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July Southwest Climate Outlook

Monthly Precipitation and Temperature: June precipitation ranged between record driest and average in most of Arizona, and between below average and average in most of New Mexico (Fig. 1a). June temperatures were above average or much above average in nearly all of Arizona and New Mexico (Fig. 1b). The daily average temperature anomalies for Jun 1 – Jul 13 (Fig. 2) highlight the fluctuations at stations around the region (see July Temperature Breakdown on p. 5)

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

Water Supply: Water year precipitation to date (Oct – Jun) is above normal to much above normal across most of southern and central Arizona and New Mexico, along with west Texas and southern California (Fig. 4). The Four Corners region, northern New Mexico, and southern Colorado are all below normal or much below normal with pockets of record driest (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 Jul 7 U.S. Drought Monitor (USDM) maintains drought characterizations in the Four Corners region while expanding severe and extreme drought characterizations (D2 and D3, respectively) in southern Colorado, and northern and eastern New Mexico. (Fig. 5).

Wildfire: Arizona, eastern and northern New Mexico, southwestern Colorado, and most of Utah and Nevada are above normal for wildfire risk in July. Arizona has seen considerable fire activity in 2020, including the Bighorn fire near Tucson, the Sawtooth and Bush fires near Phoenix, and the Mangum fire in northern Arizona. Wildfire acres burned for 2020 are already above the long term mean and median, as well as the totals for each of the past five years for Arizona, while New Mexico remains below mean/median in 2020 (Fig. 6, data as of Jul 12).

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

Precipitation and Temperature Forecast: The three-month outlook for Aug through Oct calls for equal chances of above- or below-normal precipitation in most of Arizona, New Mexico, Texas, and northern 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 July 2020 SW Climate Outlook

JUL2020 @CLIMAS_UA SW Climate Outlook, ENSO Tracker, July Heat, SW Monsoon Timing, Onset, Climatology, AZ & NM Reservoirs, https://bit.ly/3eARu4M #SWclimate

July 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

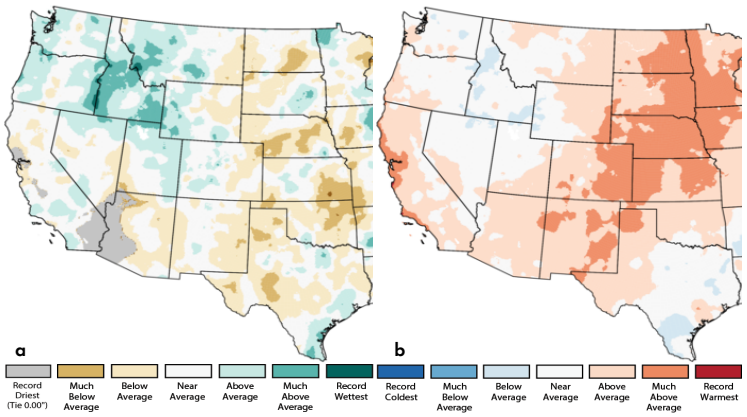


Figure 1: June 2020 Precipitation (a) & Temperature Ranks (b)

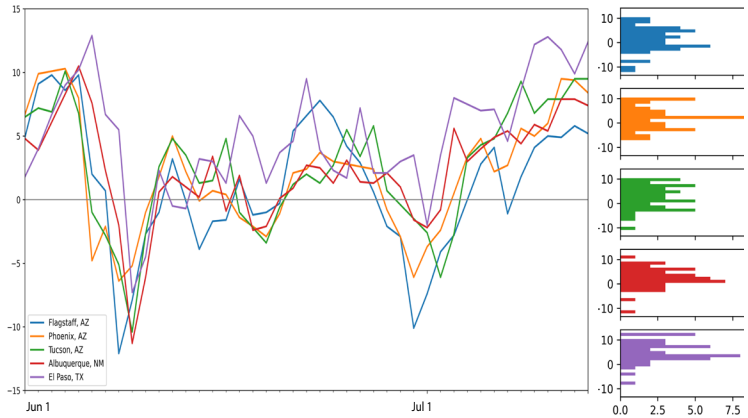


Figure 2: Daily Temperature Anomalies Jun 1 - Jul 13 (L) & Frequency of Anomalies (R)

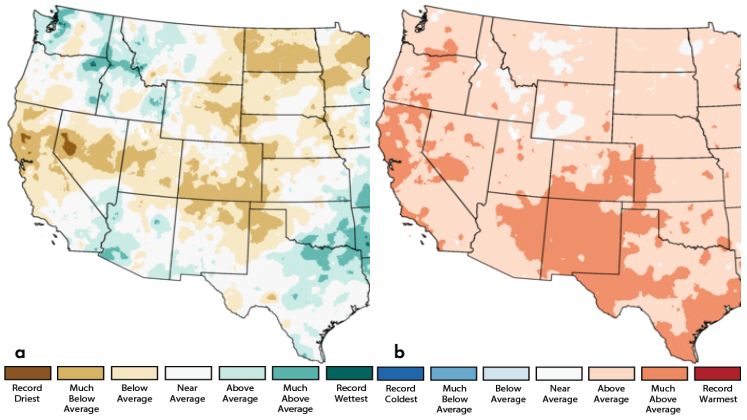


Figure 3: Jan - June 2020 Precipitation (a) & Temperature Ranks (b)

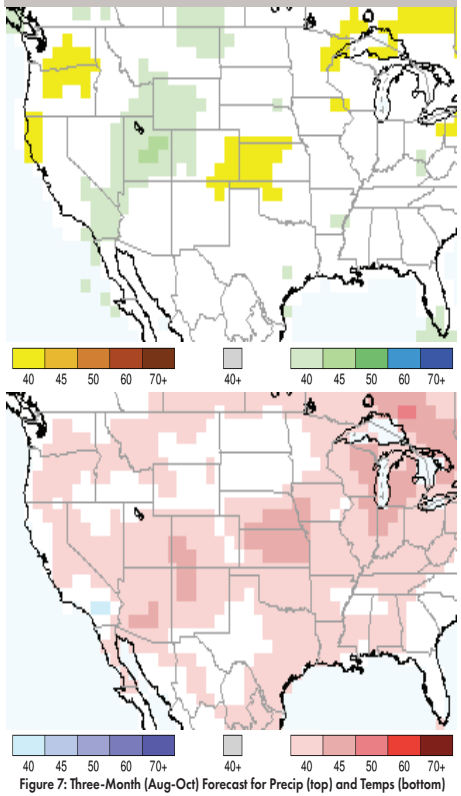


Figure 7: Three-Month (Aug-Oct) Forecast for Precip (top) and Temps (bottom)

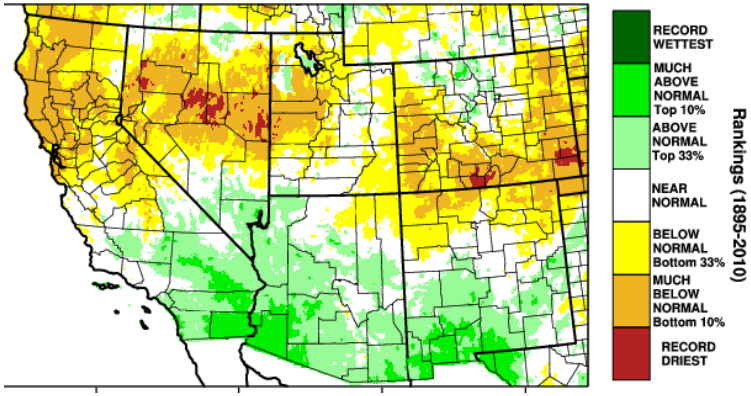


Figure 4: Water Year Precipitation (Oct 2019 - June 2020)

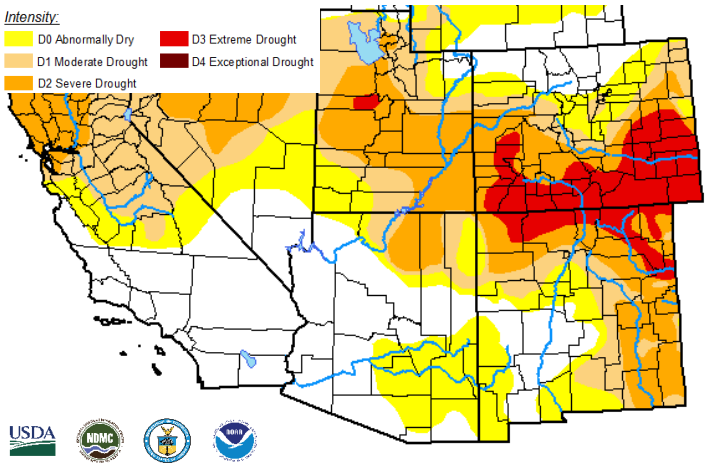


Figure 5: US Drought Monitor - Jul 7, 2020

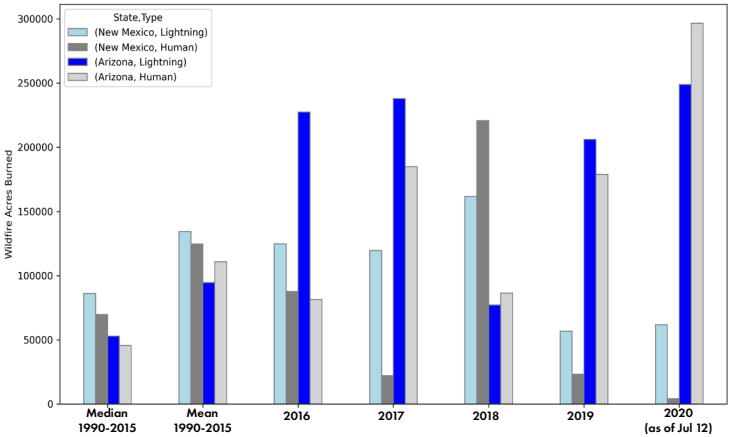


Figure 6: Lightning and Human-Caused Wildfire - AZ and NM

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

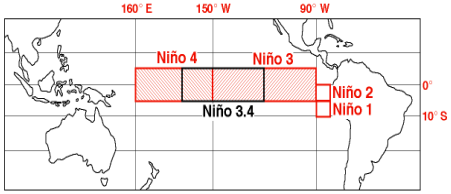
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

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) are cooling across the equatorial Pacific but are still mostly in the range of normal (Figs. 1-2). Conditions are forecast to remain ENSO-neutral through summer 2020, while seasonal outlooks point to a possible La Nina event by fall or winter 2020.

Forecast Roundup: On July 7, the Australian Bureau of Meteorology issued a La Nina watch, noting cooling SSTs, even while atmospheric indicators were still in the range of neutral. On July 9, the NOAA Climate Prediction Center (CPC) issued its ENSO diagnostic discussion with a La Nina Watch status. The CPC called for a 50- to 55-percent chance of ENSO-neutral during fall 2020, and a 50-percent chance of La Nina lasting till winter 2020-2021. On July 9, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting "the average of the forecasts of many models for fall and winter slightly exceed the borderline of weak La Niña SST conditions." On July 10, the Japanese Meteorological Agency (JMA) maintained its call for a 60-percent chance of ENSO-neutral conditions to last through summer 2020. The North American Multi-Model Ensemble (NMME) has swung to netural and the ensemble mean is projected to move closer to La Nina conditions later in 2020 (dashed black line, Fig. 4).

Summary: Oceanic conditions have cooled, and oceanic and atmospheric conditions remained ENSO-neutral over the last month. Most forecasts call for these conditions to remain ENSO-neutral through the summer, but by fall, it is essentially a toss-up between ENSO-neutral and La Nina. The tone of the forecasts further highlights the uncertainty associated with the current forecasts, and the weak-to-borderline intensity of the event were a La Nina to develop. A La Nina event would likely matter for precipitation in the U.S. Southwest, as La Nina can suppress tropical storm activity in the Fall, and often leads to drier than normal conditions in the winter.

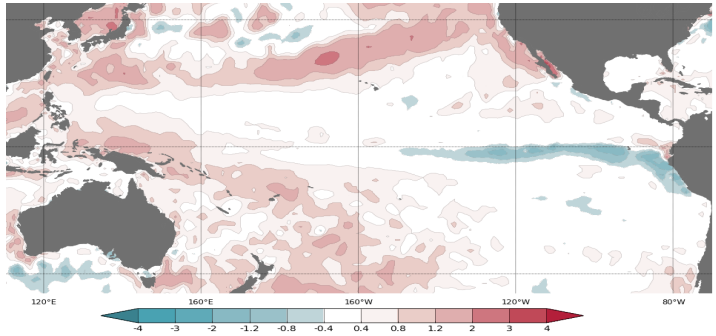


Figure 1: June 2020 Sea Surface Temperature (SST) Anomalies

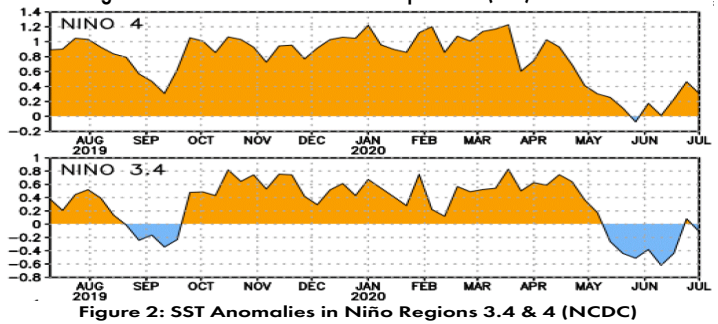


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

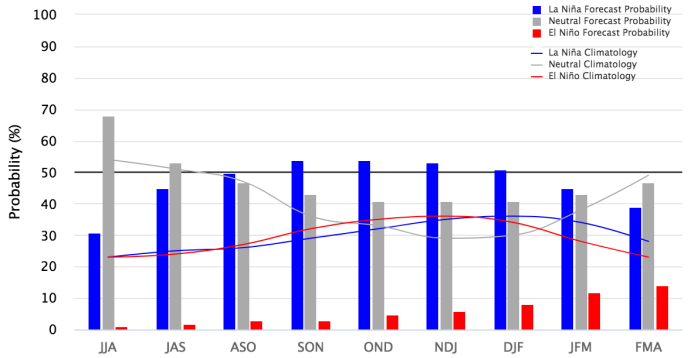


Figure 3: Early-Jul IRI/CPC Model-Based Probabilistic ENSO Forecast

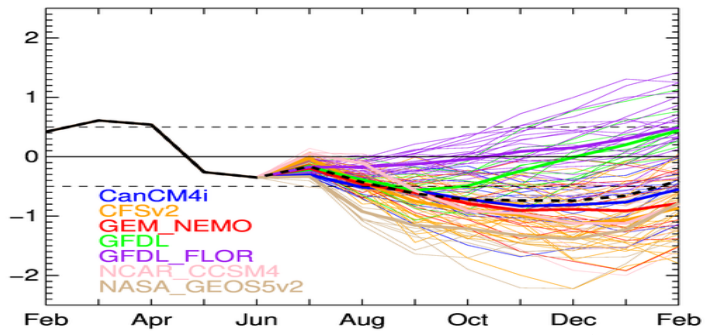


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Online Resources

Figure 1
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: ACIS

Monsoon 2020: A "Slow" Start in Context

Monsoon precipitation for Arizona and New Mexico is mostly below average (Fig. 1). This is a slower than normal start, but it is early to say much about what this means for the overall monsoon. The distributions of monthly precipitation totals (Fig. 2, top), and monthly percent of normal (Fig. 2, bottom) highlight the variable timing and intensity of monsoon precipitation. They also show how variability in monthly and seasonal totals can shape our perception of the 'character' of the monsoon each year.

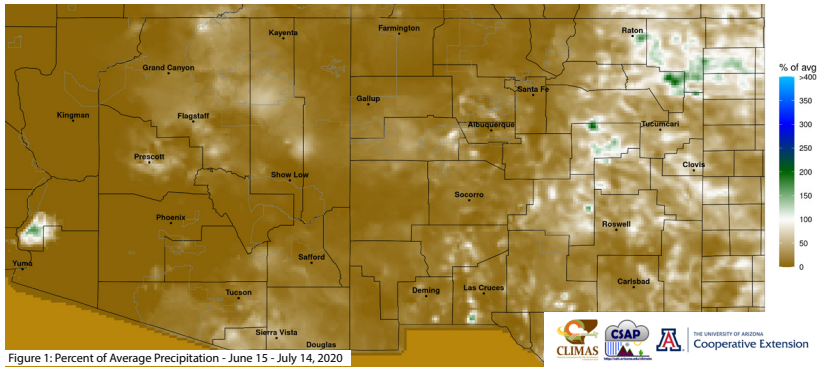


Figure 1: Percent of Average Precipitation - June 15 - July 14, 2020

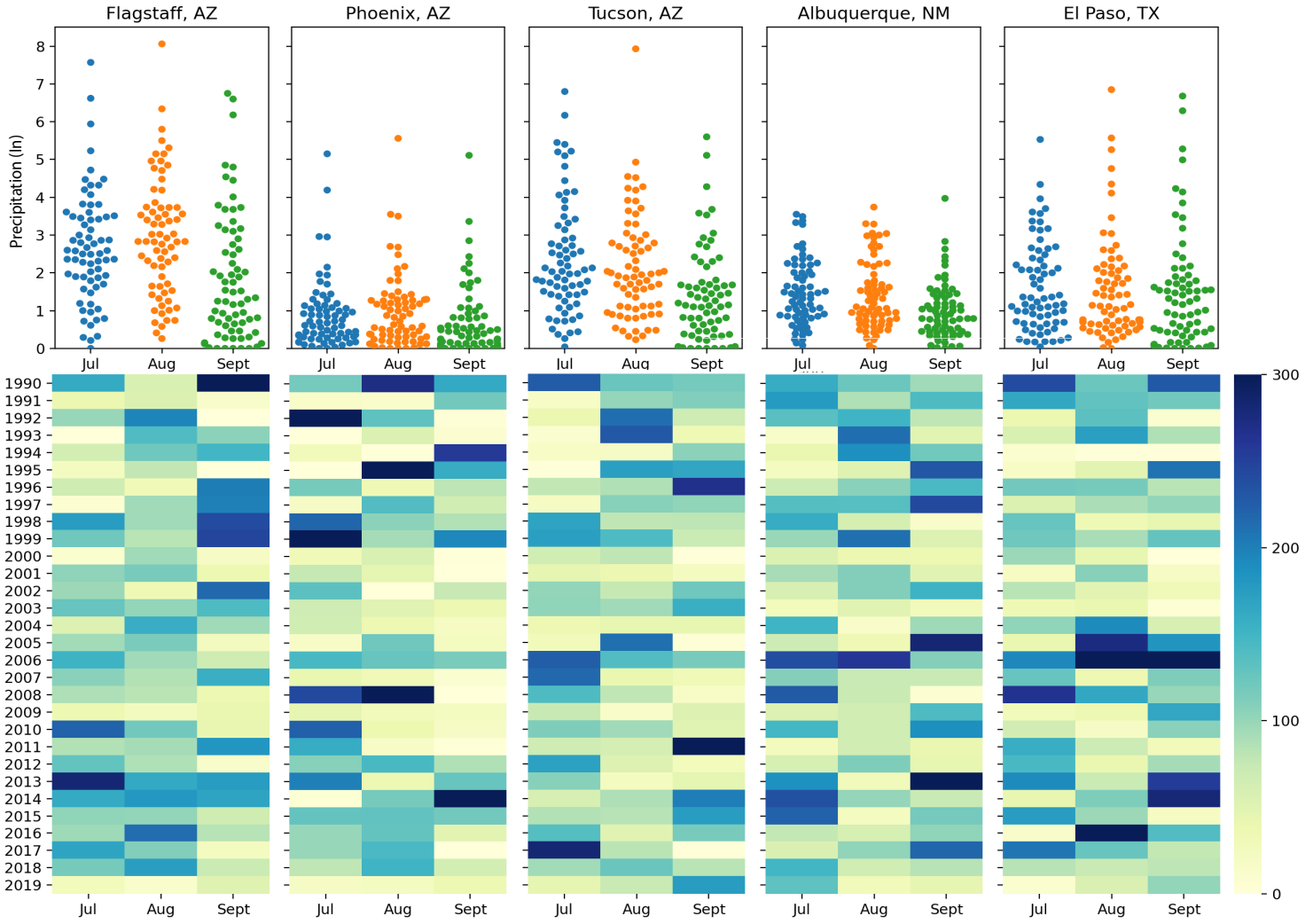


Figure 2: July-Aug-Sept Precipitation 1950-2019 (top row) & Precipitation' Percent of Normal 1990-2019 (bottom row)

Online Resources

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

Figures 2-3
National Weather Service
weather.gov

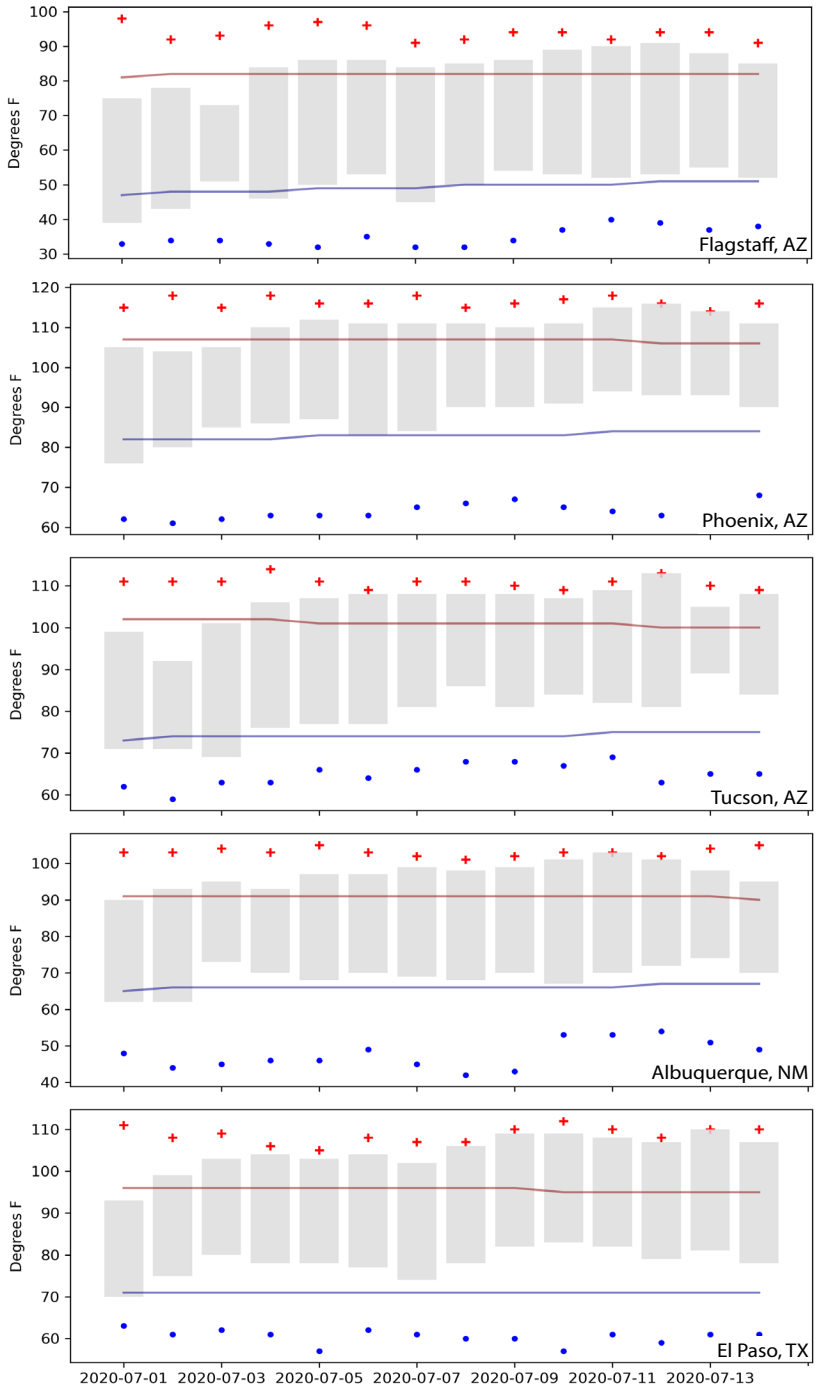


Figure 1: Daily Temperature July 1 - 14 - 2020 Range, Normal High/Low, and Record High/Low

July Temperature Breakdown

The slow start to monsoon activity has a connection to the persistent heat that has built and lingered across the US Southwest for much of the first few weeks of July (Fig. 1). The building ridge and dome of high pressure had the effect of boosting daily temperatures and preventing optimal flow of moisture into the region, not to mention missing out on the cooling effects of monsoon precipitation activity, no matter how irregular.

The period of July 10-13 were especially hot across much of the region (Figs. 2-3), with numerous record warm daily high temperatures, as well as a smattering of record warm overnight lows.

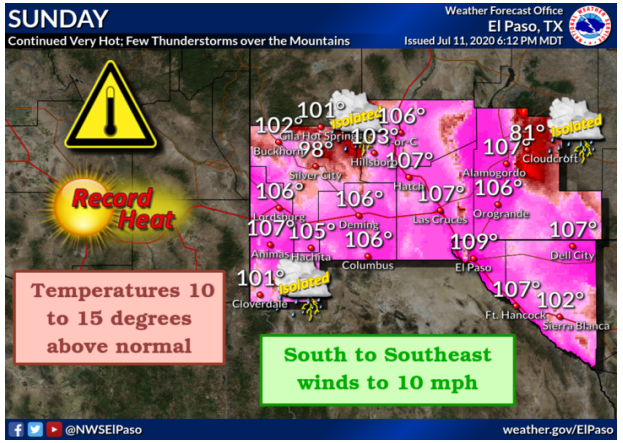


Figure 2: El Paso, TX - National Weather Service Record Heat Warnings - Jul 11 2020

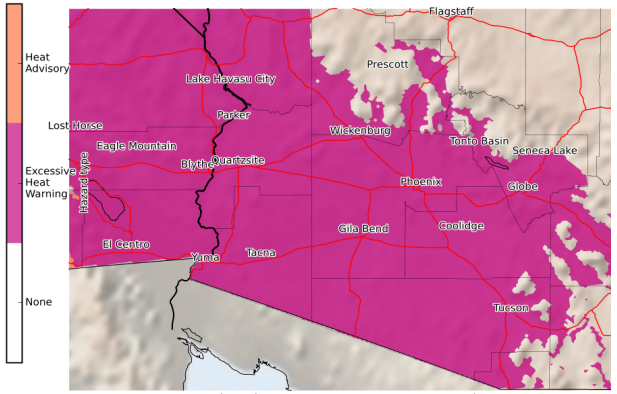


Figure 2: National Weather Service Excessive Heat Warning - Jul 11-13 2020

Southwest Climate Podcast

climas.arizona.edu/media/podcasts

July 2020 Edition:
Mike Crimmins and Zack Guido update their discussion of the 2020 wildfire season, which is turning out to be quite active for Arizona (while New Mexico is relatively quiet). Next, they move on to monsoon 2020, focusing on what the outlooks and forecasts had to say about this year, how this slow start compares to previous years: asking the question 'does a late start matter?' for the overall seasonal totals (hint: it's complicated). They also include a discussion of "key numbers" for the monsoon and a discussion of recent literature about the role of widespread precipitation events and regional monsoon precipitation totals.

climas.arizona.edu/podcast/july-2020-southwest-climate-podcast-monsoons-late-start-context-edition

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. For each month, they are estimating monthly precipitation at five cities in the US Southwest (Phoenix, Tucson, Flagstaff, Albuquerque, and El Paso).

They are picking the decile they think is most likely for each station, and focusing on the core months of monsoon precipitation (July-Aug-Sept).

Points are awarded each month (see survey link for details) and they will tally up points over the monsoon and see who scores highest for each month, each location, and overall.

We had around 35 players for July (see figures on the right), but you can still get your guesses in for August (and eventually September).

Make your August guess at:

https://bit.ly/3h2ZInS

We'll publish results here each month, but be sure to tune in to the podcast for more details about the game and the monsoon.

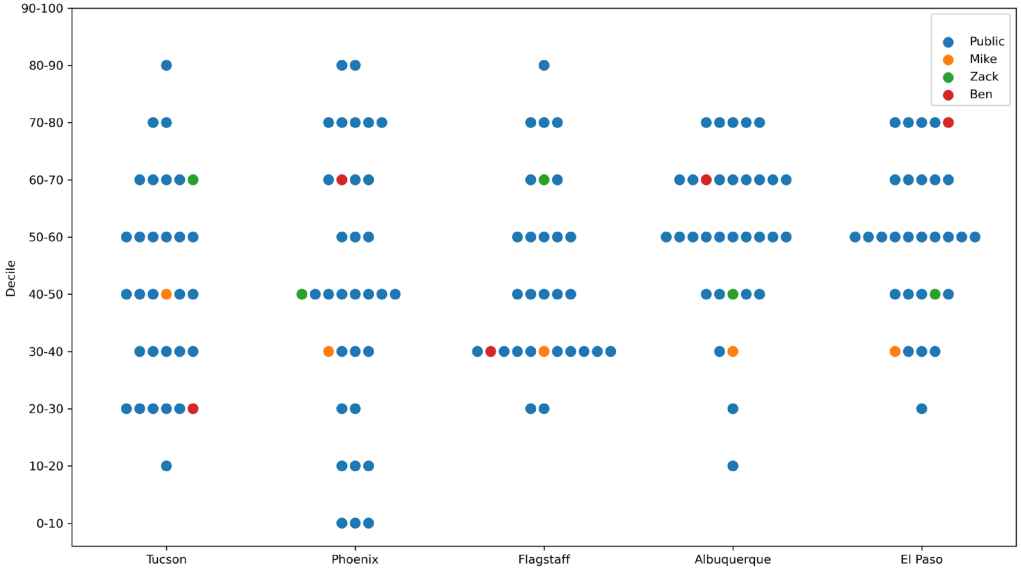


Figure 1: Range/Distribution of Guesses for Each of the Five Cities (July 2020 Guesses)

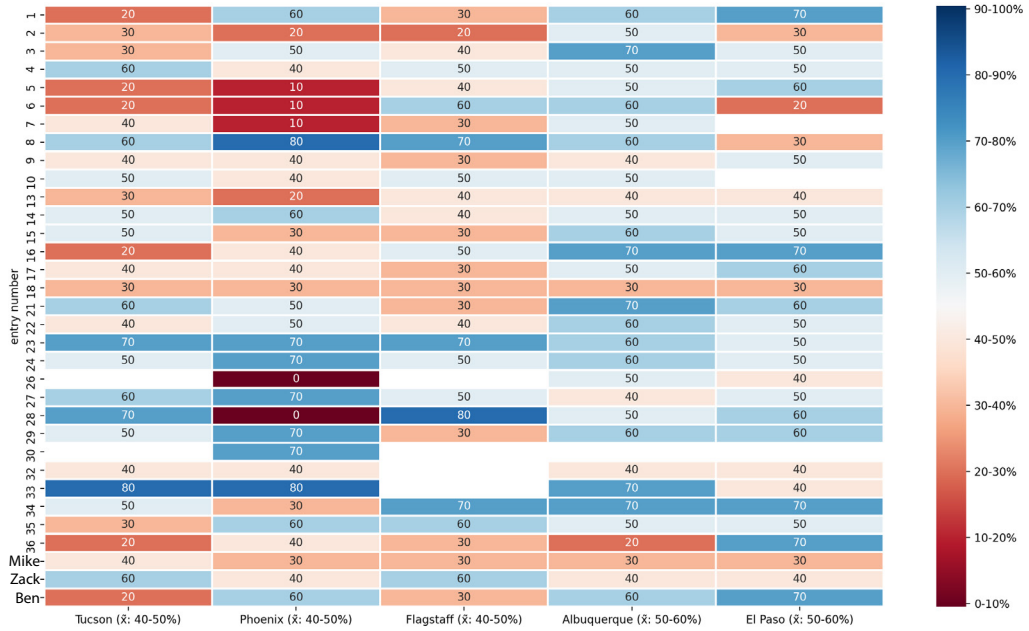


Figure 2: Heat Map of Monsoon Game Guesses for each of the Five Cities

Online Resources

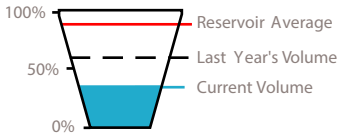
Portions of the information provided in this figure is available at the Natural Resources Conservation Service
www.wcc.nrcs.usda.gov/BOR/basin.html

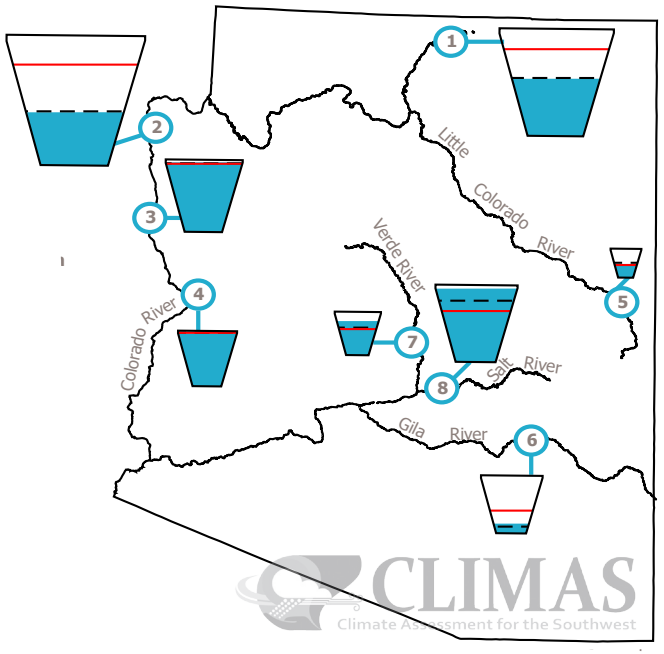
Contact Ben McMahan with questions/comments.

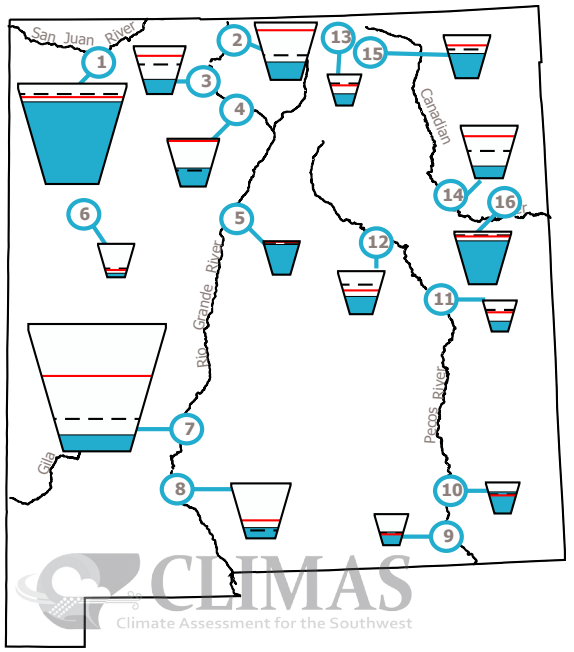
Reservoir Volumes

DATA THROUGH JULY 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	53%	12,792.8	24,322.0	554.3
2. Lake Mead	40%	10,589.3	26,159.0	-381.7
3. Lake Mohave	95%	1,712.0	1,810.0	5.0
4. Lake Havasu	94%	579.2	619.0	6.0
5. Lyman	46%	13.7	30.0	-2.0
6. San Carlos	16%	139.6	875.0	-47.5
7. Verde River System	78%	224.7	287.4	-44.2
8. Salt River System	94%	1,899.1	2,025.8	-48.6

*KAF: thousands of acre-feet

* in KAF = thousands of acre-feet
** missing data

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	80%	1354.0	1,696.0	-12.7
2. Heron	30%	119.2	400.0	-13.8
3. El Vado	30%	56.3	190.3	-4.1
4. Abiquiu	38%	70.5	186.8	-19.6
5. Cochiti	89%	44.6	50.0	0**
6. Bluewater	12%	4.7	38.5	-0.9
7. Elephant Butte	13%	285.8	2,195.0	-116.4
8. Caballo	19%	63.0	332.0	-14.4
9. Lake Avalon	42%	1.9	4.5	0.0
10. Brantley	67%	28.4	42.2	8.7
11. Sumner	31%	11.0	35.9	-5.6
12. Santa Rosa	40%	42.5	105.9	0**
13. Costilla	37%	6.0	16.0	-0.2
14. Conchas	23%	57.2	254.2	0**
15. Eagle Nest	56%	43.9	79.0	-1.4
16. Ute Reservoir	81%	161	200	0.0

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.

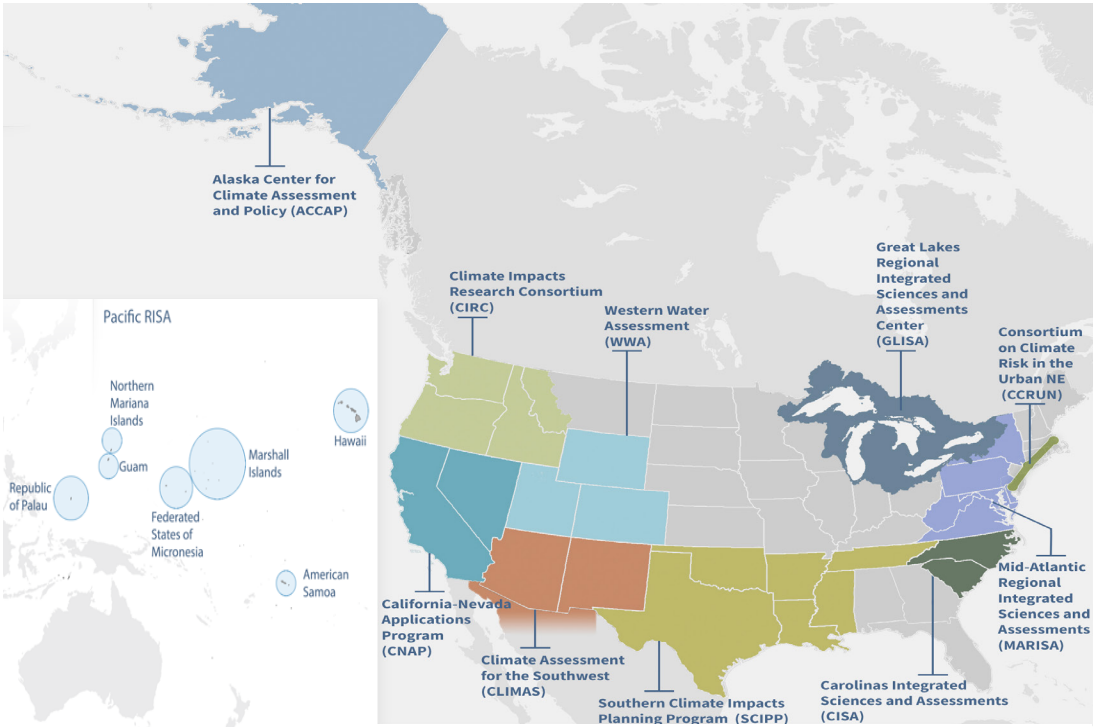


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions