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May Southwest Climate Outlook

April Precipitation and Temperature: April precipitation was average to much above-average in most of New Mexico, while Arizona ranged from below-average to above-average (Fig. 1a). April temperatures were almost entirely above-average to much above-average across the Southwest (Fig. 1b), while temperatures so far in May have been mostly below-average.

Seasonal Precipitation and Temperature: Year-to-date precipitation (Jan-Apr) is above-average for most of the western U.S. (Fig. 2a). Most of Arizona and northern New Mexico were above-average or much above-average, and across the Southwest, only southern New Mexico and far west Texas recorded below-average precipitation. Temperatures for Jan-Apr were average to above-average in Arizona and mostly above-average in New Mexico (Fig. 2b).

Drought: Water year precipitation is above normal (top 33%) for much of the Southwest, with large areas of much above normal (top 10%) and smaller pockets of record wet conditions (Fig. 3). The May. 7 U.S. Drought Monitor (USDM) continues to show improvements in regional drought conditions in the Southwest, with Arizona nearly clear of drought designations, and the intensity of drought characterizations in the four corners region and northern New Mexico further reduced compared to last month (Fig. 4).

Snowpack & Water Supply: Late season snowpack in the Southwest is waning, and snow water equivalent (SWE) in Arizona and New Mexico reflect this seasonal transition. Many stations are no longer reporting values, but those still reporting show over 200-percent of average (Fig. 5). Upper elevation areas in Utah and Colorado mostly range from 110- to 200-percent of average, which bodes well for short term reservoir storage (see streamflow forecast on p. 4 and reservoir diagrams on p. 5).

Wildfire, Health, and Safety: Wildfire outlooks for June and July paint a similar picture for lower elevation areas of Arizona, with above normal fire risk (Fig. 6), linked to widespread fine fuel growth driven by above-average precipitation in the cool season. Northern Arizona and New Mexico are projected to see below normal fire risk in June and return to normal risk in July. Cool season precipitation has done wonders for the wildflower season and helped with drought, but wildfire risk and the impact of pollen production for allergy sufferers provide examples of trade-offs associated with increased precipitation.

El Niño Tracker: Atmospheric and oceanic conditions remain in line with a weak El Niño, and most forecasts call for this event to last at least through summer. There is considerable uncertainty, however, for forecasts made in Spring, and in the Southwest, there is little in the way of a precipitation signal to alter in May and early June (see El Niño tracker on p. 3 for more details).

Precipitation and Temperature Forecast: The three-month outlook for June through August calls for increased chances of below-normal precipitation in northern and central Arizona and equal chances of above- or below-normal precipitation in much of the rest of Arizona, New Mexico, west Texas, and northern Mexico (Fig. 7, top). The three-month temperature outlook calls for increased chances of above-normal temperatures in most of Arizona, and parts of northern New Mexico, and northern Mexico, with equal chances of above- or below-average temperatures in the rest of the region (Fig. 7, bottom).

Tweet May 2019 SW Climate Outlook

CLICK TO TWEET

MAY2019 @CLIMAS_UA SW Climate Outlook, El Niño Tracker, Streamflow Forecasts, AZ & NM Reservoir volumes, CLIMAS colloquium videos, bit.ly/2LN3FlQ #SWclimate #AZWX #NMWX

May 2019 SW Climate Outlook

Online Resources

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

Figures 3,5
Western Regional Climate Center
wrcc.dri.edu

Figure 4
U.S. Drought Monitor
droughtmonitor.unl.edu

Figure 6
National Interagency Fire Center
droughtmonitor.unl.edu

Figure 7
International Research Institute for Climate and Society
iri.columbia.edu

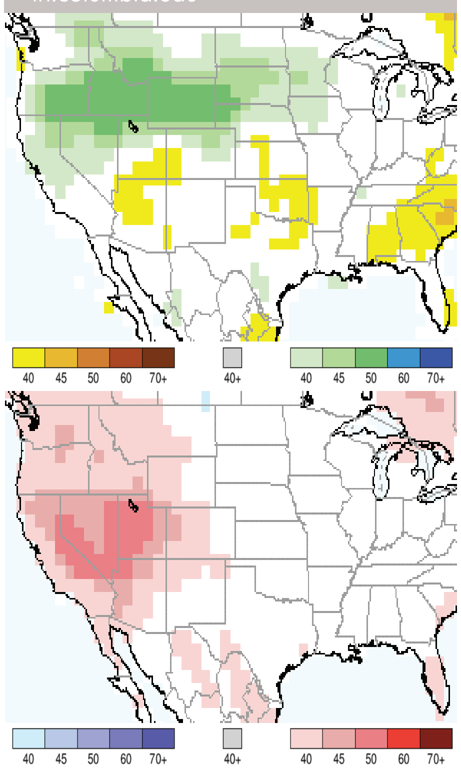


Figure 7: Three-Month (JJA) Forecast for Precipitation (top) and Temperature (bottom)

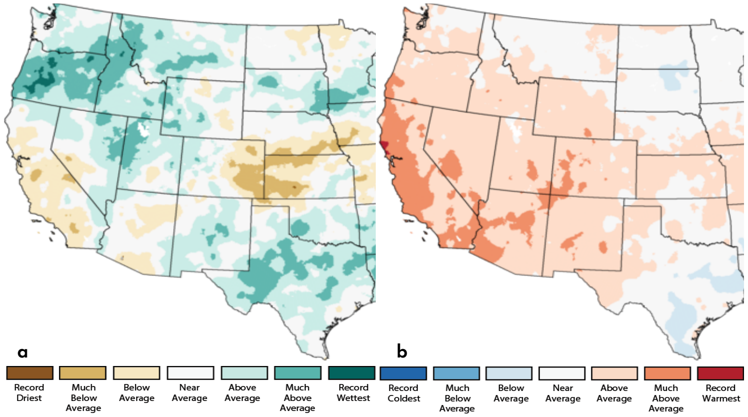


Figure 1: April 2019 Precipitation (a) & Temperature Ranks (b)

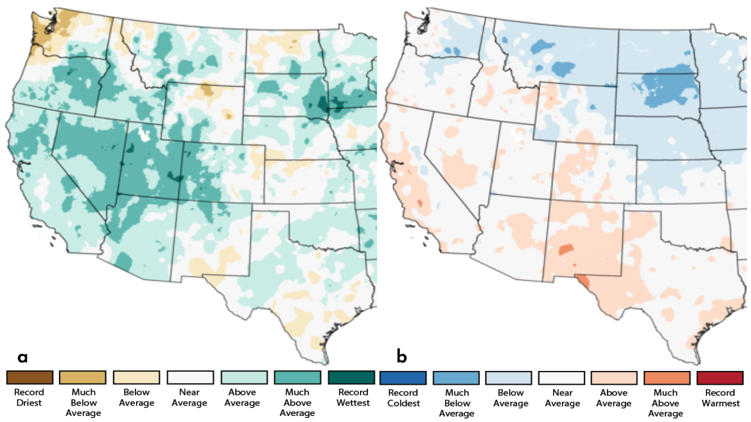


Figure 2: Jan 2019 - Apr 2019 Precipitation (a) & Temperature Ranks (b)

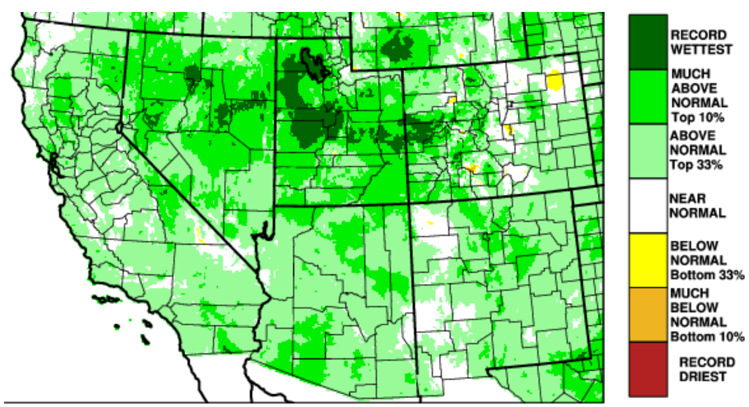


Figure 3: Oct 2018 - Apr 2019 - Precipitation Rankings

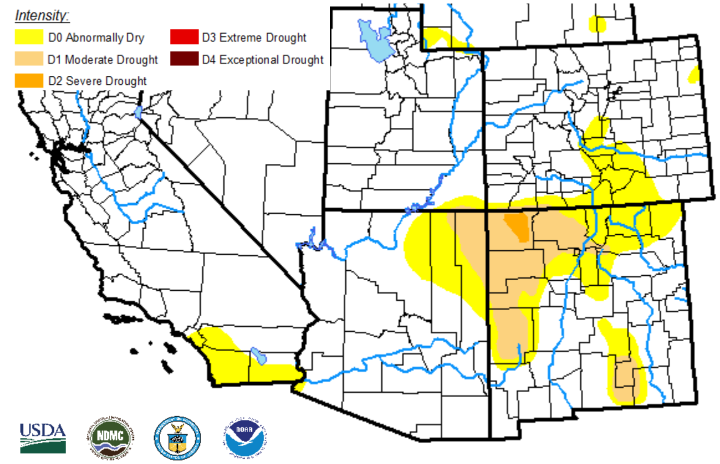


Figure 4: US Drought Monitor - May 7, 2019

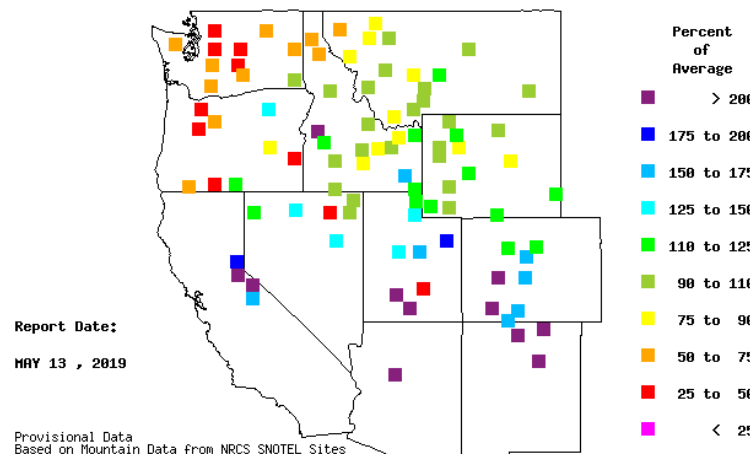


Figure 5: Snow Water Equivalent (SWE) - May 13, 2019

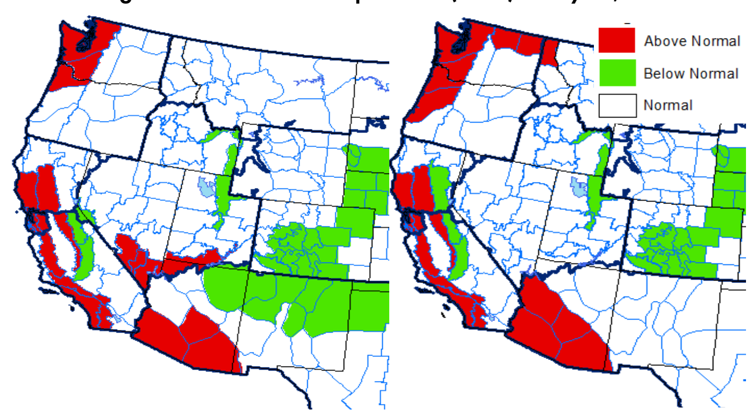


Figure 6: Significant Wildland Fire Potenatial June (Left) & July (Right)

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

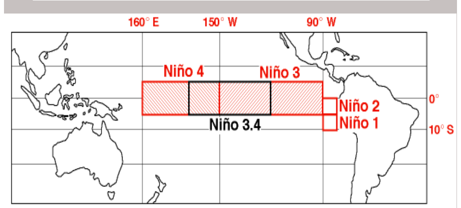
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

El Niño / La Niña

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

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

Equatorial Niño Regions



For more information: ncdc.noaa.gov/teleconnections/enso/indicators/sst/

Image source: aoml.noaa.gov/

El Niño Tracker

Seasonal outlooks highlight persistent sea surface temperature (SST) anomalies consistent with a weak El Niño event (Figs. 1-2), while other atmospheric and oceanic indicators such as convective anomalies and sub-surface temperatures are less definitive. The so-called 'spring predictability barrier' further limits certainty. Forecast discussions focus on how long the event will last and the potential for a second year of El Niño.

On May 9, the NOAA Climate Prediction Center (CPC) maintained their El Niño advisory, identifying that SSTs were consistent with El Niño even while other indicators were less definitive. Their outlook maintained a 70-percent chance of El Niño lasting through summer, and 55- to 60-percent of lasting through fall. On May 9, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), highlighting above-average SSTs and warm subsurface waters, although they noted a decline in the positive sub-surface anomalies over the last few months. On May 10, the Japanese Meteorological Agency (JMA) noted deviations from typical El Niño conditions in the atmosphere, but based on SSTs, they called for an 80-percent chance of the event lasting until summer, and a 60-percent chance to last until fall. On May 14, the Australian Bureau of Meteorology moved their ENSO Outlook to "watch" status (down from "alert"), calling for a 50-percent chance of an El Niño event sometime in 2019. The North American Multi-Model Ensemble (NMME) points toward a weak El Niño lasting into fall 2019 (Fig. 4).

Summary: El Niño conditions are in the range of a weak event, but it is difficult to nail down its longevity. It might be on the way out by the end of summer, it might extend into fall, or it might even last into 2020. With El Niño conditions expected to remain for at least the rest of summer, there are a few associations of note. The first is enhanced northern Pacific tropical storm activity, which could see tropical storms increase our warm season precipitation totals in direct ways via storms that push into the region or that provide additional moisture and instability that enhances monsoon activity. This influence is typically associated with the latter half of the monsoon and into fall, but tropical storms have augmented regional precipitation totals in late May and early June (e.g. TS Bud, last year). El Niño conditions over summer are also associated with a delayed onset of monsoon activity, but this link is tenuous given the small sample size. El Niño sends us mixed signals for summer seasonal outlooks, and provides little to improve our understanding about the timing and intensity of tropical storm activity and monsoon precipitation.

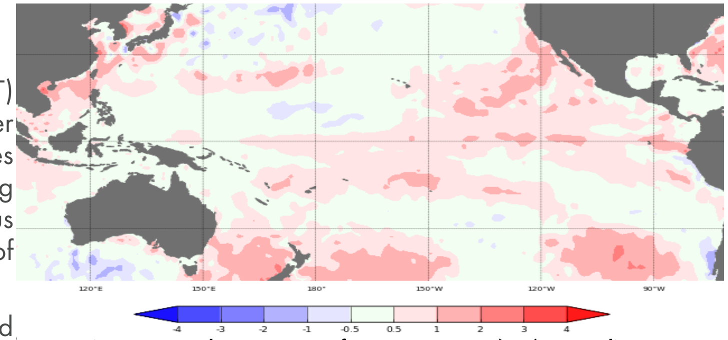


Figure 1: March 2019 Sea Surface Temperature (SST) Anomalies

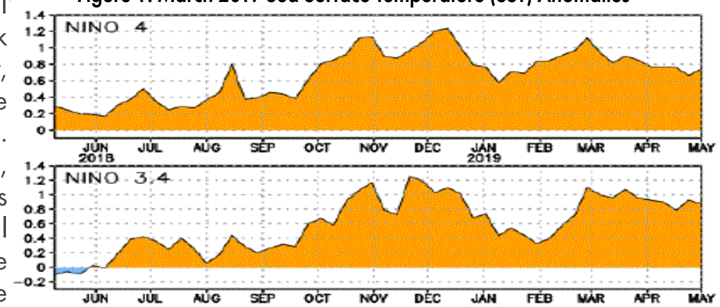


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

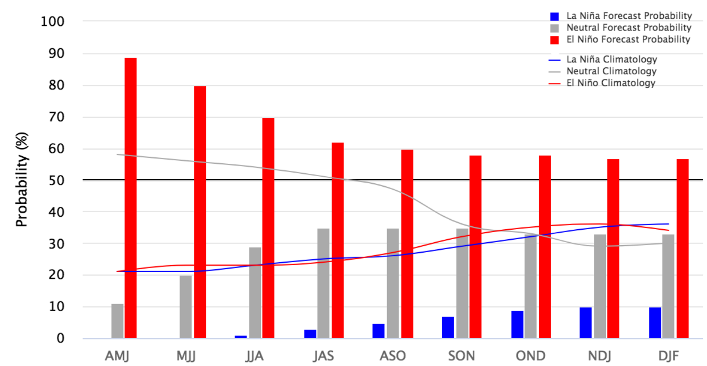


Figure 3: Early-May IRI/CPC Model-Based Probabilistic ENSO Forecast

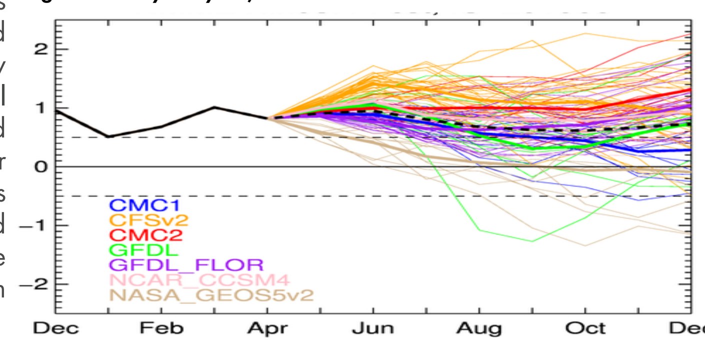


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figure 1
Natural Resources Conservation Service
nrcs.usda.gov

Figures 2-3
Western Regional Climate Center
wrcc.dri.edu

May 2019 Streamflow Forecast

Streamflow estimates as of May 1, 2019 (Fig. 1) reflect the precipation patterns observed over winter and early spring (Fig. 2). This highlights the extent to which UT, NV – and portions of CO and CA – saw much above-average precipitation during this period. This also reveals one of the reasons concerns about Lake Mead associated shortage declarations for this year have waned in recent months (although long-term management challenges remain).

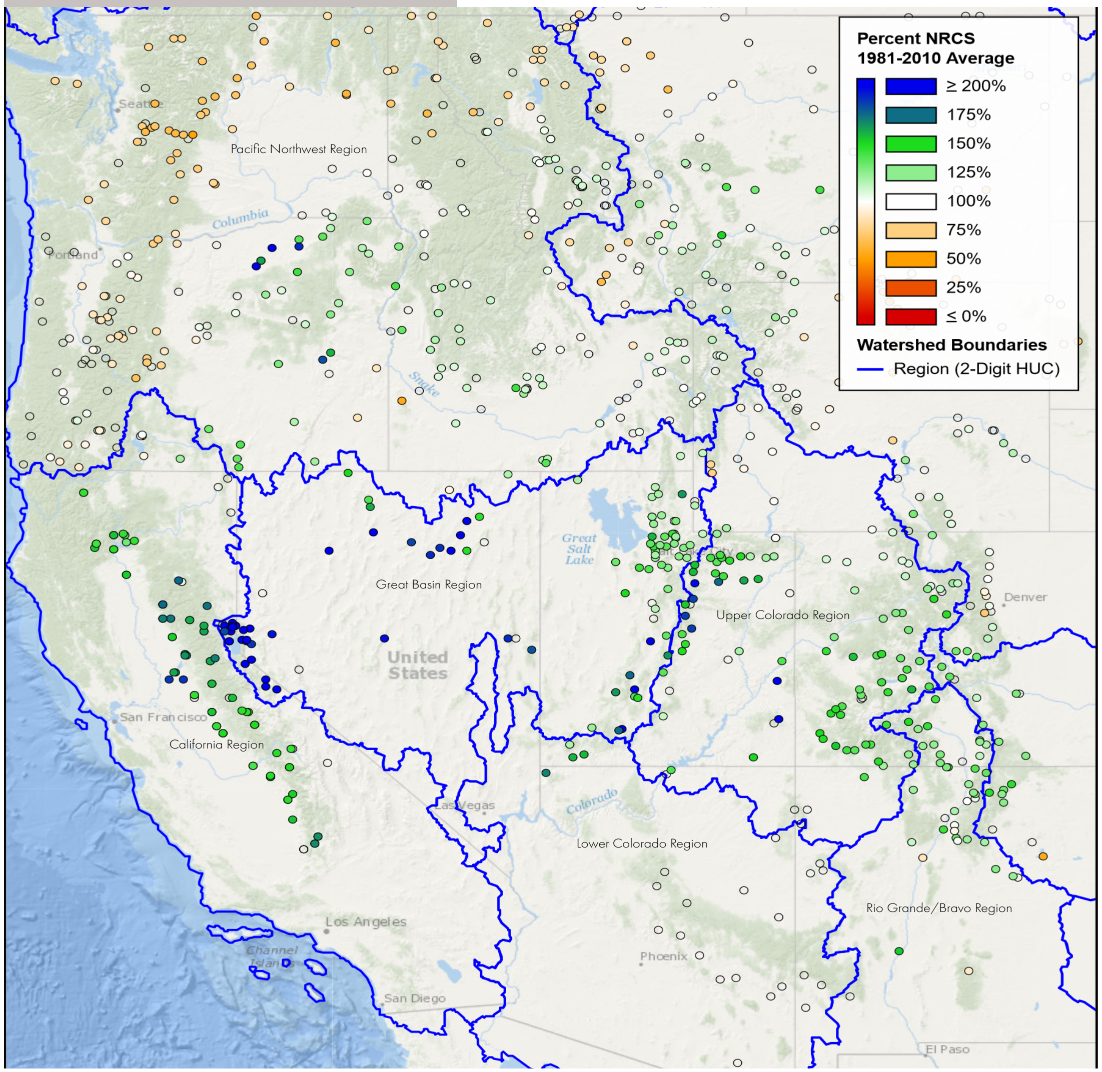


Figure 1: Forecast Volume - 50% Exceedance Probability (May 1, 2019)

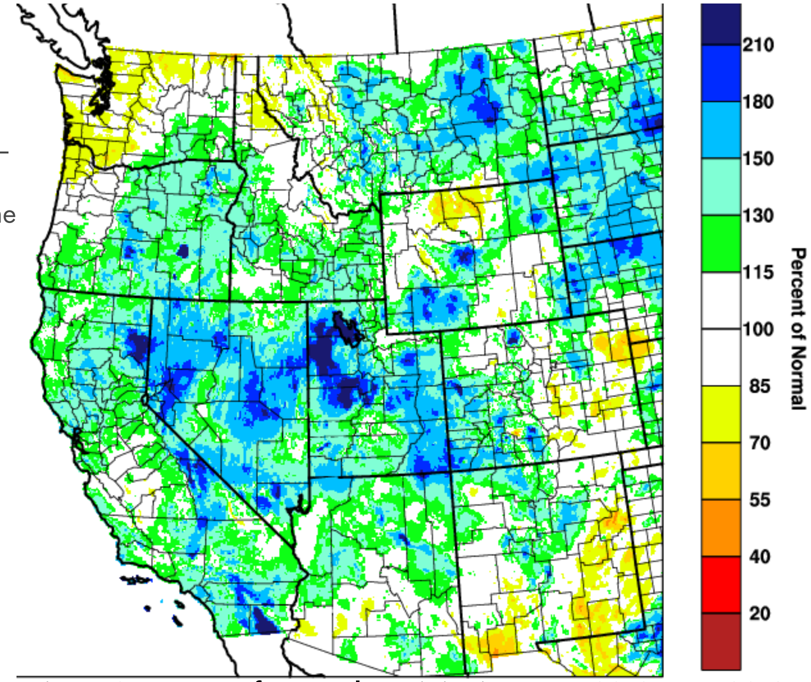


Figure 2: Percent of Normal Precipitation - Dec 2018 - Apr 2019

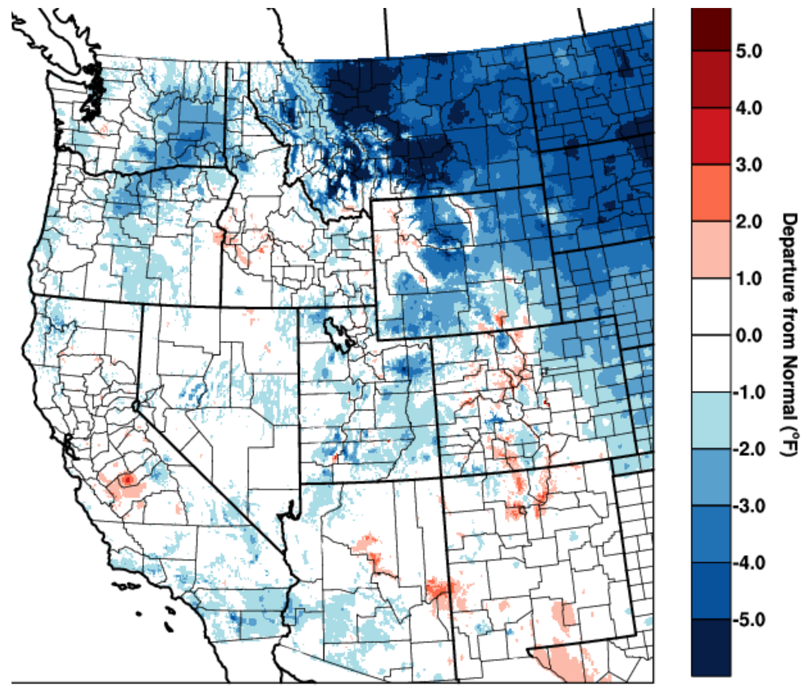


Figure 3: Temp. Departure from Normal - Dec 2018 - Apr 2019

Online Resources

Portions of the information provided in this figure is available at the Natural Resources Conservation Service
www.wcc.nrcs.usda.gov/BOR/basin.html

Contact Ben McMahan with questions/comments.

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).

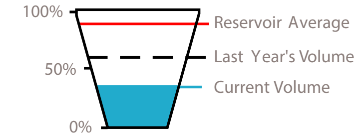
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

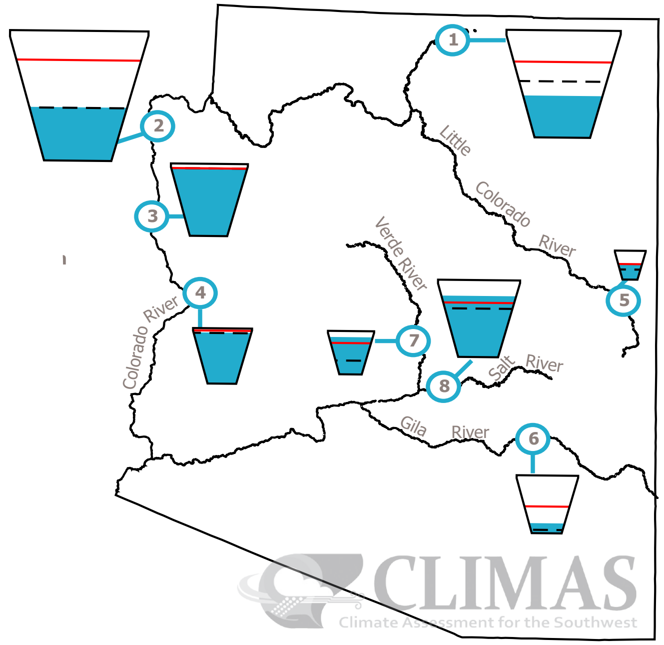
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

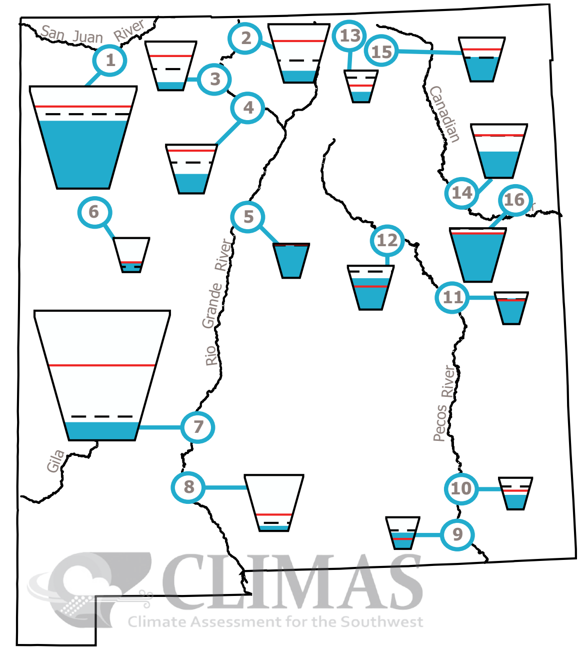
Reservoir Volumes

DATA THROUGH MAY 1, 2019

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	38%	9,197.9	24,322.0	148.9
2. Lake Mead	41%	10,767.0	26,159.0	-110.0
3. Lake Mohave	93%	1,685.0	1,810.0	-2.0
4. Lake Havasu	92%	568.6	619.0	-10.8
5. Lyman	54%	16.1	30.0	4.9
6. San Carlos	17%	150.0	875.0	0.9
7. Verde River System	85%	244.2	287.4	-36.4
8. Salt River System	79%	1,606.6	2,025.8	86.3

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	66%	1116.7	1,696.0	161.2
2. Heron	20%	81.2	400.0	22.0
3. El Vado	16%	30.6	190.3	4.9
4. Abiquiu	40%	75.2	186.8	11.9
5. Cochiti	100%	53.5	50.0	7.9
6. Bluewater	30%	11.7	38.5	0.1
7. Elephant Butte	14%	317.9	2,195.0	98.3
8. Caballo	9%	30.7	332.0	-0.5
9. Lake Avalon	51%	2.3	4.5	1.0
10. Brantley	46%	19.2	42.2	-10.6
11. Sumner	81%	29.2	35.9	-3.7
12. Santa Rosa	71%	74.8	105.9	17.3
13. Costilla	33%	5.2	16.0	2.2
14. Conchas	49%	124.6	254.2	-3.5
15. Eagle Nest	55%	43.1	79.0	6.5
16. Ute Reservoir	91%	182	200	-2.0

Online Resources

Figure 1
Climate Program Office
cpo.noaa.gov

RISA Program Homepage
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

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

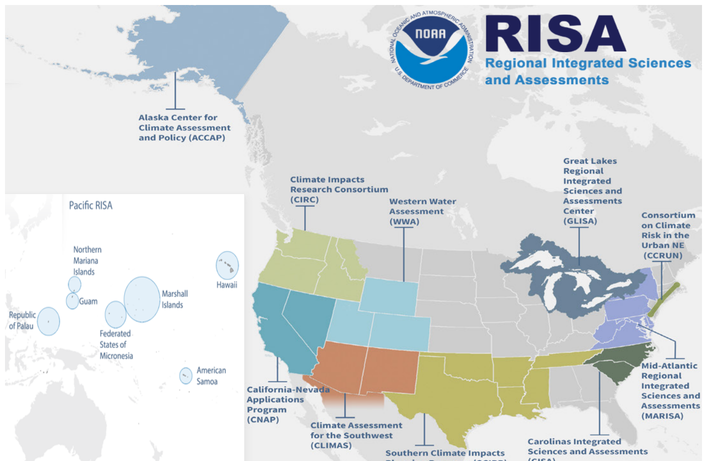


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions

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.

RISA Program Video on CLIMAS Dust Research

https://youtu.be/ENylO-coRKg

CLIMAS Colloquium Presentations on YouTube

Dave DuBois and Jaylen Fuentes: Preparing for the next dust storm: Collaborations with state and federal agencies with roadway dust hazards

https://youtu.be/2csJSTl1YBA

Zahra (Vida) Ghodisidah: Modeling of Dust Emissions over the Chihuahuan Desert

https://youtu.be/kFmIGqZv8EU

Josue Gutierrez: Dust Classification from Weather Observation Stations and Remote Sensing

https://youtu.be/WIou8gsOSJQ

Heidi Brown: Water Harvesting as Maladaptation with Respect to Vector-borne Diseases

https://youtu.be/KfVzZpnK_M0

Ladd Keith: Evaluating the Use of Urban Heat Island and Heat Increase Modeling in Land Use and Planning Decision-Making

https://youtu.be/0sg43EZ97Zk

Ben McMahan: Visualization and Analysis Tools for the North American Monsoon - Integrating Citizen Science Data and Observations

https://youtu.be/gG_kdCRwCts