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June 2022 Southwest Climate Outlook

Monthly/Seasonal Precipitation and Temperature: May precipitation was between record dry and below average in most of Arizona and New Mexico (Fig. 1a). May temperatures were above average to much above average in Arizona and New Mexico (Fig. 1b). Water year precipitation is now almost entirely below average or drier in Arizona and New Mexico, with widespread pockets of much below normal, and small pockets of record dry (Fig. 2).

Drought: The Jun 7 U.S. Drought Monitor (USDM) shows increases in categorical severity of drought characterizations in Arizona and particularly in New Mexico (Fig. 3), but drought conditions are found across the entire southwestern United States. Long term accumulated precipitation deficits are a factor in these designations, but the relatively dry conditions over the water year to date are also playing their part in the drought. Rumors of an early start to the monsoon are hopeful but are not likely to reverse long term conditions.

Streamflow & Water Supply: Jun 1 streamflow forecasts are below median in both the Colorado River and Rio Grande basins (Fig. 4). 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 tier one 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.

Wildfire: Fire season is well underway in the Southwest, particularly with the Calf Canyon/Hermit Peak Complex fire and the Black Fire in New Mexico (Fig. 5A-B), and the Tunnel Fire (Fig. 5C) and Pipeline Fire in Arizona. Weather has been challenging with high winds and temperatures, combined with very low humidity. The NIFC fire outlooks for July show normal fire risk for Arizona and New Mexico (Fig. 6), with potential for limited relief with the onset of the monsoon but the exact timing is unpredictable and brings increased risk of ignition from lightning.

ENSO Tracker: La Niña persists, and over spring, forecast consensus pivoted from a return to ENSO-neutral conditions over summer, to a slight lean towards La Niña through summer, with some indications of La Niña extending into fall and winter (see ENSO-tracker for details).

Tweet June 2022 SW Climate Outlook

JUN2022 @CLIMAS_UA SW Climate Outlook, Forecasts, ENSO Tracker, Streamflow & Snowpack, Wildfire Outlook, AZ & NM Reservoirs, bit.ly/3MKEQ4k #SWclimate #AZWx #NMWx

June 2022 - Climate Summary

Online Resources

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

Figure 2
West Wide Drought Tracker
wwdt.dri.edu

Figure 3
U.S. Drought Monitor
droughtmonitor.unl.edu

Figure 4
National Resource Conservation Service (NRCS)
nrcs.usda.gov

Figure 5
InciWeb - Wildfire Incident Information System
inciweb.nwcg.gov

Figure 6
National Interagency Fire Center
nifc.gov

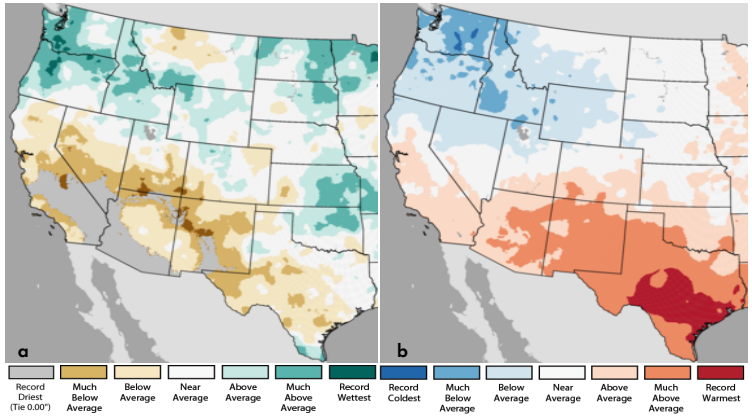


Figure 1: May 2022 Precipitation (a) & Temperature Ranks (b)

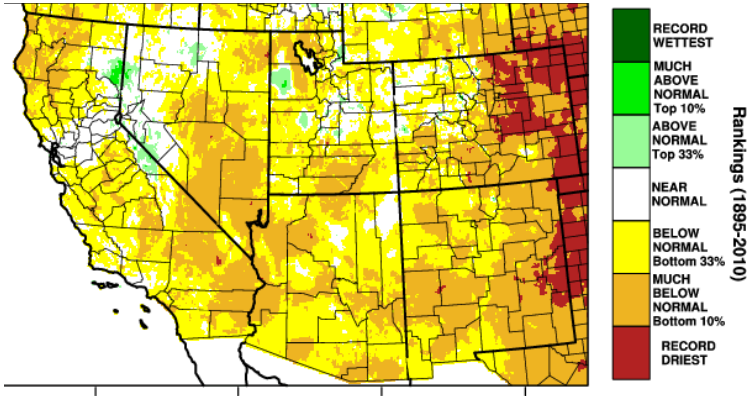


Figure 2: Water Year (Oct 2021 - May 2022) Precip Rankings

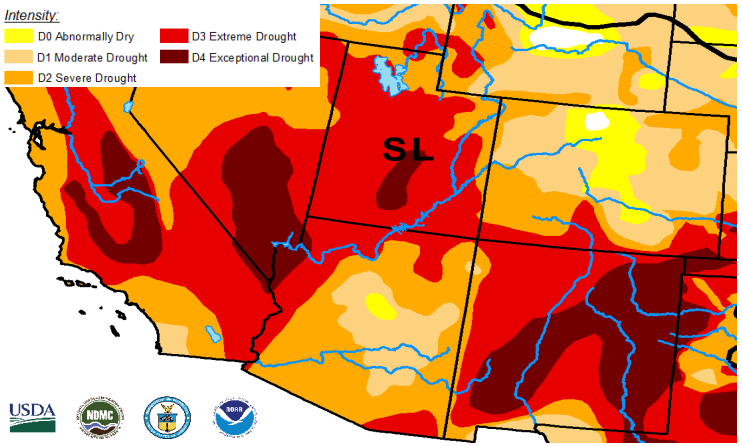


Figure 3: US Drought Monitor - Jun 7, 2022

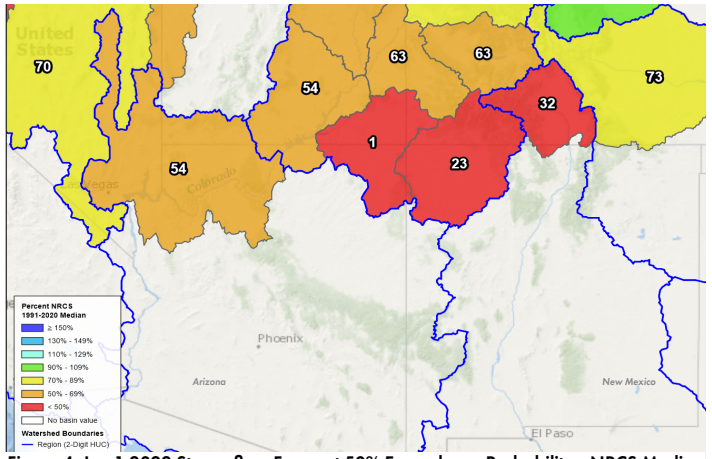


Figure 4: Jun 1 2022 Streamflow Forecast 50% Exceedance Probability - NRCS Median

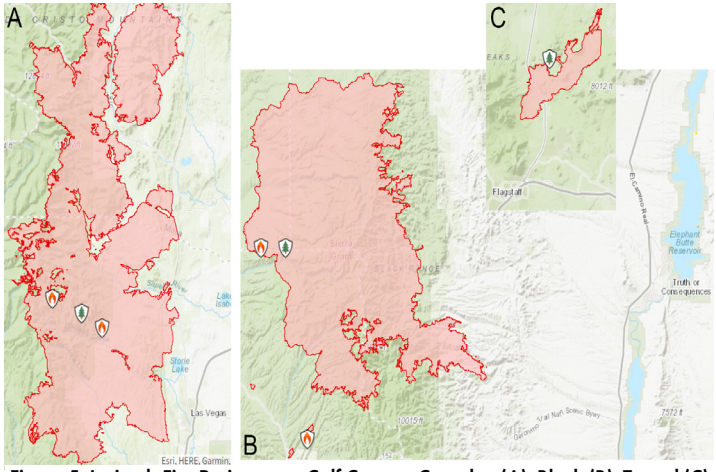


Figure 5: Inciweb Fire Perimeters - Calf Canyon Complex (A), Black (B), Tunnel (C)

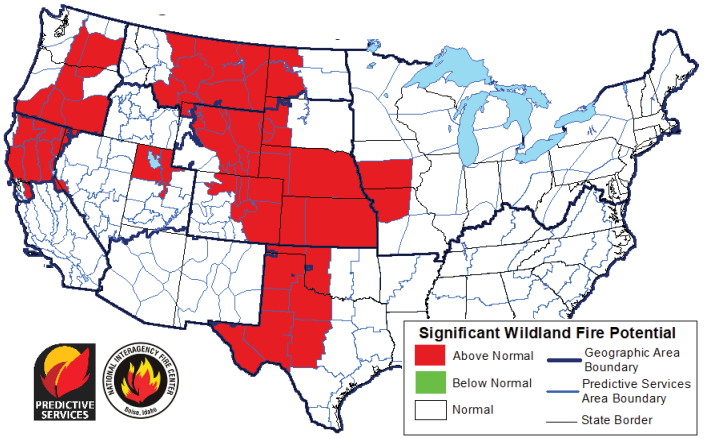


Figure 6: NIFC Significant Wildland Fire Potential Outlook - July 2022

Online Resources

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

Figure 8
NOAA Climate Prediction Center
cpc.ncep.noaa.gov

June 2022 - Seasonal Forecasts

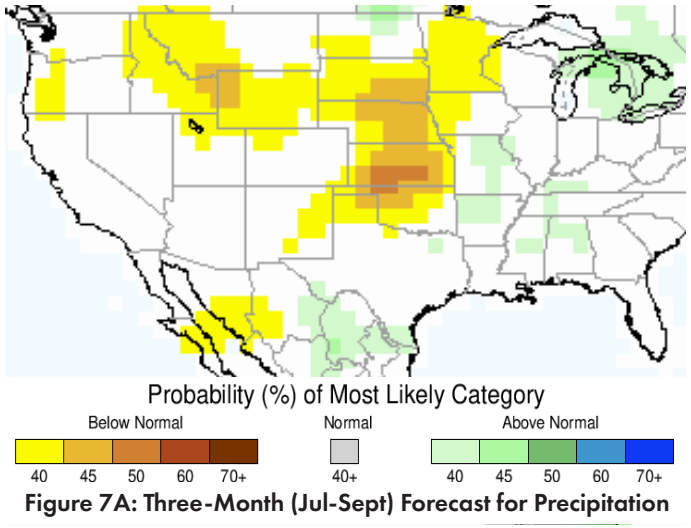


Figure 7A: Three-Month (Jul-Sept) Forecast for Precipitation

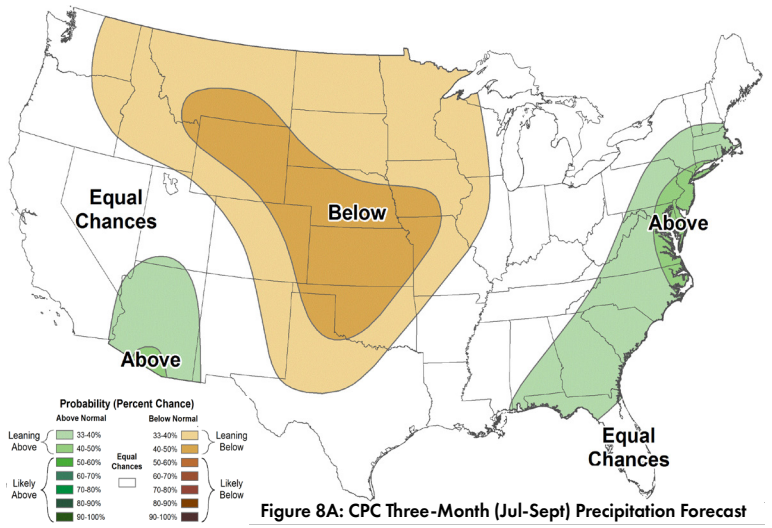


Figure 8A: CPC Three-Month (Jul-Sept) Precipitation Forecast

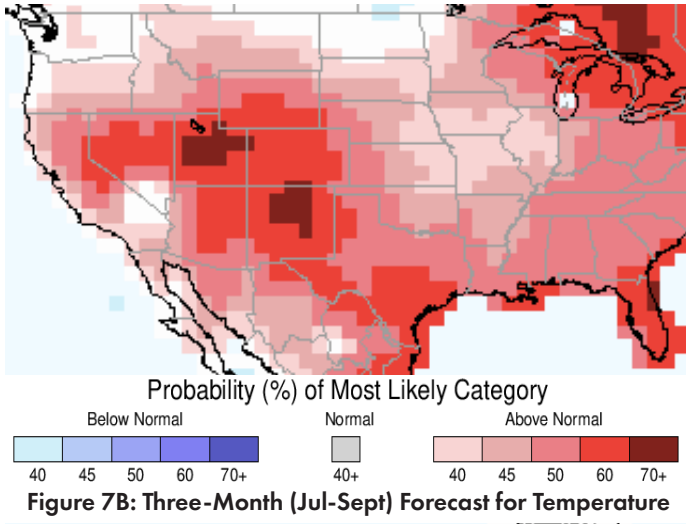


Figure 7B: Three-Month (Jul-Sept) Forecast for Temperature

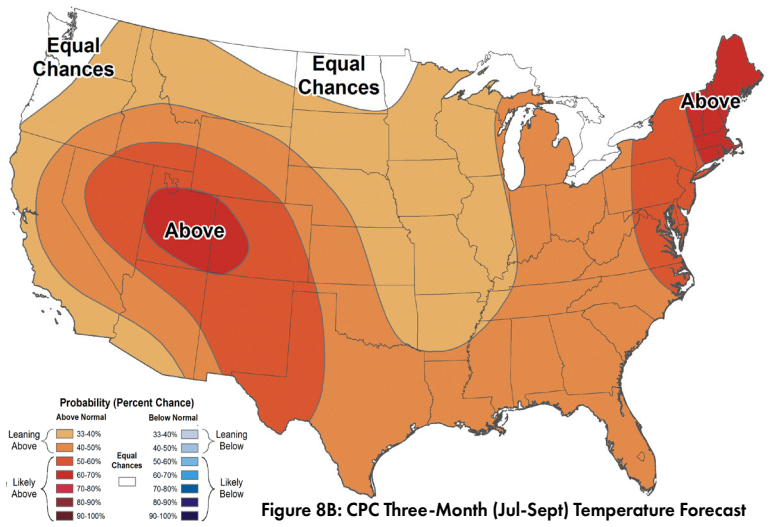


Figure 8B: CPC Three-Month (Jul-Sept) Temperature Forecast

Precipitation Forecasts: The IRI outlook for Jul-Sept calls for equal chances of above or below average precipitation in Arizona and much of New Mexico (Fig. 7a). The CPC outlook for Jul-Sept calls for increased chances of above average precipitation in most of Arizona with mostly equal chances of above or below average precipitation in most of the rest of the Southwest (Fig. 8a).

Temperature Forecasts: The IRI outlook for Jul-Sept calls for increased chance of above average temperatures across most of the Southwest (Fig. 7b). The CPC outlook for Jul-Sept 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

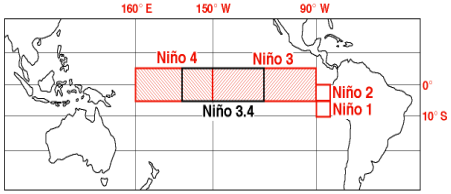
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

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

Updated sea surface temperature (SST) forecasts for Jun – Aug 2022 still indicate cool conditions across most of the equatorial Pacific (Fig. 1). Current 3.4/4 anomalies remain below the La Niña threshold but have started warming (Fig. 2). ENSO outlooks mostly lean towards La Niña lasting through summer, with some indications of La Niña lasting into fall and winter 2022.

Forecast Roundup: On Jun 7 the Australian Bureau of Meteorology ENSO outlook saw La Niña as "slowly weakening in the tropical Pacific" and highlighted atmospheric indicators show a mix of La Niña and ENSO neutral conditions. On Jun 9 the NOAA Climate Prediction Center (CPC) maintained their "La Niña Advisory" noting "the coupled ocean-atmosphere system continues to reflect La Niña" and called for a 52-percent chance of La Niña in late summer (Aug-Oct), and a 58-percent chance of La Niña in fall and early winter. On Jun 9 the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting "Sea Surface Temperatures remain below-average (strengthening slightly) in the central-eastern equatorial Pacific". Both the objective (model-based) forecast and the 'subjective' (forecaster consensus) outlook generally favor a continuation of La Nina through summer and fall, but there is some uncertainty about both the near and long term signal. On Jun 10 the Japanese Meteorological Agency (JMA) observed La Niña conditions had 70-percent chance of continuing through early summer, with increased chance of ENSO-neutral (60%) compared to La Niña (40%) by end of summer or early fall. The North American Multi-Model Ensemble (solid and dashed black line, Fig. 4) is currently in La Niña territory but shows a brief return to neutral conditions before moving back into La Nina conditions in fall 2022.

Summary: The outlooks this month continue the possibility of La Nina extending through summer into fall and winter, although there is considerable uncertainty in models and forecasts during the so-called spring predictability barrier. If La Niña does persist through summer, the potential influence on the monsoon is not well understood, partly due to the inherent variability and volatility of the monsoon, and limited sample size of ENSO events that persist over the summer period.

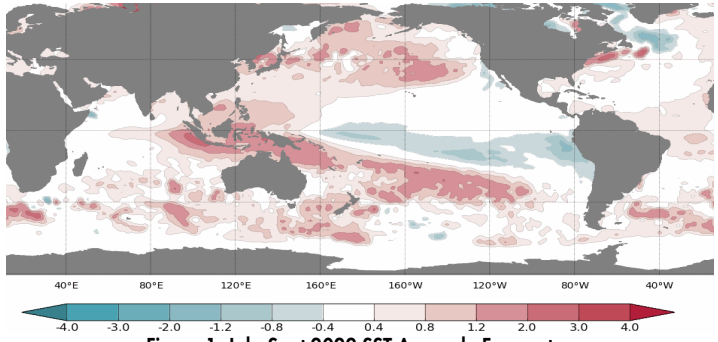


Figure 1: Jul - Sept 2022 SST Anomaly Forecast

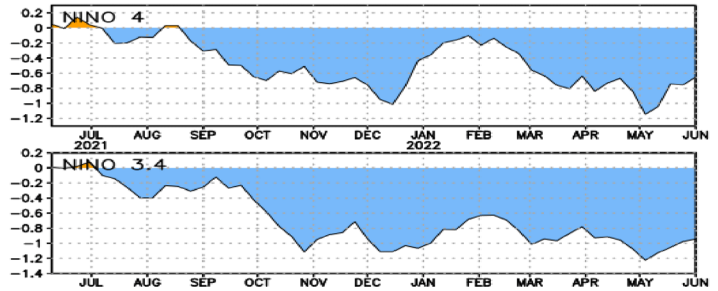


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

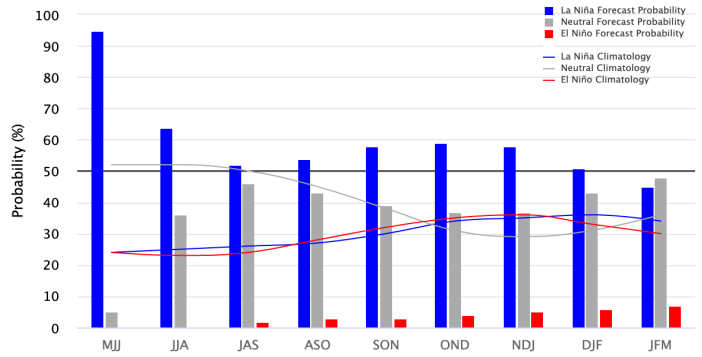


Figure 3: IRI/CPC Model-Based Probabilistic ENSO Forecast

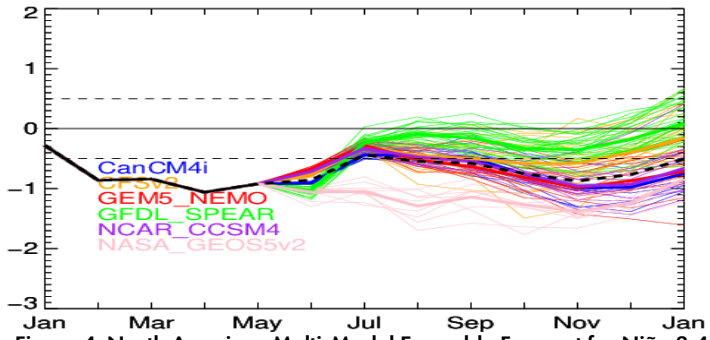


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

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.

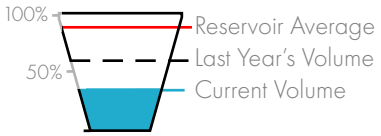
The map gives a representation of current storage for reservoirs in Arizona and New Mexico. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage (blue fill) as a percent of total 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).

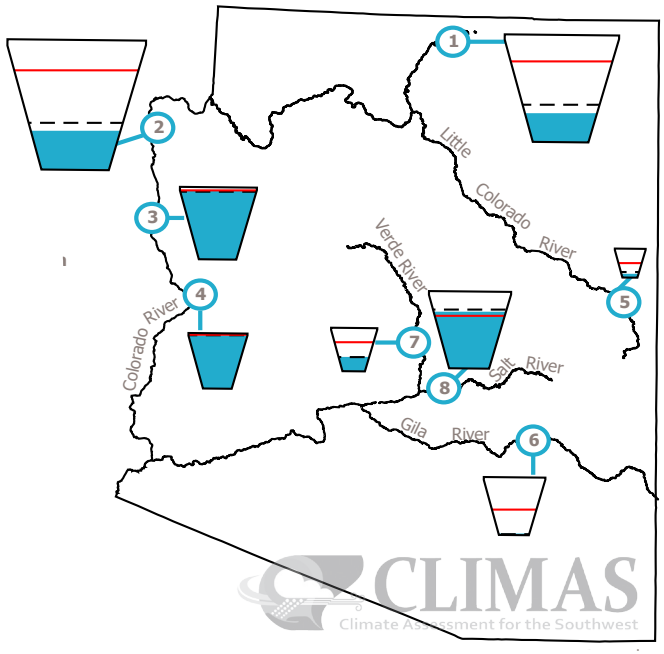
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons).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

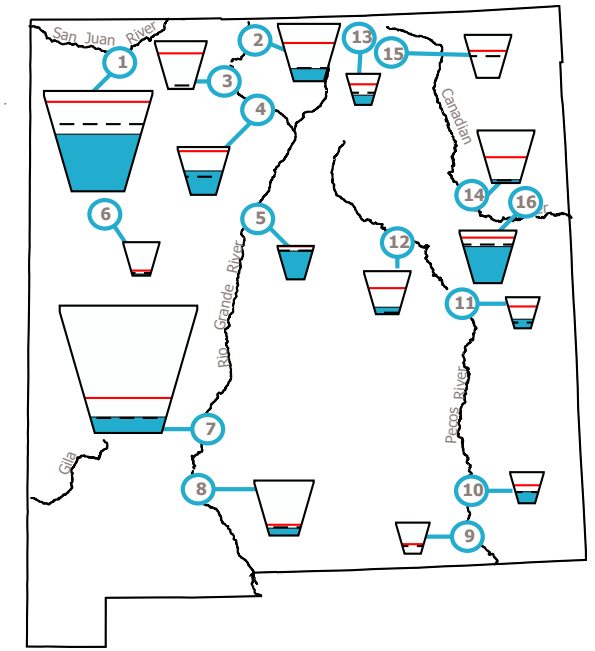
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

Reservoir Volumes

DATA THROUGH JUNE 1, 2022
Data Source: National Water and Climate Center, Natural Resources Conservation Service







Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	26%	6,346	24,322.0	+555
2. Lake Mead	29%	7,517	26,159.0	-509
3. Lake Mohave	95%	1,711	1,810.0	+5
4. Lake Havasu	96%	595	619.0	+30
5. Lyman	13%	3.8	30.0	-0.8
6. San Carlos	0%	0.2	875.0	-7.7
7. Verde River System	32%	92.1	287.4	-3.4
8. Salt River System	73%	1,481	2,025.8	-56

*KAF: thousands of acre-feet

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

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	56%	953.6	1,696.0	+55.4
2. Heron	21%	84.8	400.0	+26.2
3. El Vado	0%	0.6	190.3	-16.9
4. Abiquiu	49%	91.2	186.8	+10.2
5. Cochiti	83%	41.6	50.0	-0.9
6. Bluewater	4%	1.6	38.5	-0.1
7. Elephant Butte	12%	253.7	2,195.0	-2.9
8. Caballo	13%	43.8	332.0	28.6
9. Lake Avalon	**	**	4.5	**
10. Brantley	36%	15.1	42.2	-8.1
11. Sumner	28%	10.1	35.9	-3.8
12. Santa Rosa	16%	17.0	105.9	-0.6
13. Costilla	30%	4.7	16.0	-0.5
14. Conchas	5%	11.9	254.2	-3.1
15. Eagle Nest	**	**	79.0	**
16. Ute Reservoir	68%	135	200	-5.0

Monsoon Fantasy Forecast Game

monsoonfantasy.arizona.edu/home

How it Works

You make forecasts of the total rainfall amount in a one-month period for each of July, August, and September, at five cities in the Southwest. Your score is based on the riskiness and accuracy of your estimates compared to the actual rainfall.

You compete against all other players and the three highest scores receive Amazon gift cards with values of $400, $300, and $200, respectively. You must submit estimates in at least 2 months to qualify for the prizes.

Monsoon Fantasy Forecast Game

The monsoon fantasy forecast game is back!

The game is largely the same. You make rainfall forecasts at five cities each month. You score points based on the accuracy and riskiness of your forecasts. Here's what is new this year:

- You can make your forecasts for the month until midnight the final day of the previous month. For example, you have until June 30 at 11:59 PM to make your forecasts for July. Same goes for August and September.
- There are Amazon gift card prizes for the top 3 finishers at values of $400, $300, and $200, courtesy of the Arizona Institutes for Resilient Environments and Societies.

Mike, Zack, and Ben will be talking about the monsoon and the leaderboard each month on the Southwest Climate Podcast.

For more details or to play: *https://monsoonfantasy.arizona.edu/home*

Calling last year's monsoon fantasy players - Can you spare 2 minutes to help?

If you played last year, the game team would be grateful for two minutes of your time to answer five simple questions. Responses are anonymous. They will help them publish a description of the game.

https://uarizona.co1.qualtrics.com/jfe/form/SV_bd88HC6pAoWjGwS

Southwest Climate Podcast

climas.arizona.edu/media/podcasts

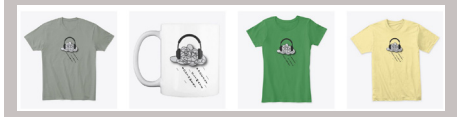
iTunes
https://apple.co/3kHh8bf

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

Jun 2022 Southwest Climate Podcast Are You Ready for the Monsoon?

In the June 2022 episode of the Southwest Climate Podcast, Mike Crimmins and Zack Guido apologize for the extended (and unintentional) break from podcasting, before diving into to a wide ranging "catch-up" episode that recaps winter and spring conditions, discusses regional hazards we see in spring into summer, and touches on the forecast and outlook for the summer...and the monsoon! They wrap with a discussion of the monsoon, whether this year could ever live up to last year and what led to last year's conditions, before addressing the excitement that a few outlooks have caused, and the early storms that have been building to the south. They also discuss the return of the Monsoon Fantasy Game and talk about how you can play and test your forecast skills against the "experts". Happy Monsoon!

Mar 2022 SW Climate Podcast: Cold(ish), Windy, and Dry - Winter Recap

In the Mar 2022 edition of the CLIMAS Southwest Climate Podcast, Mike Crimmins and Zack Guido dive into a recap of winter (so far) in the Southwest. First, recap winter to date, and put it in the context of a double-dip La Niña, including precipitation totals, temperature, and snowpack. Then they take a closer look at the phases of the PNA (Pacific/North American pattern) and how this links to ENSO/La Niña and the weather conditions this winter. Finally, they revisit temperature to consider just how "cold" it has actually been, and preview a closer look at fire outlooks, snowpack, and water supply in upcoming podcasts.
https://bit.ly/3IcHrBU

2021 CLIMAS Environment & Society Graduate Fellows Interviews

In this special episode, Gigi Owen sits down for one on one conversations with Moriah Bailey Stephenson, Simone Williams, and Lea Schram von Haupt (the 2021 CLIMAS E&S Grad Fellows) to chat with each of them about their reflections and perspectives and their fellowship experience. You can also find more information about their projects in blog posts at climas.arizona.edu/blog.
https://bit.ly/3Jk5IHw

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.

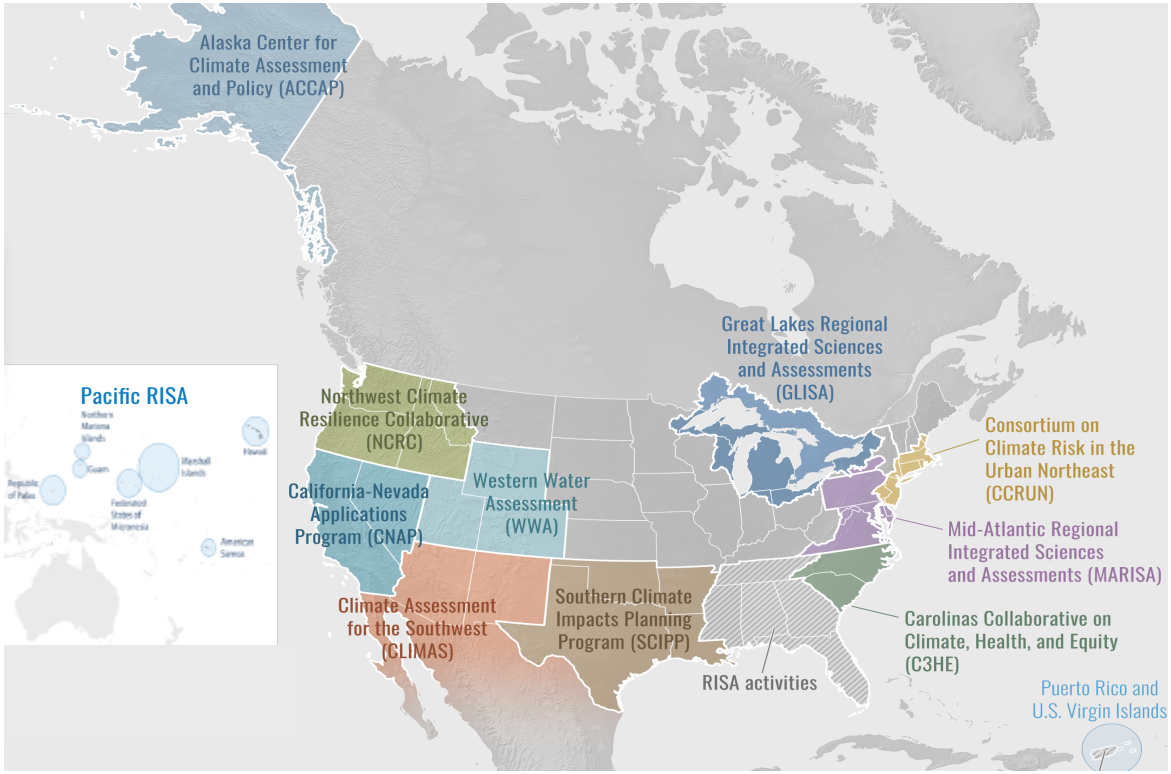


Figure 1: NOAA Regional Integrated Sciences and Assessments Regions