El Nino increasing likelihood of wet California winter, though it won't end the drought

September 14 2015, by Bjorn Carey

The latest observations are clear: A monster El Niño is currently brewing in the Pacific Ocean.

The latest satellite observations and computer models from the National Oceanic and Atmospheric Administration (NOAA) point to a sea surface warming in the eastern tropical Pacific Ocean that is on par with conditions seen in 1982-83 and 1997-98, which were two of the strongest El Niño years since at least the 1950s. And while El Niño is primarily an oceanic phenomenon – it is defined as the warming of a specific part of the eastern tropical Pacific Ocean – this shift in water temperature creates its own atmospheric events.

For California, the historical effects of El Niño have been decidedly mixed – especially during weaker events. The biggest El Niño events on record, in 1982-83 and 1997-98, however, were among California's wettest years. A wet winter would bring welcome precipitation as the state is in the midst of a historically severe drought.

However, a repeat performance of the most recent strong El Niños could mean that Californians have to deal with both flooding and drought at the same time.

Stanford scientists, including Noah Diffenbaugh, an associate professor of Earth system science and senior fellow at the Stanford Woods

Institute for the Environment, and Daniel Swain, a doctoral student in Earth system science, have been tracking the developing El Niño and projecting how it could interact with the atmospheric conditions that have contributed to California's current drought.

How much rain should Californians expect from this year's El Niño?

Diffenbaugh: California is in its most severe drought in recorded history. The drought has been caused by the combination of low precipitation and high temperatures. Throughout this drought we have seen persistent "ridging" in the atmosphere. Just as a boulder in a stream diverts water around it, this ridge has been deflecting the prevailing storm track away from California, which is a proximal cause of our current drought conditions.

There's this building hope that El Niño could save the day, and that's in part because California has experienced two of its wettest years on record during two of the strongest El Niño years on record. We're seeing really strong El Niño conditions for this time of year, at least as strong as what we observed in 1997-98. It's looking increasingly probable that this strong El Niño will persist, that the ridging will abate and that California will see storms.

There is a big difference from that last strong El Niño in that there is this area of really warm water in the northeast tropical Pacific, near California, that some people are calling "the blob." If that blob persists, the warm water could supply a lot of extra moisture to storms on their way to California. We're in a bit of uncharted territory with the combination of severe drought, strong El Niño and warm water in the northeast Pacific, but it seems at this stage that Californians would be safe to prepare for storms.

Assuming that precipitation does make land, to what extent could it reverse the current state of drought?

Swain: To completely replace all the water that California is missing over this current four-year drought, on average we'd need well in excess of double our annual precipitation in this coming winter. That's never happened before, so it's unlikely to happen even with a large El Niño event.

We need several consecutive wet years, and specifically several where substantial snowpack persists into spring so that it can slowly replenish our groundwater aquifers and provide long-term relief from drought. El Niño isn't guaranteed to bring snow to the mountains, because the very conditions that increase precipitation also often make it too warm for snowfall except in the very high altitudes.

It also bears mentioning that a massive amount of rain could pose problems of its own. We still have dry months to get through, and this drought has already influenced the intensity of wild fires. The earth is so dry, or in some cases scorched, that when the rains do arrive, it will difficult for that moisture to infiltrate the soil, so when we get a burst of rainfall, it could run off suddenly and violently, creating flood and landslide conditions.

Would a strong El Niño and a corresponding rainy season indicate a new status quo for California?

Diffenbaugh: The best evidence we have suggests that if Californians want to make a bet about precipitation in the future, it's probably worth betting on something like the historical precipitation variability that we've seen, which is some wet and quite a bit of dry.

That said, we know that temperatures are increasing in California, and that this warming has created a greater incidence of drought years, by making more years that have both low precipitation and high temperature. That's really the new normal. In the future, there will still be periods of low precipitation and periods of high precipitation, but because it's getting warmer and warmer, that increases the chance of low precipitation turning into drought.

In terms of the current drought, we know that it is going to end at some point. If this strong El Niño persists and we get a lot of storms this winter, that will definitely help, but the drought won't end this year. Also, it's clear from the historical record that we are already in a new climate, and managing the risks and impacts of drought in California takes more than just getting through this one drought. Our water rights and infrastructure and management systems were all built decades ago, in an old climate. This drought will end, but in this new climate we're in a situation where we're more likely to get the next drought the next time that we see low rainfall.

Provided by Stanford University

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