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La Niña 2020-2021: An Overview of What It Might Mean for Arizona

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La Niña conditions have developed in the tropical Pacific Ocean and current forecasts show that a weak or moderate event is very likely this winter and spring.[1,2] A few forecast models recently have hinted that a strong event is even possible. Were a weak or moderate event to happen, what might this mean for Arizona? Will rain and snow amounts be less? Will it be warmer than usual? Will there be relevant related hazards or favorable circumstances? In this Extension Climate Fact Sheet about the 2020-2021 La Niña event, we start to answer such questions by providing an overview of this phenomenon and how it possibly will influence weather across the state during the coming months.

What is a La Niña event?

A La Niña event takes place when cooler-than-average water moves into the central and eastern tropical Pacific Ocean in conjunction with a strengthening of the overlying winds that blow towards the west. Large areas of descending air and high surface pressure track this cool water and, due to their location, can substantially alter the position of the storm track relative to the Southwest during fall, winter, and spring. La Niña events usually occur once every three to five years, lasting from nine to 12 months and peaking in strength during the northern hemisphere winter.[3] Despite these typical features, no two La Niña events are alike.

How does a La Niña event influence cool-season weather in Arizona?

Changes brought about by a La Niña event can shift the winter storm track northward such that it passes through the Southwest less frequently. This potentially leads to a fewer number of storms that pass through the region. These circumstances increase the odds for below-average precipitation in Arizona during cool-season months (Figure 1).[4]

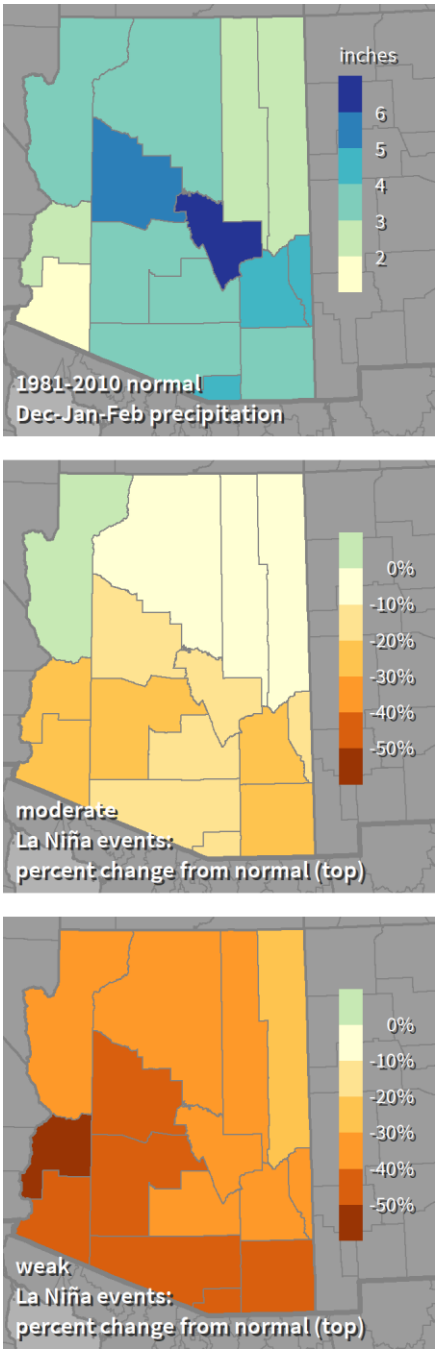

Figure 1. December through February precipitation totals often are lower than the 1981-2010 normal during weak and moderate La Niña events.[5]

In order to make this information available to Arizona counties as quickly as possible, we are publishing this Extension Climate Fact Sheet only with review by University of Arizona faculty.

Does the strength of a La Niña event matter for cool-season weather in Arizona?
Yes. When sea-surface temperatures in the central and eastern tropical Pacific Ocean become cooler, a La Niña event becomes stronger. In general, the stronger the event, the greater the chances for below-average precipitation in the Southwest.[6] As current forecasts indicate that a weak or moderate event is very possible this winter and next spring, dry conditions in the region over the coming months are more likely but not heavily favored.[1,2]

How has precipitation varied during previous weak or moderate La Niña events?
On average, below-normal precipitation amounts have occurred for almost all of the state during weak and moderate La Niña events since 1950, as compared to the 1981-2010 climatological period (Figure 1). However, there is some variation among these events. For example, rain and snow totals from December through February in much of Arizona were lower than normal in eight of the 10 La Niña events categorized as weak, and three of the four La Niña events categorized as moderate.[6] Near- and above-normal totals characterize the remaining events, including a relatively wet winter during the moderate La Niña in 1984-1985.

How has temperature varied during previous weak or moderate La Niña events?
On average, near- and slightly below-normal temperatures have occurred during weak and moderate La Niña events since 1950, as compared to the 1981-2010 climatological period (Figure 2). Like precipitation totals, however, there is variability among past events. For example, temperatures from December through February in much of Arizona were near or below normal in seven of the 10 La Niña events categorized as weak, and three of the four La Niña events categorized as moderate.[7] Above-average temperatures occurred during the remaining events, particularly during the weak La Niña in 1995-1996.

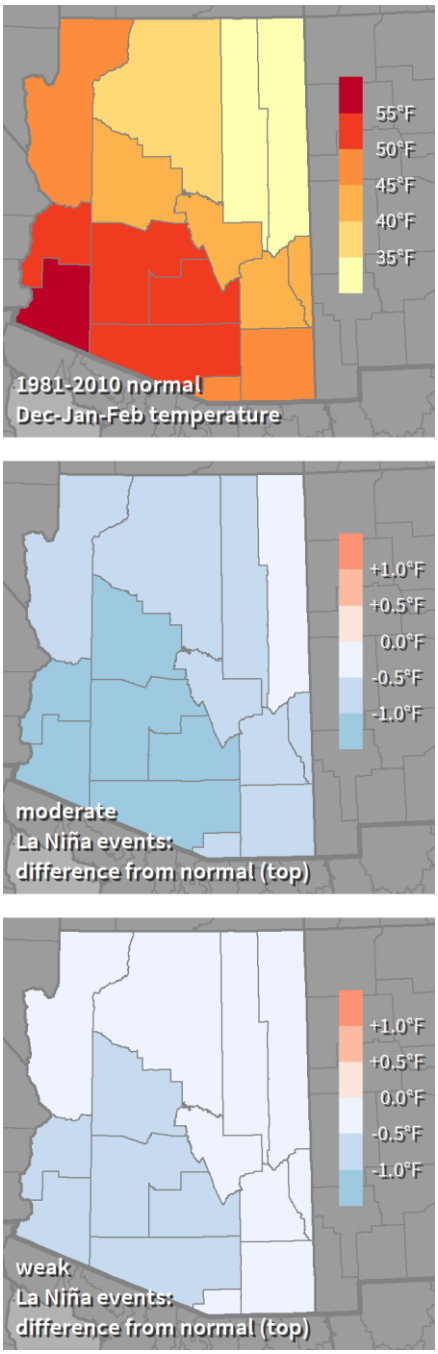

Figure 2. December through February temperatures often are near or slightly below the 1981-2010 normal during weak and moderate La Niña events.[5]

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What could be some relevant impacts related to the current La Niña event?
Below-average precipitation that might result from the 2020-2021 La Niña event could lead to a mix of related hazards and favorable circumstances that are relevant to agriculture, forestry and wildland fire management, human health and safety, property, ranching, and water resources. Worsening of current drought conditions is prominent among such impacts.

How can I get more information?
Along with near-term weather forecasts from the National Weather Service (NWS), the NWS Climate Prediction Center issues extended range outlooks for 6-10 and 8-14 days, as well as monthly and seasonal climate outlooks. These map products show probabilities of temperature and precipitation being either below, near, or above normal during these time frames. Also, in addition to producing Extension Climate Fact Sheets like this one, authors are working with the Climate Assessment for the Southwest (CLIMAS) and the Southwest Climate Adaptation Science Center to provide more information related to the 2020-2021 La Niña event. Please contact us for further information, data, and analysis that could be applied to stakeholder needs in your county.

References
[1] International Research Institute
[2] National Weather Service Climate Prediction Center
[3] National Oceanic and Atmospheric Administration (NOAA)
[4] NOAA Pacific Marine Environmental Laboratory
[5] data from NOAA National Centers for Environmental Information
[6] U.S. winter precipitation during La Niña events since 1950
[7] U.S. winter temperatures during La Niña events since 1950

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