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April 2021 Southwest Climate Outlook

Precipitation and Temperature: March precipitation was average to below average in most of Arizona and below average to above average in most of New Mexico (Fig. 1a). March temperatures were average in most of Arizona and between average and below average in New Mexico (Fig. 1b, p.2; Fig. 1, p.6). Jan-Mar precipitation ranks were average to below average across most of the Southwest, with a few pockets of above-average (Fig. 2a). Temperature ranks for the same period were average to below average across most of Arizona and New Mexico (Fig. 2b).

Drought: Water year precipitation to date (as of Mar 31, 2021) reveals below normal and much below normal conditions across most of the Southwest, along with a smattering of record driest in the CA/NV/AZ region (Fig. 3). The U.S. Drought Monitor (USDM) is mostly unchanged from last month in the U.S. Southwest (Fig. 4). This is partly because much of the region is at the highest drought category (D4, Exceptional Drought) and the scale simply does not go any drier. In Arizona and New Mexico, over 50-percent of the region is in D4, and 80-85 percent is in at least D3 (Extreme Drought).

Snowpack and Water Supply: Snow water equivalent (SWE) is well below the 1981-2010 median for much of the region (see the NRCS website for details). Streamflow forecasts reflect this reality and are below median across the Southwest, and are below fifty percent of the median in many of the sub-basins for the Colorado and Rio Grande rivers (Fig. 5). Most of the reservoirs in the region are at or below the values recorded at this time last year. Most are below their long-term average (see Arizona and New Mexico reservoir storage on p. 5).

Wildfire: Wildfire season is already underway in Arizona. The Margo fire burned Tamarisk (Salt Cedar) in a dry riverbed in central Arizona, as well as numerous structures in Dudleyville, AZ. The National Interagency Fire Center (NIFC) maps of significant fire potential for April and May highlight the widespread area of above-normal wildfire risk across the southwestern region over the next few months (Fig. 6).

ENSO Tracker: La Niña conditions have waned and outlooks and forecasts see ENSO-neutral conditions as imminent (or already arrived; see ENSO-tracker on p. 3 for details).

Precipitation and Temperature Forecast: The three-month outlook for May through July calls for increased chances for below-normal precipitation across most of the southwestern U.S., with a swath of increased chances of above-normal precipitation extending from central Mexico into southwestern and far western Arizona (Fig. 7, top). The three-month temperature outlook calls for increased chances of above-normal temperatures across the southwestern U.S. and much of northern Mexico (Fig. 7, bottom).

Tweet Apr 2021 SW Climate Outlook

APR2021 @CLIMAS_UA SW Climate Outlook, ENSO Tracker, Cumulative Precip Deficits, Recent SW Temps, AZ & NM Reservoirs, https://bit.ly/2PY6tjd #SWclimate #AZWx #NMWx

Apr 2021 SW Climate Outlook

Online Resources

Figures 1-2
National Centers for Environmental Information
ncdc.noaa.gov/sotc

Figure 3
Climate Assessment for the Southwest
climas.arizona.edu

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

Figures 5
National Resource Conservation Service
nrcs.usda.gov

Figures 6
National Interagency Fire Center
nifc.gov

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

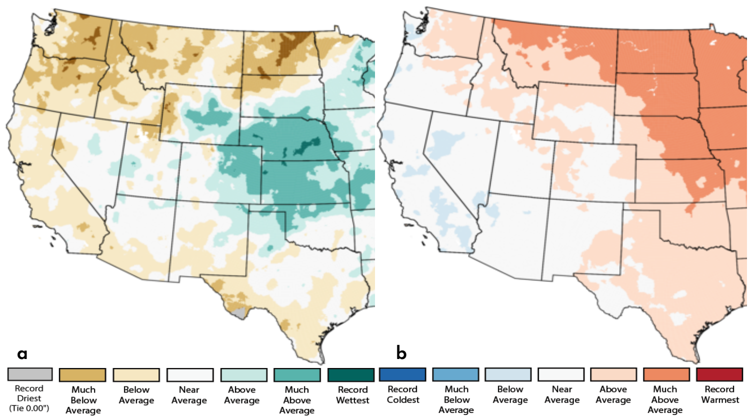


Figure 1: Mar 2021 Precipitation (a) & Temperature Ranks (b)

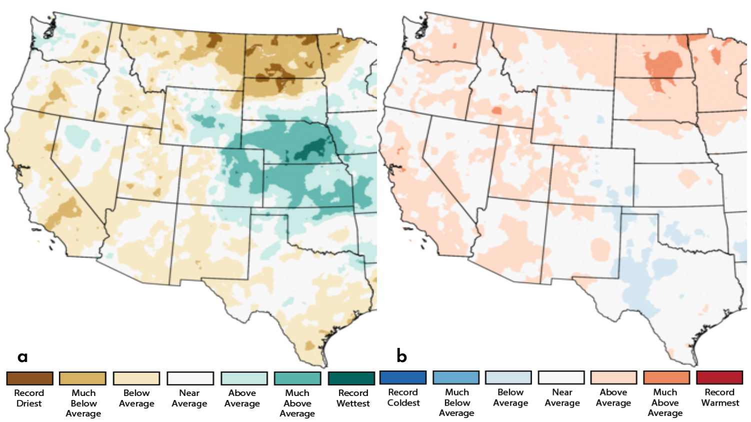


Figure 2: Jan - Mar 2021 Precipitation (a) & Temperature Ranks (b)

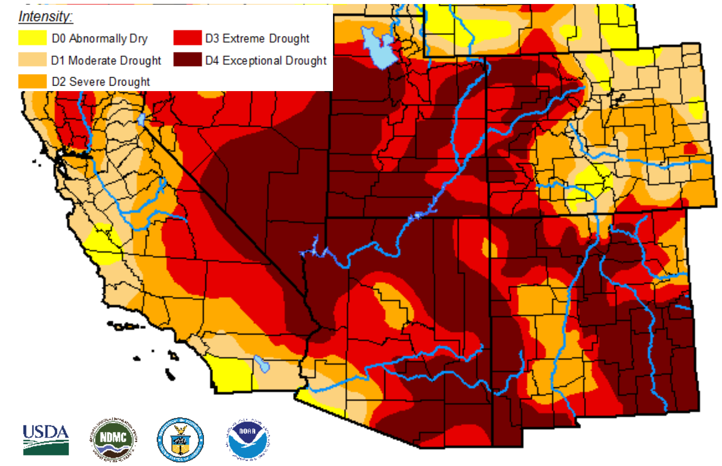


Figure 4: US Drought Monitor - Apr 6, 2021

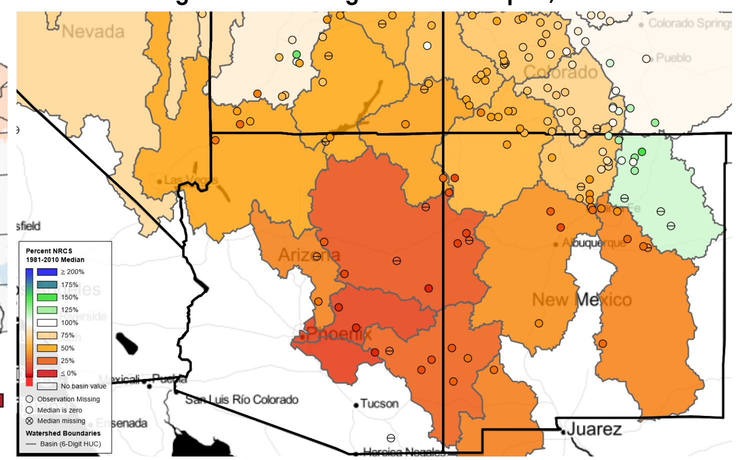


Figure 5: Apr 1 Streamflow Forecast Percent of Median (50% Exceedence Prob.)

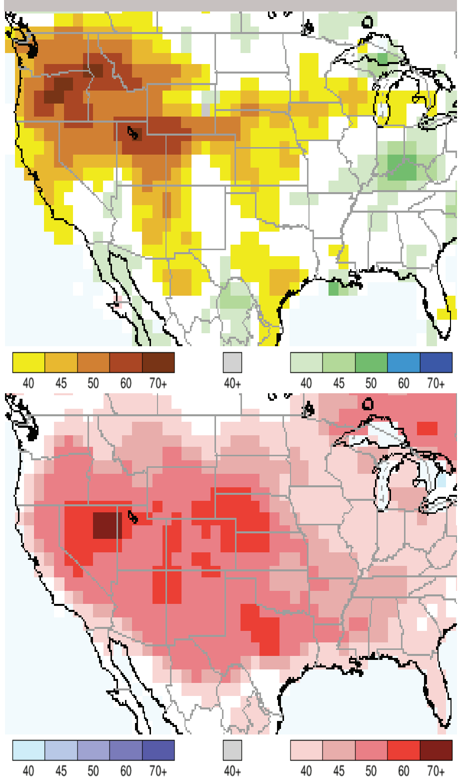


Figure 7: Three-Month (May-Jul) Forecast for Precip (top) and Temps (bottom)

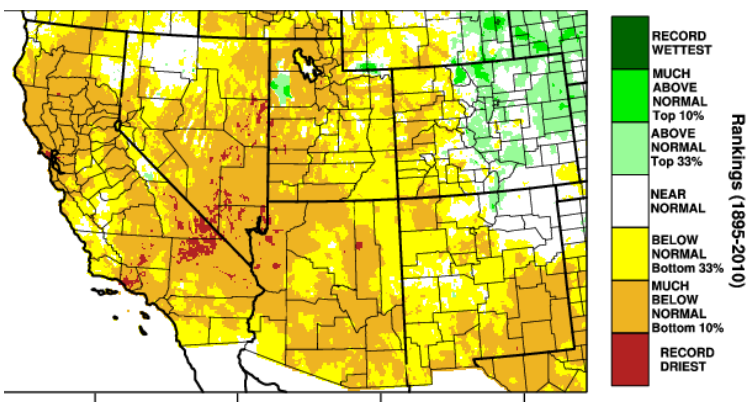


Figure 3: Water Year (Oct 2020 - Mar 2021) Precip Rankings

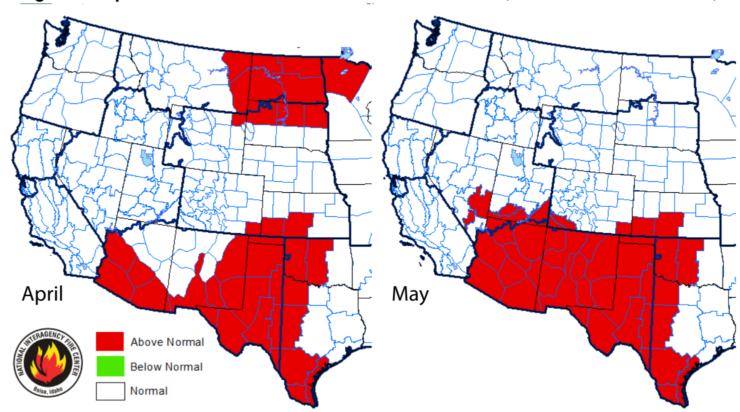


Figure 6: Significant Wildfire Potential - April and May 2021 (NIFC.gov)

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

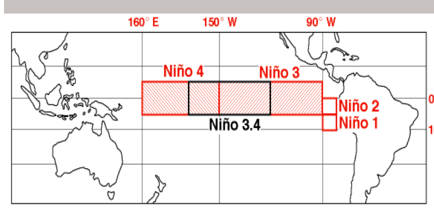
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

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/

ENSO Tracker

Sea surface temperature (SST) forecasts for May – July 2021 return to normal conditions across the equatorial Pacific (Fig. 1). The current Nino 3.4/4 anomalies show the trend, as they continue toward (or have reached) neutral conditions (Fig. 2). International climate outlooks note the imminent end of this La Niña event, with ENSO-neutral conditions likely to persist through summer.

Forecast Roundup: On Apr 8, the NOAA Climate Prediction Center (CPC) ENSO status was at La Niña Advisory, owing to negative SST anomalies. The CPC called for an 80-percent chance of ENSO-neutral during May-July 2021. On Apr 8, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting ENSO-neutral SSTs and "the evolution of most key atmospheric variables are consistent with weakening La Niña conditions." On Apr 9, the Japanese Meteorological Agency (JMA) observed that "La Niña features are decaying", with a 70-percent chance of neutral conditions over summer. On Apr 13, the Australian Bureau of Meteorology ENSO tracker was fully shifted to neutral/inactive. They cited warming surface and subsurface ocean temperatures, and ENSO-neutral atmospheric conditions. The North American Multi-Model Ensemble (solid and dashed black line, Fig. 4) are (barely) ENSO-neutral, and are expected to remain neutral for the next several months.

Summary: La Niña conditions have rapidly transitioned to ENSO neutral conditions, with the expectation these will remain in the range of neutral through at least summer. Given the current NMME forecast, and past event behavior, forecasters will keep an eye on conditions to see whether winter 2021-2022 might be a double dip of La Niña (where a short period of neutral conditions are bookended by La Niña events).

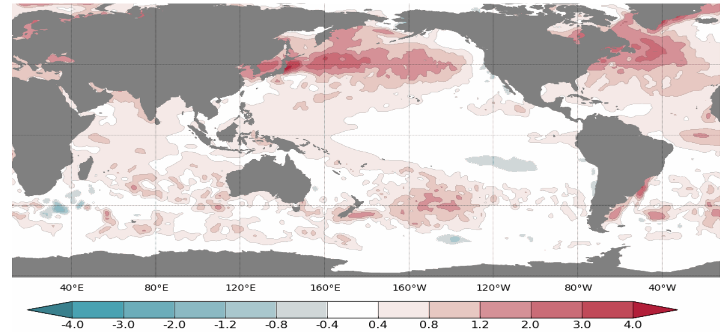


Figure 1: May - July 2021 Sea Surface Temperature (SST) Anomaly Forecast

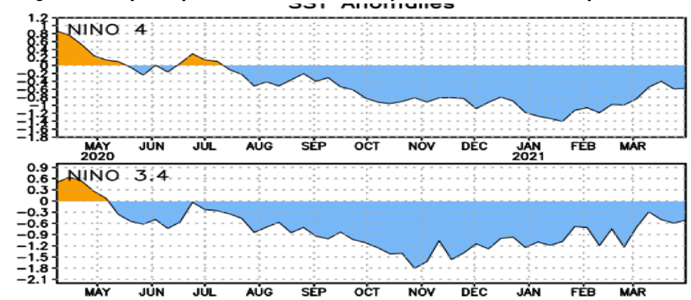


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

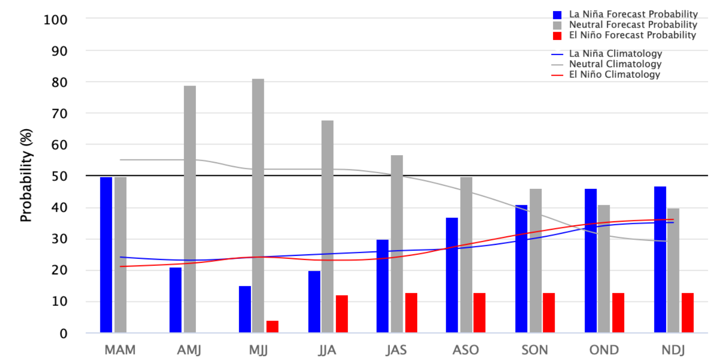


Figure 3: Early-Apr IRI/CPC Model-Based Probabilistic ENSO Forecast

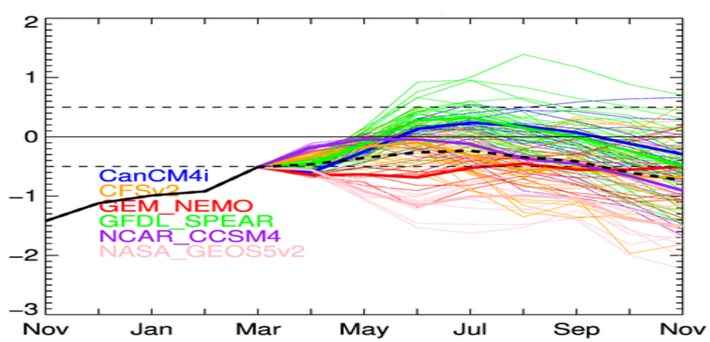


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

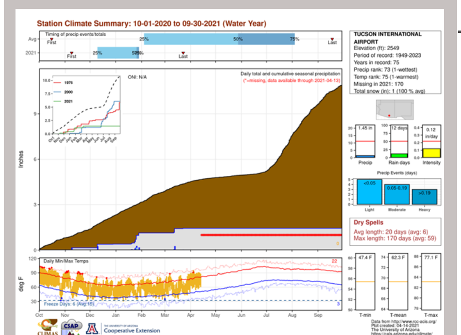
Online Resources

Figures 1A,1C, 2A, 2C
West Wide Drought Tracker
wrcc.dri.edu/wwdt

Figures 1B,2B
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

data: RCC-ACIS

For a detailed look at regional precipitation tracking, check out Mike Crimmin's Climate Station Summaries



cals.arizona.edu/climate/misc/stations/index.html

La Nina Winter Vs. Cumulative Precipitation Deficits

While the precipitation and temperature patterns in the U.S. Southwest were consistent with a typical La Niña (Figs 2A-C), these winter conditions amplified the existing deficits resulting from the widespread well-below average monsoon in 2020 (Figs 1A-C).

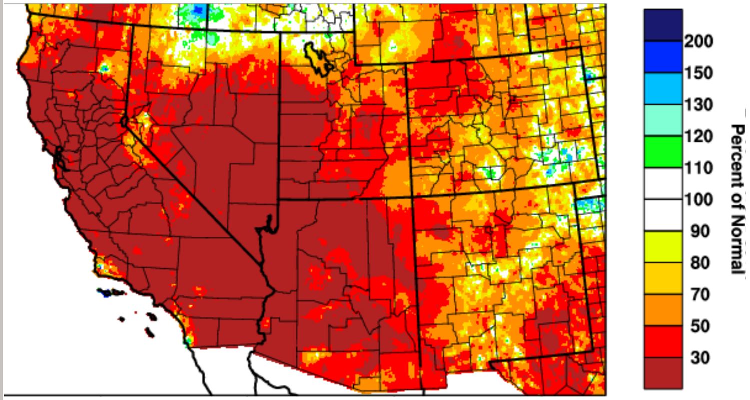


Figure 1A: Monsoon 2020 (Jun-Sept) Precipitation Percent of Normal

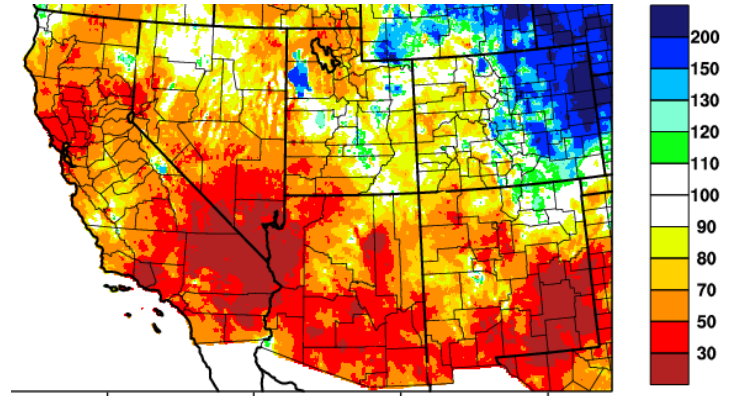


Figure 2A: Dec 2020 - Mar 2021 Precipitation Percent of Normal

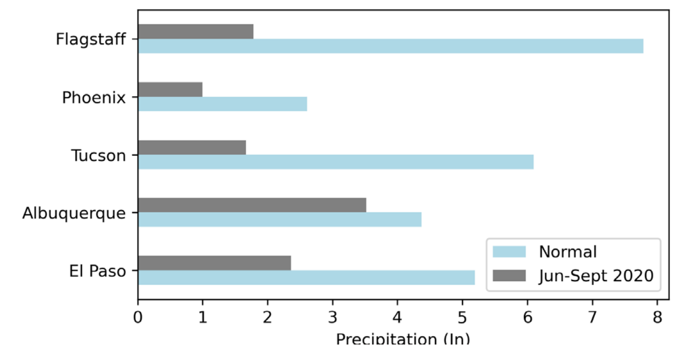


Figure 1B: Monsoon 2020 (Jun-Sept) vs. Long Term Average

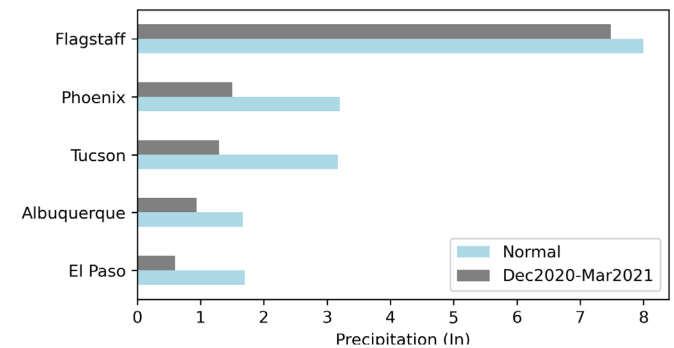


Figure 2B: Dec 2020 - Mar 2021 Precipitation vs. Long Term Average

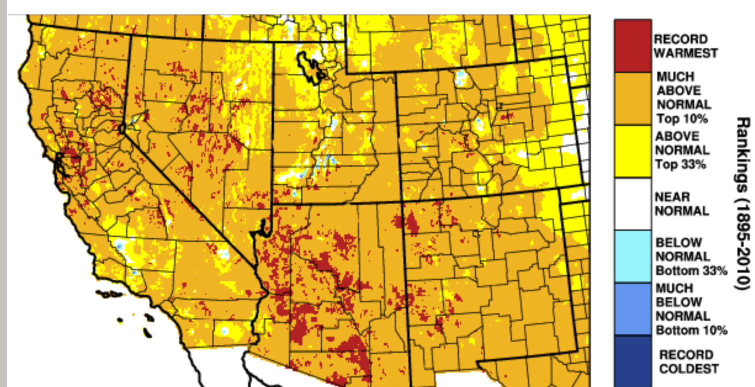


Figure 1C: Monsoon 2020 (Jun-Sept) Mean Temperature Rankings

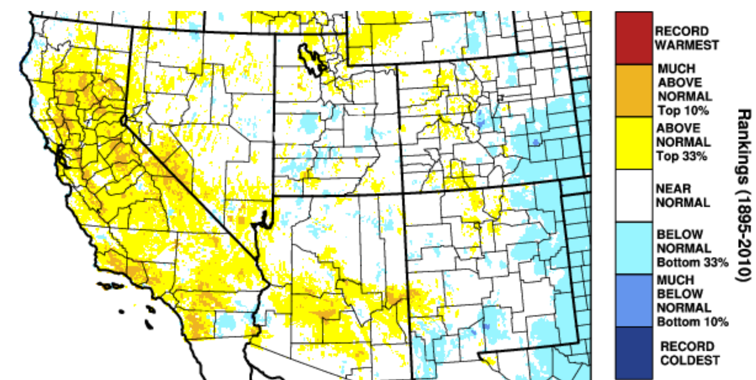


Figure 2C: Dec 2020 - Mar 2021 Mean Temperature Rankings

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).

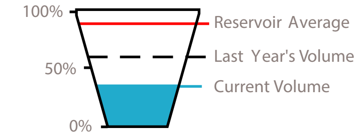
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

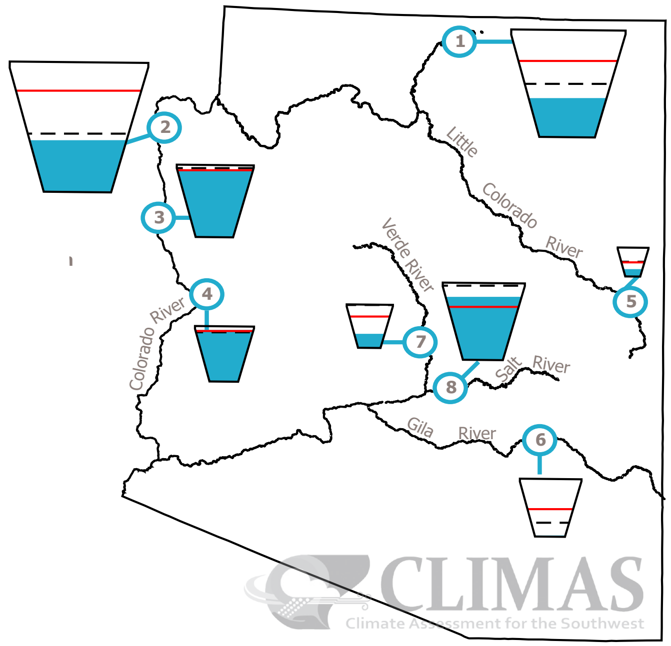
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

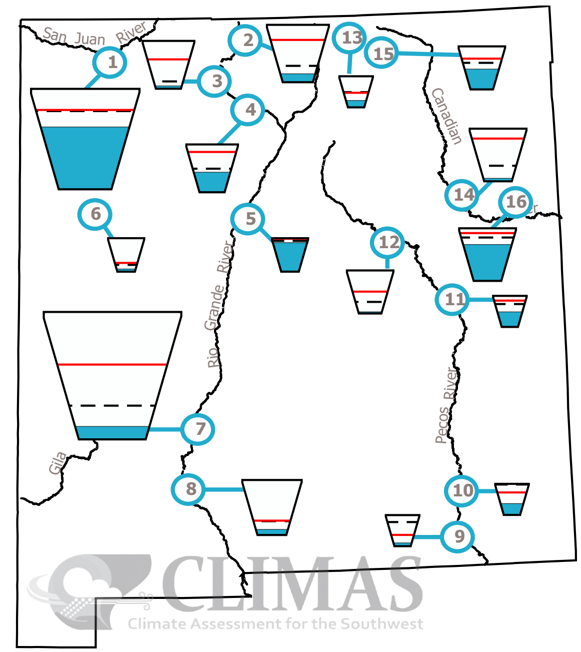
Reservoir Volumes

DATA THROUGH APR 1, 2021

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	36%	8843.8	24,322.0	-381.8
2. Lake Mead	40%	10,388.0	26,159.0	-234.0
3. Lake Mohave	93%	1,689.0	1,810.0	0.0
4. Lake Havasu	92%	568.8	619.0	-5.1
5. Lyman	24%	7.2	30.0	-0.3
6. San Carlos	0%	3.7	875.0	-9.7
7. Verde River System	32%	92.2	287.4	7.4
8. Salt River System	82%	1,653.7	2,025.8	-21.2

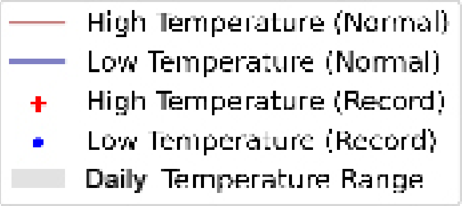
*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	61%	1,051.9	1,696.0	-9.7
2. Heron	14%	53.6	400.0	1.3
3. El Vado	5%	10.2	190.3	0.1
4. Abiquiu	41%	73.3	186.8	3.1
5. Cochiti	85%	43.2	50.0	-0.5
6. Bluewater	8%	3.2	38.5	-0.1
7. Elephant Butte	10%	182.3	2,195.0	28.2
8. Caballo	9%	30.9	332.0	-0.6
9. Lake Avalon	0%	2.5	4.5	-2.5
10. Brantley	36%	13.9	42.2	1.3
11. Sumner	48%	19.1	35.9	-1.7
12. Santa Rosa	4%	3.8	105.9	0.1
13. Costilla	22%	3.0	16.0	0.5
14. Conchas	5%	14.0	254.2	-1.5
15. Eagle Nest	47%	35.5	79.0	1.2
16. Ute Reservoir	68%	135	200	0.0

Online Resources

Figure 1
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

data: RCC-ACIS



Recent Temperatures Around the Southwest

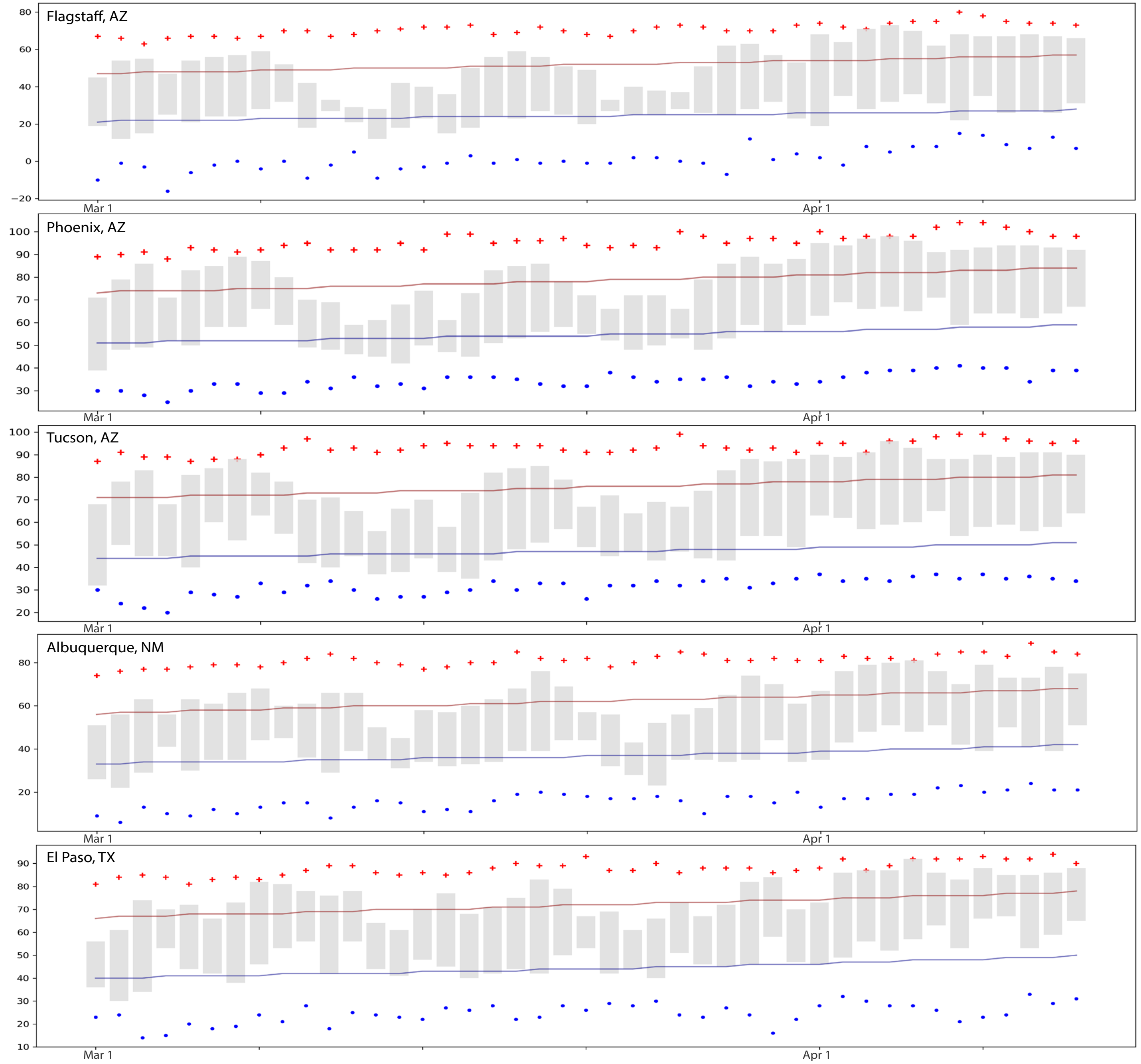


Figure 1: Daily Average, Normal, and Record High/Low Temperatures, Mar 1, 2021 - Apr 12, 2021

Southwest Climate Podcast

climas.arizona.edu/media/podcasts

iTunes

https://apple.co/3kHh8bf

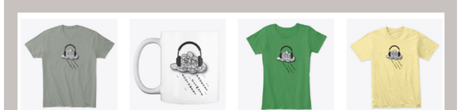
Android

https://bit.ly/2ILYHos

Stitcher

https://bit.ly/3nEWhHd

We also finally have podcast gear (shirts and mugs).



Order at: teespring.com/stores/the-southwest-climate-podcast.

Prices are the wholesale cost, so we don't make any money, but if you are interested in showing your support - or enjoying the (lack of a) monsoon in style, this is one way to do so.

The Southwest Climate Podcast

Mar 2021 Southwest Climate Podcast - Was the SW Winter "La-Niña-y"? Best of the Worst Edition

In the Mar 2021 edition of the CLIMAS Southwest Climate Podcast, Mike Crimmins and Zack Guido sit down to discuss the winter in the Southwest, and whether it lived up to expectations for a La Niña winter. They also go over streamflow, snowpack, and start a deeper dive into reservoirs, based on a listener question from last month (send in your questions if you have them!). They dabble a bit in the seasonal forecasts and talk about some of the key things they will be watching over the next 3-4 months, namely how fire season evolves, and when we can (reasonably) start looking ahead towards monsoon onset. They wrap up with a brief preview of monsoon-game 2.0, and hint at what we have planned.

https://bit.ly/3snT6pB

Previous Episodes

Feb 2021 Southwest Climate Podcast - Recent Storms and Dry Forecasts - Diving into La Niña and 2021

In the February 2021 episode of the CLIMAS Southwest Climate Podcast, Mike Crimmins and Zack Guido jump back into discussing winter conditions in the Southwest. This includes what happened so far in 2021 with a few runs of storms that affected parts of Arizona and New Mexico. This also includes the role that La Niña may be playing this winter (snowpack, streamflow forecasts, rain/snow events, etc.), and how this compares to previous winters and La Niña events. They also discuss what we might expect over the rest of the winter and into early spring (Feb-Mar).

https://bit.ly/3prODAt

Dec 2020 - Tracking Drought Conditions, La Niña Forecasts, and What 2021 Might Bring

In the December edition of the CLIMAS Southwest Climate Podcast, Mike Crimmins and Zack Guido sit down to discuss drought, La Nina, and what to expect (or at least hope for) in 2021. First, they recap the event that swept through on Dec 9-11, to talk through how different locations in the region fared in terms of precip. Next, they transition into the drought situation, which is currently looking pretty dire for the region - and discuss 'just how much worse can it get' - given much of the region is at Exceptional Drought (D4, the highest category on the US Drought Monitor), looking to some past events for comparison. They wrap things up with some 2021 predictions - things they think could (or hope might) happen in 2021.

https://bit.ly/2IV7Awl

Online Resources

Figure 1
Climate Program Office
cpo.noaa.gov

RISA Program Homepage
cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/RISA

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 Institute of the Environment—is a collaboration between the University of Arizona 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

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.

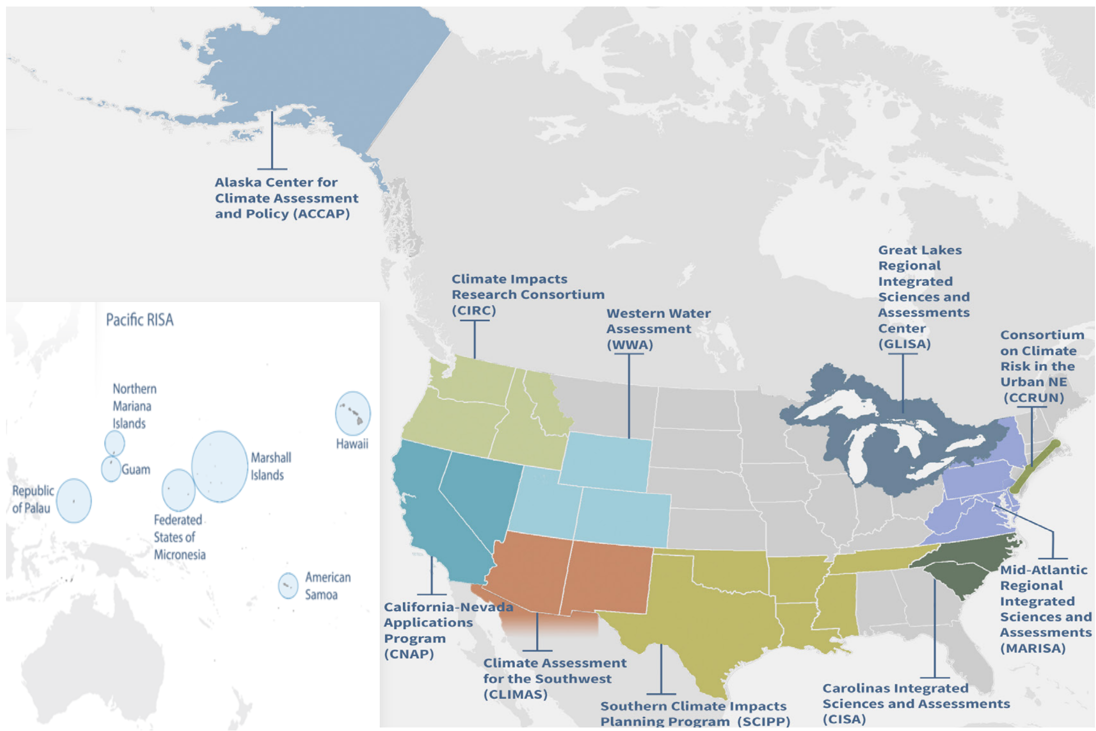


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions