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August Southwest Climate Outlook

Monthly Precipitation and Temperature: July precipitation ranged between record driest and average in most of Arizona and between below average and above average in most of New Mexico (Fig. 1a). July temperatures were much above average or record warmest in most of Arizona and New Mexico (Fig. 1b). The daily average temperature anomalies for Jul 1 – Aug 15 (Fig. 2) highlight the fluctuations at select stations around the region.

Seasonal Precipitation and Temperature: 2020 precipitation (Jan-Jul) ranged from below average to above average in Arizona and from much below average to above average in New Mexico (Fig. 3a). 2020 temperatures were above average to much above average across the U.S. Southwest (Fig. 3b).

Water Supply: Water year precipitation to date (Oct 2019 – Jul 2020) is above normal to much above normal across most of southern and central Arizona and New Mexico (along with west Texas and southern California), while the Four Corners, northern New Mexico, and southern Colorado are below normal or much below normal (Fig. 4). Many of the reservoirs in the region are at or above the values recorded at this time last year, but most are below their long-term average (see Arizona and New Mexico reservoir storage on p. 7).

Drought: The Aug 11 U.S. Drought Monitor (USDM) expanded drought characterizations across Arizona and New Mexico, with expansions of moderate (D1), severe (D2), and extreme drought (D3) that reflect the below-average monsoon precipitation as well as accumulated long term precipitation deficits (Fig. 5).

Wildfire: 2020 is turning out to be an active fire year in Arizona. Notable fires include the Bighorn Fire near Tucson, the Sawtooth and Bush Fires near Phoenix, and the Mangum fire in northern Arizona. In Arizona, wildfire acres burned for 2020 are well above mean and median (1990-2015), and have exceeded the totals for lightning and human-caused fires in the past five years. New Mexico remains below average in 2020, especially for human-caused wildfire (Fig. 6, data updated as of Aug 17).

ENSO Tracker: Conditions are expected to remain ENSO-neutral through summer 2020, with increased chances for a La Niña event this fall (see ENSO-tracker on p. 3 for details).

Precipitation and Temperature Forecast: The three-month outlook for Sept through Nov calls for equal chances of above- or below-average precipitation in most of Arizona, and an increased chance of below-normal precipitation in much of New Mexico (Fig. 7, top). The three-month temperature outlook calls for increased chances of above-normal temperatures across most of the western U.S. and northern Mexico (Fig. 7, bottom).

Tweet Aug 2020 SW Climate Outlook

AUG2020 @CLIMAS_UA SW Climate Outlook, ENSO Tracker, SW Monsoon (and lack thereof), Summer Heat, AZ & NM Reservoirs, https://bit.ly/34ijokA #SWclimate #AZWx #NMWx

August 2020 SW Climate Outlook

Online Resources

Figures 1,3
National Centers for Environmental Information
ncei.noaa.gov

Figures 2,6
Climate Assessment for the Southwest
climas.arizona.edu

Figure 4
West Wide Drought Tracker
wrcc.dri.edu/wwdt

Figure 5
U.S. Drought Monitor
droughtmonitor.unl.edu

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

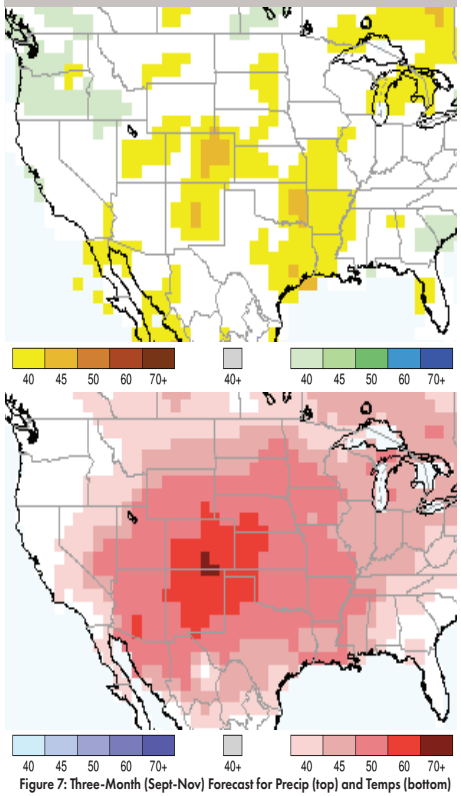


Figure 7: Three-Month (Sept-Nov) Forecast for Precip (top) and Temps (bottom)

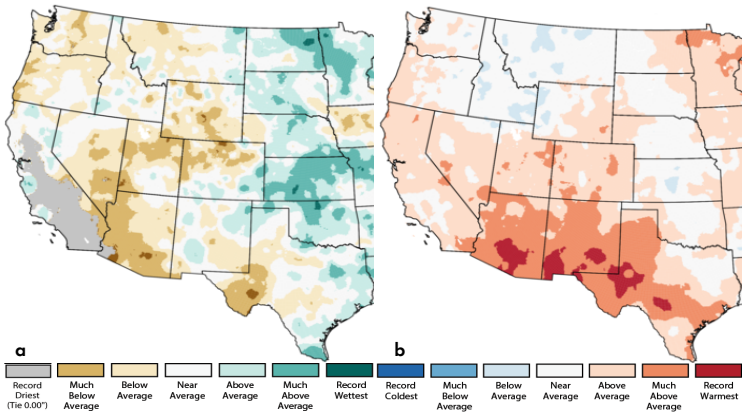


Figure 1: July 2020 Precipitation (a) & Temperature Ranks (b)

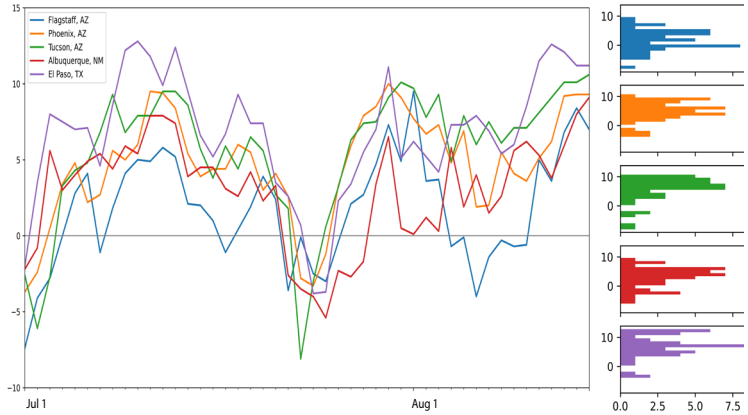


Figure 2: Daily Temperature Anomalies Jul 1 - Aug 15 (L) & Frequency of Anomalies (R)

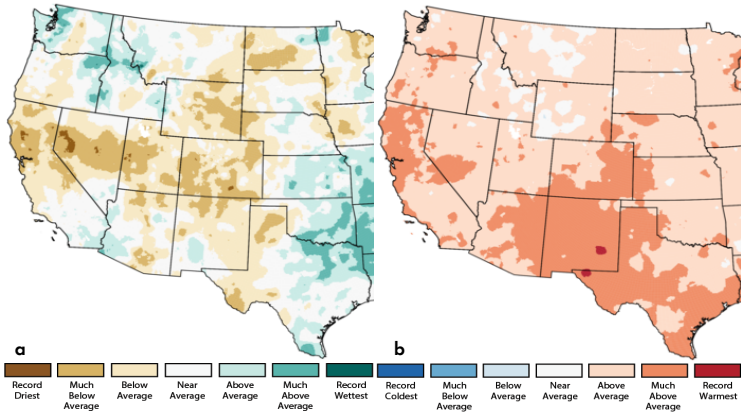


Figure 3: Jan - July 2020 Precipitation (a) & Temperature Ranks (b)

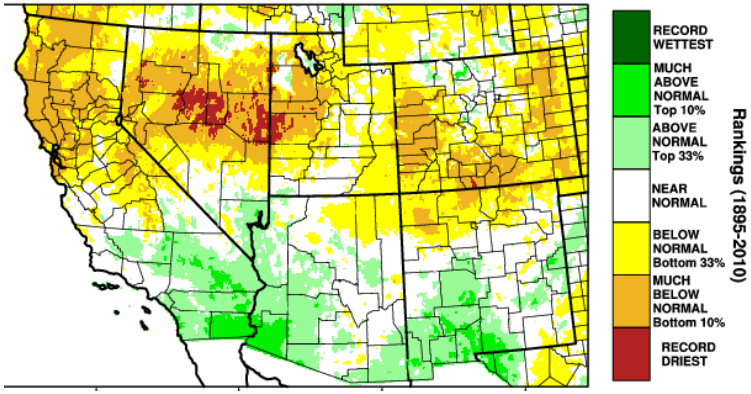


Figure 4: Water Year Precipitation (Oct 2019 - July 2020)

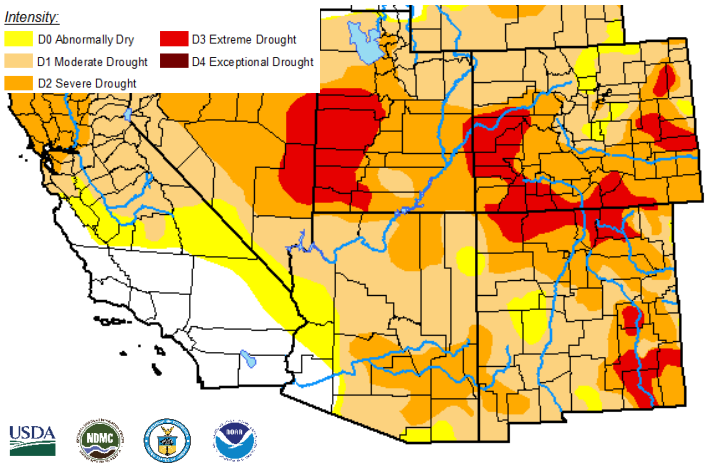


Figure 5: US Drought Monitor - Aug 11, 2020

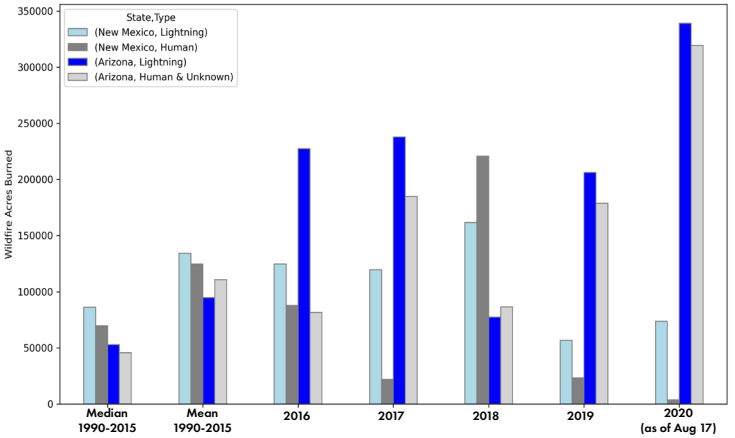


Figure 6: Lightning and Human-Caused Wildfire - AZ and NM

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

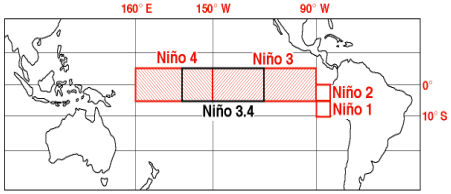
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

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 temperatures (SSTs) continue to cool across the equatorial Pacific (Figs. 1-2). Conditions are forecast to remain ENSO-neutral through summer 2020, while seasonal outlooks point to an increasingly likely chance of a La Niña event by fall or winter 2020.

Forecast Roundup: On Aug 4, the Australian Bureau of Meteorology maintained their La Niña watch, noting further cooling in both the observed SSTs and the models and outlooks for the rest of 2020. On Aug 11, the Japanese Meteorological Agency (JMA) maintained its call for a 60-percent chance of ENSO-neutral conditions to last through fall 2020. On Aug 13, the NOAA Climate Prediction Center (CPC) extended their La Niña Watch status. The CPC called for a 60-percent chance of ENSO-neutral during fall 2020, and a 55-percent chance of La Niña lasting till winter 2020-2021. On Aug 13, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting "SSTs in the east-central Pacific are in the cool-neutral range, and the atmospheric variables are either ENSO-neutral or leaning toward La Niña-ish conditions." The North American Multi-Model Ensemble (NMME) remains neutral, and the mean forecast is projected to move closer and into La Niña conditions later in 2020 (dashed black line, Fig. 4).

Summary: SSTs have further cooled, but oceanic and atmospheric conditions are still generally within the range of ENSO-neutral. Most forecasts call for these conditions to last through summer. By fall, there are increasing chances of a transition to a La Niña event. There is still uncertainty and hedging included in seasonal outlooks, given the forecast of a weak-to-borderline intensity La Niña event, so there is some 'wait and see' as the conditions become more clear by early fall. La Niña does tend to suppress (eastern pacific) tropical storm activity in the Fall, and often leads to drier than normal conditions in winter, so we will continue to monitor ENSO this fall.

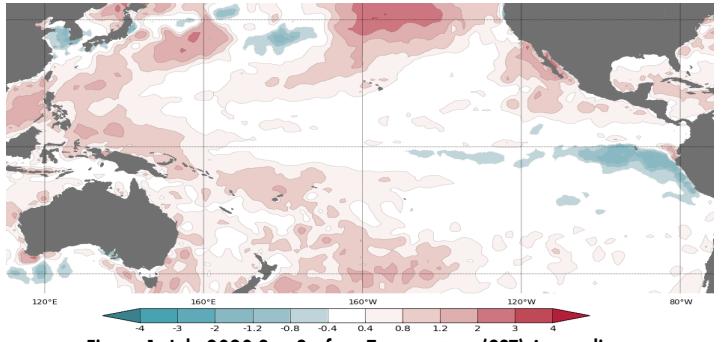


Figure 1: July 2020 Sea Surface Temperature (SST) Anomalies

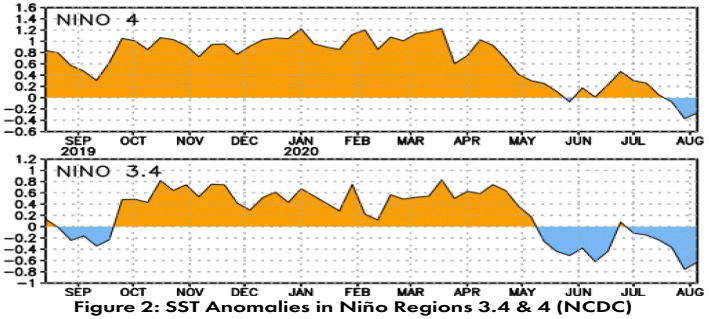


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

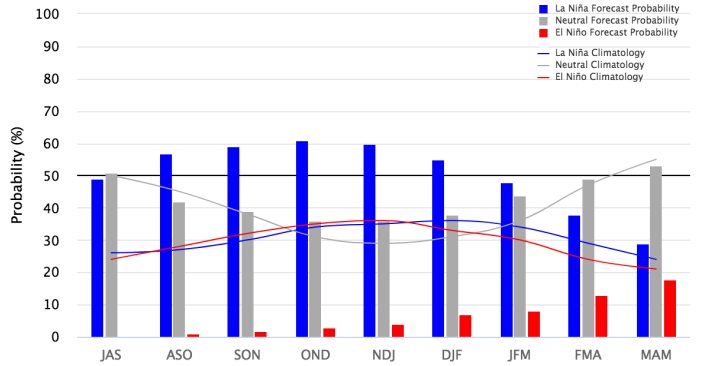


Figure 3: Early-Aug IRI/CPC Model-Based Probabilistic ENSO Forecast

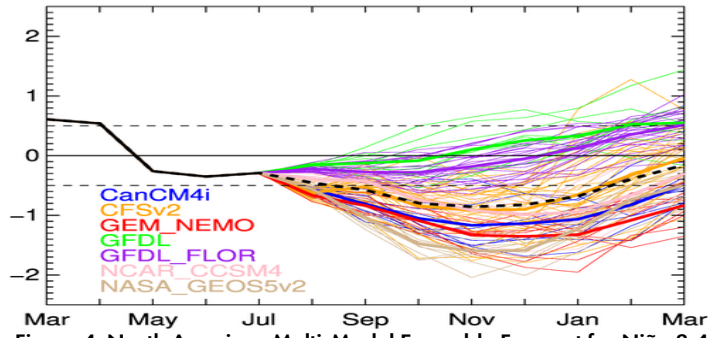


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figures 1,3
UArizona Climate Science Applications Program
cals.arizona.edu/climate/

data: PRISM Climate Group

Figure 2
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

data: RCC-ACIS

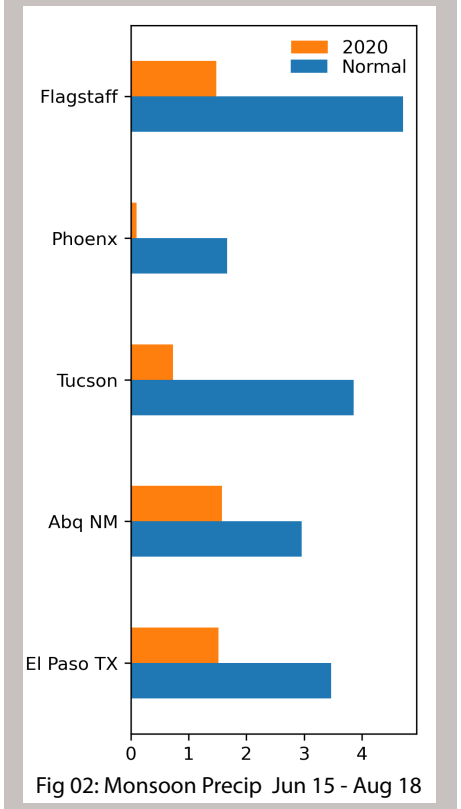


Fig 02: Monsoon Precip Jun 15 - Aug 18

Monsoon 2020: Drier than Average or Historically Dry?

Monsoon precipitation for Arizona and New Mexico is below average in most of the region (Fig. 1). Precipitation to date at regional stations (Fig. 2) and fewer days with rain (Fig. 3), both illustrate features of a relatively dry monsoon. There is still time in the monsoon window, and the rest of August and September will determine just how dry the 2020 monsoon turns out to be.

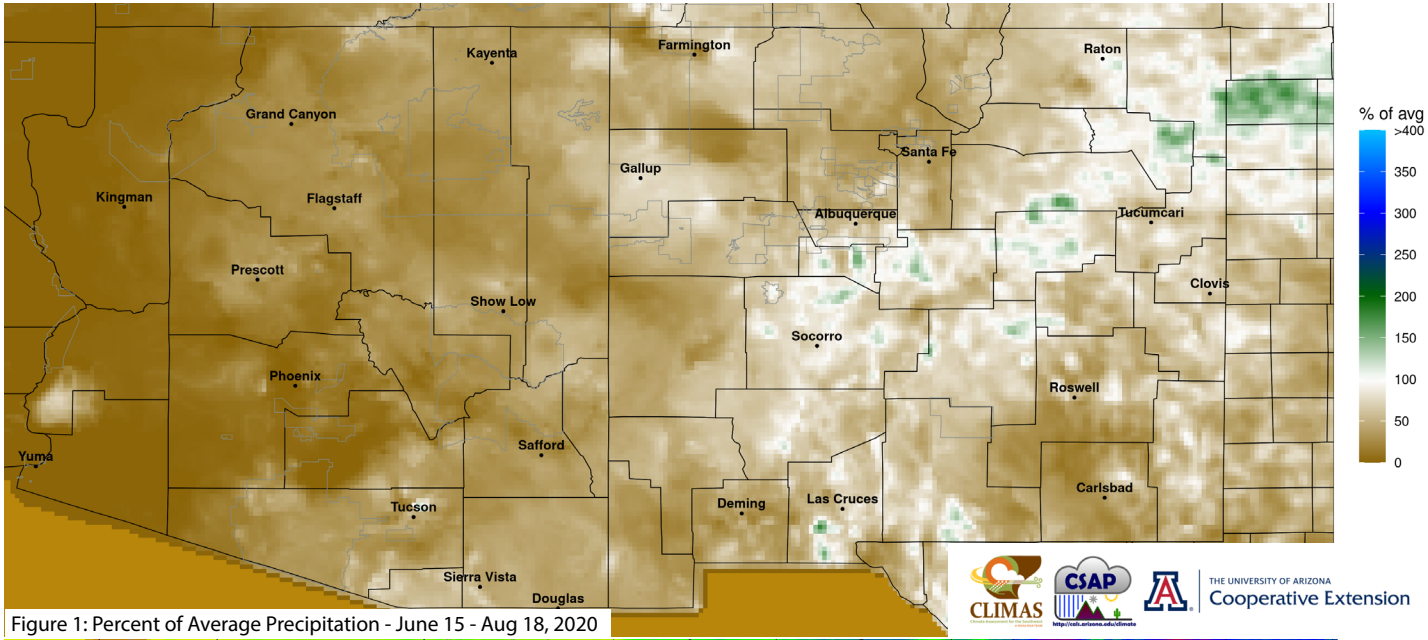


Figure 1: Percent of Average Precipitation - June 15 - Aug 18, 2020

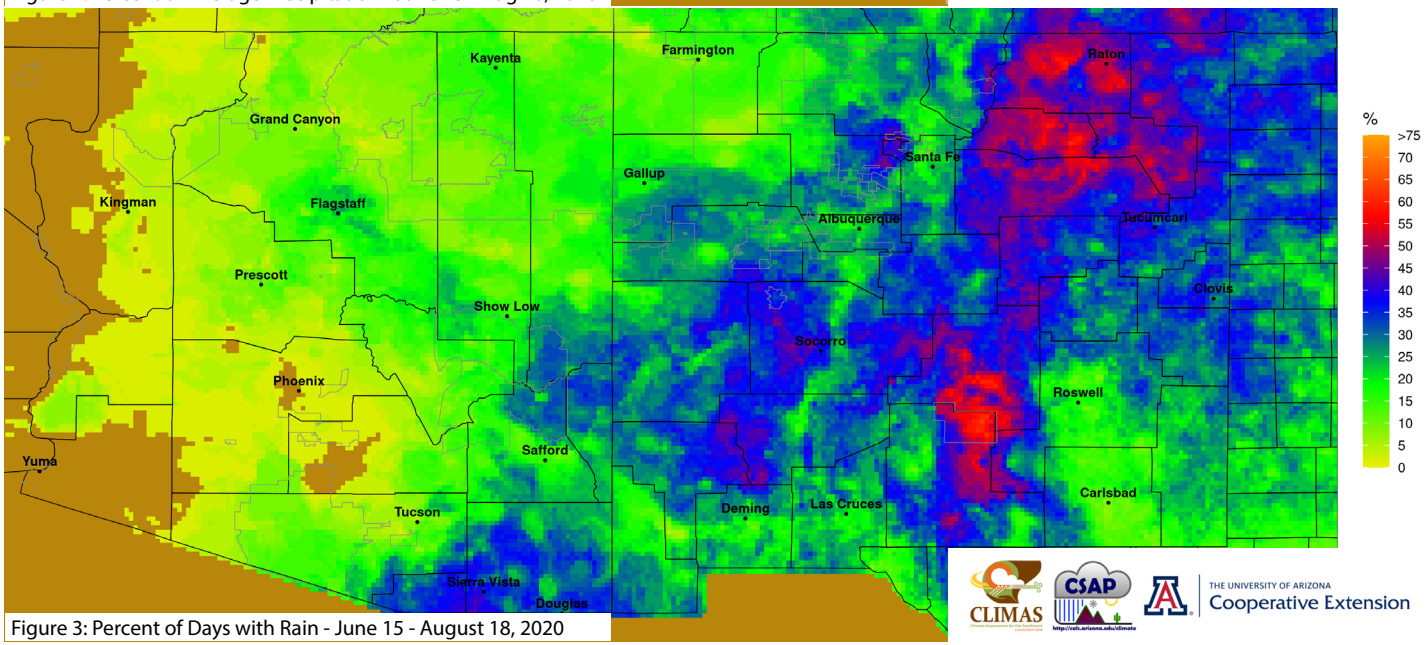


Figure 3: Percent of Days with Rain - June 15 - August 18, 2020

Online Resources

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

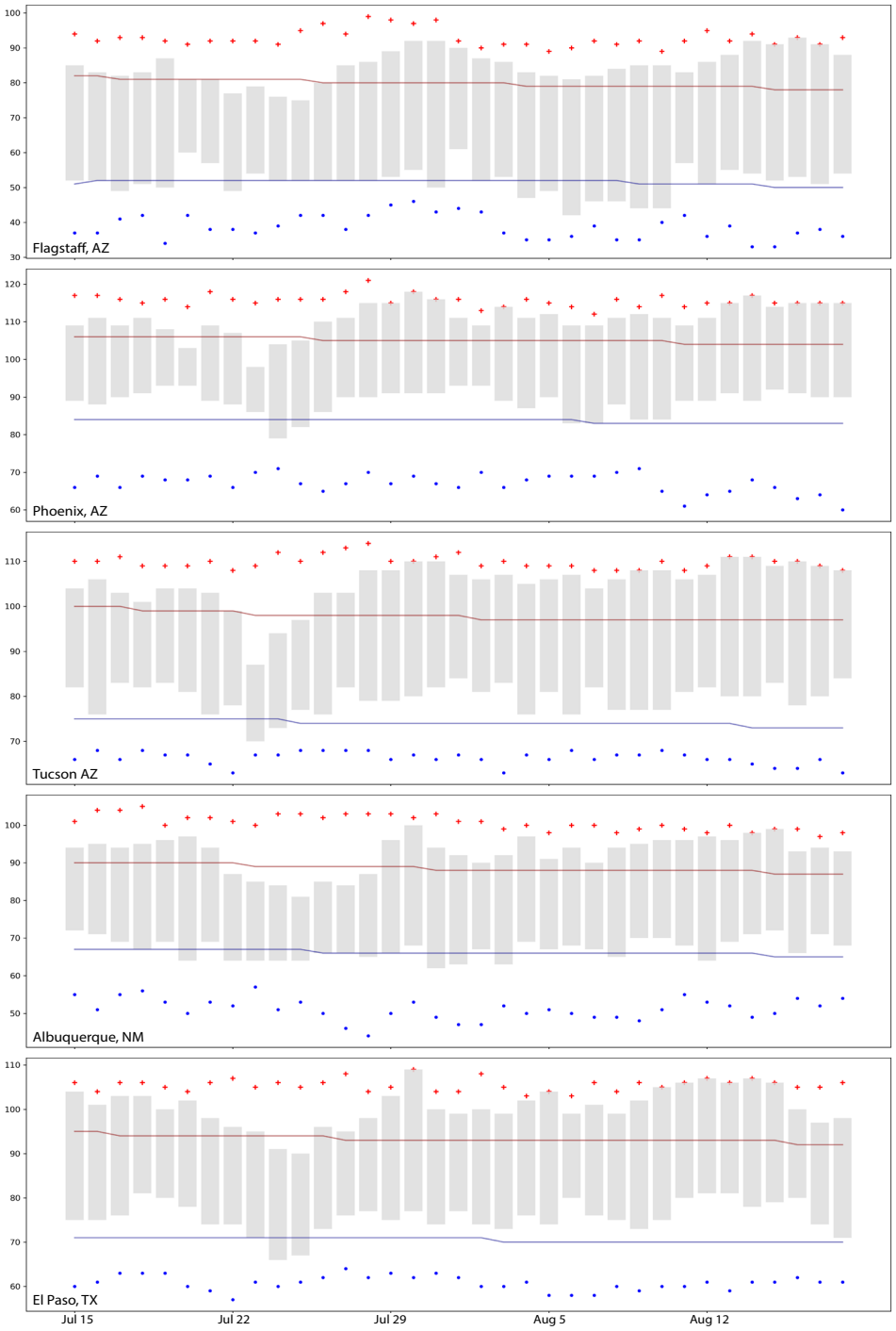


Figure 1: Daily Temperature Jul 15 - Aug 18 - 2020 Temp Range, Normal High/Low, and Record High/Low

Jul-Aug Temperature Breakdown

The slow start to monsoon activity was reflected in persistent heat that lingered across the US Southwest for much of July and August (Fig. 1).

High pressure and sub-optimal ridge position had the effect of boosting daily temperatures and preventing optimal flow of moisture into the region. This lack of moisture flow is one explanation for the drier than normal monsoon.

After a run of record warm temperatures July 10-13 (see July 2020 SWCO for details), temperatures briefly cooled in mid-to-late July during one of the only periods of widespread storm activity. By late July and through most of August, temperatures remained well above normal, including several record warm days (Fig. 1).

There have been some intermittent storm events, but little widespread storm activity that we often associate with a more typical monsoon. This lack of rain is contributing to the much warmer than normal temperatures across the Southwest, as rain events provide some relief from the summer heat.

Southwest Climate Podcast

climas.arizona.edu/media/podcasts

Aug 2020 Edition:

Mike Crimmins and Zack Guido sit down to discuss "what is going on with monsoon 2020?!" This includes a review of different locations around the U.S. Southwest, where some locales are just barely hitting long-term averages, while others are running at record or near-record driest levels (so far). They also cover factors driving these patterns, what we might expect in the 2nd half of the monsoon, and where this ranks in terms of the regional precipitation records (and unmet expectations). They wrap with a discussion of the monsoon game, which is fun despite the relatively dry conditions.

climas.arizona.edu/podcast/aug-2020-southwest-climate-podcast-june-soon-tracking-monsoon-2020-or-lack-thereof

Figures
CLIMAS: Climate Assessment for the Southwest
climas.arizona.edu

Close Only Counts in Horseshoes (and the Monsoon)

Ben, Zack, and Mike developed a monsoon game that anyone can play by submitting their entry for five cities in the US Southwest (Phoenix, Tucson, Flagstaff, Albuquerque, and El Paso). There are ten precipitation ranges for each city to choose from (deciles), based on the distribution of monthly precipitation totals for each station (1950-2019).

Points are awarded each month based on how close each guess was to the actual value (see the survey link for details). Winners get bragging rights and their name (or pseudonym) at the top of the leaderboard.

Congrats to Doug D with his top score for July (Fig. 1), and we'll have results for August entries (Fig. 2) in early September.

Entries are open for September, make your guesses here:

https://bit.ly/3aIXo3r

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

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

Prices are their 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.

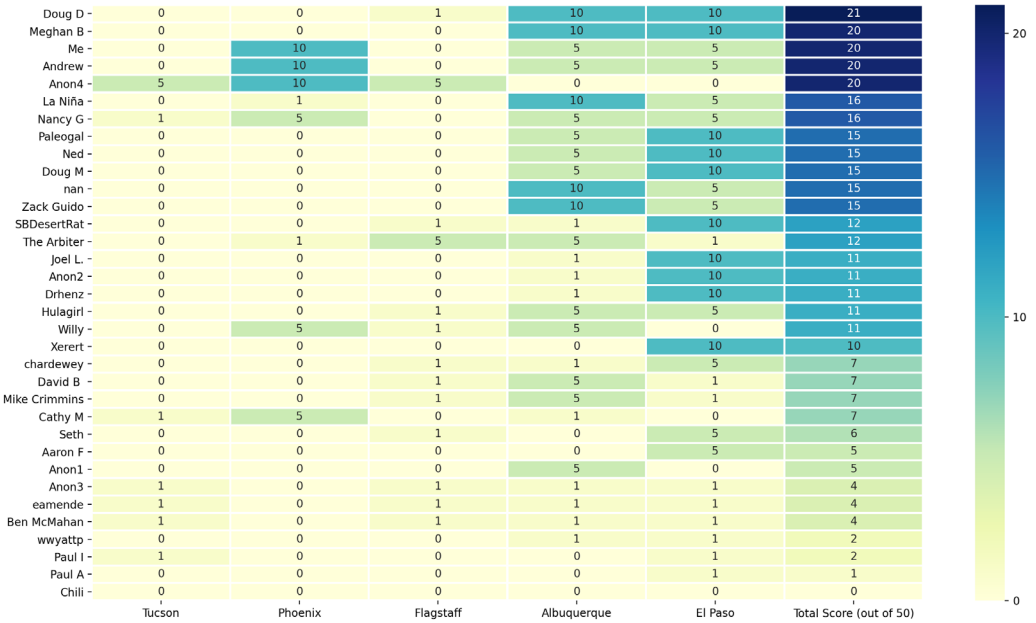


Figure 1: Heat Map of Monsoon Game Scores for July 2020

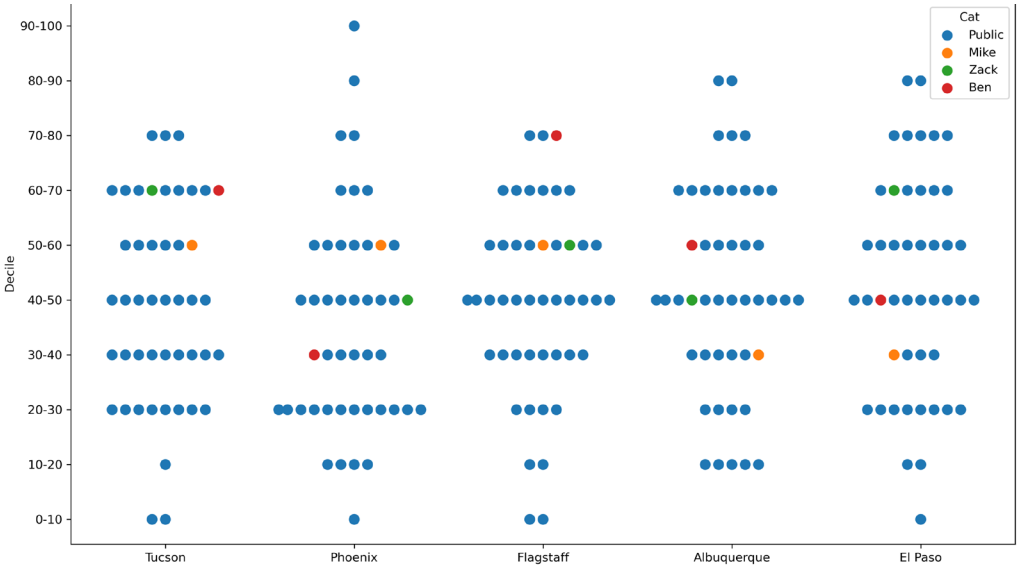


Figure 2: Range/Distribution of Guesses for Each of the Five Cities (August 2020 Guesses)

Online Resources

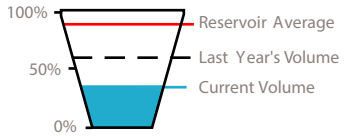
Portions of the information provided in this figure is available at the Natural Resources Conservation Service
www.wcc.nrcs.usda.gov/BOR/basin.html

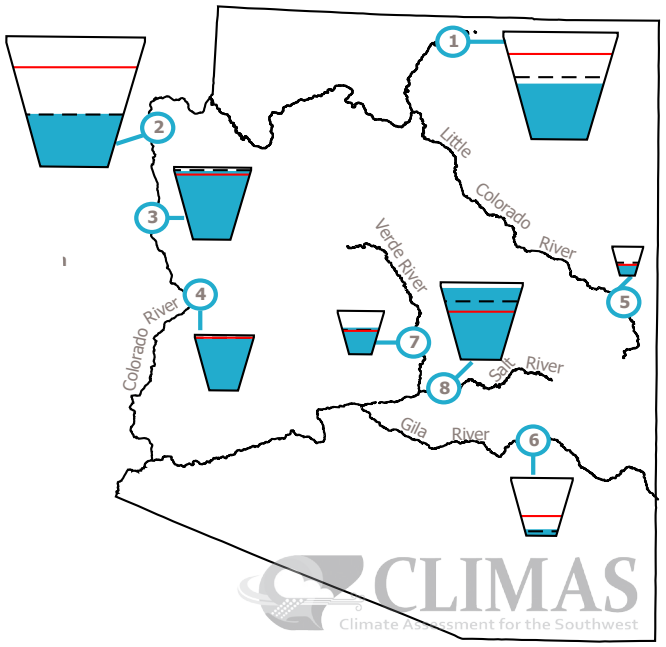
Contact Ben McMahan with questions/comments.

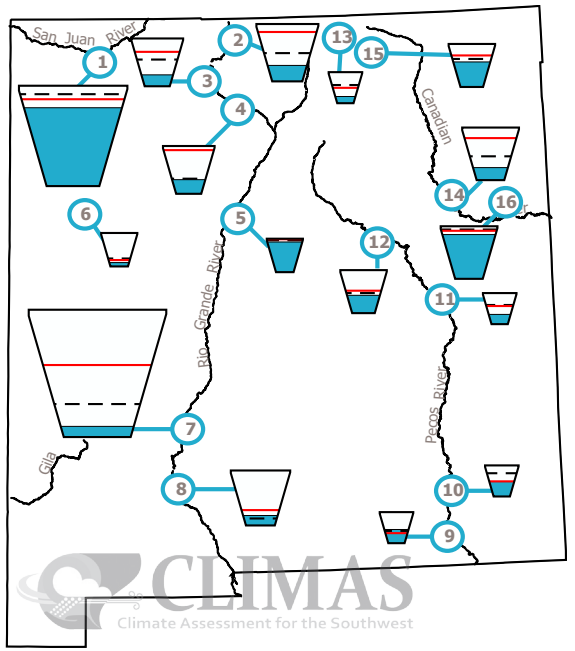
Reservoir Volumes

DATA THROUGH AUG 1, 2020

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







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	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	51%	12,356.5	24,322.0	-436.3
2. Lake Mead	40%	10,393.0	26,159.0	-196.3
3. Lake Mohave	94%	1,702.0	1,810.0	-10.0
4. Lake Havasu	93%	574.1	619.0	-5.1
5. Lyman	39%	11.7	30.0	-2.0
6. San Carlos	11%	95.5	875.0	-44.1
7. Verde River System	61%	176.0	287.4	-48.7
8. Salt River System	92%	1,858.2	2,025.8	-41.0

*KAF: thousands of acre-feet

* in KAF = thousands of acre-feet
** missing data for July 2020, values reflect Jun 2020

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	86%	1,285.4	1,696.0	-68.7
2. Heron	27%	109.9	400.0	-9.4
3. El Vado	23%	43.8	190.3	-12.5
4. Abiquiu	29%	53.8	186.8	-16.7
5. Cochiti	89%**	44.6**	50.0	**
6. Bluewater	11%	4.3	38.5	-0.4
7. Elephant Butte	8%	175.7	2,195.0	-110.1
8. Caballo	18%	59.6	332.0	-3.4
9. Lake Avalon	42%**	1.9**	4.5	**
10. Brantley	47%	20.0	42.2	-8.5
11. Sumner	30%	10.8	35.9	-0.3
12. Santa Rosa	40%**	42.5**	105.9	**
13. Costilla	21%	3.4	16.0	-2.5
14. Conchas	23%**	57.2**	254.2	**
15. Eagle Nest	56%**	43.9**	79.0	**
16. Ute Reservoir	81%	164	200	3.0

Online Resources

Figure 1
Climate Program Office
cpo.noaa.gov

RISA Program Homepage

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

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.

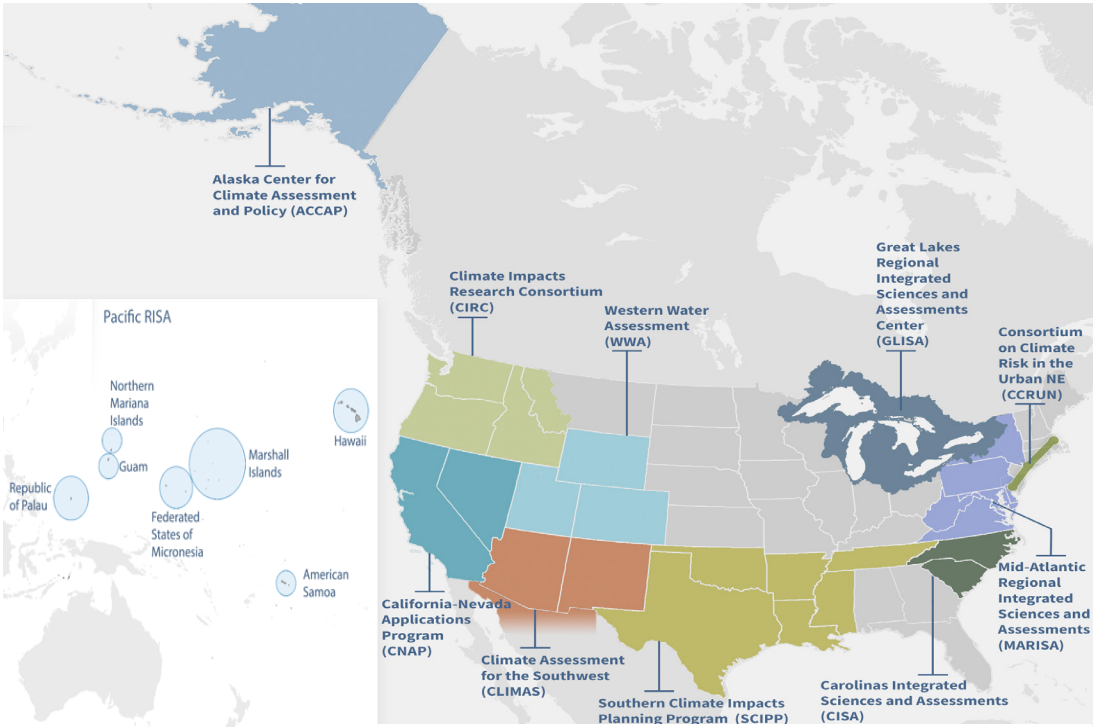


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions