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March Southwest Climate Outlook

Precipitation & Temperature: Precipitation varied considerably across the Southwest in February, but temperatures remained warm throughout the region. Precipitation amounts ranged from below average to much-above average, with the wetter areas concentrated in southern Arizona and southwestern New Mexico and the driest areas occurring in the Four Corners region and northeastern New Mexico (Fig. 1a). Temperatures ranged from average to above average in Arizona, and from above average to much-above average in New Mexico (Fig. 1b). Dec-Feb (DJF) precipitation was mostly below normal to much-below normal, with isolated areas of record-driest precipitation (Fig. 2). DJF temperatures were much-above normal to record warmest in Arizona and near normal to record warmest in New Mexico (Fig. 3).

Snowpack & Water Supply: Snowpack and snow water equivalent (SWE) have increased marginally over last month owing to increased winter storm activity. Even so, most of the stations in Arizona and New Mexico are reporting less than 25 percent of average, with the remainder reporting 25-50 percent of average (Fig. 4). The higher-elevation regions in Colorado and Utah that feed many of our waterways are not faring much better, with most stations reporting SWE of 25-75 percent of average. These data raise concerns about drought impacts on reservoir storage levels, rangeland and agricultural conditions, and wildfire risk going into the spring and summer seasons.

Drought: Drought-designated areas were further expanded and intensified in the March 13 U.S. Drought Monitor, with both Arizona and New Mexico documenting increases in the extent and intensity of drought since February's outlook. The predominant classification in both states was severe drought (D2), while the remainder was a roughly equal mix of extreme drought (D3) and moderate drought (D1) (Fig. 5). These designations reflect short-term precipitation deficits and warm temperatures at monthly and seasonal timescales, as well longer-term drought conditions that track the cumulative effect of extended periods of warmer- and drier-than-normal conditions. February clawed back some of the precipitation deficit that accumulated over the previous weeks and months, but isolated events are unlikely to reverse longer-term trends or alleviate long-term drought and its impacts.

Wildfire: The National Significant Wildland Fire Potential Outlook for April identified above-normal wildland fire risk for eastern New Mexico and the borderlands region in New Mexico and southeastern Arizona (Fig. 6). The above-normal fire risk expanded to include nearly all of Arizona and New Mexico in May and June. Warm and dry conditions this winter, in conjunction with above-normal fine-fuel loading and continuity, are major drivers of the elevated risk.

ENSO & La Niña: Oceanic and atmospheric conditions are still generally indicative of a La Niña event, but suggest a return to ENSO-neutral relatively soon. Most forecasts and outlooks call for a gradual decay to ENSO-neutral over spring, although some agencies have already declared this La Niña event over (see ENSO tracker on p. 3 for details). La Niña events tend to produce warmer- and drier-than-average winters in the Southwest, which is consistent with the DJF temperature and precipitation patterns observed this year.

Precipitation & Temperature Forecast: The three-month outlook for March through May calls for increased chances of below-average precipitation (Fig. 7, top) and increased chances of above-average temperatures (Fig. 7, bottom) for the southwestern United States.

Tweet Mar 2018 SW Climate Outlook CLICK TO TWEET

MAR2018 @CLIMAS_UA SW Climate Outlook, La Niña Tracker, La Niña WInters, AZ & NM Reservoir volumes http://bit.ly/2phEIGV #SWclimate #AZWX #NMWX #SWCO

Online Resources

Figure 1
National Centers for Environmental Information
ncei.noaa.gov

Figures 2-4
Western Regional Climate Center
wrcc.dri.edu

Figure 5
U.S. Drought Monitor
droughtmonitor.unl.edu

Figure 6
National Interagency Fire Center
nifc.gov

Figure 7
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

March 2018 SW Climate Outlook

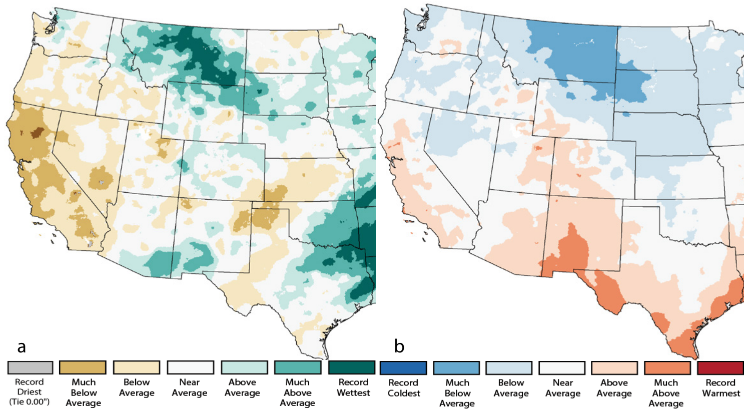


Figure 1: Feb 2018 Precipitation (a) & Temperature Ranks (b)

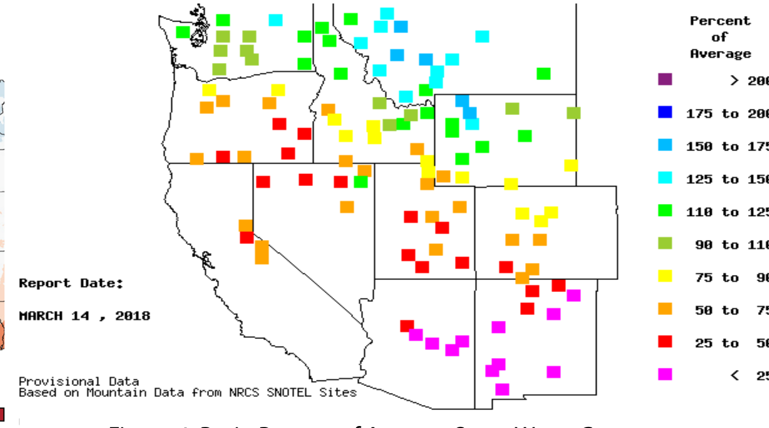


Figure 4: Basin Percent of Average Snow Water Content

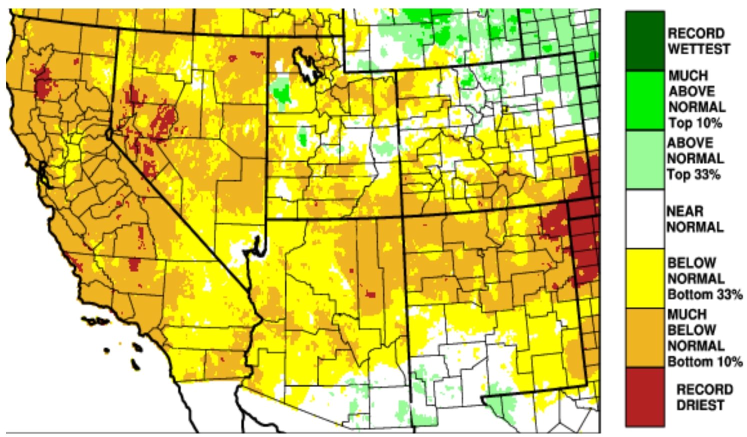


Figure 2: Dec 2017 - Feb 2018 - Precipitation Percentile

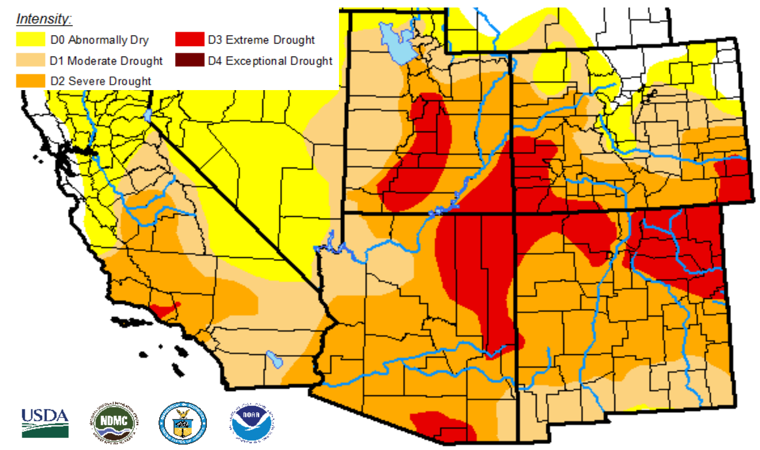


Figure 5: US Drought Monitor - Mar 13, 2018

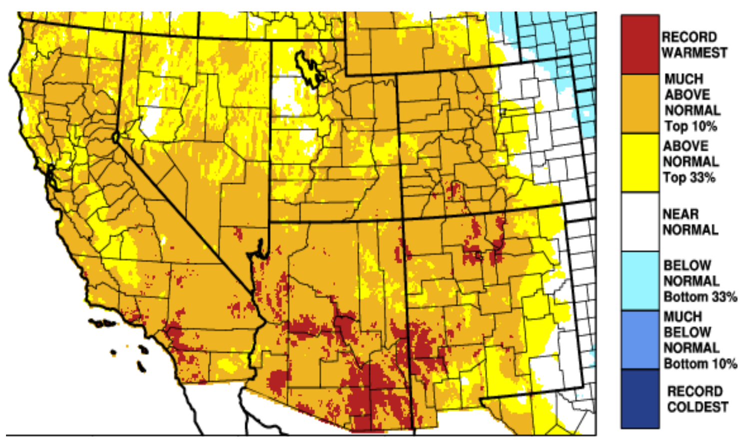


Figure 3: Dec 2017 - Feb 2018 - Mean Temperature Percentile

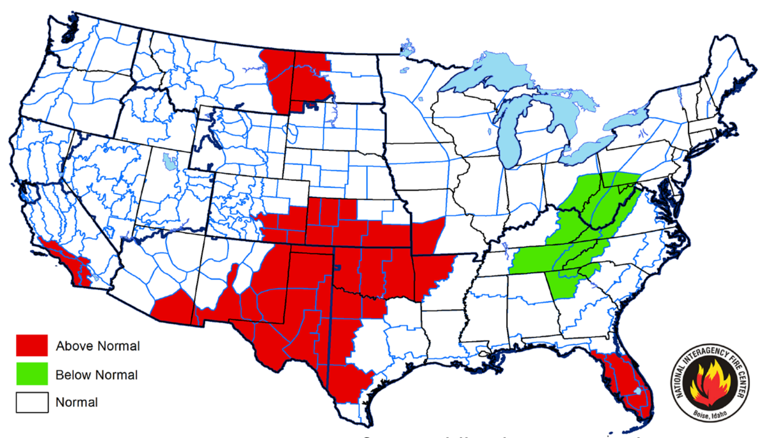


Figure 6: Apr 2018 Significant Wildland Fire Potential

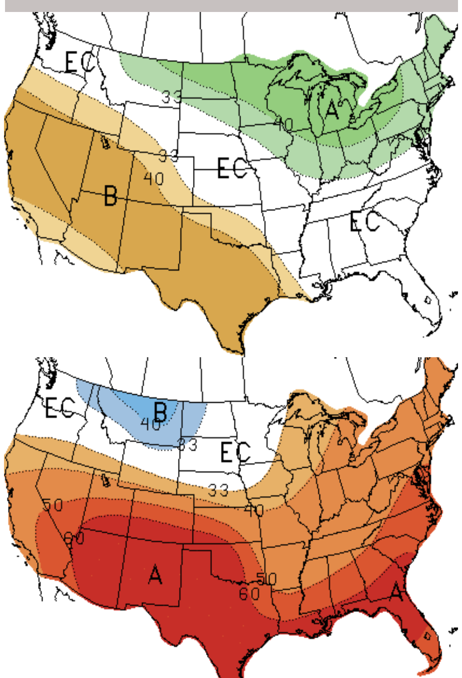


Figure 7: Three-Month Outlook - Precipitation (top) & Temperature (bottom) - Mar 15, 2018

Online Resources

Figure 1
Australian Bureau of Meteorology
bom.gov.au/climate/enso

Figure 2
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

Figure 3
International Research Institute for Climate and Society
iri.columbia.edu

Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

El Niño / La Niña

Information on this page is also found on the CLIMAS website:

climas.arizona.edu/sw-climate/el-niño-southern-oscillation

La Niña Tracker

La Niña conditions continued for another month as indicated by atmospheric and oceanic conditions (Figs. 1-2). Most forecasts saw some signs of weakening and identified a likely transition to ENSO-neutral conditions over the spring, although the exact timing varies. On March 8, the NOAA Climate Prediction Center (CPC) continued its La Niña advisory but predicted a 55-percent chance of the weakening La Niña event to transition to ENSO-neutral in the spring. On March 8, the International Research Institute's (IRI) ENSO Quick Look called for La Niña to last into early spring (Fig. 3) and a return to neutral conditions by mid-spring. On March 9, the Japanese Meteorological Agency (JMA) identified ongoing La Niña conditions and called for a 70-percent chance that this event will end this summer, with ENSO-neutral conditions likely over the summer. On March 13, the Australian Bureau of Meteorology declared the La Niña event had ended, identifying that ENSO indicators had "eased back to neutral over the past several weeks." The North American Multi-Model Ensemble (NMME) is consistently indicative of a weak La Niña event returning to neutral conditions over spring (Fig. 4).

Summary: Warmer- and drier-than-average winter conditions are associated with La Niña in the Southwest. However, Southwest winters are dry to begin with, so La Niña does not necessarily reflect a radical departure from normal. What is clear from looking at past events is that La Niña winters are rarely wetter than average at a seasonal timescale. But wetter-than-average *months* have occurred during past La Niña events, and February 2018 demonstrated what that looks like, at least in southern Arizona and southwestern New Mexico. Those regions recorded above-average precipitation in February, albeit with relatively few days of rain, while most of the rest of the region was stuck with warm and dry conditions. These storms were a welcome change of pace but did little to alter long-term drought or reverse the accumulated precipitation deficits. Warm temperatures also meant some precipitation fell as rain instead of snow at much higher elevations than might typically be expected in February. Persistent warm temperatures and below-average winter precipitation also reduced snowpack and snow water equivalent across the western United States, raising concerns about water resource management going into spring and summer, when water banked as snow provides a steady supply of water for the region in the form of snowmelt and streamflow. February 2018 may have been an outlier compared to a normal La Niña February, but the Dec-Feb precipitation totals and average temperatures were generally in line with typical La Niña events in the Southwest.

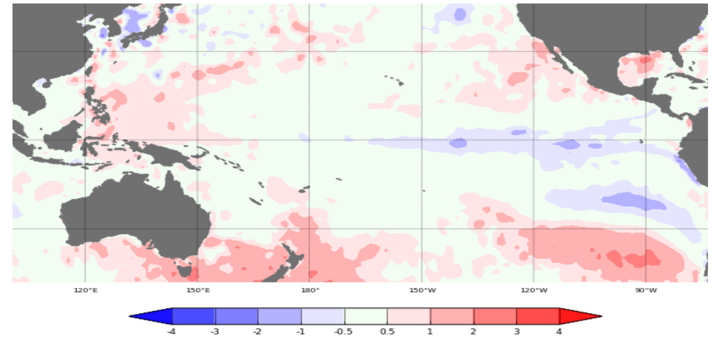


Figure 1: Feb 2018 Sea Surface Temperature (SST) Anomalies

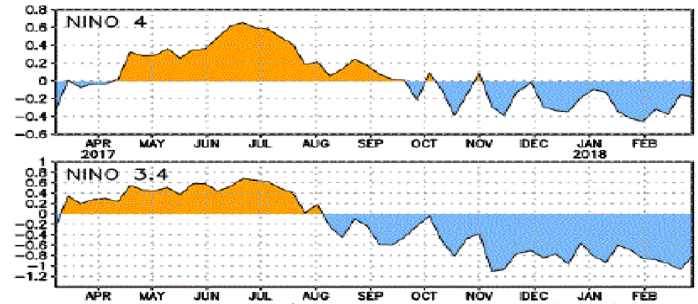


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

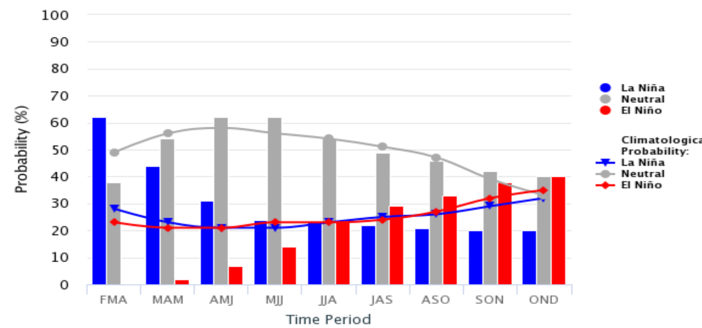


Figure 3: Early-Mar IRI/CPC Model-Based Probabilistic ENSO Forecast

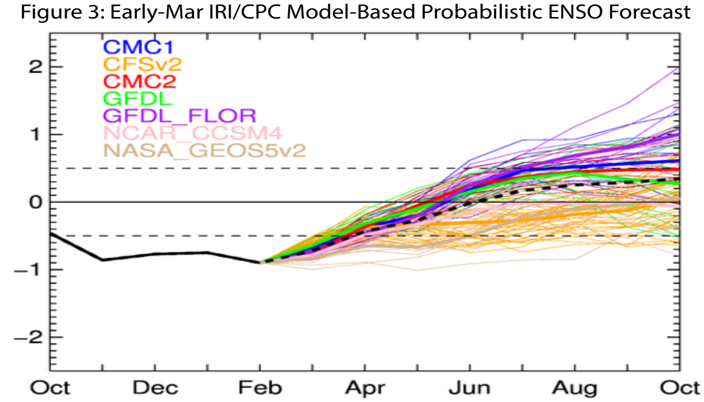


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figures 5-8
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

La Niña Tracker (cont.)

The following plots characterize the range of values for monthly and seasonal precipitation totals for Winter (Dec-Feb (DJF)), at four weathers stations in the Southwest (Flagstaff, AZ; Tucson, AZ, Albuquerque, NM, and El Paso, TX). The dots correspond to observed monthly and DJF precipitation for each year since 1950, color coded by the ENSO status of that year. The horizontal black lines correspond to 2017-2018 precipitation (monthly and DJF seasonal totals) at each station.

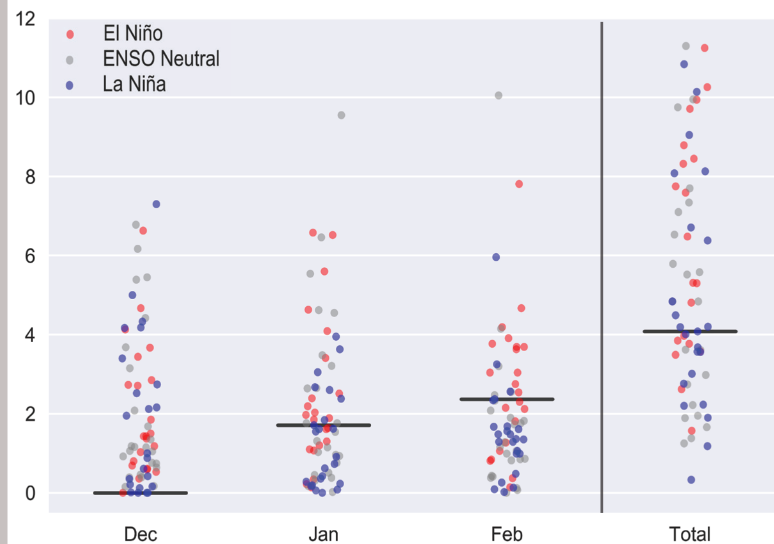


Figure 5 - Winter (DJF) Precipitation - Flagstaff, AZ

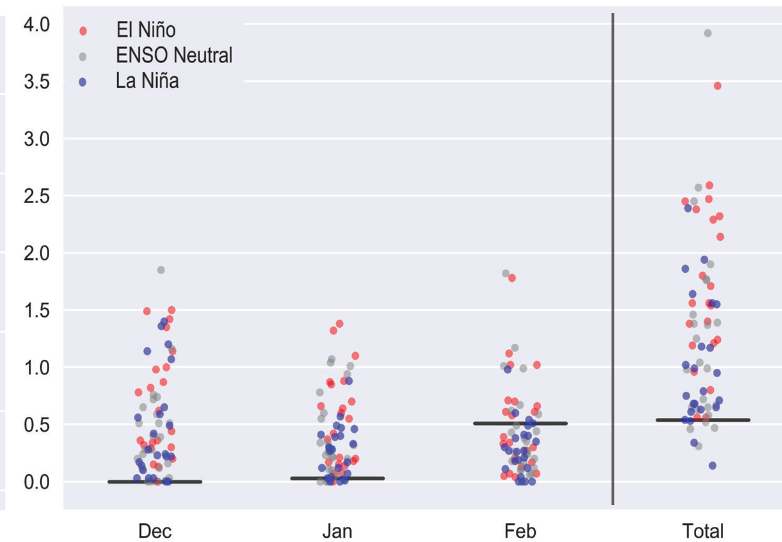


Figure 7 - Winter (DJF) Precipitation - Albuquerque, NM

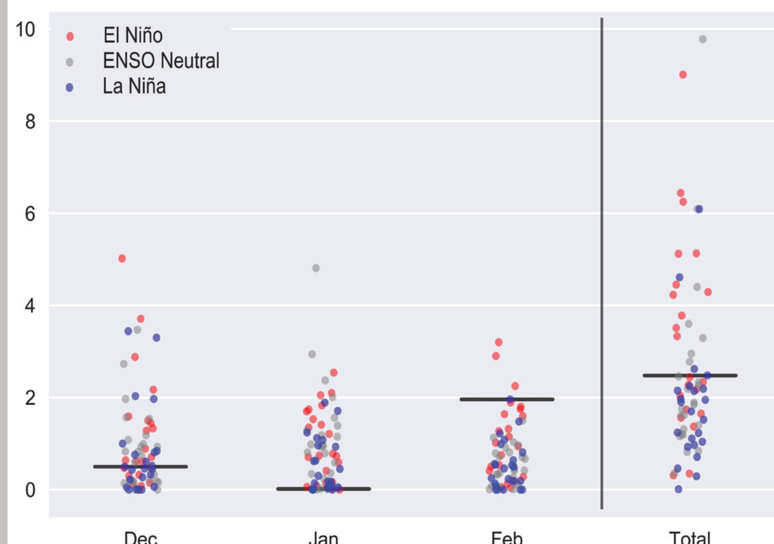


Figure 6 - Winter (DJF) Precipitation - Tucson, AZ

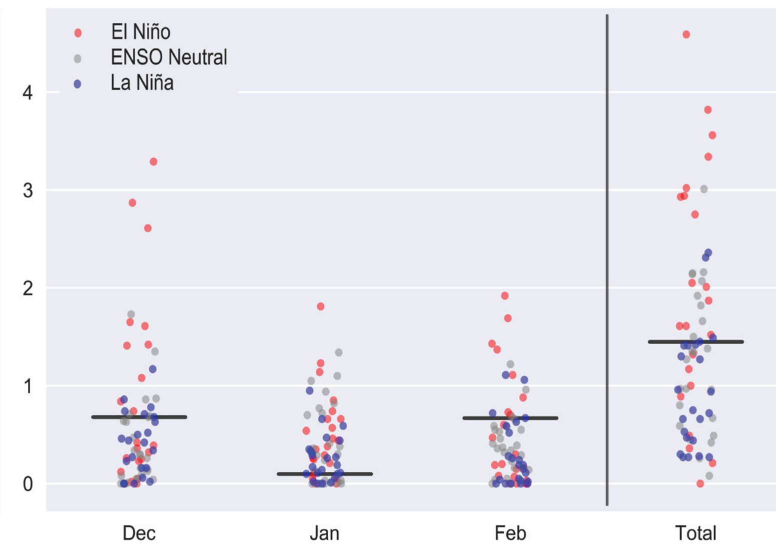
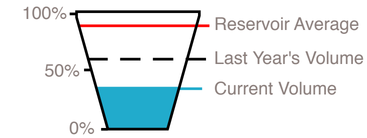


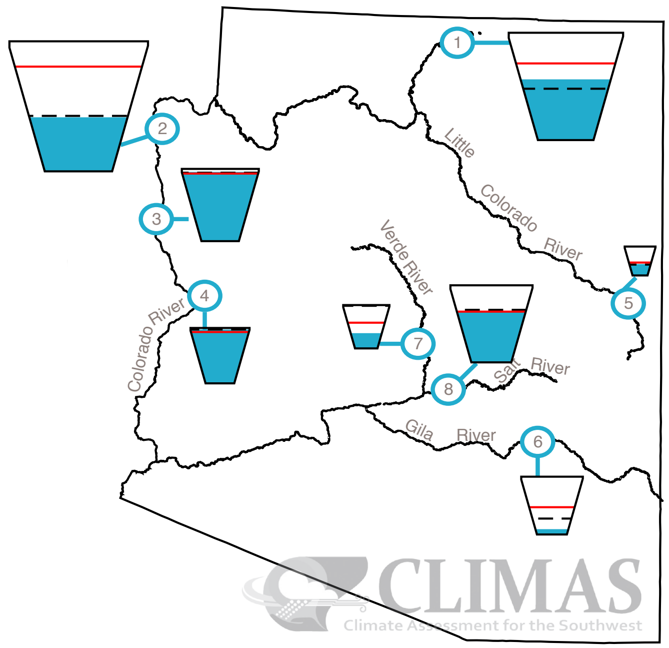
Figure 8 - Winter (DJF) Precipitation - El Paso, TX

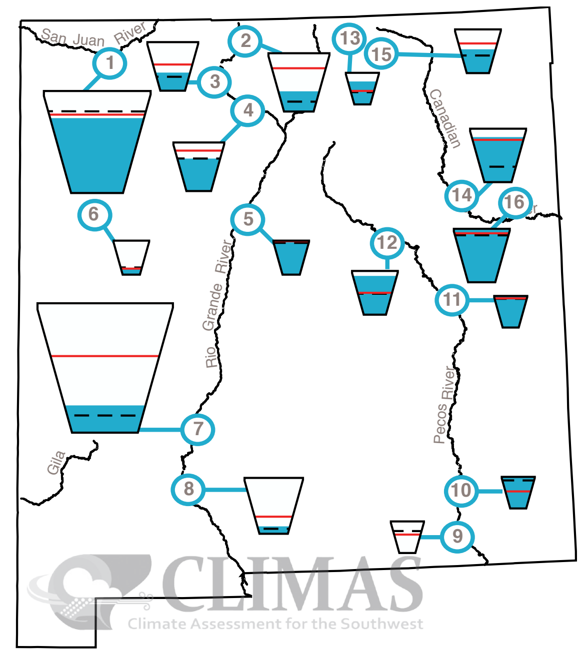
Reservoir Volumes

DATA THROUGH FEBRUARY 28, 2018

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







* in KAF = thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	55%	13,345.8	24,322.0	-326.5
2. Lake Mead	41%	10,697.0	26,159.0	55.0
3. Lake Mohave	94%	1,700.0	1,810.0	62.0
4. Lake Havasu	95%	589.1	619.0	47.7
5. Lyman	37%	11.1	30.0	0.0
6. San Carlos	7%	63.4	875.0	1.3
7. Verde River System	34%	98.0	287.4	-12.2
8. Salt River System	64%	1,297.4	2,025.8	6.4

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	73%	1,246.0	1,696.0	-8.8
2. Heron	35%	139.9	400.0	-5.9
3. El Vado	37%	70.6	190.3	3.0
4. Abiquiu	67%	125.0	186.8	4.0
5. Cochiti	96%	48.1	50.0	0.1
6. Bluewater	16%	6.2	38.5	-0.1
7. Elephant Butte	22%	482.8	2,195.0	24.2
8. Caballo	13%	44.5	332.0	6.8
9. Lake Avalon	0%	0.0	4.5	0.0
10. Brantley	100%	44.9	42.2	1.6
11. Sumner	100%	42.5	102.0	0.8
12. Santa Rosa	89%	93.9	105.9	-0.4
13. Costilla	71%	11.4	16.0	0.5
14. Conchas	84%	213.2	254.2	-0.4
15. Eagle Nest	54%	42.8	79.0	0.1
16. Ute Reservoir	100%	202	200	-1.0

Online Resources

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

www.wcc.nrcs.usda.gov/BOR/basin.html

Contact Ben McMahan with any questions or comments about these or any other suggested revisions.

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 four 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).

Online Resources

Figure 1
Climate Program Office
cpo.noaa.gov

RISA Program Homepage
http://cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/RISA

UA Institute of the Environment
environment.arizona.edu

New Mexico Climate Center
weather.nmsu.edu

CLIMAS Research & Activities

CLIMAS Research
climas.arizona.edu/research

CLIMAS Outreach
climas.arizona.edu/outreach

Climate Services
climas.arizona.edu/climate-services

CLIMAS
Climate Assessment for the Southwest
A NOAA RISA TEAM

What is CLIMAS?

The Climate Assessment for the Southwest (CLIMAS) program was established in 1998 as part of the National Oceanic and Atmospheric Administration's Regional Integrated Sciences and Assessments program. CLIMAS—housed at the University of Arizona's (UA) Institute of the Environment—is a collaboration between UA and New Mexico State University.

The CLIMAS team is made up of experts from a variety of social, physical, and natural sciences who work with partners across the Southwest to develop sustainable answers to regional climate challenges.

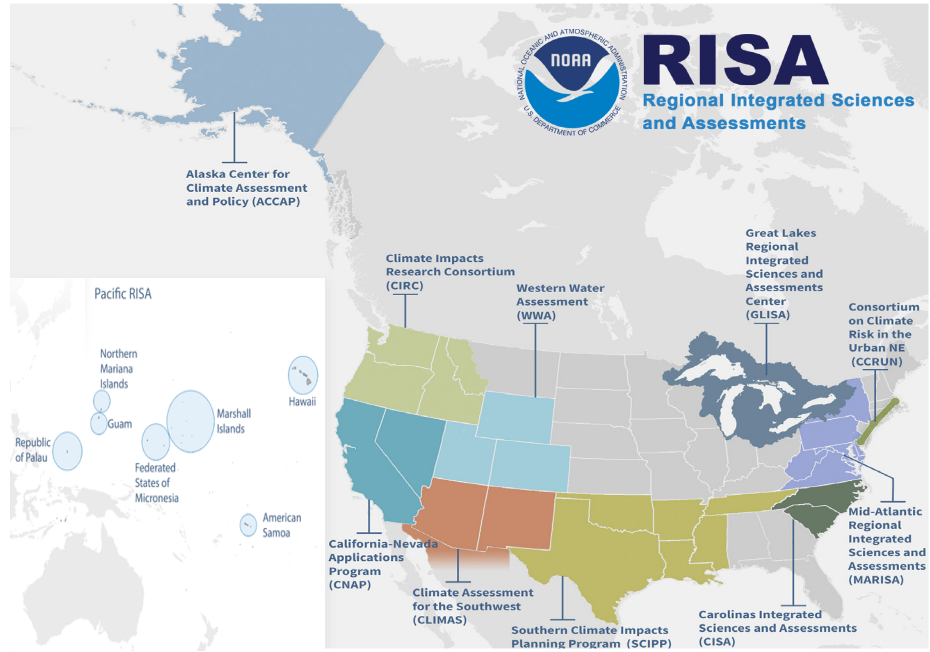


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions

What does CLIMAS do?

The CLIMAS team and its partners work to improve the ability of the region's social and ecological systems to respond to and thrive in a variable and changing climate. The program promotes collaborative research involving scientists, decision makers, resource managers and users, educators, and others who need more and better information about climate and its impacts. Current CLIMAS work falls into six closely related areas: 1) decision-relevant questions about the physical climate of the region; 2) planning for regional water sustainability in the face of persistent drought and warming; 3) the effects of climate on human health; 4) economic trade-offs and opportunities that arise from the impacts of climate on water security in a warming and drying Southwest; 5) building adaptive capacity in socially vulnerable populations; and 6) regional climate service options to support communities working to adapt to climate change.

UPCOMING - CLIMAS & Southwest Climate Science Center Colloquium & Panel Q&A

Fire in the Southwest Today

Mar 23, 10am - 11:30am (AZ/PDT time)

Dr. Tim Brown (Desert Research Institute)

Dr. Dan Cayan (Scripps Institution of Oceanography)

Dr. Don Falk (University of Arizona)

Dr. Tamara Wall (Desert Research Institute)

Join us in person or online for a colloquium and panel discussion Q&A about fire in the Southwest.

In Person: University of Arizona, ENR2, N595

Webinar/Online: http://bit.ly/2IxKHKy

Details: http://bit.ly/2GxR9Ao