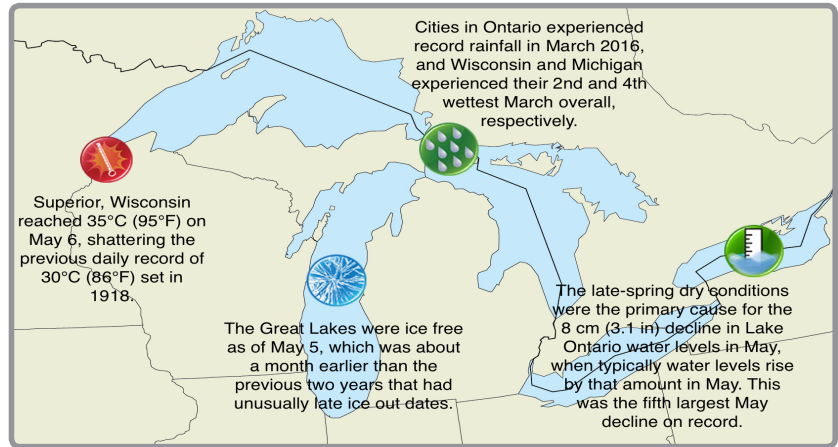




## Great Lakes Significant Events - for March - May 2016

The start of Spring 2016 was wet and warm in the Great Lakes basin, with several cities in Ontario experiencing record rainfall, including Barrie, Petawawa, and Windsor. In the U.S., Wisconsin and Michigan experienced their 2nd and 4th wettest March overall, respectively. However, April and May brought some cold spells, late-season snowfall, and drier conditions. There were widespread freeze events in early April that caused some damage to agriculture. In contrast, May also brought record-breaking warmth to portions of the basin. Superior (WI) reached 35°C (95°F) on May 6, shattering the previous daily record of 30°C (86°F) set in 1918. On the same day, Upsala (ON) set a new record for the earliest date to reach 30°C (86°F) or higher.

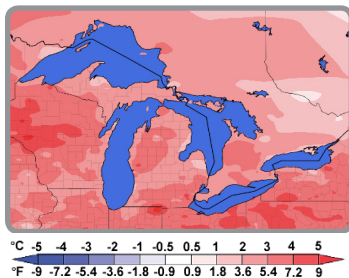
The warmer temperatures in March contributed to an early snowmelt, higher than normal rainfall amounts in many areas, and an increase in runoff. These all contributed to an early seasonal rise in water levels, and helped raise each of the Great Lakes to their highest March levels since the late 1990s. However, drier conditions in April, with the exception of Lake Erie, and all the Great Lakes in May, slowed or ended the seasonal rise. Nonetheless, Great Lakes water levels generally remained above average throughout this past quarter.



While the spring season was mostly quiet in terms of severe weather, an early-season EF1 tornado touched down on March 16 west of Mount Forest in southwestern Ontario. This tornado set the record for the earliest tornado of the year to occur in Ontario, beating the previous record of March 19. A prolonged episode of freezing rain occurred in southcentral Ontario on March 24 and reported ice accretions were as high as 35 mm (1.3 in). The weight of the ice brought down tree limbs and power lines, knocking out power to over 100,000 customers.

## Regional Climate Overview - for March - May 2016

March 2016 Temp: Dep. from Normal

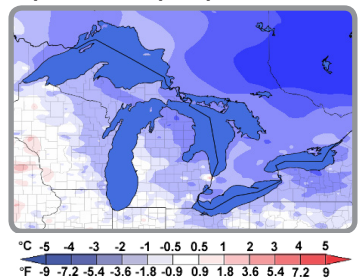


### Air Temperature

March was a mild month, with temperatures 1°C (2°F) to 5°C (9°F) above normal. The eight states that border the Great Lakes all ranked this March among their top 10 warmest. Temperatures were much cooler in April, ranging from 4°C (7°F) below normal to near normal. Milder temperatures returned in May, with most areas near normal to 2°C (4°F) above normal. Spring temperatures ranged from near normal to 2°C (4°F) above normal.

March and April 2016 graphics are shown to display the range in temperatures this spring. Temperature normals based on 1981-2010.

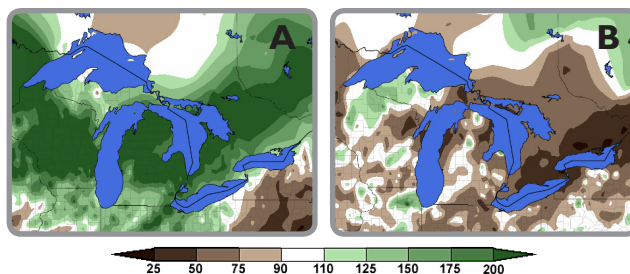
April 2016 Temp: Dep. from Normal



### Precipitation

All lake basins saw above-average precipitation in March, with the overall basin receiving 155% of average. In April and May, all lake basins experienced below-average precipitation. The Great Lakes basin saw 78% of average precipitation in April and 67% of average in May. Spring precipitation was near to below average for all lake basins, with the overall basin receiving 95% of average.

March (A) and May (B) Precipitation: Percent of Normal (%)



March and May 2016 graphics are shown to display the range in precipitation this spring. Precipitation normals based on 1981-2010.

### Great Lakes Water Levels

The spring season began wet but ended dry in the Great Lakes Basin. Despite the dry conditions, all of the Great Lakes ended the season above average with the exception of Lake Ontario, which ended the season 1 cm (0.4 in) below average but remained 17 cm (6.7 in) higher than this time last year. Lake Superior ended the season 13 cm (5.1 in) above average but 6 cm (2.4 in) below last year. Lakes Michigan-Huron and Erie both ended the season 33 cm (13 in) above average. They were 19 cm (7.5 in) and 21 cm (8.3 in) higher than last year, respectively.

Water level statistics based on 1918-2015.



## Regional Impacts - for March - May 2016

### Agriculture

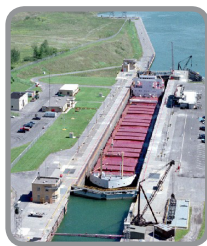


Apricot buds before (left) and after (right) an early-April 2016 freeze in Michigan (Photo: Mark Longstroth, Michigan State Extension)

The combination of a mild winter and above-average temperatures in March resulted in some Great Lakes agriculture being at risk during waves of freezing temperatures in April and May. In Michigan, initial assessments following two early-April freeze events **did not indicate any widespread severe damage**. However, considerable fruit bud loss was reported in early plums and apricots. Some damage was also reported in peaches, and both sweet and tart cherries. Later in the season in mid-May, a late-season freeze event in Minnesota resulted in frost injury to corn. However, overall corn yield in these areas this season is not expected to be affected by this frost injury.

### Shipping

As of May 1, there were **57 westbound transits** at the U.S. Eisenhower Lock in Massena (NY) by saltwater vessels, which is approximately seven transits above the 2011-2015 5-year average. In fact, the 57 westbound transits is the first time since the 2013 shipping season that there were transits made by vessels in March. The past two shipping seasons, the St. Lawrence Seaway



The U.S. Eisenhower Lock (Photo: Wikipedia Commons)

and the locks along the Seaway were late opening due to severe ice conditions and the westbound transits did not begin until early April.

### Impacts of Higher Water Levels

Water levels on lakes Superior and Michigan-Huron have **staged a remarkable rise** since the low level period from 1999-2013. The increase is due to a combination of factors, including persistently wet weather in terms of precipitation and runoff, and weather conditions that have slowed evaporation from the surface of the lake. Periods of high water levels are beneficial for coastal wetlands because natural fluctuations are considered essential to maintain habitat diversity. Other positive high water impacts include reduced dredging at marinas, greater accessibility for recreational boaters, and increased vessel loads for commercial shippers (**9.7% higher in April than a year ago**). On the other hand, high lake levels result in reduced beach width, which shrinks space for recreation and can lead to increased beach erosion as the impacts of waves occur further landward. Bluff erosion is one issue in particular that is now on the radar for many shoreline owners. Higher water levels and storms may also increase the risk of damage due to flooding of coastal properties and infrastructure.



High water on Lake Erie on 7/9/2015 (Photo: Ohio Sea Grant)

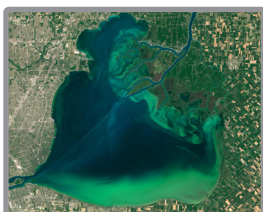
## Regional Outlook - for July - September 2016

### Temperature & Precipitation

Above-normal temperatures are predicted for the July-September period by the Climate Prediction Center (CPC) and Environment and Climate Change Canada (ECCC) for the Great Lakes basin. CPC and ECCC both indicate the signal is less clear on whether July-September precipitation will be above, near, or below normal in the basin. However, due to the above-normal temperature outlook, as well as the current abnormally dry conditions, CPC indicates there is a chance for drought development in the U.S. western Lake Superior basin during the July-September period. The current seasonal temperature and precipitation outlooks can be found through the [Climate Prediction Center](#) and [Environment and Climate Change Canada](#).

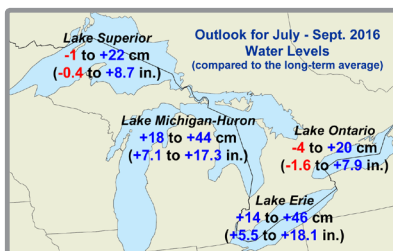
### Harmful Algal Blooms

The harmful algal bloom (HAB) season in the Great Lakes peaks annually in late summer. The severity of HABs are dependent on phosphorus and nitrogen inputs from March 1-July 31 (the "loading season"). Conditions can change quickly, so a [Lake Erie HAB bulletin](#) is updated weekly with the latest information. On July 7, NOAA will **officially announce** the predicted western Lake Erie HAB season outlook for 2016. Resource and public health managers can use these outlooks to plan for toxic blooms this summer, which could affect human and animal health.



Algal bloom on Lake St. Clair in July 2015 (Photo: NASA)

### Lake Levels



Potential range for water levels for July-Sept 2016 compared to the long-term average (1918-2015)

Water levels typically peak in the summer months before beginning to decline at the end of summer as water supplies to the lakes tend to decrease, mainly due to increasing evaporation and reduced runoff. This summer, lakes Michigan-Huron and Erie water levels are expected to be well above average unless the summer is exceedingly dry. Lakes Superior and Ontario are projected to be slightly above average unless exceedingly wet or dry conditions are experienced this summer.

## Great Lakes Region Partners

Environment and Climate Change Canada (ECCC)  
[www.ec.gc.ca](http://www.ec.gc.ca)  
Agriculture and Agri-Food Canada  
[www.agr.gc.ca](http://www.agr.gc.ca)  
Midwestern Regional Climate Center  
[mrcc.isws.illinois.edu](http://mrcc.isws.illinois.edu)  
Northeast Regional Climate Center  
[www.nrcc.cornell.edu](http://www.nrcc.cornell.edu)  
Great Lakes Region State Climatologists  
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Great Lakes Environmental Research Laboratory  
[www.glerl.noaa.gov](http://www.glerl.noaa.gov)  
NOAA Great Lakes Sea Grant Network  
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Ohio River Forecast Center  
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Office for Coastal Management  
<http://coast.noaa.gov/>  
Great Lakes Integrated Sciences & Assessments  
[www.glista.umich.edu](http://www.glista.umich.edu)  
US Army Corps of Engineers, Detroit District  
[www.lre.usace.army.mil](http://www.lre.usace.army.mil)  
National Integrated Drought Information System  
[www.drought.gov](http://www.drought.gov)

### Contact Information

Contact for NOAA:  
Molly Woloszyn: [mollyw@illinois.edu](mailto:mollyw@illinois.edu)  
Samantha Borisoff: [samantha.borisoff@cornell.edu](mailto:samantha.borisoff@cornell.edu)

Contact for ECCC:  
[greatlakes-grandslacs@canada.ca](mailto:greatlakes-grandslacs@canada.ca)  
[enviroinfo@canada.ca](mailto:enviroinfo@canada.ca)

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