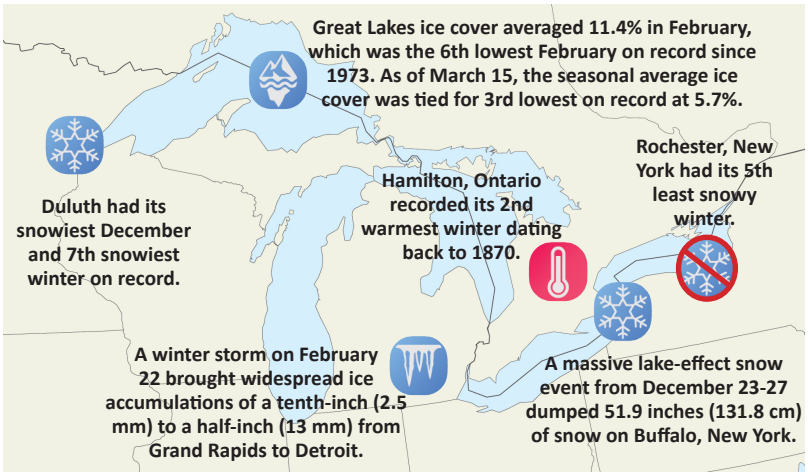
Quarterly Climate Impacts and Outlook

Great Lakes Region

March 2023

Great Lakes Significant Events – *December 2022 - February 2023*



A rapidly intensifying storm traversed the Great Lakes region in late December bringing strong winds, high waves, and snow to the eastern basin. A seiche developed on Lake Erie from December 23-24 resulting in an 18.4-foot (5.6-meter) lake level difference between Toledo and Buffalo. Buffalo recorded its 4th all-time snowiest day with 22.3 inches (56.6 cm) on December 23. Lake-effect snow persisted for nearly a week, dropping over 50 inches (127 cm) of snow in localized areas downwind of Lakes Erie and Ontario. Snowfall in southern Ontario ranged from about 20-40 inches (50-100 cm).

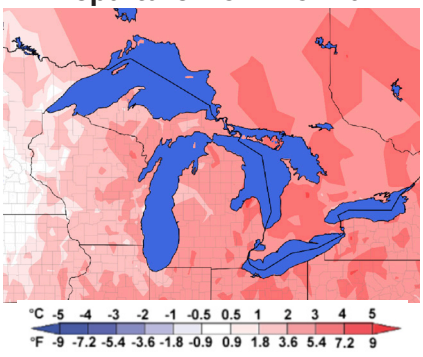
Only a few deep cold periods affected the Great Lakes, and long warm stretches were widespread. This resulted in persistently low lake ice extent, much above-normal water temperatures, and below-normal snowfall.

Winter weather advisories spanned the region on February 22 as a strong storm brought rain, ice, and snow. The Green Bay area had about 6-10 inches (15-25 cm) of snowfall while the Detroit area had over a half-inch (13 mm) of ice.

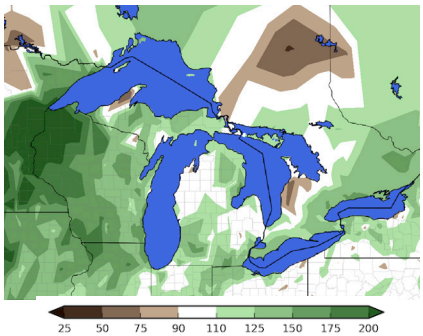
A lack of snow and warm temperatures contributed to drought intensification in southeast Michigan and southern Ontario across the winter months.

Regional Climate Overview – *December 2022 - February 2023*

Winter Temperature Departure from Normal



Winter Precipitation Percent of Normal



Precipitation normals based on 1991-2020. Temperature normals based on 1991-2020 (U.S) and 1981-2010 (Canada).

Air Temperature and Precipitation

Winter was up to 4°C (7°F) above normal. December ranged from 2°C (4°F) below normal in the west to 3°C (5°F) above in the east. January was up to 6°C (11°F) above normal across the basin. February ranged from near normal in the west to 5°C (9°F) above normal in the east.

Winter precipitation ranged from 75-200% of normal across the basin. December precipitation was over 150% of normal in the far western and eastern ends of the basin, with 50-150% in between. January ranged from 50-125% of normal in the west up to 200% in the east. February ranged from 75% of normal in the eastern end of the basin to over 150% of normal in the western lakes.

Michigan had its 6th warmest winter. In Ohio, Cleveland had its 2nd warmest winter and Toledo had its 8th least snowy. Watertown, New York has its 2nd wettest winter.

Current Water Levels

Sup.	+21 cm	+30 cm	-16 cm	-10 cm
Mich.-Huron	+11 cm	-12 cm	-9 cm	-17 cm
Erie	+42 cm	-3 cm	+26 cm	+3 cm
Ont.	+19 cm	-11 cm	+39 cm	+10 cm

End of February water levels were above average on all lakes, while Lake Superior was the only lake above its level from last February. Lakes Superior and Michigan-Huron experienced a net decrease in water levels from the beginning of December to the end of February, which is typical for this time period. In contrast, lakes Erie and Ontario experienced well above average rises in water level over the same time horizon due to warm and wet conditions throughout January and February.

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Regional Impacts – *December 2022 - February 2023*

December 23-27 Winter Storm: A potent storm brought excessive lake-effect snow and high winds to western New York. Multiple locations recorded gusts greater than 70 mph (113 kph). Buffalo had blizzard conditions for around 36 hours, resulting in many hours of zero visibility. Falling trees and frozen substations knocked out power to tens of thousands of customers in Erie County. Travel bans were enacted in Erie and Jefferson counties, and the Buffalo Airport was shut down for several days. Hundreds of people were stranded on roads or in unheated homes and required rescuing; however, even first responders got stuck and needed to be rescued. There were at least 46 deaths in Erie County, making it among the deadliest weather events for the county.

Recreation: Michigan recreation took a hard hit due to warm temperatures with reduced snowfall, poor ice fishing conditions, and reduced snow trail quality. Multiple dog sled races in Michigan's Upper Peninsula were cancelled. A general lack of snow across New York resulted in a poor snowmobiling season. For the first time since it was opened in 1971, the world's longest ice skating rink, the Rideau Skateway in Ottawa, did not open citing poor ice conditions due to warm temperatures.

Ice Cover: Warm temperatures reduced ice coverage on Lake Michigan, allowing for an extended shipping season at Green Bay. The Canadian Coast Guard only responded to 20 icebreaking requests this winter compared to over 150 last season. The Madeline Island Ice Road off the northern Wisconsin coast of Lake Superior remained closed due to thin ice.



Maple syrup production started earlier than usual (credit: Barbara MacKay)



Satellite image from February 12 showed Great Lakes with little ice (credit: NOAA)



Snow piled high in Buffalo on December 25 (credit: NWS Buffalo)

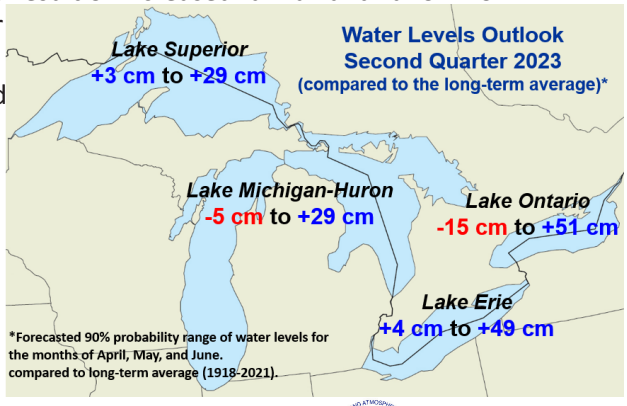
Regional Outlook – *for April - June 2023*

Temperature and Precipitation

The outlook from American and Canadian forecasters shows enhanced chances of above-normal temperatures for the central and eastern portions of the Great Lakes, with equal chances for above-, below- and near-normal temperatures in the western side of the basin. Precipitation outlooks are less consistent. American forecasters indicate an enhanced chance of above-normal precipitation across the entire basin, whereas Canadian forecasters indicate equal chances for above-, below- and near-normal precipitation.

Great Lakes Water Level Outlook

The March water level forecast indicates that in the second quarter (April, May, June) water levels in all the lakes will be in their period of seasonal rise. Lake Superior is forecast to finish its seasonal decline in March, while the other lakes will start or continue their seasonal rise in March. Water levels typically rise during the spring months as a result of increased rainfall and runoff from snowmelt. In the 2nd quarter of 2023, Lakes Superior, Michigan-Huron, St. Clair, and Erie are forecast to remain above average levels under most potential water supply conditions. For Lake Ontario, above-average water levels are likely in the 2nd quarter, but could be near or below average if drier conditions occur.



Partners

- Midwestern Regional Climate Center
- Environment and Climate Change Canada
- Agriculture and Agri-Food Canada
- Northeast Regional Climate Center
- Great Lakes Region State Climatologists
- NOAA
  - NCEI
  - GLERL
  - CoastWatch Great Lakes Node
  - Great Lakes and IL-IN Sea Grant Networks
  - North Central River Forecast Center
  - Ohio River Forecast Center
  - Climate Prediction Center
  - Office for Coastal Management
- GLISA
- US Army Corps of Engineers, Detroit District
- NIDIS
- USDA Midwest Climate Hub

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