

A Comparison of Historical Versus Recent Precipitation Response in Central Texas to Oceanic Niño Index 3.4 Sea Surface Temperature

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The Lower Colorado River Authority manages the Highland Lakes in Central Texas to provide water for more than 1.4 million people, as well as businesses, industries, the environment and agriculture in the lower Colorado River basin. As a regional water supplier, LCRA needs to be able to accurately monitor and predict precipitation runoff into the lakes.

LCRA relies heavily on the El Niño Southern Oscillation (ENSO), and associated Oceanic Niño Index (ONI), which provide some of the best long-range precipitation forecast skill in Central Texas. Historically, a warm anomaly of sea surface temperatures in the Pacific equatorial Niño 3.4 region, known as El Niño, is associated with increased precipitation in Central Texas, particularly in October through June. A cold anomaly of Pacific sea surface temperatures, known as La Niña, is associated with decreased precipitation. Forecasters recently have questioned if historical ENSO relationships are still relevant. We have examined the relationships between Pacific sea surface temperatures and precipitation in Central Texas to help answer that question. Using a 2-degree region of Central Texas from latitude 30° to 32° and longitude -98° to -100°, we analyzed monthly gridded precipitation (Texas Water Development Board) from 1950 to 1999 and compared it with precipitation from 2000 to 2017 for all months and ENSO conditions.

Based on period averages, precipitation under La Niña and neutral conditions seems unchanged, and under El Niño are somewhat wetter. Variations are less than one standard deviation from the prior period for all but July under El Niño conditions. Based on parametric (t-test) and nonparametric (Mann-Whitney) tests for each of the months and conditions, precipitation likely is unchanged between the two periods in all but July and October under El Niño conditions. The uncertainty in July and October depends on the chosen confidence level. Due to limited observations of monthly conditions in the recent period, a longer observation period is needed to be more conclusive that the recent period is wetter. With about a 92-percent confidence, our evaluation shows El Niño brings more precipitation than La Niña to Central Texas for the months of February, March, May, June, October, November and December – which coincides with the seasonality of ENSO anomalies. ENSO continues to impact Central Texas precipitation in this recent period similarly to the prior period, and ENSO continues to provide skill in long-range precipitation forecasting.

Key Terms: ENSO, El Niño, precipitation, water supply, water resources.