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October 2022 Southwest Climate Outlook

Precipitation and Temperature: Sept precipitation was average to above average in most of Arizona and average to below average in most of New Mexico (Fig. 1a). Sept temperatures were between above average and much above average in most of Arizona and New Mexico, with some pockets of record warmest in the Four Corners region (Fig. 1b). Water year precipitation rebounded with the monsoon in some locations, and water year totals range between below average and above average in most of Arizona and New Mexico (Fig. 2) Summer/Monsoon (JJAS) precipitation rankings for the region demonstrate this rebound, with widespread areas of much above average and large areas of record wettest (Fig. 3).

Drought: The Oct 4 U.S. Drought Monitor (USDM) shows another month of decreases in the severity of drought characterizations in parts of Arizona and New Mexico (Fig. 4) following widespread monsoon activity (See Fig. 3). Despite the regional improvement, drought conditions are still found across most of the southwestern United States. Longer-term accumulated precipitation deficits are a factor in these designations. Sustained monsoon activity continues to help reduce extreme drought characterizations but is not enough to fully reverse long-term drought conditions.

Water Supply: Most of the reservoirs in Arizona and New Mexico are at or below the values recorded at this time last year. Most are also below their long-term average (see reservoir storage for Arizona and New Mexico). The shortage declaration for the Colorado River in 2022 and low water levels in the Rio Grande highlight ongoing concerns about the intersection of long-term drought and water resource management, especially with tier 2a restrictions under discussion given current conditions at Lakes Mead and Powell.

ENSO Tracker: The forecast consensus is that La Niña will persist into winter with a return to ENSO-neutral conditions sometime in early 2023 (see ENSO-tracker for details).

Monsoon: Official monsoon precipitation totals are impressive across the region (Fig. 5). Storms in June helped with an early start, and persistent recent activity has brought nearly the entire region to at or above average, calculated as a percent of the average seasonal total to date (Fig. 6, Fig. 3 also shows the spatial pattern). While the monsoon is officially over, persistent moisture in the Southwest has led to recurrent transition events and storms lasting well into October. This is no longer the monsoon, but does represent a great start to the water year.

Tweet Oct 2022 SW Climate Outlook

OCT2022 @CLIMAS_UA SW Climate Outlook, Seasonal Forecasts, ENSO Tracker, SW Monsoon, AZ & NM Reservoirs, bit.ly/3yX23MN #SWclimate #AZWx #NMWx

October 2022 - Climate Summary

Online Resources

Figure 1
National Centers for Environmental Information
ncdc.noaa.gov/sotc

Figures 2-3
West Wide Drought Tracker
wwdt.dri.edu

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

Figures 5-6
Climate Science Applications Program/CLIMAS
cals.arizona.edu/climate

data: PRISM

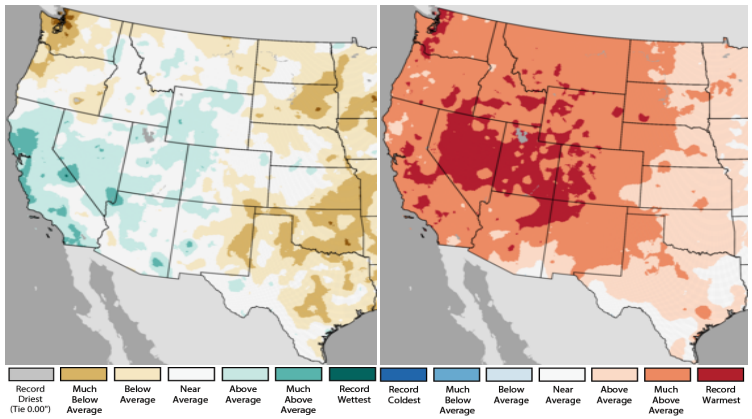


Figure 1: Sept 2022 Precipitation (a) & Temperature Ranks (b)

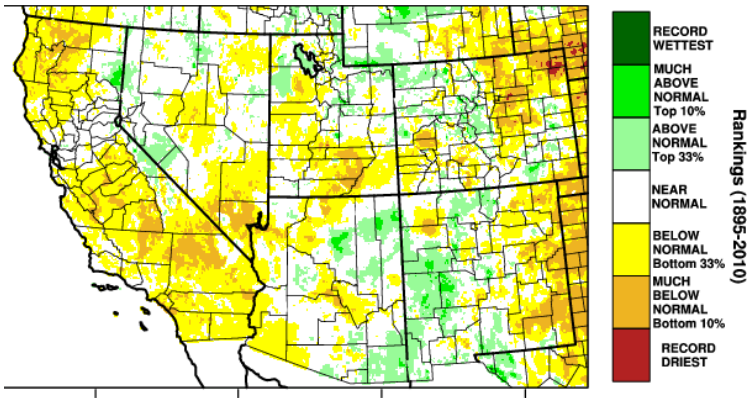


Figure 2: Water Year (Oct 2021 - Sept 2022) Precip Rankings

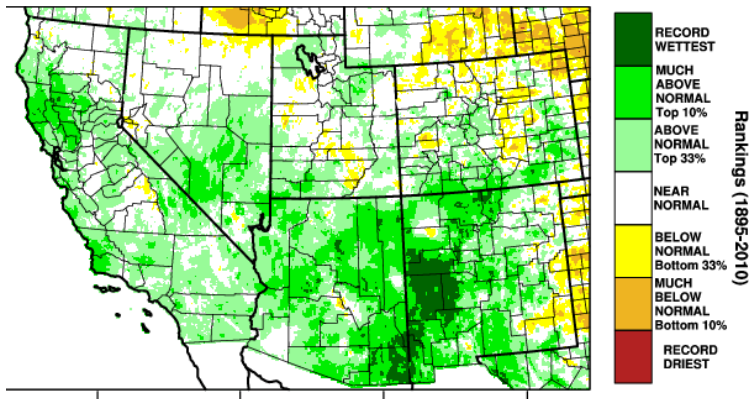


Figure 3: Summer (JJAS: Jun - Sept 2022) Precip Rankings

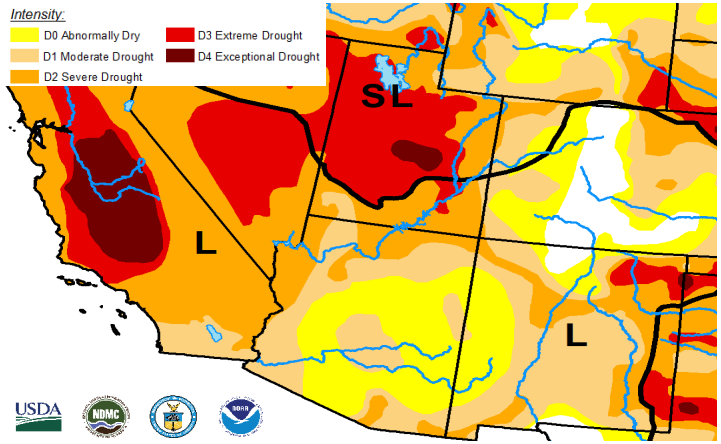


Figure 4: US Drought Monitor - Oct 4, 2022

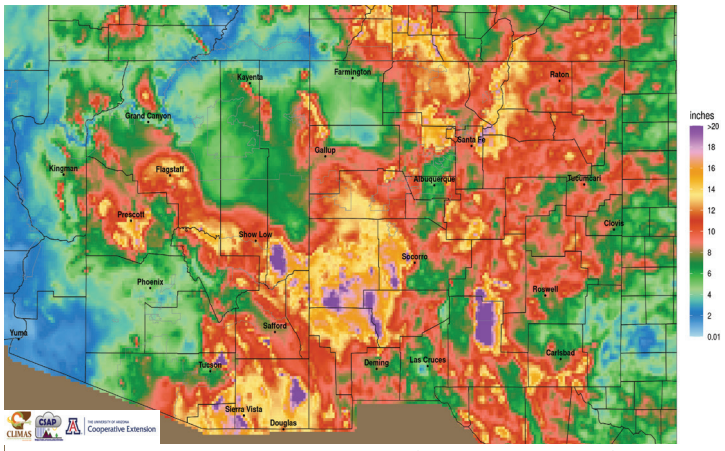


Figure 5: Monsoon Total Precipitation (Jun 15 - Sept 30, 2022)

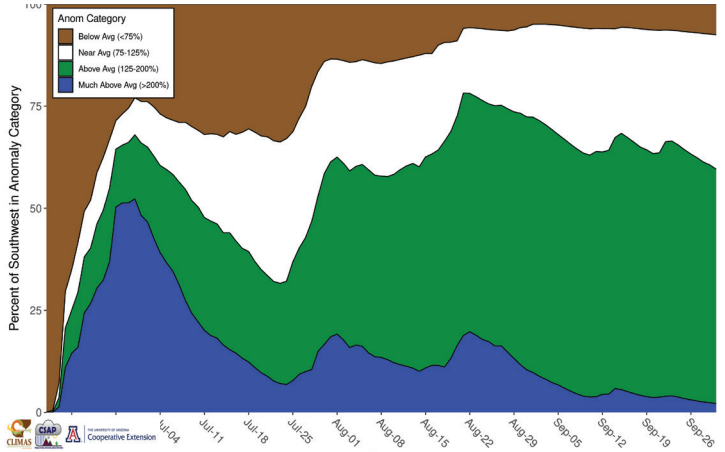


Figure 6: Precipitation Anomaly (% of Ave) Coverage - Jun 15 - Sept 30, 2022

Online Resources

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

Figures 8-9
NOAA Climate Prediction Center
cpc.ncep.noaa.gov

October 2022 - Seasonal Forecasts

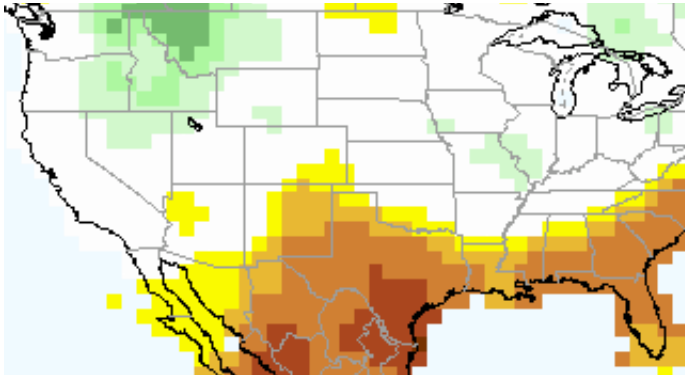


Figure 7A: Three-Month (Nov-Jan) Forecast for Precipitation

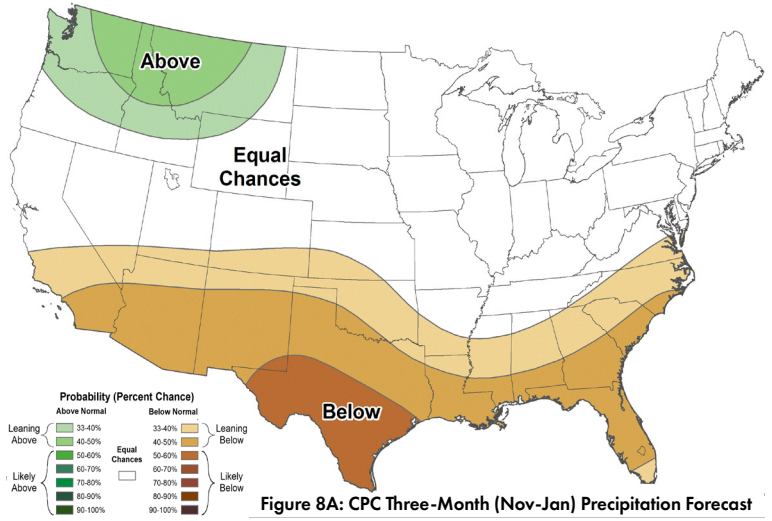


Figure 8A: CPC Three-Month (Nov-Jan) Precipitation Forecast

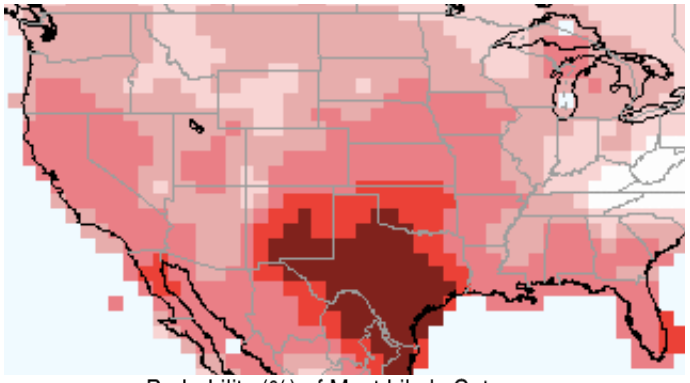


Figure 7B: Three-Month (Nov-Jan) Forecast for Temperature

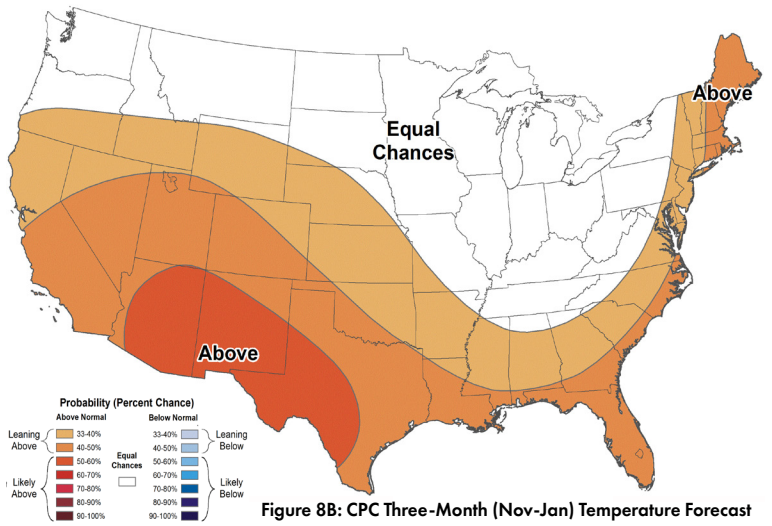


Figure 8B: CPC Three-Month (Nov-Jan) Temperature Forecast

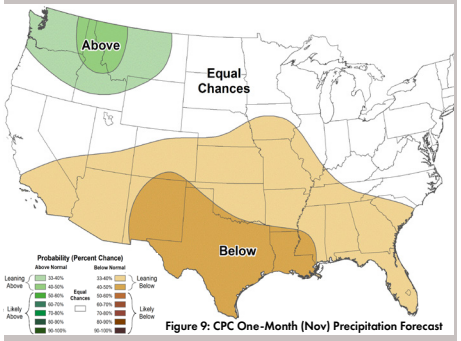


Figure 9: CPC One-Month (Nov) Precipitation Forecast

Precipitation Forecasts: The IRI outlook for Nov-Jan calls for increased chances of below average precipitation in most of New Mexico and parts of Arizona (Fig. 7a). The NOAA-CPC outlook for Nov-Jan calls for increased chances of below average precipitation across New Mexico and Arizona (Fig. 8a). The Nov outlook calls for increased chances of below average precipitation in New Mexico and Arizona (Fig. 9).

Temperature Forecasts: The IRI outlook for Nov-Jan calls for increased chances of above average temperatures across the western U.S. (Fig. 7b). The NOAA-CPC outlook for Nov-Jan calls for increased chances of above average temperatures across the Southwest (Fig. 8b).

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

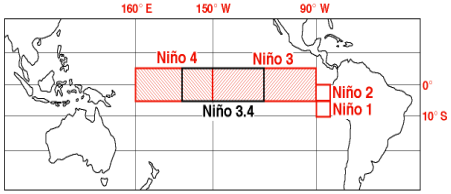
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

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 Nov 2022 – Jan 2023 call for cooler than average conditions across most of the equatorial Pacific (Fig. 1), and the current 3.4/4 anomalies are below the La Niña threshold (Fig. 2). ENSO outlooks generally call for La Niña to last well into winter, but most forecasts highlight a return to ENSO-neutral conditions in early 2023.

Forecast Roundup: On Oct 11 the Australian Bureau of Meteorology highlighted an ongoing La Niña event, noting "atmospheric and oceanic indicators...are consistent with an established La Niña" and noted a likely return to ENSO-neutral conditions by early 2023. On Oct 11 the Japanese Meteorological Agency (JMA) observed ongoing La Niña conditions that had a 90-percent chance of continuing into early winter, and a 60-percent chance through the end of winter. On Oct 12 the NOAA Climate Prediction Center (CPC) maintained their "La Niña Advisory" noting "the coupled ocean-atmosphere system continued to reflect La Niña" and called for a 75-percent chance of La Niña through winter and a 54-percent chance of ENSO-neutral in Feb-Apr 2023. On Oct 13, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting "oceanic and atmospheric variables have remained consistent with La Niña" with increasing signs of a transition to ENSO neutral by end of winter. The North American Multi-Model Ensemble (solid and dashed black line, Fig. 4) is currently forecast to remain under the La Niña temperature threshold through fall and well into winter.

Summary: The triple dip La Niña may be short-lived, with forecasts for a return to ENSO-neutral in early 2023. La Niña typically brings below-average precipitation to the Southwest, but if the La Niña conditions return to ENSO-neutral before winter is over, it will be interesting to see if this has any bearing on cumulative winter precipitation totals (i.e. is there a chance of normal precipitation in late winter and early spring that might offset any early season deficits resulting from the influence of La Niña).

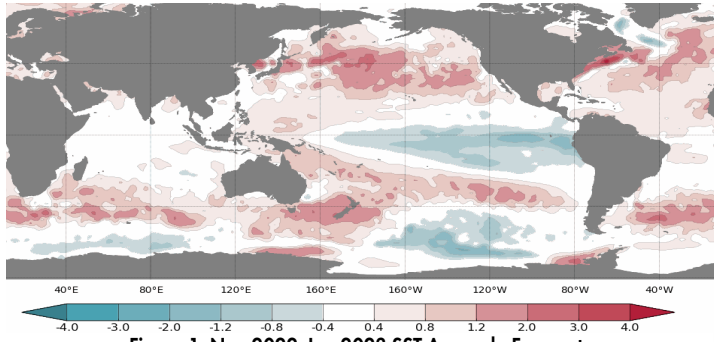


Figure 1: Nov 2022-Jan 2023 SST Anomaly Forecast

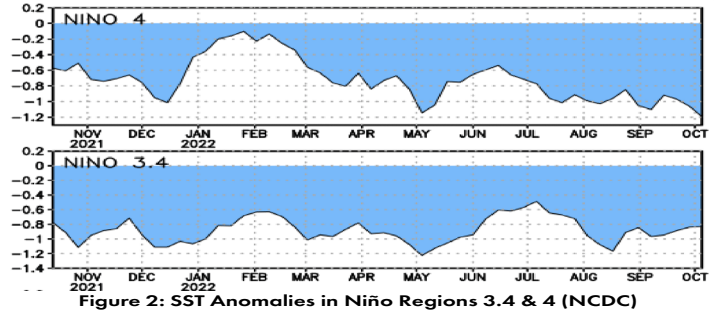


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

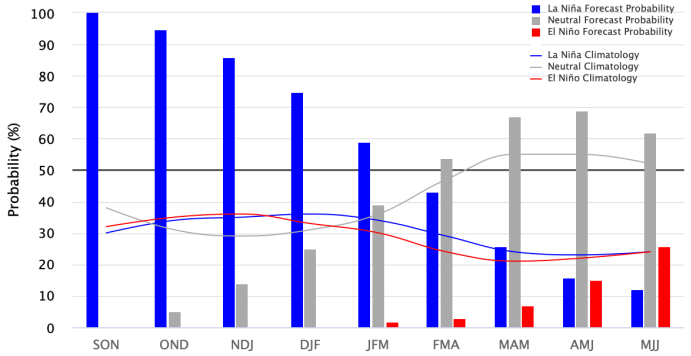


Figure 3: IRI/CPC Model-Based Probabilistic ENSO Forecast

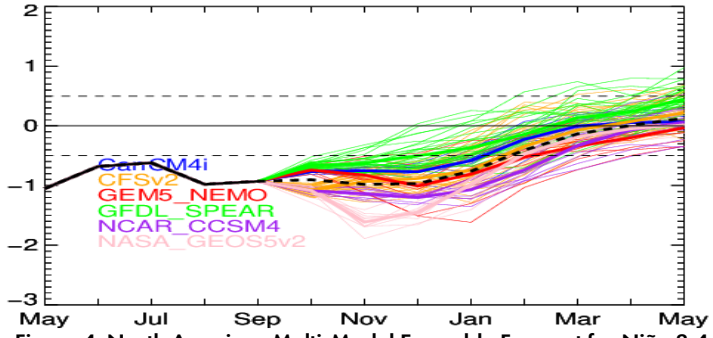


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

Monsoon 2022

Online Resources

Figures 1-4
Climate Science Applications Program/CLIMAS
cals.arizona.edu/climate

data: PRISM

Monsoon Resources

NWS Tucson Monsoon Tracker
weather.gov/twc/Monsoon

NWS Tucson Monsoon Info
weather.gov/twc/MonsoonInfo

CLIMAS Monsoon Info
climas.arizona.edu/sw-climate/monsoon

Monsoon WRF Forecast Discussion
arizonawrf.blogspot.com

Madweather SW Weather Discussion
madweather.blogspot.com

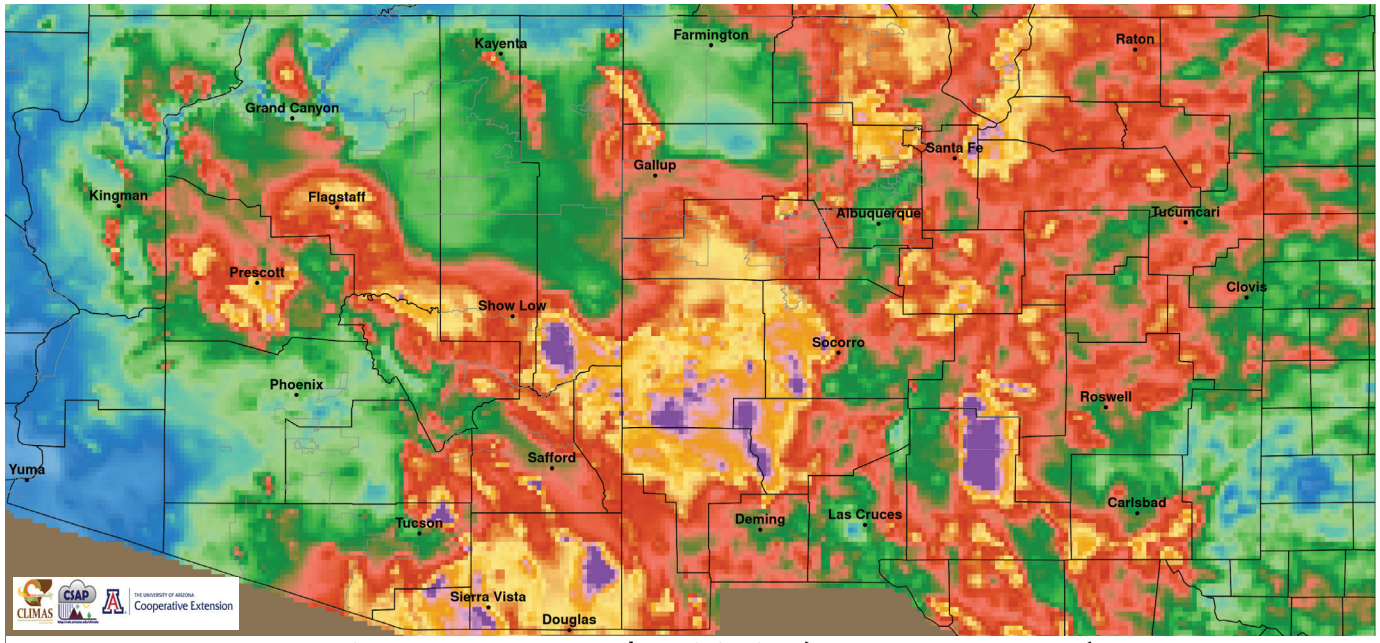


Figure 1: Monsoon Total Precipitation (Jun 15 - Sept 30, 2022)

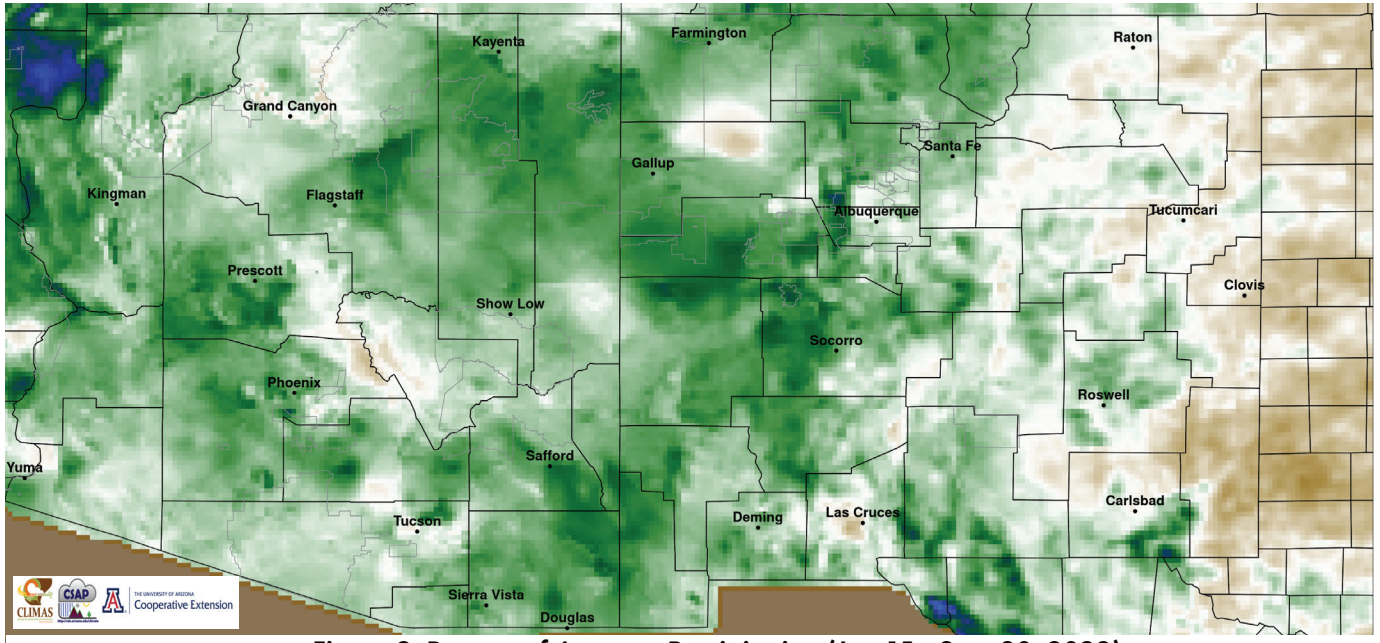


Figure 2: Percent of Average Precipitation (Jun 15 - Sept 30, 2022)

Online Resources

Figures 1-4
Climate Science Applications Program/CLIMAS
cals.arizona.edu/climate

data: PRISM

Monsoon Resources

NWS Tucson Monsoon Tracker
weather.gov/twc/Monsoon

NWS Tucson Monsoon Info
weather.gov/twc/MonsoonInfo

CLIMAS Monsoon Info
climas.arizona.edu/sw-climate/monsoon

Monsoon WRF Forecast Discussion
arizonawrf.blogspot.com

Madweather SW Weather Discussion
madweather.blogspot.com

Monsoon 2022

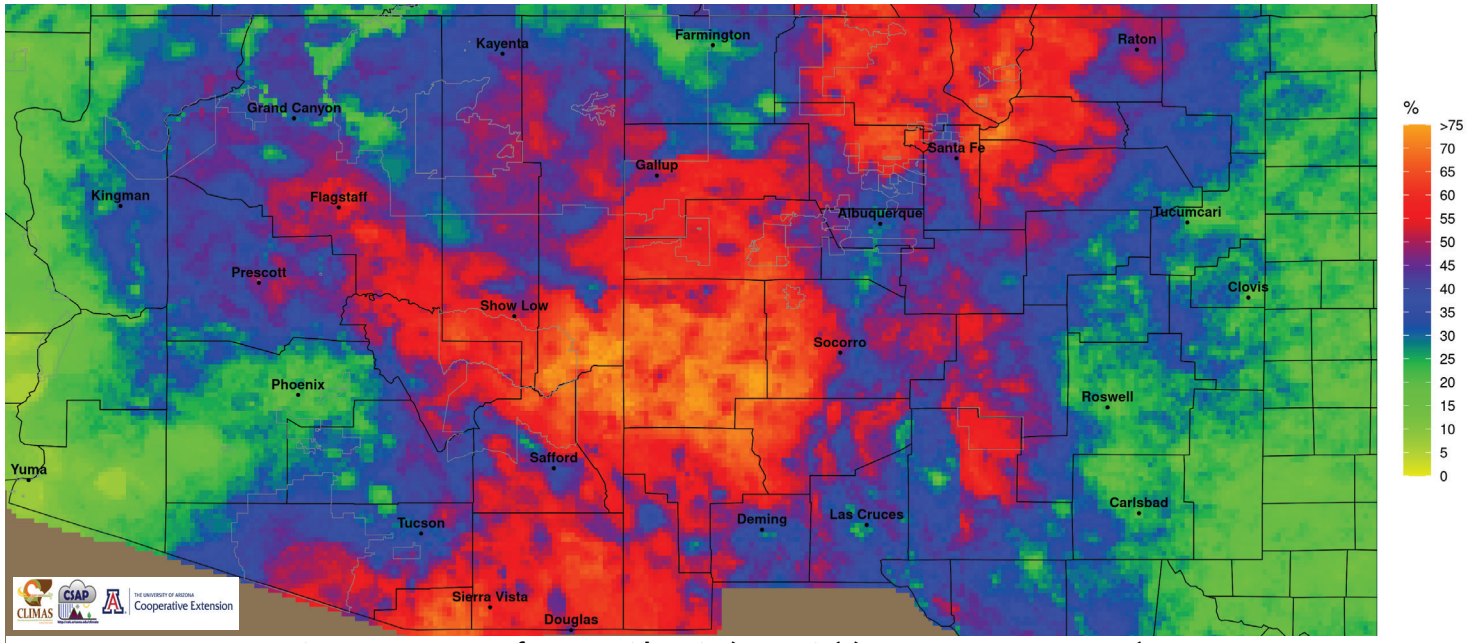


Figure 3: Percent of Days With Rain (>0.01 in) (Jun 15 - Sept 30, 2022)

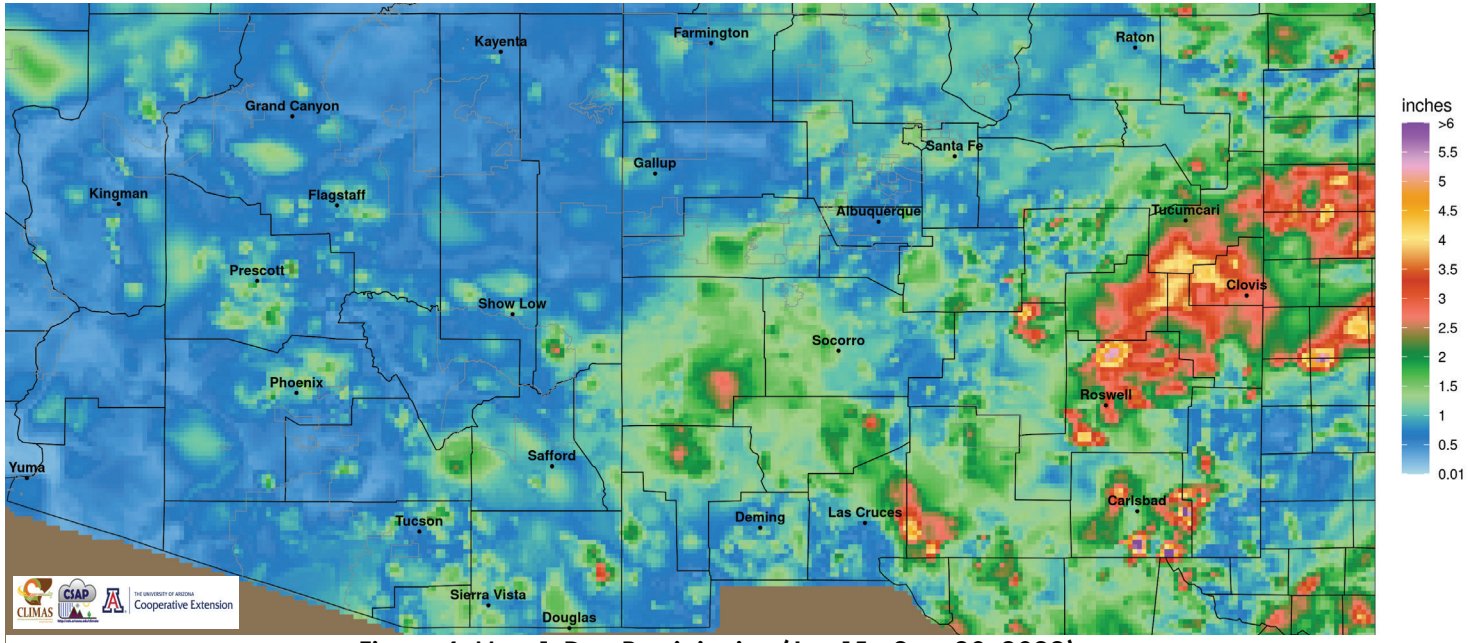


Figure 4: Max 1-Day Precipitation (Jun 15 - Sept 30, 2022)

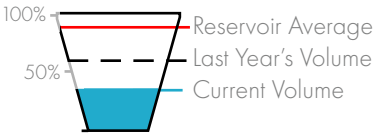
Online Resources

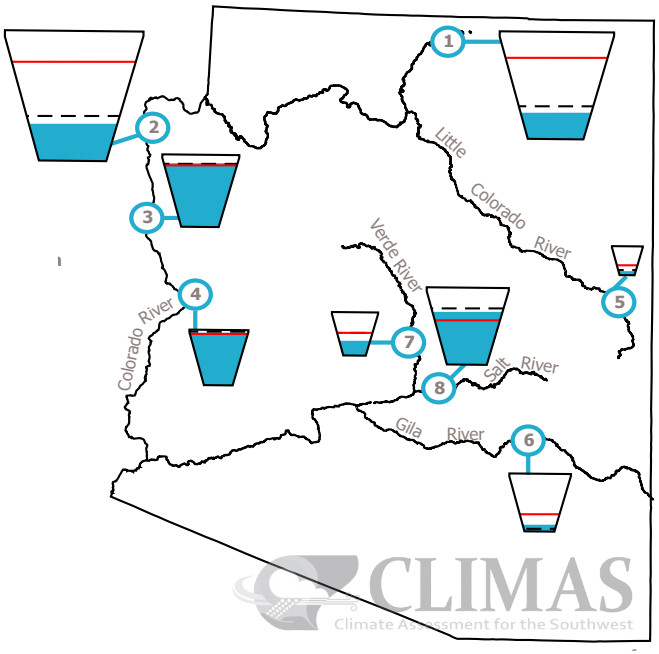
Portions of the information provided in this figure is available at the Natural Resources Conservation Service
www.wcc.nrcs.usda.gov/BOR/basin.html

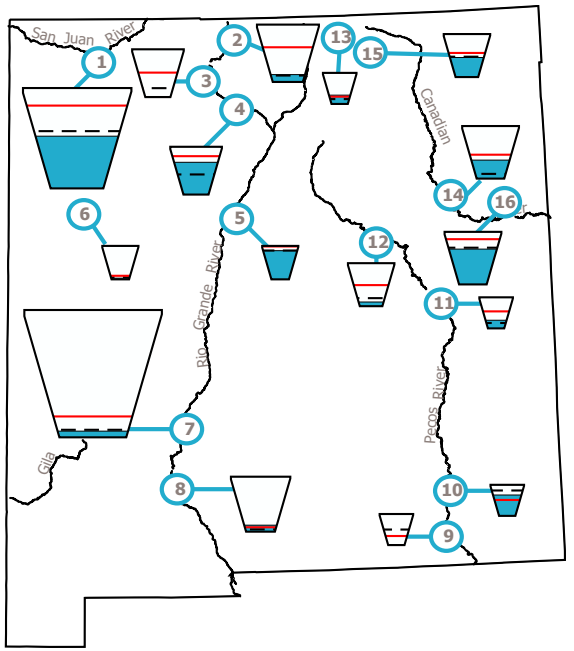
Contact Ben McMahan with questions/comments.

Reservoir Volumes

DATA THROUGH OCT 1, 2022
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	24%	5,797	24,322	-141
2. Lake Mead	28%	7,329	26,159	+54
3. Lake Mohave	88%	1,594	1,810	-104
4. Lake Havasu	94%	582	619	-4
5. Lyman	14%	4.3	30	-0.2
6. San Carlos	12%	100.9	875	+22.4
7. Verde River System	34%	96.3	287	+1.3
8. Salt River System	68%	1,372	2,026	-35.4

*KAF: thousands of acre-feet

* in KAF = thousands of acre-feet, ** = missing/incomplete data this/last month

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	51%	902.1	1,696.0	-30.1
2. Heron	12%	67.4	400.0	-20.8
3. El Vado	0%	0.2	190.3	0.2
4. Abiquiu	66%	105.5	186.8	+17.7
5. Cochiti	83%	41.4**	50.0	**
6. Bluewater	3%	1.3	38.5	-0.1
7. Elephant Butte	5%	95.0	2,195.0	+14.5
8. Caballo	11%	33.7	332.0	+1.7
9. Lake Avalon	**	**	4.5	**
10. Brantley	66%	25.5	42.2	+2.6
11. Sumner	25%	12.0	35.9	-2.9
12. Santa Rosa	9%	9.6**	105.9	**
13. Costilla	28%	4.8	16.0	+0.3
14. Conchas	34%	85.7**	254.2	**
15. Eagle Nest	44%	34.4**	79.0	**
16. Ute Reservoir	66%	133	200	-1.0

Southwest Climate Podcast

climas.arizona.edu/media/podcasts

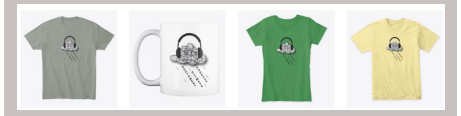
iTunes
https://apple.co/3kHh8bf

Spotify
https://spoti.fi/3zZIvWu

Android
https://bit.ly/2ILYHos

Stitcher
https://bit.ly/3nEWhHd

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



Order at: the-southwest-climate-podcast.creator-spring.com/

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

Oct 2022 SW Climate Podcast
Sending the Monsoon Away in Style

In the October 2022 edition of the Southwest Climate Podcast, Mike Crimmins and Zack Guido sit down to discuss where 2022 stands in relation to other years, landing on 2022 as a sneaky candidate for one of the best SW-regional monsoons, ever. They talk through the various ways one might assess monsoon performance, what happened in September, and how to make sense of all the lingering storm activity in early October, despite the monsoon being officially over. They wrap with a quick nod to winter and the incoming triple-dip La Niña, and what this might mean for the Southwest this winter.

Sept 2022 Southwest Climate Podcast
The Case for 2022 as a Generational Monsoon

In the September episode of the Southwest Climate Podcast, Mike Crimmins and Zack Guido catch up on where the monsoon ranks through August, and what September might bring (and how that might affect those rankings). After a tour of regional stats and how various parts of the Southwest are faring with the monsoon, Zack and Mike take a deeper dive into some comparisons with previous monsoon years, to see where 2022 stacks up, and how one might go about identifying the top 3-4 monsoons, based on coverage, intensity, and how sustained the precipitation was in that year. They wrap with a quick discussion of monsoon fantasy and what the forecasts hint at for September and into Fall.

Online Resources

Figure 1
Climate Program Office
cpo.noaa.gov

NOAA Climate Adaptation Partnerships Homepage

https://cpo.noaa.gov/Divisions-Programs/Climate-and-Societal-Interactions/CAP-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 CAP/RISA TEAM

The Climate Assessment for the Southwest (CLIMAS) program was established in 1998 as part of the National Oceanic and Atmospheric Administration's Climate Adaptation Partnerships (formerly the 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.