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July 2021 Southwest Climate Outlook

Precipitation and Temperature: June precipitation was between below average and much above average in Arizona and New Mexico (Fig. 1a). June temperatures were above average to record warmest in Arizona and between above average and much above average in most of New Mexico (Fig. 1b). 2021 precipitation ranks (Jan-Jun) were between average and much below average across most of the Southwest, with a few pockets of above-average and much above average (Fig. 2a). Temperature ranks for 2021 (Jan-Jun) were above average to much above average across most of the Southwest (Fig. 2b).

Drought: Water year precipitation (as of Jun 30, 2021) is between below normal and record driest across most of the Southwest (Fig. 3). The U.S. Drought Monitor (USDM) has scaled back some of the drought categorizations in eastern New Mexico and small areas in central Arizona (Fig. 4). Nearly all of the region was already characterized as experiencing drought, and these changes reflect a few areas with less intense, but still persistent, drought characterization. The rest of the region remains mostly unchanged.

Water Supply: Most of the reservoirs in the region are at or below the values recorded at this time last year. Most are also below their long-term average (see Arizona & New Mexico reservoir storage on p. 7).

Wildfire: Wildfire season saw a large and rapid surge in activity in May and June, particularly in Arizona. This led to numerous waves of closures and evacuations. New Mexico saw a much quieter early season. As of July 11, Arizona is much above both mean and median acres burned, while New Mexico is below mean and median for acres burned (Fig. 5). The National Interagency Fire Center (NIFC) significant wildland fire potential outlooks call for normal wildfire risk across all of Arizona and New Mexico in July and August. This forecast leaned on monsoon precipitation tamping down fire risk.

Monsoon Tracker: So far, early monsoon activity has been a welcome change from 2020 with numerous areas seeing normal to above-normal monsoon precipitation to date (Fig. 6, see details on pp. 4-6).

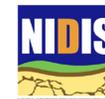
ENSO Tracker: ENSO conditions have reverted to ENSO-neutral. The long-term forecasts see a possible return to La Niña conditions this fall and winter. The forecasts have considerable uncertainty, so this picture will likely become clearer by the end of summer (see ENSO-tracker on p.3 for details).

Precipitation and Temperature Forecast: The three-month outlook for August through October calls for increased chances for normal to below-normal precipitation across much of Arizona and New Mexico (Fig. 7, top). The three-month temperature outlook mostly calls for equal chances of above- or below-normal temperatures across much of the southwestern U.S. and portions of northern Mexico (Fig. 7, bottom).



Tweet July 2021 SW Climate Outlook

JUL2021 @CLIMAS_UA SW Climate Outlook, SW Monsoon Tracker, AZ & NM Reservoirs, Monsoon Fantasy Forecast Game, <https://bit.ly/3rkEsQX> #SWclimate #AZWx #NMWx



Online Resources

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

Figure 3
West Wide Drought Tracker
wwdt.dri.edu

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

Figure 5
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

Figure 6
UA Climate Science Applications Program
cals.arizona.edu/climate

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

July 2021 SW Climate Outlook

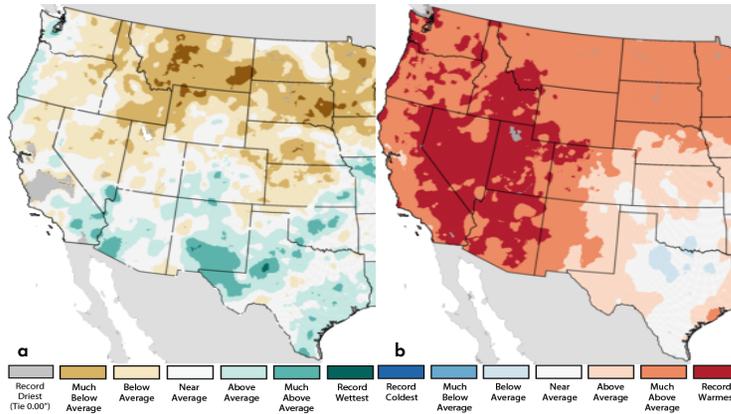


Figure 1: June 2021 Precipitation (a) & Temperature Ranks (b)

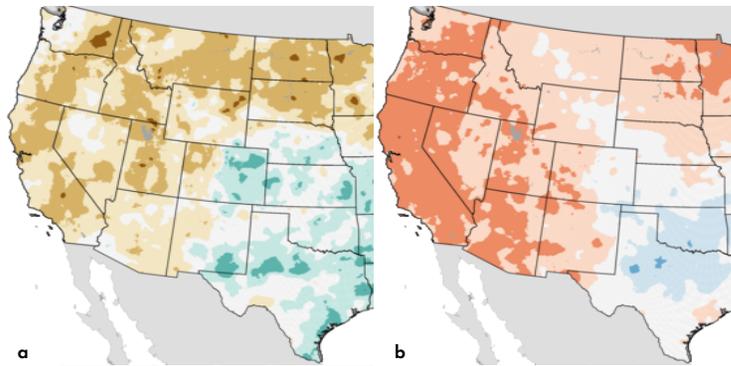


Figure 2: Jan-Jun 2021 Precipitation (a) & Temperature Ranks (b)

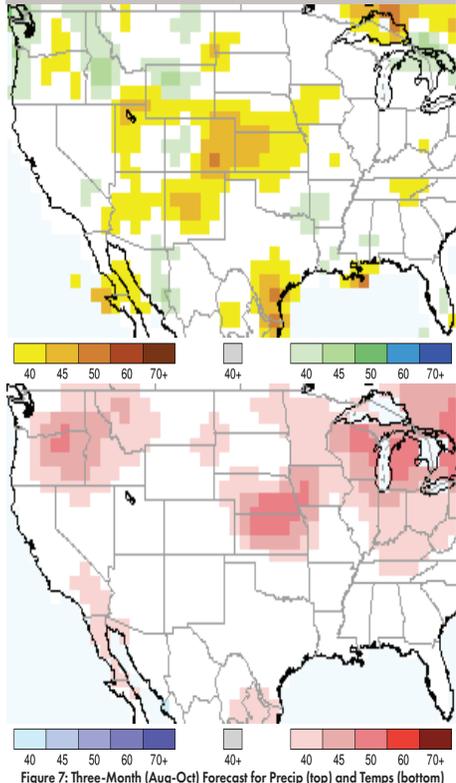


Figure 7: Three-Month (Aug-Oct) Forecast for Precip (top) and Temps (bottom)

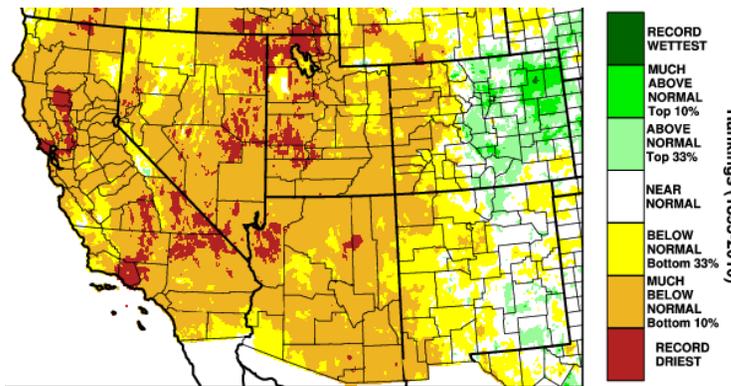


Figure 3: Water Year (Oct 2020 - June 2021) Precip Rankings

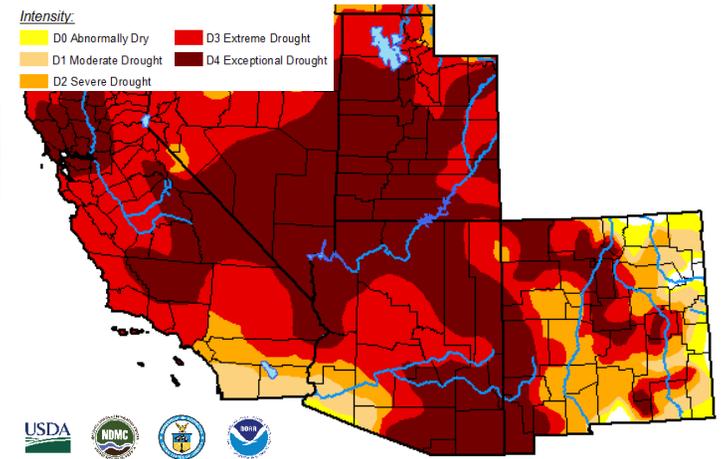


Figure 4: US Drought Monitor - Jul 6, 2021

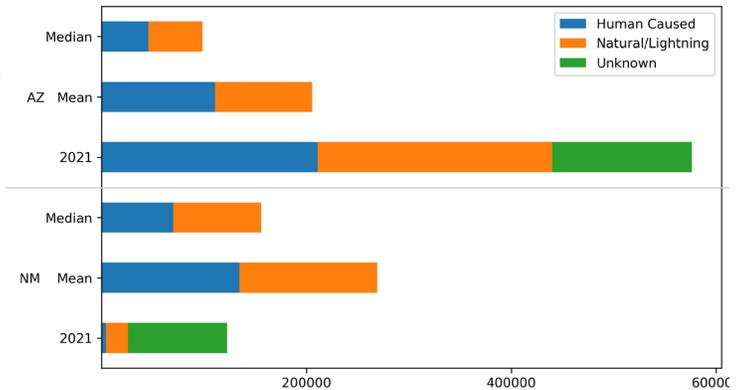


Figure 5: Wildfire Fire Acres burned - AZ and NM (as of Jul 11, 2021)

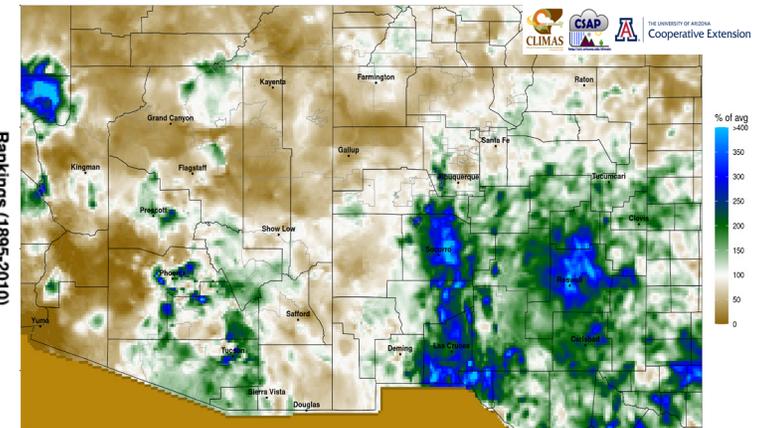


Figure 6: Percent of Average Precipitation, Jun 15 - Jul 14, 2021 (PRISM Data)

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

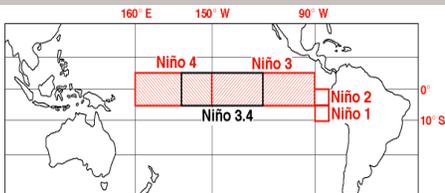
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

El Niño / La Niña

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

[climas.arizona.edu/sw-climate/
el-niño-southern-oscillation](http://climas.arizona.edu/sw-climate/el-niño-southern-oscillation)

Equatorial Niño Regions



For more information: [ncdc.noaa.gov/
teleconnections/enso/indicators/sst/](http://ncdc.noaa.gov/teleconnections/enso/indicators/sst/)

Image source: aoml.noaa.gov/

ENSO Tracker

Sea surface temperature (SST) forecasts for Aug – Oct 2021 call for cooling conditions across the equatorial Pacific (Fig. 1). The current Niño 3.4/4 anomalies have returned to the range of neutral (Fig. 2). The ENSO outlooks note the persistence of neutral conditions in the short term, along with the potential return of La Niña conditions in winter 2021-2022.

Forecast Roundup: On July 6, the Australian Bureau of Meteorology ENSO tracker was neutral/inactive, stating ENSO “remains neutral with all oceanic and atmospheric indicators within the neutral range”, but noted likely cooling in the Pacific SSTs into Fall 2021. On July 8, the NOAA Climate Prediction Center (CPC) ENSO status moved to “La Niña Watch” with a 51-percent chance of ENSO-neutral during Aug-Oct, and a 66-percent chance of La Niña emerging in Nov-Jan. On July 8, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting “most key atmospheric variables are consistent with ENSO-neutral conditions”, and with ENSO-neutral likely through fall, but “with greater uncertainty later in the year”. On July 9, the Japanese Meteorological Agency (JMA) observed ENSO-neutral conditions were persistent, and called for a 70-percent chance of neutral conditions continuing to autumn. The North American Multi-Model Ensemble (solid and dashed black line, Fig. 4) are back to ENSO-neutral, and are expected to remain neutral through summer, but then indicate a more towards La Niña conditions in late 2021.

Summary: ENSO neutral conditions persist, and the seasonal forecasts are relatively certain that neutral conditions will remain through the summer. Longer-term forecasts are starting to lean towards a return of La Niña later in 2021, despite considerable uncertainty in these forecasts. La Niña winters are typically drier than average in the Southwest, so this forecast is something to watch, along with the ongoing North American Monsoon, given the accumulated drought conditions in the region.

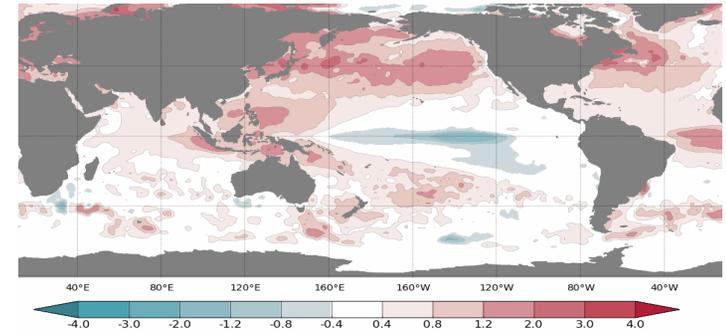


Figure 1: Aug - Oct 2021 Sea Surface Temperature (SST) Anomaly Forecast

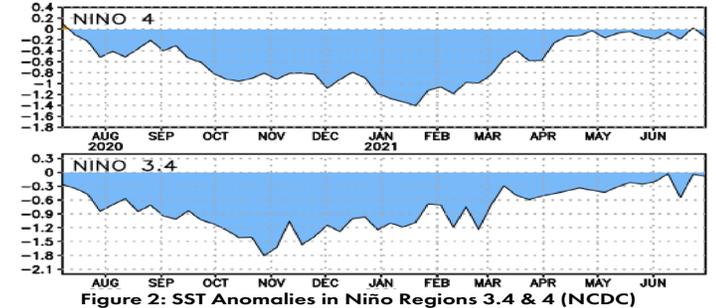


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

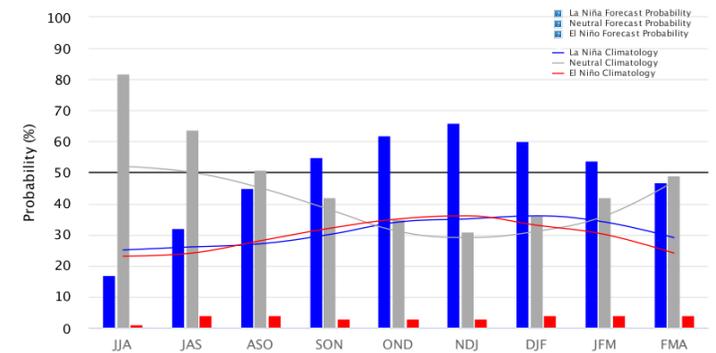


Figure 3: Early-July IRI/CPC Model-Based Probabilistic ENSO Forecast

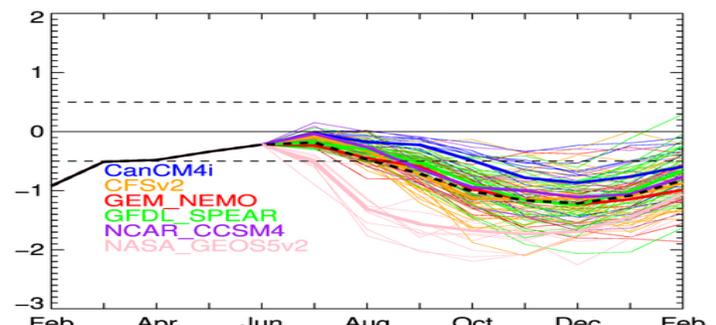


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figures 1-2
UA Climate Science Applications
Program
cals.arizona.edu/climate

SW Monsoon Tracker - 2021 to Date

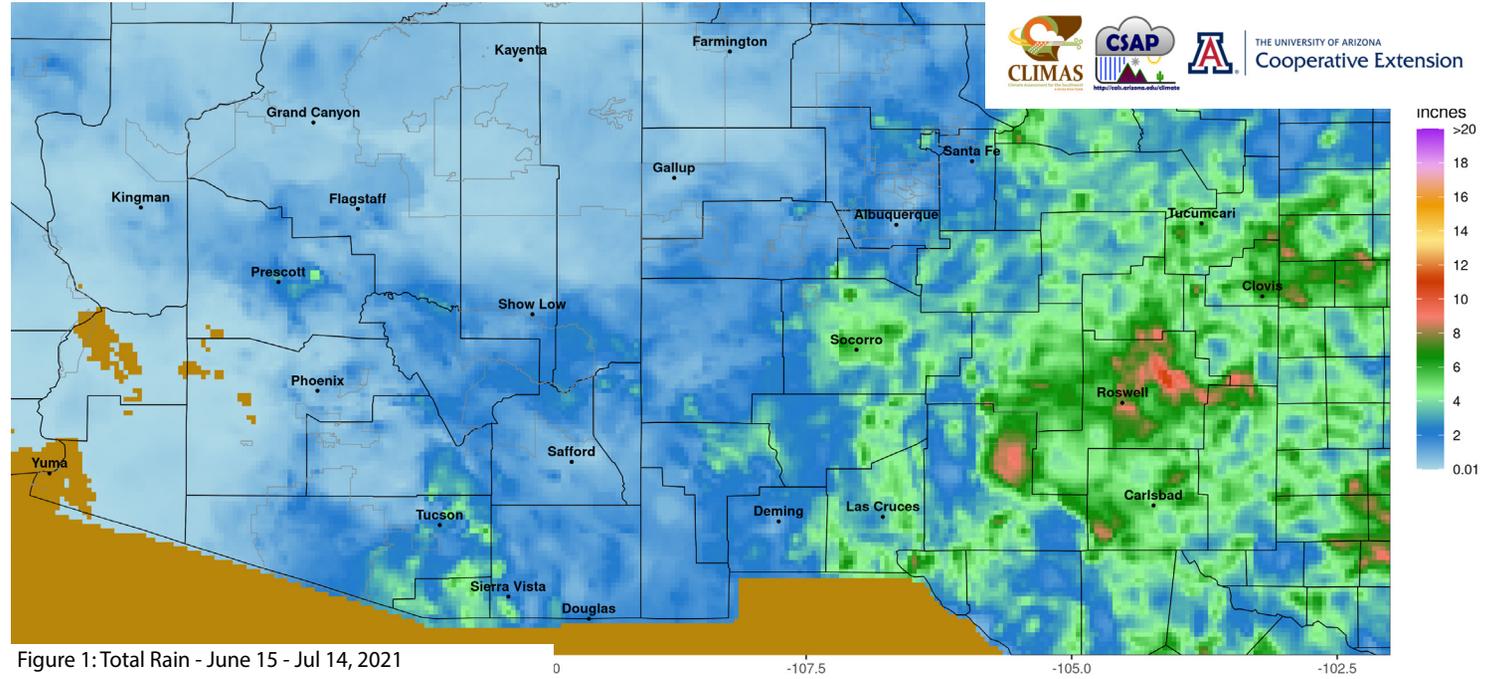


Figure 1: Total Rain - June 15 - Jul 14, 2021

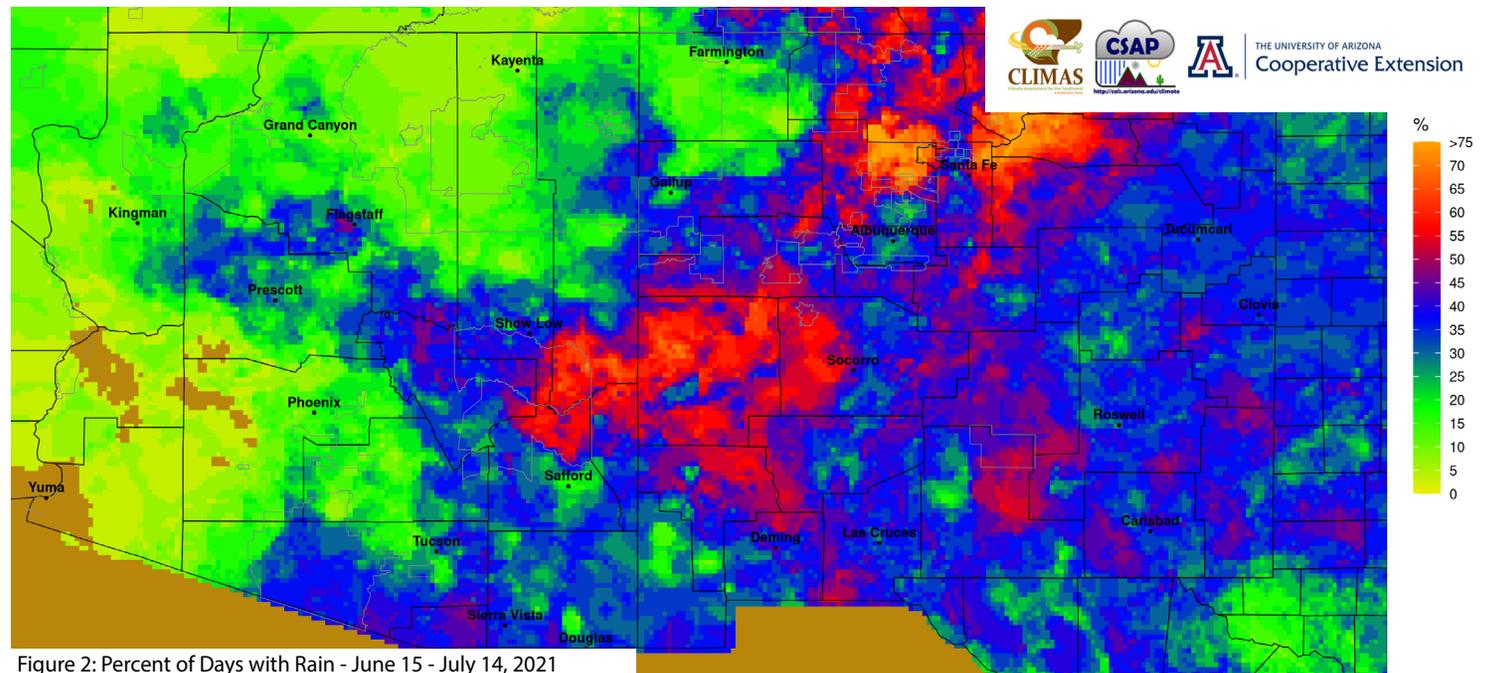


Figure 2: Percent of Days with Rain - June 15 - July 14, 2021

Online Resources

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

Figure 4
UA Climate Science Applications Program
cals.arizona.edu/climate

SW Monsoon Tracker: 2020 in Historical Context

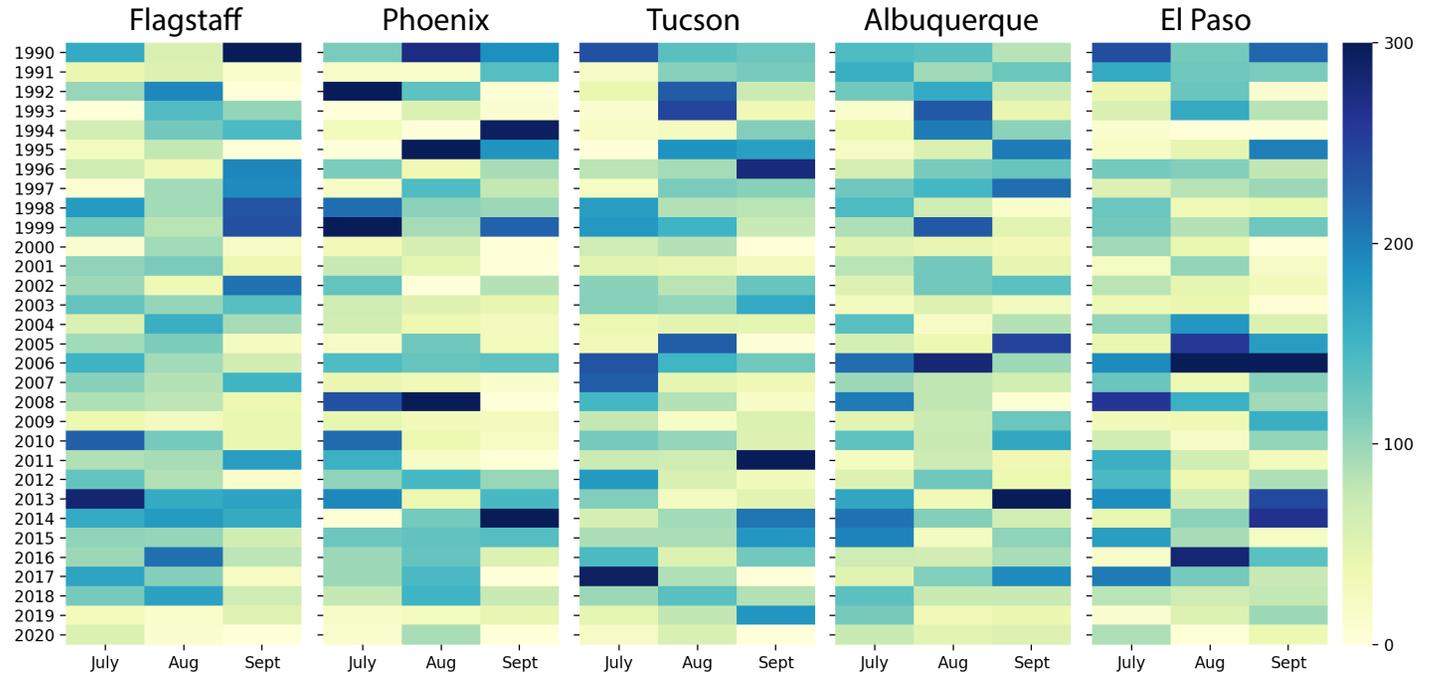


Figure 3: Monsoon Monthly Percent of Normal Precipitation, Jul-Aug-Sept; 1990-2020

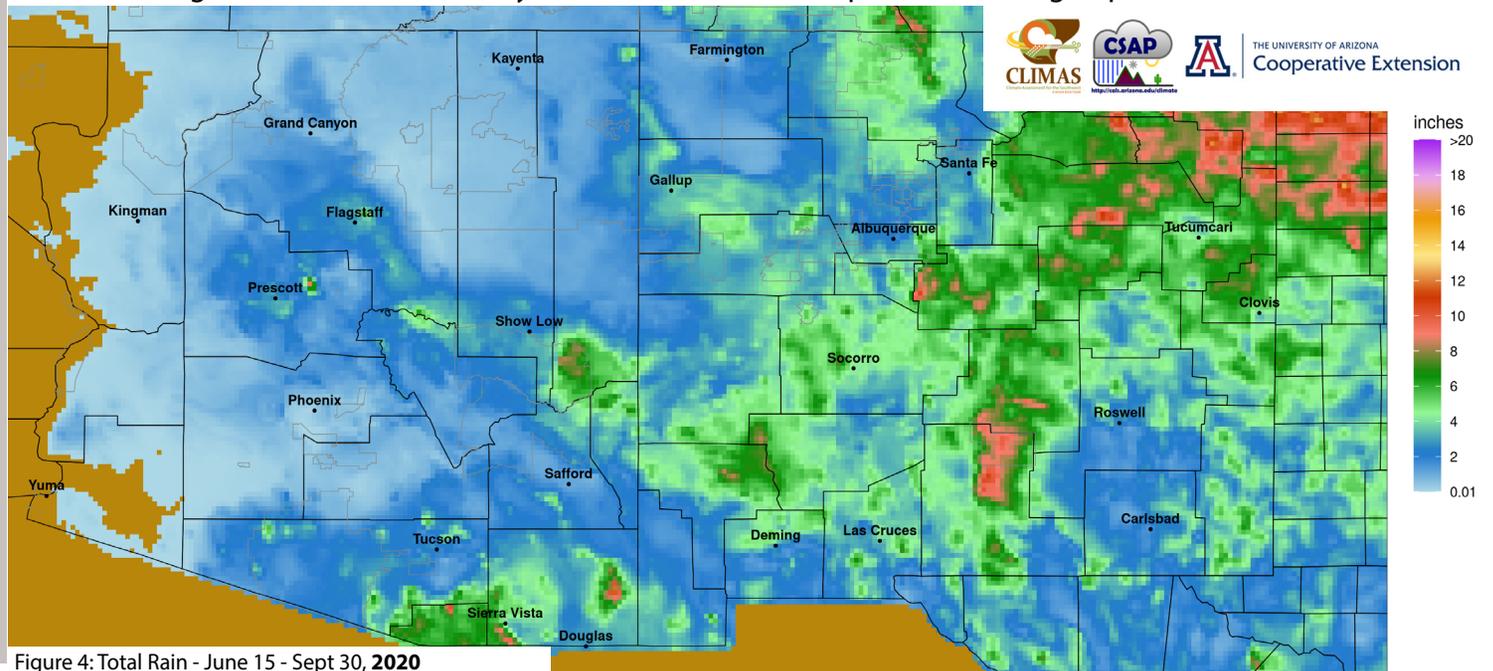


Figure 4: Total Rain - June 15 - Sept 30, 2020

Online Resources

Figure 5
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

SW Monsoon Tracker: 2021 Temperature, Dewpoint & Precipitation

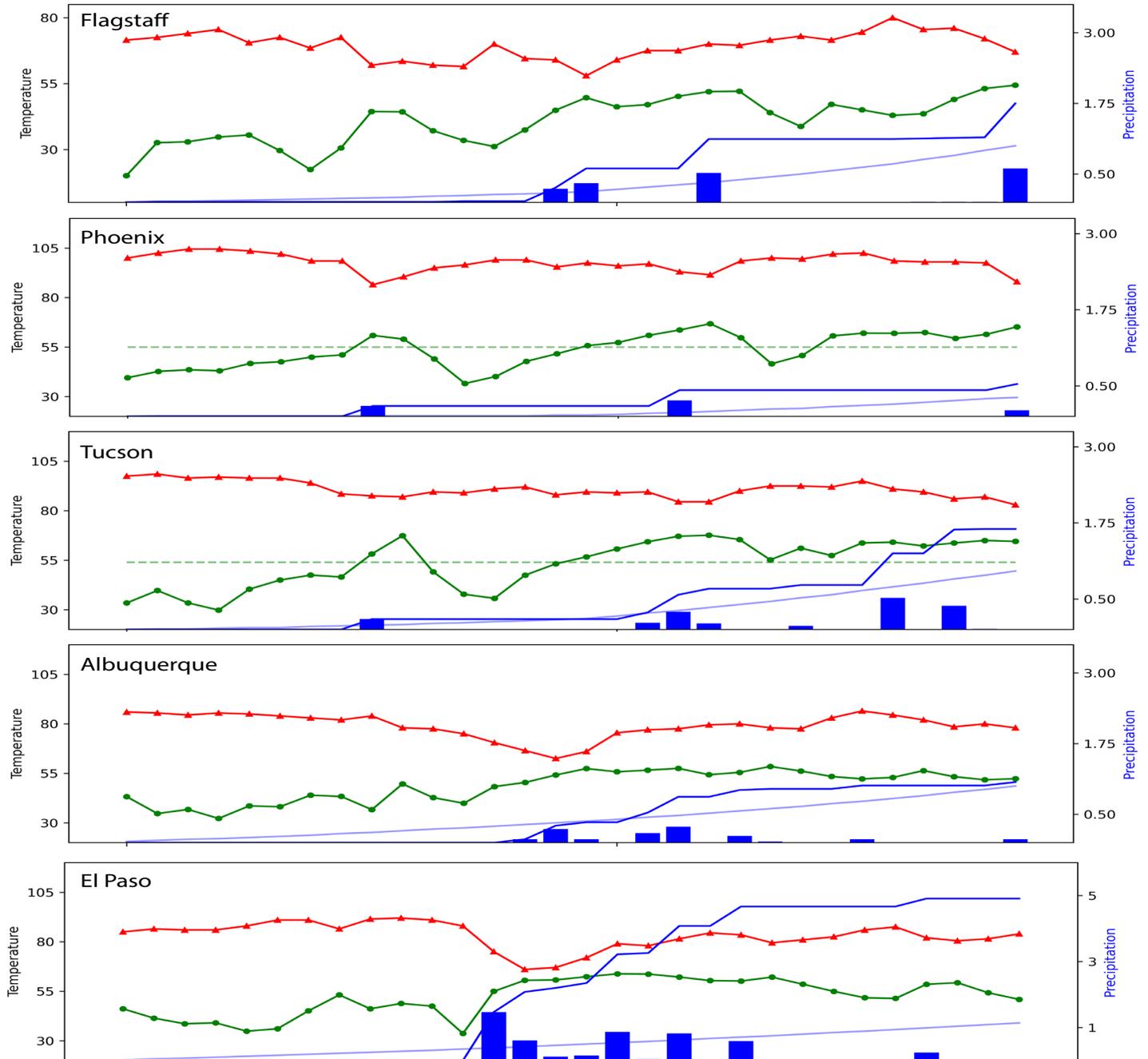


Figure 5: Daily Average Temperature and Dewpoint, Daily and Cumulative Precipitation - Jun 15 - Jul 14, 2021

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).

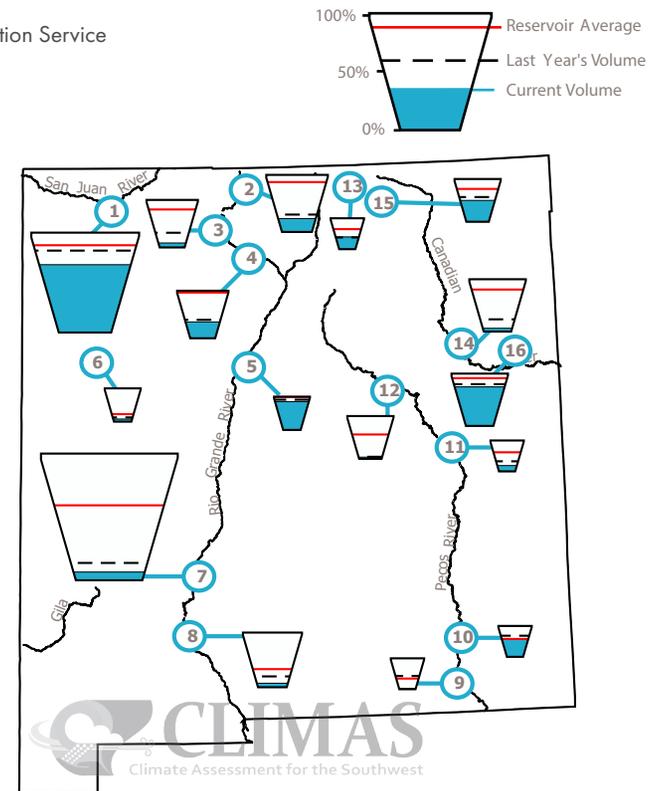
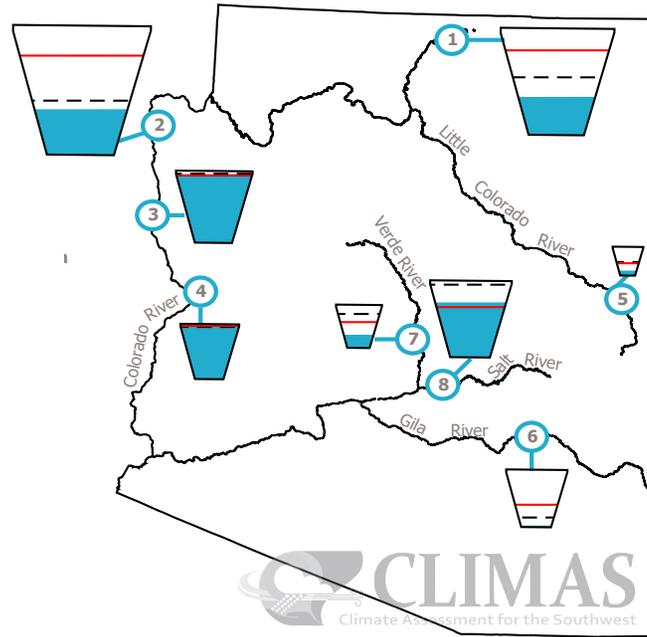
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). 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 JULY 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	34%	8,327.6	24,322.0	-38.8
2. Lake Mead	35%	9,102.0	26,159.0	-378.0
3. Lake Mohave	95%	1,714.0	1,810.0	31.0
4. Lake Havasu	96%	592.7	619.0	1.0
5. Lyman	16%	4.8	30.0	-1.0
6. San Carlos	0%	0.0	875.0	-0.1
7. Verde River System	29%	84.6	287.4	-6.4
8. Salt River System	71%	1,429.6	2,025.8	-99.9

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	66%	1,114.3	1,696.0	9.4
2. Heron	23%	92.3	400.0	3.0
3. El Vado	8%	16.0	190.3	2.0
4. Abiquiu	34%	64.3	186.8	-2.1
5. Cochiti	83%	41.7	50.0	-0.1
6. Bluewater	7%	2.5	38.5	-0.2
7. Elephant Butte	6%	139.0	2,195.0	-95.4
8. Caballo	7%	24.3	332.0	-23.1
9. Lake Avalon	0%	0.0	4.5	-1.1
10. Brantley	55%	23.0	42.2	8.1
11. Sumner	17%	6.0	35.9	-0.4
12. Santa Rosa	3%	3.5	105.9	-0.1
13. Costilla	39%	6.2	16.0	0.2
14. Conchas	5%	12.6	254.2	-0.3
15. Eagle Nest	49%	38.6	79.0	-0.1
16. Ute Reservoir	73%	146	200	1.0

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

July 2021 Southwest Climate Podcast - Tracking Heat Waves and the Onset of the Monsoon

In the June/early-July edition of the CLIMAS Southwest Climate Podcast, Mike Crimmins and Zack Guido sit down to discuss weather and climate in the Southwest. They start with June heatwaves, and where these sit in comparison to climatology/normal for the Southwest, and how they differ from the record heat waves seen in the Pacific Northwest. They transition to a discussion of the early(ish) onset of the monsoon this year, and whether this bodes well for a better monsoon than last year (frankly, this is a low bar to clear). Finally, they recap their own (forecast) guesses for July and run through the Southwest Monsoon Fantasy Forecast game we are trying out this year.

<https://bit.ly/3xNGmvS>



Southwest Monsoon Fantasy Forecast Game

Every year the most anticipated weather words (in the Southwest) are spoken:

“What will the monsoon be like?”

Here's your chance to use your experience and be a forecaster. Researchers at the Arizona Institutes for Resilience created a game where players make monsoon forecasts, score points based on them, and compete with others.

July guesses are locked in and July precipitation is well underway, but there is still time to play in August and September!

For details on how to play, information on scoring and prizes, and to sign up, visit the game page:

<https://monsoonfantasy.arizona.edu/home>

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



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.

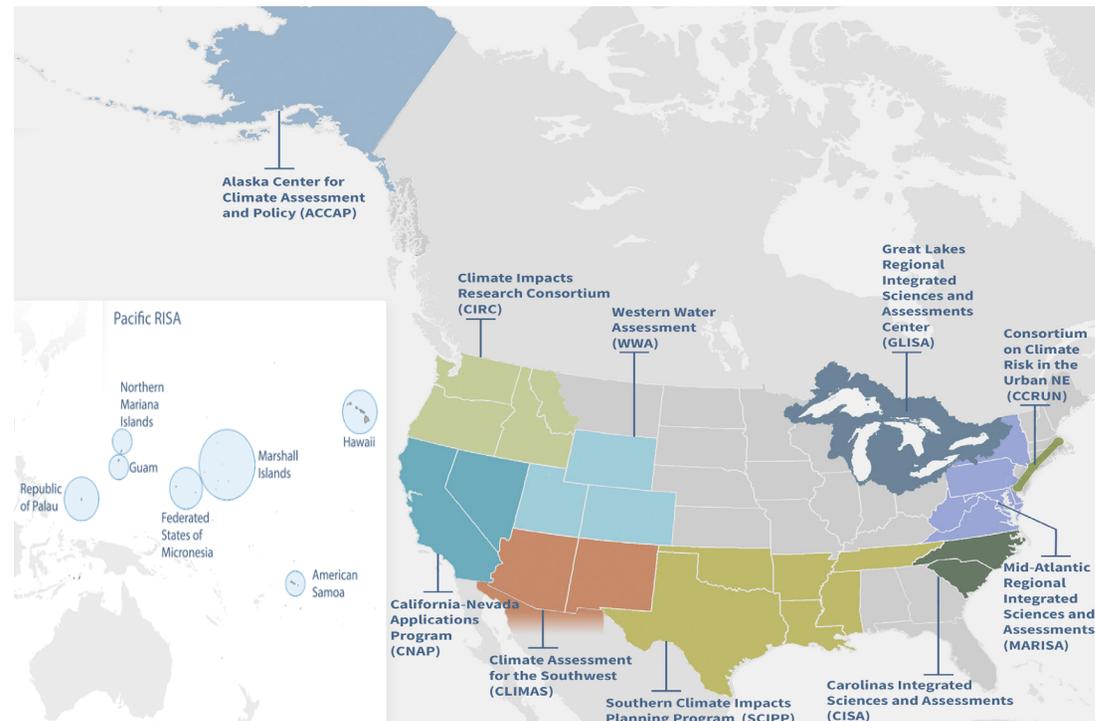


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions