

What does the 2010-2011 La Niña mean for the Southeastern USA?

An Apalachicola-Chattahoochee-Flint River Basin Drought Early Warning System Fact Sheet

Prepared by Christopher J Martinez¹ for the Southeast Climate Consortium (SECC) and the National Integrated Drought Information Service (NIDIS). January 2011.

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La Niña typically brings warmer and drier conditions to the Southeastern USA during winter, resulting in reduced streamflow, lower reservoir and lake levels, and greater risk of wildfire. La Niña events can last one or more years. In multi-year La Niña events, there is a greater likelihood for successive winters to be warmer and drier than normal.

The winter of 2010-2011 has been colder than would be expected during a La Niña, with some locations in the Southeastern USA recording the coldest December on record. This unusually cold weather has been caused by the North Atlantic Oscillation (NAO), which has effectively overpowered La Niña for much of this winter. However, the condition of the NAO can change in a manner of a week or two, while La Niña conditions are expected to continue through the spring.

The purpose of this document is to describe the 2010-2011 La Niña, the impact the NAO has had this winter, and the potential impacts of La Niña for the remainder of the winter and through the spring.

What Is La Niña?

La Niña is a cooling of the surface of the eastern and central Pacific Ocean along the equator and is part of the climate phenomenon known as the El Niño-Southern Oscillation (ENSO). Periods of warming of the eastern and central tropical Pacific are known as El Niño. The change in heating and cooling of the ocean caused by El Niño or La Niña cause changes in the atmosphere in the tropical Pacific, which in turn impacts atmospheric circulation in many regions of the world.

El Niño and La Niña events tend to occur every 3-7 years. Periods where the tropical Pacific Ocean is neither warmer nor cooler than usual are called Neutral. El Niño events may last for a period of a few months up to one year (though multi-year events have occurred in the past), while La Niña events have a greater tendency to continue for multiple years (Figure 1). The La Niña events in 1954-1957, 1973-1976, and 1998-2000 are examples of past multi-year events.

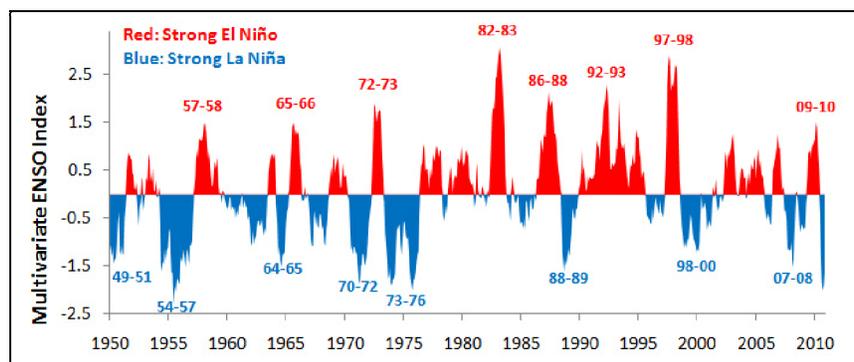


Figure 1. The Multivariate ENSO Index (MEI). La Niña events are indicated by large, negative values of the index and El Niño events as large, positive values. The MEI is essentially a weighted average of the significant features related to ENSO over the tropical Pacific and includes the following six variables: sea-level pressure, the east-west and north-south components of the surface wind, sea surface temperature, surface air temperature, and total amount of cloudiness. Details of the MEI can be found at:

<http://www.esrl.noaa.gov/psd/people/klaus.wolter/MEI/mei.html>

How does ENSO affect the Southeastern USA?

During El Niño, tropical rains and thunderstorms that are usually centered over Indonesia and the western tropical Pacific Ocean shift eastward as they are supplied with moisture and energy from the warmer waters. During La Niña, these tropical rains and thunderstorms shift westward. These thunderstorms, in turn, feed both moisture and energy into the upper atmosphere, where they influ-

ence upper atmosphere west-to-east winds, known as the jet streams.

The change in the position of the jet stream associated with El Niño or La Niña impacts wintertime precipitation and temperature in the USA as shown in Figures 2 and 3.

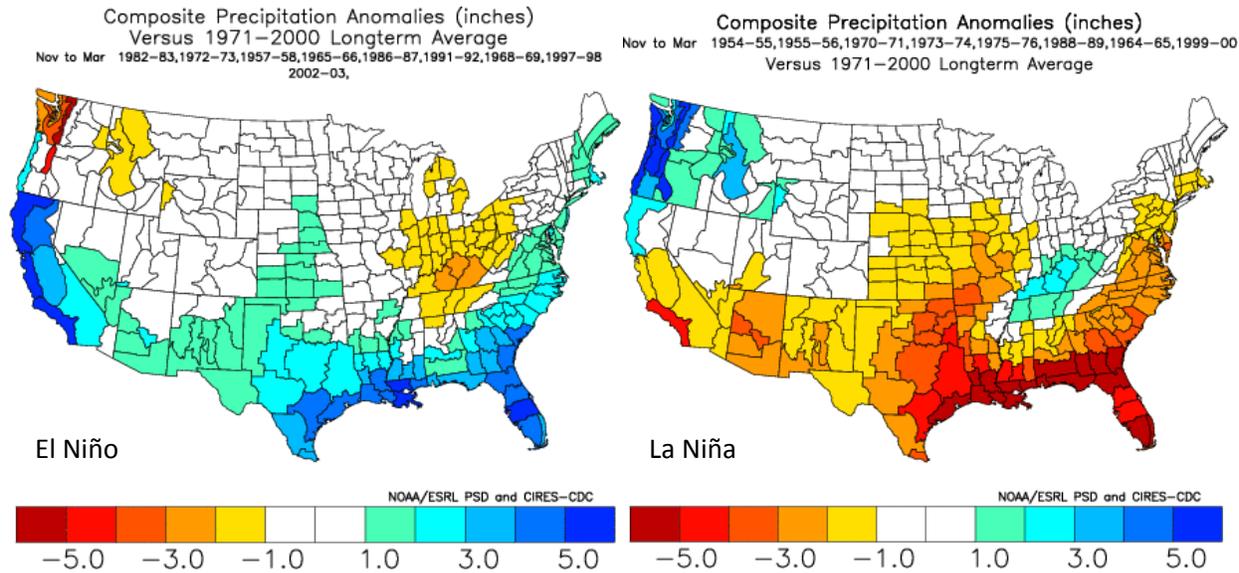


Figure 2. Average change in winter (November-March) precipitation (in inches) during El Niño (left) and La Niña (right) events. (Image provided by the NOAA/OAR/ESRL PSD, Boulder, Colorado from their Web site at <http://www.esrl.noaa.gov/psd/>)

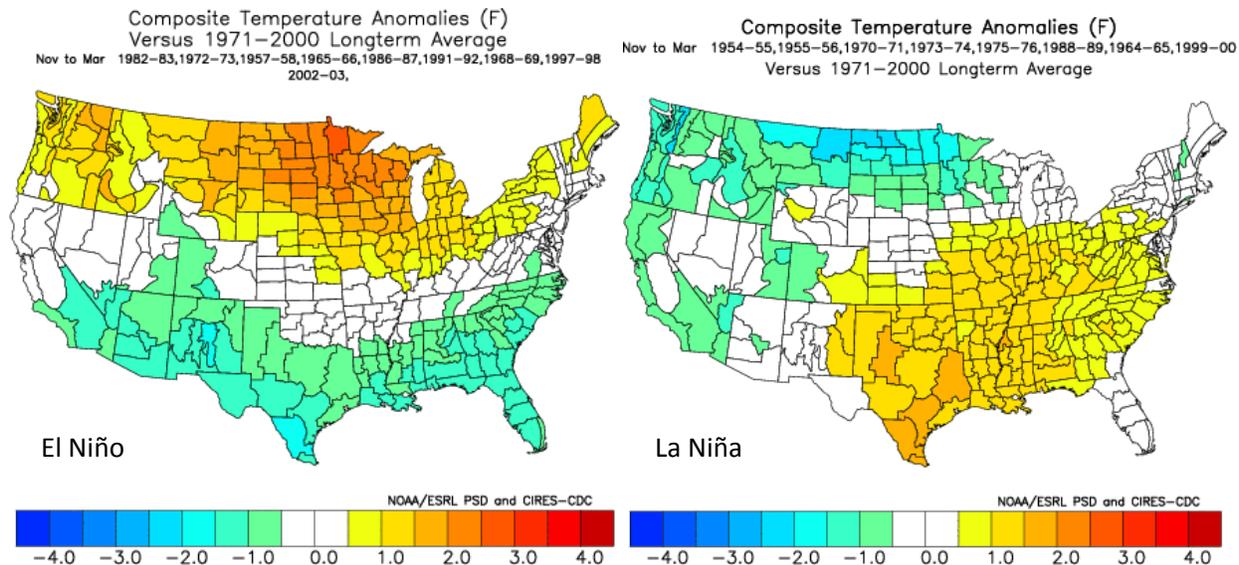


Figure 3. Average change in winter (November-March) temperature (in degrees F) during El Niño (left) and La Niña (right) events. (Image provided by the NOAA/OAR/ESRL PSD, Boulder Colorado from their Web site at <http://www.esrl.noaa.gov/psd/>)

What are the expected impacts of the current La Niña in the Southeastern USA?

According to the most recent discussion from the NOAA Climate Prediction Center (issued January 6, 2011; http://www.cpc.noaa.gov/products/analysis_monitoring/ens_o_advisory/), La Niña is expected to last at least until spring 2011. The fate of La Niña after spring 2011 is uncertain, with some forecast models indicating a return to

neutral conditions and others indicating continuation of La Niña conditions into the summer.

The current drought forecast (<http://www.drought.gov>) shows that drought is likely to persist or intensify over much of the southeast over the next few months (Figure 4).

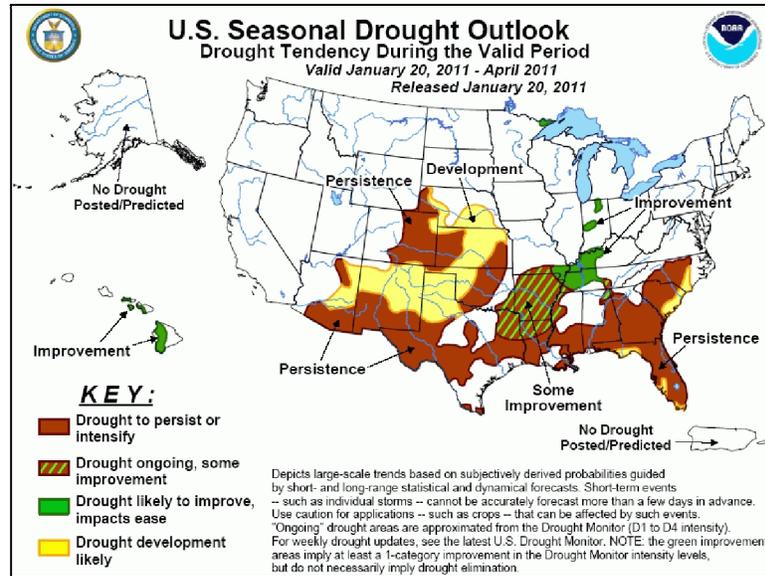


Figure 4. Seasonal drought outlook for the USA, issued January 20, 2011.

Why has this winter been colder than expected across the Southeastern USA?

This winter has been unusually cold, and colder than would typically be expected for a La Niña, due to the North Atlantic Oscillation (NAO). Like ENSO, the NAO is a climate phenomenon that affects weather in North America during winter. The NAO represents differences in atmospheric pressure between Iceland and the Azores. When the NAO is in its negative (cold) phase,

arctic air pushes further south into the USA. Unlike ENSO, the phase of the NAO can change in a manner of 1-2 weeks and these changes are not predictable. So, while the NAO may be responsible for recent cold weather in the Southeastern USA, it can change relatively quickly to its positive phase – when pulses of arctic air into the Southeastern USA are infrequent.

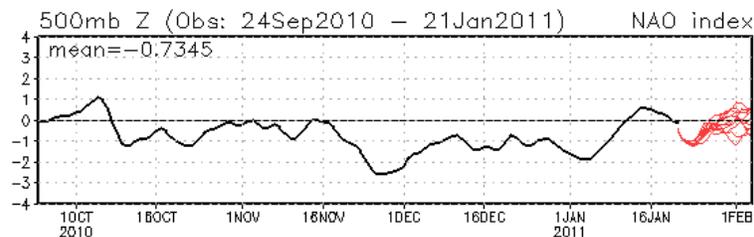


Figure 5. Recent observed (black) and forecasted values of the North Atlantic Oscillation (NAO), issued January 20, 2011. (Image provided by the NOAA Climate Prediction Center from their Web site at <http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/nao.shtml>)

Further reading

- **About El Niño/La Niña:**

<http://www.esrl.noaa.gov/psd/enso/enso.description.html>

http://www.cpc.noaa.gov/products/analysis_monitoring/ensocycle/enso_cycle.shtml

<http://www.pmel.noaa.gov/tao/elnino/el-nino-story.html>

<http://iri.columbia.edu/climate/ENSO>

- **Frequently asked questions about La Niña:**

http://www.elnino.noaa.gov/lanina_new_faq.html

- **NOAA's El Niño page:**

<http://www.elnino.noaa.gov/>

- **Current ENSO conditions:**

http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/

<http://iri.columbia.edu/climate/ENSO>

- **Drought monitoring and forecasts:**

<http://www.drought.gov>

<http://www.climate.gov/#dataServices/predictions>

<http://iri.columbia.edu/climate/ENSO/currentinfo/QuickLook.html>

- **About the North Atlantic Oscillation:**

<http://www.ideo.columbia.edu/res/pi/NAO/>

- **Current NAO conditions and forecast:**

http://www.cpc.noaa.gov/products/precip/CWlink/pna/nao_index_ensm.shtml

About the Southeast Climate Consortium

The SECC was established in 1999 to use advances in climate sciences, including improved forecasting capabilities for seasonal climate variability and long-term climate change, to provide scientifically sound information and decision support tools for more sustainable resource management in agricultural, coastal, and other terrestrial ecosystems in the Southeast USA.

- **Member institutions**



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