WE WANT YOUR FEEDBACK - SEE PAGE 7

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April Southwest Climate Outlook

Precipitation & Temperature: March precipitation totals were average to below average in most of the Southwest except for the northeastern corner of New Mexico (Fig. 1a). March temperatures were much-above average across the entire Southwest, with record warm temperatures in the southeast corner of Arizona and most of New Mexico (Fig. 1b). April precipitation to date has been below average for much of southern Arizona and New Mexico (Fig. 2), while April temperatures have been between 0 and 6 degrees above normal for most of the region. Water year precipitation has been normal to above normal for most of Arizona and New Mexico, aside from a dry region along much of the Arizona-Mexico border (Fig. 3).

Snowpack & Water Supply: Warm temperatures across the West (particularly in the Upper Colorado River Basin) have begun to put a dent in the snowpack and snow water equivalent (SWE) values this month, especially in warmer low-elevation areas. Most of the stations in Arizona and New Mexico have dipped to below 50 percent of normal SWE, a decline that is also reflected in the Upper Colorado River Basin region of Utah and Colorado (Fig. 4). Snowpack and SWE remain markedly above average in other locations in the West, particularly in much of the Great Basin and the Sierras in CA. The persistent warm temperatures of early 2017 combined with the ample snowpack are resulting in similarly remarkable streamflow forecasts (see Fig. 6 on p. 4), as well as improvements in reservoir storage values (see p.5 for details on reservoir levels).

Drought: While much of the West has seen improvements in drought conditions (notably, California declared an end to its drought), southern Arizona and New Mexico have experienced an increase in drought designation, especially near the borderlands, owing to near-record- to record-warm temperatures and very little precipitation in the last few months (Fig. 5). Thus the wetter-than-normal conditions that helped reduce drought conditions across much of the West (see Fig. 3), provided only short-lived recovery in southern Arizona and New Mexico.

Environmental Health & Safety: The impressive wildflower bloom has continued, fueled by a combination of fall and early-winter precipitation and sustained warm temperatures over the last few months. These conditions have also resulted in a particularly bad year for allergies, with sustained growing periods leading to high pollen levels across the region. The warm and dry weather continues to produce dry and dusty conditions, again resulting in numerous closures of interstate highways when dust conditions are severe. The temperature and precipitation patterns of the past six months have also contributed to elevated levels of fine fuels, so with temperatures on the rise and precipitation on the wane, fire managers will continue to keep watch very carefully, especially on days when high winds and low dew-point temperatures create conditions favorable for fire ignition and spread.

El Niño Southern Oscillation: Current forecasts suggest ENSO-neutral conditions continuing through the spring and early summer, with increasing chance of an El Niño event during the second half of 2017 (see ENSO Tracker on p. 3-4).

Precipitation & Temperature Forecast: The April 20 NOAA Climate Prediction Center's outlook for April calls for equal chances of above- or below-average precipitation, and increased chances of above-average temperatures across the region. The three-month outlook for May through July calls for equal chances of above- or below-average precipitation in most of Arizona and increased chance of above-average precipitation in New Mexico and the remainder of Arizona (Fig. 6, top), along with increased chances of above-average temperatures across the region (Fig. 6, bottom).

Tweet Apr SW Climate Outlook CLICK TO TWEET

APR2017 @CLIMAS_UA SW Climate Outlook & Summary, ENSO Tracker, Reservoir Volumes -- http://bit.ly/2ory9tI #SWclimate #AZWX #NMWX #SWCO

April Southwest Climate Outlook

Online Resources

Figure 1
National Center for Environmental Information
http://www.ncdc.noaa.gov

Figure 2
High Plains Regional Climate Center
http://www.hprcc.unl.edu/

Figures 3-4
Western Regional Climate Center
http://www.wrcc.dri.edu/

Figure 5
U.S. Drought Monitor
http://droughtmonitor.unl.edu/

Figure 6
NOAA - Climate Prediction Center
http://www.cpc.ncep.noaa.gov/

CLIMAS YouTube Channel

Visit our YouTube channel for videos of content pulled from the podcast.

www.youtube.com/user/UACLIMAS/

Podcasts

Visit our website or iTunes to subscribe to our podcast feed.

www.climas.arizona.edu/media/podcasts

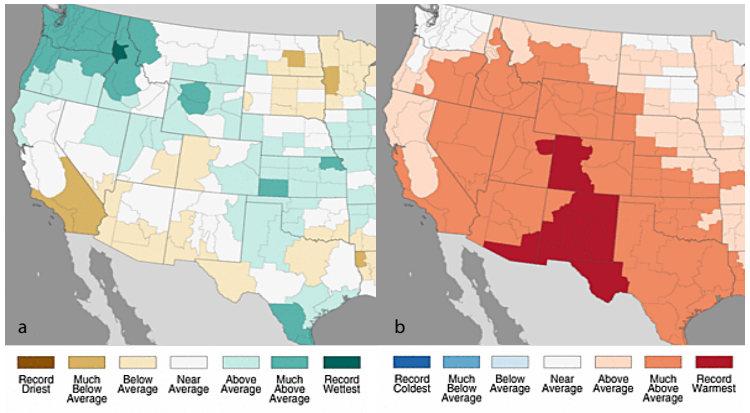


Figure 1: Mar 2017 Precipitation (a) & Temperature Ranks (b)

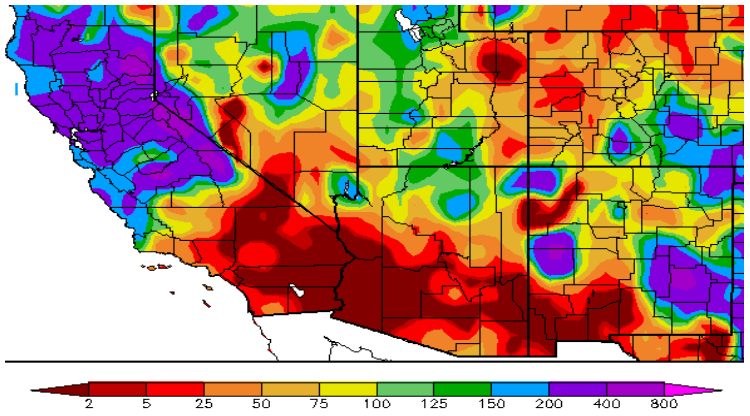


Figure 2: Apr 2017 - Pct. of Normal Precipitation 4/1 - 4/19/2017

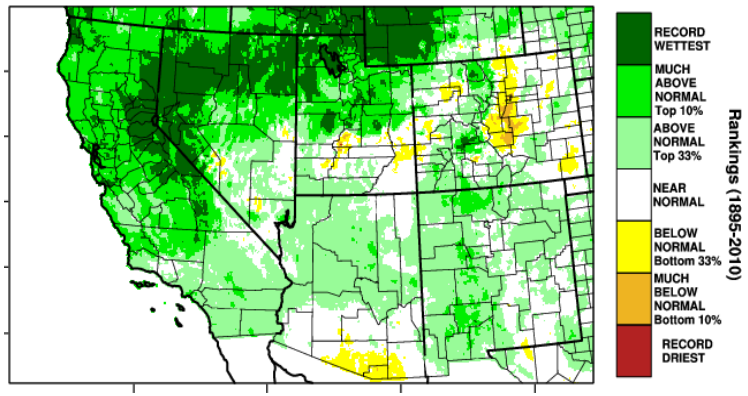


Figure 3: Water Year Precipitation Percentiles Oct 2016 - Mar 2017

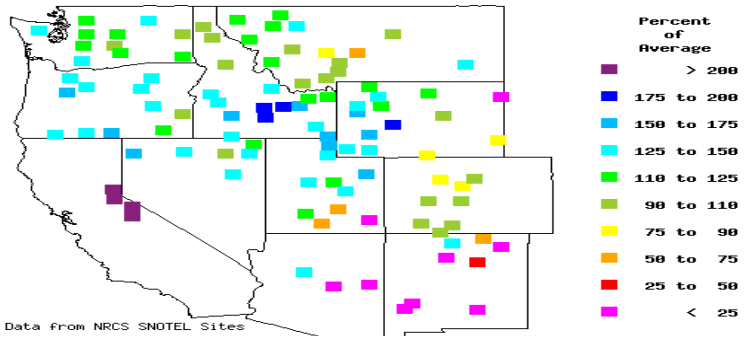


Figure 4: Basin Percent of Average Snow Water Equivalent (Apr 20, 2017)

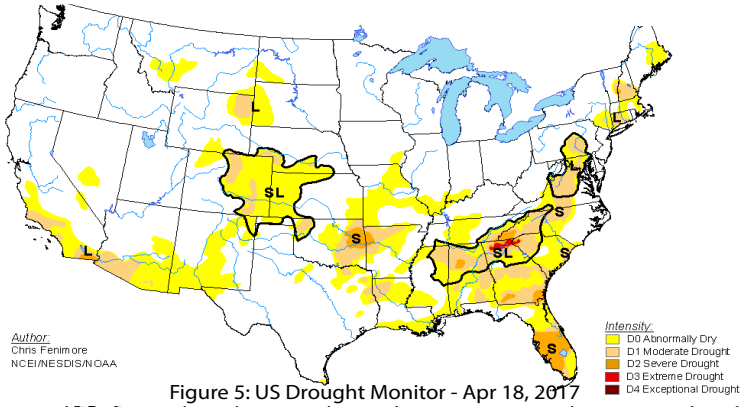


Figure 5: US Drought Monitor - Apr 18, 2017

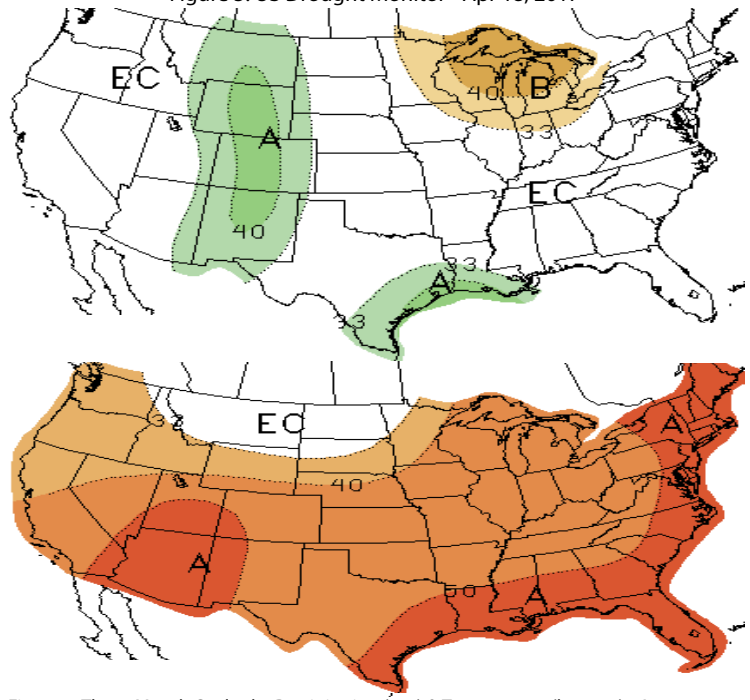


Figure 6: Three-Month Outlook - Precipitation (top) & Temperature (bottom) - Apr 20, 2017

Online Resources

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

Figure 2
NOAA - Climate Prediction Center
http://www.cpc.ncep.noaa.gov/

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

Figure 4
NOAA - Climate Prediction Center
http://www.cpc.ncep.noaa.gov/

NOAA - Climate.gov
The Spring Predictability Barrier: we'd rather be on Spring Break
http://bit.ly/1Xipsx7

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

ENSO Tracker

Similar to last month, oceanic and atmospheric indicators of the El Niño-Southern Oscillation (ENSO) are in the range of neutral (Figs. 1-2), and these conditions are forecast to last through the spring and summer. Most forecasts and outlooks indicate that El Niño conditions could return in mid-to-late 2017, but these assessments come with the annual caveat of increased uncertainty associated with the "spring predictability barrier" (see link in sidebar), during which time the specifics regarding the possibility, timing, and intensity of an El Niño event are elusive. At any rate, the models and forecasts indicate a near-zero probability of La Niña in 2017, leaving forecasters to decide between the probability of neutral or El Niño conditions in later 2017.

The various forecasts provide insight into the range of predictions for the remainder of spring and the ENSO signal for the rest of 2017. On April 10, the Japanese Meteorological Agency (JMA) identified a continuation of ENSO-neutral conditions, with a 50-percent chance of El Niño conditions by the end of summer, but flagged high uncertainties in the models. On April 11, the Australian Bureau of Meteorology maintained their El Niño Watch, also with a 50-percent chance of an El Niño event. They identified warming oceanic conditions as indicating an increased chance of El Niño conditions in 2017 (and having contributed to recent severe flooding in South America). On April 13, the NOAA Climate Prediction Center (CPC) observed that oceanic and atmospheric conditions were consistent with ENSO-neutral conditions, but that some flagging La Niña-like convection was still affecting their assessment. They forecast a 60- to 65-percent chance of ENSO-neutral conditions for April-June 2017, and a 50-percent chance of El Niño conditions between August and December. On April 20, the International Research Institute for Climate and Society (IRI) and CPC identified ongoing neutral conditions, but with some westerly anomalies that may indicate the "first sign of a brewing El Niño." The IRI model spread shows a wide range from neutral to strong El Niño, and the mid-April forecast shows an approximately 65-percent chance of an El Niño event starting in summer and lasting through 2017 (Fig. 3). The North American Multi-Model Ensemble (NMME) characterizes the current model spread and highlights the variability looking forward. The NMME mean is projected to reach weak El Niño status by early summer (Fig. 4).

(continued on next page)

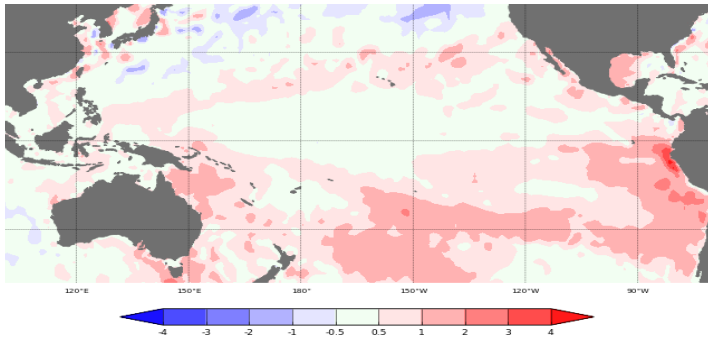


Figure 1: March 2017 Sea Surface Temperature (SST) Anomalies

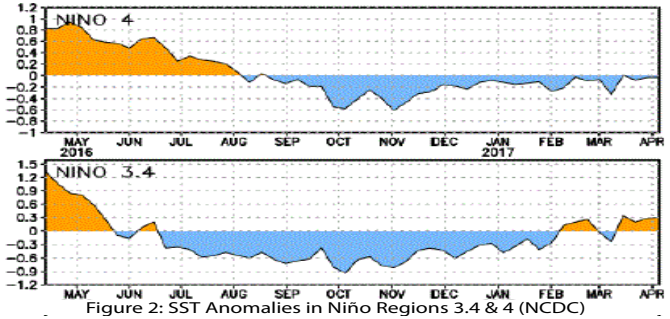


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

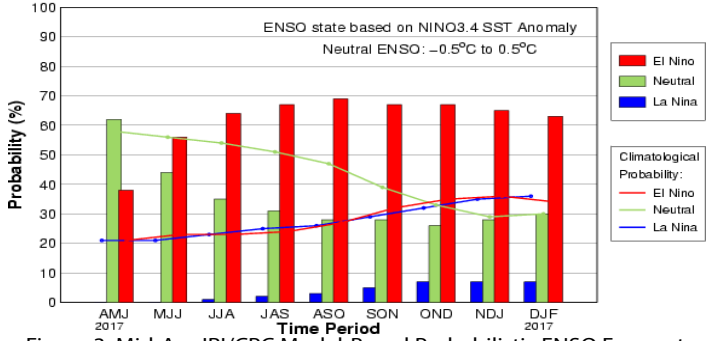


Figure 3: Mid-Apr IRI/CPC Model-Based Probabilistic ENSO Forecast

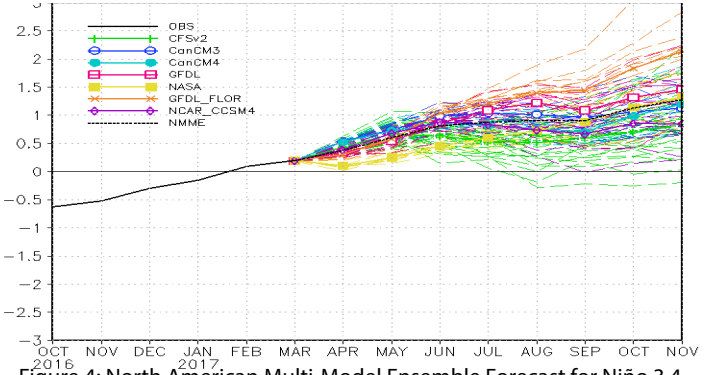


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figures 5a-c
National Centers for Environmental Information
http://www.ncdc.noaa.gov

Figures 6
Natural Resources Conservation Service
http://www.wcc.nrcs.usda.gov/

NOAA - Climate Prediction Center
El Niño Criteria and Oceanic Niño Index Values
http://bit.ly/RjTP9B

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

ENSO Tracker - Summary

Given the uncertainty associated with springtime forecasts and the waning influence of remnant La Niña conditions, the Southwest remains in a holding pattern regarding an El Niño event in 2017. Even if an El Niño event develops, there is no certainty about the strength of the event or the scale of the impacts likely to be felt in the Southwest.

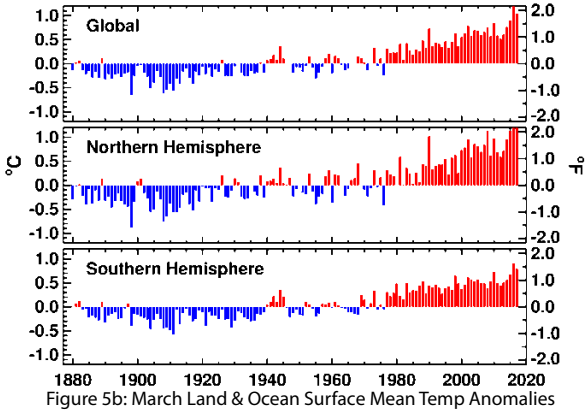


Figure 5b: March Land & Ocean Surface Mean Temp Anomalies

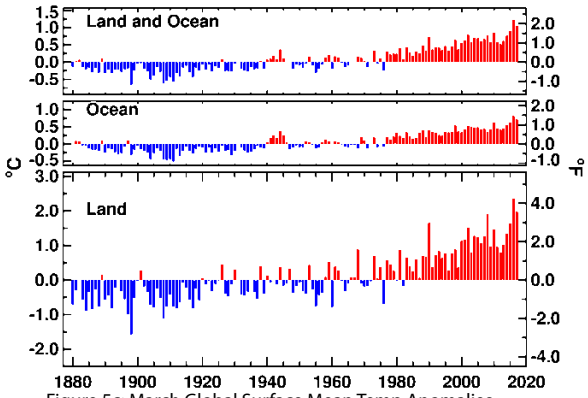


Figure 5c: March Global Surface Mean Temp Anomalies

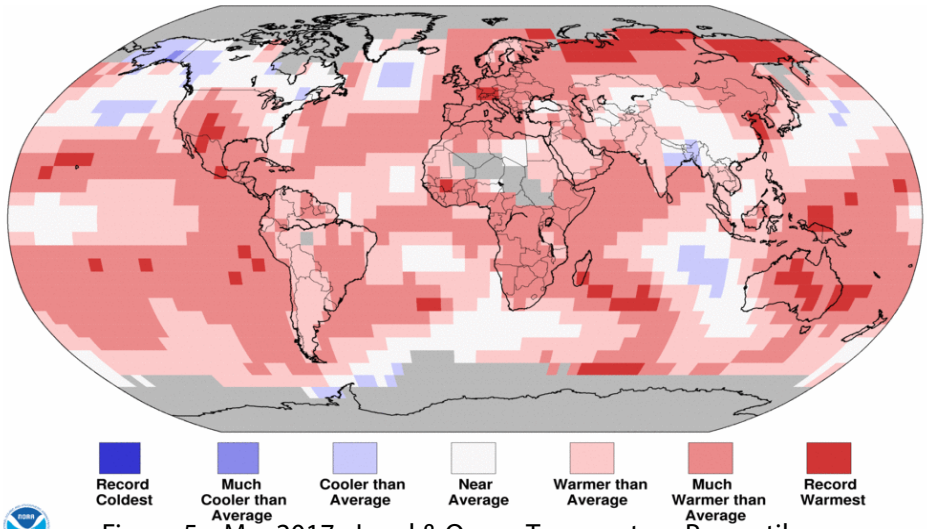


Figure 5a: Mar 2017 - Land & Ocean Temperature Percentiles

Streamflow Forecasts

March 2017 turned out to be the warmest non-El Niño March on record and the second warmest March overall (Figs. 5a-c). The warm temperatures in 2017, in conjunction with mostly above-average precipitation across the West, mean streamflow forecasts remain well-above average (Fig. 6), and ahead of schedule.

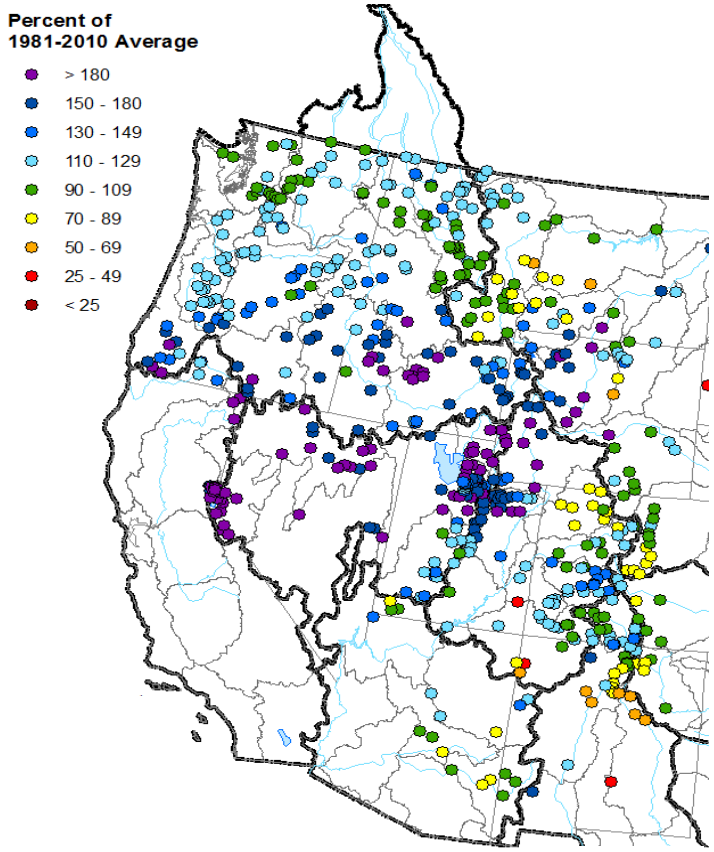


Figure 6: USDA NRCS Spring & Summer Streamflow Forecast - Apr 1, 2017

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

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).

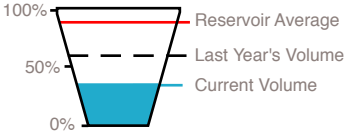
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

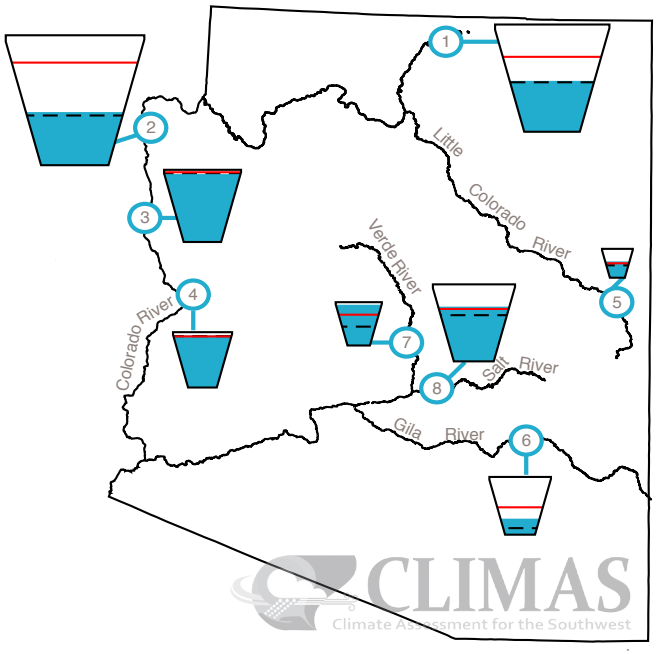
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

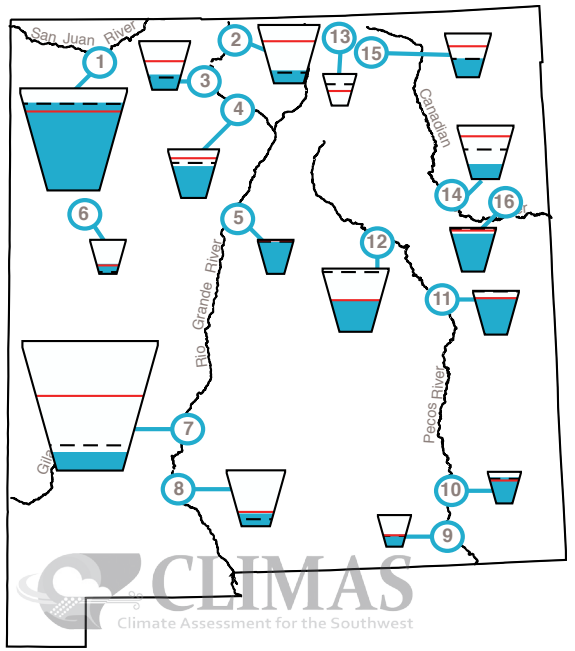
Reservoir Volumes

DATA THROUGH MAR 31, 2017

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







Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	47%	11,350.0	24,322.0	137.6
2. Lake Mead	41%	10,707.0	26,159.0	-119.0
3. Lake Mohave	95%	1,718.0	1,810.0	30.0
4. Lake Havasu	94%	579.0	619.0	-8.8
5. Lyman	56%	16.9	30.0	6.4
6. San Carlos	28%	241.8	875.0	13.9
7. Verde River System	94%	271.3	287.4	-8.8
8. Salt River System	72%	1,467.2	2,025.8	141.9

*KAF: thousands of acre-feet

* in KAF = thousands of acre-feet
**Reservoirs with updated "Max Storage"
***The last available reading for Costilla reservoir is Jan 5, 2017

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	86%	1,464.7	1,696.0	125.0
2. Heron	22%	86.7	400.0	19.6
3. El Vado	31%	58.6	190.3	4.7
4. Abiquiu	66%	122.4	186.8**	-1.3
5. Cochiti	95%	47.7	50.0**	1.7
6. Bluewater	29%	11.3	38.5	3.5
7. Elephant Butte	14%	312.7	2,195.0	17.6
8. Caballo	23%	77.0	332.0	47.2
9. Lake Avalon	38%	1.7	4.5**	-1.4
10. Brantley	83%	34.9	42.2**	-3.2
11. Sumner	84%	30.1	102.0**	-1.8
12. Santa Rosa	51%	54.6	105.9**	3.3
13. Costilla	5%	0.0	16.0	***
14. Conchas	28%	72.3	254.2	-1.3
15. Eagle Nest	43%	34.1	79.0	2.2
16. Ute Reservoir	86%	171	200	-1.0

Online Resources

Figure 1
Climate Program Office
http://cpo.noaa.gov/

RISA Program Homepage

http://cpo.noaa.gov/ClimateDivisions/ClimateandSocietalInteractions/RISAProgram.aspx

UA Institute of the Environment

http://www.environment.arizona.edu/

New Mexico Climate Center

http://weather.nmsu.edu/

CLIMAS Research & Activities

CLIMAS Research

www.climas.arizona.edu/research/

CLIMAS Outreach

www.climas.arizona.edu/outreach

Climate Services

www.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 all work with partners across the Southwest to develop sustainable answers to regional climate challenges.

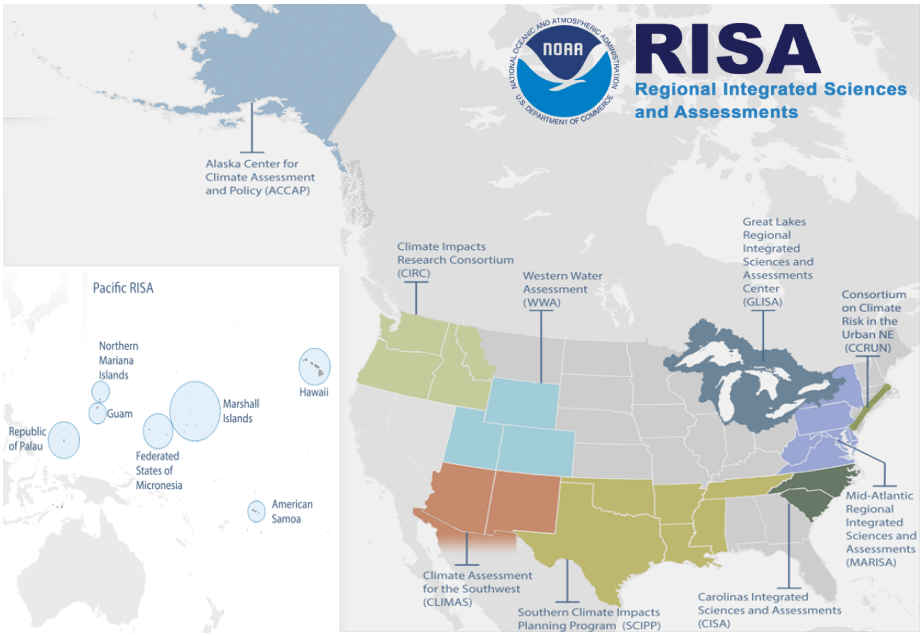


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions

What does CLIMAS do?

The CLIMAS team and our 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; 6) regional climate service options to support communities working to adapt to climate change.

Why is this work important?

Climate variability and the long-term warming trend affect social phenomena such as population growth, economic development, and vulnerable populations, as well as natural systems. This creates a complex environment for decision making in the semi-arid and arid southwestern United States. For example, natural resource managers focused on maintaining the health of ecosystems face serious climate-related challenges, including severe sustained drought, dramatic seasonal and interannual variations in precipitation, and steadily rising temperatures. Similarly, local, state, federal, and tribal governments strive to maintain vital economic growth and quality of life within the context of drought, population growth, vector-born disease, and variable water supplies. Uncertainties surrounding the interactions between climate and society are prompting decision-makers to seek out teams of natural and social scientists—like those that comprise CLIMAS—for collaborations to help reduce risk and enhance resilience in the face of climate variability and change.

Online Resources

Figure 1
Climate Program Office
http://cpo.noaa.gov/

RISA Program Homepage

http://cpo.noaa.gov/ClimateDivisions/ClimateandSocietalInteractions/RISAProgram.aspx

UA Institute of the Environment

http://www.environment.arizona.edu/

New Mexico Climate Center

http://weather.nmsu.edu/

CLIMAS Research & Activities

CLIMAS Research

www.climas.arizona.edu/research/

CLIMAS Outreach

www.climas.arizona.edu/outreach

Climate Services

www.climas.arizona.edu/climate-services

CLIMAS
Climate Assessment for the Southwest
A NOAA RISA TEAM

Dear colleagues,

We are reaching out to ask you share your CLIMAS story with us, and tell us about the kind of work you would like to see us do in the coming years.

In 1998, the Climate Assessment for the Southwest (or CLIMAS) was founded with a mission to improve the ability of people across the Southwest to respond sufficiently and appropriately to climate events, variability, and changes. Over those 19 years, we have worked directly with many of you to try to fulfill that mission. We are now looking ahead to the next 5 years and we would like to hear from you.

If you interact with CLIMAS--whether you read the Southwest Climate Outlook, listen to our podcast, or have partnered with us on projects–we would love to hear your story:

Please visit **www.climas.arizona.edu/climas-stories** to tell us what you think.

If your story or feedback is brief, you can also tweet it to us at @CLIMAS_UA

Thanks,

Dan

Daniel Ferguson, Ph.D.

Associate Research Scientist, Institute of the Environment

Director, Climate Assessment for the Southwest (CLIMAS)

Assistant Research Professor, School of Natural Resources and the Environment

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