



International Joint Commission
Great Lakes
Water Levels Boards

Les conseils de régularisation
des eaux des Grands Lacs
de la Commission mixte internationale

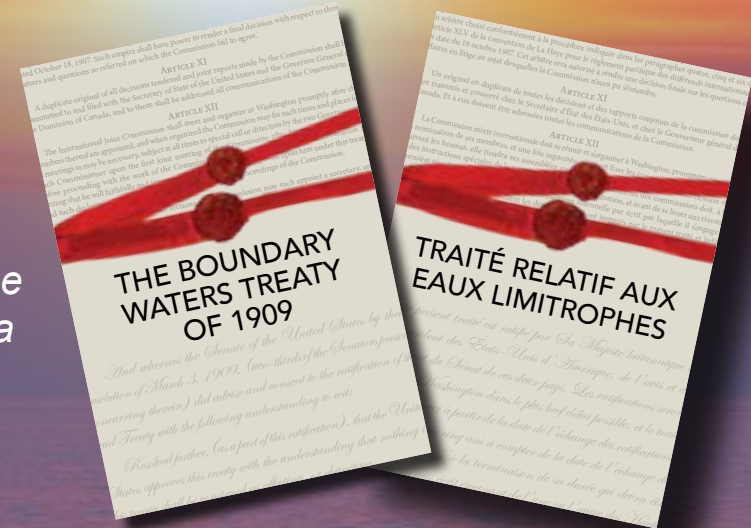
Tri-Board Tribune

The Great Lakes in Depth

Winter 2024

WELCOME!

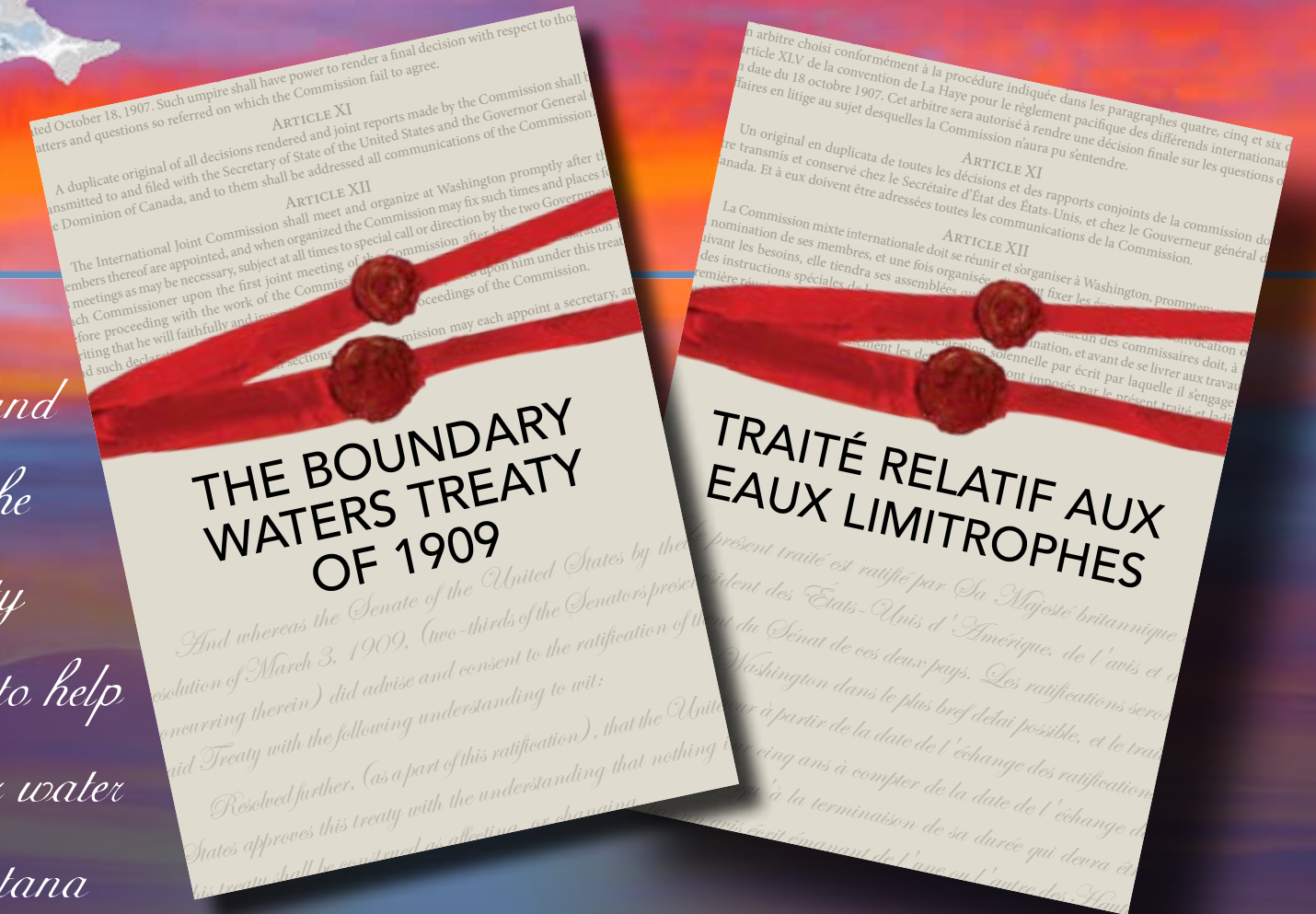
The Tri-Board Tribune is a quarterly newsletter designed by the Great Lakes Water Levels Boards of the International Joint Commission (IJC) to share information and articles related to the entire Great Lakes basin and provide regional updates presented by each Board. The Great Lakes Water Levels Boards includes the International Lake Superior Board of Control, International Niagara Board of Control, and International Lake Ontario-St. Lawrence River Board.



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The Boundary Waters Treaty was signed in 1909 to prevent and resolve disputes over the use of the waters shared by Canada and the United States and to settle other transboundary issues. The treaty established the International Joint Commission (IJC) to help the two countries carry out its provisions. At the time, disputes over water were already creating tension along the border. Settlers in Montana and Alberta were building competing canals to divert the waters of the St. Mary and Milk Rivers for their own use. On the Niagara River, it was increasingly clear that the two countries needed a management plan that could balance the growing demand for hydroelectric power with the interests of navigation, while safeguarding the unique natural beauty of Niagara Falls. The treaty provided a framework to deal with these disputes. The IJC held its first meeting in 1912 and has worked to resolve more than 100 matters raised by the two federal governments.



[Read the entire treaty.](#)

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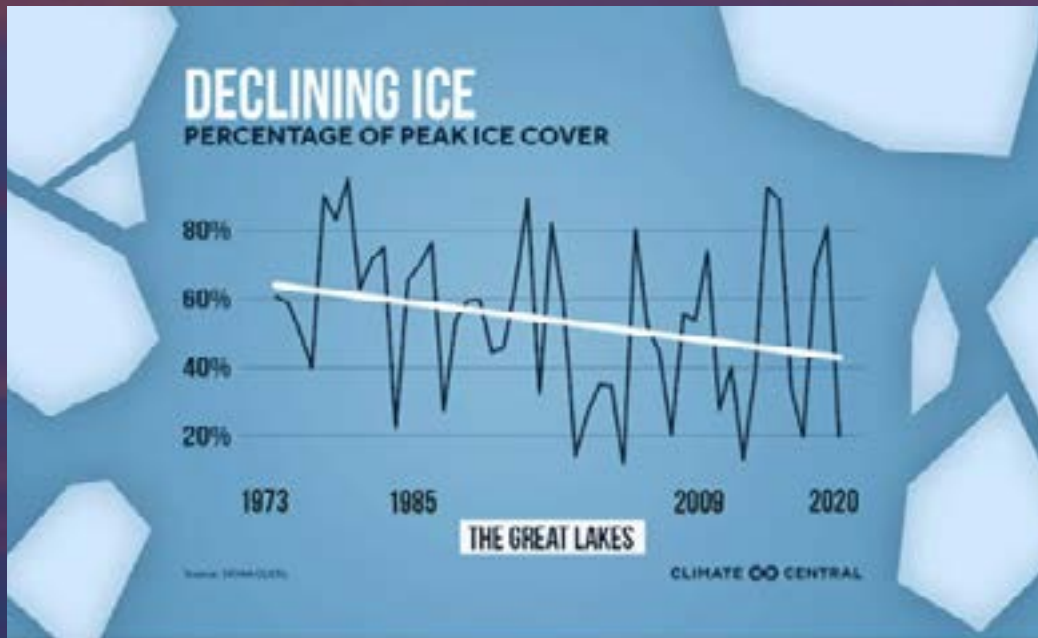
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Great Lakes Ice Cover is Shrinking



There has been a declining ice cover trend in the Great Lakes over the past several decades, though there remains strong year-to-year variability. Above average air and water temperatures in the basin contribute to a shorter ice season and below-average lake ice cover.

According to *Climate Central* the annual maximum ice cover is, on average, 22 percent lower than it was a half-century ago. In addition, Great Lakes tend to experience ice formation later in the season and ice melt is occurring earlier than documented in historic records. In fact, for the current ice season of 2023-24, the ice cover has been very low and may end up being the lowest since records began in 1973.



The Great Lakes Integrated Sciences and Assessment (GLISA), who is one of 12 *Climate Adaptation Partnerships* and serves the Province of Ontario and the eight Great Lakes states: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin has documented trends in freeze-thaw cycles throughout the Great Lakes. Freeze-thaw cycles occur when air temperatures drop below freezing and then increase above freezing. The research acknowledged that warming temperatures due to climate change make it more difficult for water to reach freezing and contribute to more frequent *freeze-thaw cycles*. However, variability exists throughout the region and year-to-year.

According to the '*Great Lakes Evaporation: Implications for Water Levels*' report published in 2015, seasonal and long-term changes in ice cover and evaporation rates carry large implications for future lake levels and more specifically states, "A single day's loss of approximately 0.5 inches of water from the surface area of the Great Lakes is roughly 20 times the amount of water that flows over Niagara Falls each day". According to the Great Lakes Integrated Sciences and Assessment, "declining ice cover, or longer periods of the year with open lake water, combined with warmer surface temperatures, will lead to increased lake-effect precipitation in the future. In the near term this may mean increased lake-effect snow, but as air temperatures rise lake-effect snow will transition to lake-effect rain".

Current ice conditions in the Great Lakes are available from *Environment and Climate Change Canada* and *National Weather Service at National Oceanic and Atmospheric Administration*.



Destratification in the Great Lakes



Twice each year, the Great Lakes experience destratification which is the turnover of water in the lakes. Destratification typically occurs in the fall when surface water temperatures decrease to 4 degrees Celsius (39 degrees Fahrenheit) and in spring when surface water temperatures increase to 4 degrees Celsius (39 degrees Fahrenheit). It is important to understand that deeper waters remain at about 4 degrees Celsius (39 degrees Fahrenheit) and water is densest at

that temperature. Surface waters are lighter, less dense, when they are above 4 degrees Celsius (39 degrees Fahrenheit). This inflection point results in mixing of water in the water column due to changing density of the water. Oxygen is carried down from the surface and nutrients are carried up from the bottom.

According to the United States 2018 *National Climate Assessment*, climate change has resulted in the fall destratification occurring later than historically documented and spring destratification is occurring earlier than historically recorded. A decreased period of stratification is expected to negatively impact a variety of species and ultimately lead to decreased populations. An article published in Nature Communications titled '*Seasonal overturn and stratification changes drive deep-water warming in one of Earth's largest lakes*' (Lake Michigan) indicates that impacts could include "reorganization of food web structure and shifts in dominant species, including the possible proliferation of non-native invasive species."

Winter research in the Great Lakes has been limited until recent years. Thankfully, scientists are conducting *winter research* in the Great Lakes to further understand the impacts of climate change. Early research results predict that shortened periods of destratification will have extensive impacts on the ecosystem throughout the Great Lakes.

Lakes Erie and Ontario Eclipse the Upper Lakes

International
Lake Ontario -
St. Lawrence River Board



Conseil international
du lac Ontario
et du fleuve Saint-Laurent

By now you know, the lower Great Lakes are the place to be April 8, 2024, to be in totality for the upcoming solar eclipse. Lake Erie, Lake Ontario, and the St. Lawrence River will be in the path of totality.

The eclipse will enter the United States in Texas, and travel through Oklahoma, Arkansas, Missouri, Illinois, Kentucky, Indiana, Ohio, Pennsylvania, New York, Vermont, New Hampshire, and Maine. Small parts of Tennessee and Michigan will also experience the total solar eclipse. The eclipse will enter Canada in Southern

Ontario, continue through Quebec, New Brunswick, Prince Edward Island, and Cape Breton. The eclipse will exit continental North America on the Atlantic coast of Newfoundland, Canada.

The last time a total solar eclipse was in the lower Great Lakes was 1925 and after the April 2024 total solar eclipse, the next total solar eclipse in the Great Lakes will be 2144. According to the United States National Aeronautics and Space Administration, the 2024 eclipse is expected to be very different from the 2017 North American eclipse.

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Solar Eclipse Facts	2024	2017
Path Width	108-122 miles	62-71 miles
Persons that live in totality	31.6 million*	12 million
Duration of maximum totality	4 minutes, 28 seconds	2 minutes, 42 seconds
Sun's magnetic field (solar activity)	Solar maximum	Solar minimum
What will be/was seen	Corona – the star's outer atmosphere with streamers (bright, pink curls or loops coming off the Sun), and coronal mass ejection (a large eruption of solar material)	Corona – the star's outer atmosphere

* An additional 150 million people live within 200 miles of the path of totality.

During an eclipse, the air temperature decreases slightly due to the moon blocking the sun. Nocturnal animals may come out from slumber thinking it is night and diurnal animals may exhibit erratic behavior during the eclipse.

Learn more about the [2024 Total Solar Eclipse](#) and how to view it safely. Consider sharing your Great Lakes eclipse photos on the Boards Facebook pages using #2024eclipse.

- International Lake Superior Board of Control (English): <https://www.facebook.com/InternationalLakeSuperiorBoardOfControl/>
- International Lake Ontario-St. Lawrence River Board (English): <https://www.facebook.com/InternationalLakeOntarioStLawrenceRiverBoard/>
- International Lake Ontario-St. Lawrence River Board (French): <https://www.facebook.com/ConseilIntlnduLacOntarioetduFleuveSaintLaurent/>



Updates from Around the Basin



This is a busy time of year for the Boards as they prepare for the semi-annual meetings with the International Joint Commission in Washington, DC. The purpose of these meetings is to provide a summary of work accomplished the last six months, and discuss research and activities planned for the next six months. Semi-annual reports are

published by each Board and available online in their respective libraries:

[International Lake Superior Board of Control](#)

[International Niagara Board of Control](#)

[International Lake Ontario-St. Lawrence River Board](#)

Winter Operation Outflows of Lake Superior and Lake Ontario



Conseil international
de contrôle du lac Supérieur

Regulation Plan 2012, which governs outflows from Lake Superior into Lake Michigan-Huron, and Regulation Plan 2014 which governs outflows from Lake Ontario through the St. Lawrence River include operational rules that are specific to winter weather.

- Lake Superior outflows are restricted in winter to reduce the risk of ice jams that could cause flooding in the lower St. Marys River. It is important to note, ice conditions typically prevent movement of the gates at the Compensating Works. But what if there is no ice cover and the gates can be opened and closed?

The Board must follow Regulation Plan 2012, which assumes ice conditions that would prevent gate movements. Therefore, if there is no ice present, and conditions warrant a different outflow setting, the Board would need to request *deviation authority* from the International Joint Commission. This winter, with near-average water levels of Lake Superior and Lake Michigan-Huron, the St. Marys River flow prescribed by Plan 2012 is low enough that increased gate settings have not been necessary. It is anticipated that the *current gate setting* (equivalent to approximately one-half gate fully open) will be maintained through March and April.

- Lake Ontario outflows are operationally adjusted in accordance with the Plan 2014 *I Limit*, as needed in winter months, to promote the formation and stability of ice covers in the *St. Lawrence River*. The Board, in conjunction with the Operations Advisory Group, monitors water temperatures and ice formation in the St. Lawrence River closely for ice management purposes. A stable ice cover helps prevent unconsolidated ice from accumulating at narrow points and obstructions in the river and causing ice jams and associated flooding. A stable ice cover also prevents unconsolidated ice from flowing into and clogging hydropower intakes.

- This winter, ice formation in the Beauharnois Canal required *outflow* reductions from January 18 through 23. Otherwise, outflows this winter have been set in accordance with the Plan 2014 Rule Curve.
- The I Limit is not time specific and would still apply if ice cover formed later than usual.

Ice cover in the Great Lakes basin (including in the St. Marys River and St. Lawrence River) can extend from mid-December to early-May and this varies greatly year to year, and by each lake and river. We know weather in the Great Lakes region is very unpredictable. Long term forecasts are typically reliable up to about 10-days and according to the National Oceanic and Atmospheric Administration, a 10-day forecast has an accuracy of about 50 percent. A short-term forecast of five-days is accurate approximately 80 percent of the time. Due to so many variables with the weather and climate trends, it is important to have rules in place for the Boards to follow based on seasonal conditions, as well as authority to deviate from those rules under unusual or extreme conditions.

Lake Erie-Niagara River Ice Boom Status



Conseil de contrôle
international du Niagara

Weather conditions in late December 2023 remained mild, with rain, occasional light snow flurries, and on December 31, the water temperature of Lake Erie was 43 degrees Fahrenheit (6 C). Ice boom installation occurred January 3 through 8, 2024 and the first ice was reported the week of January 14 in the west end of Lake Erie and shore ice in the east end of Lake Erie. Water temperatures near Buffalo, NY remained above freezing throughout the month of January and February.

Each winter since 1964, the Lake Erie-Niagara River Ice Boom has been installed near the outlet of Lake Erie to reduce the amount of ice entering the Niagara River. A reduction in ice entering the river reduces the potential for ice jams, which can result in damage to shoreline property and significantly reduce water flow for hydroelectric power production. This year marks one of five latest ice boom installations in 60 years:

1. 1994-1995 (January 7 through 10)
2. 1973-1974 (December 19, 1973, through January 9, 1974)
3. 1982-1983 (January 6 through 8)
4. 2023-2024 (January 4 through 8)
5. 1998-1999 (January 2 through 8)

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According to the *National Oceanic and Atmospheric Administration*, January 2024 was Earth's warmest on record and the warm temperatures in February have led to the 9th month in a row of record global warmth due to climate change and the El Niño pattern. According to the *National Aeronautics and Space Administration Earth Observatory* "Air temperatures are strongly correlated with ice cover, said Jia Wang, an ice climatologist at GLERL, and four patterns of climate variability influence temperature over the Great Lakes. This year, **three of the four patterns exerted a strong influence**, said Wang. "*El Niño*, the *Atlantic Multidecadal Oscillation*, and the *Pacific Decadal Oscillation* **simultaneously imposed warming to the Great Lakes.**"

The earliest start date for removal of the ice boom to begin was February 28, 2012. This year, ice boom removal was scheduled to beat that record with removal planned to start on February 27, 2024. However, due to inclement weather removal began March 13, 2024. Winter 2024 may have been the shortest duration in which the ice boom remained installed – our team is still evaluating historical records.

Integrated Socio-Economic and Ecosystem Team



The Great Lakes-St. Lawrence River Adaptive Management (GLAM) Committee includes many supporting staff that focus on specific research. This season, we feature the Integrated Socio-Economic and Ecosystem Team. This team includes four working groups:

- Ecosystem
- Shoreline (associated with municipal and industrial, shoreline property, recreational boating and tourism, and social impacts)
- Commercial Navigation
- Hydropower

Each workgroup focuses their efforts on specific research and assessments related to outflow management rules specified in the regulation plans. The workgroups are in the process of developing performance indicators for comparison and modeling purposes for the review of Plan 2014. Performance indicators will serve as a metric, or method to compare and analyze the regulation plans under past, present, and potential future conditions. It should be noted that only preliminary work and data collection has commenced related to review of Plan 2012 with the full effort on this review occurring after the

expedited review of Plan 2014.

The GLAM Committee is expected to complete the development of a modelling framework and visualization tool to assess outcomes from regulation plan alternatives using performance indicators. The tool, known as the Integrated Social, Economic and Environmental (ISEE) System

that will focus on modelling system response related to Lake Ontario outflows into the St. Lawrence River is expected to be completed in 2024. Below is a table of the various performance indicators being developed across the various uses and interests including shoreline property, municipal and industrial uses, recreational boating and tourism, hydropower, ecosystem services and commercial navigation.

According to the GLAM Committee, *Phase 2* of the review of Plan 2014 is scheduled to be completed by the end of 2024 and a report on the findings will be issued shortly thereafter. The International Lake Ontario-St. Lawrence River Board will review the GLAM Committee's report and could recommend changes to Regulation Plan 2014, if deemed appropriate. Any such recommendations would be submitted to the International Joint Commission who would gather public comments prior to consideration of any proposed changes. The International Joint Commission would then submit any recommendations to the governments of Canada and the United States for concurrence to implement.

Visit the GLAM Committee [website](#) to learn more.

Flooded buildings	Violations of water intakes thresholds	Marina functionality index	Dependable power	Meadow marsh index	Draft restrictions
Flooded public assets	Violations of wastewater threshold	Beach access index	Spill	Wetland classes	Lost tonnage
Flooded roads			Average seasonal energy	Wild rice	Gradients
Agriculture yield loss			Opportunity for peaking	Northern pike	
Shoreline protection failure			Critical infrastructure thresholds	Spawning window	
				Marsh bird	
				Migratory waterfowl	
				Least bittern	
				Black tern	
				Turtles	
				Muskrat	
				Exposed riverbed	



Contact Us

International Lake Superior Board of Control



Website: <https://www.ijc.org/en/lisbc>

Facebook: <https://www.facebook.com/InternationalLakeSuperiorBoardOfControl>

Web form: https://www.ijc.org/en/contact/contact_the_international_lake_s

International Niagara Board of Control



Website: <https://www.ijc.org/en/nbc>

Web form: https://www.ijc.org/en/contact/contact_the_international_niagar

International Lake Ontario-St. Lawrence River Board



Website: <https://www.ijc.org/en/loslrb>

Facebook: <https://www.facebook.com/InternationalLakeOntarioStLawrenceRiverBoard/>

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