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January Southwest Climate Outlook

December Precipitation & Temperature: December precipitation ranged from average to much-below average across most of Arizona and New Mexico, with record-dry conditions along the western edge of Arizona and in pockets of central and eastern New Mexico (Fig. 1a). December temperatures were above average to record warmest in both states (Fig. 1b), continuing the pattern observed during fall 2017.

Water Year (to-date) and 2017 Precipitation and Temperature: 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 (for more details see the water year to date report on p. 5-7). Annual precipitation in 2017 ranged from much-below average to average in Arizona, and from below average to much-above average in New Mexico (Fig. 4a), while average annual temperatures were record warm across most of Arizona and New Mexico (Fig. 4b).

Snowpack & Water Supply: Snowpack and snow water equivalent (SWE) are below average across the Southwest (Fig. 5), with most stations in Arizona and New Mexico recording SWE of less than 25 percent of normal. The above-average temperatures and dry conditions that drove this pattern are attributable, at least in part, to the ongoing La Niña event. If warm and dry conditions persist through winter—not uncommon in a La Niña event—this will have implications for drought and water resource management throughout 2018 (see Arizona and New Mexico reservoir volumes, p. 8).

Drought: Above-average temperatures and below-normal precipitation are reflected in the expanding areas of drought designation in the Jan. 17 U.S. Drought Monitor (Fig. 6), with Arizona and New Mexico documenting increases in extent and intensity of drought since the December outlook. Most of both states was classified as moderate drought (D1), but severe drought (D2) was noted over a large area along the Arizona/New-Mexico border and in a smaller region of eastern New Mexico. Below-average precipitation in the Southwest over the last few months is a primary driver for these designations, but the drought monitor authors also considered the effect of long-term drought in their designations.

ENSO & La Niña: La Niña conditions continued for another month, although the event may have reached its peak intensity. Current forecasts suggest this weak-to-moderate event will last through winter 2018 before weakening this spring. In the Southwest, weak La Niña events tend to produce drier-than-average winters, but moderate events have resulted in more consistently dry conditions over the winter (see La Niña Tracker on p. 3 and DJF La Niña Precip in the SW on p. 4 for details). Given the drier-than-average conditions in the Southwest last fall and so far this winter, the presence of a 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 February through April calls for increased chances of below-average precipitation for all of Arizona and New Mexico (Fig. 7, top), and increased chances of above-average temperatures for the entire southwestern United States (Fig. 7, bottom).

Tweet Jan 2018 SW Climate Outlook

CLICK TO TWEET

JAN2018 @CLIMAS_UA SW Climate Outlook, La Niña Tracker, Water Year To-Date (Temp & Precip), AZ & NM Reservoir volumes http://bit.ly/2EU6GIM #SWclimate #AZWX #NMWX #SWCO

January 2018 SW Climate Outlook

Online Resources

Figures 1,4
National Centers for Environmental Information
ncei.noaa.gov

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

Figure 5
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

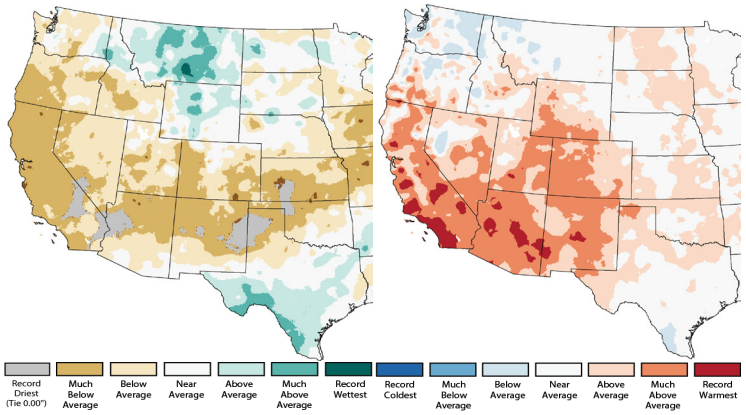


Figure 1: Dec 2017 Precipitation (a) & Temperature Ranks (b)

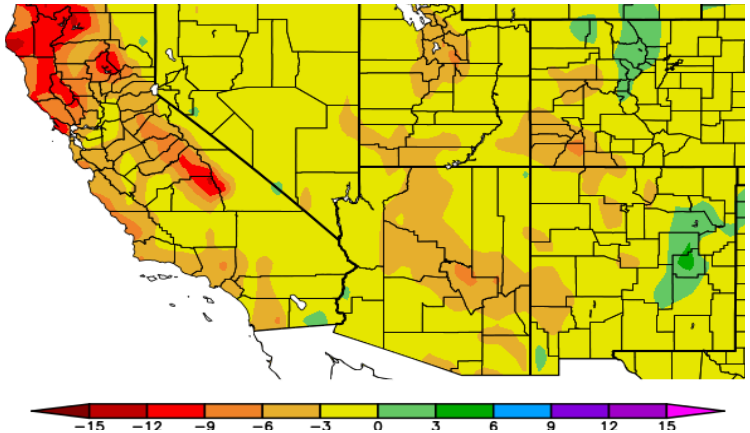


Figure 2: Oct 1 2017 - Jan 15, 2018 - Departure from Normal Precipitation

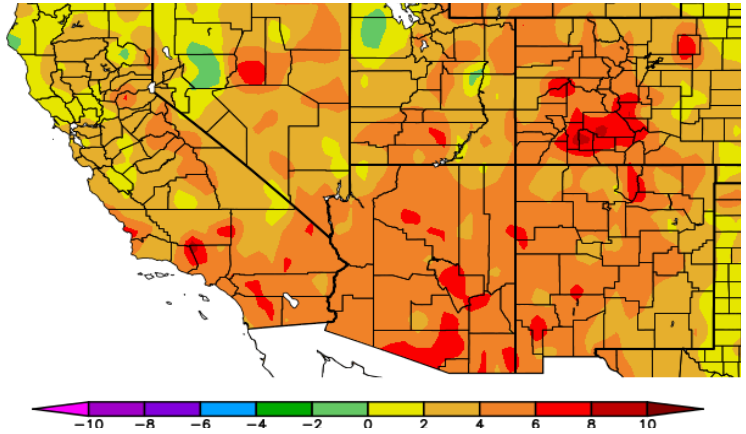


Figure 3: Oct 1 2017 - Jan 15, 2018 - Departure from Normal Temperature

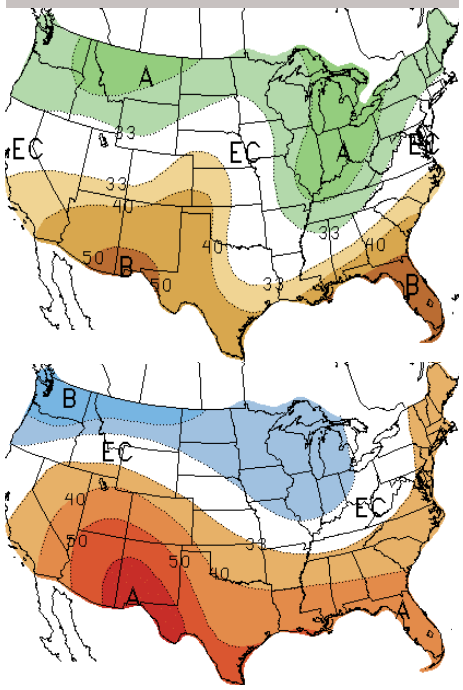


Figure 7: Three-Month Outlook - Precipitation (top) & Temperature (bottom) - Jan 18, 2018

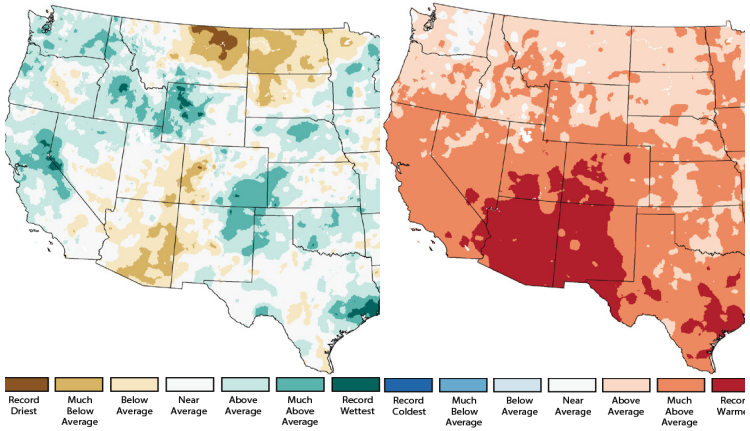


Figure 4: 2017 (Jan - Dec) Precipitation (a) & Temperature Ranks (b)

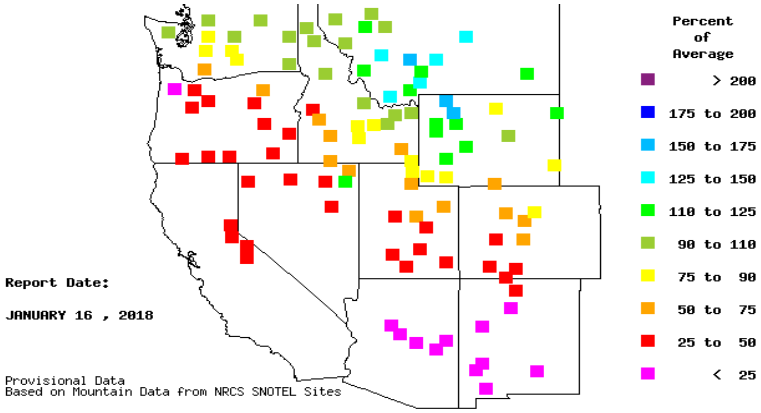


Figure 5: Basin Percent of Average Snow Water Content

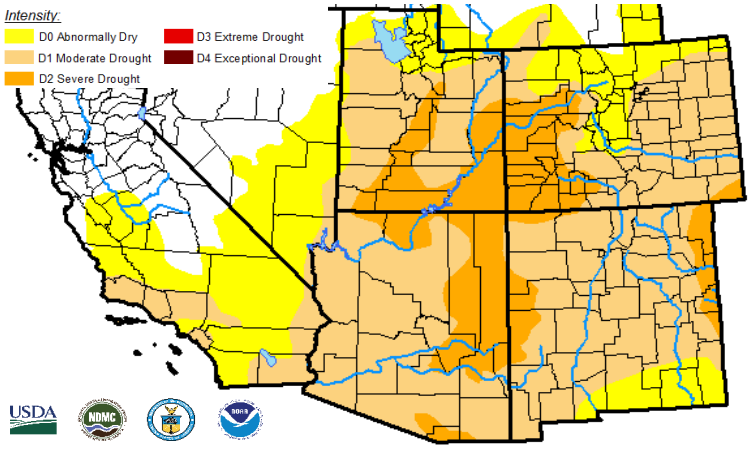


Figure 6: US Drought Monitor - Jan 16, 2018

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 have continued for another month at weak-to-moderate strength, with both atmospheric and oceanic conditions, including sea-surface temperatures (SSTs), demonstrating a consistent La Niña pattern (Figs. 1-2). Forecasts continue to suggest that a weak-to-moderate La Niña event will last through the winter before weakening this spring. On Jan. 11, the Japanese Meteorological Agency (JMA) identified ongoing La Niña conditions and called for a 70-percent chance of these conditions persisting through spring 2018. On Jan. 11, the NOAA Climate Prediction Center (CPC) continued its La Niña advisory, identifying an 85-95-percent chance of La Niña conditions lasting through the winter, with a transition to ENSO-neutral in the spring. On Jan. 11, the International Research Institute (IRI) issued its ENSO quick look, calling for La Niña to last into the spring (Fig. 3) as a weak event, but with recognition that the conditions were very close to the threshold for a moderate event. On Jan. 16, the Australian Bureau of Meteorology updated its ENSO tracker to reflect continued La Niña conditions, but noted that this event "may be nearing its peak," with a return to neutral values by spring 2018. The North American Multi-Model Ensemble (NMME) is consistently indicative of a La Niña event of weak to moderate intensity this winter (Fig. 4).

Summary: Given the consistent La Niña patterns observed in both oceanic and atmospheric indicators, seasonal outlooks forecast that La Niña will last through the winter. Current conditions reflect a borderline weak-to-moderate event. Warmer- and drier-than-average winter conditions are associated with La Niña of any strength in the Southwest, so the presence of La Niña is certain to heighten concerns about winter precipitation and drought. Southwestern winters are already relatively dry, however, so La Niña does not ensure an exceptionally dry winter (although this is the trajectory much of the Southwest appears to currently be on), but it does take a wetter-than-average winter off the table based on past La Niña events. If the La Niña strengthens to moderate intensity, the likelihood of an even drier Southwest winter increases (see the following page for a few examples).

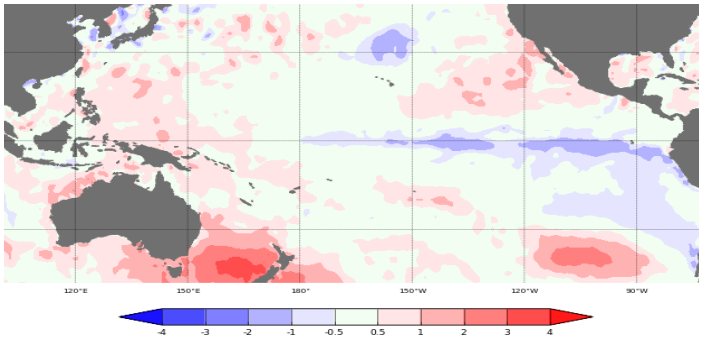


Figure 1: Dec 2018 Sea Surface Temperature (SST) Anomalies

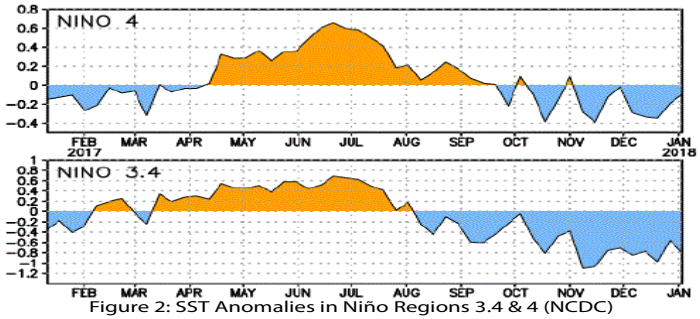


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

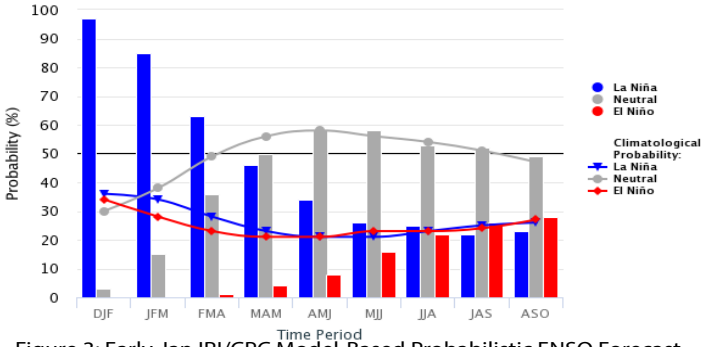


Figure 3: Early-Jan IRI/CPC Model-Based Probabilistic ENSO Forecast

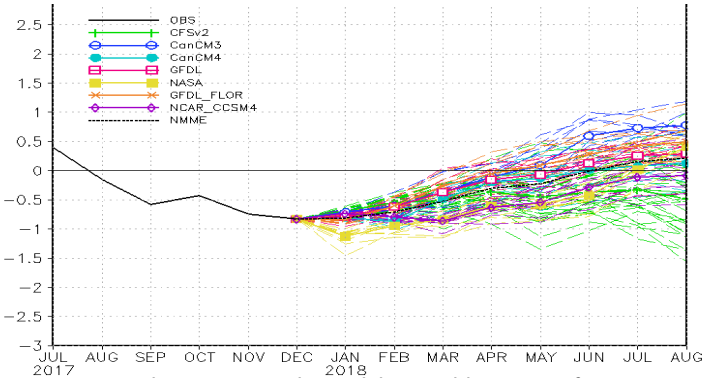


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

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.

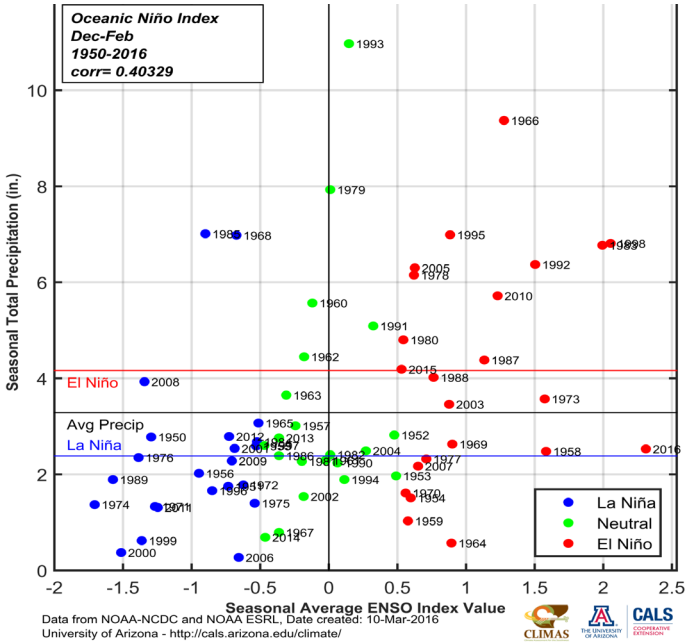


Figure 5: Arizona Climate Division 7 - ENSO vs. Winter (DJF) Precipitation

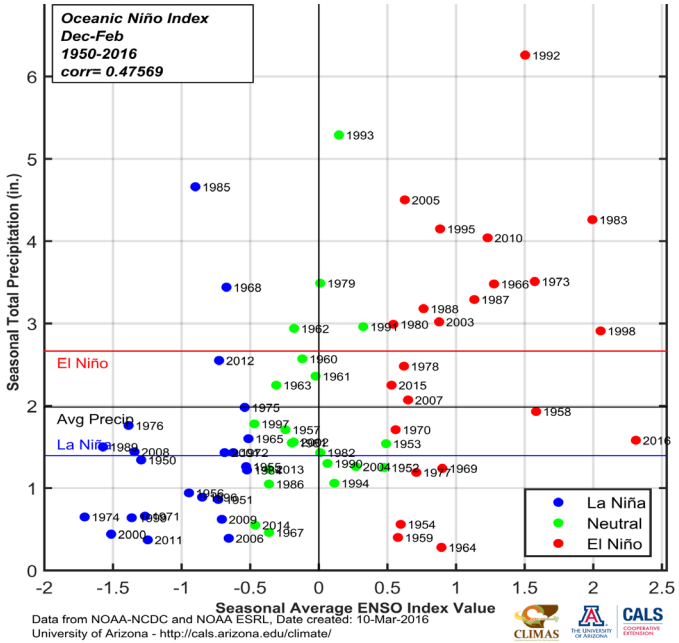


Figure 6: New Mexico Climate Division 8 - ENSO vs. Winter (DJF) Precip

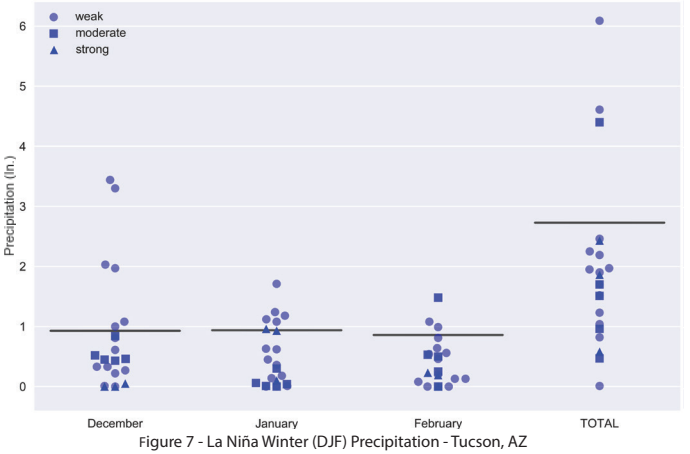


Figure 7 - La Niña Winter (DJF) Precipitation - Tucson, AZ

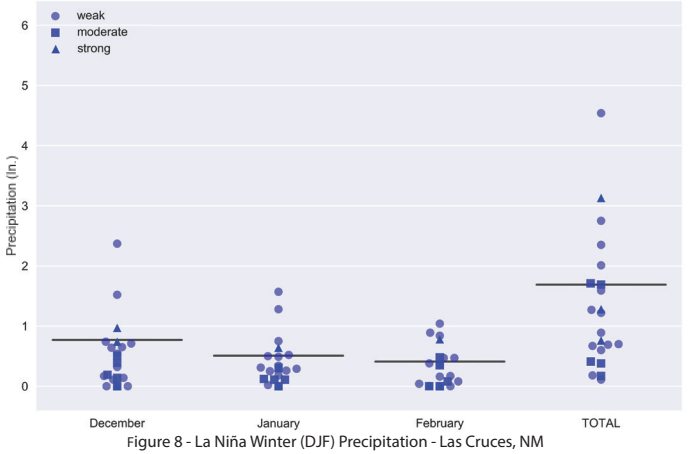


Figure 8 - La Niña Winter (DJF) Precipitation - Las Cruces, NM

Online Resources

Figures 1-3
West Wide Drought Tracker
wrcc.dri.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

Water Year To-Date (Oct 1, 2017 - Jan 15, 2018)

The year 2017 was record warm across most of Arizona and New Mexico, in no small part thanks to the exceptionally warm conditions during the final three months of the year (and November in particular).

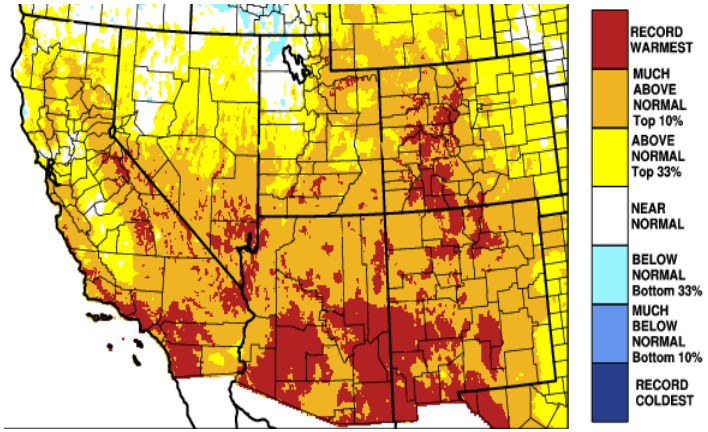


Figure 1: Southwest Mean Temperature Rankings Oct - Dec 2017

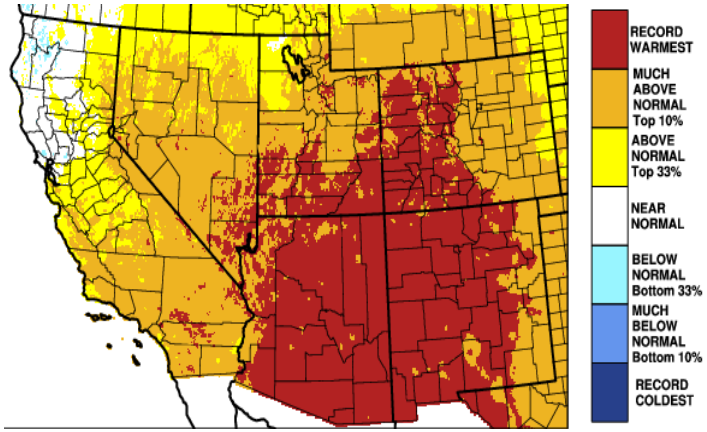


Figure 2: Southwest Mean Temperature Rankings Nov 2017

These months were also very dry, with limited eastern Pacific tropical storm activity making its way into the Southwest during the fall and very little early winter precipitation, further exacerbating the dry conditions brought about by a relatively early end to the monsoon last summer.

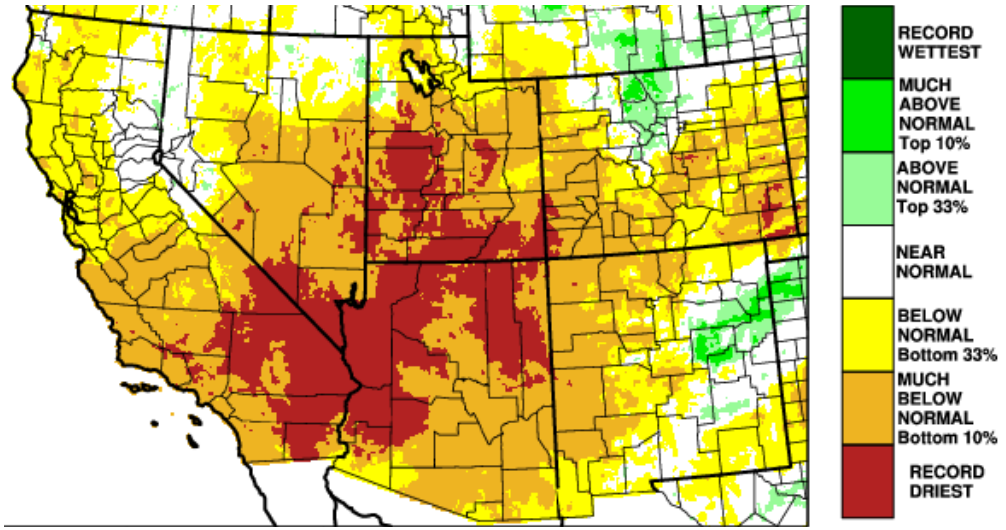


Figure 3: Southwest Precipitation Percentile Rankings Oct-Dec 2017

Online Resources

Figures 4-5
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

Water Year To-Date (Oct 1, 2017 - Jan 15, 2018) (cont.)

Looking to a selection of weather stations in Arizona (below) and New Mexico (p. 7), water-year temperature and precipitation departure from normal since Oct. 1 demonstrate just how warm and dry conditions have been across the region.

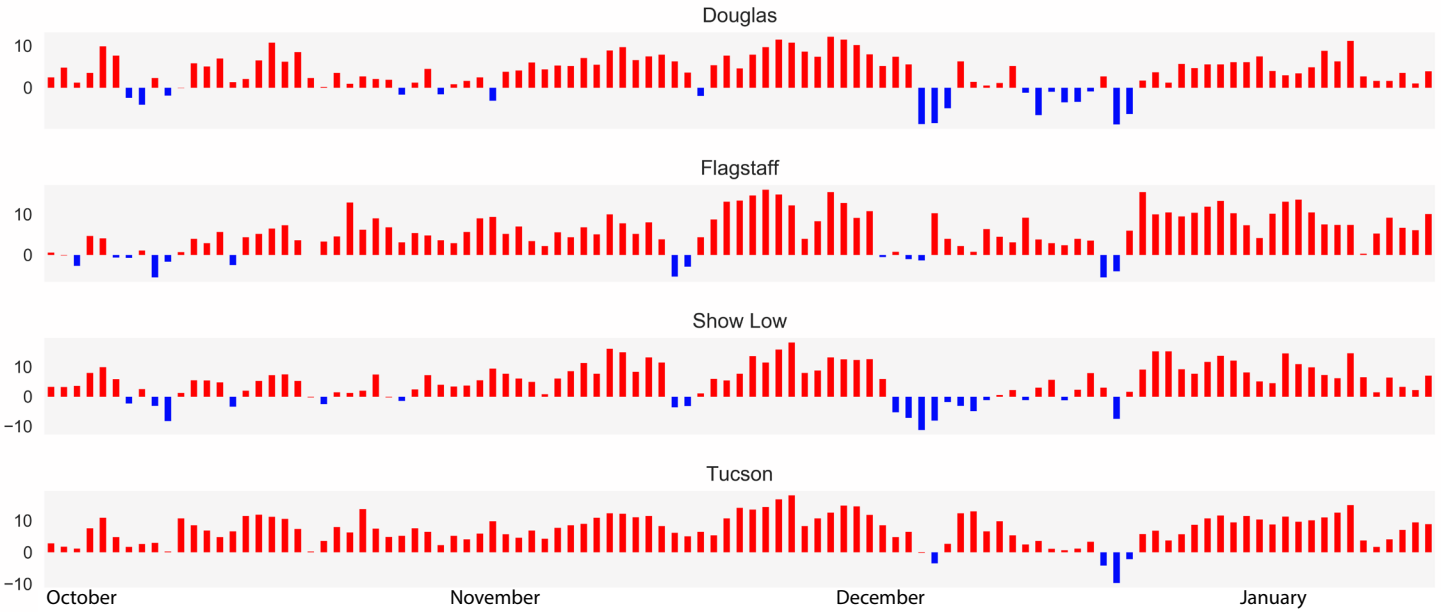


Figure 4: Daily average temperature departure from normal for selected Arizona locations (degrees of departure from normal)

Figure 5: Water-year precipitation to date (inches), for selected Arizona locations, Oct. 1, 2017 - Jan. 15, 2018

Online Resources

Figures 6-7
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

Water Year To-Date (Oct 1, 2017 - Jan 15, 2018) (cont.)

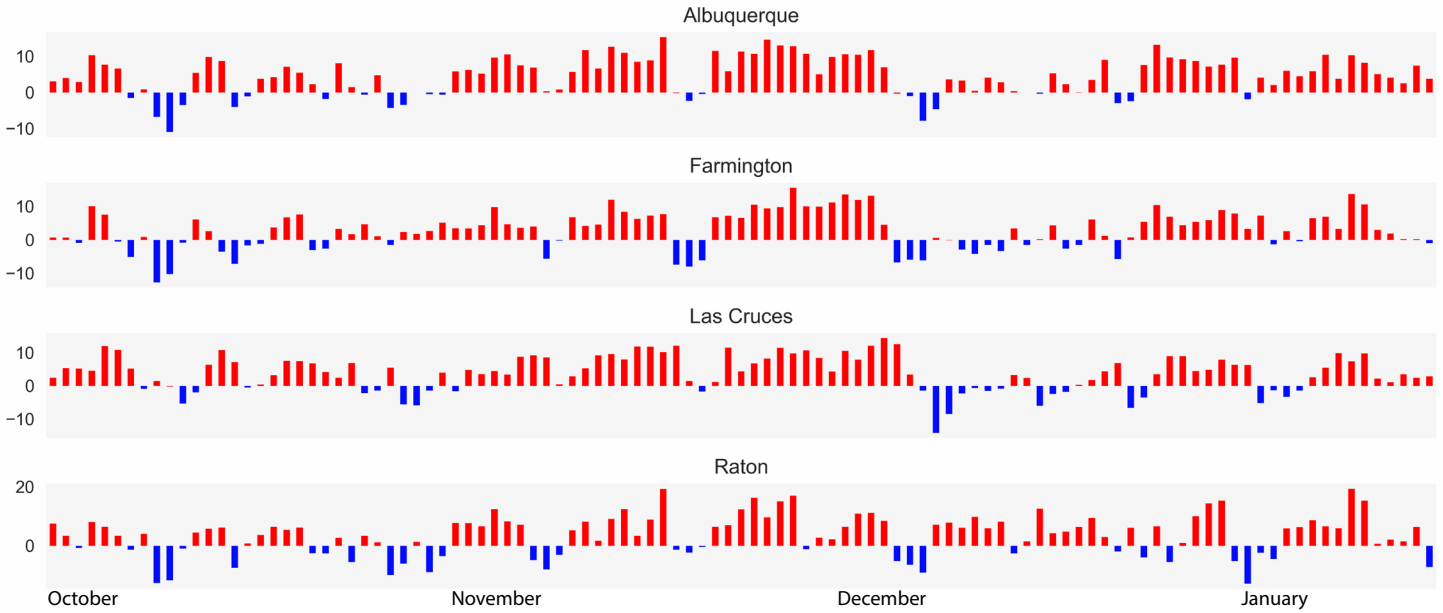


Figure 6: Daily average temperature departure from normal for selected New Mexico locations (degrees of departure from normal)
(note different vertical scale for Raton)

Figure 7: Water-year precipitation to date (inches), for selected New Mexico locations, Oct. 1, 2017 - Jan. 15, 2018

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).

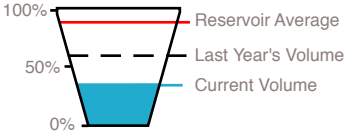
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

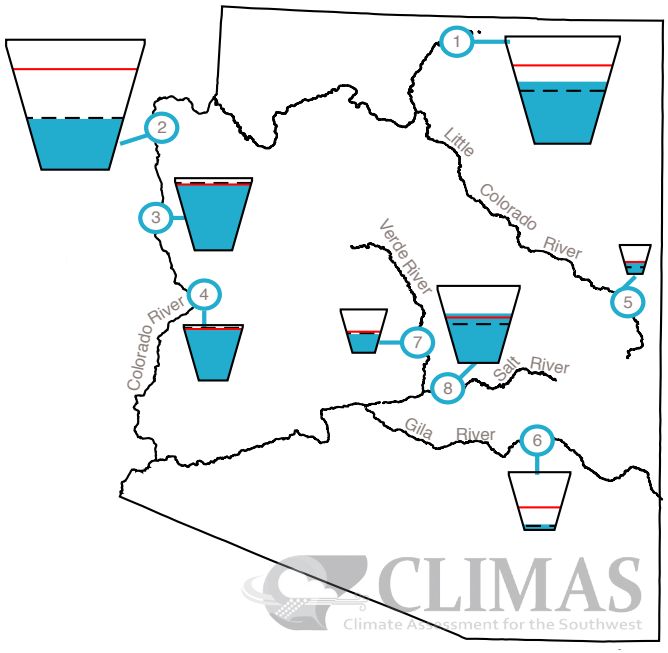
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

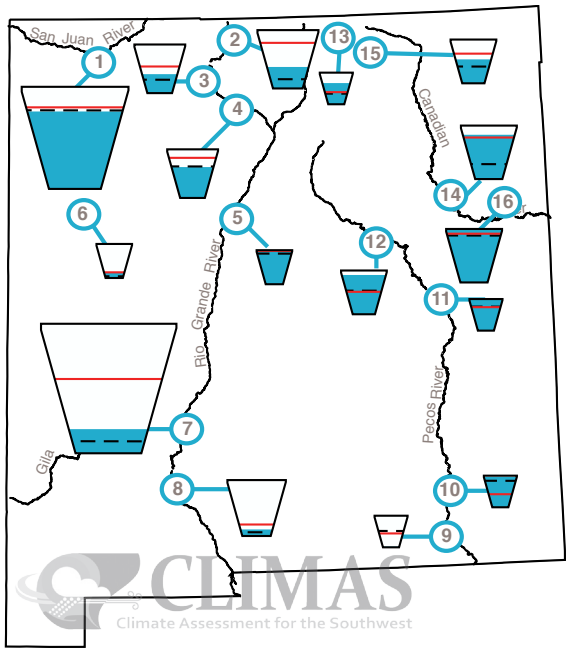
Reservoir Volumes

DATA THROUGH DECEMBER 31, 2017

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	58%	14,067.6	24,322.0	-264.5
2. Lake Mead	39%	10,221.0	26,159.0	-131.0
3. Lake Mohave	90%	1,632.0	1,810.0	15.0
4. Lake Havasu	90%	557.6	619.0	-21.4
5. Lyman	37%	11.2	30.0	0.0
6. San Carlos	7%	57.3	875.0	-2.1
7. Verde River System	41%	117.4	287.4	-4.6
8. Salt River System	63%	1,284.9	2,025.8	0.9

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	75%	1,269.6	1,696.0	-16,4
2. Heron	37%	146.7	400.0	-0.9
3. El Vado	38%	72.2	190.3	-17.4
4. Abiquiu	63%	117.7	186.8	-10.8
5. Cochiti	94%	46.9	50.0	-0.2
6. Bluewater	17%	6.5	38.5	-0.2
7. Elephant Butte	19%	422.4	2,195.0	67.6
8. Caballo	11%	37.1	332.0	0.8
9. Lake Avalon	0%	0.0	4.5	0.0
10. Brantley	96%	40.4	42.2	2.6
11. Sumner	100%	39.1	102.0	3.3
12. Santa Rosa	89%	94.7	105.9	-0.6
13. Costilla	66%	10.6	16.0	0.5
14. Conchas	83%	211.5	254.2	2.0
15. Eagle Nest	54%	42.4	79.0	0.0
16. Ute Reservoir	100%	203	200	-3.0

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.

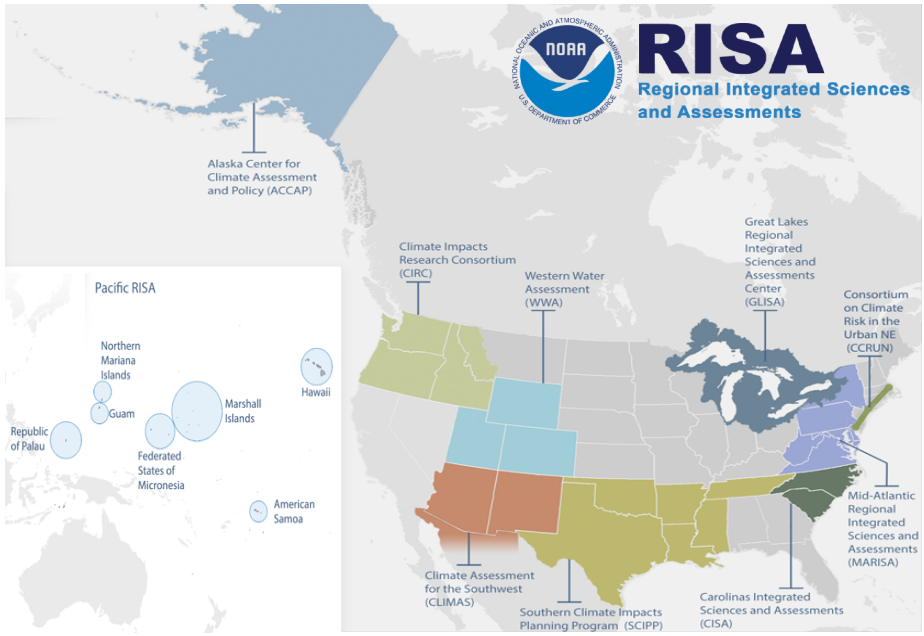


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions

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 Climate & Health Project Showcase

Heidi Brown & Erika Barrett – *https://youtu.be/k4BKecrKTQQ*

Applying vector-borne disease projections for climate and health strategic planning in Arizona

Gregg Garfin & Sarah LeRoy – *https://youtu.be/TYPljqQKy9s*

Accidental tourists: adventures in climate and public health in the U.S.-Mexico border region

Ben McMahan – *https://youtu.be/DDN89XTj_i8*

Heat and vulnerability in the U.S. Southwest – assessing connections between social and environmental risks across multiple timescales

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-climate-health-southwest