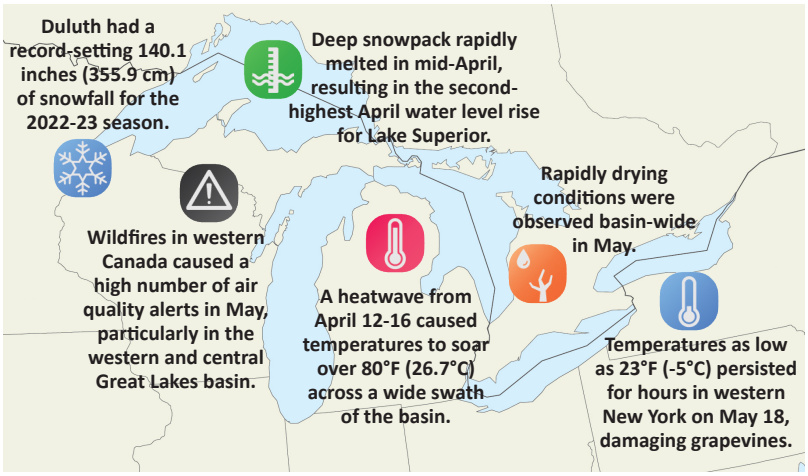
Quarterly Climate Impacts and Outlook

Great Lakes Region

June 2023

Great Lakes Significant Events – *March - May 2023*



A nor'easter on March 14-15 brought localized snowfall totals up to 18 inches (45.7 cm) east/southeast of Lake Ontario.

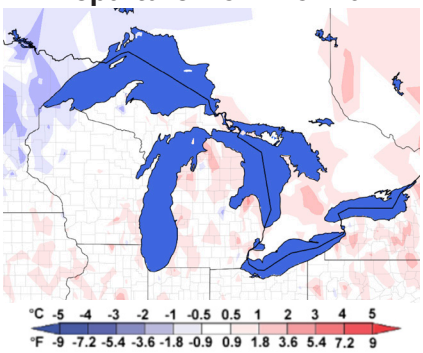
Early April brought widespread warmth across the basin. Temperatures rose above 80°F (26.7°C) for 4 consecutive days mid-month from western Lake Michigan to southern Lake Erie. This warm-up prompted rapid snowmelt of a deeper-than-normal snowpack in the northwest, saturating soils and rising lakes levels. A cold front traversed the region April 16-17, ushering in temperatures 50-60°F (27.7-33.3°C) cooler than at the peak warmth days prior.

A stalled weather system lingered in the Great Lakes from late April into early May, dumping rainfall on saturated ground in the northwest and fueling high snowfall in Michigan's Upper Peninsula. Herman, Michigan, recorded 52 inches (132.1 cm) of snowfall from April 30-May 3, with a single-day snowfall total of 27 inches (68.6 cm) on May 2.

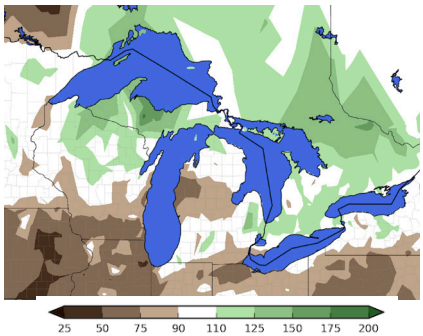
Rapid drying occurred across the Great Lakes basin throughout May due to the combined effects of below-normal precipitation and an unusually dry atmosphere (low humidity).

Regional Climate Overview – *March - May 2023*

Spring Temperature Departure from Normal



Spring 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

March and April temperatures ranged from 3°C (5°F) below normal in the western Superior basin to 3°C (5°F) above normal in the southern Erie and Ontario basins. Conditions reversed in May, with temperatures ranging from 2°C (4°F) above normal in the western Superior basin to 2°C (4°F) below normal in the southern Erie and Ontario basins. Spring temperatures ranged from 2°C (4°F) below normal to 1°C (2°F) above normal.

March precipitation was 109% of average, with all basins being near or wetter than average. April precipitation was 124% of average, with all basins but Erie being wet. All basins were dry in May, with the overall basin seeing 47% of average. Spring precipitation was 90% of average, with the Erie basin being dry, Superior basin being wet, and the other basins near average.

Current Water Levels

Lake	End of May 2023 Level Compared to:		Change in Level from beg. of Mar. to end of May:	
	Average for May	May 2022	2023 Change in Level	Average Change in Level
Sup.	+26 cm	+14 cm	+22 cm	+17 cm
Mich.-Huron	+15 cm	-9 cm	+28 cm	+24 cm
Erie	+27 cm	-5 cm	+16 cm	+31 cm
Ont.	+23 cm	+15 cm	+47 cm	+43 cm

End of May water levels were above average on all lakes, with Superior's level the fifth highest on record. Lakes Superior and Ontario were above levels from last May, while Lakes Michigan-Huron and Erie were below. All lakes except Erie had a larger-than-average rise from the start of March to the end of May. Dry conditions in the Lake Erie basin resulted in the lake rising only about half of its average. Very wet conditions in the Lake Superior basin during April resulted in that lake's second-highest April rise.

Contact: Melissa Widhalm (mwidhalm@purdue.edu)

Regional Impacts – *March - May 2023*

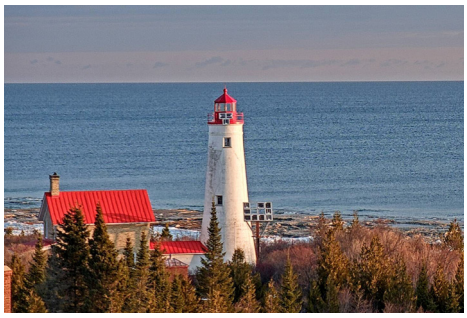
Agriculture: A late-season freeze severely damaged grapevines in New York when temperatures persisted as low as 23°F (-5°C) for several hours on May 18. Bud break occurred earlier than normal due to an unusually warm April, leaving the grapevines susceptible. While most vineyards were affected, the damage was highly variable. Preliminary losses in some varieties were 70-100% at several vineyards. Dry conditions in southern Ontario delayed row crop planting by two weeks.

Flooding: Extreme warmth in mid-April led to rapid snowmelt and associated flooding in the northwest portion of the basin. Michigan's Governor declared a state of emergency across the Upper Peninsula as snowmelt flooding washed out roads, overwhelmed stormwater systems, and caused millions of dollars in damages. In Duluth, floodwater resulted in raw sewage overflows. Near Sault Ste. Marie, portions of Whitefish Island were closed due to flooding.

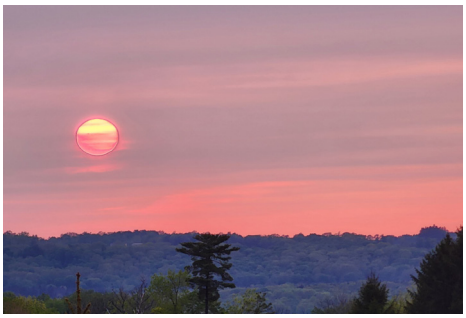
Air Quality: Historically large wildfires in western Canada prompted Minnesota's worst start to the year on record for air quality. The National Weather Service in Duluth issued 21 air quality alerts during May, which is above normal, as ground-level air quality reached problematic levels for sensitive populations. In the east, hazy skies were common in May as wildfire smoke was lofted high into the atmosphere, where it muted the sky color without negative health impacts.

Recreation: Mild winter conditions led to low ice coverage on the Great Lakes, which allowed a record early start to the Niagara Falls boat tour season. Put-In-Bay on Lake Erie reported just 4 days were suitable for ice fishing all season.

April 7 satellite image shows snowpack across northwest basin (credit: MODIS)



View from Thunder Bay on March 20 showing no ice cover (credit: NOAA)



Colorful, smoky sunset in western New York on May 21 (credit: NWS)

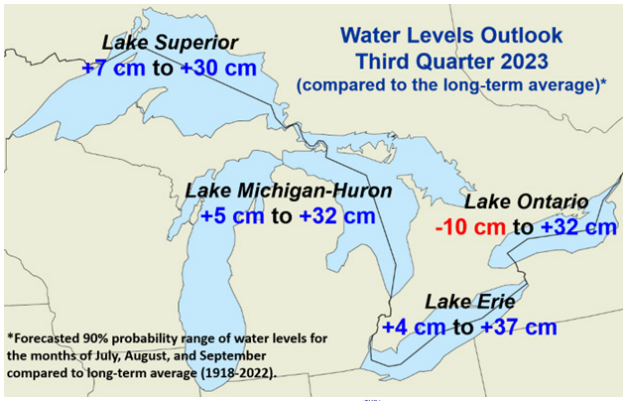
Regional Outlook – *for July - September 2023*

Temperature and Precipitation

The outlook from American and Canadian forecasters shows enhanced chances of above-normal temperatures for the entire basin, with the highest confidence in the central portion of the basin. The precipitation outlook shows a slight chance of below-normal precipitation in the western and central basin, and equal chances for above-, below- and near-normal precipitation in the eastern basin.

Great Lakes Water Level Outlook

In the third quarter (July, August, September), the June 6-month Great Lakes water level forecast indicates that under most water supply scenarios, water levels are forecast to remain above average on Lakes Superior, Michigan-Huron, and Erie. If drier conditions occur in the Lake Ontario basin, water levels could drop below average. During the third quarter, water levels are projected to reach their peak and begin their seasonal decline on Lakes Superior and Michigan-Huron. Lakes Erie and Ontario have likely already reached their peak monthly mean levels in May and will be in their period of seasonal decline throughout the third quarter.



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