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July Southwest Climate Outlook

Precipitation: In the past 30 days, much of New Mexico and portions of eastern Arizona recorded above-average precipitation (Fig. 1). We are closing out one of the driest times of year, climatologically speaking, and any amount of recorded precipitation can push monthly totals well above average. To that point, we saw anomalous incursions of moisture from tropical systems in early to mid-June, as well as an early start to monsoon-associated precipitation in mid- to late June (see Monsoon Summary, page 5-6). In the longer term, water year observations (since Oct 1) show above-average precipitation across most of New Mexico and eastern Colorado, with a mix of average and below-average precipitation across the rest of the Intermountain Southwest (Fig. 2).

Temperature: May and early June were exceptionally mild, but overall, June temperatures were consistent with warming southwestern summers, with much of New Mexico and nearly all of Arizona recording above-average temperature anomalies over the past 30 days (Fig. 3). An early start to monsoon activity has provided some relief, but increased humidity can offset lower temperatures by driving heat index values higher.

Monsoon: Last month, we reported on the general association between El Niño and a delayed onset to the monsoon. El Niño is showing no sign of letting up (see El Niño Tracker, pages 3-4), but our monsoon decided to ignore this association and got off to an early start anyway, about a week ahead of the average onset of monsoon storms in early July. The monsoon ridge set up and drove relatively frequent precipitation events over the past 30 days (see Monsoon Summary, page 5-6, for more details).

Drought & Water Supply: The U.S. Drought Monitor highlights drought conditions across the West, with particularly severe conditions in California and Nevada (Fig. 4). Arizona and western New Mexico continue to grapple with the impacts of years of accumulated drought and water deficit (see Reservoir Volumes, page 7). El Niño, particularly if it remains a moderate to strong event, offers some hope for above-average precipitation in the Southwest this winter.

Wildfire: Mild spring weather, above-average precipitation, and above-average relative humidity reduced wildfire risk in Arizona and New Mexico for much of the fire season (Fig. 5). An early start to the monsoon has continued to keep the most extreme fire risk conditions at bay, and a number of fires that started were allowed to burn for beneficial use, such as to manage fuel loads. As of July 7, wildland fires had burned approximately 100,000 acres in Arizona and approximately 40,000 acres in New Mexico.

Precipitation & Temperature Forecasts: The July 16 NOAA-Climate Prediction Center seasonal outlook predicts above-average precipitation for most of the Southwest and Intermountain West this summer, with Northern California and far western Nevada as notable exceptions (Fig. 6, top). Temperature forecasts are split, with elevated chances for above-average temperatures along the West Coast and into western Arizona (and most of the western U.S.), and increased chances for below-average temperatures in the midwestern U.S. and extending across New Mexico (Fig. 6, bottom).

Tweet July SW Climate Outlook

CLICK TO TWEET

Jul2015 @CLIMAS_UA SW Climate Outlook -El Niño looks stronger, monsoon summary and SW climate summary-forecasts http://bit.ly/1MwKDpB

Online Resources

Figures 1 & 2
NOAA/NWS - Advanced Hydrologic Prediction Service
http://water.weather.gov/precip/

Figure 3
High Plains Regional Climate Center
http://www.hprcc.unl.edu/

Figure 4
U.S. Drought Monitor
http://www.droughtmonitor.unl.edu

Figure 5
National Interagency Coordination Center
http://www.nifc.gov/nicc/

Figure 6
NOAA/NWS - Climate Prediction Center
http://www.cpc.ncep.noaa.gov/

June Southwest Climate Outlook

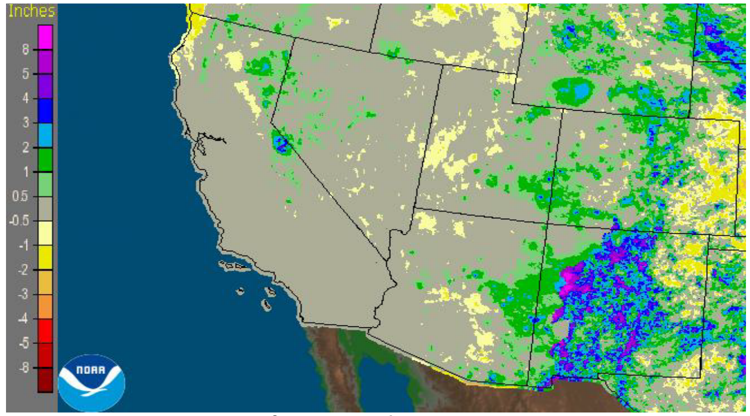

Figure 1: Departure from Normal Precipitation - Past 30 Days

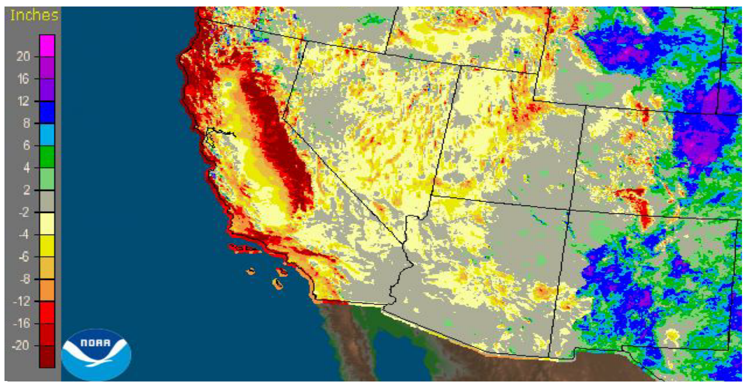

Figure 2: Departure from Normal Precipitation - Since Oct 1

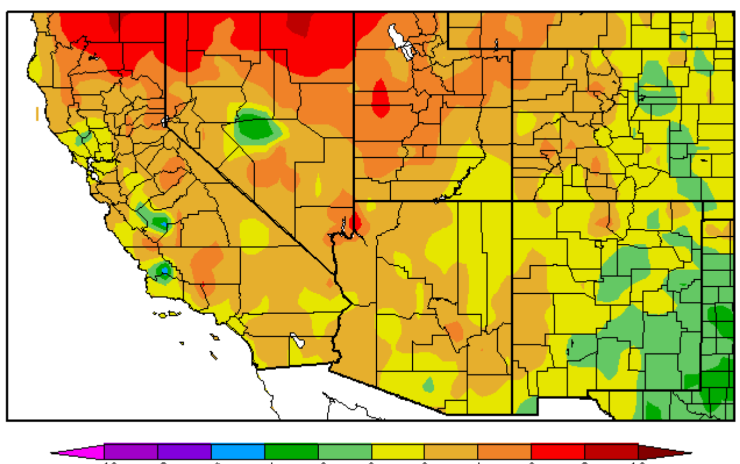

Figure 3: Departure from Normal Temp (F) - Jun 15 - Jul 14, 2015

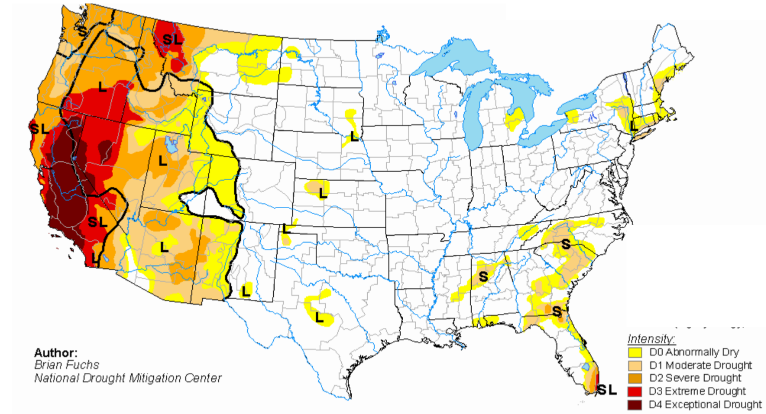

Figure 4: US Drought Monitor - July 7, 2015

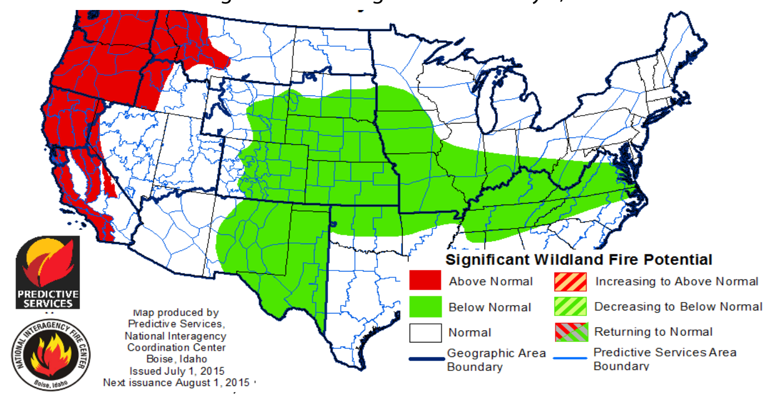

Figure 5: Significant Wildland Fire Potential Outlook - July 2015

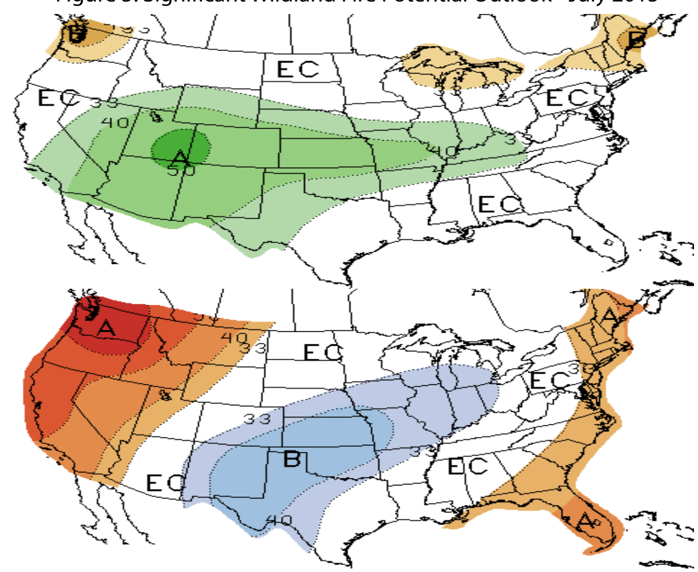

Figure 6: Three-Month Precipitation & Temperature Outlook - Jul 16, 2015

Online Resources

Figure 1
Australian Bureau of Meteorology
http://www.bom.gov.au/climate/enso/index.shtml

Figure 2
NOAA - National Climatic Data Center
http://www.ncdc.noaa.gov/teleconnections/enso/

Figure 3
International Research Institute for Climate and Society
http://iri.columbia.edu/our-expertise/climate/forecasts/enso/

Figure 4
NOAA - Climate Prediction Center
http://www.cpc.ncep.noaa.gov/products/NMME/current/plume.html

2015 El Niño Tracker

El Niño conditions continue for a fifth straight month, and at this point, forecasters are relatively bullish that we are witnessing the development of a moderate-to-strong event that could rival 1997 in absolute magnitude later this year. The most recent outlooks from various sources offer a consistent cluster of forecasts calling for a clear El Niño signal that is maintained or even strengthens well into early 2016. Forecasts focused on the persistence of sea-surface temperature (SST) anomalies (Figs.1 - 2) along with weakening trade winds, ongoing convective activity in the central and eastern Pacific, and El Niño-related ocean-atmosphere coupling.

On July 7, the Australian Bureau of Meteorology maintained its tracker at official "El Niño" status, identifying a strengthening El Niño (in part due to increased tropical storm activity), and projecting the event as likely to persist through the end of 2015 and into 2016. On July 10, the Japan Meteorological Agency identified strengthening El Niño conditions in the equatorial Pacific, and forecast that the current El Niño conditions were likely to last until winter. On July 9, the NOAA-Climate Prediction Center (CPC) extended its El Niño advisory with a greater than 90-percent chance that El Niño will continue through winter 2015-2016, and an 80-percent chance it will last into early spring 2016. It cited the increasingly positive SST anomalies in the central and eastern Pacific and ongoing ocean-atmospheric coupling and convection activity as indicators of an ongoing and strengthening event (Fig. 3). On July 16, the International Research Institute for Climate and Society (IRI) and CPC forecasts indicated continued strengthening of El Niño through 2015 and into 2016, with a moderate event likely becoming a strong event by summer or early fall and lasting into early 2016. The North American multi-model ensemble currently shows a moderate event extending through early summer, with potential for a strong event by mid-summer or early fall (Fig. 4).

It is clear that we are in the midst of an ongoing and strengthening El Niño event. If this event remains on the current trajectory, it could surpass the strongest El Niño events of recent decades (1997 in particular), with implications for both Southwest and global communities.

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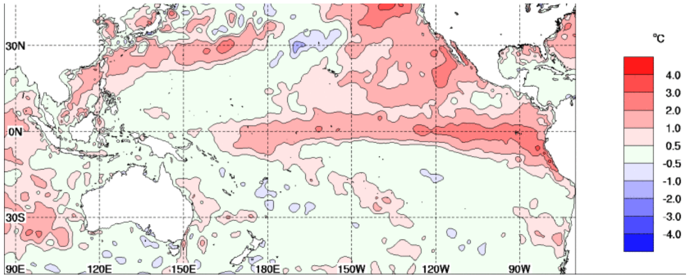

Figure 1: June 2015 Sea Surface Temperature (SST) Anomalies

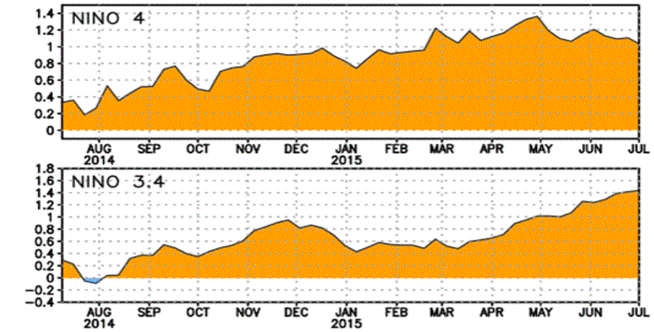

Figure 2: SST Anomalies in Niño Regions 3.4 & 4 (NCDC)

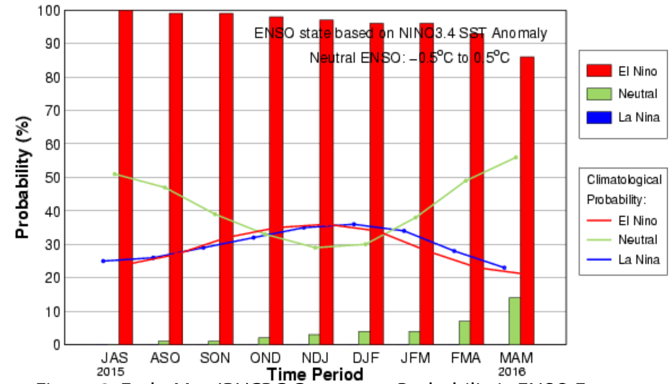

Figure 3: Early-May IRI/CPC Consensus Probabilistic ENSO Forecast

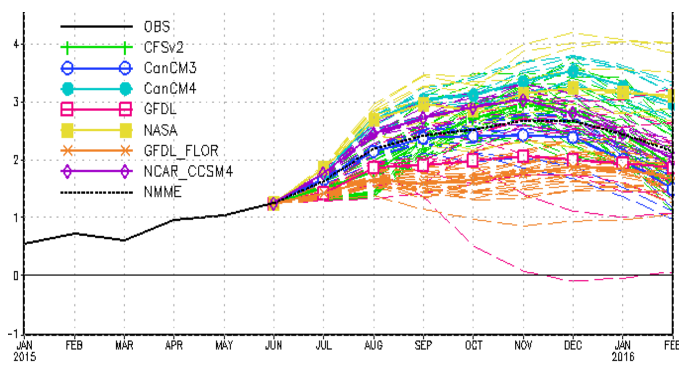

Figure 4: North American Multi-Model Ensemble Forecast for Niño 3.4

2015 El Niño Tracker (cont.)

In May and early June, we witnessed exactly the sort of patterns we might expect to see in Arizona and New Mexico under El Niño conditions—above-average precipitation and below-average temperatures. If El Niño persists into winter 2015-2016, particularly if it remains a moderate-to-strong event, we would likely continue to see above-average precipitation in the Southwest (Fig. 5). Although the presence of El Niño conditions often has been associated with a delay in the start of the monsoon, this year the monsoon began early. However, a resurgent El Niño signal now may be pushing back and could work to disrupt the monsoon ridge, leading to one or more 'breaks' in the monsoon. The event could also lead to a repeat of 2014's above-average eastern Pacific tropical storm season, when conditions favorable to El Niño were thought to be driving increased tropical storm activity in the Southwest in September and October.

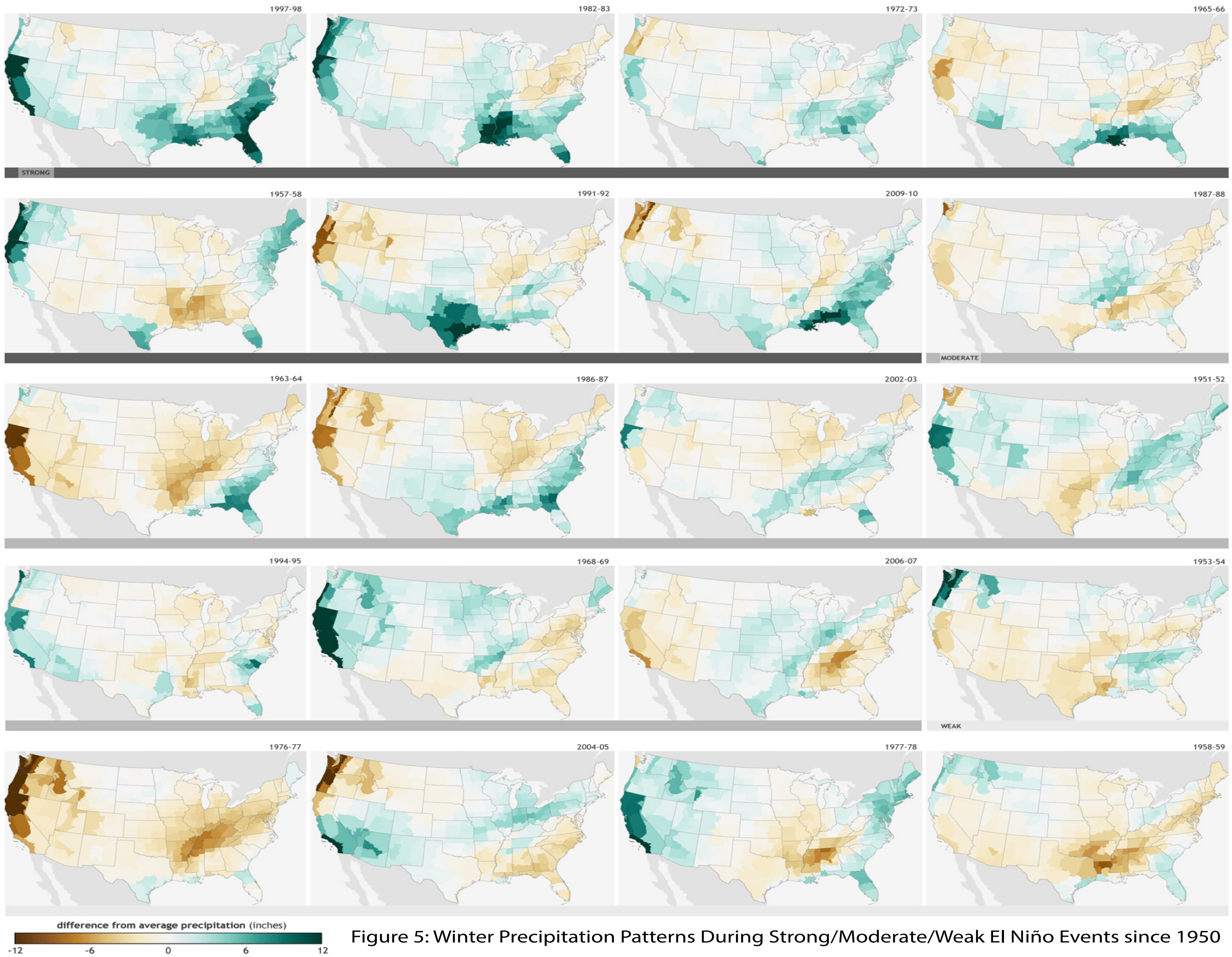

Figure 5: Winter Precipitation Patterns During Strong/Moderate/Weak El Niño Events since 1950

Online Resources

Figure 5
NOAA Climate.gov
https://www.climate.gov/

https://www.climate.gov/news-features/blogs/enso/united-states-el-ni%C3%B1o-impacts-0

CLIMAS YouTube Channel

Visit our YouTube channel for videos of content pulled from the podcast

www.youtube.com/user/UACLIMAS/

Podcasts

Visit our website or iTunes to subscribe to our podcast feed

www.climas.arizona.edu/media/podcasts

Online Resources

Figure 1
Earth Systems Research Laboratory
http://www.esrl.noaa.gov/

Figure 2
NOAA - National Weather Service
http://www.wrh.noaa.gov/twc/monsoon/dewpoint_tracker.php

Monsoon Summary (June 15 - July 16)

After a few anomalous incursions of tropical moisture in early June, we saw an early beginning to the monsoon in mid- to late June, a few weeks ahead of the typical start date (Fig. 1). Regional dewpoint/humidity readings for June illustrate the multiple incursions of tropical moisture, followed by the onset of monsoon conditions later in the month (Fig. 2).

The monsoon ridge was able to set up early, leading to a number of precipitation events (including above-average precipitation) across the Southwest starting in the last week of June. As recently as last month, we had been anticipating a delayed start to the monsoon, as El Niño conditions tend to suppress its onset. However, the opposite occurred, possibly due to a record-strong Madden Julian Oscillation (MJO) pattern that temporarily suppressed El Niño's typical influence on the subtropical ridge. We have seen some weakening of the monsoon ridge since July 5, likely due to El Niño convection picking back up, but it remains to be seen what the overall impact of El Niño will be on this year's monsoon.

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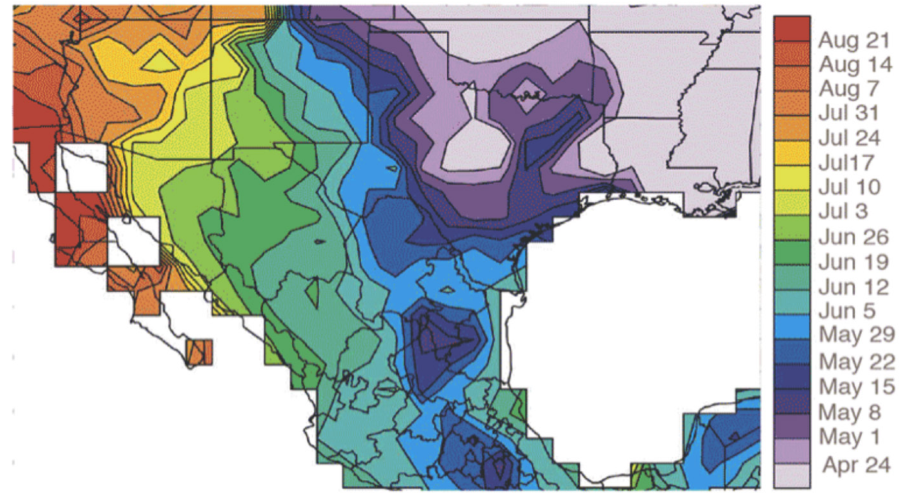


Figure 1: Historical Monsoon Onset Date

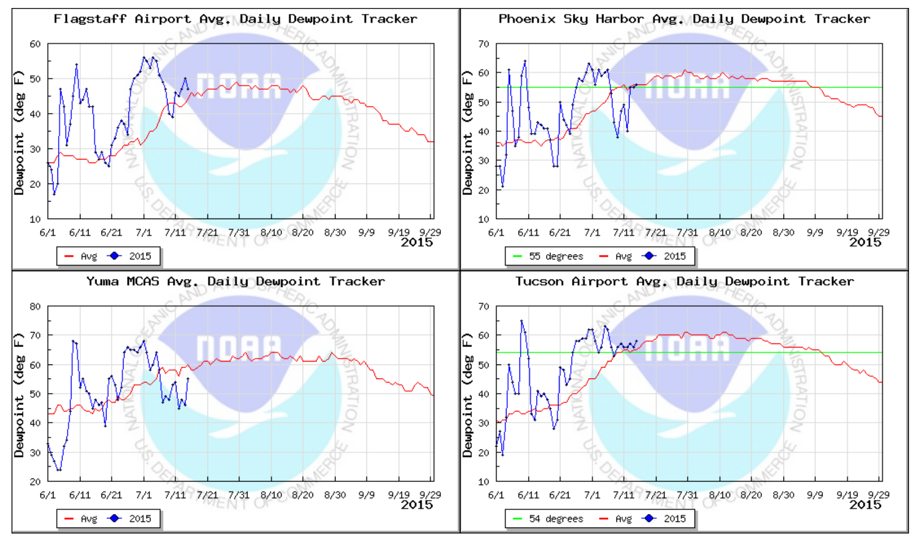


Figure 2: Average Daily Dewpoint Tracker - Flagstaff - Phoenix - Yuma - Tucson

Online Resources

Figure 3-6
Climate Science Applications Program
http://cals.arizona.edu/climate/

Monsoon Summary (June 15 - July 16)

In the first month of the monsoon, most of New Mexico and much of eastern Arizona received well-above-average precipitation (Fig. 3a-b), albeit with a wide range of precipitation totals across the region (Fig. 4a-b). Western Arizona (particularly the southwest and northwest corners) are notable exceptions to this pattern, although these regions typically receive far less monsoon precipitation overall. The percent of days with rain highlights the regularity of monsoon precipitation thus far, with much of eastern Arizona and most of New Mexico recording rain events (>0.01") on 35-50 percent of days since Jun 15 (Fig. 5a-b). The daily intensity index (Fig. 6a-b) further illustrates the steady nature of most of this monsoon precipitation, where higher values indicate much of the rain fell in a single event and lower values indicate more frequent and less intense events.

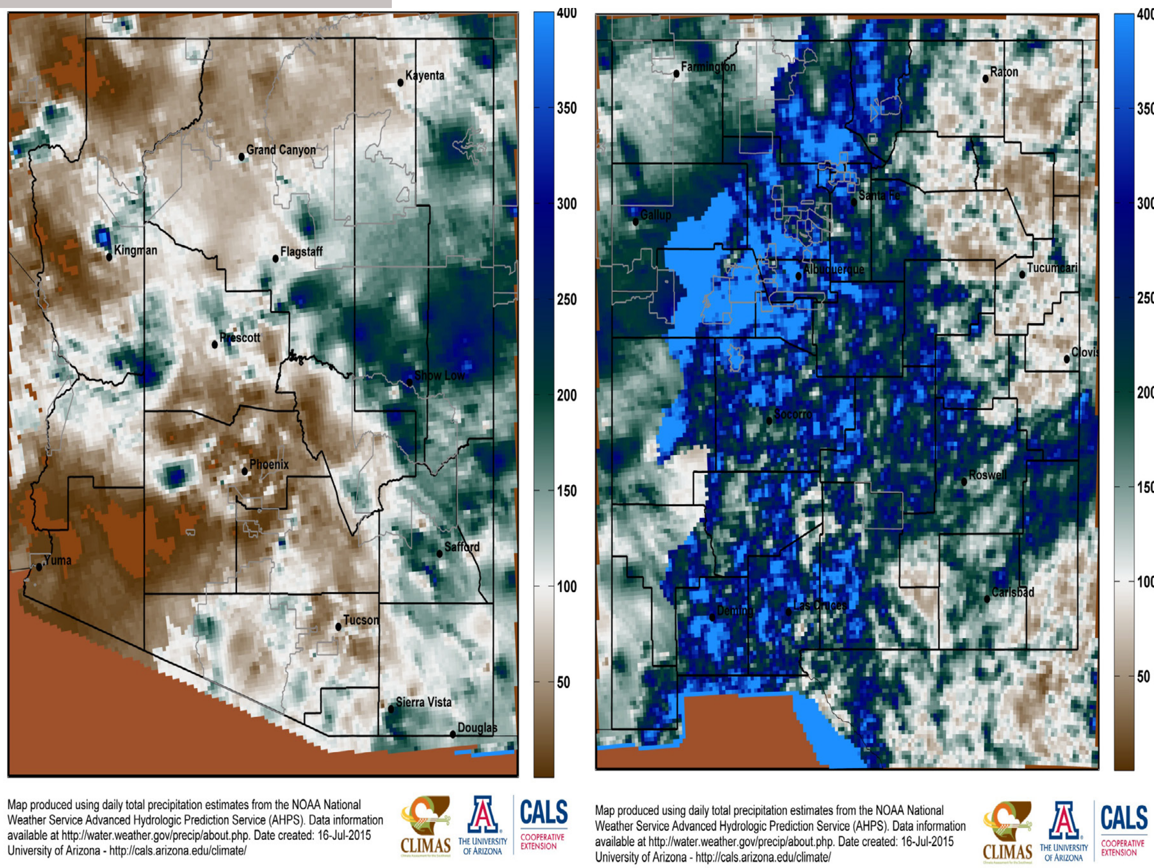


Figure 3a-b: Percent of Average Precipitation - Jun 15 - Jul 15

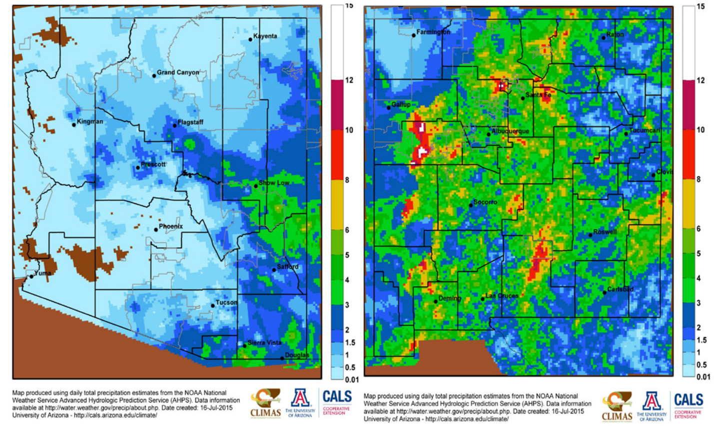


Figure 4a-b: Total Precipitation - Jun 15 - Jul 15

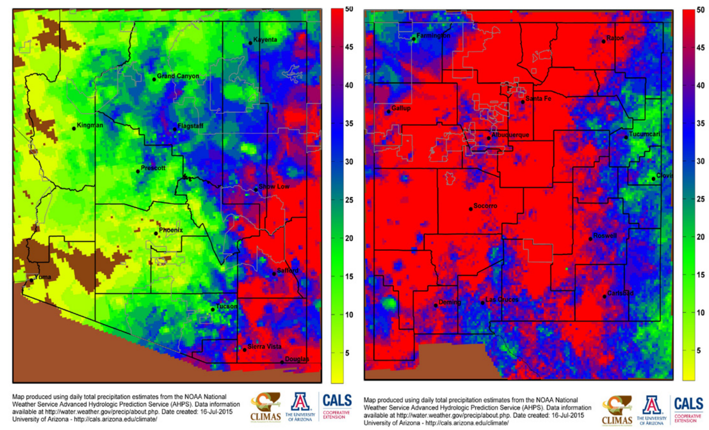


Figure 5a-b: Percent of Days With Rain (>0.01") - Jun 15 - Jul 15

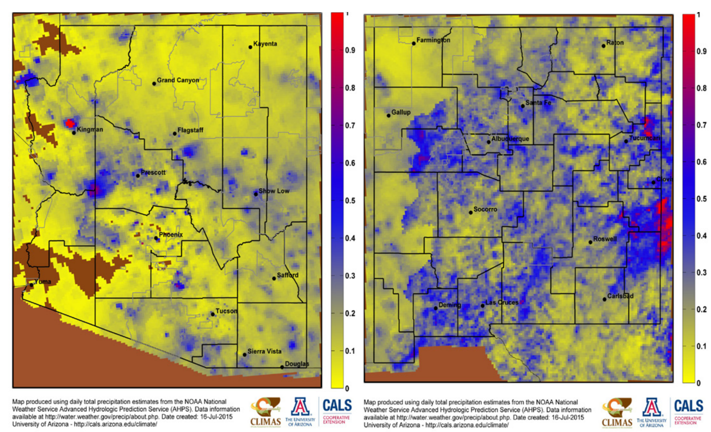


Figure 6a-b: Daily Intensity Index (total precip/days with rain) - Jun 15 - Jul 15

Online Resources

Portions of the information provided in this figure can be accessed at the Natural Resources Conservation Service

Arizona: http://1.usa.gov/19e2BdJ

New Mexico: http://www.wcc.nrcs.usda.gov/cgibin/resv_rpt.pl?state=new_mexico

Updated storage using information found here: http://155.83.192.50/wc/htmlrpts/Abiquiu.html & http://uttoncenter.unm.edu/pdfs/water-matters-2014/19-new-mexico%C2%B9s-major-reservoirs--an-overview.pdf

Contact Ben McMahan with any questions or comments about these or any other suggested revisions

Notes

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).

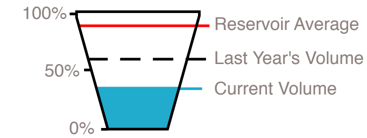
The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). On average, 1 acre-foot of water is enough to meet the demands of 4 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.

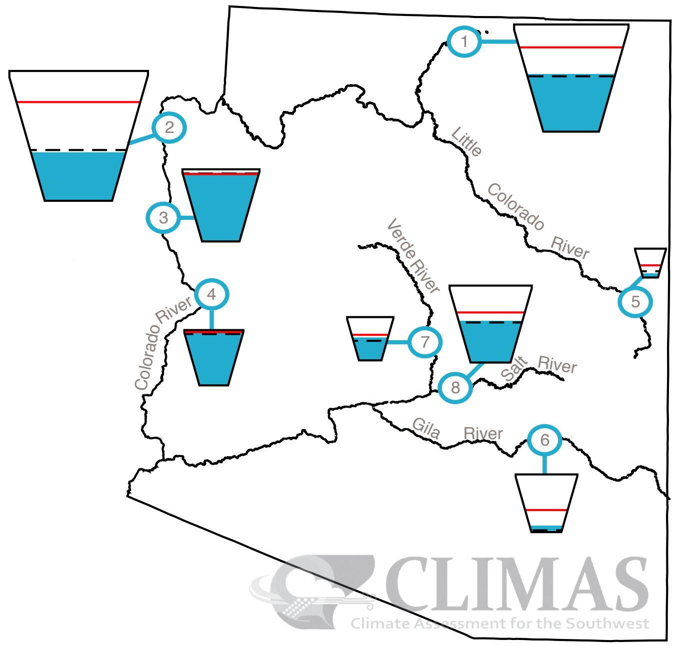
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

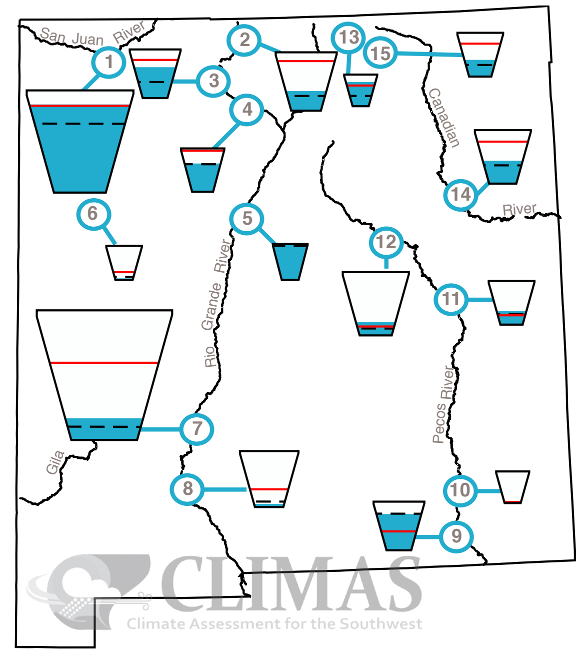
Reservoir Volumes

DATA THROUGH JUNE 30, 2015

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	54%	13,089.9	24,322.0	1598.4
2. Lake Mead	37%	9,607.0	26,159.0	-122.0
3. Lake Mohave	95%	1,720.9	1,810.0	13.8
4. Lake Havasu	96%	597.2	619.0	7.5
5. Lyman	14%	4.1	30.0	0.0
6. San Carlos	11%	93.3	875.0	0.0
7. Verde River System	53%	151.4	287.4	-3.4
8. Salt River System	54%	1,084.5	2,025.8	-45.0

*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	85%	1,461.3	1,696.0	194.8
2. Heron	34%	134.6	400.0	39.2
3. El Vado	63%	120.3	190.3	6.8
4. Abiquiu	65%	122.0	186.8**	-3.4
5. Cochiti	96%	48.2	50.0**	0.8
6. Bluewater	5%	2.1	38.5	-0.1
7. Elephant Butte	16%	342.0	2,195.0	-57.5
8. Caballo	5%	17.3	332.0	-27.0
9. Lake Avalon	75%	3.0	4.0	1.6
10. Brantley	7%	70.5	1,008.2	-9.0
11. Sumner	32%	32.8	102.0	-2.5
12. Santa Rosa	21%	91.4	438.3	-2.5
13. Costilla	76%	12.1	16.0	4.0
14. Conchas	43%	108.5	254.2	13.8
15. Eagle Nest	38%	30.1	79.0	1.6

* in KAF = thousands of acre-feet

**Abiquiu and Cochiti max storage adjusted recer