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August Southwest Climate Outlook

Precipitation: Much of Arizona and New Mexico received average to above-average precipitation in the past 30 days, although as is often the case with the monsoon, precipitation intensity and location were inconsistent. New Mexico experienced more consistent precipitation, and central New Mexico saw a number of storms that brought considerable moisture. Arizona's monsoon has been patchy in nature, with large storm events, but fewer areas seeing repeated rainfall events. Many areas with above-average seasonal totals received most of their rainfall from just one or two large storms.

Temperature: Monsoon storms drove short-term temperature variability on a day-to-day basis, but over the past 30 days, most of Arizona and New Mexico experienced near-average temperatures.

Water Supply: In Arizona, total reservoir storage dropped by about 340,000 acre-feet (AF) in July, putting total reservoir capacity at 46 percent (compared to 48 percent last year). In New Mexico, total reservoir storage dropped 100,000 AF in July, putting total reservoir capacity at 22 percent (compared to 16 percent last year). Lake Mead and the Colorado River Basin received significant media attention in light of falling reservoir levels and the ongoing drought in the West. Our podcast series on the Colorado River ("1075") features extended conversations with regional experts on these issues.

Drought: Monsoon precipitation scaled back short-term drought conditions in Arizona and New Mexico, especially in the categories between severe and exceptional drought. This reduction reflects steady monsoon precipitation in New Mexico, and links to ongoing discussions about the extent to which monsoon moisture actually helps mitigate long-term drought.

Monsoon: Monsoon precipitation was variable across much of Arizona, with some regions (such as western Arizona) well above average for total monsoon precipitation thus far, and other areas (such as the Four Corners area) below monsoon average. A series of powerful monsoon storms drenched central New Mexico, and most of the state has tallied well-above-average monsoon precipitation, with the exception of the Four Corners region and the southeast.

ENSO: ENSO-neutral conditions continue, and August projections reduced the probability of an El Niño event developing from 80 percent to 65 percent. The potential strength of an El Niño event now is projected as weak to moderate, with little indication that it could develop into a strong event. A recent dip in sea-surface temperatures contributed to this dampened enthusiasm, but ongoing conditions still support the likely formation of an El Niño event later this fall or early winter.

Precipitation & Temperature Forecasts: The monsoon is expected to continue to bring storms and moisture into the region. Longer-term forecasts point toward above-average precipitation for Arizona and New Mexico, especially as conditions remain favorable for the development of an El Niño event. In the near term there is increased probability of above-average temperatures, but as we approach fall and winter, the prospect of an El Niño event, regardless of strength, suggests an increased probability of below-average temperatures for the Southwest.

Tweet August SW Climate Snapshot

CLICK TO TWEET

Lots of monsoon precipitation, but long-term drought conditions persist...And El Niño is still dragging its feet @ http://bit.ly/1ngg21V

Online Resources

Figure 1.
Climate Science Applications Program - University of Arizona Cooperative Extension
http://cals.arizona.edu/climate/misc/monsoon/perc_precip.jpg

Figure 2.
CSAP - University of Arizona Cooperative Extension
http://cals.arizona.edu/climate/misc/monsoon/perc_precip_nm.jpg

Figure 3.
CSAP - University of Arizona Cooperative Extension
http://cals.arizona.edu/climate/misc/monsoon/perc_days_rain.jpg

Figure 4.
CSAP - University of Arizona Cooperative Extensionn
http://cals.arizona.edu/climate/misc/monsoon/ perc_days_rain_nm.jpg

For more maps and other climate information, visit the Climate Science Applications Program (CSAP):

http://cals.arizona.edu/climate/

Monsoon Summary (June 15 – Aug 19)

The 2014 monsoon can be characterized many ways—the amount and intensity of rain has been spotty both spatially and temporally, the humidity has been persistently high, and precipitation has improved short-term drought conditions in many areas. Certainly it cannot be characterized as a dud.

With about a month remaining in the 2014 monsoon season, southeast Arizona, the higher elevation areas in central Arizona, and west-central Arizona have generally experienced above-average precipitation (Figure 1). West-central Arizona historically experiences less monsoon rainfall and more infrequent storms then other regions, and this year only a few storms have generated most of the observed rainfall in this region. Consequently, west-central Arizona boasts higher storm intensity, a metric that takes the total accumulated precipitation and divides it by the number of days with precipitation. Using this metric, west-central Arizona has an intensity of 0.5 inches per day; many of the higher elevation regions also have a similar intensity, where as the desert values are less than 0.2 inches per day. A notable exception occurs around Phoenix where 2–3 inches of rainfall fell on August 19 (with some nearby stations tallying as much as 5–6 inches) and caused severe flash flooding. In New Mexico, precipitation has been above average across most of the state and in particular within the Rio Grande basin (Figure 2). Consequently, short-term drought conditions have improved in recent weeks, although water storage is still low from the accumulated impacts of below-average winter rain and snow over the last decade.

The frequency of rain tells another story and shifts the focus to southeastern Arizona. In this region, precipitation greater than 0.1 inches has fallen during half of the days since June 15 (Figure 3). Most rain gauges in this region have measured near-average or above-average precipitation. Monsoon storms have also been frequent in New Mexico, with most of the state experiencing rainfall on half of the days since June 15 (Figure 4).

Tropical storm activity in the eastern Pacific Ocean has also been active, although all eight of the named cyclones have tracked westward away from the North American continent. Hurricane activity is expected to continue through October; this could bring even more moisture to the Southwest, as some of the biggest floods on record have occurred from decaying tropical storms wafting over the region.

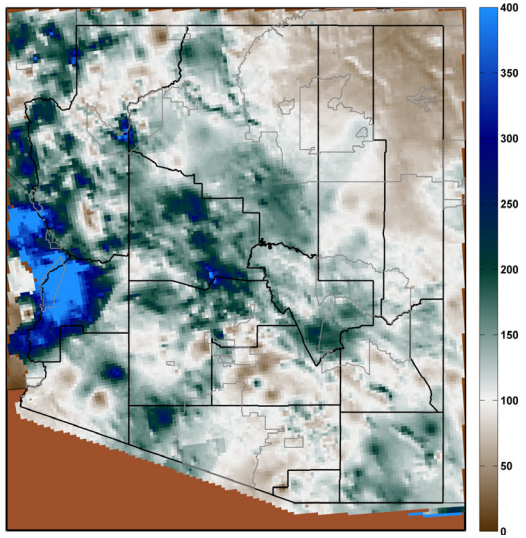


Figure 1: Arizona - Percent of Average Precipitation 6/15 - 8/19

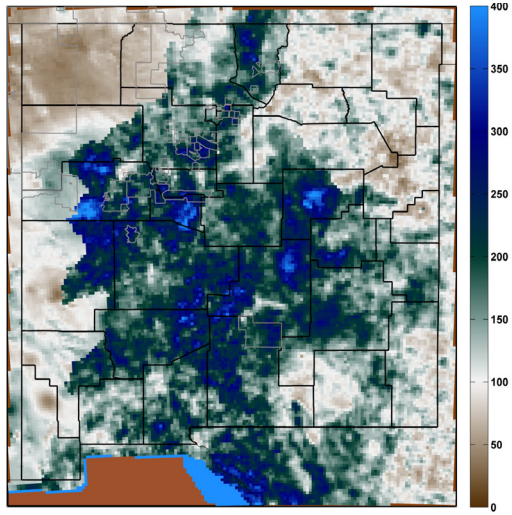


Figure 2: New Mexico - Percent of Average Precipitation 6/15 - 8/19

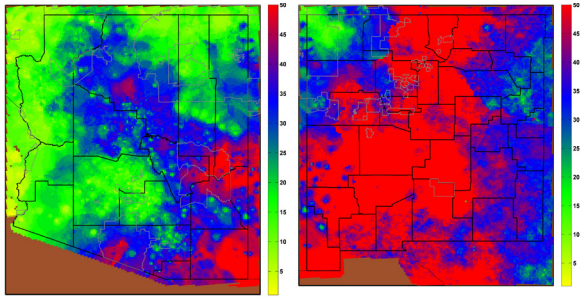


Figure 3-4: Arizona and New Mexico - Percent of Days with Rain 6/15 - 8/19

Online Resources

Figure 1.
International Research Institute for Climate and Society
http://iridl.ldeo.columbia.edu/maproom/ENSO/SST_Plots/Weekly_Anomaly.html

Figure 2.
NOAA Climate Prediction Center
http://www.cpc.ncep.noaa.gov/products/CFSv2/CFSv2seasonal.shtml

El Niño Watch

An "El Niño Watch" continues this month as issued by the NOAA Climate Prediction Center several months ago. The watch is just that: we are waiting and watching for the development of a full-fledged El Niño event that has yet to materialize across the equatorial Pacific Ocean. Several indicators of El Nino-Southern Oscillation (ENSO) status declined, moving back towards ENSO-neutral values over the past month instead of leaning towards an El Niño event as they had been. These shifts included slight cooling in the eastern Pacific Ocean and near-average wind patterns along the equator (Figure 1). But for those cheering on the development of an El Niño event, not all hope is lost. A slug of warm water just below the surface has materialized in the western Pacific Ocean and is slowly moving eastward. This is similar to the pulse of warm water that led to dramatic warming in the eastern Pacific Ocean earlier this spring. This "Kelvin Wave" is not as strong in magnitude as the earlier springtime wave, but is expected to surface in the eastern Pacific over the next several months, pouring fuel back into the El Niño engine.

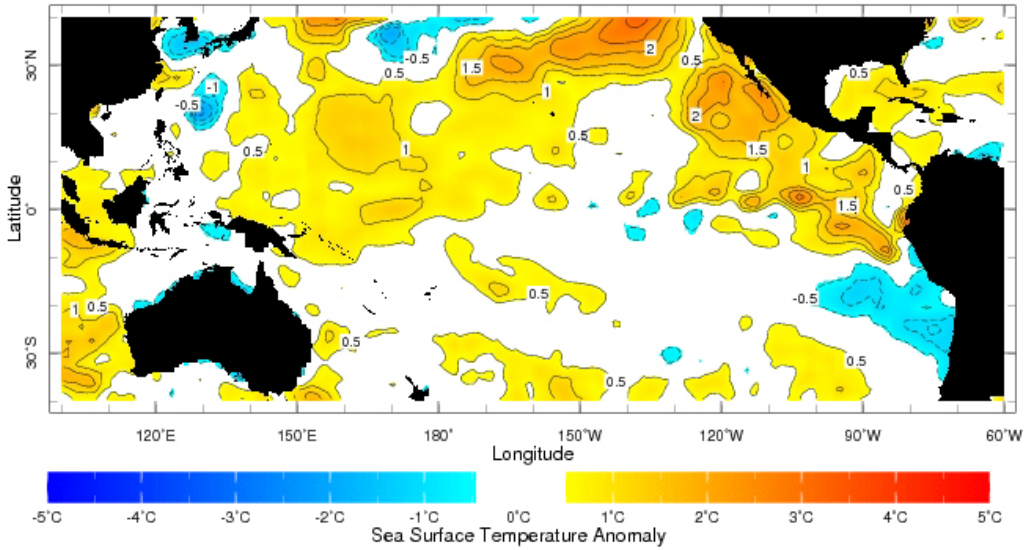


Figure 1: Sea-surface temperature departures from average for the period of Aug. 10-16, 2014

Seasonal ENSO outlooks pick up on this pattern and remain rather bullish in suggesting that an El Niño event is likely later this fall that would peak in early winter (Figure 2). The models suggest this would be a moderate event at best; in fact most models suggest a weak El Niño event of around 1 degree C above average in sea-surface temperatures in the central/eastern Pacific Ocean. The weaker the event, the trickier the forecast with respect to expected precipitation across Arizona and New Mexico. Weak El Niño events vary between wet, near average, and even dry winters in historical records across the Southwest. Official seasonal precipitation forecasts continue to suggest an enhanced chance of above-average precipitation across Arizona and New Mexico through the winter, but confidence in these forecasts is tied to the development and ultimate strength of the El Niño event that has yet to materialize.

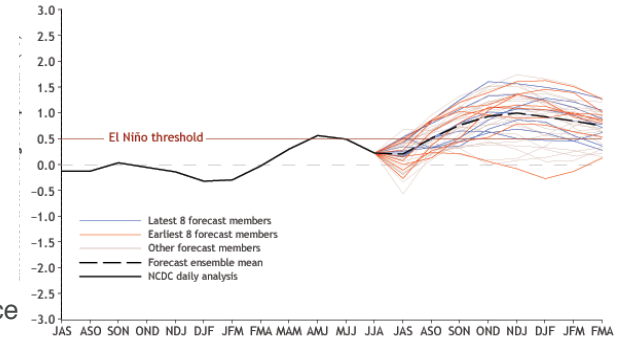


Figure 2: Sea Surface Temperature Anomalies for Niño 3.4 Region (CFSv2)

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).

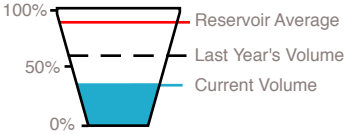
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). 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.

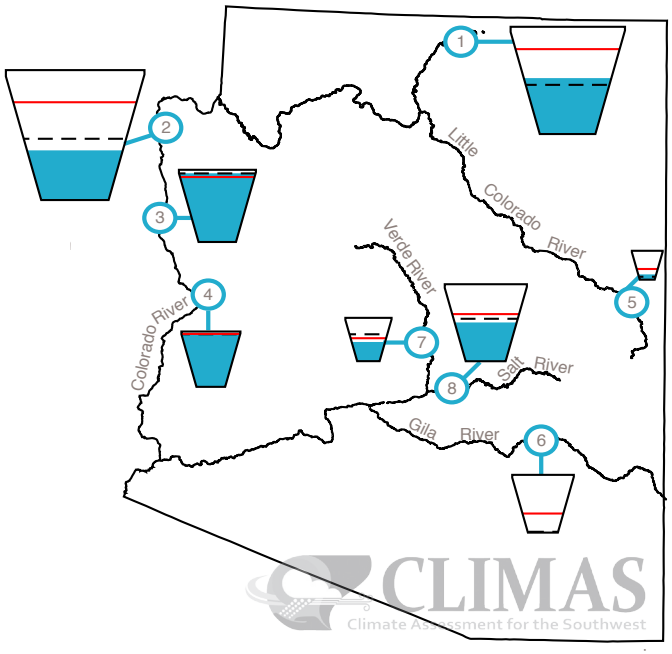
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

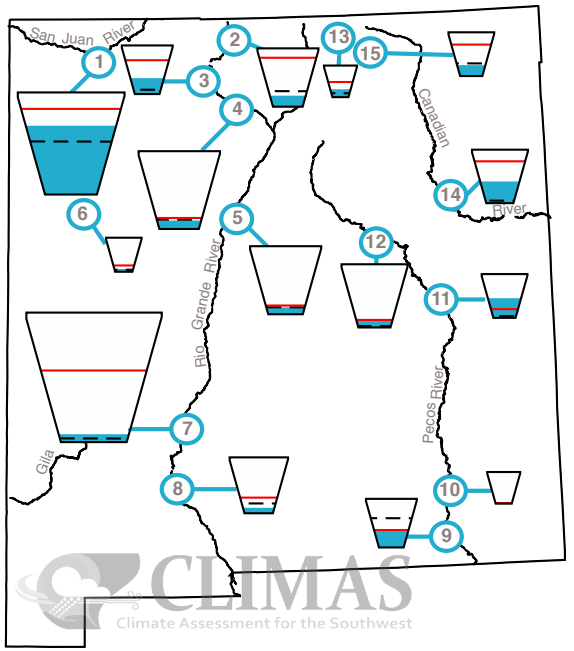
Reservoir Volumes

DATA THROUGH JULY 31, 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%	12,535.0	24,322.0	-114.0
2. Lake Mead	38%	10,061.0	26,159.0	-172.0
3. Lake Mohave	94%	1,701.3	1,810.0	7.2
4. Lake Havasu	95%	585.2	619.0	7.0
5. Lyman	18%	5.4	30.0	-1.3
6. San Carlos	1%	10.5	875.0	-13.6
7. Verde River System	44%	126.5	287.4	-1.6
8. Salt River System	50%	1,005.3	2,025.8	-56.2

*thousands of acre-feet

Reservoir Name	Capacity (% capacity)	Current Storage (KAF)*	Max Storage (KAF)*	Change in Storage (KAF)*
1. Navajo	67%	1134.9	1,696.0	-41.8
2. Heron	19%	77.0	400.0	-24.0
3. El Vado	33%	63.6	190.3	1.0
4. Abiquiu	11%	126.1	1,192.8	7.1
5. Cochiti	10%	48.6	491.0	1.1
6. Bluewater	8%	2.9	38.5	-0.1
7. Elephant Butte	6%	133.9	2,195.0	-92.5
8. Caballo	10%	31.6	332.0	1.0
9. Lake Avalon	35%	1.4	4.0	-1.6
10. Brantley	3%	34.9	1,008.2	11.1
11. Sumner	45%	46.0	102.0	20.2
12. Santa Rosa	12%	53.3	438.3	3.4
13. Costilla	25%	4,0	16.0	-1.2
14. Conchas	39.9%	101.3	254.2	15.7
15. Eagle Nest	24.8%	19.6	79.0	-1.6

* KAF = thousands of acre-feet

Southwestern Oscillations

A longer version of this article can be found on the CLIMAS blog

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

http://www.climas.arizona.edu/blog/recap-drought-and-water-supplies-southwest-1075-shortage-colorado-river

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

Online Resources

Figure 1.
Wikimedia Commons
https://en.wikipedia.org/wiki/Lake_Mead_National_Recreation_Area

1075 - Shortage on the Colorado River - CLIMAS Podcast Series

1075 is a CLIMAS podcast series that explores what a shortage declaration on the Colorado River would mean to those living in the Southwest. 1075 refers to the elevation of Lake Mead – in feet above sea level – that serves as the trigger for shared shortage restrictions. After years of drought and ever-increasing demands on the river, the latest projections from the Bureau of Reclamation suggest the lake could drop below 1075 sometime in 2015. Water availability and potential shortages are a persistent concern for the Southwest, and careful management and creative conservation efforts are a requisite part of a sustainable water use plan for the region. We knew this was a relevant issue when we planned and recorded the series, but we didn't anticipate the media frenzy that led to sensationalistic media coverage of Lake Mead levels in particular, and of water issues in the West more generally.

The media attention reinforced our goal of demystifying the rules and regulations that govern water use on the Colorado River, discussing what it means to the people and sectors across Arizona when a shortage occurs, and exploring the opportunities and consequences of a shortage to construct a nuanced view of a complex issue. The negative side—the specter of water shortage—is what receives the most attention. But, perhaps a shortage will spur innovation and lead to better conservation that saves money. At the most fundamental level, we wanted to know if Lake Mead falling below 1075 would be looked back upon as a moment in history that "changed everything" or if this seemingly inevitable moment would feel a lot like the Y2K craze.

We turned to regional water experts to help us understand Southwest water supply issues, the Central Arizona Project, realities of water management, opportunities for conservation, and details on what will actually happen if—and more likely when—a shortage declaration is made in the next few years.

Episode 1: Management of the Colorado River: Zack Guido and Ryan Thomas interview Doug Kenney of the University of Colorado Law School about the management and history of the Colorado River, who uses the water, and what a potential shortage could mean for the system. It provides a detailed overview of Colorado River management issues and is an excellent foundation for subsequent episodes.

Episode 2: Stressors on the River: Zack talks with University of Arizona researchers Bonnie Colby, George Frisvold, and Kiyomi Morino to discuss specific stressors (such as agricultural or municipal use) on the Colorado River Basin, how these stressors may change over time, and how these changes may affect management and behaviors across the Southwest.

Episode 3: Shortage Impacts on the Central Arizona Project: Zack and Ryan are joined by Mohammed Mahmoud of the Central Arizona Project (CAP) to talk about the role that CAP plays in delivering Colorado River water throughout Arizona, as well as implications for the CAP system if a shortage declaration is made.

Episode 4: The Central Arizona Groundwater Replenishment District: Zack interviews Dennis Rule of the Central Arizona Groundwater Replenishment District (CAGRD) to get into details about the CAGRD in the management of Arizona groundwater and potential impacts on the system from continued drought in the Colorado River Basin.

Episode 5: Tucson Water and Municipal Water Issues: Zack talks with Alan Forrest, the director of Tucson Water, about strategies that Tucson implemented to deal with potential water shortages, the conservation and recapture efforts of municipalities in Southern Arizona, and the practical realities of providing municipal water to an growing population in the Southwest.

CLIMAS PODCASTS ONLINE

Available on iTunes

www.climas.arizona.edu/media/podcasts