Quarterly Climate Impacts and Outlook

Great Lakes Region

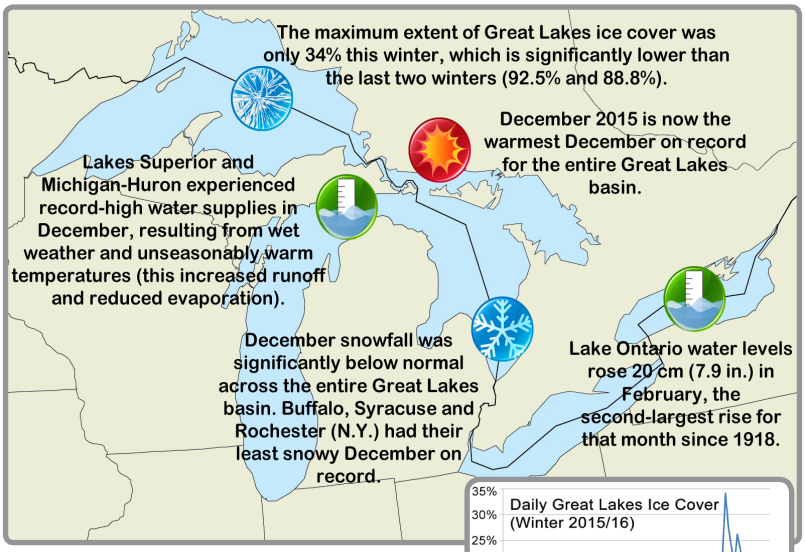
March 2016

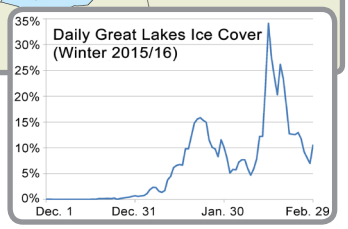
Great Lakes Significant Events - *for December 2015 - February 2016*

Winter temperatures were much above normal for the Great Lakes basin. This resulted in below-normal snowfall for much of the basin, as well as a delayed start and reduced extent of Great Lakes ice cover. El Niño conditions were the driver for the unseasonably warm Great Lakes weather this winter.

December was remarkably warm across the entire Great Lakes basin, with all U.S. states and the entire province of Ontario experiencing the warmest December on record. December snowfall was significantly below normal across the basin, and the first snow of the season fell late in some places. Buffalo, N.Y. recorded its latest date for first measurable snowfall on December 18 (breaking the previous record of December 3 set in 1899).

While still above-normal overall, January and February temperatures were more variable. For example, locations in Ontario experienced record-breaking warmth on February 3 and just 10 days later, many of the same locations experienced record-breaking cold (a temperature swing was 40-46°C (72-83°F) in some locations).





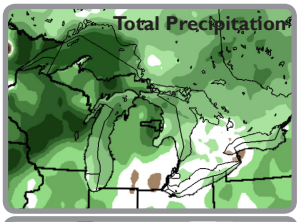
Great Lakes ice cover reached its maximum extent of 34% on February 14, not long after a delayed start in late December due to warmer temperatures. Ice cover fluctuated along with the temperatures in January and February (see daily graph). The uncovered lakes also produced significant lake-effect snow (LES) this winter. In mid-January, multiple LES events produced 0.9-1.2 m (3-4 ft.) of snow eastward of Lake Ontario and 0.3-0.6 m (1-2 ft.) eastward of Lake Erie.

Significant atmospheric pressure differences produced very strong winds across the basin on February 19. Peak wind gusts reached 116 km/h (72 mph), causing significant damage around Chicago, Ill. and producing waves of 3-6 m (10-20 ft) on lakes Michigan-Huron and Ontario.

Regional Climate Overview - *for December 2015 - February 2016*

Precipitation

Winter precipitation across the Great Lakes basin was near to above normal. However, much fell as rain, while snowfall was mostly below normal. **December**: The upper lake basins were wetter than normal, while the Erie and Ontario basins were near normal. Snowfall was below normal for the entire basin. **January:** Precipitation was below normal in the Erie and Ontario basins, while other basins had areas ranging from below to above normal. **February:** Precipitation ranged from below normal in the Michigan basin to above normal in the Ontario basin. Snowfall varied from 25% to more than 200% of normal.

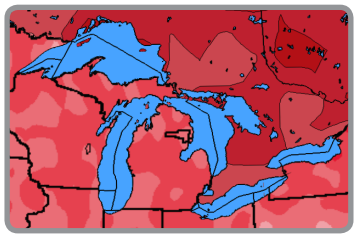


Normals based on 1981-2010.

Air Temperature

December was record warm for the Great Lakes basin, as temperatures were more than 5°C (9°F) above normal region-wide. January temperatures ranged from near normal to 4°C (7°F) warmer than normal. February temperatures ranged from near normal to 3°C (5°F) above normal. The winter season was 2°C (4°F) to 5°C (9°F) above normal.

Temperature normals based on 1981-2010.



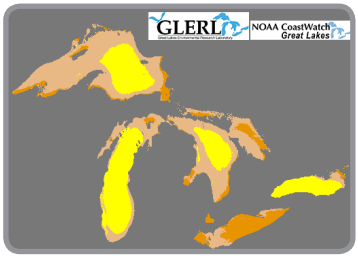
Great Lakes Water Levels

After a winter of generally wet weather and mild temperatures, water levels on all the Great Lakes were well above average and higher than last year. Lake Ontario ended the quarter 30 cm (11.8 in.) above average and 50 cm (19.7 in.) higher than last year. Lake Erie ended the quarter 33 cm (13 in.) well above average and 38 cm (15 in.) higher than last year. Lake Michigan-Huron's water level was 29 cm (11.4 in.) above average and the highest end of February since 1998. Lake Superior ended the quarter 24 cm (9.4 in.) above average and the highest for this time of year since 1997.

Water level statistics based on 1918-2014.

Great Lakes Ice Cover

Ice cover was below the long-term average on all basins this winter. The largest departures of 30% to 45% below normal ice cover were on Lake Erie. Colder temperatures in mid-January caused rapid growth, but a warm spell in late January and early-February caused considerable of melting before temperatures turned cold again. Ice cover peaked on February 14 at 34% but quickly began melting after warmer temperatures in late February.



Long-term average based on 1973-2015.

Regional Impacts - *for December 2015 - February 2016*

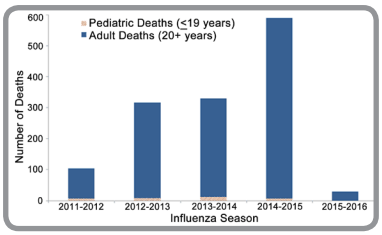
Recreation

Warmer winter temperatures had both negative and positive impacts on recreation around the Great Lakes. Minimal and/or unstable ice resulted in a poor ice fishing season, which hurt local fishing supply stores and caused dangerous conditions as trucks and snowmobilers fell through thin ice. Organizers of the U.S. Pond Hockey Championship postponed the January tournament by two weeks due to ice safety concerns. Ski resorts in Pennsylvania and New York opened late and had limited trails due to the lack of snowfall and warmer temperatures. On the other hand, the golfing and kayaking season were extended well into December, which was a positive for local businesses that provide for these sports.

A truck that fell through the Lake Superior Ice (Photo: J. Pillath/St. Louis County Rescue Squad)

Public health

The influenza (flu) season got off to a slow start and did not peak as high this year, partially due to the warmer temperatures since the virus tends to live longer in cold and dry conditions. In Canada, there have been 30 influenza deaths in the 2015-2016 season, compared to 600 deaths in 2014-2015 and 300 deaths in 2012-2013 and 2013-2014. The number of reported influenza cases is down in Chicago, Ill. and other areas of the U.S. as well.



Reported number of deaths by influenza season in Canada (Public Health Agency of Canada)

Municipal services

The below-normal snowfall resulted in decreased snow removal costs for many Great Lakes municipalities this winter (i.e. less salt, fuel, and personnel). Some municipalities have used the saved funds to purchase new equipment for upcoming winter seasons.

Transportation

Several winter weather events impacted transportation around the Great Lakes. A mid-February LES event in Lake County, Ohio caused a fatal multi-vehicle accident and shutdown a major interstate for several hours. The high wind event on February 19 cancelled over 160 flights at Chicago O'Hare International Airport and also caused dangers to highway transportation (semi-truck rollovers) and commuter train disruptions in Chicago.

The multi-car accident on 2/11/16 (Photo: Lake County Sheriff's Office)

Shipping

With less ice cover on the Great Lakes this winter, the St. Lawrence Seaway opened on its regularly scheduled date of March 21, which was a welcome change for the shipping industry since the opening was delayed the last two years. Also, limited ice allowed ships to move more quickly than they would otherwise.

Regional Outlook - *for April - June 2016*

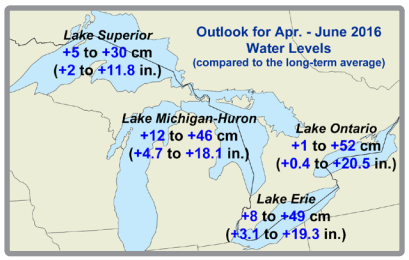
Temperature and precipitation outlook

Above-normal temperatures are expected to continue across the Great Lakes basin into April-June 2016, according to the seasonal outlooks from the Climate Prediction Center (CPC) and Environment and Climate Change Canada (ECCC). The driver for the above-normal temperature outlooks are the El Niño conditions in the tropical Pacific Ocean, which are beginning to weaken. CPC is forecasting below-normal precipitation for most of the U.S. Great Lakes basin, with greater chances near Lake Superior and Lake Michigan-Huron. Currently, there is no strong signal in the Canadian Great Lakes basin on whether April-June precipitation will be above-, near-, or below-normal.

The current seasonal temperature and precipitation outlooks can be found through the CPC and ECCC.

Lake level outlook

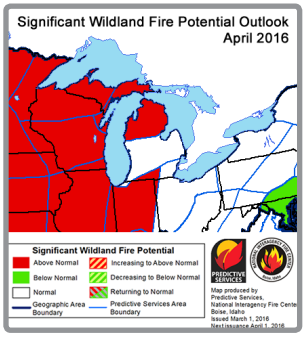
Great Lakes water levels typically climb in the spring months as temperature and runoff increases and evaporation decreases. All of the Great Lakes are expected to remain above average in the Spring unless exceedingly dry conditions are experienced.



Potential range for water levels for Apr-June 2016 compared to the long-term average (1918-2015).

Wildfire potential

The 2016 spring fire season may begin earlier than normal across portions of the Great Lakes basin. The National Interagency Fire Center and Natural Resources Canada are forecasting above-normal wildfire potential in the western Great Lakes in April 2016, particularly in areas around lakes Superior and Michigan-Huron. Increasing dryness in these areas is the main reason for the increased wildfire potential, as much of the eastern U.S. fire activity is based on shorter-term precipitation and temperature trends. Wildfire potential conditions are expected to return to normal in May and June.



Great Lakes Region Partners

Environment and Climate Change Canada (ECCC)
www.ec.gc.ca
Agriculture and Agri-Food Canada
www.agr.gc.ca
Midwestern Regional Climate Center
mrcc.isws.illinois.edu
Northeast Regional Climate Center
www.nrcc.cornell.edu
Great Lakes Region State Climatologists
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  www.nohrsc.noaa.gov
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- **North Central River Forecast Center**
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- **Ohio River Forecast Center**
  www.weather.gov/ohrfc
- **Climate Prediction Center**
  www.cpc.noaa.gov
- **Office for Coastal Management**
  http://coast.noaa.gov/

Great Lakes Integrated Sciences & Assessments
www.glisa.umich.edu
US Army Corps of Engineers, Detroit District
www.lre.usace.army.mil
National Integrated Drought Information System
www.drought.gov

Contact Information

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

Contact for ECCC:
greatlakes-grandslacs@canada.ca
enviroinfo@canada.ca

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