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December Southwest Climate Outlook

Precipitation: November was particularly dry in Arizona and New Mexico, with many locations recording no measureable precipitation (Fig. 1). A few events in December brought widespread moisture to the region, but actual measureable precipitation was still relatively low despite these incursions. The dew point remains well above seasonal averages, likely related to the persistent tropical activity and the conditions that favor the formation of an El Niño event.

Temperature: Arizona and New Mexico were warmer than average over the past 30 days (Fig. 2), continuing a yearlong trend, and Arizona is on track for the warmest year on record. The persistently high dew point is also related to observed temperature, as we have yet to see an extended cool/dry period that brings lower nighttime temperatures to the region.

Snowpack & Water Supply: Snow water equivalent (SWE) is low across Arizona and New Mexico, ranging from 0 to 50 percent of average in Arizona and 0 to 90 percent of average in New Mexico (Fig. 3). Despite a few widespread snowfall events, high temperatures and below-average precipitation have led to lower-than-average snowpack levels across the region. In October, total reservoir storage was 45 percent in Arizona (compared to 47 percent last year) and 22 percent in New Mexico (compared to 22 percent last year).

Drought: The monsoon and tropical storm season brought seasonal rainfall totals close to or above average across Arizona and New Mexico, but these intense storms provided limited long-term drought relief, with widespread areas well below-average over the past 12 to 36 months (Fig. 4). The Four Corners region, northeast New Mexico, and portions of southern Arizona experienced the largest deficits in the past 12 months. The likelihood of an El Niño event continues to offer hope for additional drought relief. There is hope that regular precipitation over the winter may still help saturate soils in the region, which could lead to higher reservoir storage during springtime snowmelt runoff events, even if temperatures stay above average and snowpack is below average,

ENSO: Forecast projections range from 65 percent to more than 80 percent probability that an El Niño will occur, with several outlooks indicating an El Niño event is imminent, if not already underway. The Southwest is experiencing El Niño-like weather patterns and should continue to do so into the spring, especially if the El Niño event is moderate in strength.

Precipitation Forecasts: The Dec. 18 NOAA-Climate Prediction Center seasonal outlook continues to predict above-average precipitation through the winter and into early spring (Fig. 5). This forecast is tied to the ongoing conditions favorable to an El Niño event and the impact of the Pacific Decadal Oscillation.

Temperature Forecasts: The Dec. 18 NOAA-Climate Prediction Center temperature forecasts remain split across the region, with elevated chances for above-average temperatures along the West Coast, extending eastward into Arizona, and with increased chances for below-average temperatures along the Gulf Coast into New Mexico (Fig. 5). This pattern is projected through the winter and into the spring.

Tweet Dec SW Climate Snapshot

CLICK TO TWEET

DEC @CLIMAS_UA Southwest Climate Outlook-Climate Summary, El Niño Update, Snow-Water Supply, Winter Forecast. http://bit.ly/1xsOaBl

December Southwest Climate Outlook

Online Resources

Figure 1-2,4
High Plains Regional Climate Center - HPRCC
http://www.hprcc.unl.edu/maps/current/

Figure 3
Natural Resources Conservation Service - NRCS
http://www.wcc.nrcs.usda.gov/gis/snow.html

Figure 5
NOAA-Climate Prediction Center
http://www.cpc.ncep.noaa.gov/products/forecasts/

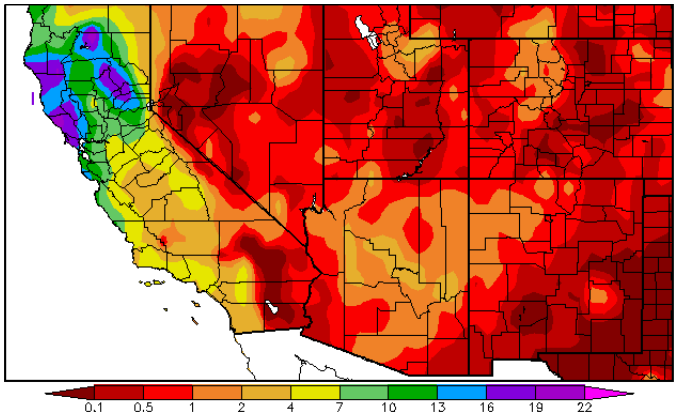


Figure 1: Total Precipitation 11/18/2014 - 12/17/2014

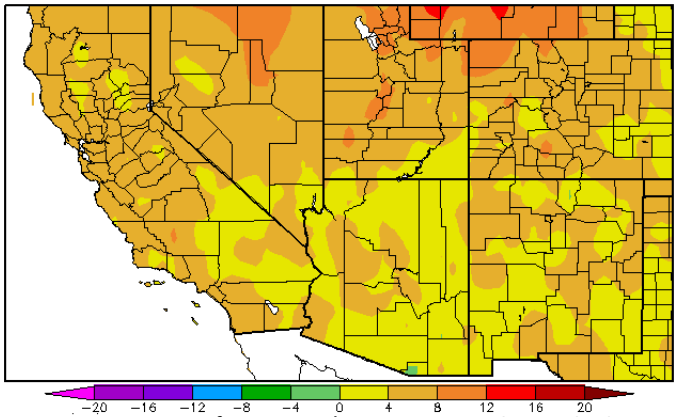


Figure 2: Departure from Normal Temperature 11/18 - 12/17/2014

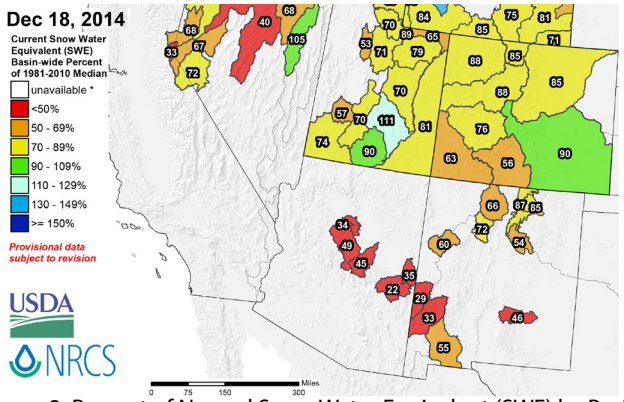


Figure 3: Percent of Normal Snow Water Equivalent (SWE) by Basin

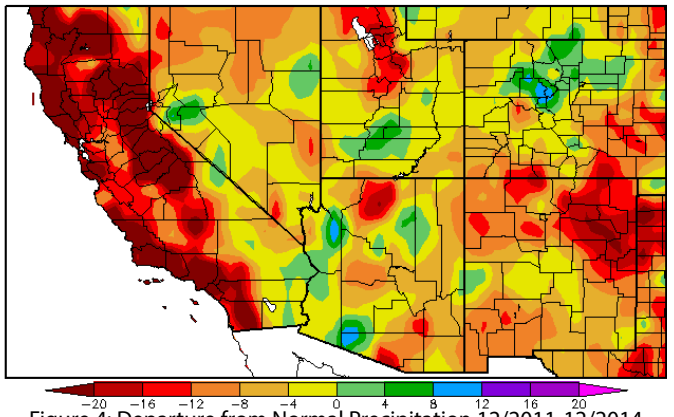
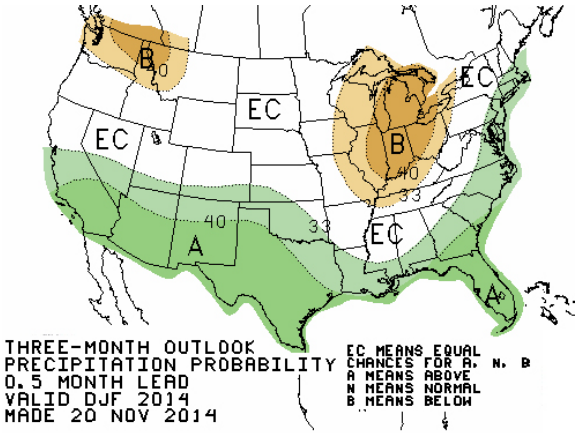


Figure 4: Departure from Normal Precipitation 12/2011-12/2014



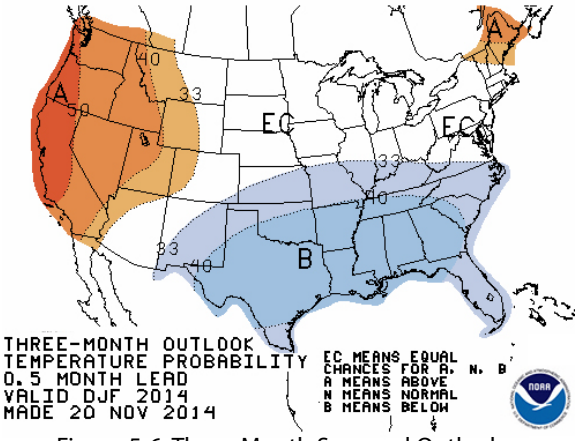


Figure 5-6: Three-Month Seasonal Outlook

Online Resources

Figure 1.
Australian Bureau of Meteorology
http://www.bom.gov.au/climate/enso/index.shtml

Figure 2.
NOAA-National Climatic Data Center
http://www.ncdc.noaa.gov/teleconnections/enso/

Figure 3.
International Research Institute for Climate and Society
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/

Figure 4.
NOAA-Climate Prediction Center
http://www.cpc.ncep.noaa.gov/products/NMME/current/plume.html

2014-15 El Niño Tracker

We are still waiting for a decisive signal, but conditions indicate we are near, or possibly already into, at least a weak El Niño event. Sea surface temperatures (SSTs) are elevated across the equatorial Pacific Ocean (Fig. 1), and the measurements in the Niño 3.4 region are indicative of El Niño having already started (Fig. 2). There remains a distinct lack of cooperation on the part of the atmosphere. This lack of coupling between ocean and atmosphere (demonstrated by near-normal wind and rainfall anomalies), along with a lack of temperature gradient along the equatorial Pacific and little in the way of El Niño wind patterns, means that while we are likely already experiencing El Niño-like conditions in the Southwest (e.g. some of the recent wet weather), it may be a little longer before a formal declaration occurs, even if retroactively.

On Dec. 4, the NOAA-Climate Prediction Center (CPC) issued another El Niño Watch, with a 65 percent probability of a weak El Niño event occurring. Anomalous SSTs alone were probably enough to suggest a weak El Niño event, but the lack of atmospheric coupling kept the current assessment at ENSO-neutral. On Dec. 10, the Japan Meteorological Agency declared that an El Niño started in late summer and that it would continue through early 2015. This was based on favorable El Niño conditions and elevated SSTs, even while other more robust criteria were not yet met. On Dec. 16, the Australian Government's Bureau of Meteorology maintained its El Niño tracker status at El Niño Alert status, despite a lack of atmospheric conditions to complement the anomalous SSTs. That outlook assigned a 70 percent probability of a weak El Niño event developing in winter 2014–2015. The Dec. 18 International Research Institute for Climate and Society (IRI) and CPC upped the probability of El Niño conditions developing to more than 80 percent in the next three months and more than 70 percent through spring and into summer (Fig. 3). The North American multi-model ensemble shows a weak event that extends well into spring (Fig. 4). The extended period of above-average SSTs appears to be increasing confidence in the formation of El Niño this winter into spring.

Seasonal precipitation forecasts still indicate an enhanced chance of above-average precipitation over the upcoming winter, but confidence in this forecast is partially contingent on the strength of the emerging El Niño event. The impacts associated with weak El Niño events are generally less certain than those of a moderate or strong event, with past weak events bringing both dry and wet conditions to the Southwest U.S. during the winter. Ultimately, the above-average tropical storm season and the humidity that has remained in the region may be indicative of the effect of El Niño-like conditions, and we may be seeing the emergent effects of El Niño impacts on the climate of the Southwest, despite the absence of a formal definition identifying the start of a bounded El Niño event.

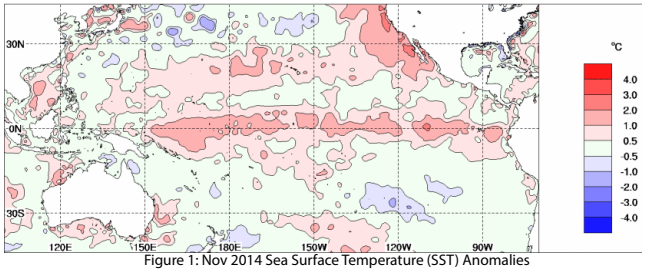


Figure 1: Nov 2014 Sea Surface Temperature (SST) Anomalies

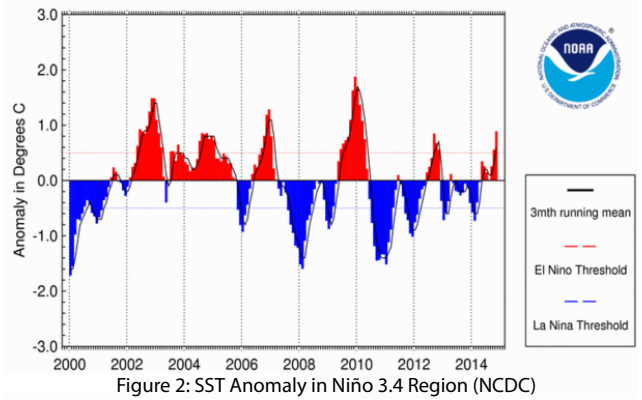


Figure 2: SST Anomaly in Niño 3.4 Region (NCDC)

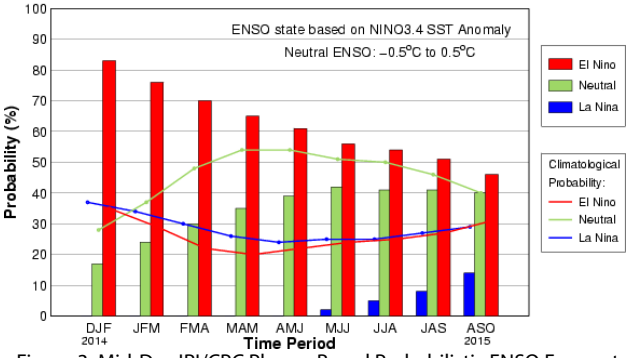


Figure 3: Mid-Dec IRI/CPC Plume_Based Probabilistic ENSO Forecast

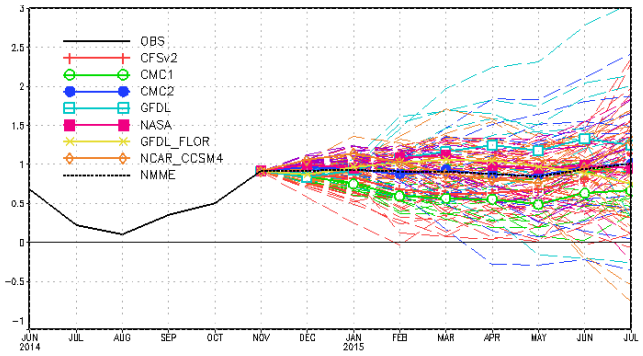


Figure 4: North American Multi Model Ensemble Forecast for Niño 3.4

Online Resources

Portions of the information provided in this figure can be accessed at the Natural Resources Conservation Service

Arizona: http://1.usa.gov/19e2BdJ

New Mexico: http://www.wcc.nrcs.usda.gov/cgibin/resv_rpt.pl?state=new_mexico

Notes

The map gives a representation of current storage for reservoirs in Arizona and New Mexico. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage (blue fill) as a percent of total capacity. Note that while the size of each cup varies with the size of the reservoir, these are representational and not to scale. Each cup also represents last year's storage (dotted line) and the 1981–2010 reservoir average (red line).

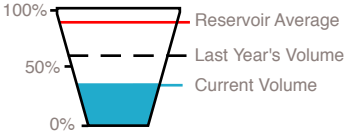
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). On average, 1 acre-foot of water is enough to meet the demands of 4 people for a year. The last column of the table lists an increase or decrease in storage since last month. A line indicates no change.

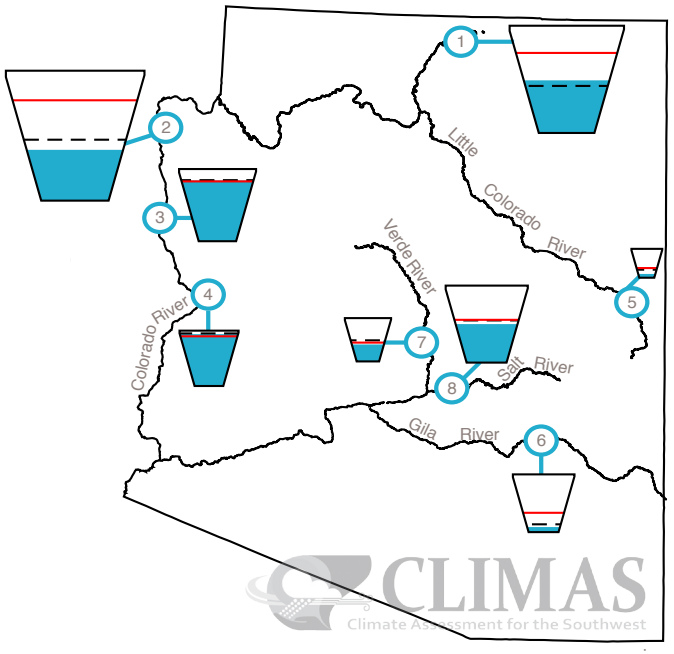
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

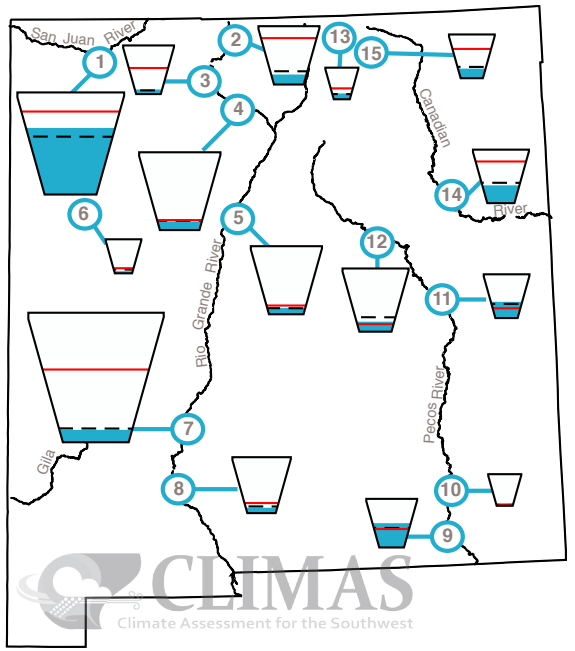
Reservoir Volumes

DATA THROUGH NOVEMBER 30, 2014

Data Source: National Water and Climate Center, Natural Resources Conservation Service







Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	49%	11,929.0	24,322.0	-361.0
2. Lake Mead	39%	10,309.0	26,159.0	66.0
3. Lake Mohave	84%	1,520.1	1,810.0	49.8
4. Lake Havasu	93%	575.7	619.0	25.5
5. Lyman	13%	3.8	30.0	-0.2
6. San Carlos	9%	74.8	875.0	5.3
7. Verde River System	39%	113.3	287.4	-18.9
8. Salt River System	50%	1,009.4	2,025.8	3.6

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	65%	1095.9	1,696.0	-0.5
2. Heron	17%	67.9	400.0	-2.5
3. El Vado	9%	17.7	190.3	-2.5
4. Abiquiu	11%	127.7	1,192.8	0.2
5. Cochiti	9%	45.9	491.0	-1.0
6. Bluewater	6%	2.4	38.5	-0.2
7. Elephant Butte	10%	212.5	2,195.0	28.9
8. Caballo	10%	31.6	332.0	0.4
9. Lake Avalon	50%	2.0	4.0	0.9
10. Brantley	8%	79.5	1,008.2	1.4
11. Sumner	37%	38.2	102.0	2.9
12. Santa Rosa	16%	69.8	438.3	-0.8
13. Costilla	18%	2.9	16.0	0.4
14. Conchas	33%	84.6	254.2	-2.8
15. Eagle Nest	22%	17.0	79.0	-0.1

* in KAF = thousands of acre-feet

Southwestern Oscillations

Be sure to visit our blog, Southwestern Oscillations

http://www.climas.arizona.edu/blog

CLIMAS YouTube Channel

Visit our new YouTube channel for mini-videos of content/discussion pulled from the podcast

https://www.youtube.com/user/UACLIMAS/

CLIMAS Podcasts

Visit our website or iTunes to subscribe to our podcast feed

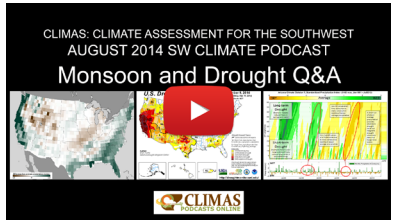
www.climas.arizona.edu/media/podcasts

https://itunes.apple.com/us/itunes-u/climate-in-the-southwest/id413143045

Notes from the Podcast - New Mini-Podcast Videos

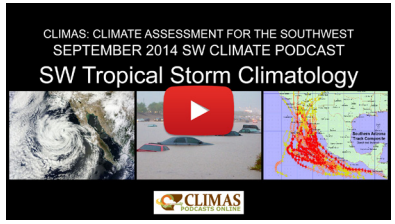
Regular podcast listeners will know that we cover a wide range of Southwest climate topics in a conversational manner. To make these discussions even more accessible and useful, we are pulling small segments from the podcasts and adding maps, images, and video to supplement the content. These offer an opportunity to quickly digest key points from the podcast and also serve as stand-alone teaching/illustration tools that are suitable for a wide range of audiences. You can find the videos and subscribe to the YouTube channel at https://www.youtube.com/user/UACLIMAS/.

We already have posted several mini-video podcasts:



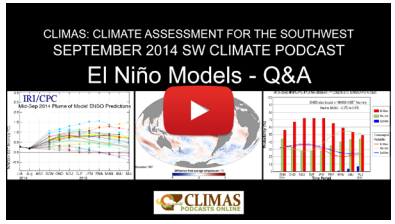
Monsoon and Drought Q&A

https://www.youtube.com/watch?v=Dk001_Yr-7k



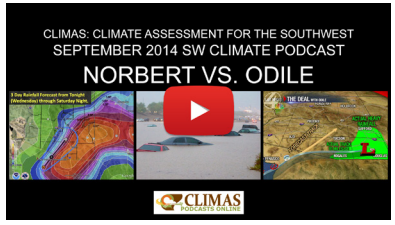
Southwest Tropical Storm Climatology

https://www.youtube.com/watch?v=IPRQxKI_jrw



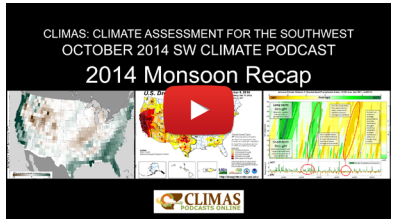
El Niño Forecast Models Q&A

https://www.youtube.com/watch?v=4kkQoArI8ck



Norbert vs. Odile - Tropical Storms in the Southwest

https://www.youtube.com/watch?v=UZpfyV2YCtw



2014 Monsoon Recap

https://www.youtube.com/watch?v=xkB7zHHpypU