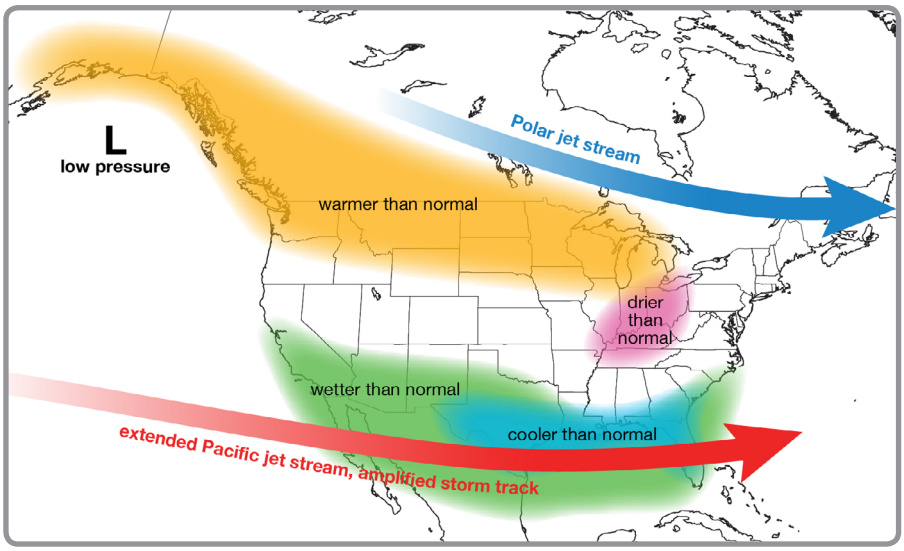
El Niño Impacts and Outlook

Great Lakes Region

November 2015

Typical El Niño Winter Pattern



The image above shows the typical pattern in the winter during El Niño events. The polar jet stream tends to stay to the north of the Great Lakes region, while the Pacific jet stream remains across the southern U.S. With the Great Lakes positioned between the storm tracks, warmer and possibly drier conditions can develop during El Niño events.

Graphic created by the Illinois State Water Survey (with data from NOAA).
For more information please visit: https://www.climate.gov/news-features/department/enso-blog

El Niño in Winter

An El Niño develops when sea surface temperatures are warmer than average in the equatorial Pacific for an extended period of time. This is important to North America because El Niño has an impact on our weather patterns, most predominantly in the winter.

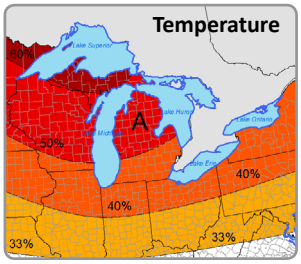
Although each El Niño is different, there are some general patterns that are predictable. For instance, the polar jet stream is typically farther north than usual, while the Pacific jet stream remains across the southern United States (see figure to left).

This pattern brings above-normal temperatures to much of the Great Lakes region, particularly across the northern states. This does not mean that cold weather will not happen this winter but typical extreme cold weather may be milder and less frequent. In addition, this pattern may bring drier conditions to the eastern Great Lakes basin.

Warmer conditions may reduce total snowfall in the basin and lead to minimal ice cover on the Great Lakes this winter. In addition, the above-normal temperatures will likely reduce the amount of snowpack accumulation in the season.

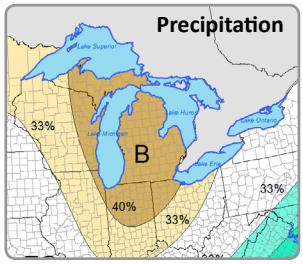
El Niño Outlook

Winter Temperature & Precipitation Outlooks



A: Above normal
B: Below normal
EQ: Equal chances of above-, near- or below-normal (white)

Climate Prediction Center Outlook for December 2015 - February 2016

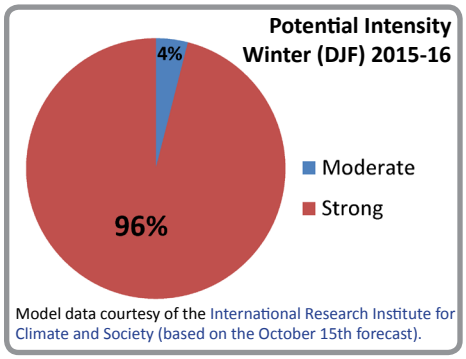


The winter 2015-16 outlook from the Climate Prediction Center (CPC) shows an increased chance of above-normal temperatures in the U.S. Great Lakes basin, especially near the Lake Superior basin. Meanwhile, the precipitation outlook indicates a greater chance for below-normal precipitation across most of the basin, with the exception of the Lake Ontario basin which is not showing a clear signal on whether precipitation will be above-, near-, or below-normal. Environment Canada is also forecasting above-normal temperatures for December 2015-February 2016 for the Canadian Great Lakes basin. However, precipitation in the Canadian basin is less conclusive with equal chances for above-, near-, or below-normal precipitation according to Environment Canada.

The prediction of a warmer than average winter in the Great Lakes could lead to minimal ice cover on the Great Lakes. In addition, this forecast could have implications for many sectors, in both positive ways (reduced heating costs, fewer transportation costs and delays, and increased retail sales) and negative ways (reduced winter recreation and increased survival through the winter of agricultural pests).

The seasonal outlooks above combine many factors including dynamical models, the effects of long-term trends, soil moisture, and the El Niño Southern Oscillation (ENSO) cycle. Because these outlooks combine many inputs, they do not match the typical El Niño conditions exactly.

El Niño Strength



Model data courtesy of the International Research Institute for Climate and Society (based on the October 15th forecast).

El Niño conditions have continued since spring 2015 and forecasts indicate that this El Niño will continue to strengthen, with 96% of models agreeing that it will be a strong event in winter 2015-16 (December-February). In terms of how long the event may last, the CPC says there is a 95% chance that these conditions will continue through the winter, gradually weakening through spring 2016. A few strong El Niños in the past have been quickly followed by La Niñas, so conditions should continue to be monitored closely, especially if the El Niño weakens next spring as predicted.

Based on the October 8th ENSO outlook from CPC.

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Potential Winter and Spring Impacts

Agriculture

Grapes in Michigan.
Image: Matthew Kanable (via Flickr CC)

El Niño has worldwide impacts to the agricultural sector. For the Great Lakes, most of the winter impacts are beneficial. Milder winter weather could benefit winter wheat, forage crops, cover crops, and fruits such as apples and grapes. However, because El Niño winters typically result in reduced snowpack in the Great Lakes, this could expose these crops to the occasional cold air outbreaks and harsh wind. Milder winter temperatures should be beneficial for livestock producers by reducing operating costs, reducing stress to animals, and improving production. El Niño could increase commodity prices due to negative impacts internationally.

Economy

Wintertime construction in Michigan.
Image: MSU IPF (via Flickr CC)

Mild and dry winters with below-average snowfall can have a significant overall positive impact on the economy. During the strong El Niño of 1997-98, economic benefits outweighed losses by a factor of 10 to 1 according to one study. The largest positive impacts were reductions in home heating costs and increases in retail sales. The economic losses were suffered by those sectors that depend on normal winter weather. These include winter recreation, snow removal businesses, towing companies, and road salt sales. In addition, less ice on the Great Lakes could mean the potential exists for an extended navigation season for shipping.

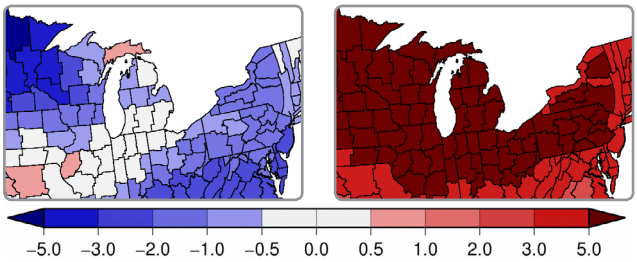
Water Levels

High water levels on Lake Erie (7/9/15).
Image: Ohio Sea Grant (via Flickr CC)

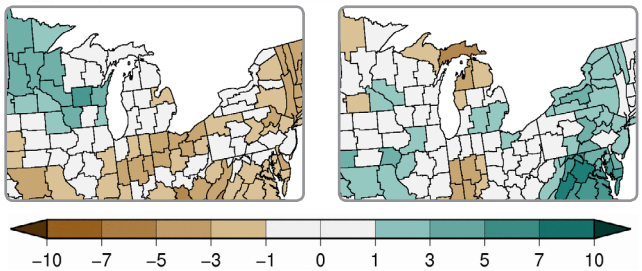
Above-average temperatures could lead to reduced snowpack accumulation this winter season, meaning there may be a chance for decreased runoff into the lakes during the spring when runoff is typically a major contributor to increasing water levels. Also, less ice on the lakes would lead to more evaporation off the lake surfaces compared to a winter when the lakes are mostly ice covered. Decreased runoff and increased evaporation could act to take more water away from the system than normal. Since the lakes are mostly above average levels right now, this could lead to a return to normal water level conditions.

Comparisons and Limitations

Winter Conditions During Past El Niños



Departure from mean temperature (°F) for December-February during the 1965-66 El Niño (left) and the 1997-98 El Niño (right). The mean period is 1981-2010.



Percent of mean precipitation (inches) for December-February during the 1965-66 El Niño (left) and the 1997-98 El Niño (right). The mean period is 1981-2010.

While the current El Niño is on track to be one of the strongest on record, it is important to remember that each El Niño episode is different. The maps above illustrate winter conditions in the Great Lakes basin during two strong El Niño events in the past. In 1997-98, temperatures were above average across the basin. However, in 1965-66, temperatures were below average across a majority of the basin. While forecasts show the chance for below-normal precipitation in the Great Lakes, these two strong events in the past produced varied precipitation conditions. In addition, the response of Great Lakes water levels to El Niño has varied during strong events in the past as antecedent conditions have been found to play a major role. Other large-scale oscillations also need to be considered such as the Pacific Decadal Oscillation, the North Atlantic Oscillation, and the Arctic Oscillation. Click here for more information.

While past El Niño events can help inform forecasters about certain conditions, there are some limitations. For instance, El Niño is not known to impact the track or intensity of any single weather system or the timing of freeze events in the fall or spring.

Great Lakes Region Partners

Environment Canada
www.ec.gc.ca
Midwestern Regional Climate Center
mrcc.isws.illinois.edu
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
- **Climate Prediction Center**
  www.cpc.noaa.gov
- **Office for Coastal Management**
  http://coast.noaa.gov/
- **NOAA Great Lakes Sea Grant Network**
  www.seagrant.noaa.gov
- **National Operational Hydrologic Remote Sensing Center**
  www.nohrsc.noaa.gov
- **North Central River Forecast Center**
  www.weather.gov/ncrfc
- **Ohio River Forecast Center**
  www.weather.gov/ohrfc

Great Lakes Integrated Sciences & Assessments
www.glisa.umich.edu
US Army Corps of Engineers, Detroit District
www.lre.usace.army.mil
American Association of State Climatologists
www.stateclimate.org
National Integrated Drought Information System
www.drought.gov

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