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# September 2022 Southwest Climate Outlook

**Monthly/Seasonal Precipitation and Temperature:** Aug precipitation was above average or much above average in most of Arizona and New Mexico (Fig. 1a). Aug temperatures were between below average and much above average in Arizona and New Mexico (Fig. 1b). Water year precipitation has rebounded considerably with the monsoon, and now ranges between below average and above average in most of Arizona and New Mexico (Fig. 2). Summer (JJA) precipitation rankings for the region demonstrate why, with widespread areas of either record wettest or much above average (Fig. 3).

**Drought:** The Sept 6 U.S. Drought Monitor (USDM) shows another month of widespread decreases in the severity of drought characterizations in 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. 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, although many showed modest improvement in August. 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 generally that La Niña is very likely to persist through fall and possibly into winter (see ENSO-tracker for details).

**Monsoon:** Monsoon precipitation to-date has been widespread across the region (Fig. 5). Early storms in June helped with an early start, and persistent recent activity has brought most of the 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). La Niña generally suppresses (but does not eliminate) eastern Pacific tropical storm activity, and TS Kay brought considerable moisture and storm activity to the Southwest in mid-September. If any additional surges in tropical moisture enhance late-season monsoon activity, this will further boost seasonal totals – otherwise, the atmospheric activity that drives ‘typical’ monsoon activity is in rapid decline.



## Tweet Sept 2022 SW Climate Outlook

SEP2022 @CLIMAS\_UA SW Climate Outlook, Seasonal Forecasts, ENSO Tracker, SW Monsoon, AZ & NM Reservoirs, [bit.ly/3QVJAq5](https://bit.ly/3QVJAq5) #SWclimate #AZWx #NMWx



## Online Resources

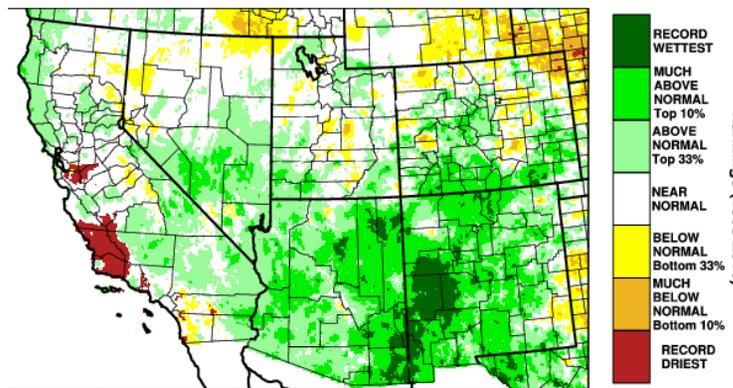
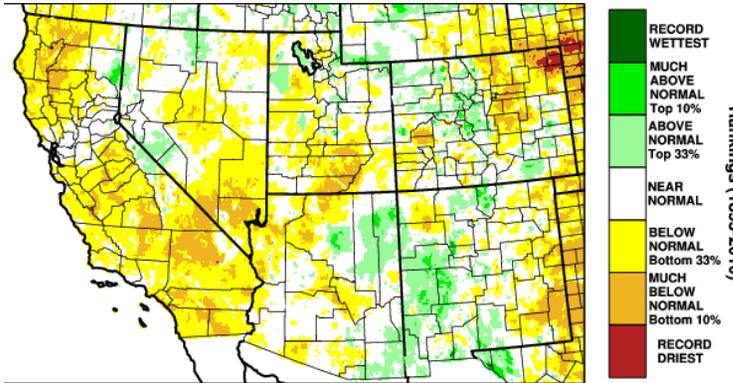
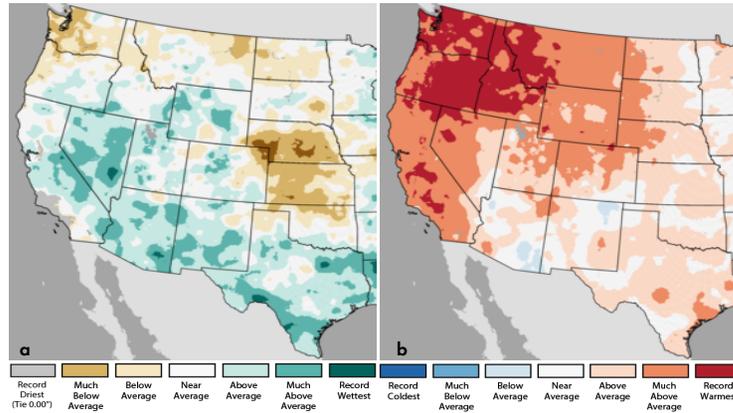
**Figure 1**  
National Centers for Environmental Information  
[ncdc.noaa.gov/sotc](https://ncdc.noaa.gov/sotc)

**Figures 2-3**  
West Wide Drought Tracker  
[wwdt.dri.edu](https://wwdt.dri.edu)

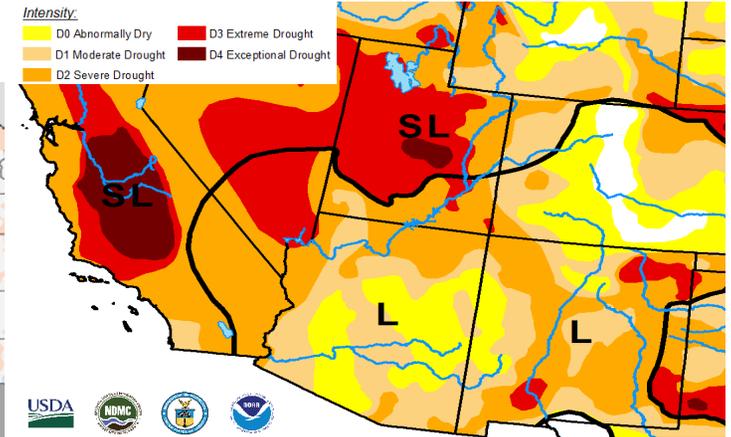
**Figure 4**  
U.S. Drought Monitor  
[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

**Figures 5-6**  
Climate Science Applications Program/CLIMAS  
[cals.arizona.edu/climate](https://cals.arizona.edu/climate)  
data: PRISM

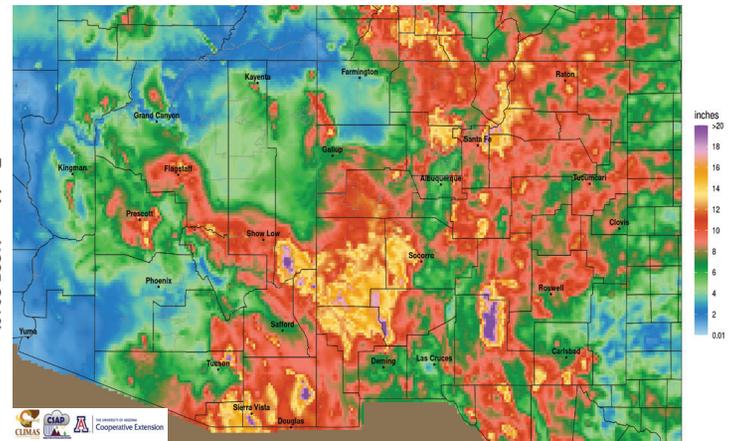
# September 2022 - Climate Summary



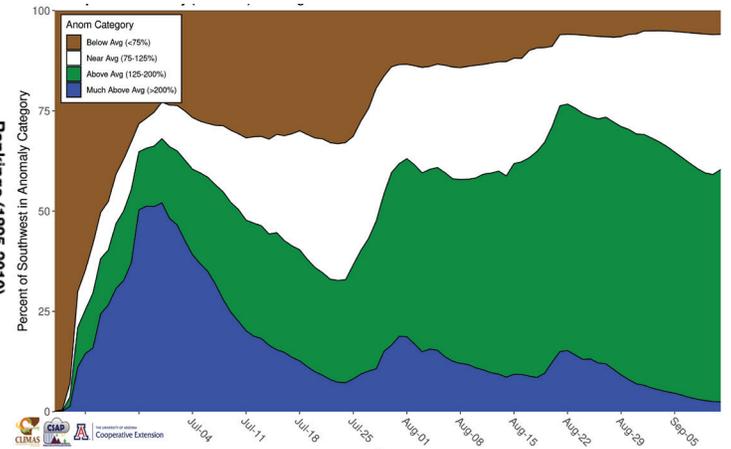
**Figure 3: Summer (JJA: Jun 2021 - Aug 2022) Precip Rankings**



**Figure 4: US Drought Monitor - Sept 6, 2022**



**Figure 5: Monsoon Total Precipitation (Jun 15 - Sept 11, 2022)**



**Figure 6: Precipitation Anomaly (% of Ave) Coverage - Jun 15 - Sept 11, 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

# September 2022 - Seasonal Forecasts

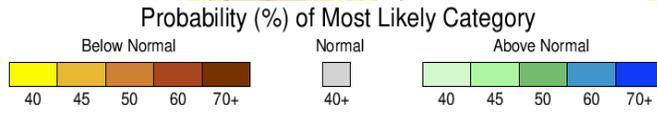
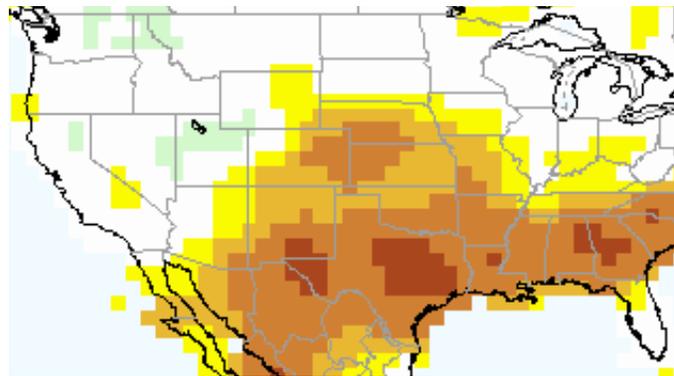


Figure 7A: Three-Month (Oct-Dec) Forecast for Precipitation

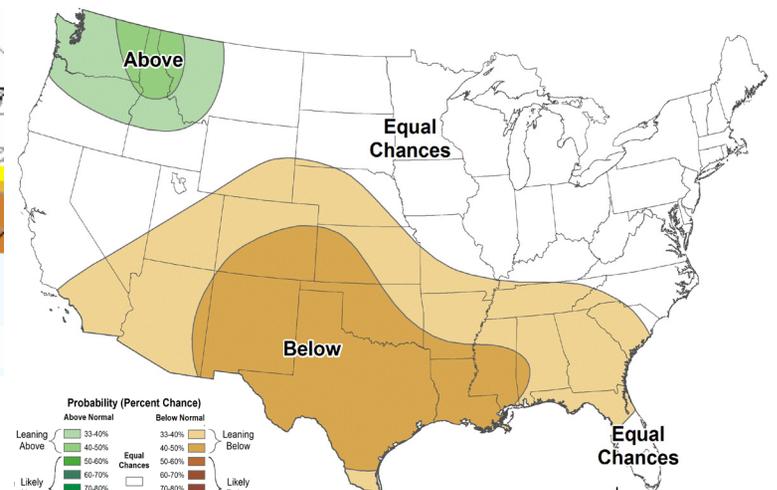


Figure 8A: CPC Three-Month (Oct-Dec) Precipitation Forecast

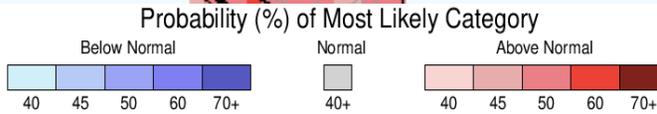
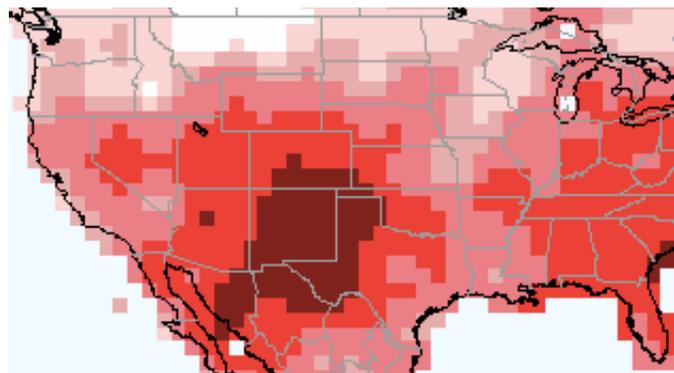


Figure 7B: Three-Month (Oct-Dec) Forecast for Temperature

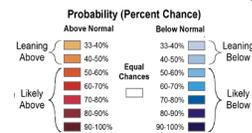
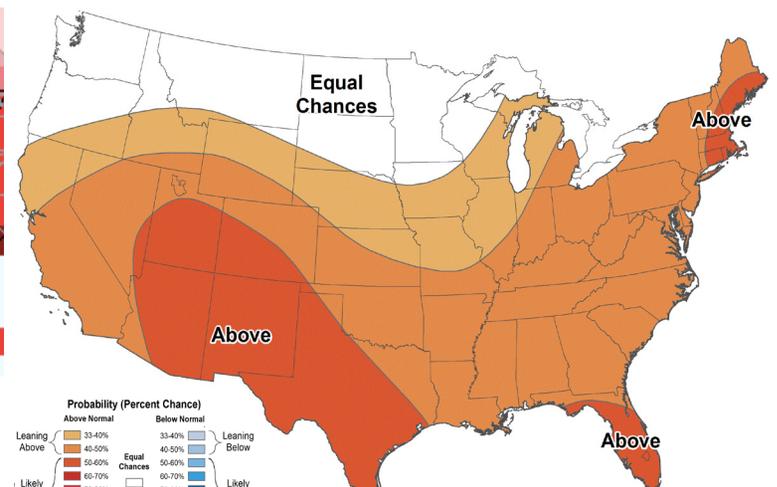


Figure 8B: CPC Three-Month (Oct-Dec) Temperature Forecast

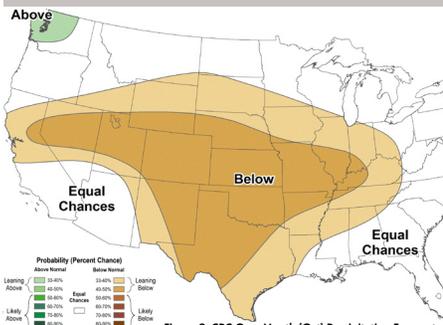


Figure 9: CPC One-Month (Oct) Precipitation Forecast

**Precipitation Forecasts:** The IRI outlook for Oct-Nov calls for increased chances of below average precipitation in most of New Mexico and Arizona (Fig. 7a). The NOAA-CPC outlook for Oct-Dec calls for increased chances of below average precipitation in New Mexico and Arizona (Fig. 8a). The Oct outlook calls for increased chances of below average precipitation in New Mexico and the upper Colorado River (Fig. 9).

**Temperature Forecasts:** The IRI outlook for Oct-Nov calls for increased chances of above average temperatures across the Southwest (Fig. 7b). The NOAA-CPC outlook for Oct-Dec 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](http://bom.gov.au/climate/enso)

### Figure 2

NOAA - Climate Prediction Center  
[cpc.ncep.noaa.gov](http://cpc.ncep.noaa.gov)

### Figure 3

International Research Institute for  
 Climate and Society  
[iri.columbia.edu](http://iri.columbia.edu)

### Figure 4

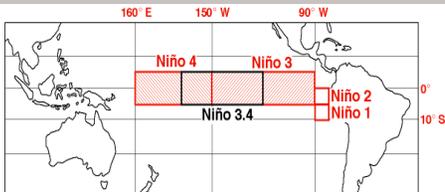
NOAA - Climate Prediction Center  
[cpc.ncep.noaa.gov](http://cpc.ncep.noaa.gov)

## 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/](http://aoml.noaa.gov/)

# ENSO Tracker

Sea surface temperature (SST) forecasts for Sept – Nov 2022 continue to 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 fall and possibly through winter.

**Forecast Roundup:** On Sept 8 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 91-percent chance of La Niña through fall, and a 54-percent chance of La Niña in winter into spring. On Sept 8, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting below “oceanic and atmospheric variables have remained consistent with La Niña, strengthening slightly”. On Sept 9 the Japanese Meteorological Agency (JMA) observed ongoing La Niña conditions that had a 70-percent chance of continuing into winter. On Sept 13 the Australian Bureau of Meteorology raised their ENSO outlook to a La Niña event, noting “Key atmospheric and oceanic indicators of the El Niño–Southern Oscillation (ENSO) show an established La Niña.” 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 appears to be here, with the new question of how long it will last this fall and winter. If La Niña conditions persist through winter, the Southwest can anticipate seasonal outlooks that call for below average winter precipitation, especially if this turns out to be a moderate instead of a weak La Niña event.

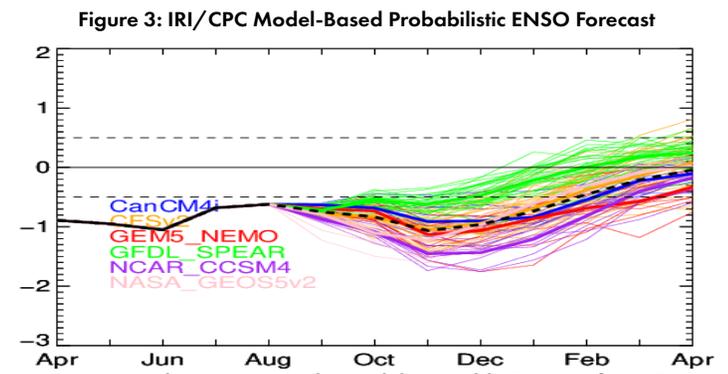
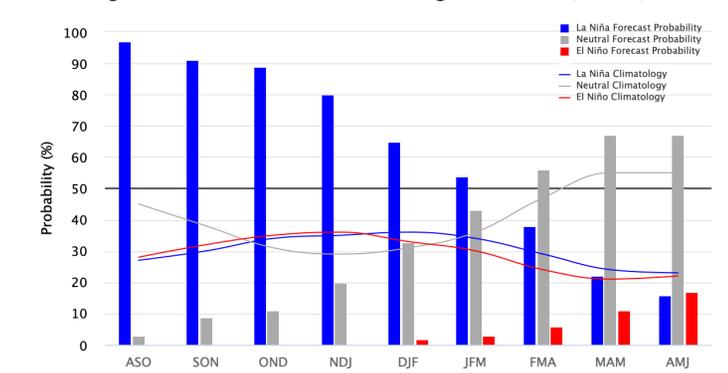
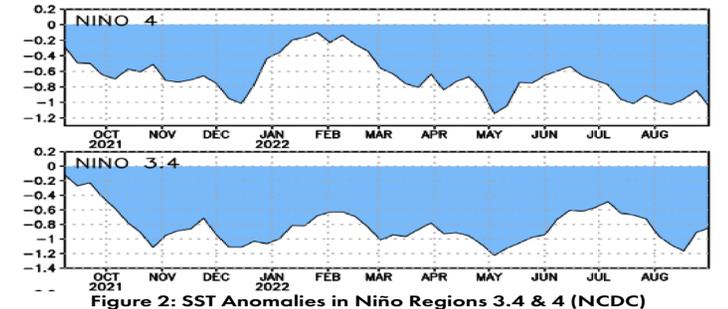
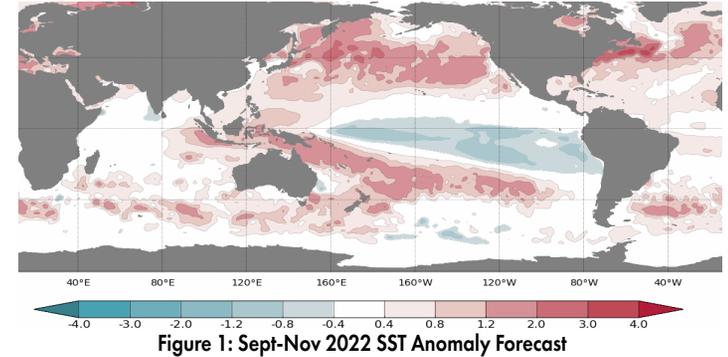


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

## 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

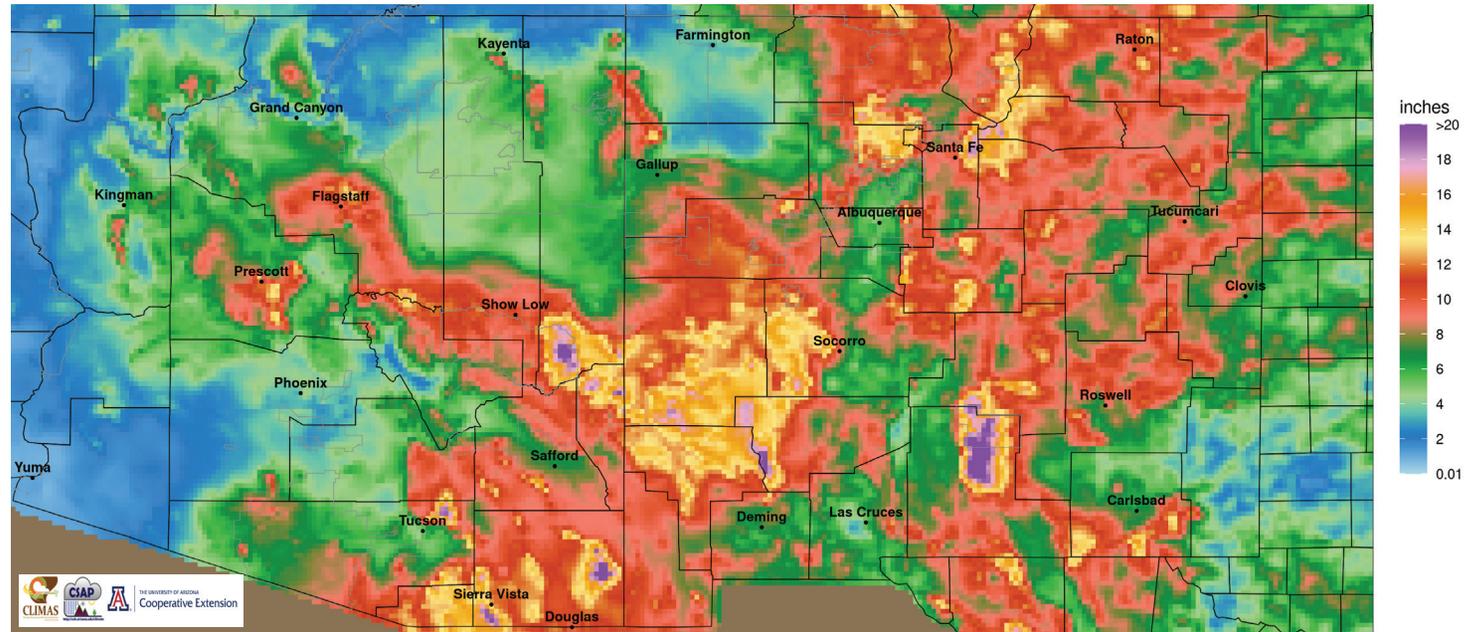


Figure 1: Monsoon Total Precipitation (Jun 15 - Sept 11, 2022)

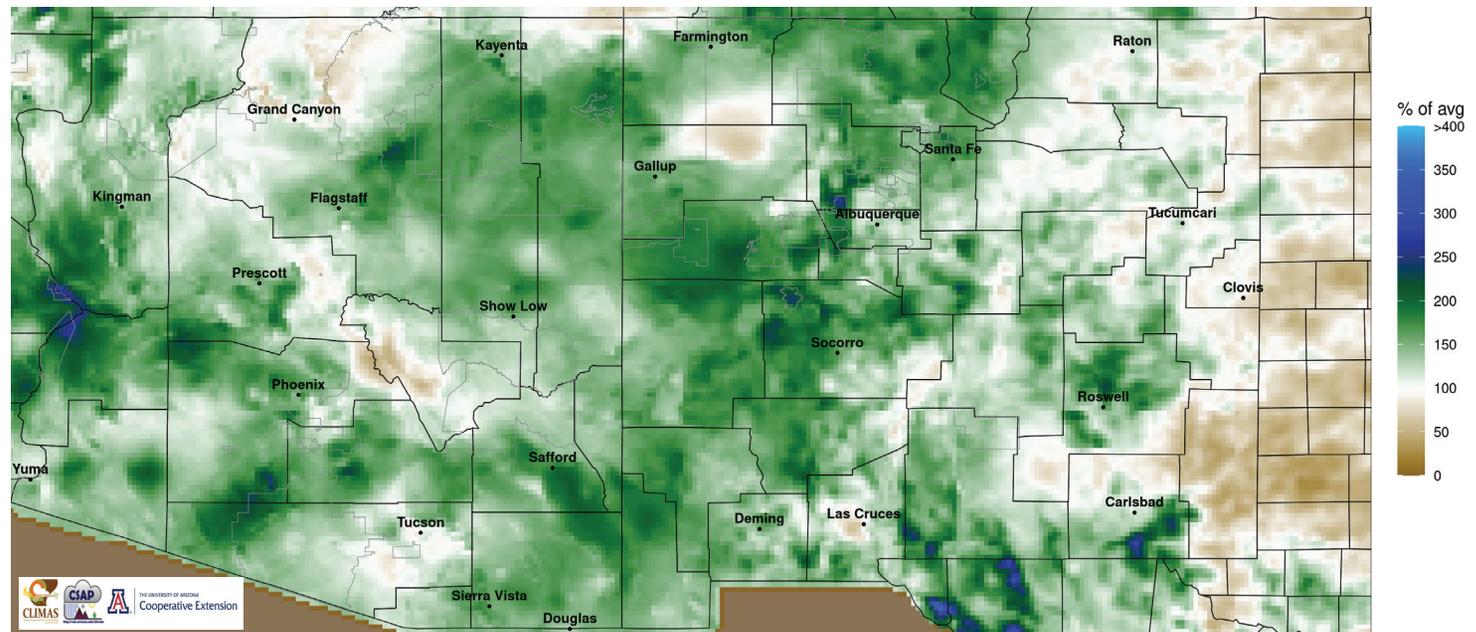


Figure 2: Percent of Average Precipitation (Jun 15 - Sept 11, 2022)

## Online Resources

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Climate Science Applications Program/CLIMAS  
cals.arizona.edu/climate  
data: PRISM

## Monsoon Resources

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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

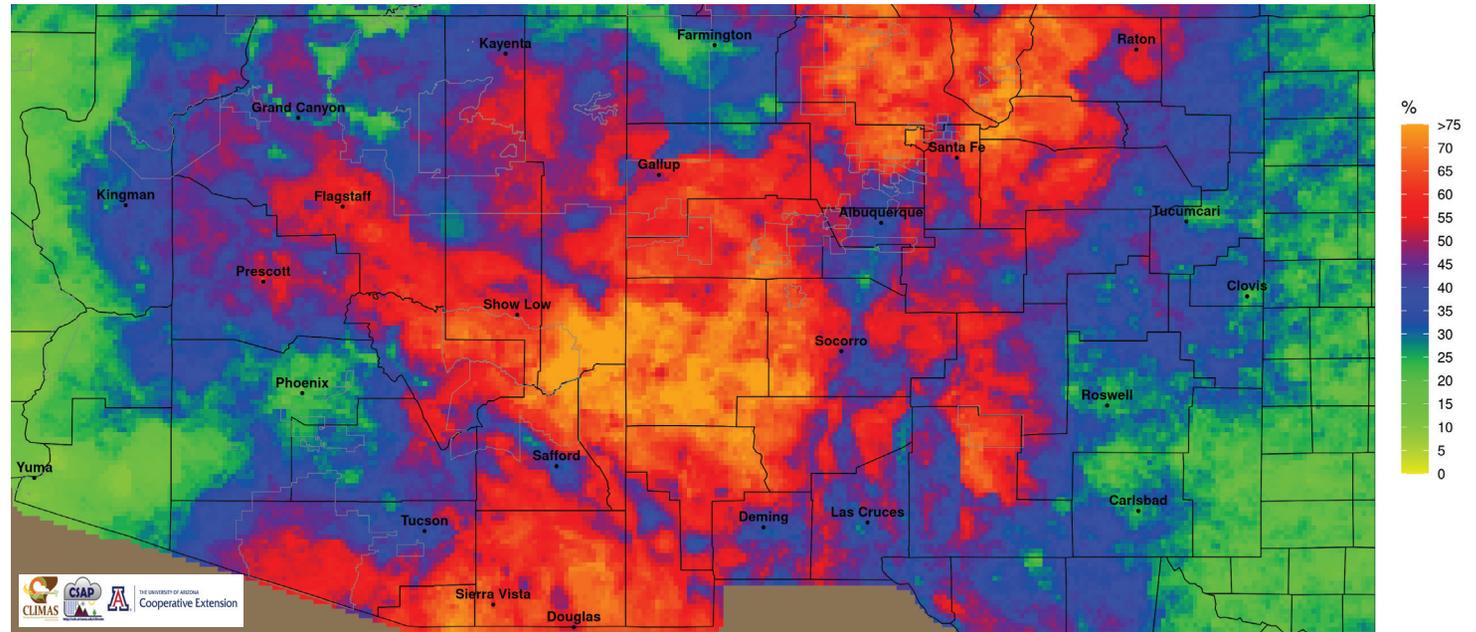


Figure 3: Percent of Days With Rain (>0.01 in) (Jun 15 - Sept 11, 2022)

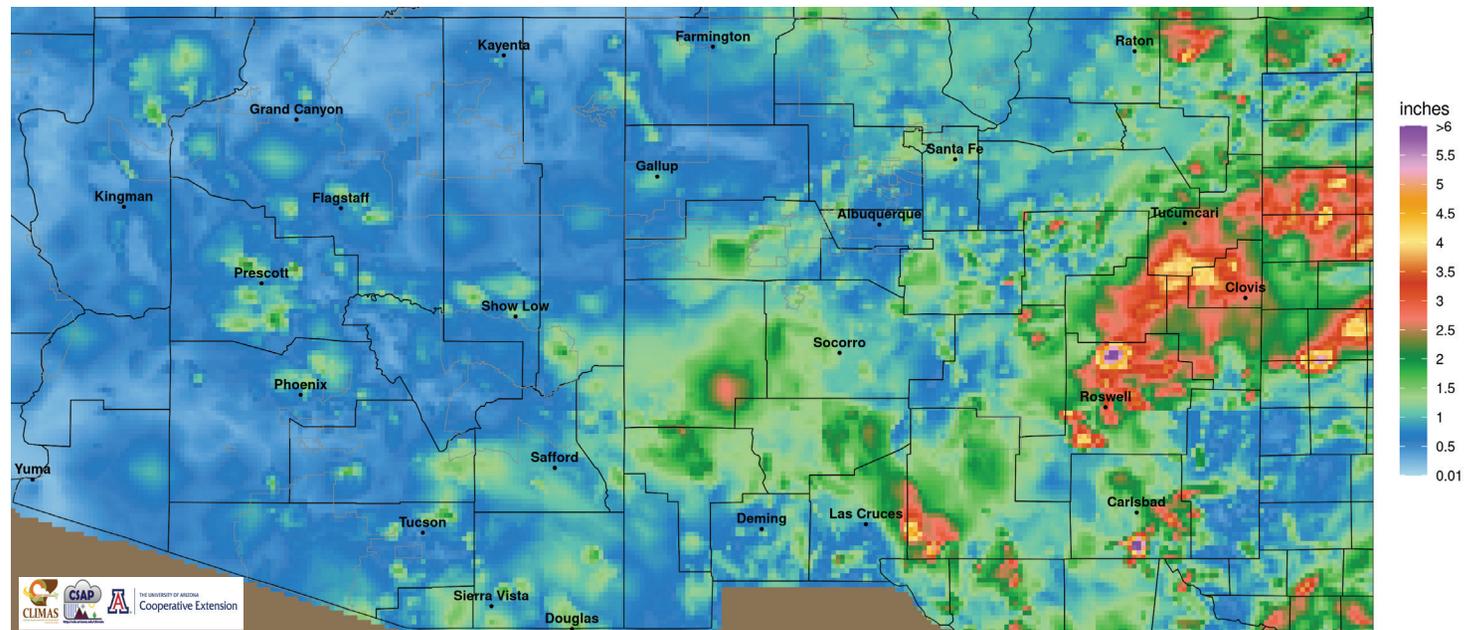


Figure 4: Max 1-Day Precipitation (Jun 15 - Sept 11, 2022)

## 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](http://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).

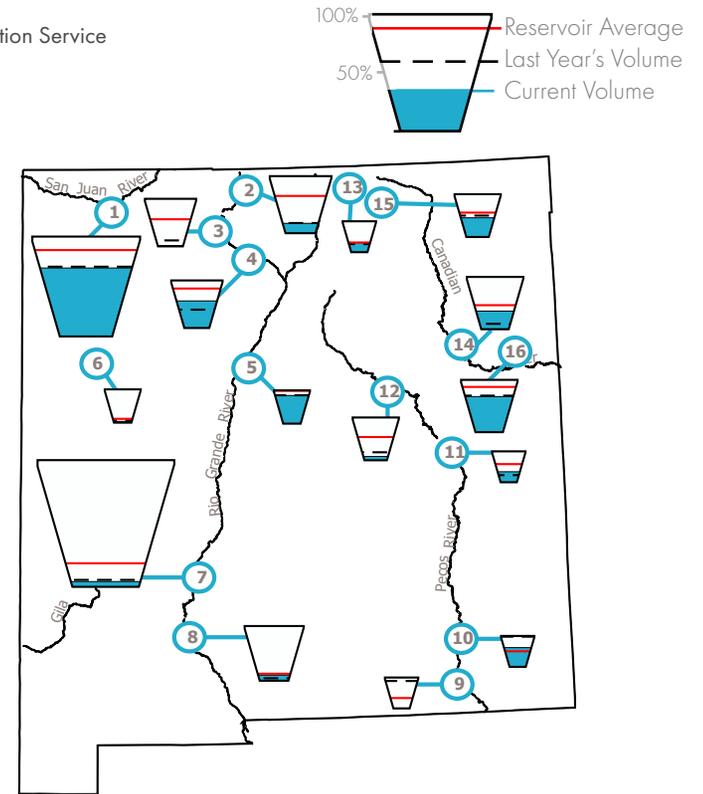
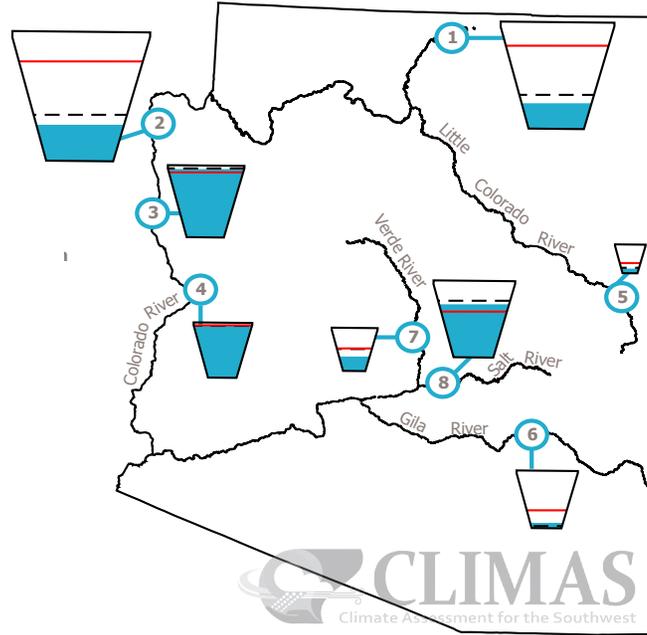
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). 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 SEPT 1, 2022

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



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

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	24%	5,938	24,322	-274
2. Lake Mead	28%	7,275	26,159	+234
3. Lake Mohave	94%	1,698	1,810	-31
4. Lake Havasu	95%	586	619	-13
5. Lyman	15%	4.5	30	+1.6
6. San Carlos	9%	78.5	875	+78.2
7. Verde River System	33%	95.0	287	+9.5
8. Salt River System	69%	1,407	2,026	+36.2

\*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	53%	902.1	1,696.0	-13.6
2. Heron	17%	67.4	400.0	-4.3
3. El Vado	0%	0.2	190.3	-0.5
4. Abiquiu	56%	105.5	186.8	+7.8
5. Cochiti	83%	41.4	50.0	**
6. Bluewater	3%	1.3	38.5	-0.1
7. Elephant Butte	4%	95.0	2,195.0	+12.3
8. Caballo	10%	33.7	332.0	+14.9
9. Lake Avalon	**	**	4.5	**
10. Brantley	60%	25.5	42.2	+13.2
11. Sumner	33%	12.0	35.9	+8.0
12. Santa Rosa	9%	9.6	105.9	**
13. Costilla	30%	4.8	16.0	+1.8
14. Conchas	34%	85.7	254.2	**
15. Eagle Nest	44%	34.4	79.0	**
16. Ute Reservoir	67%	133	200	-1.0

## Southwest Climate Podcast

[climas.arizona.edu/media/podcasts](https://climas.arizona.edu/media/podcasts)

### iTunes

<https://apple.co/3kHh8bf>

### Spotify

<https://spoti.fi/3zZlvWu>

### 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/](https://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



### 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.

### Jul 2022 Southwest Climate Podcast Is this a Good or Bad Monsoon?

In this episode of The Southwest Climate Podcast, Mike Crimmins and Zack Guido sit down to talk through the last month of monsoon activity, how the monsoon is performing around the region (and at their houses). They follow up with some discussions of MCV/MCS dynamics based on a listener question and try to make the case whether this is a good monsoon or a bad monsoon. Finally, they dive back into the monsoon fantasy game to see how the first month looks with a few days to go.

### Last Call for Southwest Climate Podcast Survey

We'd like to learn more about who is listening, why they listen, and what we could do to improve.

5 min anonymous survey at <http://tinyurl.com/swclimatepod>

Even if you don't listen, you can still weigh in on topics/improvements

## Online Resources

### Figure 1 Climate Program Office

[cpo.noaa.gov](http://cpo.noaa.gov)

### RISA Program Homepage

[cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/RISA](http://cpo.noaa.gov/Meet-the-Divisions/Climate-and-Societal-Interactions/RISA)

### New Mexico Climate Center

[weather.nmsu.edu](http://weather.nmsu.edu)

## CLIMAS Research & Activities

### CLIMAS Research

[climas.arizona.edu/research](http://climas.arizona.edu/research)

### CLIMAS Outreach

[climas.arizona.edu/outreach](http://climas.arizona.edu/outreach)

### Climate Services

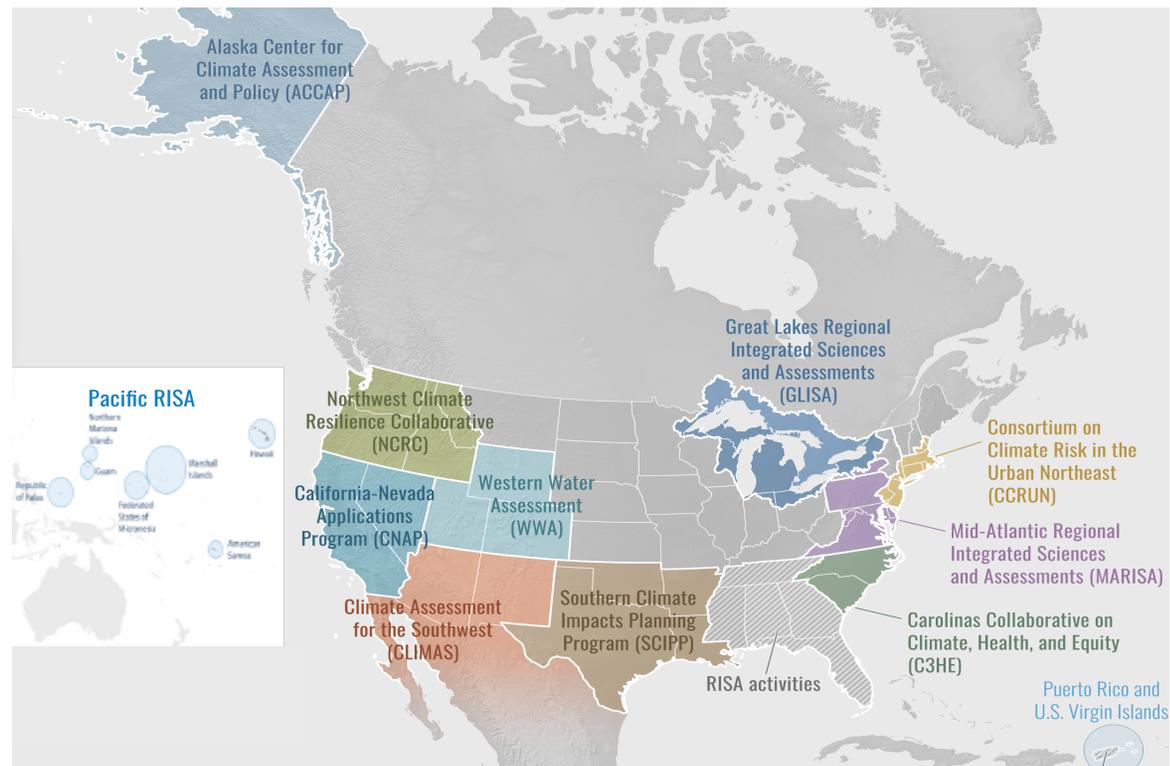
[climas.arizona.edu/climate-services](http://climas.arizona.edu/climate-services)



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**