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

Published by the Climate Assessment for the Southwest (CLIMAS), with support from University of Arizona Cooperative Extension, the Arizona State Climate Office, and the New Mexico State Climate office.

April Southwest Climate Outlook

Precipitation and Temperature: Precipitation varied across the Southwest in March, but temperatures remained warm throughout the region. Precipitation amounts ranged from record driest to above average (Fig. 1a). Temperatures ranged from average to above average in Arizona, and from above average to much-above average in New Mexico (Fig. 1b). 2018 year-to-date (Jan-Mar) precipitation ranged from near average to much-below average (Fig. 2a), while temperatures for the same period were above average to much-above average (Fig. 2b).

Snowpack and Water Supply: Above-average temperatures and below-average precipitation resulted in snowpack and snow water equivalent (SWE) values that are well-below average across the Southwest (and much of the western United States) (Fig. 3). These warm and dry conditions also affected streamflow and runoff timing: streamflow forecasts for Arizona and New Mexico are all well-below normal (Fig. 4).

Drought: Drought-designated areas were expanded in the April 17 U.S. Drought Monitor, with Arizona and New Mexico documenting increases in the extent and intensity of drought. Nearly 90 percent of Arizona is classified as experiencing severe (D2) or extreme (D3) drought, with a pocket of exceptional drought (D4) in the north-central region (Fig. 5). Approximately 70 percent of New Mexico is classified as experiencing severe (D2) or extreme (D3) drought, with a notable increase in drought intensity from south to north, where exceptional drought (D4) has emerged. These designations reflect short-term precipitation deficits, above-normal temperatures at monthly and seasonal timescales, and longer-term drought that tracks the cumulative effect of extended periods of warmer- and drier-than-normal conditions.

Wildfire: The National Significant Wildland Fire Potential Outlook for May identified above-normal wildland fire risk for eastern New Mexico and the borderlands region in New Mexico and southeastern Arizona, as well as higher-elevation regions in the Upper Colorado River Basin (Fig. 6). The June outlook expands above-normal fire risk to include nearly all of Arizona and New Mexico. Warm and dry conditions this winter, in conjunction with above-normal fine-fuel loading and continuity, are major drivers of the elevated risk, and the Southwest Coordinating Center increased to preparedness level 3 on April 12, reflecting growing concern about fire risk.

ENSO & La Niña: Oceanic and atmospheric conditions remain broadly indicative of a weak La Niña event, but are clearly waning, and trends in these anomalies indicate an imminent return to ENSO-neutral conditions. Most forecasts and outlooks are tracking the gradual decay to ENSO-neutral conditions over spring, and some agencies have already declared this La Niña event over (see La Niña tracker on p. 3 for details). Regardless of when this La Niña event officially ends (or ended), the onset of the characteristically warmer and drier spring conditions in the Southwest means the region is unlikely to see much if any additional precipitation before this summer's monsoon. Looking back over cool-season precipitation (for details see pp. 4-5), the low seasonal total and relatively few number of days with measurable precipitation are certainly consistent with the reduced precipitation we might expect in a La Niña year.

Precipitation and Temperature Forecast: The three-month outlook for April through June calls for equal chances of above- or below-average precipitation in Arizona and New Mexico (Fig. 7, top) and increased chances of above-average temperatures (Fig. 7, bottom) for the entire southwestern United States.

Tweet Apr 2018 SW Climate Outlook

CLICK TO TWEET

APR2018 @CLIMAS_UA SW Climate Outlook, La Niña Tracker, Cool Season Precipitation, AZ & NM Reservoir volumes https://bit.ly/2F1Nzw2 #SWclimate #AZWX #NMWX #SWCO

April 2018 SW Climate Outlook

Online Resources

Figures 1-2
National Centers for Environmental Information
ncei.noaa.gov

Figure 3
Western Regional Climate Center
wrcc.dri.edu

Figure 4
Natural Resources Conservation Svc
wcc.nrcs.usda.gov

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

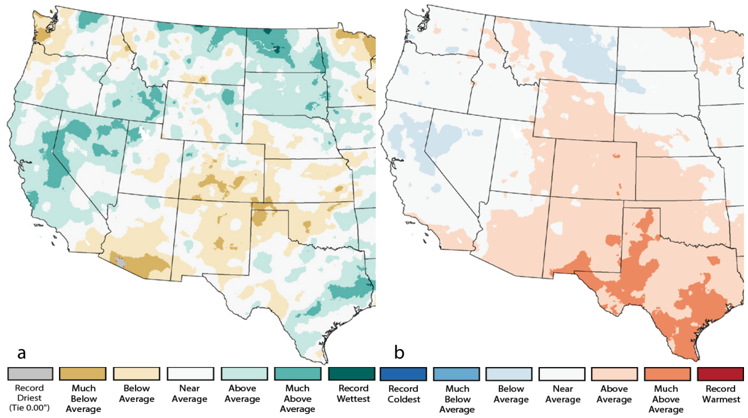


Figure 1: Mar 2018 Precipitation (a) & Temperature Ranks (b)

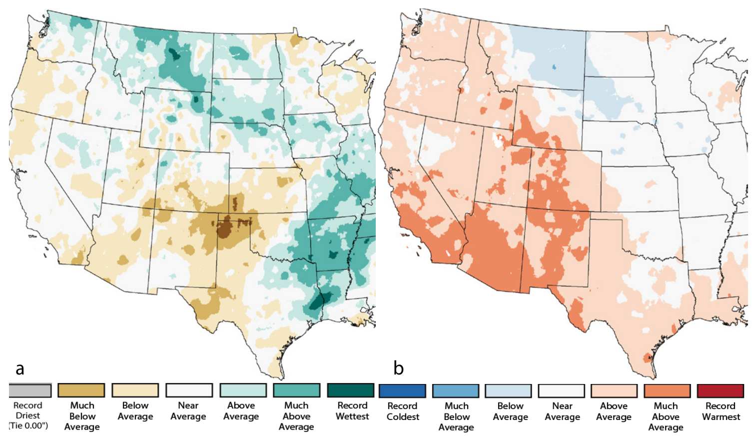


Figure 2: Jan-Mar 2018 Precipitation (a) & Temperature Ranks (b)

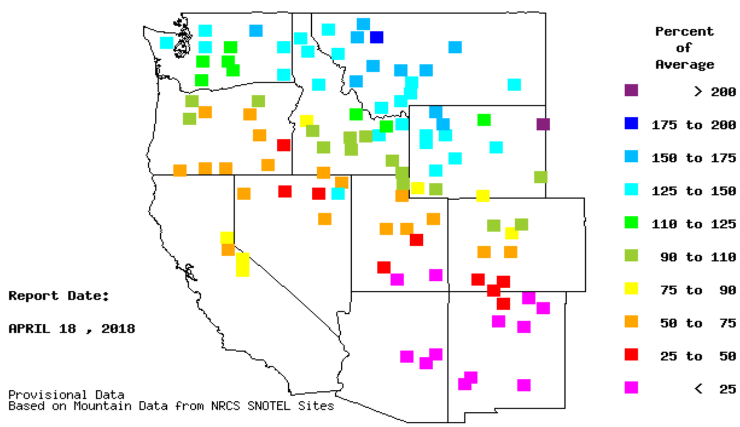


Figure 3: Basin Percent of Average Snow Water Content

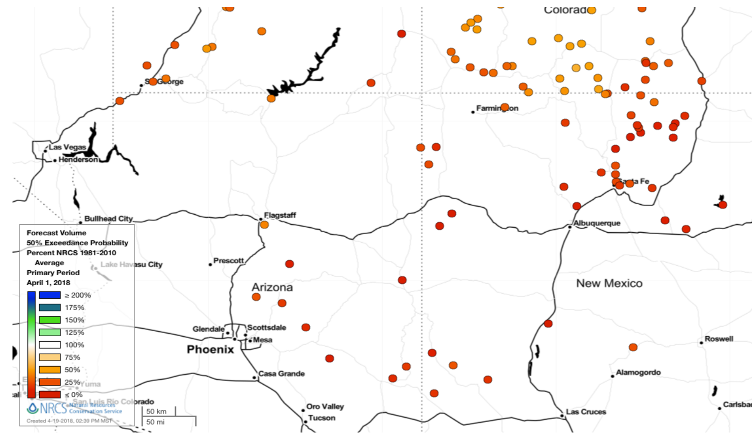


Figure 4: April 1, 2018 NRCS Streamflow Forecast

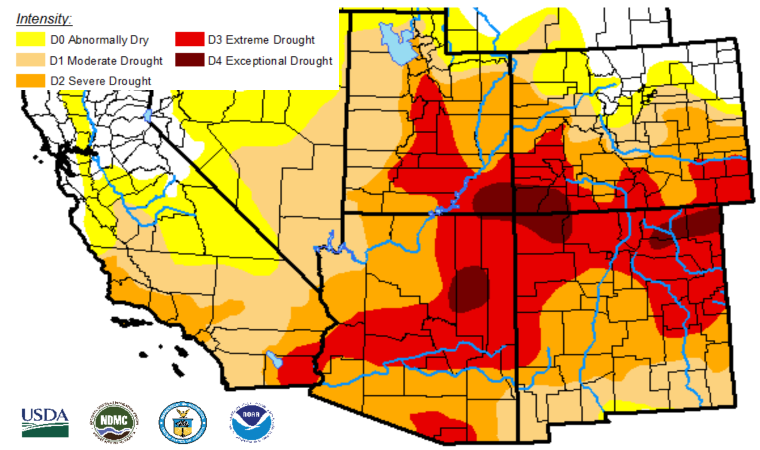


Figure 5: US Drought Monitor - Apr 17, 2018

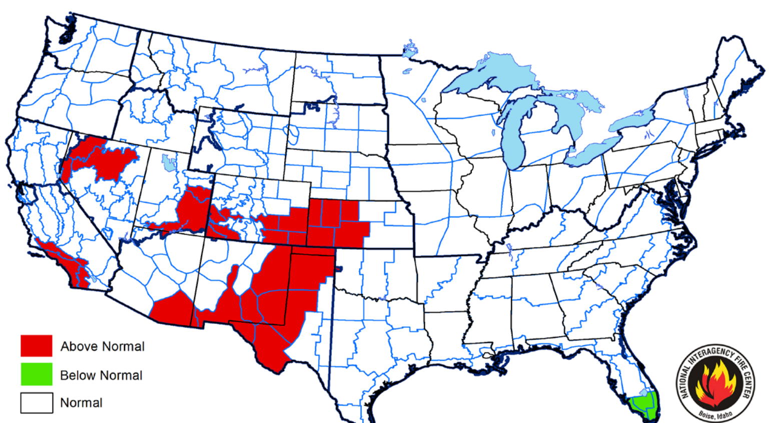


Figure 6: May 2018 Significant Wildland Fire Potential

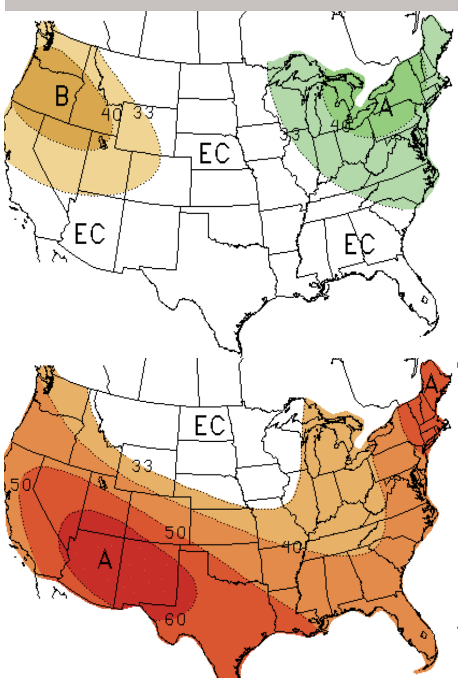


Figure 7: Three-Month Outlook - Precipitation (top) & Temperature (bottom) - Apr 19, 2018

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

Oceanic and atmospheric conditions over the last month remained generally consistent with a La Niña event (Figs. 1-2), but given the rapid decline of these conditions and the imminent seasonal transition, it is only a matter of time before ENSO-neutral conditions return. The current ENSO forecasts reflect this steady weakening, with most indicating a likely transition to ENSO-neutral conditions over the spring, and others having already declared an end to this La Niña event. On April 10, the Japanese Meteorological Agency (JMA) identified ongoing La Niña conditions but called for a 90-percent chance that this event will end in spring. On April 10, the Australian Bureau of Meteorology maintained their ENSO Outlook at “inactive,” stating “there is little sign of El Niño or La Niña developing in the coming months.” On April 12, the NOAA Climate Prediction Center (CPC) continued its La Niña advisory but expected a transition to ENSO-neutral conditions by May and forecast a greater-than-50-percent chance of ENSO-neutral lasting through summer. On April 19, the International Research Institute (IRI) issued its ENSO Quick Look, which still identified weak La Niña conditions present but called for a rapid transition to ENSO-neutral conditions over spring (Fig. 3). The North American Multi-Model Ensemble (NMME) is consistently indicative of a return to ENSO-neutral conditions, but with greater uncertainty over what the latter half of 2018 might hold (Fig. 4).

Summary: In the Southwest, the effects of La Niña events can be difficult to distinguish from normal winter conditions. La Niñas are associated with warmer- and drier-than-average winters, but as Southwest winters are relatively dry to begin with, La Niña does not always reflect a radical departure from normal. That said, the above-average temperatures and below-average precipitation of this winter and spring have been characteristic of a La Niña year. The resulting reduction in snowpack and snow water equivalent across the western United States raises concerns about water resource management since the region relies on snowmelt and streamflow to provide a steady supply of water for the region. Thus the impacts of a seasonal event like La Niña, especially in a drought-sensitive area such as the Southwest, can extend far beyond the duration of that event to affect long-term strategies to manage demand, use, and supply in a resource-constrained environment. Water systems in the Southwest are designed with arid conditions in mind, but accumulated precipitation deficits associated with long-term drought, seasonal climate phenomena like La Niña, and the variability of weather all threaten the stability of these systems and the communities and sectors that depend on these water resources.

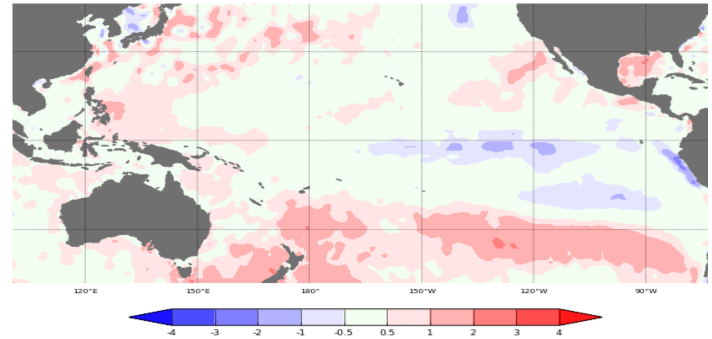


Figure 1: Mar 2018 Sea Surface Temperature (SST) Anomalies

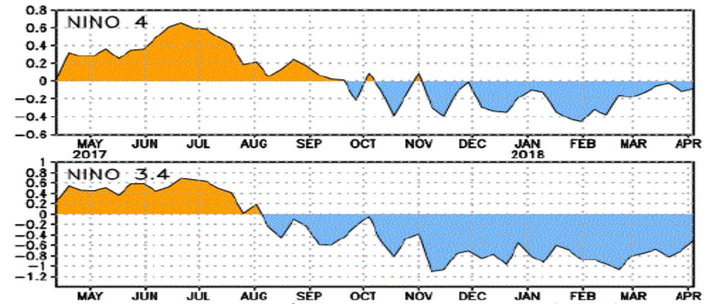


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

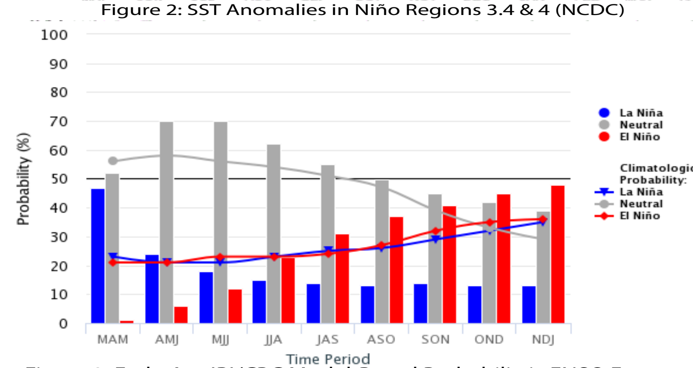


Figure 3: Early-Apr IRI/CPC Model-Based Probabilistic ENSO Forecast

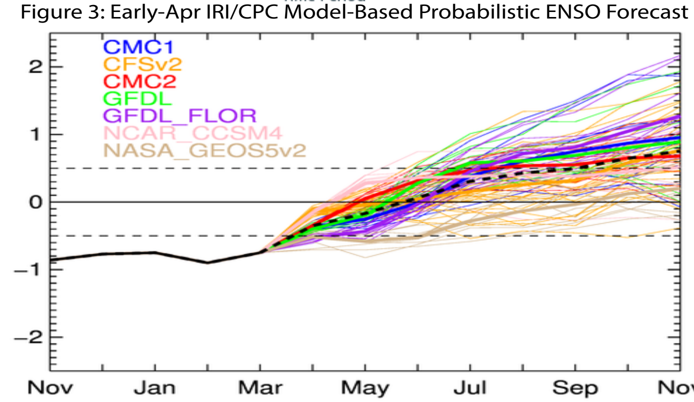


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figures 5a-6a
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

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

La Niña Tracker - Cool Season Precipitation Recap (Oct-Mar)

Monthly and cool-season (Oct-Mar) precipitation totals demonstrate how this La Niña year compares to previous years, and helps characterize the influence of ENSO on cool-season precipitation. Figures 5a-8a describe monthly and cool season precipitation totals at four weather stations (Flagstaff, AZ; Tucson, AZ, Albuquerque, NM, and El Paso, TX), where each dot corresponds to observed monthly and cool-season precipitation for each year since 1950, color coded by the ENSO status of that year, and the horizontal black lines correspond to 2017-2018 precipitation. Figures 5b-8b are scatterplots of ENSO index vs. precipitation totals for the regional climate division that contains each weather station.

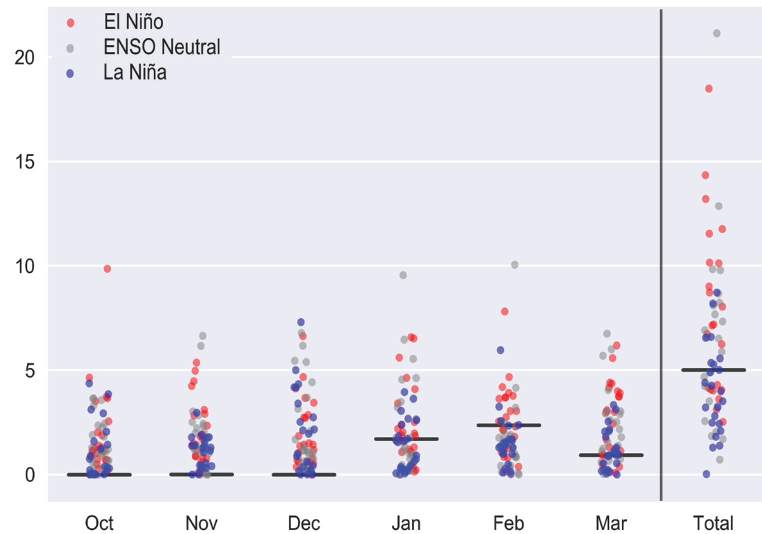


Figure 5a - Cool Season Precipitation - Flagstaff, AZ

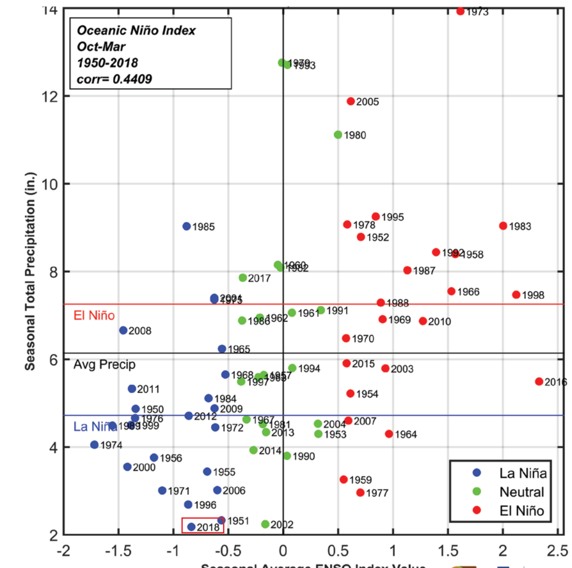


Figure 5b - Cool Season Precipitation - AZ Climate Div 2

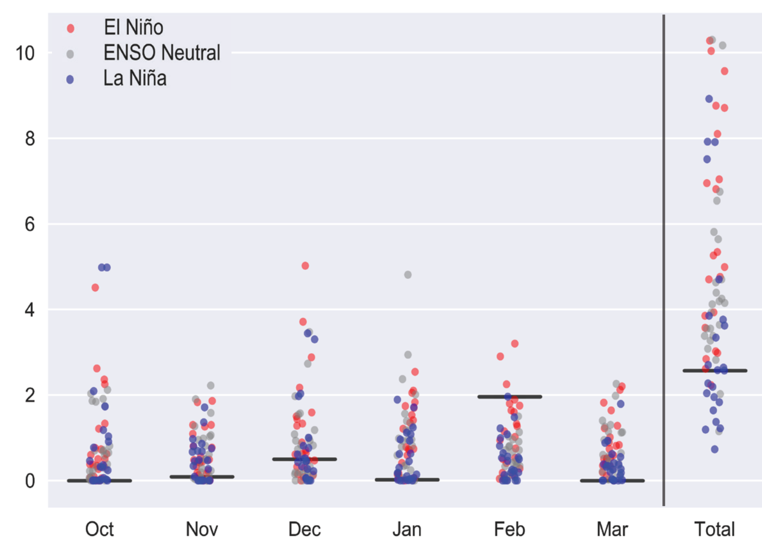


Figure 6a - Cool Season Precipitation - Tucson, AZ

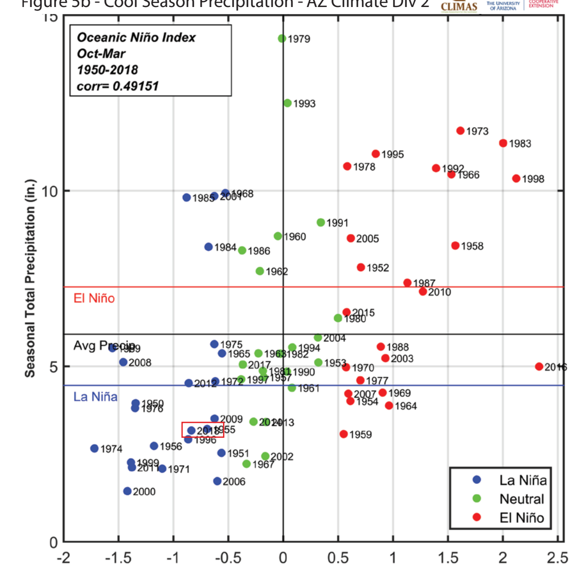


Figure 6b - Cool Season Precipitation - AZ Climate Div 7

Online Resources

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

Figures 7b-8b
Climate Science Applications Program
cals.arizona.edu/climate/

La Niña Tracker - Cool Season Precipitation Recap (Oct-Mar)

A closer look at individual stations highlights some notable observations. Flagstaff recorded almost no precipitation from October through December, and the corresponding climate division recorded record-dry conditions for the entire October-through-March period. In Tucson, nearly all of the October-through-March precipitation fell over just a few days, and the plot illustrates the role that those few storms played in boosting seasonal totals. Albuquerque had a run of months with near-zero precipitation broken by a few storms in February that boosted the station from record-dry to merely top-five driest, while the regional climate division was just below average. El Paso fared better than many regional stations, but still recorded generally below-average precipitation.

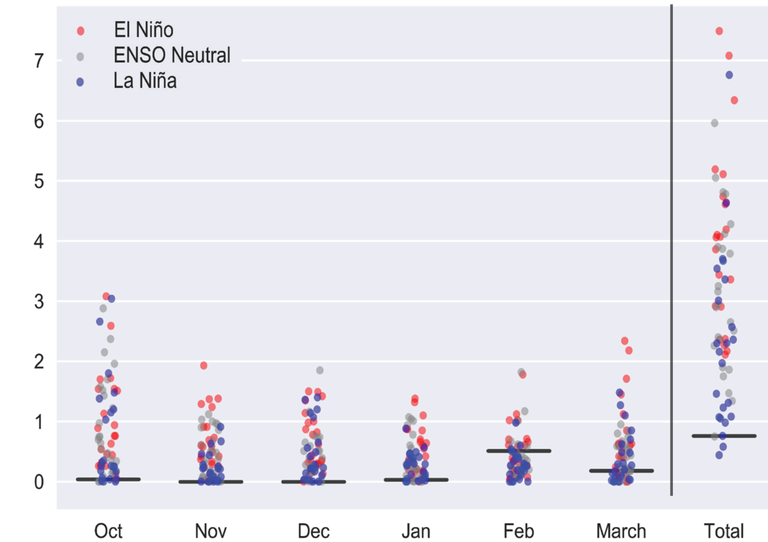


Figure 7a - Cool Season Precipitation - Albuquerque, NM

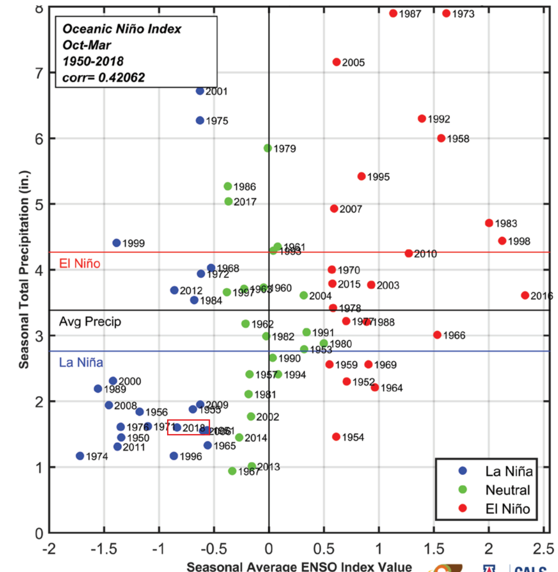


Figure 7b - Cool Season Precipitation - NM Climate Div 5

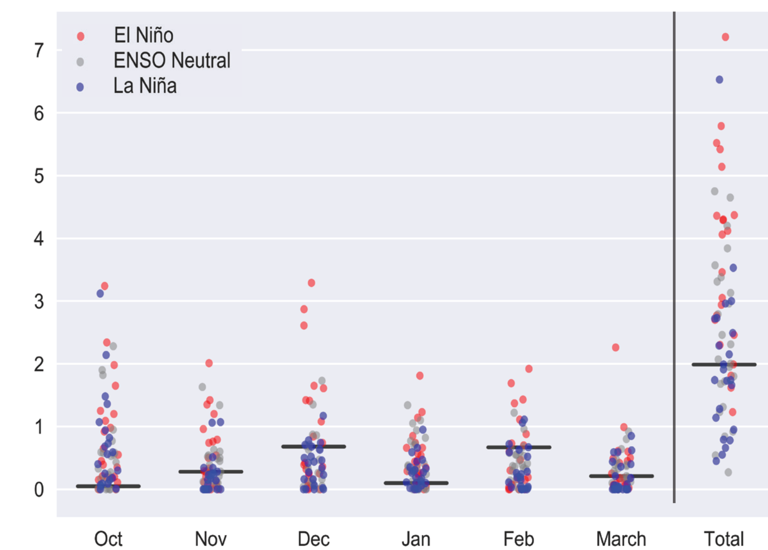


Figure 8a - Cool Season Precipitation - El Paso, TX

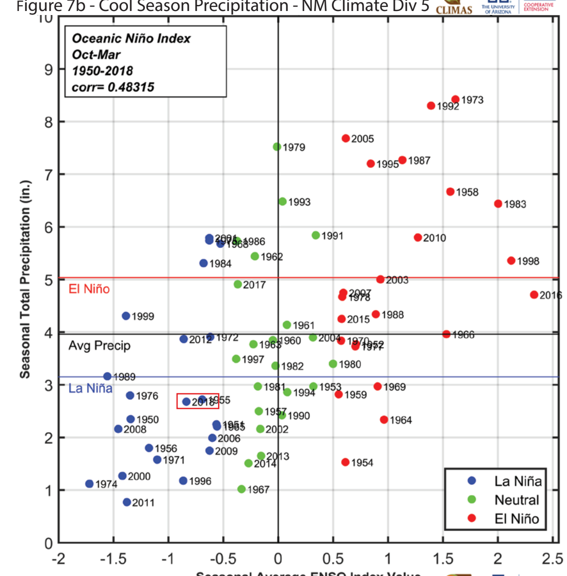


Figure 8b - Cool Season Precipitation - NM Climate Div 8

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).

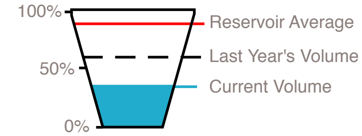
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

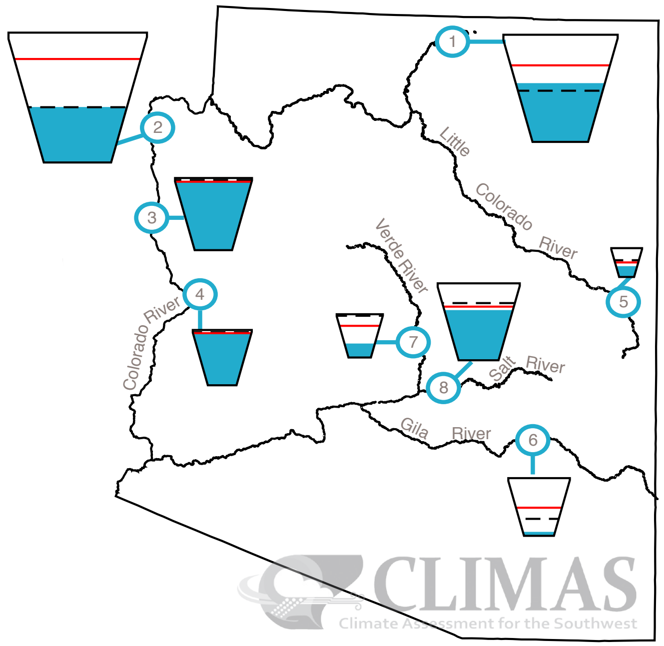
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

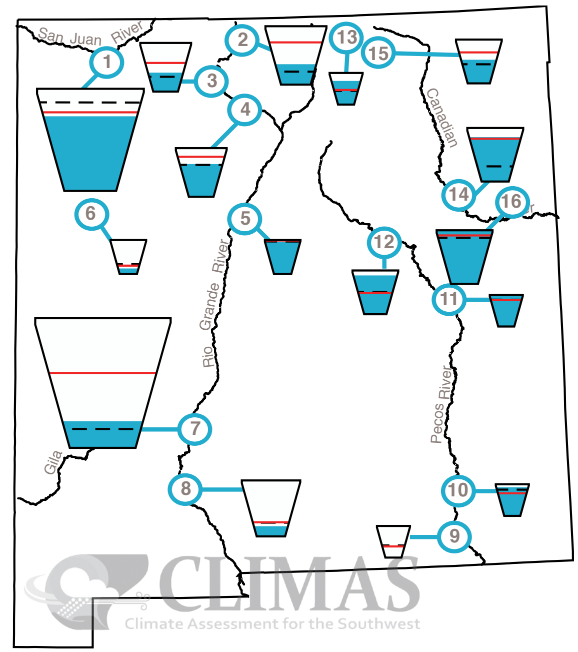
Reservoir Volumes

DATA THROUGH MARCH 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	53%	12,956.1	24,322.0	-389.7
2. Lake Mead	41%	10,695.0	26,159.0	-2.0
3. Lake Mohave	93%	1,686.0	1,810.0	-14.0
4. Lake Havasu	92%	571.8	619.0	-17.3
5. Lyman	36%	10.9	30.0	-0.2
6. San Carlos	6%	52.9	875.0	-10.5
7. Verde River System	31%	88.7	287.4	-9.3
8. Salt River System	64%	1,286.9	2,025.8	-10.5

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	73%	1,236.4	1,696.0	-9.6
2. Heron	35%	139.9	400.0	0.0
3. El Vado	38%	72.1	190.3	1.5
4. Abiquiu	67%	124.9	186.8	-0.1
5. Cochiti	95%	47.4	50.0	-0.7
6. Bluewater	16%	6.1	38.5	-0.2
7. Elephant Butte	20%	434.9	2,195.0	-47.9
8. Caballo	17%	57.9	332.0	13.4
9. Lake Avalon	0%	0.0	4.5	0.0
10. Brantley	90%	38.0	42.2	-6.9
11. Sumner	100%	41.0	102.0	-1.6
12. Santa Rosa	88%	93.2	105.9	-0.7
13. Costilla	74%	11.8	16.0	0.4
14. Conchas	83%	211.5	254.2	-1.7
15. Eagle Nest	54%	43.0	79.0	0.2
16. Ute Reservoir	99%	198	200	-4.0

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.

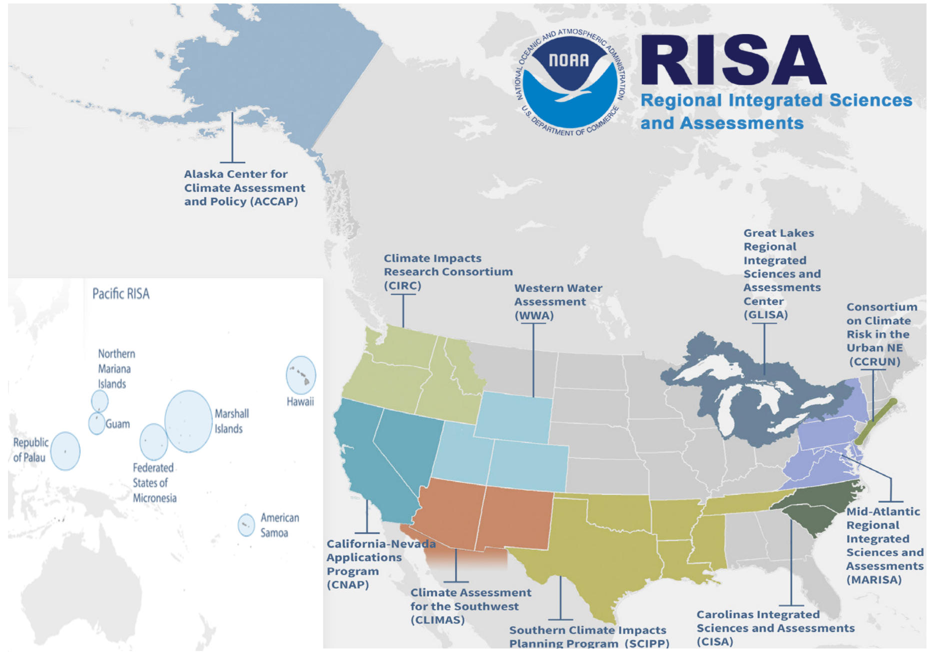


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions

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.

UPCOMING - CLIMAS Events

Colloquium: Evaluating Environmental Water Acquisitions & Regional Climate Services

Details: https://bit.ly/2JKIHjV

April 20, 10:30am - 12:00pm (AZ/PDT time)

Bonnie Colby and Gigi Owen

In Person: University of Arizona, ENR2, room N595

Online Webinar: https://bit.ly/2Ja5Mdw

Colloquium: The Southwestern Monsoon - Research Presentations and Q&A

Details: https://bit.ly/2HwbhWC

April 27, 10:30am - 12:00pm (AZ/PDT time)

Chris Castro (UA HAS), Ryan Dennis (UA HAS), Dan Leins (NWS Tucson), and Ben McMahan (CLIMAS)

In Person: University of Arizona, ENR2, room N604

Online Webinar: https://bit.ly/2JXH6pE