

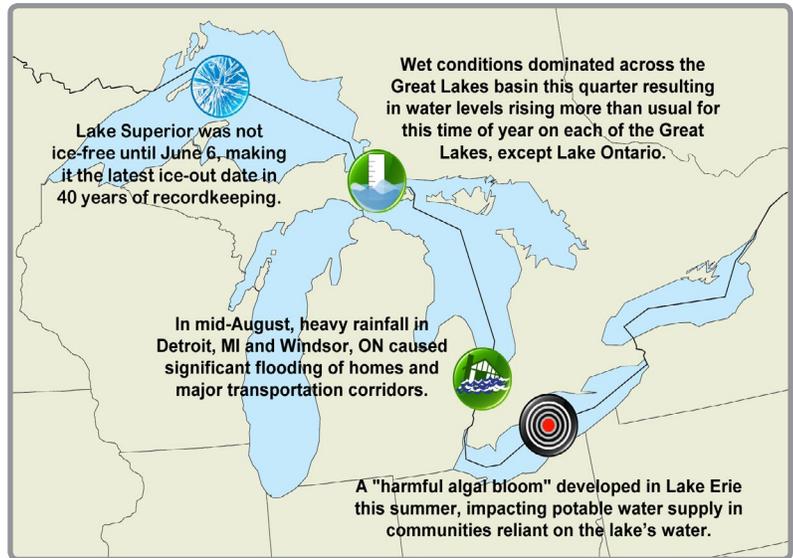


Great Lakes Significant Events - for June - August 2014

Summer 2014 was cooler than normal across the Great Lakes basin, with basin temperatures 1°C (1.8°F) to 3°C (5.4°F) below normal in July and August. In fact, 5 of the 8 U.S. Great Lakes states ranked July 2014 among their top 11 coldest Julys on record.

Wet conditions continued to dominate across the Great Lakes basin resulting in water levels rising more than usual for this time of year on each of the lakes, except Lake Ontario where above average outflows offset wet conditions. Lake Superior ended the quarter above-average and at levels not seen since 1996. Lake Michigan-Huron levels began September just below its long-term monthly average and at levels not experienced since 1998.

A "harmful algal bloom" developed in Lake Erie this summer, with wet weather and agriculture fertilizers the suspected drivers. Harmful algal blooms are any large increased density of algae with significant socioeconomic or ecological effects including toxins, beach fouling, intake clogging, reduced property value, and/or taste-odor issues.

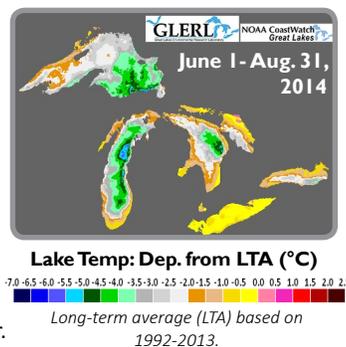


Flooding was a major issue this summer across the Great Lakes basin. In mid-August, Detroit, MI and Windsor, ON both experienced significant flooding after intense, heavy rainfall. In Detroit, 102 mm (4 in) to 152 mm (6 in) of rain fell within 8 hours on August 11, much of which fell during evening rush hour. In Windsor, the 74 mm (2.9 in) of rain that fell on August 11 was their second wettest August day on record. On August 4, significant flooding of highways, streets, and a few thousand homes occurred in Burlington, ON, when up to 190 mm (7.5 in) fell locally within a few hours. Several communities within MN also felt the impacts of flooding in late June. In particular, the Mississippi River rose to a near-record 6 m (20 ft) crest in Minneapolis-St. Paul, forcing the closing of some roads. The mayor of St. Paul, MN declared a state of emergency for this area.

Regional Climate Overview - for June - August 2014

Surface Water Temperature

Surface water temperatures were colder than usual for Summer 2014. Lakes Superior and Michigan-Huron generally saw departures from near average to -6.6°C (-11.9°F) from average. Lake Ontario's water temperatures deviated from near average to -4.6°C (-8.3°F) from average, while Lake Erie had departures from near average to -1°C (-1.8°F) from average. The below-average water temperatures were due to below-normal air temperatures and late-season ice cover.



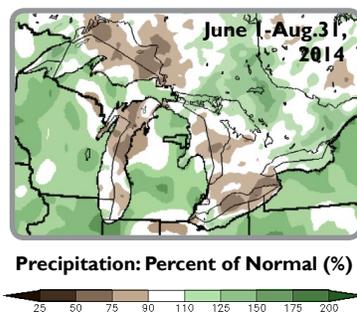
Great Lakes Water Levels

Levels on all of the Great Lakes remain above last year's levels at the beginning of September, with the exception of Lake Ontario, which was 2 cm (0.8 in) lower than last year. Continued wet weather contributed to Lake Superior finishing the quarter 15 cm (5.9 in) above its long-term average and 20 cm (7.9 in) above last year's level. Lake Michigan-Huron continued to rise, finishing the quarter just 2 cm (0.8 in) below average, but 42 cm (16.5 in) higher than last year's level. The other lakes also received above average water supplies. At the beginning of September, Lake Erie was 11 cm (4.3 in) above average while Lake Ontario was 7 cm (2.8 in) above average.

Water level statistics based on 1918-2013.

Precipitation

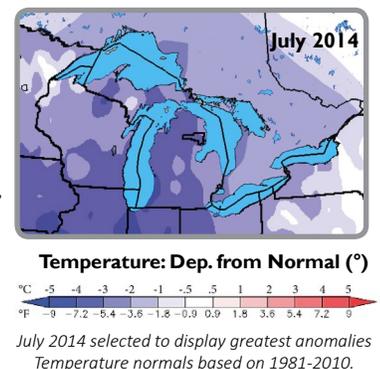
The Great Lakes basin received 120% of its average summer precipitation. In June, all lake basins were wetter than average, with the overall basin seeing 135% of average. July and August were wet for all lake basins but Superior. Overall, the Great Lakes basin saw 110% of average in July and 120% in August.



Map: precip normals based on 1981-2010 (NOAA, EC).
Text: precip averages based on 1900-2010 (USACE)

Temperature

Summer was cooler than normal in the Great Lakes basin, with departures from near normal to -2°C (-3.6°F) from normal. July was quite cool as departures ranged from -1°C (-1.8°F) to -3°C (-5.4°F) from normal. August was also cool, with departures from near normal to -2°C (-3.6°F) from normal. June was the only warmer-than-normal month, with departures from near normal to +2°C (+3.6°F) from normal.



Regional Impacts - for June - August 2014

Water Quality

The harmful algal bloom in Lake Erie created toxic, undrinkable water for residents and businesses in the western Lake Erie area. On August 2, city of Toledo and Ohio state officials informed residents of Toledo not to use their tap water (restrictions were lifted on August 4). Many businesses reported lost revenue since they had to close during the water emergency. The governor of Ohio declared a state of emergency for Lucas, Wood, and Fulton counties and said that officials were working to have drinking water shipped for affected residents. On August 26, residents of Pelee Island, ON were advised not to drink the water (restrictions were lifted on September 9). The water emergencies put a spotlight on Lake Erie's algae problem, which has been occurring for more than a decade. To try to combat this issue, Ohio is receiving \$2 million in new federal emergency funds to reduce runoff in the western Lake Erie basin.



Sampling Lake Erie on 8/4/14 (NOAA)

Navigation & Recreation

The recent rise in water levels has been beneficial to the shipping and recreational boating community on the Great Lakes. The Lake Carriers Association cited an example of a carrier leaving Duluth, MN in June 2014 that was able to transport over 2,000 more tons of cargo compared to this same time last year. Marina owners had more slips to sell and required less dredging. Boaters and fisherman were able to access areas on the lakes that they could not access before.

Public Health

The lack of hot temperatures this summer helped reduce the typical summer occurrence of smog/ozone pollution. In fact, the Ontario Government and Environment Canada did not issue any Air Quality Advisories this summer for the Canadian Great Lakes basin. In the U.S., Ozone Action Days were only issued in Michigan (Detroit and southwest) from July 20-22 by the Michigan Department of Environmental Quality. In addition, the heat wave was missing in action this summer across the basin, with many locations only experiencing less than half their normal number of 30°C+ (86°F+) days for the summer. The absence of heat waves resulted in less heat stress, which is a positive effect on the public health of the basin.



Smoggy morning in Toronto, ON on 4/13/05 (Martin Cathrae - via Flickr)

Infrastructure & Transportation

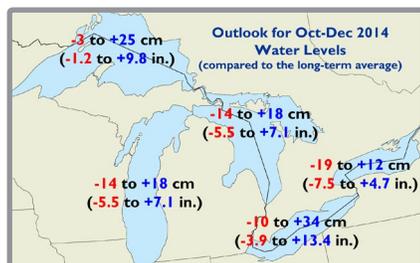


Flooded I-75/I-696 interchange in Royal Oak, MI on 8/12/14 (BGilbow - via Flickr)

Several Great Lakes cities felt infrastructure and transportation impacts related to flooding this summer. The Detroit, MI flooding event on August 11 left thousands of motorists stranded on flooded freeways and streets, many of which remained closed for days. Delivery interruptions and absenteeism slowed automobile production in Detroit. On June 20, heavy rains produced a massive mudslide behind a University of Minnesota Medical Center, dumping 1.8 m (6 ft) to 2.4 m (8 ft) of mud and tree debris on a parkway below.

Regional Outlook - for October - December 2014

Lake Level Outlook



Outlook from the US Army Corps of Engineers and Environment Canada (October-December 2014)

The fall season is the time of year when water levels are typically in a seasonal decline. Current outlook for October through December indicate that levels on lakes Superior and Erie are expected to remain 9 cm (3.5 in) to 14 cm (5.5 in) above average unless exceedingly wet or dry water supply conditions are experienced. Lake Michigan-Huron is expected to rise above average unless dry conditions return. Lake Ontario is expected to drop a few centimeters below average unless above average water supplies are received.

Temperature and Precipitation Outlook

Environment Canada (EC) and the Climate Prediction Center (CPC) are forecasting greater chances for above normal temperatures for October through December for their respective Canadian and U.S. Great Lakes basins. However, both EC and the CPC indicate there is no clear signal on whether precipitation will be above, near, or below normal for their basins for the same time period.

El Niño has a 60-70% chance of developing by mid to late fall. Based on previous years, El Niño winters tend to be warmer than normal in the Great Lakes basin, with drier than normal conditions in the eastern basin, less snow than usual, and reduced ice cover on the lakes.

Harmful Algal Bloom Outlook

As of early September, the harmful algal bloom still persists in western Lake Erie and has now reached the northern shore of the west central basin. However, the size and toxicity of the bloom have decreased since the bloom peaked in early August. According to researchers, harmful algal blooms in Lake Erie typically dissipate by the middle to end of October. Until the 2014 algae bloom dissipates, monitoring of contamination levels of drinking water in the Toledo area is ongoing.



Great Lakes Region Partners

Environment Canada
www.ec.gc.ca

Agriculture and Agri-Food Canada
www.agr.gc.ca

Midwestern Regional Climate Center
www.mrcc.isws.illinois.edu

Northeast Regional Climate Center
www.nrcc.cornell.edu

Great Lakes Region State Climatologists
www.stateclimate.org

National Oceanic and Atmospheric Administration
www.noaa.gov

National Operational Hydrologic Remote Sensing Center
www.nohrsc.nws.gov

Great Lakes Environmental Research Laboratory
www.glerl.noaa.gov

NOAA Great Lakes Sea Grant Network
www.seagrant.noaa.gov

North Central River Forecast Center
www.crh.noaa.gov/nrcfc

Ohio River Forecast Center
www.crh.noaa.gov/ohrfc

Climate Prediction Center
www.cpc.noaa.gov

Great Lakes Integrated Sciences & Assessments
www.glista.umich.edu

US Army Corps of Engineers, Detroit District
www.lre.usace.army.mil

National Integrated Drought Information System
www.drought.gov

Great Lakes Water Level Dashboard
www.glerl.noaa.gov/data/dashboard/GLHCD.html

Contact Information

Contact for NOAA:
Molly Woloszyn: mollyw@illinois.edu
Samantha Borisoff: samantha.borisoff@cornell.edu

Contact for Environment Canada:
greatlakes-grandslacs@ec.gc.ca
enviroinfo@ec.gc.ca

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www.drought.gov/drought/content/resources/reports
www.ec.gc.ca/eau-water/default.asp?lang=En&n=F5329B03-1