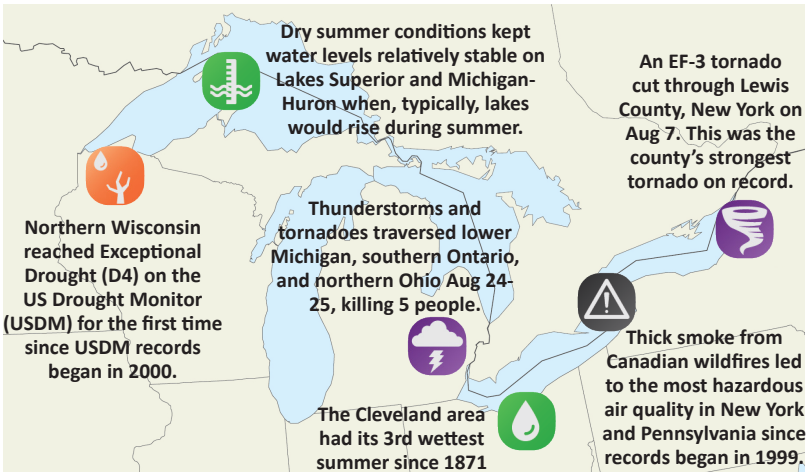
Quarterly Climate Impacts and Outlook

Great Lakes Region

September 2023

Great Lakes Significant Events – *June - August 2023*



Widespread dryness across the Great Lakes and generally cool temperatures led to a quiet start to summer. Wildfire smoke was a persistent issue basin-wide in June and July due to atypical northerly winds and large Canadian wildfires.

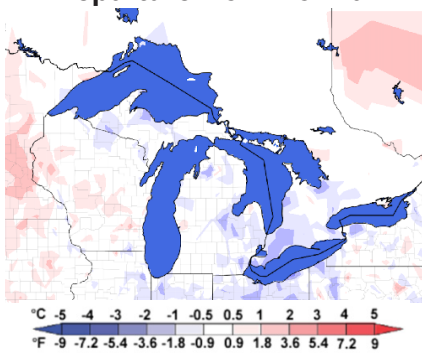
An active weather pattern shifted into the eastern Great Lakes in July and August. Up to 8 inches (203 mm) of rain fell on July 2 in Chicago, prompting officials to temporarily reverse the flow of the Chicago River. On July 9, over 5 inches of rain fell in just a few hours in Ontario County, New York, flooding buildings and roads.

Syracuse, New York had its ninth wettest August day on August 7 with 2.45 inches (62.2 mm) of rain. Over 3 inches (76 mm) fell across Detroit, Windsor, and Cleveland on August 23-24 associated with storms that also produced tornadoes and damaging winds.

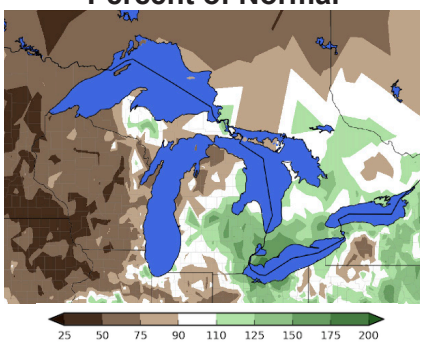
Meanwhile, drought expanded in the west, and Duluth had its 7th driest July-August since 1871. Summer concluded with about 39 percent of the Great Lakes basin abnormally dry or in drought according to the North American Drought Monitor.

Regional Climate Overview – *June - August 2023*

Summer Temperature Departure from Normal



Summer Precipitation Percent of Normal



Precipitation and temperature normals based on 1991-2020.

Air Temperature and Precipitation

Summer temperatures were 2°C (4°F) below normal in the Erie basin, to near normal elsewhere. June temperatures ranged from 2°C (4°F) below normal in the Erie basin to 2°C (4°F) above normal in the Superior basin. July temperatures ranged from 2°C (4°F) below normal in the Superior basin to 2°C (4°F) above normal in the Ontario basin. August ranged from 2°C (4°F) below normal to near normal in the basins.

Summer precipitation was 96% of average, with Superior being dry, Ontario being wet, and the others being near average. June precipitation was 74% of average, with all basins being drier or near average. Michigan had the 5th driest June on record, followed by the 6th wettest July. July precipitation was 113% of average, with all basins except Superior being wet. August precipitation was 100% of average, with the basins being near or wetter than average.

Current Water Levels

Lake	End of Aug 2023 Level Compared to:		Change in Level from beg. of Jun. to end of Aug:	
	Average for Aug	Aug 2022	2023 Change in Level	Average Change in Level
Sup.	+10 cm	+1 cm	-3 cm	+13 cm
Mich.-Huron	+13 cm	-8 cm	-1 cm	+1 cm
Erie	+38 cm	+10 cm	0 cm	-11 cm
Ont.	+16 cm	+33 cm	-31 cm	-24 cm

End of August levels were above average and above last year on all lakes, except Lake Erie. Dry conditions in the Lake Superior basin led to water level declines from the beginning of June to the end of August, which is only the 3rd time this has occurred. Lake Erie basin was wet during the summer with steady water levels, when on average, the level declines. Despite wetter conditions in the Lake Ontario basin, the water level decreased slightly more than average. Lake Michigan-Huron declined by 1 cm when on average the water level increases by 1 cm.

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Regional Impacts – *June - August 2023*

Air Quality: Historic Canadian wildfires brought unhealthy air quality and hazy skies across the Great Lakes basin on numerous days in June and July. These resulted in periodic closures of outdoor spaces and events, reduced visibility, and a record-high number of air quality alerts. Persistent poor air quality also increased respiratory-related hospitalizations and emergency room visits, especially for people with asthma and pulmonary disease.

Severe Storms: On August 24-25, damaging thunderstorms and tornadoes moved across southern Michigan, Ontario, and northern Ohio, resulting in at least 5 fatalities. Wind gusts of 70-80 mph (113-129 kph) downed trees and knocked out power to over 500,000 customers in lower Michigan. Heavy rain flooded and washed out major roadways in southern Ontario and southeast Michigan.

Agriculture: Extremely wet conditions in July and August were problematic for crops in southern Ontario, where farmers reported reduced yields, crop rot, and problems accessing wet fields. Field crops in western New York started the season with delayed planting due to drought and ended with delayed harvest due to excess wetness. The official Michigan apple crop estimate was above average, citing favorable weather for most growers in 2023, with some regionalized losses due to frost and hail.



Very dry pasture conditions were observed in far northern Wisconsin in late August (credit: CMOR/NDMC)



July 15 satellite image shows heavy smoke around northern Lake Michigan (credit: MODIS)



Heavy rainfall Aug 24-25 washed out roadways in Ypsilanti Township, Michigan (credit: Washtenaw County Roads)

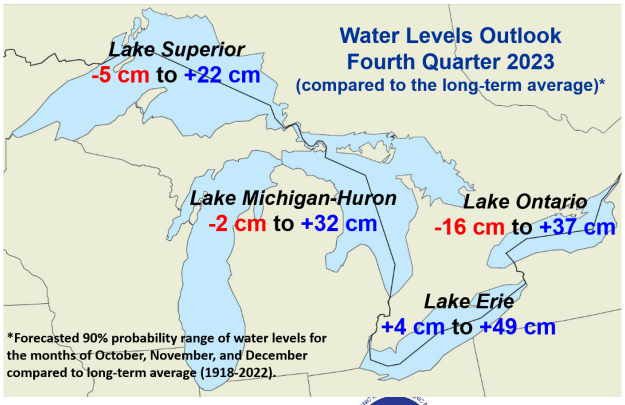
Regional Outlook – *for October - December 2023*

Temperature and Precipitation

American and Canadian forecasts lean towards above-normal temperatures for most of the basin, with the highest confidence in the central portion of the basin. The American forecast shows a slight chance of below-normal precipitation in the central and eastern basins. The Canadian forecast shows equal chances of below-, above, and near-normal precipitation basin-wide.

Great Lakes Water Level Outlook

In the fourth quarter (October, November, December), the September 6-month Great Lakes water level forecast indicates that water levels on all lakes will be in their period of seasonal decline. This is typical for this time of year, as evaporation becomes more prominent across the lakes due to cold air moving over the relatively warm lake water surfaces. Under average water supply conditions, all the lakes are expected to remain above average during the 4th quarter. If very dry conditions occur in the Lakes Superior, Michigan-Huron, or Ontario basins, those water levels could drop below average.



Potential El Niño Impacts

El niño conditions have developed and will continue through the winter. Generally, an El niño pattern leads to warmer and drier conditions across the Great Lakes basin.

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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