

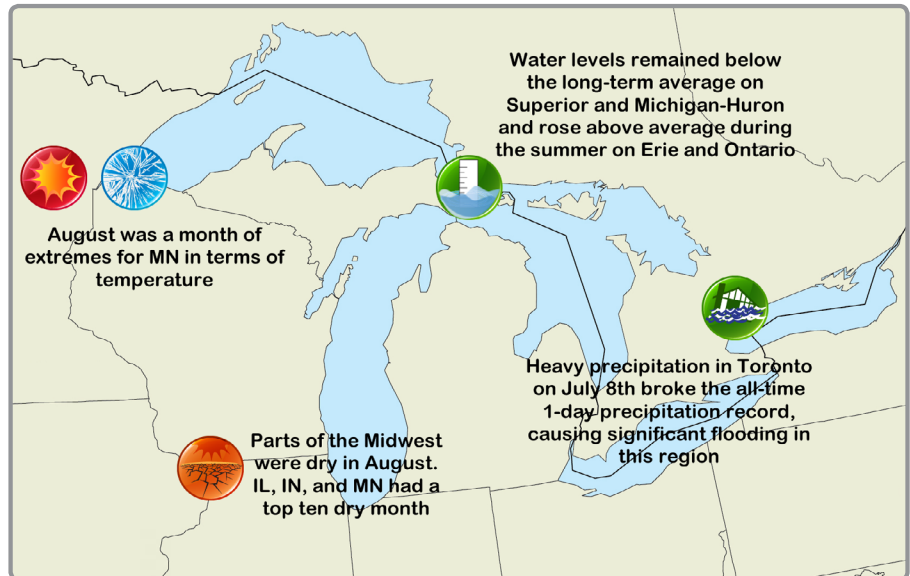
## Great Lakes Significant Events - for June - August 2013

Summer conditions generally helped maintain the water level rise in each of the lakes due to the wet spring with all the lakes above their levels from this time last year and all above their chart datum's over the summer. Nevertheless, water levels of Lake Michigan-Huron remained well below the long-term average.

On July 8th, 126.6 mm (5 in.) of rain fell in the Toronto region in just a few hours, causing severe flash flooding in the city and other issues like widespread power outages and major transportation problems. This precipitation, which for this region was more than the average monthly total for July, broke the all-time record for heaviest 1-day precipitation in Toronto.

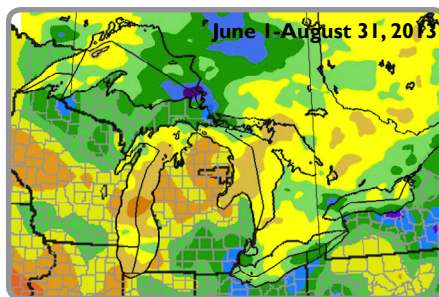
Parts of the Midwest were abnormally dry in August. In the Great Lakes basin, Illinois experienced its 3rd driest August, while Indiana experienced its 4th driest and Minnesota its 7th driest.

August was a month of extremes for Minnesota in terms of temperature. The month kicked off with much cooler than normal temperatures across the state and early season freeze warnings as well as the first 0°C (32°F) freeze reports of the fall season. As the month went on, it warmed up drastically and August ended with a late-season heat wave across the state. Duluth, Minnesota experienced 14 consecutive days of temperatures above 26.6°C (80°F) from August 15th-28th, three of which were days over 32°C (90°F). Temperatures over 32°C (90°F) do not occur very frequently in Duluth, even in August.

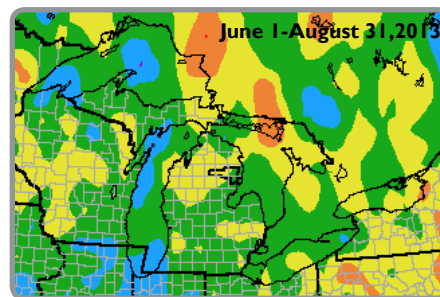
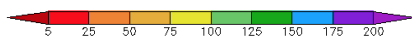


## Regional Climate Overview - for June - August 2013

### Precipitation and Temperature



Precipitation: Percent of Normal (%)



Temperature: Departure from Normal (deg)

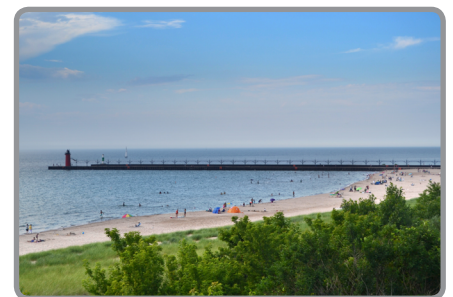


During summer, the U.S. Great Lakes basin received 301.24 mm (11.86 in.) of rain, 108% of normal. Of 25 climate divisions, 14 were wetter than normal, with North Central Ohio having its wettest summer on record at 153% of normal. The driest division, northeast lower Michigan, received 68% of normal. The Canadian side received above-normal summer precipitation overall, but it was not evenly distributed. Most regions were abnormally wet in July, but drier in August. For instance, north of Lake Erie saw 150-200% of normal July rainfall, but only 40-60% in August.

The average summer temperature of 19.3°C (66.8°F) in the U.S. Great Lakes basin was 0.1°C (0.2°F) cooler than normal. Seventeen of the 25 divisions were cooler than normal with departures ranging -1.0°C (-1.8°F) in northwest Indiana to +0.6°C (+1.0°F) in northeast Minnesota. The Canadian side of the Great Lakes basin experienced near-normal temperatures during summer with record heat and humidity near the end of July.

Normals based on 1981-2010.  
Precip: Canada/Great Lakes data based on Canadian Precipitation Analysis. U.S. data based on interpolated station data.

### Great Lakes Water Levels



South Haven, MI - June 27, 2013

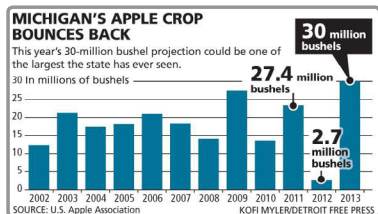
Photo: Michigan Sea Grant

Water levels on all the lakes except Superior reached seasonal peaks between June and August. From winter low to summer high, all lakes had an above-average seasonal rise. While Lake Superior's August mean level was 9 cm (3.5 in.) below average, it was at its highest August level since 1999. Lake Michigan-Huron's August mean level was 47 cm (18.5 in.) below average, but 11 cm (4.3 in.) higher than it was at the same time in 2012. August water levels on Lakes Erie and Ontario were above long-term average at +3 cm (1.2 in.) and +11 cm (4.3 in.).

Water level statistics based on 1918-2012.

## Regional Impacts - for June - August 2013

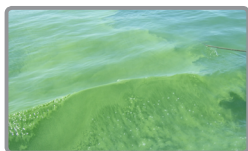
### Agriculture



Abnormal spring weather in 2012 devastated 90% of Michigan's apple crop, yielding just 2.7 million bushels last year. This year, thanks to perfect growing conditions, Michigan apples are back. The Michigan Apple Committee estimates that the state's apple crop will be 30 million bushels in 2013, which is about 10 million bushels above average. The Apple Committee said a crop like this could pump as much as \$900 million into the state's economy.

### Water Quality

Sources of phosphorus runoff are to blame for a rash of harmful algal blooms on Lake Erie that developed in July. The International Joint Commission said in a draft report that urgent steps need to be taken by the U.S. and Canada to curb runaway algae, which produce harmful toxins and contribute to oxygen-deprived "dead zones" where fish cannot survive. Climate change and heavier rains, leading to increased runoff, could increase the occurrence of algal blooms in the future.



Above: algal bloom on August 16th; Photo courtesy of OH Sea Grant & Jeff Reutter

### Infrastructure & Transportation



Left: commuters were stranded for more than three hours on a GO Train; Photo courtesy of CBC News

The July 8th flooding event in Toronto caused \$850 million worth of damage in this area, making it the most expensive insurance event in Ontario's history. Residential flooding was a major issue, but infrastructure and transportation issues were also widespread. Infrastructure and transportation issues included damage to hydro-electric power plants, widespread power outages, and flooded subway stations and streets, making a horrific and dangerous evening commute the day of the event.

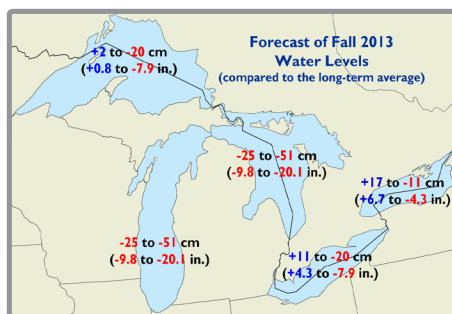
### Shipping

Shipping on the U.S. Great Lakes is suffering as a result of low water levels. Typically, the Great Lakes shipping sector transports more than 160 million tons of cargo each year, resulting in a \$34 billion industry. However, when water levels are low, shippers cannot load their vessels with as much cargo. The aggregate impact over time will be to raise the cost of commodities, which in turn will raise the price of manufacturing goods and price to the consumer.

## Regional Outlook - for Fall 2013

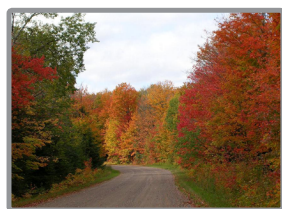
### Lake Level Outlook

Current projections for the fall months indicate that Lake Superior and Lake Michigan-Huron will remain below average, although it is very unlikely water levels will fall to record low levels seen last fall and winter. On the other hand, a wet fall could see levels on Lake Superior slightly above average. A prolonged period of above-average water supplies will be required to return the water levels of Lake Michigan-Huron to their long-term averages. Lakes Erie and Ontario are expected to remain near their long-term averages through the next quarter.



Outlook from the US Army Corps of Engineers and Environment Canada (Fall 2013)

### Fall Foliage



Above: Ottawa National Forest; Photo courtesy of USDA

In the northern Great Lakes, normal peak color time is typically late September through early October. In the southern Great Lakes, normal peak color time is later, typically in mid-October. This year, peak dates and intensity of fall color in the western Great Lakes may be affected slightly by the late summer drought that developed in this region.

### Temperature & Precipitation Outlook

The Climate Prediction Center and Environment Canada are both forecasting equal chances for above, below, or near normal precipitation in their respective basins throughout October, November, and December. For the same time period, the temperature outlook from the Climate Prediction Center is calling for equal chances of above, below, or near normal temperatures in the U.S. basin, while Environment Canada is forecasting greater chances for temperatures to be slightly above normal in the Canadian basin.

## Great Lakes Region Partners

- Environment Canada  
[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  
[www.mrcc.isws.illinois.edu](http://www.mrcc.isws.illinois.edu)
- Northeast Regional Climate Center  
[www.nrcc.cornell.edu](http://www.nrcc.cornell.edu)
- Great Lakes Region State Climatologists  
[www.stateclimate.org](http://www.stateclimate.org)
- National Oceanic and Atmospheric Administration  
[www.noaa.gov](http://www.noaa.gov)
- National Climatic Data Center  
[www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)
- National Ocean Service  
[www.oceanservice.noaa.gov](http://www.oceanservice.noaa.gov)
- National Operational Hydrologic Remote Sensing Center  
[www.nohrsc.nws.gov](http://www.nohrsc.nws.gov)
- Great Lakes Environmental Research Laboratory  
[www.glerl.noaa.gov](http://www.glerl.noaa.gov)
- NOAA Great Lakes Sea Grant Network  
[www.seagrant.noaa.gov](http://www.seagrant.noaa.gov)
- North Central River Forecast Center  
[www.crh.noaa.gov/ncrfc](http://www.crh.noaa.gov/ncrfc)
- NOAA's Great Lakes Regional Collaboration Teams  
[www.regions.noaa.gov](http://www.regions.noaa.gov)
- Climate Prediction Center  
[www.cpc.noaa.gov](http://www.cpc.noaa.gov)
- Great Lakes Integrated Sciences & Assessments  
[www.gliisa.umich.edu](http://www.gliisa.umich.edu)
- US Army Corps of Engineers  
[www.usace.army.mil](http://www.usace.army.mil)
- National Integrated Drought Information System  
[www.drought.gov](http://www.drought.gov)
- Great Lakes Water Level Dashboard  
[www.glerl.noaa.gov/data/now/wlevels/dbd/](http://www.glerl.noaa.gov/data/now/wlevels/dbd/)
- United States Department of Agriculture  
[www.usda.gov](http://www.usda.gov)
- Ontario Tourism  
[www.ontariotravel.net](http://www.ontariotravel.net)