Contributors

Ben McMahan
SWCO Editor; Research, Outreach & Assessment Specialist (CLIMAS)

Mike Crimmins
UA Extension Specialist

Dave Dubois
New Mexico State Climatologist

Gregg Garfin
Founding Editor and Deputy Director of Outreach, Institute of the Environment

Nancy J. Selover
Arizona State Climatologist

Betsy Woodhouse
Institute of the Environment

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February Southwest Climate Outlook

Precipitation & Temperature: January was warm and dry across the Southwest. Precipitation was average to below average in most of Arizona, and below average to much-below average in New Mexico (Fig. 1a). Temperatures were much-above average to record warmest in Arizona, and ranged from near average to much-above average in New Mexico (Fig. 1b). Looking to the water year (Oct. 1-present), much of Arizona and New Mexico have been recording below-normal precipitation (Fig. 2) and above-average temperatures (Fig. 3) for the period.

Snowpack & Water Supply: Snowpack and snow water equivalent (SWE) are below average across the Southwest (Fig. 4), with most stations in Arizona and New Mexico having recorded less than 25 percent of normal until recent storms in mid-February boosted SWE in central Arizona. La Niña typically brings warmer and drier conditions to the Southwest in winter, so these patterns are not unexpected, but they do raise concerns about drought impacts on water resource management, reservoir storage levels, rangeland and agricultural conditions, and wildfire risk.

Drought: Drought-designated areas were further expanded and intensified in the Feb. 13 U.S. Drought Monitor, with both Arizona and New Mexico documenting increases in the extent and intensity of drought since January's outlook. The predominant classification in both states was severe drought (D2), with moderate drought (D1) covering the remaining areas except for small pockets of extreme drought (D3) (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. A winter storm is bringing substantial moisture to southern and central Arizona at the time of this writing, which will help moderate short-term conditions but do little to alleviate long-term drought and its impacts.

Wildfire: Warm and dry conditions this winter, in conjunction with above-normal fine fuel loading and continuity, have led to a relatively early start to fire season, thus we are initiating the seasonal fire risk outlooks sooner than in previous years. The National Significant Wildland Fire Potential Outlook for February and March identifies above-normal wildland fire risk for southeastern New Mexico and portions of the borderlands region in southwestern New Mexico and southeastern Arizona (Fig. 6). The extended outlook for April and May identifies above-normal wildland fire risk in nearly all of Arizona and New Mexico. Notably, two fires are already burning in southern Arizona, including the Altar fire and the Knob Hill fire.

ENSO & La Niña: Oceanic and atmospheric conditions continue to indicate an ongoing La Niña event of near-moderate strength. The event is starting to show signs of returning to ENSO-neutral, and most forecasts and outlooks indicate a gradual decay to ENSO-neutral this spring. In the Southwest, La Niña events tend to produce drier-than-average winters, and given the observed conditions this fall and winter, the La Niña influence continues to cause concern in the Southwest in terms of winter precipitation, drought, and water resource management.

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 Feb 2018 SW Climate Outlook

CLICK TO TWEET

FEB2018 @CLIMAS_UA SW Climate Outlook, La Niña Tracker, Recent La Niña WInters, AZ & NM Reservoir volumes http://bit.ly/2EuAThS #SWclimate #AZWX #NMWX #SWCO

February 2018 SW Climate Outlook

Online Resources

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

Figures 2-3
High Plains Regional Climate Center
hprcc.unl.edu

Figure 4
Western Regional Climate Center
wrcc.dri.edu

Figure 6
U.S. Drought Monitor
droughtmonitor.unl.edu

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

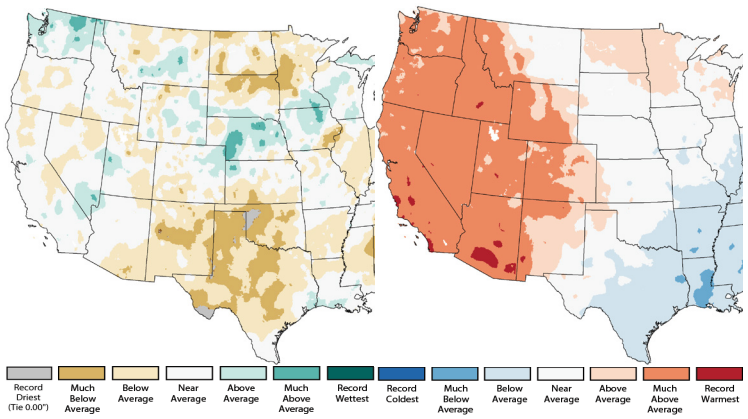


Figure 1: Jan 2018 Precipitation (a) & Temperature Ranks (b)

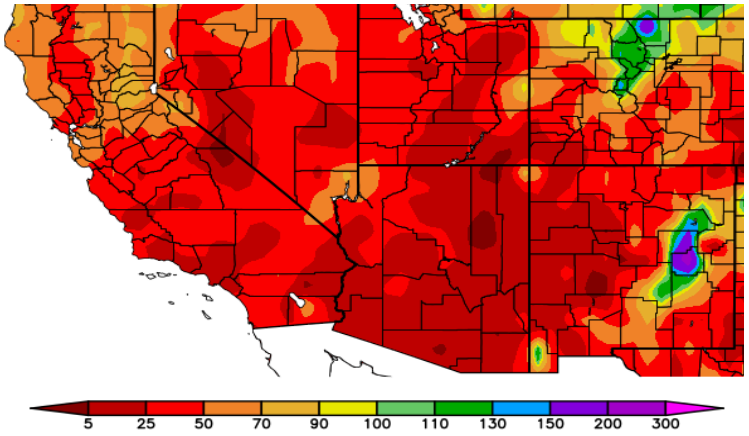


Figure 2: Oct 1 2017 - Feb 14, 2018 - Percent of Normal Precipitation

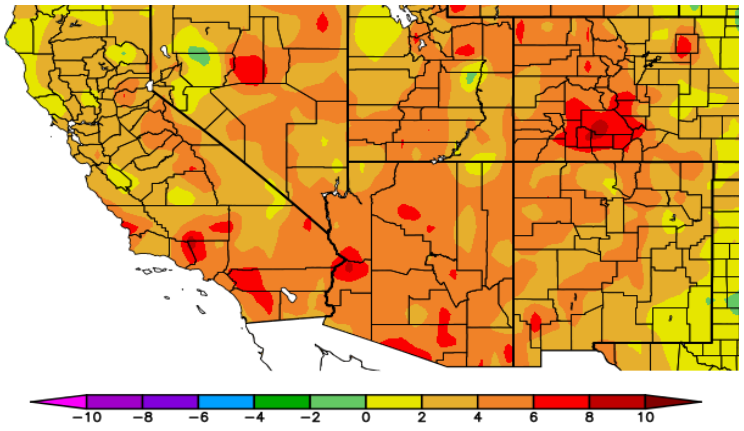


Figure 3: Oct 1 2017 - Feb 14, 2018 - Departure from Normal Temperature

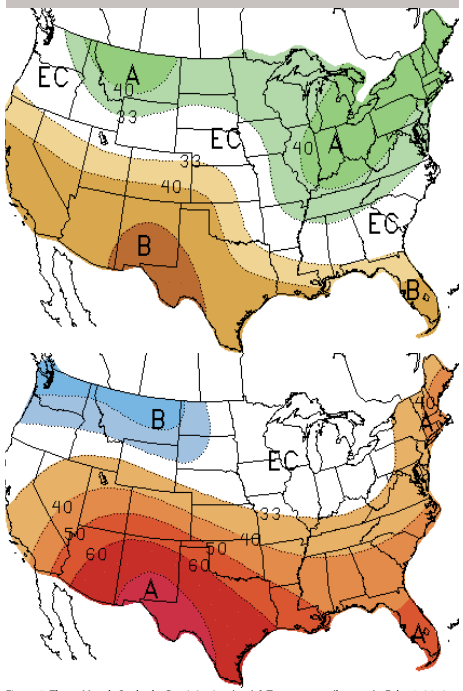


Figure 7: Three-Month Outlook - Precipitation (top) & Temperature (bottom) - Feb 15, 2018

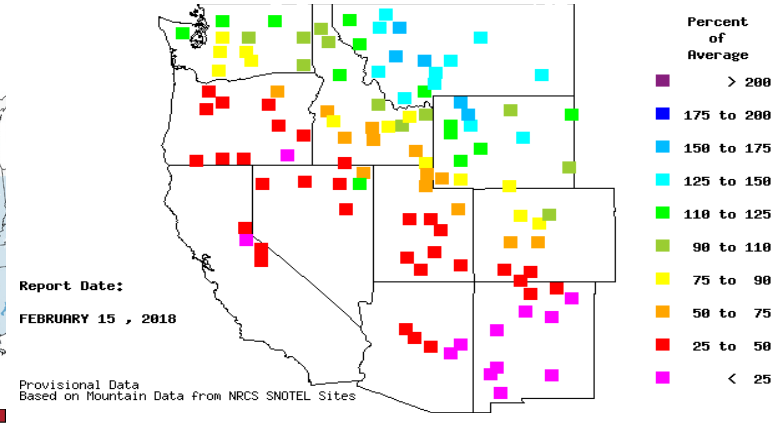


Figure 4: Basin Percent of Average Snow Water Content

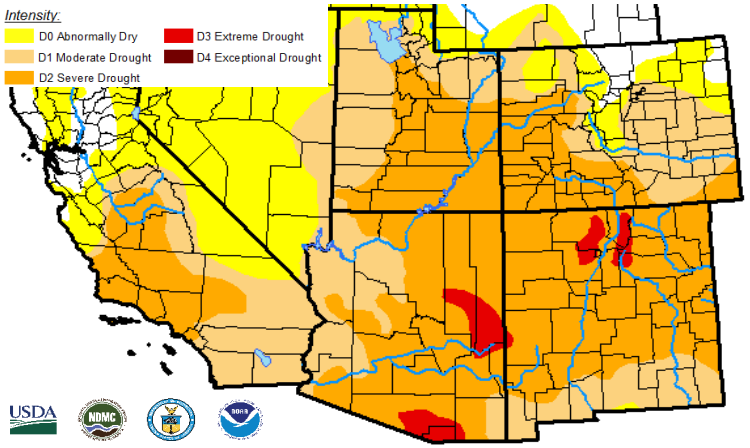


Figure 5: US Drought Monitor - Feb 13, 2018

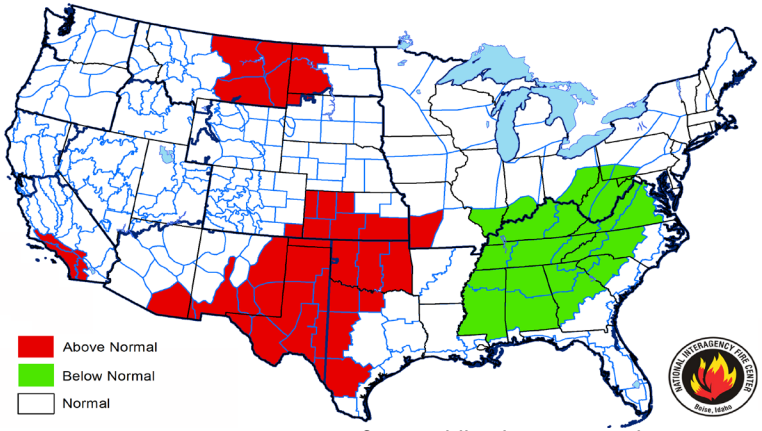


Figure 6: Mar 2018 Significant Wildland Fire Potential

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, with both atmospheric and oceanic conditions demonstrating a La Niña pattern (Figs. 1-2). Forecasts continue to suggest a weak-to-moderate La Niña event that has likely peaked and will gradually weaken this spring. On Jan. 30, the Australian Bureau of Meteorology saw evidence in recent observations that the event has peaked and is likely already in decline. On Feb. 8, the NOAA Climate Prediction Center (CPC) continued its La Niña advisory based on oceanic and atmospheric conditions, but identified a 55-percent chance of a transition to ENSO-neutral in the spring. On Feb. 8, the International Research Institute (IRI) issued its ENSO Quick Look calling for La Niña to last into the spring (Fig. 3) as a weak-to-moderate event, with a likely return to neutral conditions by mid-spring. On Feb. 9, the Japanese Meteorological Agency (JMA) identified ongoing La Niña conditions straddling weak to moderate strengths and called for a 70-percent chance that the event will end this spring. The North American Multi-Model Ensemble (NMME) is consistently indicative of a weak La Niña event returning to neutral conditions by spring (Fig. 4).

Summary: This La Niña event has hovered in the weak-to-moderate range, although it appears to have finally reached moderate strength at the time of this writing. La Niña strength matters in the Southwest, but intensity is not the only factor that affects winter temperature and precipitation patterns. Warmer- and drier-than average winter conditions are associated with La Nina events of any strength, so the presence of La Nina is certain to heighten concerns about winter precipitation and drought, regardless of strength. At the same time, Southwest winters are relatively dry to begin with, so the existence of La Nina does not necessarily bring winter conditions that depart radically from normal, even as they are reliably not wetter than average. However even ENSO-neutral winters have included some of driest (as well as wettest) winters on record. One notable linkage when looking at past events is La Niña conditions generally take wetter-than-average winters off the table. The recent winter storms in the Southwest represent a welcome change, but given the conditions observed so far this winter, a warmer- and drier-than-normal winter certainly appears to be the most likely trajectory.

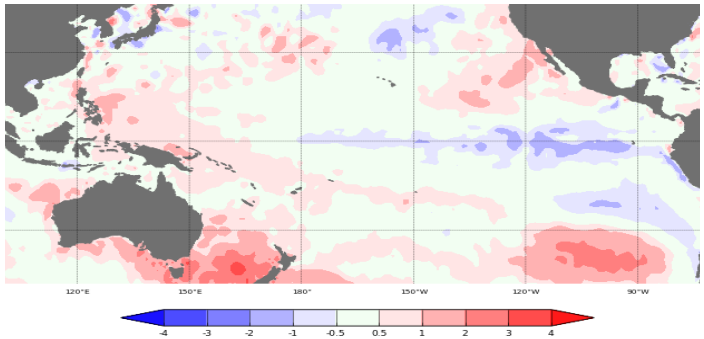


Figure 1: Jan 2018 Sea Surface Temperature (SST) Anomalies

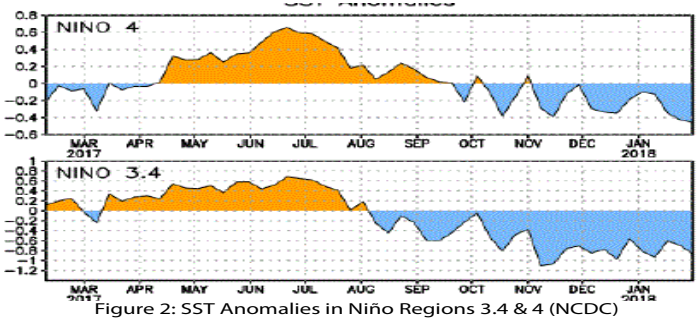


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

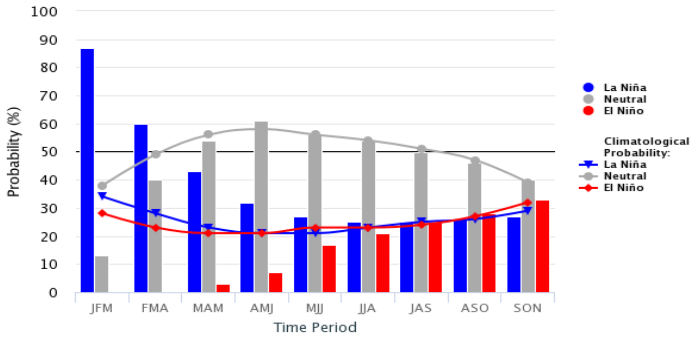


Figure 3: Early-Feb IRI/CPC Model-Based Probabilistic ENSO Forecast

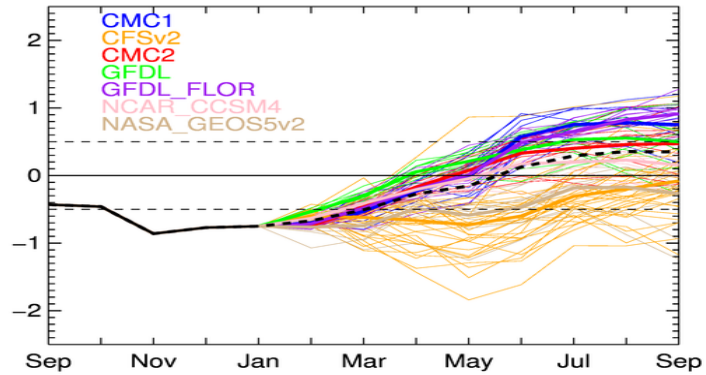


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figures 5-6
UA Climate Science Applications Program
cals.arizona.edu/climate

Figure 7-8
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

El Niño / La Niña

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

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

La Niña Tracker (cont.)

Winter precipitation (Dec-Feb (DJF)), during most weak La Niña events (ENSO Index Value between -0.5 and -1.0) has been below average, although a few years (1968, 1985) were notable outliers (Figs. 5-6). The monthly breakdown of weak, moderate, and strong La Niña events reveals that while the DJF totals for Tucson, AZ and Las Cruces, NM have been mostly below average (Figs. 7-8), there have been individual months that recorded precipitation above the monthly average (represented by black lines on the plots). The most likely outcome for the Southwest this year is below-average precipitation totals for the winter season, but the way that these events unfold will have an impact on how residents perceive and experience this La Niña event (see the following page for examples from Arizona and New Mexico during La Niña events).

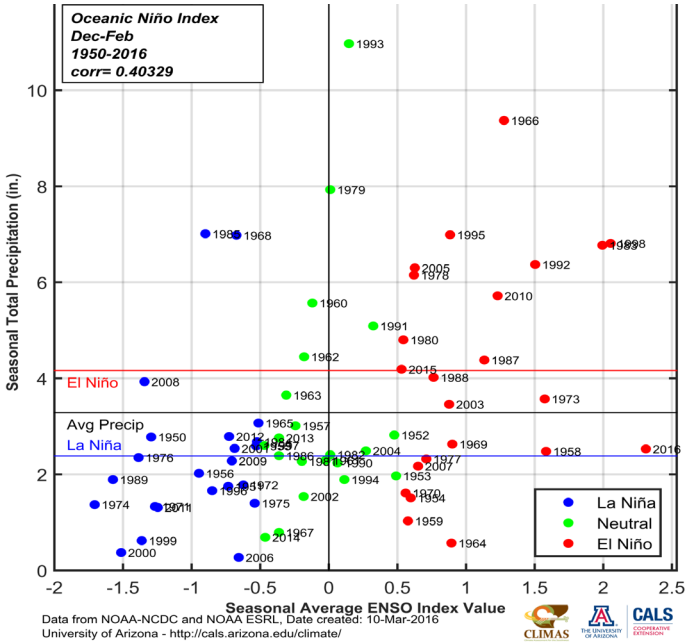


Figure 5: Arizona Climate Division 7 - ENSO vs. Winter (DJF) Precipitation

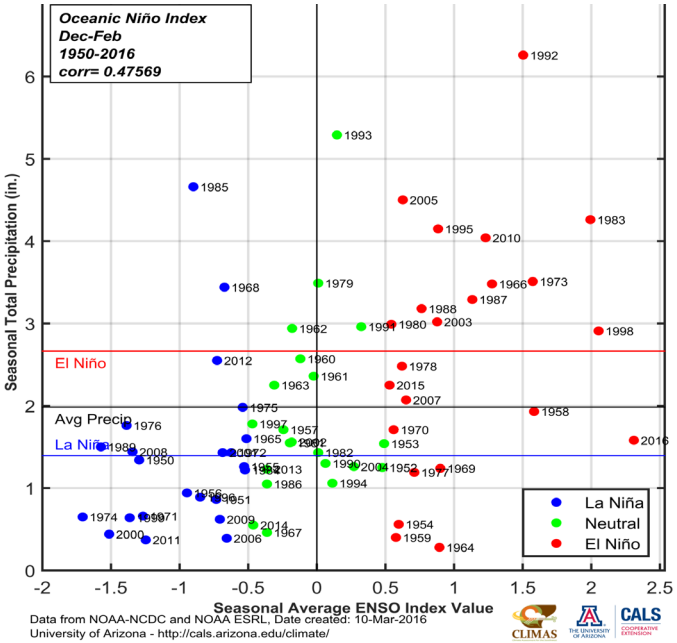


Figure 6: New Mexico Climate Division 8 - ENSO vs. Winter (DJF) Precip

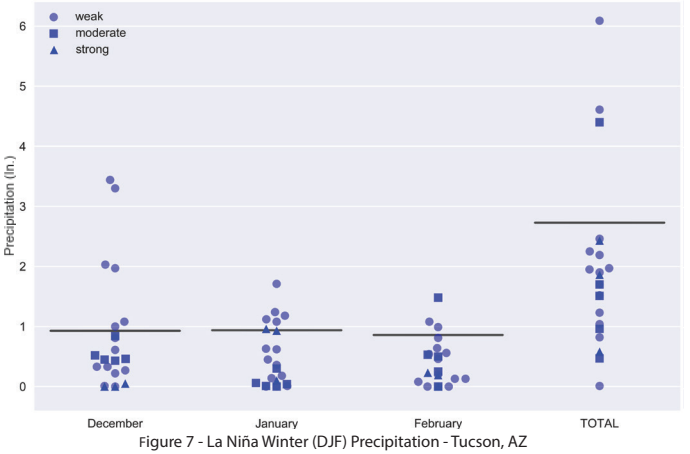


Figure 7 - La Niña Winter (DJF) Precipitation - Tucson, AZ

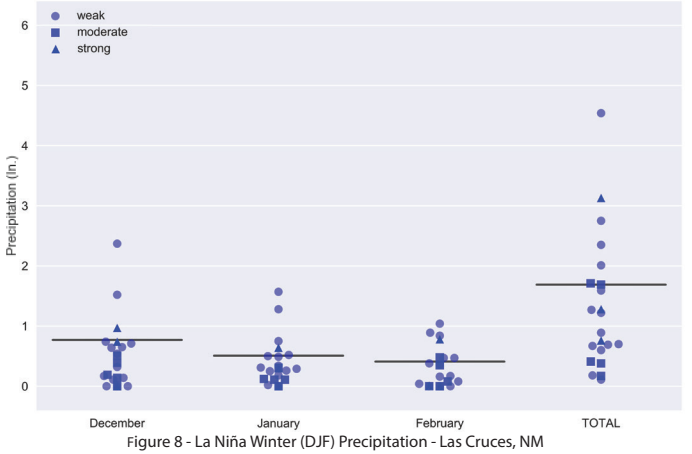


Figure 8 - La Niña Winter (DJF) Precipitation - Las Cruces, NM

Online Resources

Figures 9-10
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

El Niño / La Niña

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

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

La Niña Tracker (cont.) - Comparison to Recent La Niña Events (Dec 1 - Feb 14)

Temperature anomalies (show below as departures from normal) have been mostly warmer than average during the core of this winter season (Dec 1-Feb 14) across the Southwest (Fig 9). The accumulation plots in Figure 10 display the average precipitation for this timeframe (blue), the observed precipitation this year (green), and the observed precipitation for two recent La Niña events (red, purple) (Fig. 10). These plots reveal similar accumulation patterns, especially in the southern locations, and highlight just how far behind the normal accumulation we are in most of the Southwest.

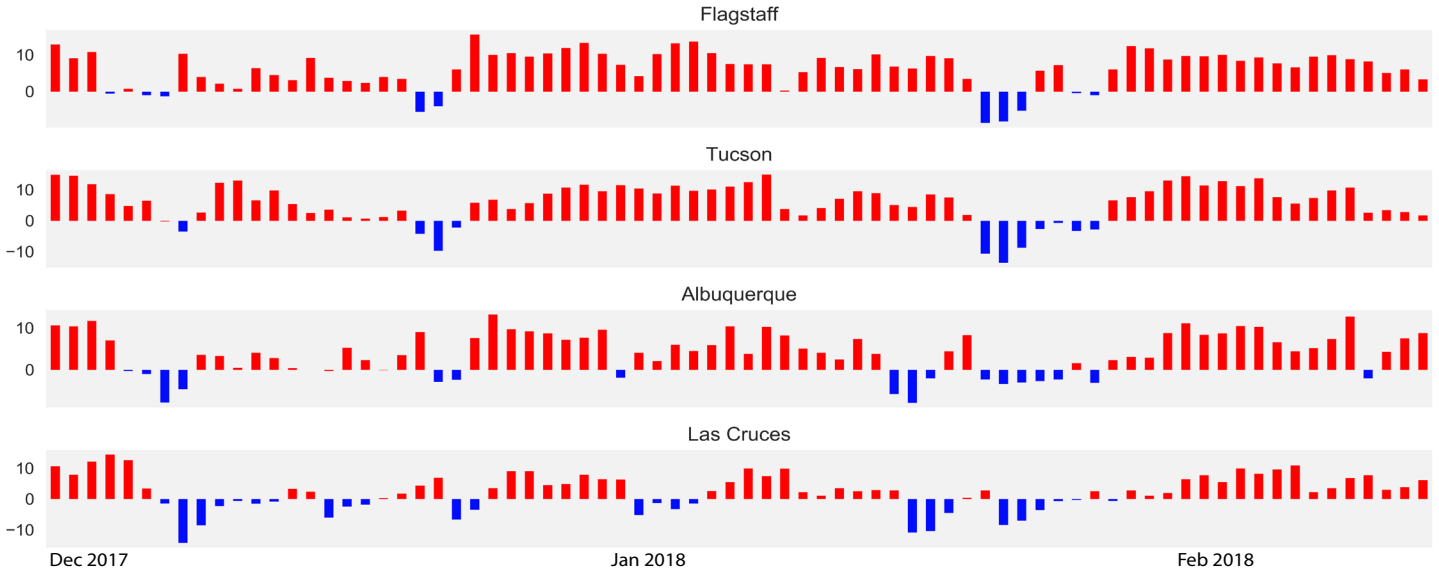


Figure 9: Daily average temperature departure from normal for selected Southwest locations (degrees of departure from normal)

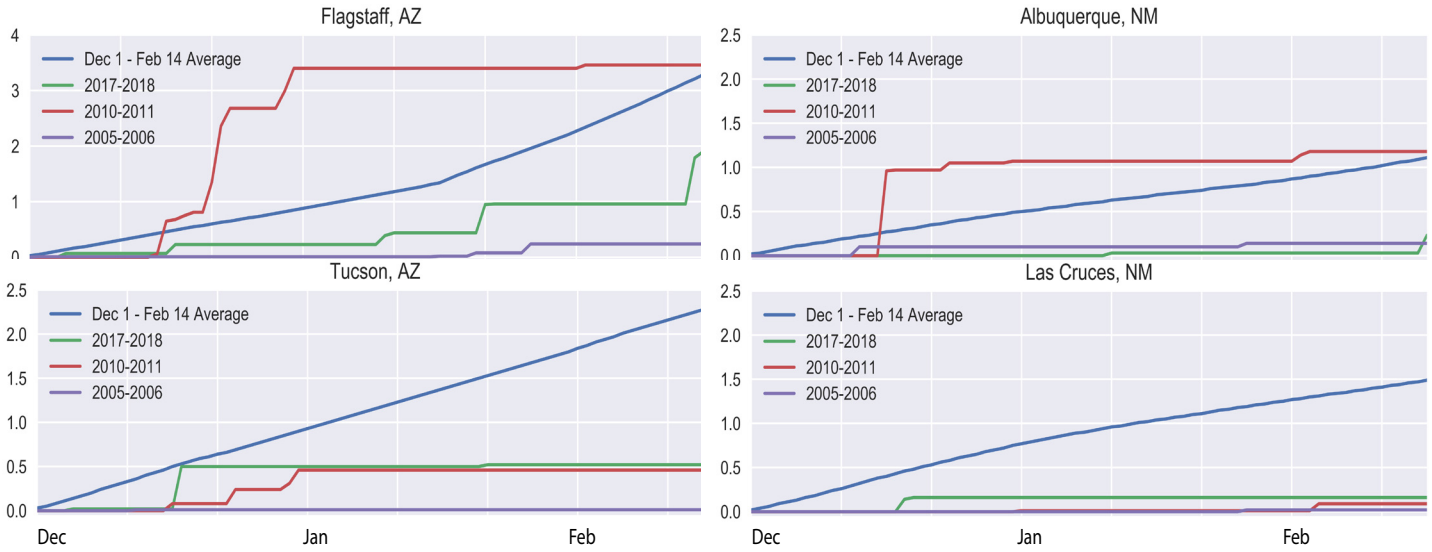


Figure 10: Precipitation for selected Southwest locations during recent La Niña Events, Dec. 1 - Feb. 14

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).

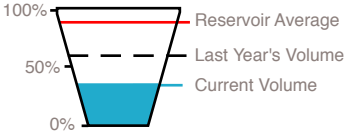
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

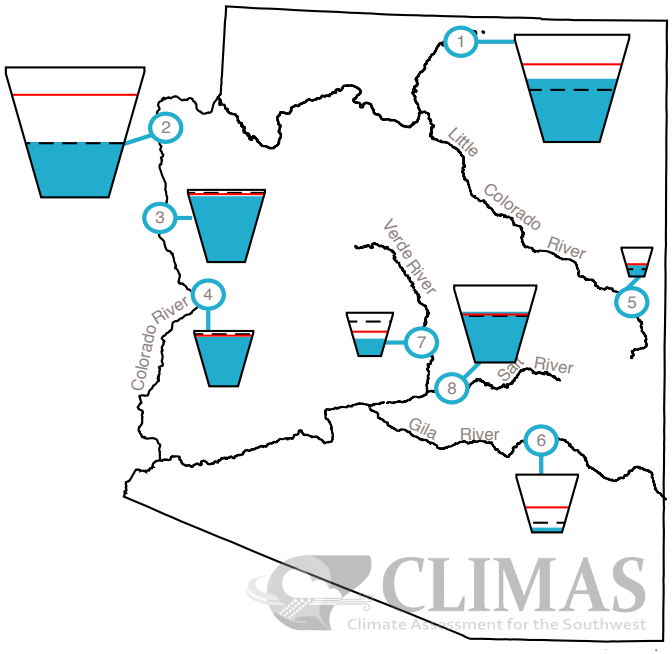
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

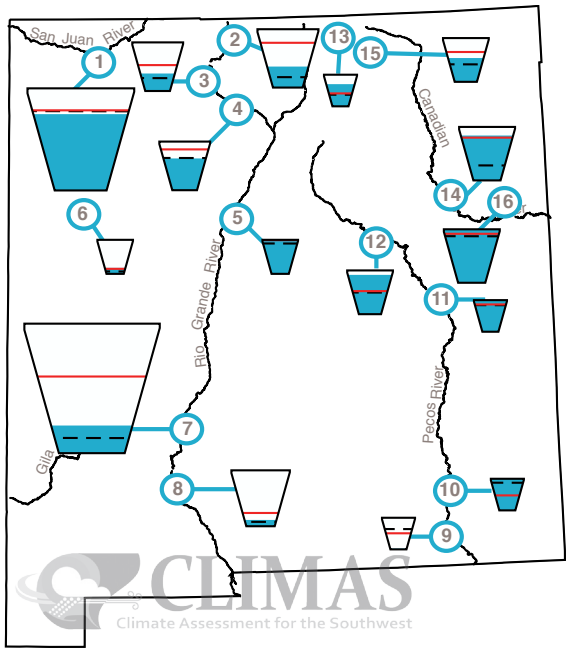
Reservoir Volumes

DATA THROUGH JANUARY 31, 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	56%	13,672.3	24,322.0	-395.3
2. Lake Mead	41%	10,642.0	26,159.0	421.0
3. Lake Mohave	90%	1,638.0	1,810.0	6.0
4. Lake Havasu	87%	541.4	619.0	-16.2
5. Lyman	37%	11.0	30.0	-0.2
6. San Carlos	7%	62.1	875.0	4.8
7. Verde River System	38%	110.2	287.4	-7.2
8. Salt River System	64%	1,291.0	2,025.8	6.1

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	74%	1,254.9	1,696.0	-14,7
2. Heron	36%	145.8	400.0	-0.8
3. El Vado	36%	67.6	190.3	-4.6
4. Abiquiu	65%	121.0	186.8	3.3
5. Cochiti	96%	48.0	50.0	1.1
6. Bluewater	17%	6.4	38.5	-0.1
7. Elephant Butte	21%	458.6	2,195.0	36.3
8. Caballo	11%	37.7	332.0	0.6
9. Lake Avalon	0%	0.0	4.5	0.0
10. Brantley	100%	43.3	42.2	2.9
11. Sumner	100%	41.7	102.0	2.6
12. Santa Rosa	89%	94.3	105.9	-0.4
13. Costilla	69%	11.0	16.0	0.3
14. Conchas	84%	213.6	254.2	2.1
15. Eagle Nest	54%	42.7	79.0	0.3
16. Ute Reservoir	100%	202	200	-1.0

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.

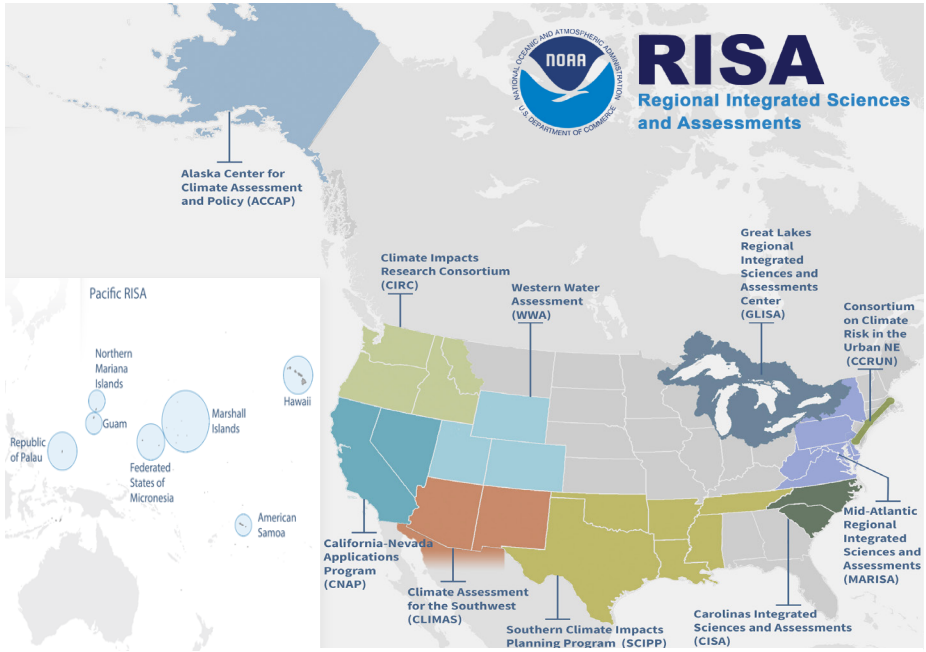


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions

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.

CLIMAS Colloquium - Drought in the Southwest

The colloquium was on Jan 26, 2018 - but if you missed the talks, be sure to watch the videos.

Dr. Connie Woodhouse - *https://youtu.be/SpY5i3R-wYc*

Runoff efficiency: The impact of warming temperatures on Colorado River drought

Dr. Chris Guiterman - *https://youtu.be/gWh-C2UBK4g*

Synchronized growth: The impact of rising temperature and aridity on Navajo Nation forests

Dr. Mike Crimmins - *https://youtu.be/tTj9voyJzno*

Tracking drought across the SW US in a changing climate

Concluding Panel Discussion - *https://youtu.be/eVpJ9I8_7II*

Videos of the presentations (slides + audio) are available on the CLIMAS youtube channel – *youtube.com/user/UACLIMAS*

For more details:

climas.arizona.edu/event/climas-colloquium-series-drought-southwest