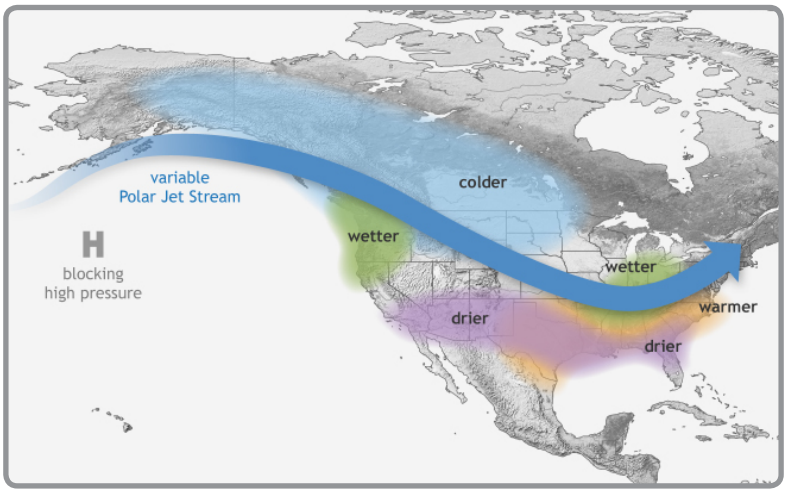
La Niña Impacts and Outlook

Great Lakes

November 2017

Typical La Niña Winter Pattern



Typical impacts of La Niña on U.S. winter temperature and precipitation. Such impacts have been associated with past episodes, but all impacts aren't seen with every episode. NOAA Climate.gov drawing by Fiona Martin. (Image Source: NOAA Climate.gov) For more information please visit: https://www.climate.gov/news-features/department/enso-blog

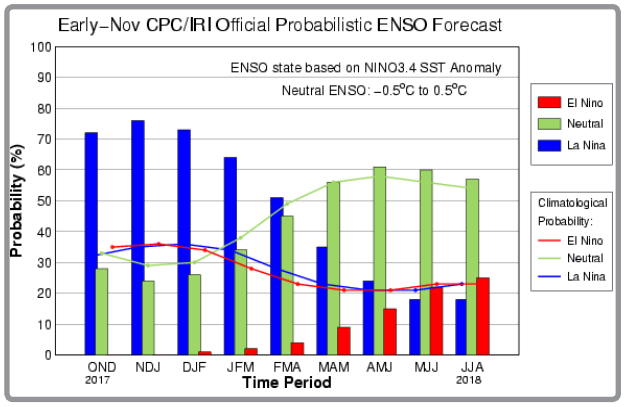
A La Niña develops when sea surface temperatures in the equatorial Pacific Ocean are cooler than average for an extended period of time. This affects the location of jet streams, causing impacts in North America. The most notable impacts occur in the winter, when the wind patterns in the atmosphere are strongest.

While no two La Niña events are alike, the typical winter weather pattern (image) brings the polar jet stream into Alaska, then plunges into the central and eastern United States. This path can bring colder-than-normal temperatures into the northern United States, especially the northern Rockies across the northern plains and into the Great Lakes. Meanwhile, the southern Great Plains often are left warm and dry. The Pacific jet stream tends to track closely along the Pacific Northwest, bringing increased chances for moisture. Finally, odds increase slightly for wetter-than-normal conditions in the Ohio River valley.

The result for the Great Lakes is that odds shift toward chances to be cooler than normal, especially in the western Great Lakes area. The southern Great Lakes, near the Ohio River valley, also may see a slight shift toward wetter-than-normal conditions. Finally, there is evidence that weak La Niñas favor more ice cover especially when coupled with other large-scale climate influences that are only predictable on much shorter time scales.

Winter Outlook

La Niña Evolution



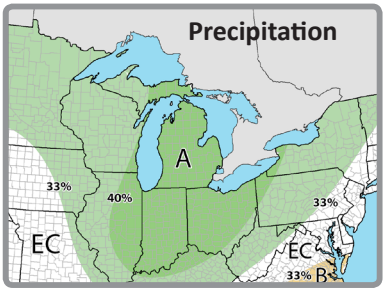
La Niña conditions emerged in the fall of 2017. Conditions strengthened enough to reach a weak La Niña phase as predicted when the sea surface temperature anomalies surpassed −0.5°C on the Oceanic Niño Index (ONI). The La Niña conditions are predicted to continue at least through winter. The bar chart shows the likelihood of La Niña, El Niño, and neutral conditions over the upcoming seasons. The odds are highest for La Niña (blue bars) through winter. The highest odds shift toward neutral (green bars) in late spring through the summer months. El Niño (red bars) chances increase through the summer as well but remain relatively small. This is a typical evolution of the ENSO pattern. For more information please visit:
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

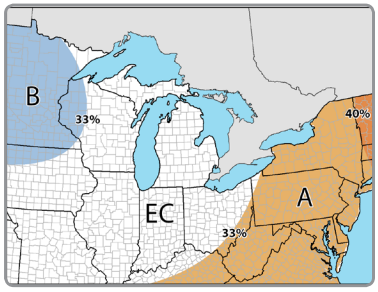
Precipitation and Temperature

The Great Lakes straddles the boundary of temperature conditions, with slightly increased chances for colder temperatures in the far western portion of the basin, equal chances for above-, below-, or neutral temperatures across the central lakes, and an increased chance of warmer temperatures near the eastern lakes. Note that these chances are quite small because of uncertainty in the strength and position of the La Niña as well as other potential influences.

For precipitation, the outlook indicates greater chances for wetter-than-normal conditions over the Great Lakes and surrounding areas.

The temperature and precipitation outlooks are consistent with a more active storm track across the region this winter, leading to more cold outbreaks and precipitation chances. The outlook is complicated by the likely weakness of the La Niña, as well as the potential for other climate effects to play a larger role from time to time. The La Niña impacts will likely reach their climax during winter and then slowly ebb as spring approaches. Please visit the Climate Prediction Center at: http://www.cpc.ncep.noaa.gov





Valid for Dec 2017–Feb 2018. A: Above normal; B: Below normal; EC: Equal chances for above-, below-, or near-normal

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Climate Impacts

Agriculture

Image courtesy of: Mark Longstroth, Michigan State Extension

La Niña has worldwide impacts on the agricultural sector. For the Great Lakes, most of the impacts are felt in winter. Winters associated with La Niña tend to be cold with above-average precipitation and could negatively impact winter wheat and fruit orchards. However, because La Niña winters typically result in increased snowpack in the Great Lakes, this could insulate these crops to the cold air outbreaks and harsh wind. Harsher winter temperatures could be negative for livestock producers due to increased operating costs and potential stress on animals. La Niña could affect commodity prices due to negative impacts internationally.

Economic

Image courtesy of: Illinois-Indiana Sea Grant

Cold and wet winters with above-average snowfall can have sector-specific impacts on the economy. The largest negative impacts associated with La Niña are increases in home heating costs, costs associated with snow removal, and difficulties in overland transportation. Sectors that depend on winter weather conditions will likely see a benefit from increased snowfall. These include winter recreation, snow removal businesses, towing companies, and road salt sales. In addition, more ice on the Great Lakes could mean the potential exists for a delayed navigation season for shipping in the spring.

Water Levels and Lake Ice

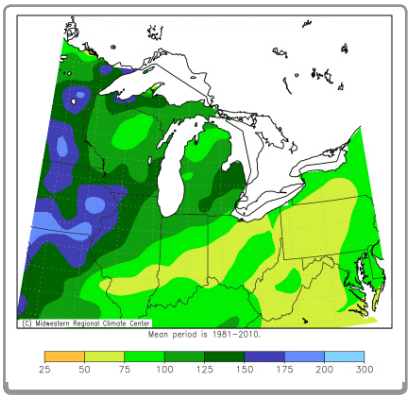
Image courtesy of: Illinois-Indiana Sea Grant

The potential for increased snowpack accumulation leads to a better chance for more runoff into the lakes during the spring, when runoff is typically a major contributor to a seasonal rise in water levels. With potentially more ice on the lakes later in the winter due to cooler-than-normal conditions, less evaporation may occur when compared to a winter when the lakes are mostly ice free. Increased runoff and decreased evaporation could act to take less water away from the system than normal. These combined factors could lead to higher lake levels into next season. Finally, with the increase in chances for above-normal precipitation the likelihood of greater snow accumulations are greater as well.

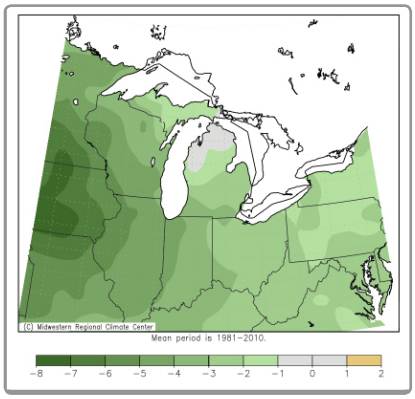
Comparisons and Limitations

No Two La Niñas Are the Same

Accumulated Precipitation (%)



Departure from Mean Temperature (° F)



Departure from mean tempearture (left) and percent of mean percipitation (right) during the La Niña winter of 2000-2001. Maps courtesy of the Midwestern Regional Climate Center

The images above show the differences from the mean in the last weak La Niña event from the winter of 2000–2001 (December–February). In many ways, the cooler than normal temperatures and mainly wetter conditions across much of the Midwest and Great Lakes is typical. There is no guarantee this or anything close to it will be the pattern this year. There are limits to our predictability of La Niña impacts this winter. As mentioned previously, short-term climatic influences that are not predictable beyond a week or two can play havoc with the seasonal forecasts and can overshadow the "typical" La Niña pattern. Even the strength of the La Niña (weak versus strong) has an influence on whether temperatures will be cold or warm in some cases. Below are some additional common limiting factors:

La Niña impacts can be limited by many factors, including:

- It may not fully develop and thus not influence the weather as much.
- It may be weak, with little or no discernible influence on weather patterns.
- It may be overcome by other weather and climate events which dampen the impacts.
- One or two extreme events can cause the average precipitation or temperature for the winter to appear differently than the rest of the season.

La Niña can affect some temperature and precipitation signals in the region, but it is not known to affect:

- First freeze date in the fall (either early or late).
- Last freeze date in the spring (either early or late).
- Potential for ice storms or blizzards.
- Track or intensity of any single weather system.
- Potential for drought or flooding events in the spring.

Great Lakes Partners

National Oceanic and Atmospheric Administration
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- Great Lakes Environmental Research Laboratory
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- Office for Coastal Management
  http://coast.noaa.gov/
- NOAA Great Lakes Sea Grant Network
  www.seagrant.noaa.gov

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