



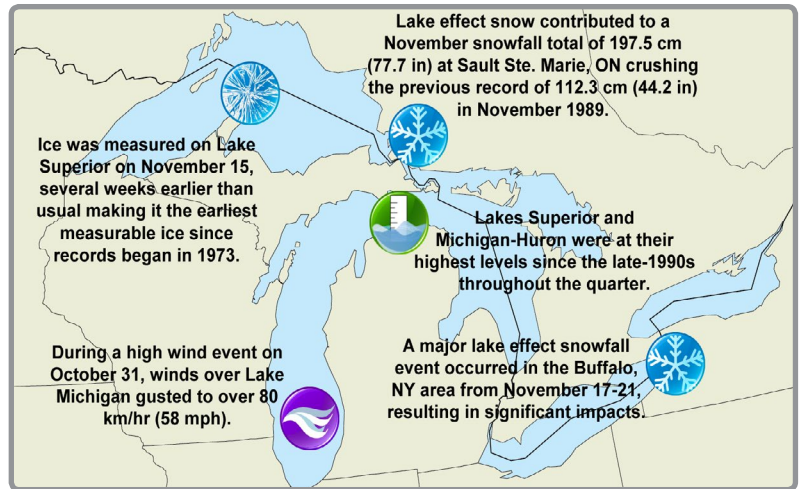
Great Lakes Significant Events - for September - November 2014

September and October were relatively mild across the Great Lakes basin, but November turned cold fairly abruptly, with over 90 low temperature records tied or broken in Michigan alone and an early onset of ice on Lake Superior. However, the record cold was followed by record warmth in some areas. For example, on November 18, Hamilton, ON tied its record low of -11°C (12.2°F). Only six days later, nearby Toronto, ON broke a record high when 18.3°C (65°F) was recorded.

The wet conditions from the spring and summer continued through the start of fall, resulting in September water levels on all of the Great Lakes being above monthly averages for the first time since 1998. Wet conditions in the upper Great Lakes delayed the seasonal decline of water levels (which typically begins in mid to late summer) until late fall on Lake Superior, and it had not begun by the end of November on Lake Michigan-Huron.

A major lake effect snow event occurred in the Buffalo, NY area from November 17-21. Up to 223 cm (88 in) of snow fell, making it one of the Buffalo area's largest snow events in history. Extreme snowfall rates of up to 15 cm (6 in) per hour occurred. Evaporation rates measured at Long Point, ON on Lake Erie the day before the snow event in Buffalo rose to four times the rate measured the week prior, a clear indication of lake effect in action. Coinciding with the Buffalo snowfall, severe lake effect snowfall also occurred in areas east of Lakes Superior, Huron, Ontario and Georgian Bay.

Winds on Lake Michigan gusted to over 80 km/hr (58 mph) during a high wind event on Halloween (October 31), causing wave heights to reach 6.6 m (21.7 ft) at an offshore buoy, the second highest wave event since buoy observations of Lake Michigan began in 1981. The storm surge caused a water level rise of 0.7 m (2.4 ft) in less than 8 hours at Calumet Harbor, IL. On November 24, an intense low pressure system brought wind gusts up to 100 km/hr in parts of southern Ontario that caused tens of thousands of people to lose power, as well as tree and minor structural damage.

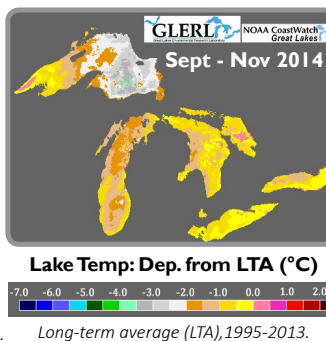


Regional Climate Overview - for September - November 2014

Great Lakes Water Levels

The continuation of wet conditions has resulted in above average water levels for the Great Lakes throughout the quarter with the exception of Lake Ontario, which saw dry conditions and below average levels in October and November. Water supplies to Lakes Superior and Michigan-Huron were well above average during each of the past three months. Lake Superior finished the quarter 22 cm (8.6 in) above average, the highest since 1986. Lake Michigan-Huron rose above average for the first time since the late-1990s in September and finished the quarter 20 cm (7.9 in) above average, the highest since 1997. Lake Erie was 19 cm (7.5 in) above average at the end of November, whereas Lake Ontario was 9 cm (3.5 in) below average and 12 cm (4.7 in) lower than a year ago. *Water level statistics based on 1918-2013.*

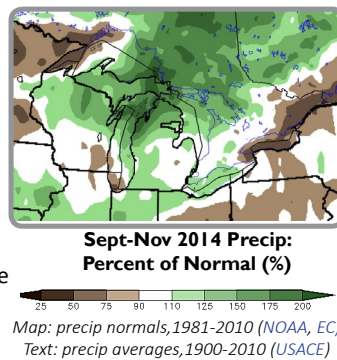
Surface Water Temperature



During fall, 98% of the Great Lakes' surface water temperatures were colder than average. Lake Superior's waters had the greatest range, with departures from 4.2°C (7.6°F) below average to 0.5°C (0.9°F) above average. Lake Michigan's water temperatures ranged from 3°C (5.4°F) below average to near average. Lakes Ontario, Erie, and Huron generally saw departures from 2°C (3.6°F) below average to 1°C (1.8°F) above average.

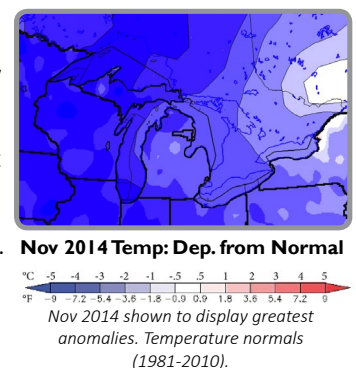
Precipitation

The Great Lakes basin precipitation was 115% of average during fall, with all lake basins but Ontario seeing near to above average precipitation. In September, all lake basins but Ontario were wetter than normal, with the overall basin seeing 110% of average. The entire basin saw 135% of average precipitation in October, with all lake basins seeing near to above normal precipitation. All lake basins saw near to below normal precipitation in November, with the overall basin seeing 95% of average.



Temperature

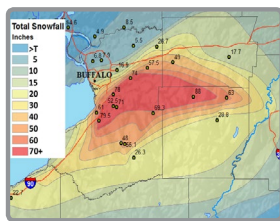
The Great Lakes basin was generally colder than normal this fall, with temperatures from 2°C (3.6°F) below normal to near normal. November was cold for the entire basin, with temperatures from 1°C (1.8°F) to 4°C (7.2°F) below normal. September temperatures ranged from 2°C (3.6°F) below normal to near normal. In October, the Lake Superior basin was below normal by up to 1°C (1.8°F), the Lake Michigan basin was near normal, and the basins of lakes Huron, Erie, and Ontario were up to 2°C (3.6°F) warmer than normal.



Regional Impacts - for September - November 2014

Impacts from Buffalo, NY Lake Effect Snow

The lake effect snow event from November 17-21 in the Buffalo, NY area resulted in 14 deaths. Major roadways were shut down for over three days, driving bans were in place for up to five days, and thousands of motorists were stranded. The weight of the snow caused hundreds of collapsed roofs and structural failures. Several towns spent their entire snow removal budget in one week. Three school districts were closed until



Total observed snowfall (in) from Nov 17-21, 2014 (graphic by Buffalo National Weather Service)



National Guard in Buffalo, NY on 11/22/14 (via Flickr)

December 1 due to hazards from high snow piles and falling trees. A state of emergency was declared in Erie County, allowing snow removal equipment and personnel, along with the National Guard, to be sent to the area to assist with recovery efforts. Fortunately, rapid snowmelt due to warmer temperatures and rain caused only minor flooding after the event.

Agriculture

The climate conditions this September and October on the U.S. side of the basin were ideal for harvest. However, precipitation amounts during the fall were extremely high in Ontario. Combined

with a relatively cool and wet spring, these conditions delayed crop development and harvest by up to five weeks in some areas, particularly for corn. As of December 1, 5% of soybeans and 40% of corn acres remain to be harvested in Ontario. The delayed soybean harvest has also resulted in a reduction of the winter wheat acres seeded.

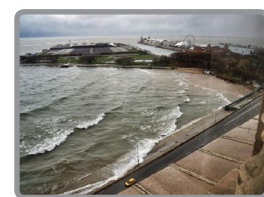


The Waukegan, IL lighthouse on 10/31/14 (John Edmondson via WGN Weather Center Blog)

Halloween High Wind Event

The high wind event over Lake Michigan on October 31 caused significant issues for the third largest city in the U.S, Chicago, IL. The strong waves off Lake Michigan managed to push water from the lake onto the northbound lane of Lakeshore Drive (a major expressway in Chicago), just in time for the evening commute.

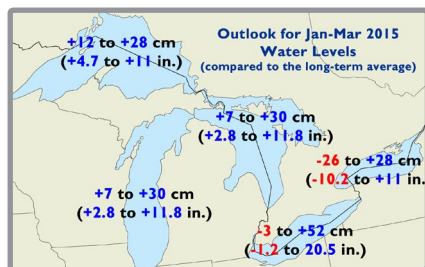
Chicago's O'Hare International Airport had to cancel more than 700 incoming and outgoing flights that day because of the high winds and heavy rain that were associated with this event. In addition, the storm surge, coupled with higher October water levels, caused the D.C. Cook Nuclear Plant in Bridgeman, MI to shut down both of its reactors for several days. The storm surge clogged the intake tunnels used to draw in water for reactor cooling.



Lakeshore Drive in Chicago, IL on 10/31/14 (Todd Arkenbauer via WGN Weather Center Blog)

Regional Outlook - for January - March 2015

Lake Level Outlook



Outlook from the US Army Corps of Engineers and Environment Canada (January-March 2015)

Water levels typically reach their seasonal low during winter, as water supplies tend to decline and evaporation increases this time of year. Current projections for January through March show water levels on lakes Superior, Michigan-Huron, and Erie remaining above average, unless exceedingly dry conditions are experienced. Lake Ontario is expected to remain near or slightly below average for this time of year unless above-normal water supplies are received.

Temperature & Precipitation Outlook

The Climate Prediction Center (CPC) indicates an increased likelihood of below-normal temperatures near the southern edge of the Great Lakes basin in Illinois, Indiana, and Ohio. Otherwise, both the CPC and Environment Canada (EC) are calling for equal chances of above, near or below normal temperatures for January-March across the Great Lakes basin.

For precipitation, the CPC forecast for January-March suggests a greater chance of below normal precipitation for much of the U.S. basin, while EC forecasts show no clear signal for the coming quarter in the Canadian basin.

El Niño has a 65% chance of developing during winter, but likely to be weak if it does emerge and may not impact winter temperatures and precipitation. In general, El Niño winters generally 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.

Ice Cover Outlook

For winter 2014/15, NOAA's Great Lakes Environmental Research Laboratory projects maximum ice coverage of the Great Lakes to be about 54%, which is a little above the long-term average maximum ice cover of 52%.



Lake Michigan from Sheboygan, WI in Feb. 2014 (WI Sea Grant)

Ice cover projections: GLERL statistical regression model.

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/nrcfc

Ohio River Forecast Center

www.weather.gov/ohrfc

Climate Prediction Center

www.cpc.noaa.gov

Great Lakes Integrated Sciences & Assessments

www.gliisa.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:

Samantha Borisoff: samantha.borisoff@cornell.edu

Molly Woloszyn: mollyw@illinois.edu

Contact for Environment Canada:

greatlakes-grandslacs@ec.gc.ca

enviroinfo@ec.gc.ca



Environment Canada

Environnement Canada

Great Lakes Region
Quarterly Climate Impacts and Outlook
- December 2014 -

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



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