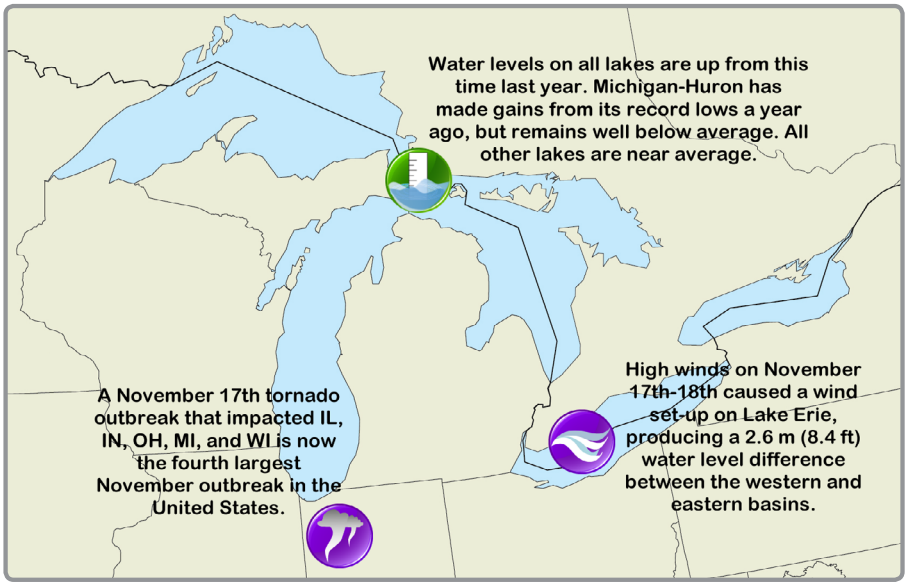
Quarterly Climate Impacts and Outlook

Great Lakes Region

Dec. 2013 (*Experimental*)

Great Lakes Significant Events - *for September - November 2013*

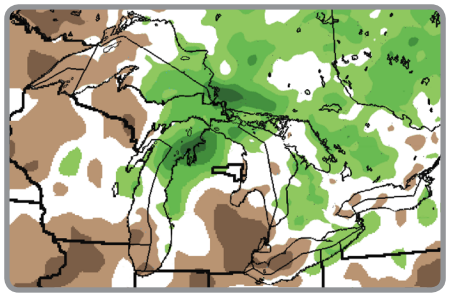
There were contrasting conditions across the Great Lakes basin over the fall season, yet water levels on all the Great Lakes remained well above last year's levels and near or above chart datum throughout the quarter. The largest gain from last year has been on Lake Michigan-Huron, which is 38 cm (15 in) higher entering December compared to this time last year when it set a new record low. Nonetheless, Michigan-Huron remains well below its long-term average, whereas all of the other lakes have been within 8 cm (~3 in) of their long-term averages throughout the fall season.



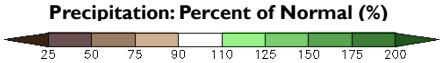
On November 16th-18th, a storm system tracked across the Great Lakes basin and brought widespread regional impacts including strong winds, heavy rainfall, and tornadoes. High westerly winds in excess of 111 km/hr (69 mph) pushed water on Lake Erie from one end of the lake to the other causing water levels on the west end of the lake to fall by nearly 1.2 m (4 ft), while levels on the east end at Buffalo, NY rose by close to 1.4 m (4.5 ft). At the same time, high wind gusts created large waves on eastern Lake Michigan. A rare November tornado outbreak was also associated with this system on November 17th, where there were 72 tornadoes in the U.S., some of which occurred within the Great Lakes basin. In addition, heavy rain in excess of 100 mm (3.9 in) fell over portions of northern Michigan, causing localized flooding. This type of widespread extreme event may become more common in a changing climate.

Regional Climate Overview - *for September - November 2013*

Precipitation

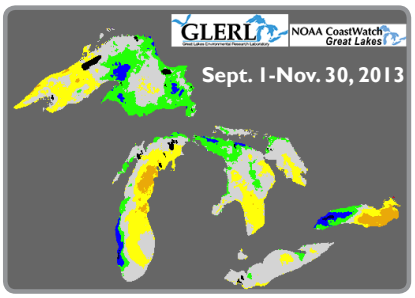


Precipitation: Percent of Normal (%)

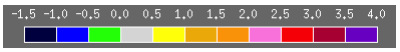


During fall, the Great Lakes basin precipitation was 104% of average (based on 1900-2010). Michigan-Huron received 112% of its average fall precipitation, while Erie and Ontario received 102% of average and Superior received 91% of average. All lake basins received below-average precipitation in September, with 82% of average in the basin. In October, all lake basins received above-average precipitation, with 141% of average in the basin. November was drier than average with the exception of Michigan-Huron, with 93% of average in the basin.

Lake Surface Temperature



Average Lake Surface Temperature: Departure from Long-Term Average (°C)



For Sept.-Nov. 2013, departures of surface water temperatures on the Great Lakes ranged from -1.3°C (-29.7°F) to +3.4°C (+38.1°F) (compared to the long-term average from 1995-2013). Although a large portion of the lakes had a small positive deviation from the long-term average for fall (shown in gray), around 74% of the surface water temperatures were above the long-term average while 26% were below the long-term average.

Great Lakes Water Levels

Stone Lab on Lake Erie: 11/1/13
Photo: Ohio Sea Grant

The Great Lakes are typically in their period of seasonal decline during the autumn months. At the end of November, Lake Superior was 6 cm (2.4 in) below average, having fallen 10 cm (3.9 in) since the start of September, which is 1 cm (0.4 in) more than average. Wet conditions over Lake Michigan-Huron caused a decline of only 8 cm (3.1 in), compared to the usual 18 cm (7.1 in), but the lake remained 34 cm (13.4 in) below average at the end of the quarter. Both lakes Erie and Ontario fell more than normal during the quarter, but both were within 3 cm (1.2 in) of their average levels to start December.

Precip map normals based on 1981-2010 and lake surface temperature normals based on 1995-2013.
Canada/Great Lakes precip data: Canadian Precipitation Analysis. U.S. precip data: interpolated station data.

Water level statistics based on 1918-2012.

Contacts:
Molly Woloszyn (mollyw@illinois.edu)
Samantha Borisoff (samantha.borisoff@cornell.edu)

Great Lakes Region Quarterly Climate Impacts and Outlook
Dec. 2013 (Experimental)
www.drought.gov/drought/content/resources/reports

Environment Canada Environnement Canada
Contact: Environment Canada Public Inquiries | 1-800-668-6767 (in Canada only) 416-739-4826 enviroinfo@ec.gc.ca

Regional Impacts - *for September - November 2013*

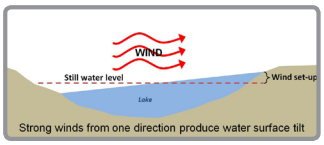
Water Quality

Above: Algal bloom in Lake Erie - 9/20/13; photo courtesy of Ohio Sea Grant

Toxins from algal blooms on western Lake Erie impacted water treatment plants along the shoreline in October, causing some cities to spend more money to make sure their drinking water is safe. In October, one township in Ohio cautioned its 2,000 residents not to drink or use water coming from their taps. This is believed to be the first time that a city in Ohio has banned its residents from using the water because of toxins from algae in the lake. Climate change and heavier rains, leading to increased runoff, could increase the occurrence of toxic and nuisance algal blooms in the future, which is why updating and implementing new phosphorus loading targets is a key deliverable under the new Canada-U.S. Great Lakes Water Agreement (http://www.ec.gc.ca/grandslacs-greatlakes/).

Shipping

Great Lakes water levels for the Sept.-Nov. 2013 period are well above the low levels that were being experienced during the same period one year ago. While the increasing water levels have helped to alleviate shipping concerns at critical locations throughout the system, shippers still continue to have to take into consideration low levels on Lake Michigan-Huron when loading. Shipping is not only impacted by long-term and seasonal lake level fluctuations, but short-period changes as well, such as the one that occurred on Lake Erie on November 17th and 18th that pushed water from one end of the lake to the other. This event grounded a shipping vessel near Sandusky, OH.



Above: Depiction of wind set-up; courtesy of Environment Canada

Infrastructure & Transportation

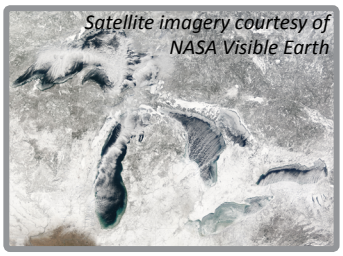
Heavy rains and strong winds on November 17th wreaked havoc across the eastern Upper Peninsula in Michigan and the Sault Ste. Marie area in Ontario where there were flooded roads, power outages, and interruptions to communication throughout the region. Traffic was also interrupted on the Mackinac Bridge as high winds prevented semi-trucks and other high-profile vehicles from crossing the 8 km (5 mi) bridge.

Right: A bridge in Sault Ste. Marie, MI on 11/17/13 Photo courtesy of Jim Lehocky

Regional Outlook - *for Winter 2013/2014*

Ice Cover Outlook

For the winter of 2013/14, NOAA's Great Lakes Environmental Research Laboratory projects maximum ice coverage of the Great Lakes to be 57% to 62% by February, which is a little above the long-term average max ice cover of 55%.



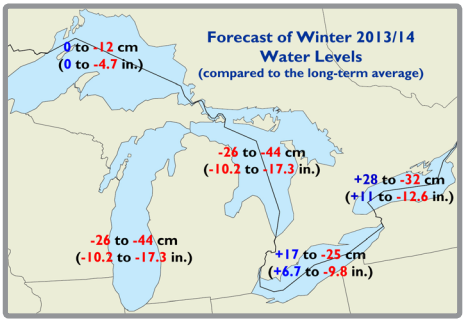
Projections based on statistical regression model with NAO and ENSO indices.

Temperature & Precipitation Outlook

The NOAA Climate Prediction Center and Environment Canada are both forecasting equal chances for above, below, or near normal precipitation and temperature in their respective basins throughout January-March 2014. On a monthly scale, Environment Canada is forecasting all three months to have equal chances as well for the Canadian basin.

Lake Level Outlook

Current projections for the winter months indicate that Lake Superior will likely remain below average, but a wet winter could result in levels on Lake Superior rising slightly above average in the next quarter. A prolonged period of above-average water supplies will be required to return the water levels of Lake Michigan-Huron to its long-term average, but current projections show virtually no risk of the record lows experienced last winter. Lakes Erie and Ontario are expected to remain within 8 cm (~3 in.) of their long-term averages through the next quarter.



Outlook from the US Army Corps of Engineers and Environment Canada (Winter 2013/14)

Great Lakes Region Partners

Environment Canada
www.ec.gc.ca
Agriculture and Agri-Food Canada
www.agr.gc.ca
Midwestern Regional Climate Center
www.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.nws.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
- **Climate Prediction Center**
  www.cpc.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
Great Lakes Water Level Dashboard
www.glerl.noaa.gov/data/now/wlevels/dbd/

#regionalclimateoutlooks

Contacts:
Molly Woloszyn (mollyw@illinois.edu)
Samantha Borisoff (samantha.borisoff@cornell.edu)

Great Lakes Region Quarterly Climate Impacts and Outlook
Dec. 2013 (Experimental)
www.drought.gov/drought/content/resources/reports

Environment Canada Environnement Canada
Contact: Environment Canada Public Inquiries
1-800-668-6767 (in Canada only)
416-739-4826 enviroinfo@ec.gc.ca