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July Southwest Climate Outlook

Precipitation: June was very dry, with little to no precipitation save for remnant moisture from Hurricane Cristina. An on-time start to the monsoon led to above-average precipitation in the first two weeks of July in parts of Arizona and New Mexico. Since mid-January, most of Arizona and New Mexico have logged less than 50 percent of average precipitation.

Temperature: Most of Arizona and New Mexico were warmer than average in June. The onset of the monsoon around July 3 has driven lower-than-average temperatures across the region.

Water Supply: Total reservoir storage increased by about 1.2 million acre-feet (AF) in Arizona in June. Lake Powell rose by about 1.8 million AF and Lake Mead fell by about 394,000 AF. Storage stands at 47 percent of capacity in Arizona and is lower than it was one year ago (49 percent). In New Mexico, storage decreased by 127,000 AF in June, mostly due to a 137,000 acre-foot drop at Elephant Butte. Storage in New Mexico stands at 23 percent of capacity and is greater than it was one year ago (17 percent).

Drought: Moderate to extreme drought continues to cover nearly all of Arizona. More than 72 percent of the state is classified with severe drought while extreme drought covers about 16 percent of the state. Almost all of New Mexico is under moderate to exceptional drought (the highest category), with more than 77 percent of the state designated as severe and over 40 percent designated as extreme drought.

Monsoon: Monsoon storms began in southeastern Arizona around July 3, falling within the historical average onset date range. Precipitation since July 1 has been above average in many parts of southern Arizona but generally below average in southern New Mexico.

Fire Summary: Between January 1 and July 14, 1,074 wildfires burned 157,497 acres in Arizona and 551 wildfires scorched 20,675 acres in New Mexico. The monsoon has brought much needed moisture and humidity to the region.

ENSO: ENSO-neutral conditions continue. The probability that an El Niño event will develop is 70 percent, increasing to 80 percent in fall and winter. Most projections, however, remain uncertain as to the overall strength of the event.

Precipitation Forecasts: Forecasts point to above-average precipitation for Arizona and New Mexico over the next three months. Given widespread drought conditions, even an average monsoon could help improve drought conditions.

Temperature Forecasts: Monsoon storm cycles introduce variability into short-term temperature patterns, but the longer-term forecasts call for equal chances for above-, below-, and near-average temperatures. These forecasts are based in part on increasing temperature trends.

Tweet July's SW Climate Snapshot

CLICK TO TWEET

Strong start to the monsoon brings welcome moisture, even if we're still waiting for El Niño to ramp up @ http://bit.ly/1nfCmNE

Online Resources

Figure 1.
International Research Institute for Climate and Society
http://journals.ametsoc.org/doi/abs/10.1175/2007JCLI1762.1

Figure 2.
High Plains Regional Climate Center

http://www.hprcc.unl.edu/maps/current/

Figure 3.
National Weather Service, Tucson Forecast Office

http://www.wrh.noaa.gov/twc/monsoon/dewpoint_tracker.php

Monsoon Summary (June 15 – July 15)

Monsoon storms began around July 3 in many parts of southern Arizona. The average onset date of the monsoon in southeast Arizona is between July 1 and 6 (Figure 1). In months that preceded the monsoon, climatologists speculated that a developing El Niño event could delay the onset, an interpretation based on past analogs. This did not occur, in part because the atmosphere has yet to respond to the El Niño, despite warmer-than-average sea surface temperatures (SSTs) in the tropical Pacific Ocean (see El Niño Watch for details).

Many parts of Arizona received above-average precipitation last month thanks to monsoon rainfall (Figure 2). The spotty nature of the monsoon, however, belies sweeping characterizations that apply to all regions because above- and below-average rainfall is often experienced over short distances not captured by more sparsely located rain gauges. The Prescott area of Arizona, for example, has not yet been doused as much as other areas. Nonetheless, many weather stations in southeastern Arizona have measured above-average rainfall since June 15. These include the Tucson International Airport and airports in Douglas and Nogales, where rain has measured 1.61, 2.59, and 3.4 inches since June 15, respectively. These totals amount to 0.45, 1.01, and 1.14 inches above average, respectively. Sierra Vista logged 4.87 inches of rain—3.36 inches above average.

Many places around Arizona have felt above-average humidity. This is reflected in dewpoint temperatures, which increase as moisture content in the air increases, across the state. In Tucson, for example, dewpoints often have been above 60 degrees F (Figure 3), as they have in Phoenix and Yuma. These humidity levels indicate that moisture is present and, if other conditions converge, storms will result. The intensity and geographic coverage of the storms, however, also depend in part on atmospheric temperature gradients that enable air to rise, condense, and squeeze out rain, and on the presence of winds aloft that push storms off the mountains. Even if rain does not fall, higher levels of humidity help suppress fire risk, and fire restrictions across the regions are being eased.

While southern Arizona generally has experienced an active monsoon thus far, the opposite story has evolved in southern New Mexico and southwest Texas (Figure 2). El Paso, for example, has only received 0.32 inches of rain, or about 0.8 inches below average. The position of the high pressure system, which has largely been centered north of southeast Arizona, has helped create this juxtaposition. On the western, Arizona side of the system, moisture-laden air has been streaming from the south, whereas dry air has been wafting from the north on the eastern, New Mexican side.

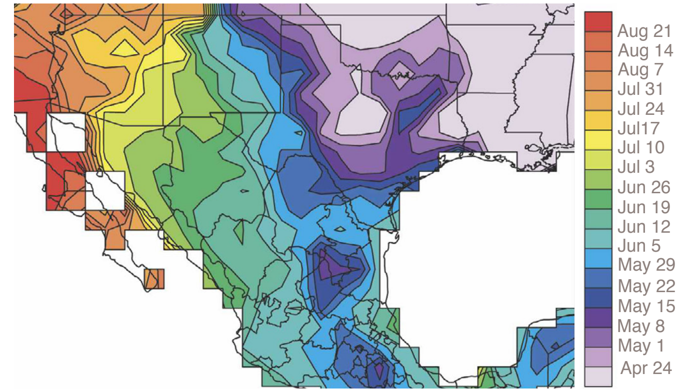


Figure 1. Historical monsoon onset date. Source: Liebmann et al., 2008; Journal of Climate.

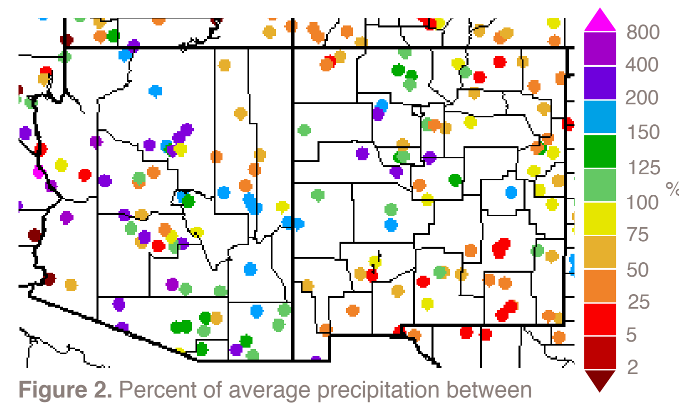


Figure 2. Percent of average precipitation between June 16 and July 15 at individual weather stations.

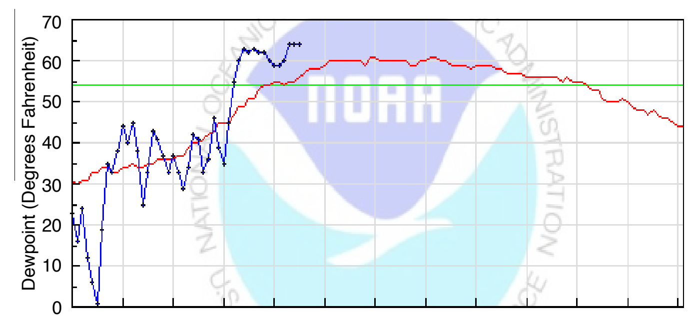


Figure 3. Dewpoint temperatures in Tucson, Arizona. Source: National Weather Service, Tucson.
http://www.wrh.noaa.gov/twc/monsoon/monsoon_tracker.php

Online Resources

Figure 1.
International Research Institute for Climate and Society
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/

Figure 2.
International Research Institute for Climate and Society

http://iri.columbia.edu/wp-content/uploads/2014/06/quick_look_composite_jun141.pdf

Figure 3.
Data from Climate Prediction Center; image created by CLIMAS

http://www.esrl.noaa.gov/psd/data/gridded/data.unified.daily.conus.html

El Niño Watch

The El Niño event that has been anticipated for the past several months continues to suffer from stage fright; it has yet to fully materialize across the equatorial Pacific Ocean. Nonetheless, forecasts remain bullish that an El Niño will form in coming months, and consequently the El Niño Watch is still in place. Probabilities that an El Niño will fully materialize this fall and winter reach slightly more than 70 percent, according to the mid-July ENSO forecast issued by the NOAA-Climate Prediction Center (CPC) and the International Research Institute for Climate and Society (IRI; Figure 1). These high probabilities reflect above-average sea surface temperatures (SSTS) in the far eastern Pacific and weak westerly winds in the central Pacific. Belief that this event will evolve into a strong El Niño, however, has lost muster because SSTs have hovered slightly above average and not steadily climbed (Figure 2). In addition, the atmosphere has failed to cooperate in a manner consistent with above-average SSTs. For an El Niño to gain strength, the warming SSTs in the central Pacific need to be accompanied by a subsequent weakening of the easterly trade winds which, in turn, reinforce warm SSTs. The easterly winds have yet to slacken as much as expected.

Nonetheless, the CPC forecast suggests that both the ocean and atmosphere are transitioning to and ultimately will become an El Niño. Feeding this expectation is the observation that convection in the central Pacific has become more organized in recent weeks. This indicates a growing atmospheric connection with the SSTs that could eventually lead to a weakening of the trade winds. Moreover, many of the dynamical forecast models (those that included both ocean and atmosphere dynamics) suggest a rapid warming in the central Pacific during the August–October period, with the El Niño event peaking in mid-winter of 2014 and 2015. Although the ultimate strength and duration remains uncertain, a weak to moderate event appears the most likely outcome, and the CPC notes the possibility for a strong event has diminished greatly in the past several months.

El Niño events tend to bring wetter conditions to the Southwest during the winter (Figure 3), with moderate and strong events delivering higher chances for above-average precipitation. However, if the El Niño event is weak, the precipitation outlook for the upcoming fall and winter becomes more uncertain. The strength and duration of the event should become clearer over the next two months as ocean and atmosphere signals lock in to each other.

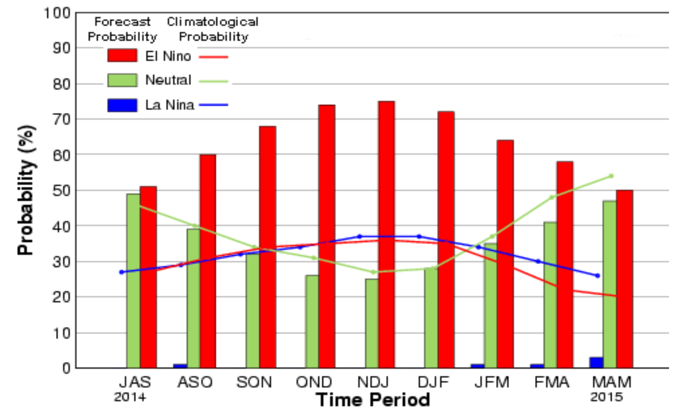


Figure 1. Mid-July seasonal probablities for ENSO phases. ENSO states based on sea surface temperature anomalies in the Niño 3.4 region. El Niño anomalies greater than 0.5 C; La Niña anomalies less than -0.5 C.

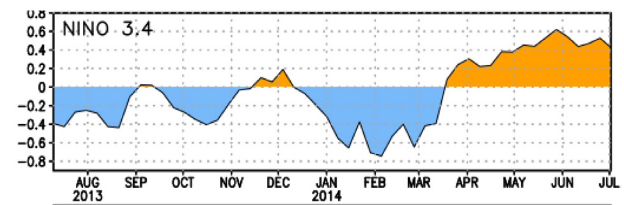


Figure 2: Time series of area-averaged SST anomalies (°C) in the Niño-3.4 (5°N–5°S, 170°W–120°W). SST anomalies are departures from the 1981–2010 base-period weekly averages.

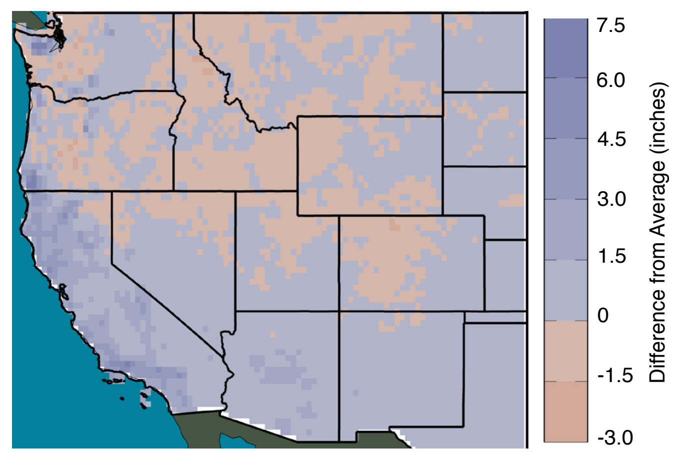


Figure 3. Precipitation anomalies during El Niño events. Anomalies are calculated for all El Niño events between 1950 and 2013.

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).

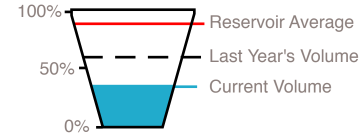
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

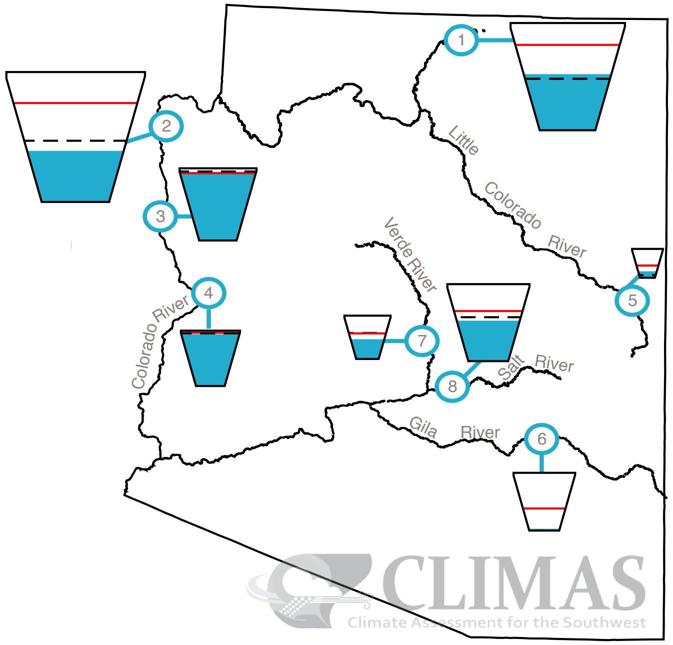
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

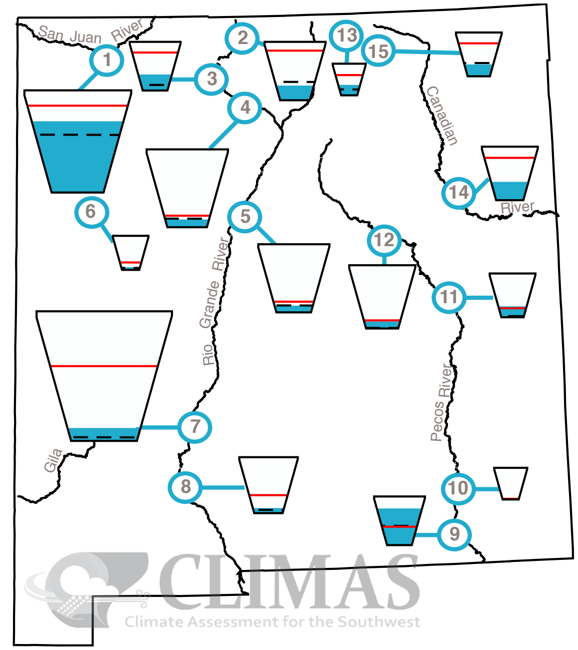
Reservoir Volumes

DATA THROUGH JUNE 30, 2014

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







Reservoir Name	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	52%	12,649.0	24,322.0	1799.0
2. Lake Mead	39%	10,233.0	26,159.0	-394.0
3. Lake Mohave	94%	1,694.1	1,810.0	-27.7
4. Lake Havasu	93%	578.2	619.0	-12.7
5. Lyman	22%	6.7	30.0	-2.0
6. San Carlos	3%	24.1	875.0	-23.6
7. Verde River System	45%	128.1	287.4	-3.9
8. Salt River System	52%	1,061.5	2,025.8	-66.4

*thousands of acre-feet

Reservoir Name	Capacity (% capacity)	Current Storage (KAF)*	Max Storage (KAF)*	Change in Storage (KAF)*
1. Navajo	69%	1176.7	1,696.0	34.6
2. Heron	25%	101.0	400.0	-4.3
3. El Vado	33%	62.6	190.3	14.4
4. Abiquiu	10%	119.0	1,192.8	-9.8
5. Cochiti	10%	47.5	491.0	-1.7
6. Bluewater	8%	3.0	38.5	-0.3
7. Elephant Butte	10%	226.4	2,195.0	-136.7
8. Caballo	9%	30.6	332.0	3.8
9. Lake Avalon	75%	3.0	4.0	-1.2
10. Brantley	2%	23.8	1,008.2	22.6
11. Sumner	25%	25.8	102.0	-4.5
12. Santa Rosa	11%	49.9	438.3	-17.1
13. Costilla	33%	5,2	16.0	-0.3
14. Conchas	86%	85.6	254.2	2.5
15. Eagle Nest	21%	21.2	79.0	-0.6

* KAF = thousands of acre-feet