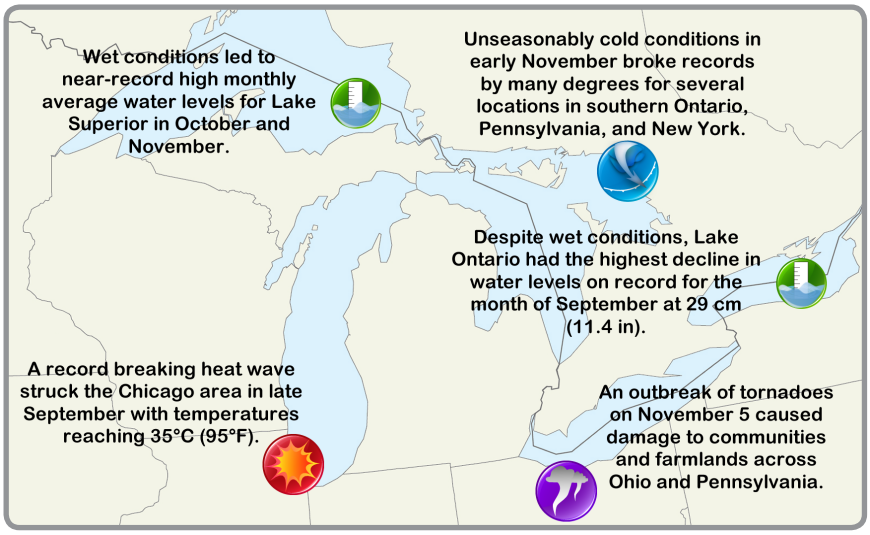
Quarterly Climate Impacts and Outlook

Great Lakes Region

December 2017

Great Lakes Significant Events - *for September - November 2017*

Across the Great Lakes basin, conditions were generally unseasonably warm. Several instances of record-breaking temperatures occurred. Chicago experienced seven consecutive days (September 20-26) with record-breaking warm temperatures up to 35°C (95°F). At the same time, several locations in southern Ontario reported heat-wave conditions with some locations experiencing humidex values reaching 40°C (104°F). These events marked the latest recorded heat wave for the season of this magnitude. Conversely, record cold temperatures were set from November 10-11 in many parts of southern Ontario, New York, and Pennsylvania. Most locations broke their previous record by several degrees.



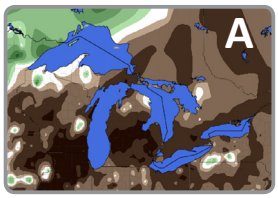
Precipitation overall for autumn was near-normal across the Great Lakes basin; however, it varied greatly depending on the month and location. Michigan went from its fifth driest September on record to its wettest October on record for the state. Watertown, NY had its wettest October on record, breaking the previous record by 9.1 cm (3.6 in). A storm system on November 5 produced 7.2 cm (2.85 in) of precipitation in Erie, PA, a record for daily November precipitation for the location. This event flooded roads and buildings, and resulted in two fatalities.

A strong wind event on October 24 led to straight-line-wind damage and high waves along the southern coastline of Lake Superior. Wind gusts of up to 97 kph (60 mph) resulted in downed trees and power lines leading to road closures and widespread power outages. Waves up to 9.1 m (30 ft) in height were also reported.

Regional Climate Overview - *for September - November 2017*

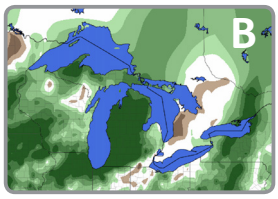
Precipitation

All lake basins saw near- or above-average autumn precipitation, with the Great Lakes basin receiving 103% of average. In September, all basins were drier than average except Superior. The overall basin received 71% of average. All basins were wetter than average in October, with the overall basin seeing 144% of average. November precipitation was below average in the Michigan-Huron basin, near average in the Superior and Ontario basins, and above average in the Erie basin. The overall basin received 97% of average in November.

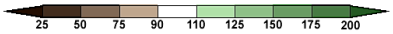


Precipitation normals based on 1981-2010.

Sep. and Oct. graphics are shown to highlight large precipitation range this autumn.



September (A) and October (B) 2017 Precipitation: Percent of Normal (%)

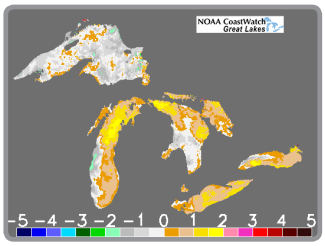


Great Lakes Water Levels

Lake	End of November 2017 Compared to:		Change since Sept 1st	
	Average	Last Year	2017	Average
Superior	+28 cm (+11 in)	+14 cm (+5.5 in)	-7 cm (-2.8 in)	-10 cm (-3.9 in)
Michigan-Huron	+47 cm (+18.5 in)	+26 cm (+10.2 in)	-14 cm (-5.5 in)	-17 cm (-6.7 in)
Erie	+49 cm (+19.3 in)	+29 cm (+11.4 in)	-22 cm (-8.7 in)	-23 cm (-9.1 in)
Ontario	+31 cm (+12.2 in)	+38 cm (+15 in)	-39 cm (-15.4 in)	-29 cm (-11.4 in)

Water level statistics based on 1918-2016.

Temperature



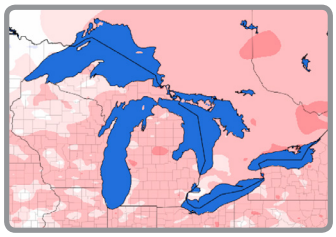
November Lake Surface Temperature (LST) Anomaly

Anomaly calculated with average Nov. 2017 LST compared to LTA Nov. LST (1995-2016).

Air Temperature: Autumn was up to 3°C (5°F) warmer than normal. September temperatures ranged from 1°C (2°F) to 3°C (5°F) above normal. October temperatures ranged from 1°C (2°F) above normal in the western Superior basin to 5°C (9°F) above normal in the Huron and Ontario basins. November temperatures ranged from 2°C (4°F) below to near normal.

Water Temperature: The average lake water temperatures for the autumn months were consistently above the long-term average (LTA). Several lakes exceeded the LTA by as much as two degrees Celsius. This was especially the case in November (left)

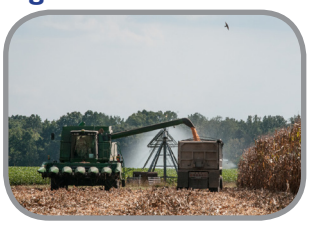
Air temperature normals based on 1981-2010. Water temperature LTA from 1995-2016.



Autumn 2017 Air Temperature: Departure from Normal

Regional Impacts - *for September - November 2017*

Agriculture



Corn harvest (Photo: USDA)

While early autumn saw promising harvest conditions, the rapid transition to above normal precipitation in October increased harvest difficulties. For Michigan, this led to the harvesting of both corn and soybean transitioning from being ahead of schedule in mid-October to being behind schedule by late November. In Wisconsin and Minnesota, the rapid onset of cold conditions in conjunction with wetter weather also led to a delayed harvest. This pattern was largely representative of the conditions across the basin.

Water Quality

A heavy precipitation event on October 14 led to more than 12.7 cm (5 in) of rain falling in a 24-hour period. Such rapid inundation led to the flooding of the Chicago River. For the first time since June 2015, the locks were opened allowing the Chicago River to flow into Lake Michigan. This reversal polluted the waters of Lake Michigan by forcing storm runoff and sewage into the lake. The 2017 Lake Erie harmful algal bloom has extended into autumn and covered over 2500 km^2 (1000 mi^2). This ties it with 2013 as the third worst bloom this century.

Harmful Algal Bloom - Western Lake Erie - September 2017 (Photo: NOAA GLERL)

Coastal Damage and Erosion

The shoreline of Lake Superior was heavily impacted by the storms present in late October. These storms were able to generate winds of 97 kph (60 mph) which, when combined with already high lake levels, produced record breaking waves as high as 9.1 m (30 ft). Such extreme conditions led to damage along the northern and southern coastlines of Lake Superior. Many locations experienced lakeshore flooding while others saw coastal erosion that was able to uproot trees and destroy structures. The impacted coastline was declared a disaster area, and damages were estimated to exceed 3.5 million US dollars.

Damage due to coastal erosion in Marquette, MI (Photo: NWS Marquette, MI)

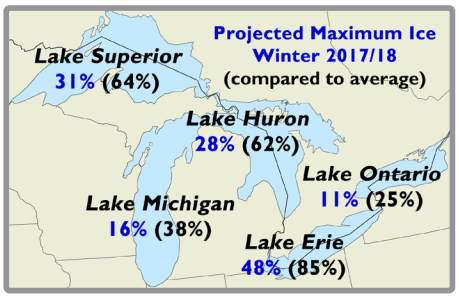
Societal

On November 5, an outbreak of tornadoes impacted many parts of northern Ohio and western Pennsylvania. As many as 14 tornadoes were documented and ranged in intensity from EF0-EF2 in magnitude. The tornadoes caused damage to several structures and injured many locals. Many rural areas reported large livestock fatalities and lost crops.

Damaged home in Williamsfield, OH due to EF2 tornado on Nov. 5 (Photo: NWS Cleveland, OH)

Regional Outlook - *for January - March 2018*

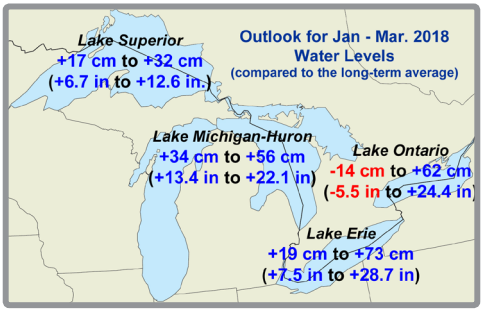
Ice Cover



NOAA's Great Lakes Environmental Research Laboratory is forecasting maximum ice coverage of the Great Lakes to be about 26% this winter, only half of the long-term average of 55% (see figure for individual lakes). This forecast results from the presence of a La Niña, positive North Atlantic Oscillation, negative Pacific Decadal Oscillation, and positive Atlantic Multidecadal Oscillation. All these patterns combine to create warmer conditions for the Great Lakes.

Water Levels

Great Lakes water levels typically decline to seasonal lows during winter largely due to reduced runoff and streamflow combined with higher lake evaporation rate. Nonetheless, levels of Lakes Superior, Michigan-Huron and Erie are likely to remain well above average even with very dry conditions. Lake Ontario's levels will approach average levels if typical conditions occur over the next few months.



Potential range for water levels for Jan-Mar 2018 compared to the long-term average (1918-2016).

Temperature & Precipitation

The Climate Prediction Center (CPC) and Environment and Climate Change Canada (ECCC) are forecasting a greater chance for below-normal temperatures for much of the west and central portions of the basin and a greater chance for above-normal precipitation across the entire Great Lakes basin for January-March. Similarly, NOAA now says there is an increasing chance (>80%) of La Niña continuing through winter 2017-18. While not always the most reliable predictor, La Niña can often create wetter and cooler conditions in the winter months. Current outlooks can be found through CPC and ECCC.

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
www.stateclimate.org
National Oceanic and Atmospheric Administration
www.noaa.gov
- **National Centers for Environmental Information**
  www.ncei.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
- **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
USDA Midwest Climate Hub
https://www.climatehubs.oce.usda.gov/midwest

Contact Information

Contact for NOAA:
Jonathan Weaver: jw1067@illinois.edu
Samantha Borisoff: samantha.borisoff@cornell.edu

Contact for ECCC: ec.enviroinfo.ec@canada.ca

Archive: goo.gl/3WA5QZ