



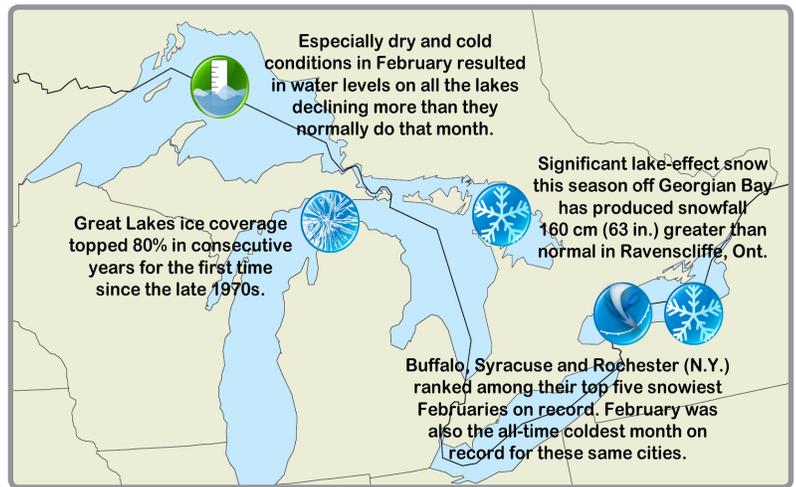
Great Lakes Significant Events - for December 2014 - February 2015

February brought record-breaking cold conditions to the Great Lakes basin, and ice cover on the Great Lakes quickly responded to the extreme cold. By the end of February, the maximum extent of ice cover was 88.8%, which is the **first time since the late 1970s** that Great Lakes ice cover has topped 80% in consecutive years (last year's maximum extent was 92.5%).

The wet conditions that dominated much of the Great Lakes region throughout 2014 came to an abrupt end during this past quarter. Especially dry and cold conditions in February resulted in water levels on all the lakes declining more than they normally do that month. This was most notable on lakes Erie and Ontario, where water supplies were near record lows in February, and levels of both lakes ended the quarter below average. Lakes Superior and Michigan-Huron remain well above average.

February's cold temperatures set many records across the basin. February 2015 was the all-time coldest month on record for Buffalo, Syracuse and Rochester, NY. A few stations in Michigan, New York and Ohio experienced their coldest temperature ever on record in February 2015. At the downtown Toronto station, February 2015 was the first month in which temperatures remained below the freezing mark for the whole month (since records began in 1840).

Buffalo, Syracuse and Rochester saw more than double their normal February snowfall, with February ranking among the top five snowiest Februaries on record at these sites (it also ranked among the top 20 all-time snowiest months). Snowfall this season has reached 481 cm (189 in.) in Ravenscliffe, Ontario, so far, which is 160 cm (63 in.) above normal. Much of this came from enhanced lake-effect snow off Georgian Bay, which is located 80 km (50 mi.) to the west of Ravenscliffe. While the eastern Great Lakes basin experienced abundant snowfall, the opposite was true in the western basin. Snowfall totals were only 25% to 75% of normal in many areas across Minnesota, Wisconsin and Michigan.



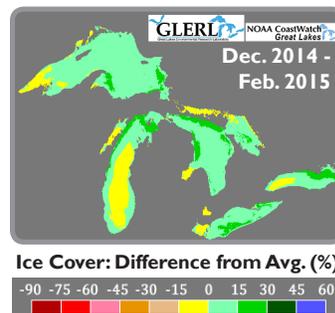
Regional Climate Overview - for December 2014 - February 2015

Great Lakes Water Levels

The especially dry and very cold February caused greater than usual seasonal declines on all of the Great Lakes for that month. Despite this, Lake Superior water levels ended the quarter 19 cm (7.5 in.) above the long-term average and the highest this time of year since 1997. Lake Michigan-Huron finished the quarter 22 cm (8.7 in.) above average and 54 cm (21.3 in.) higher than this time last year. The dry conditions caused Lake Erie to plunge to 5 cm (2 in.) below average, the second-largest February decline on record, and Lake Ontario to drop to 20 cm (7.9 in.) below average by the end of the quarter. Despite heavy snowfall in areas of the eastern basin, February precipitation overall was less than normal across the basin, and this contributed to the large decline in lake levels.

Water level statistics based on 1918-2013.

Great Lakes Ice Cover

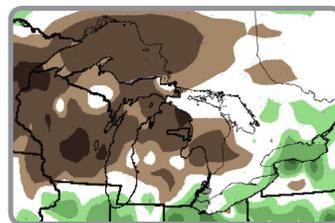


February's record-cold conditions caused rapid ice growth on the Great Lakes. By February 28, the maximum ice cover extent was 88.8%, making it the fourth highest since 1973 and slightly higher than this time last year. Lakes Superior, Huron and Erie were all 95% or more ice-covered by the end of February.

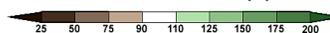
Long-term average based on 1973-Feb. 2015.

Snowfall

Winter snowfall was below normal near the western lakes, but above normal near the eastern lakes. Most of the region saw less than 75% of normal snowfall in December. January snowfall ranged from 25% of normal to 175% of normal. February snowfall ranged from 25% of normal near Lake Superior to more than 200% of normal near Lakes Erie and Ontario.



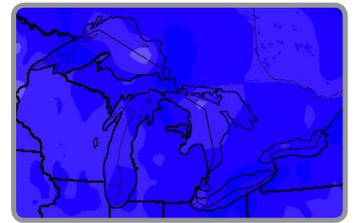
Dec. 2014-Feb. 2015 Snowfall: Percent of Normal (%)



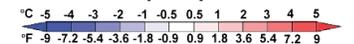
Snowfall normals based on 1981-2010.

Temperature

Winter was generally 1°C to 4°C (1.8°F to 7.2°F) colder than normal in the Great Lakes region. February was extraordinarily cold, with temperatures up to 9°C (16°F) below normal. January temperatures ranged from 3°C (5.4°F) below normal near lakes Ontario and Erie to 3°C (5.4°F) above normal near Lake Superior. December was quite warm, with temperatures up to 5°C (9°F) above normal.



Feb. 2015 Temp.: Dep. from Normal



Feb 2015 shown to display greatest anomalies. Temp. normals (1981-2010).

Regional Impacts - for December 2014 - February 2015

Infrastructure

The extreme cold in February was the cause for several water main breaks and pipes bursting in homes and apartments in areas of the Great Lakes basin, leaving roadways, homes, apartments and businesses flooded. In mid-February, **Toronto, ON** reported 48 water main breaks and more than 1000 reports of frozen pipes in homes and apartment buildings across the city. **Toledo, Ohio**, has reported 148 water main breaks so far in 2015.



Water main break in the Greater Toronto area this winter
(Jeremy Cohn, Global News, @JeremyGlobalTV)

Societal

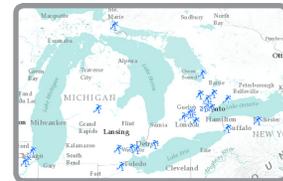
Toronto media attributed a number of deaths to the extreme cold. In mid-January, poor visibility due to high winds and snowfall contributed to a **193-car pileup** near Battle Creek, Michigan, which killed 1 person and injured 22 others.

Shipping

It is the second straight tough winter for shipping as extensive ice cover persists on the Great Lakes. A **freighter in Lake Erie** spent more than two weeks battling through ice for a trip that typically takes two days. In addition, the ice cover has **delayed the start of the shipping season**, similar to last year. The Montréal/Lake Ontario Section and Welland Canal is now scheduled for April 2 (originally March 27). As of now, the U.S. Soo Locks are scheduled to open on time on March 25.

Recreation and Tourism

Unseasonably warm weather in Minnesota in December and January, along with a lack of snow on state trails, essentially shut down the **snowmobile season in Minnesota** this winter. There are several businesses located along these state trails that are feeling the negative effects. On the other hand, the cold conditions in February were a good thing for some winter activities, like outdoor skating and ice fishing. Tourism was boosted near **Niagara Falls** due to amazing ice formations on the falls.



Skateable rinks (i.e. blue skaters) in February 2015 (RinkWatch.org)

Agriculture and Natural Resources

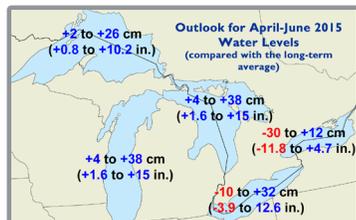
The **maple syrup season** in southwestern Ontario is off to a slow start because of the colder-than-normal temperatures this winter. Many producers are currently waiting for ideal weather conditions (freezing overnight but above freezing during the day) to start tapping trees. In addition, extremely cold January and February temperatures in the Finger Lakes, N.Y. **potentially damaged grapevines** at wineries in this area. The lack of snowfall and overall dry winter in northern Minnesota could also make for a **damaging wildfire season** later this year.



Maple sap being transformed to syrup (QUOI Media Group - via Flickr)

Regional Outlook - for April-June 2015

Lake Level Outlook



Outlook from the U.S. Army Corps of Engineers and Environment Canada (April-June 2015)

Water levels typically rise during the spring as snow melts, precipitation and runoff increase, and evaporation rates are low this time of year. Current projections for April through June show above-average levels on lakes Superior, Michigan-Huron and Erie, unless exceedingly dry conditions are experienced. Lake Ontario is expected to remain below average unless conditions are wet.

Ice Cover Outlook

Ice cover on the Great Lakes is naturally variable from year-to-year. Typically, maximum ice occurs on lakes Michigan, Huron, Ontario and Erie in mid-February and in early March on Lake Superior. However, the cold temperatures and extensive ice cover currently present may delay start of ice breakup by two or three weeks. Also, fog may be an issue in the coming months in the Great Lakes region, as it is going to take longer than normal for the ice to melt.



Western Lake Erie ice cover on 2/26/15 (Ohio Sea Grant)

Temperature and Precipitation Outlook

There is no clear signal from Environment Canada (EC) on whether temperature or precipitation will be above, near or below normal in the Canadian Great Lakes basin for the April through June time period, reflecting an absence of large-scale climatic driving influences for the region during this period. However for the U.S. Great Lakes basin, the Climate Prediction Center (CPC) is forecasting a greater chance for above-normal temperatures and below-normal precipitation in the western U.S. basin (no clear signal for eastern U.S. basin).

For April, the CPC is calling for greater chances of below-normal temperatures in the eastern U.S. basin, as well as below-normal precipitation in the western U.S. basin. EC is calling for greater chances for below-normal temperatures in the Canadian basin, and there is no clear signal on whether April precipitation will be above, near or below normal. Current outlooks can be found through the **Climate Prediction Center** and **Environment Canada**.

Great Lakes Region Partners

Environment Canada
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
www.stateclimate.org

National Oceanic and Atmospheric Administration
www.noaa.gov

National Operational Hydrologic Remote Sensing Center
www.nohrsc.noaa.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/ncrfc

Ohio River Forecast Center
www.weather.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

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Great Lakes Region
Quarterly Climate Impacts and Outlook
- March 2015 -

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



#regionalclimateoutlook