Quarterly Climate Impacts and Outlook

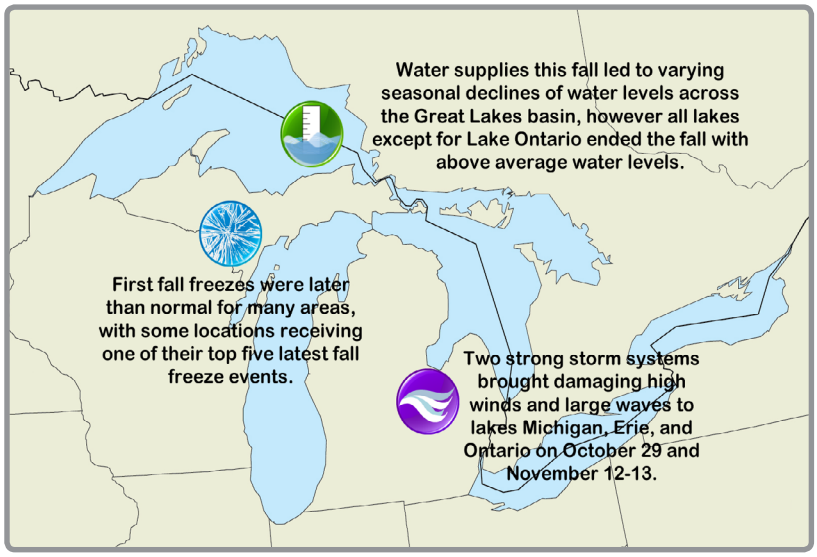
Great Lakes Region

December 2015

Great Lakes Significant Events - *for September - November 2015*

Fall 2015 was unseasonably warm across the Great Lakes basin. With above-average fall temperatures, areas across the basin experienced record or near-record late fall freeze dates, reduced snow cover, and delayed development of ice cover on the Great Lakes. It was the second warmest fall on record for Ohio and the third warmest for New York and Pennsylvania, with several locations in the Great Lakes basin (U.S. and Canada) having near-record warmth for individual fall months. Fall precipitation varied from near- to below-average across the Great Lakes basin.

Water levels for the Great Lakes typically decline during the fall months as evaporation increases. October was relatively dry for most of the Great Lakes basin and water levels throughout the system declined more than usual for that month. In November, above-average water supplies for the Lake Superior and Lake Michigan-Huron basins slowed the decline for those lakes, while dry conditions persisted throughout the Lake Erie and Lake Ontario basins resulting in above average water level declines.



Two major storm events occurred in the Great Lakes basin on October 29 and November 12-13, bringing heavy precipitation, high winds, and large waves to the Great Lakes. During both events, wind gusts of 83 to 93 km/hr (52 to 58 mph) produced high waves on lakes Michigan, Erie, and Ontario. On October 29, waves topped out at 3.7 m (12 ft) and 4.6 m (15 ft) on lakes Michigan and Erie, respectively, while waves on November 12 and 13 reached a height of 4 m (13 ft) on Lake Ontario and 5.2 m (17 ft) on lakes Michigan and Erie. In both events, the high westerly winds over Lake Erie pushed water from one end of the lake to the other causing water levels on the west end at Toledo, Ohio to fall while levels rose on the east end at Buffalo, New York. The water level change was more significant during the November 13 event, with water levels falling in Toledo by 1.8 m (5.9 ft) and rising in Buffalo by 2.1 m (6.9 ft).

Regional Climate Overview - *for September - November 2015*

Great Lakes Water Levels

Conditions for the Lake Superior and Lake Michigan-Huron basins were generally wet this fall. Lake Superior and Lake Michigan-Huron were 13 cm (5.1 in) and 18 cm (7.1 in) above average at the end of November, respectively. However, these levels are 9 cm (3.5 in) and 2 cm (0.8 in) lower, respectively, than this time last year. The fall season started wet but ended dry for the Lake Erie and Lake Ontario basins. Despite the dry latter half of the season, Lake Erie ended the quarter 22 cm (8.7 in) above average, which was 4 cm (1.6 in) higher than last year. Lake Ontario was 4 cm (1.6 in) below average at the end of the fall season but 5 cm (2 in) higher than last year.

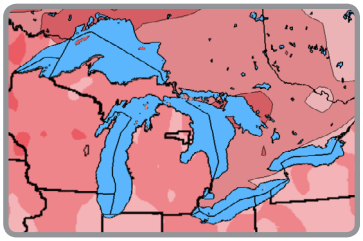
Lake Michigan on 9/15/2015 (Photo: GLERL via Flickr)

Water level statistics based on 1918-2014.

Temperature

Air Temperature

September was a warm month, with temperatures up to 5°C (9°F) above normal. October temperatures varied. Areas east of Lake Ontario were up to 1°C (1.8°F) below normal, while temperatures ranged from near normal to 2°C (3.6°F) above normal elsewhere. November was also warm, with temperatures up to 6°C (10.8°F) above normal. With generally mild temperatures each month, fall 2015 average temperatures were up to 4°C (7.2°F) above normal.



Sept-Nov 2015 Air Temp: Departure from Normal

°C -5 -4 -3 -2 -1 -0.5 0.5 1 2 3 4 5

°F -9 -7.2 -5.4 -3.6 -1.8 -0.9 0.9 1.8 3.6 5.4 7.2 9

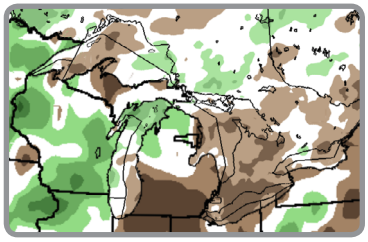
Water Temperature

Great Lakes water temperatures were also unseasonably warm during fall. A majority of the basin was above the long-term average by up to 2.5°C (4.5°F), with only a few small areas of below-normal water temperatures.

Air temperature normals based on 1981-2010. Water temperature normals based on long-term average (1995-2014).

Precipitation

September brought near- to below-average precipitation to all lake basins but Ontario, with the Great Lakes basin receiving 85% of average. October precipitation was near-average for all lake basins, so the entire basin saw 95% of average. The Erie and Ontario basins were quite dry in November, while the other basins were near average. The overall basin received 88% of average. Fall precipitation for the whole basin was 89% of average, with all lake basins seeing near- to below-average precipitation.



Sept-Nov 2015 Precip: Percent of Normal (%)

25 50 75 90 110 125 150 175 200

Precipitation normals based on 1981-2010.

Regional Impacts - *for September - November 2015*

Transportation, Society, & Recreation

Waves break near the lighthouse in Muskegon, MI on 11/12/15. (Photo: NOAA GLERL)

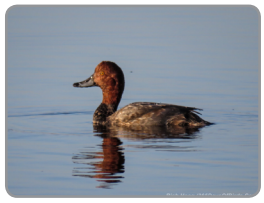
The high winds during the November 12-13 event caused significant transportation issues in areas around the Great Lakes. The Chicago Skyway Bridge was closed in both directions for just over 12 hours due to high winds and the Indiana Toll Road issued a ban on some large trucks as well. Hundreds of flights were delayed at Chicago O'Hare International Airport and Detroit Metropolitan Airport. The high winds caused extensive power outages in Illinois, Indiana, Michigan, Wisconsin, Ohio, and Pennsylvania. With the large waves on the Great Lakes, boaters were urged to stay off the water. The large rise in water levels on November 13 in eastern Lake Erie caused water to flow up over the breakwall in Fort Erie, Ontario, producing significant flooding along the Niagara Parkway in Fort Erie.

Agriculture

Despite the cold start to the growing season and a wet June, the unseasonably warm and drier conditions this fall allowed for proper crop maturity and development, as well as a timely harvest of crops across the basin. The weather conditions were also ideal for planting of crops like winter wheat. In Ontario, yields for grains, oilseeds, and late-season crops were above average.

Wildlife

The migration of waterfowl is weather dependent and mild fall weather typically delays migration. This has been the case this year and it has been most pronounced in the western Great Lakes basin and northern Great Plains in the U.S.



A redhead duck in Duluth, MN on 11/15/15 (Rich Hoeg via Flickr)

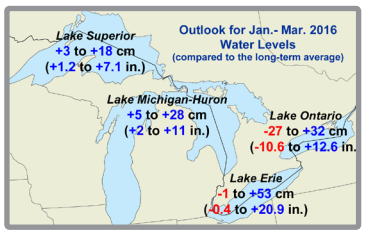
Water Quality

The 2015 harmful algal bloom in Lake Erie was recorded as the largest bloom this century. Although the bloom was the largest on record, the toxin concentrations were not as severe as expected considering the bloom's extent and no drinking water advisories were issued. Drinking water impacts from the algal toxins in Lake Erie are extremely rare even though the blooms have been occurring for over 15 years. This indicates that bloom severity does not always equate to increased risk and highlights the ability of municipalities along Lake Erie to successfully treat incoming water and provide safe drinking water to Great Lakes residents.

The 2015 harmful algal bloom in Lake Erie. (Photo: Ohio Sea Grant)

Regional Outlook - *for January - March 2016*

Lake Level Outlook



Potential range for water levels for Jan-Mar 2016 compared to the long-term average (1918-2014).

Great Lakes water levels are typically at their lowest during the winter due to higher evaporation rates and reduced basin runoff at this time of year. Water levels are expected to remain above average for Lakes Superior, Michigan-Huron and Erie unless exceedingly dry conditions are experienced. Lake Ontario water levels are expected to remain near or slightly below average unless exceedingly dry or wet conditions are experienced.

Ice Cover Outlook

Winter 2015/16 is projected to be influenced by strong El Niño conditions, similar in magnitude to the 1997/98 event, which resulted in significant warming in the Great Lakes region. Consequently, NOAA's Great Lakes Environmental Research Laboratory is forecasting maximum ice coverage of the Great Lakes to be about 30.9% this winter, well below the long-term average of 53.2%. How the warmer-than-average temperatures due to El Niño will influence evaporation totals and water levels this winter is uncertain, though, since the variability in water supply for the Great Lakes watershed is sensitive to a number of other meteorological and hydrologic factors.

MODIS image of below normal ice cover on the Great Lakes on 2/19/2010 (Image: NOAA GLERL).

Temperature & Precipitation Outlook

Environment Canada (EC) and the Climate Prediction Center (CPC) are both calling for high chances of above-normal temperatures across the Great Lakes basin from January-March 2016, with higher chances in the northern Great Lakes near Lake Superior. For precipitation, CPC shows a greater chance for below-normal precipitation in the U.S. basins of Superior and Michigan-Huron, while EC's outlook does not show a strong signal on whether precipitation will be below-, near-, or above-normal in the Canadian Great Lakes basin.

The current seasonal temperature and precipitation outlooks can be found through the Climate Prediction Center and Environment Canada.

Great Lakes Region Partners

- Environment Canada
- Agriculture and Agri-Food Canada
- Midwestern Regional Climate Center
- Northeast Regional Climate Center
- Great Lakes Region State Climatologists
- National Oceanic and Atmospheric Administration
  - National Operational Hydrologic Remote Sensing Center
  - Great Lakes Environmental Research Laboratory
  - NOAA Great Lakes Sea Grant Network
  - North Central River Forecast Center
  - Ohio River Forecast Center
  - Climate Prediction Center
  - Office for Coastal Management
- Great Lakes Integrated Sciences & Assessments
- US Army Corps of Engineers, Detroit District
- National Integrated Drought Information System

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