOs in the Lake Superior basin — producing, storing and spreading 6.8 million gallons of manure per year on predominantly clay soil. That proposal now appears to have been abandoned, in Fischbach's view, because the likely requirements to manage phosphorus pollution from associated row crop fields would have limited the operation's ability to produce enough animal feed.

The truly difficult challenge of controlling runoff and pollution from clay soils, Fischbach explained, is that traditional methods, which work well elsewhere — such as reducing or eliminating tillage, planting cover crops and buffer strips, a variety of precision management techniques in fertilizer application and drainage control — are inadequate in this region. The most promising path to renewing the regional farm economy while preserving water quality, he said, is to convert a lot of land from annual crops to perennial plantings with deep root structures and simpler nutrient needs. An especially promising approach called agroforestry mixes grassy forages with woody shrubs and trees. These approaches are ready for field-scale research and demonstration projects to show farmers they can realize income from working outside the realm of conventional agriculture. "Our focus needs to be not so much on mitigating annual row crops," Fischbach said. "That's the approach we've taken forever and look what's happened to our 303(d) list [of pollution-impaired waterways]. It gets longer, and longer, and longer, and longer."

## Mines and Pipelines in the Headwaters of Lake Superior Tributaries

Among the resources of the Ashland region that attract industrial interest, and raise water quality concerns, are the iron deposits of the Penokee/Gogebic Range, which runs roughly 80 miles from Lake Namekagon in Bayfield County, southwest of Ashland, into Michigan's Upper Peninsula, east of Ashland. The iron here is in a form called magnetite, which is a lower-grade ore that is typically mined in large, open pits. In 2011, [Gogebic Taconite, LLC proposed a massive, open-pit mine in the Penokee/Gogebic Range](#), similar in size to some of the largest on Minnesota's Mesabi Range.

The first potential problem with that project, Northland College Geoscience Professor Tom Fitz told the IJC, is that "you can't dig a hole in the ground that's 4.5 miles long and 1,000 feet deep without a big effect on surface water and groundwater." The area contains a large number of wetlands, and although the company said it would not be mining in those areas, Fitz noted, the wet areas would have become the repository for piles of waste-rock tailings. These ores contain a lot of iron pyrite, a sulfide mineral which reacts with water to release sulfuric acid. There were concerns that acid-mine drainage would have flowed to the Bad River, potentially poisoning the Great Lakes basin's largest wild rice beds, located where the river approaches Lake Superior. Moreover, some portions of the proposed pit were rich in amphibole minerals, which form the long, needle-like fibers characteristic of asbestos. "There has not been a mine anywhere in the world that we know of," Fitz said, "where asbestiform minerals of this type have been mined and people have not died."

The mine project was shelved in 2015 due to concerns about impacts on wetlands and the threat of litigation. But mining projects tend to fade as prices in the metals markets fall, and then they often revive when prices rise, as Bad River tribal chairman Mike Wiggins, Jr. pointed out. He said his reservation feels under perpetual pressure from projects like Gogebic Taconite, the Badgerwood CAFO, and [increasing concerns about Enbridge Inc.'s embattled Line 5 pipeline](#), which transports petroleum products through northern Wisconsin and Michigan to Sarnia, Ont., on the St. Clair River north of Detroit.



Michael Wiggins, Jr.,  
Bad River Band of the  
Lake Superior Tribe of  
Chippewa Indians

This is the same aging pipeline that has caused so much concern in the state of Michigan, where it lies on the bottom of the Straits of Mackinac, between the state's upper and lower peninsulas. But hundreds of miles to the west, the pipeline also crosses the Bad River Reservation. In the summer of 2019, a section was found to have been "unburied" by watery erosion,





IJC Commissioners Robert Sisson, Lance Yohe and Henry Lickers field public comments at Northland College on Sept. 25, 2019.

possibly from recent major storm events, and found to have been laid without the supports that protect against flexing and rupture. Now the tribe is pressing Enbridge to reroute the line off of reservation land, at a minimum, and preferably out of the Bad River watershed altogether. As Wiggins told the IJC, a rupture at the Bad River — in a line that carries more than 22 million gallons of petroleum products per day — would cause a “catastrophic release and an apocalyptic event for our river,” and, potentially, Lake Superior just 17 miles away.

“We are an ancient people in our ancestral home, our final migration stopping point,” Wiggins said. “We resist mines and pipelines because of damage to our bodies and the health of mother earth.” So, fighting against Line 5 “isn’t just a bunch of Indians being negative. It’s taking a holistic, cumulative viewpoint that goes way back to the volcanoes [that created the bedrock beneath Ashland] ... and thinking about babies that are still on the way here. Think about the humility of just asking for clean air and clean water so that grandchildren yet to arrive not only have a place for their feet but can actually survive.”

## How Do These Concerns Relate to the Future of the Water Quality Agreement?

At several points during the day-long series of private water quality briefings with the IJC, speakers suggested that the commissioners and staff examine the GLWQA for signs that it may need to be reworked — perhaps significantly — to address new and emerging issues that were not of concern when the document was first drafted nearly 50 years ago, such as climate adaptation. The GLWQA is comprehensive but also segmented, with 10 annexes addressing — separately —

such topics as chemical pollution, nutrient loads, vessel discharges, invasive species, groundwater protection and (penultimately) a nod to climate-change impacts. Over time, it has seemed, that there has been resistance to rewriting the core agreement, with a preference instead to tack on a series of issue-specific annexes that address important topics, but not necessarily the whole. After nearly a half century of updates-by-annex, some people in the room wondered if it might be time to consider a complete rewrite of the entire document.

Chairman Wiggins called on the IJC to strive for a more holistic view of the basin’s problems and needs. He was echoed by Mic Isham of the Great Lakes Indian Fish and Wildlife Commission, who said, “Agencies tend to be very compartmentalized — the wildlife division is separate from the fisheries division, fisheries division is separate from the soil division, and that’s separate from the water division, and then even the water division is separated into the surface water division and the groundwater division.” Overall, there was a suggestion that perhaps a more ecosystem-wide approach to water quality would be better in a reworked Water Quality Agreement, including an approach that would incorporate more traditional ecological knowledge.



Mic Isham, Great Lakes Indian Fish and Wildlife Commission

As the day’s official briefings concluded, David Burden, who leads the IJC’s Great Lakes Regional Office in Windsor, Ont., thanked the presenters for their assessments and asked them to go a step further as the



Ted Cline

The Kakagon/Bad River Slough on the Bad River Indian Reservation is home to the largest wild rice beds in the Great Lakes watershed and it is a globally recognized Ramsar Wetland of International Importance.

GLWQA approaches its 50th anniversary. As the IJC prepares to update its assessment of current challenges, Burden asked, “If you had the chance to influence the IJC’s next triennial report, what would you like us to be saying about the state of the Great Lakes? Do we actually feel that it is [in the phrasing of the last report], ‘fair and unchanging’? Or are we in a situation after 50 years where we have to double down?”

A pointed answer came from the Burke Center’s Associate Director Matt Cooper, who also homed in on the “compartmentalization” of the original Water Quality Agreement, suggesting the current version of the document may not be nimble enough to adequately address many of the modern water quality issues. “Historically we’ve thought of Great Lakes issues in fairly compartmentalized ways,” Cooper said. “The Water Quality Agreement has its own compartments — the annexes. There are tremendous success stories and accomplishments that have been made. But as

we talked about earlier, there’s a lot of cross-cutting issues that break down those boundaries between the annexes. For example, restoring wetlands is a water quality solution. And so, my recommendation would be that as we think about the future and ways to look at climate change, let’s think across those annexes and look at solutions that are much more holistic than the boxes we’ve historically put them into.”

Other responses to Burden’s question varied from the broad and speculative, to the technical and narrow, but a common thread was that the time may have come to see the GLWQA as something of a relic. The agreement was born as Lake Erie was “dying” from the chronic industrial pollution that caused the Cuyahoga River to catch fire. After decades of successful binational cleanups and cuts in point-source pollution, there seems to be a new paradigm of concerns, where a changing climate contributes to unprecedented algal blooms on the coldest Great Lake, or devastating



David Burden, International Joint Commission



Matthew Cooper, Burke Center



President Richard Nixon and Prime Minister Pierre Trudeau at the signing ceremony for the Great Lakes Water Quality Agreement in 1972.



blooms on Lake Erie, the warmest Great Lake — such as those in [2014 that prompted officials to cut off drinking water access for days to half a million people in Toledo](#).

Back in the 1970s, one of the biggest concerns in Lake Superior was controlling the sea lamprey that threatened native fisheries. Federal officials in the United States and Canada worked together to contain the lamprey problem and confront many other environmental issues in the Great Lakes. But in recent years, that binational commitment does not seem as coordinated or strong as it was when the Water Quality Agreement was created. This transition in the binational water quality relationship has occurred as climate change is bringing massive storms, amplified runoff, infrastructure collapse and potentially toxic algal blooms to south shore communities of a lake once believed to be immune from such threats.

How should the federal governments tweak the Water Quality Agreement to help tackle the algal-bloom era on Lake Superior and the algal-bloom era on Lake Erie — two very different lakes that are part of the same complex binational ecosystem? Where old patterns are giving way to a new normal, the situation may require not just redoubled efforts but perhaps completely revising instruments that help design and direct actions to protect water quality — not just along the south shore of Lake Superior but throughout the entire Great Lakes system.

In other words, tweaking may not be enough. Perhaps a thoroughly revised Water Quality Agreement could also reinvigorate the binational water quality relationship, bringing new attention and new vigor to the complex Great Lakes water quality challenges of the 21st century. But for the next generation of water quality stewards at Northland College — and throughout the watershed — the situation will require more than just vigor. It will require tangible binational action that leads to measurable and significant improvements to “the chemical, physical and biological integrity of the waters of the Great Lakes.”



The Apostle Islands National Lakeshore is one of the most popular tourist destinations on the south shore of Lake Superior.





**NORTHLAND COLLEGE**  
 Northland College integrates liberal arts studies with an environmental emphasis, enabling those it serves to address the challenges of the future.

The Northland College campus with Chequamegon Bay in the background.

**ASHLAND MEETING PRESENTERS & CONTRIBUTORS**

- Peter Annin**, Director, Mary Griggs Burke Center for Freshwater Innovation, Northland College
- John Butler**, Director of Public Works, City of Ashland, Wis.
- Dr. Matthew Cooper**, Associate Director, Mary Griggs Burke Center for Freshwater Innovation, Northland College
- Valerie Damstra**, Operations Manager, Mary Griggs Burke Center for Freshwater Innovation, Northland College
- James Dunn**, Hydrogeologist, Wisconsin Department of Natural Resources (retired)
- Jason Fischbach**, Agricultural Agent, Bayfield/Ashland Counties, University of Wisconsin-Madison Division of Extension
- Dr. Tom Fitz**, Professor of Geoscience, Northland College
- Matthew Hudson**, Associate Director, Mary Griggs Burke Center for Freshwater Innovation, Northland College
- Michael Isham, Jr.**, Executive Administrator, Great Lakes Indian Fish and Wildlife Commission
- Dr. Brenda Moraska Lafrancois**, Aquatic Ecologist, Midwest Region, National Park Service
- Linda Nguyen**, Environmental Director, Red Cliff Band of Lake Superior Chippewa
- Aidan Reilly**, Research Specialist, Mary Griggs Burke Center for Freshwater Innovation, Northland College
- Michael Wiggins, Jr.**, Chairman, Bad River Band of the Lake Superior Tribe of Chippewa Indians

**INTERNATIONAL JOINT COMMISSION PARTICIPANTS**

- Henry Lickers**, Canadian Commissioner, International Joint Commission
- Robert Sisson**, U.S. Commissioner, International Joint Commission
- Lance Yohe**, U.S. Commissioner, International Joint Commission
- Raj Bejankiwar**, Physical Scientist, International Joint Commission, Great Lakes Office
- David Burden**, Director, International Joint Commission, Great Lakes Office
- Matthew Child**, Physical Scientist, International Joint Commission, Great Lakes Office
- Sally Cole-Misch**, Public Affairs Officer, International Joint Commission, Great Lakes Office
- Sarah Loblrichon**, Public Affairs Advisor, International Joint Commission, Ottawa Office
- Allison Voglesong Zejnati**, Video-Communications Specialist, International Joint Commission, Great Lakes Office

**WHITE PAPER TEAM**

- Peter Annin**, Editor
- Ron Meador**, Author
- Aidan Reilly, Emma Holtan**, Research
- Dr. Matthew Cooper, Valerie Damstra, Matthew Hudson**, Reviewers
- Jerry Lehman**, Layout and Design
- Julie Buckles**, Communications Director
- Demeri Mullikin**, Production Editor

Northland College would like to thank Debbie Cervenka of Duluth, Minn., and George and Jane Shinnors of Antigo, Wis., for generously supporting the 2019 Water Summit and white paper.

**MARY GRIGGS BURKE CENTER FOR FRESHWATER INNOVATION**  
 NORTHLAND COLLEGE  
 1411 Ellis Avenue  
 Ashland, Wis. 54806  
[northland.edu/sustainability/mgbc](http://northland.edu/sustainability/mgbc)  
 715-682-1699

Disclaimer: This white paper is a nonpartisan endeavor authored and produced by Northland College. While the white paper is meant to reflect the Water Summit discussions that took place on Sept. 25, 2019, the analysis and conclusions herein were produced by Northland College. None of the participants in the Water Summit, nor any of the funders, necessarily endorses any of the analysis or specific conclusions contained in this document. Northland College is solely responsible for this content.