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April Southwest Climate Outlook

Monthly Precipitation and Temperature: March precipitation ranged between average and record wettest in Arizona and between below average and record wettest in New Mexico (Fig. 1a). March temperatures were average to much above average in Arizona and above average to much above average in New Mexico (Fig. 1b). The daily average temperature anomalies for Mar 1 – Apr 14 (Fig. 2) highlight the fluctuations at select stations around the region.

Seasonal Precipitation and Temperature: Jan-Mar precipitation ranged between below average and much above average across Arizona and New Mexico, with large areas of below average conditions in northern California, central Nevada, and southern Colorado (Fig. 3a). Jan-Mar temperatures were average to much above average across most of the western U.S. (Fig. 3b). **Water Year Precipitation:** Water year precipitation to date (since Oct 1, 2019) has been normal to much above normal for much of Arizona and New Mexico (Fig. 4), while southeastern New Mexico recorded record wettest conditions, and northern New Mexico was below normal.

Snowpack & Water Supply: As of Apr 13, snow water equivalent (SWE) was mostly below median in New Mexico, eastern Arizona, and southern Colorado, while southern Utah and northern Arizona were more consistently above median (Fig 5). 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 reservoir storage on p. 5).

Drought: The Apr 7 U.S. Drought Monitor (USDM) maintains drought characterizations similar to last month in the Four Corners region, while expanding drought in central and southeastern New Mexico (Fig. 6). "Moderate Drought" (D1) and "Severe Drought" (D2) characterizations are centered on the Four Corners region, reflecting localized acute and accumulated precipitation deficits.

ENSO Tracker: Oceanic and atmospheric conditions are generally consistent with an ENSO-neutral outlook for 2020, although some forecasts hint at a possible La Niña event later this year (see ENSO-tracker on p. 3 for details).

Precipitation and Temperature Forecast: The three-month outlook for May through July calls for slightly increased chances of below-normal precipitation in areas of western Arizona and northern Mexico. The outlook calls for slightly increased chances of above-normal precipitation in central New Mexico and much of Utah and Colorado (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 Apr 2020 SW Climate Outlook

CLICK TO TWEET

APR2020 @CLIMAS_UA SW Climate Outlook, ENSO Tracker, AZ & NM Reservoirs, SWE, Webinar on Agriculture, Air Quality, & Climate, plus E&S Graduate Fellows - https://bit.ly/34HPJzF #SWclimate

April 2020 SW Climate Outlook

Online Resources

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

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

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

Figure 5
Natural Resources Conservation Service
nrcs.usda.gov

Figure 6
U.S. Drought Monitor
droughtmonitor.unl.edu

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

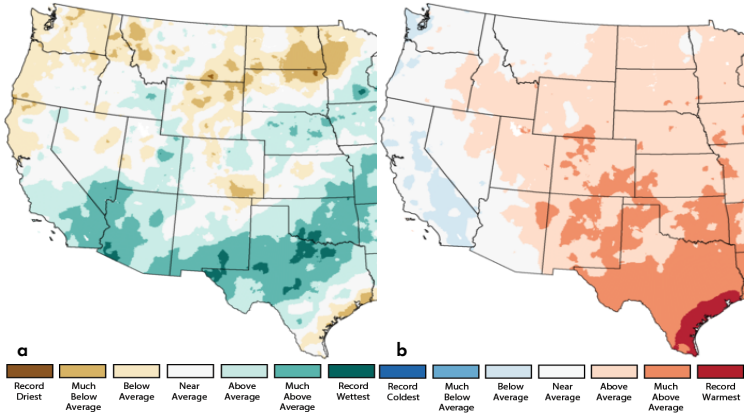


Figure 1: Mar 2020 Precipitation (a) & Temperature Ranks (b)

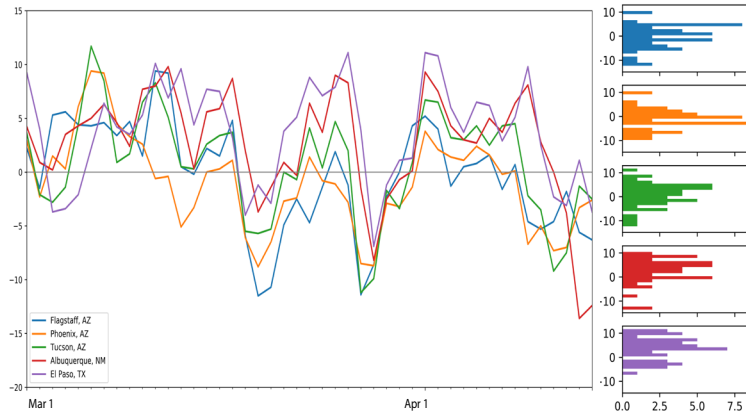


Figure 2: Daily Temperature Anomalies Mar 1 - Apr 14 (L) & Frequency of Anomalies (R)

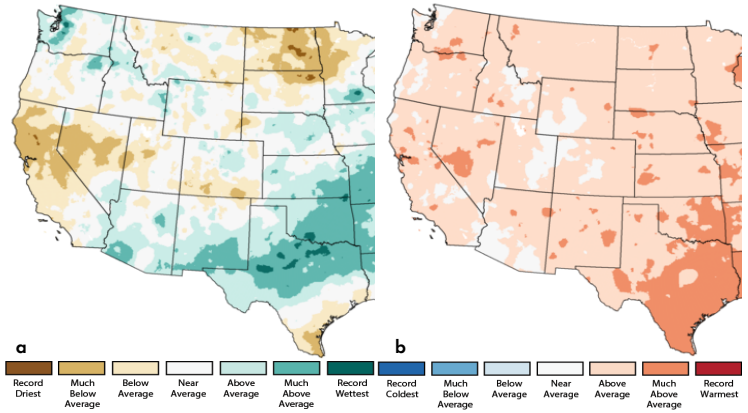


Figure 3: Jan - Mar 2020 Precipitation (a) & Temperature Ranks (b)

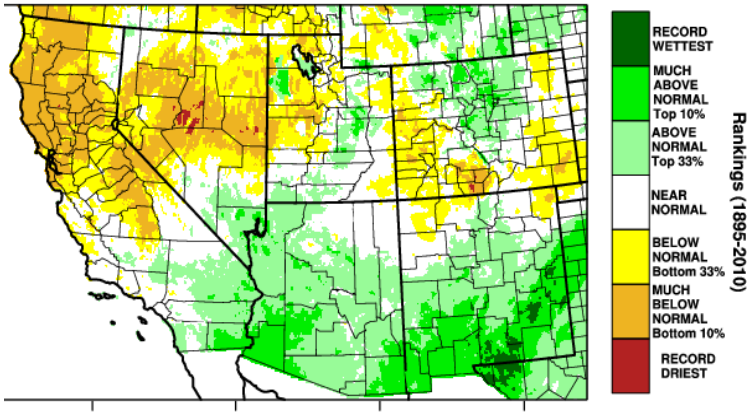


Figure 4: Oct 2019 - Mar 2020 - Water Year Precipitation Rankings

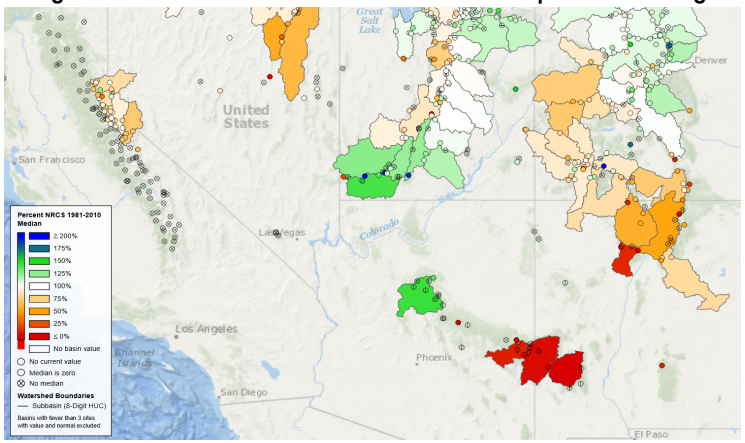


Figure 5: Apr 13 Snow Water Equivalent (Pct. 1981-2010 Median)

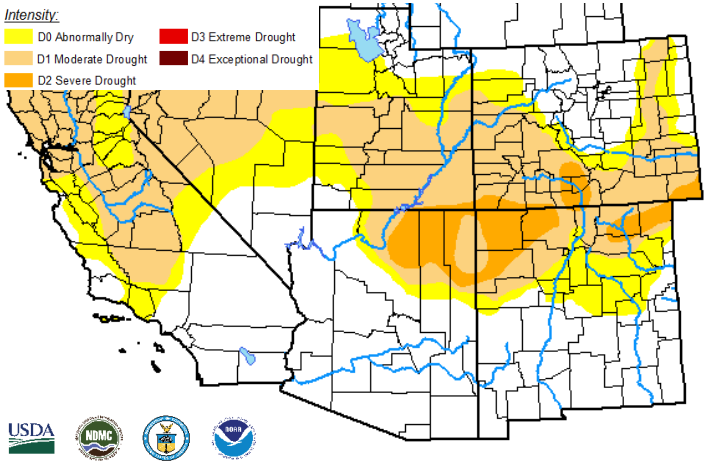


Figure 6: US Drought Monitor - Apr 7, 2020

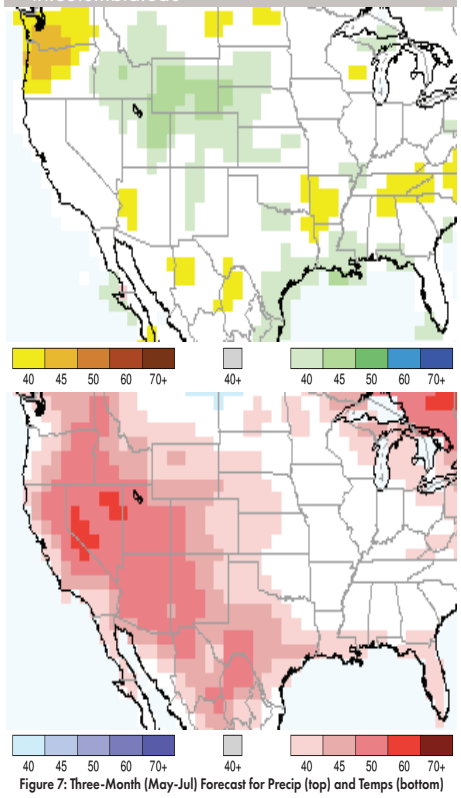


Figure 7: Three-Month (May-Jul) Forecast for Precip (top) and Temps (bottom)

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

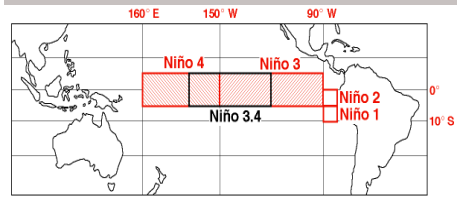
Figure 4
NOAA - Climate Prediction Center
cpc.ncep.noaa.gov

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

There are positive sea surface temperature (SST) anomalies across the equatorial Pacific (Figs. 1-2). Forecasts expect conditions will stay within the range of ENSO-neutral through at least summer 2020, with hints at a possible La Niña later in 2020.

Forecast Roundup: On Apr 9, the NOAA Climate Prediction Center (CPC) issued its ENSO diagnostic discussion with an inactive alert status. The CPC called for a 60-percent chance of ENSO-neutral through summer 2020 and remains the most likely outcome through fall 2020. On Apr 9, the International Research Institute (IRI) issued an ENSO Quick Look (Fig. 3), noting "SSTs...near the borderline of El Niño during early April," but no corresponding atmospheric conditions. They highlight that most models remain warm through spring with cooling over summer and also call for ENSO-neutral conditions through fall 2020. On Apr 10, the Japanese Meteorological Agency (JMA) maintained its call for a 60-percent chance of ENSO-neutral conditions to last until summer 2020. On Apr 14, the Australian Bureau of Meteorology maintained their ENSO outlook at an inactive status but did highlight that a few models were beginning to suggest the possibility of a La Niña. The Feb 2020 North American Multi-Model Ensemble (NMME) remains borderline El Niño but shows steady movement into ENSO-neutral territory through the summer, and approaching La Niña conditions later in 2020 (see dashed black line, Fig. 4).

Summary: SST anomalies hovered at the El Niño border for months. To be considered an El Niño event, the three-month SST average would need to stay above the El Niño threshold for five consecutive months, and the atmosphere would need to cooperate (i.e. 'oceanic-atmospheric coupling'), neither of which has happened. ENSO-neutral conditions are forecast to last through summer and into fall, with recognition of the challenges associated with the spring predictability barrier (i.e., the difficulty of accurate forecasts made this time of year). In the Southwest, ENSO-neutral winters produce some of the wettest and driest winters (and everything in between). This winter has been particularly wet across parts of the Southwest, especially when averaged across longer timescales (such as seasonal or water-year; for details see pp 1-2 of this outlook, and the Mar 2020 SW Climate Outlook). The next few months are typically dry in much of the arid Southwest, so any precipitation will be welcome (but not necessarily expected). We look to the onset of the monsoon for the next period of regular precipitation activity.

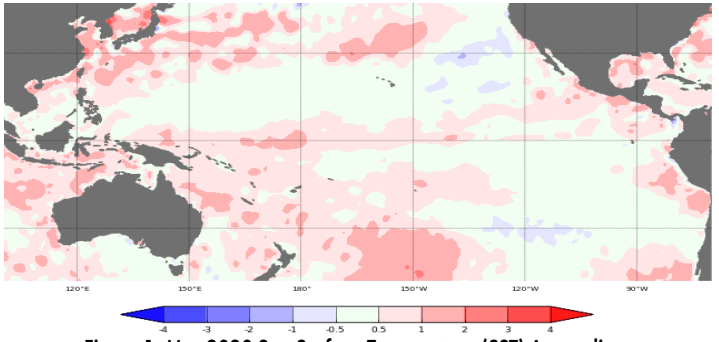


Figure 1: Mar 2020 Sea Surface Temperature (SST) Anomalies

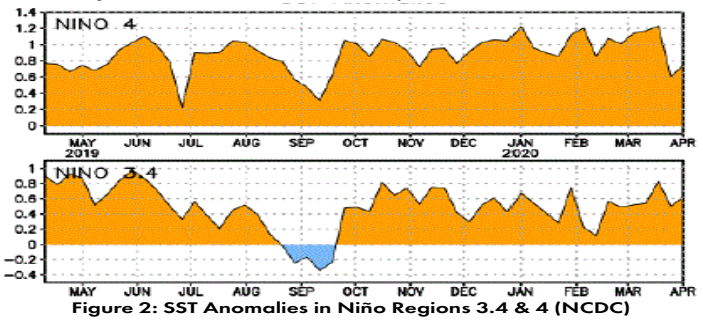


Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

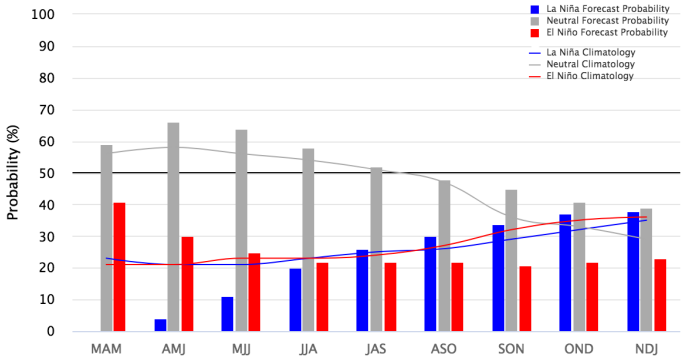


Figure 3: Early-Apr IRI/CPC Model-Based Probabilistic ENSO Forecast

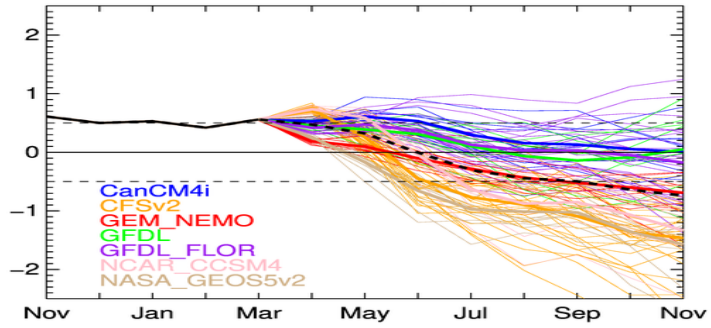


Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

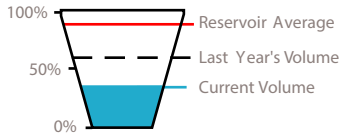
Online Resources

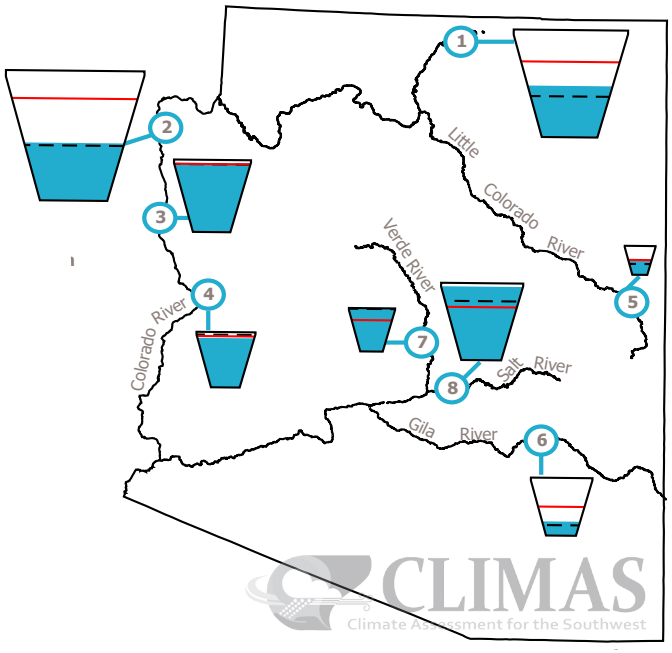
Portions of the information provided in this figure is available at the Natural Resources Conservation Service
www.wcc.nrcs.usda.gov/BOR/basin.html

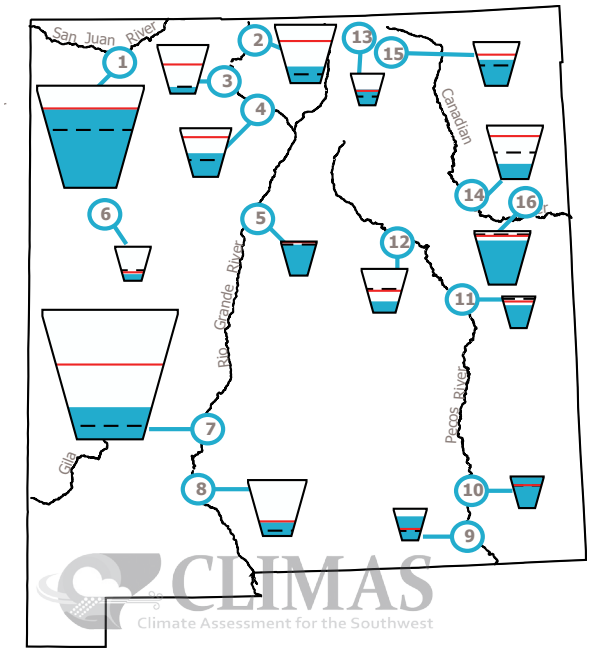
Contact Ben McMahan with questions/comments.

Reservoir Volumes

DATA THROUGH APR 1, 2020
Data Source: National Water and Climate Center, Natural Resources Conservation Service







* in KAF = thousands of acre-feet

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	49%	11,817.9	24,322.0	-179.0
2. Lake Mead	44%	11,602.0	26,159.0	188.0
3. Lake Mohave	94%	1,708.0	1,810.0	33.0
4. Lake Havasu	88%	545.9	619.0	-38.7
5. Lyman	50%	15.1	30.0	6.3
6. San Carlos	23%	199.7	875.0	80.8
7. Verde River System	100%	286.6	287.4	101.7
8. Salt River System	96%	1,952.2	2,025.8	268.7

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	76%	1292.5	1,696.0	-2.3
2. Heron	27%	108.4	400.0	3.7
3. El Vado	14%	27.0	190.3	-0.9
4. Abiquiu	48%	89.9	186.8	3.4
5. Cochiti	90%	45.2	50.0	-1.0
6. Bluewater	19%	7.2	38.5	0.6
7. Elephant Butte	25%	552.9	2,195.0	-56.6
8. Caballo	24%	78.8	332.0	42.4
9. Lake Avalon	76%	3.4	4.5	-0.2
10. Brantley	97%	41.1	42.2	-0.9
11. Sumner	72%	25.7	35.9	-0.9
12. Santa Rosa	26%	27.8	105.9	1.7
13. Costilla	48%	7.6	16.0	0.9
14. Conchas	28%	72.1	254.2	-1.5
15. Eagle Nest	60%	47.4	79.0	1.5
16. Ute Reservoir	82%	164	200	8.0

Online Resources

Figure 1
University of Arizona - SnowView
climate.arizona.edu/snowview/

Snow Water Equivalent - Details Across the Southwest

Researchers at the University of Arizona developed a data visualization tool for snow cover and snow water equivalent (Fig. 1). This website helps demonstrate the variability of snowpack and snow water equivalent (SWE) across the Southwest, at finer scales compared to basin and sub-basin estimates, and with greater spatial coverage than single SNOTEL station measurements. The image below from Apr 13, 2020 highlights the range of SWE anomaly values (deviations from normal) in the Southwest, including the relatively stark difference between southern Utah and northern New Mexico and southern Colorado.

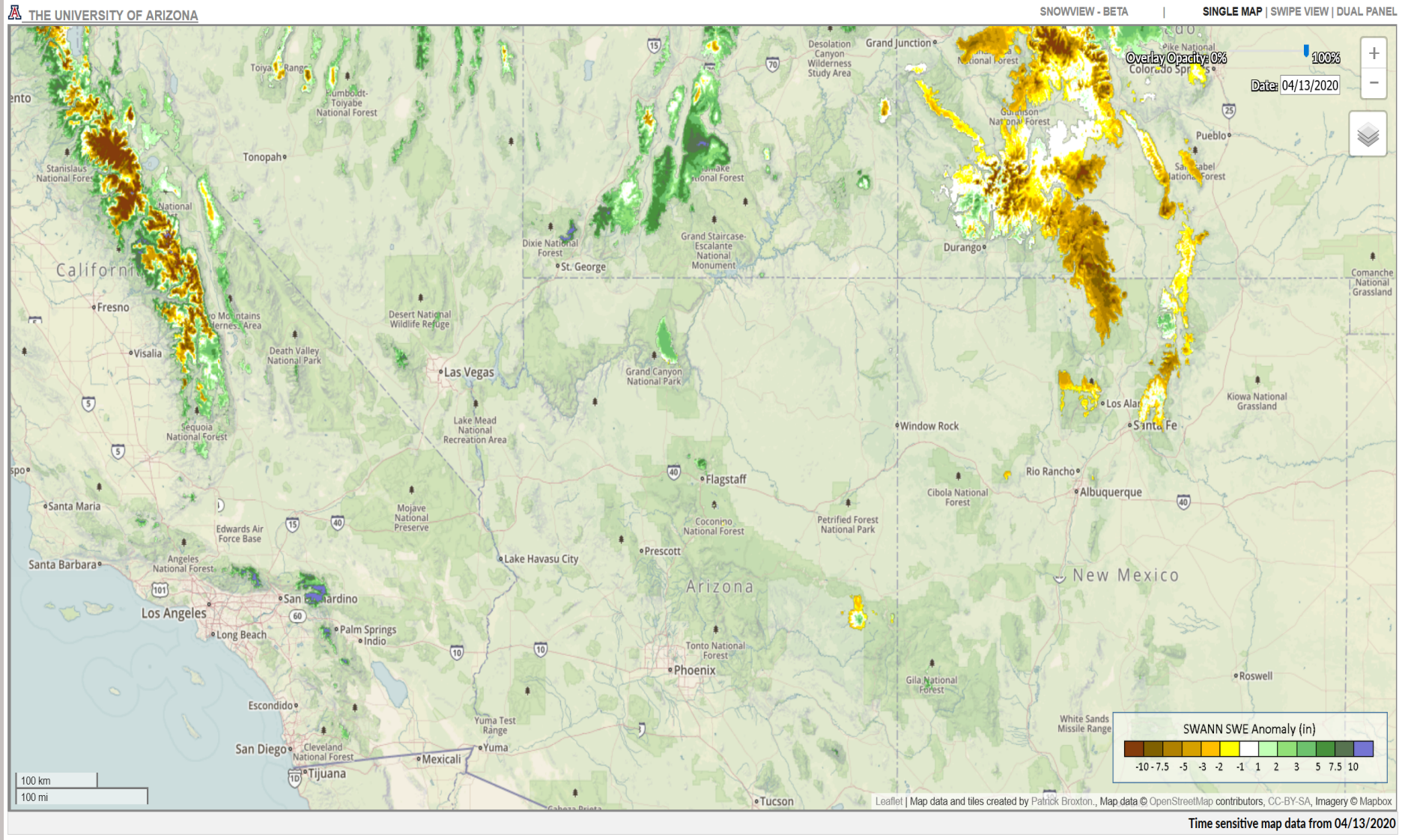


Figure 1: Snow Water Equivalent (SWE) Percent of Median - Source: UArizona SnowView Data Viewer (climate.arizona.edu/snowview)

Webinar

Co-Sponsored with the USDA Southwest Climate Hub and CLIMAS

May 18, 2020 - 2:00 pm (MDT), 1:00 pm (Arizona - PDT)

Register here:

arizona.zoom.us/webinar/register/WN_yx6qfQgYT1Kylw6TN0HNmQ

Event details:

climas.arizona.edu/event/regional-linkages-production-agriculture-air-quality-climate

UNDERSTANDING REGIONAL LINKAGES BETWEEN PRODUCTION, AGRICULTURE, AIR QUALITY, AND CLIMATE.

DR. DAVID DUBOIS
NEW MEXICO STATE CLIMATOLOGIST

The USDA Southwest Climate Hub and CLIMAS are partnering to provide a webinar highlighting the intersection of production agriculture, air quality and climate. As global demand for agricultural products continues to increase, agricultural systems will need to become more productive, while also adapting to a changing climate. Environmental impacts to food safety, security and production in the coming decades are critically important. While it is known that agricultural production systems are impacted by air quality and that air quality is impacted by production systems, these systematic relationships often remain ill-defined. Research and management topics requiring further exploration include agriculture and dust related hazards, herbicide and pesticide drift issues, and other air-quality related production impacts. In this webinar, Dr. Dave DuBois, New Mexico State Climatologist, will present the results of a national air quality and production agriculture synthesis focused on expected impacts in a changing climate. Dr. DuBois will synthesize and present the current state of knowledge regarding air quality impacts on production agriculture, and vice-versa, within the context of weather conditions and a changing climate. This national synthesis as part of a larger project of the USDA Climate Hub Network, the Agricultural Research Service and the Natural Resources Conservation Service to identify, elucidate, and respond to critical questions about agricultural production and air quality, which are strongly linked to United States food security, public safety, and health. For more information, please contact Skye Aney at sierra25@nmsu.edu (Southwest Climate Hub) or Ben McMahan (CLIMAS)

Webinar Only
May 18th 2020
2:00 pm MDT

JOIN THE ZOOM MEETING!
HTTPS://ARIZONA.ZOOM.US/WEBINAR/REGISTER/WN_YX6QFQGYT1KYLW6TNOHNMQ

USDA Southwest Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

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Climate Assessment for the Southwest
A NOAA RISA TEAM

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Environment & Society Graduate Fellows

The Environment & Society Fellowship was created in 2013 as a funding opportunity for graduate students to practice use-inspired research and science communication.

The Fellowship supports projects that connect social or physical sciences, the environment, and decision-making.

climas.arizona.edu/education/fellowship-program

The 2020 CLIMAS E&S fellows have written an introductory blog post that tells part of their story - how and why they landed where they did.

These excerpts are the introductions to their longer posts, which will be posted on the CLIMAS blog:

climas.arizona.edu/blog

Emily Cooksey - The World is My Oyster

Over the past eight years, I have lived in five different states as I have been pursuing my dream of becoming an environmental microbiology and water quality research scientist.

As a native Floridian, I ventured to Michigan during my undergraduate degree and became interested in molecular genetics research. I focused on confocal microscopy analysis of tau protein in fruit flies to better understand potential drivers of Alzheimer's disease and was a collegiate soccer player. After I graduated, I moved to rural Colorado to serve a term with AmeriCorps and work in a county public health office as a tobacco specialist. I provided math and literacy intervention to students in grades K-12 and ran an after-school program. While working in the county public health office, I was influential in changing the tobacco policy in the school district. I realized the importance of public health and headed to Louisiana for my MSPH. It was during my time at Tulane University that I was introduced to microbial water quality and food safety.

JoRee LaFrance - Responsibility of an Apsáalookbia (Crow Woman) to the protection of Apsáalooke bilé (Crow Water)

I was raised by an Apsáalooke/Crow matriarch who also came from strong, independent Apsáalookbia/Crow women. Apsáalooke people are a matrilineal and, traditionally, an egalitarian society. It is innately known that we have three mothers: the earth, our homes, and our birth mothers. We are taught that we must respect all three mothers and do what we must so that they stay protected. Our mothers are our first teachers and have taught us much of what we know as Apsáalooke people. We were taught the stories of Hisshiishduwiia/Red Woman, the Chíilapsahpua/Seven Sacred Big Horn Rams, rock medicine, and old man coyote stories. In particular, it was the stories of Hisshiishduwiia/Red Woman and the seven sacred rams that struck a distinct chord with me. Both of these stories remind me of the inherent responsibility I have to protect all that has provided. I know that I only play a small role in protecting but I hope that role has a much larger impact than I can imagine.

Kunal Palawat - What feeds you? An exploration of resilience, sense of place, and food

This question has followed me around my entire life. Who and what contributes to my healing, development, growth? Literally, physically, romantically, academically, environmentally; what gives me strength? Growing up Jain, I was taught critical appreciation and curiosity about the natural world through the lenses of food and non-human connection. I also grew up in an affluent New Jersey suburb where I had easy access to hiking trails, farmer's markets, and my Nani's cooking in Queens. My family, queerness, privileges, religion, experiences with whiteness, and more all contribute to my sense of place.

I ask this question to other Queer, Trans, Two-Spirit, Black, Indigenous, and People of Color (QT2SBIPOC) because we are not often given the space we need to deeply consider our relationships to environment and healing. For me, there is a lot that keeps me going in the wake of environmental catastrophe, personal hardship, and activist burnout. But, it boils down to sharing meaningful food with meaningful people.

Rachel Rosenbaum - Recycle Lebanon

In the summer of 2017, a young woman living in Beirut remarked to me, "People are used to going around the government to achieve what needs to get done. People are resilient, resourceful, and fed up." This sentiment is common among those I work with in Lebanon as daily life is structured by intersecting issues of environmental and infrastructural degradation, perceptions of instability, and government ineptitude. Since the civil war ended in the 1990s, the government has struggled to provide basic infrastructures like 24-hour electricity, waste management, or public transportation and, like most places around the world, continually mismanages environmental resources from their forests to their coasts. As an anthropologist, however, I work to understand how these issues of infrastructure and the environment intersect with people's resilience and resourcefulness, leading them to create alternatives to increase wellbeing for themselves, their communities, and the planet.

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.

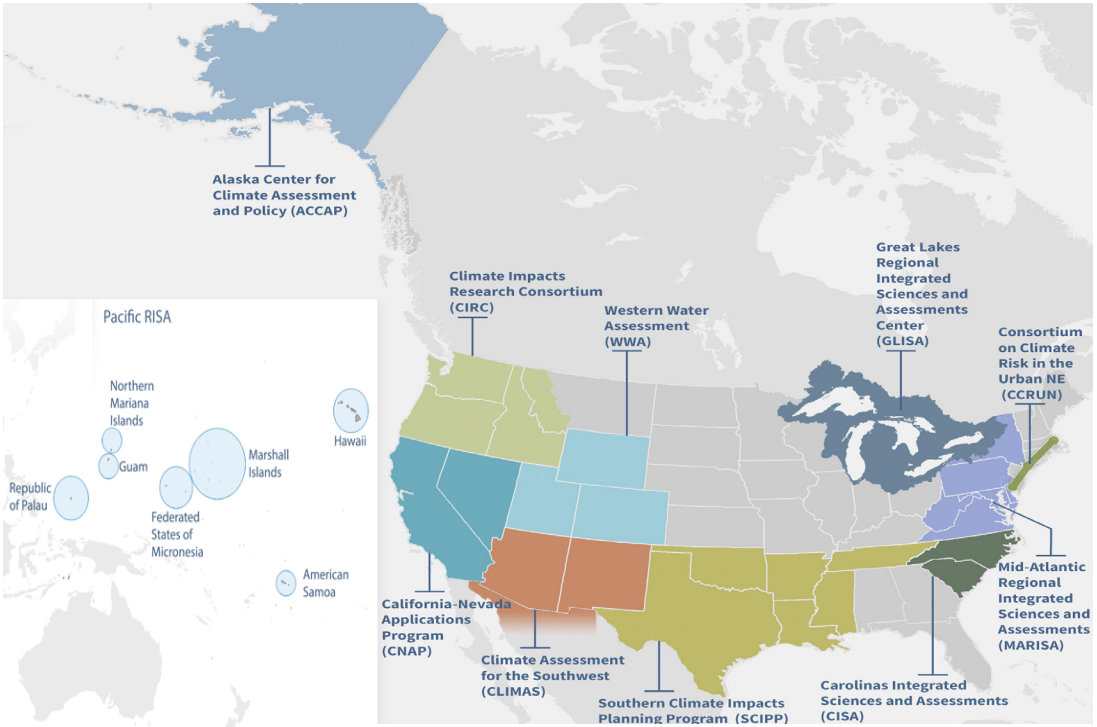

Figure 1: NOAA Regional Integrated Sciences and Assessments Regions