



**REGIONAL WASTEWATER RECLAMATION DEPARTMENT**

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August 27, 2015

**TO:** Jackson Jenkins, Director  
**FROM:** Kathleen Chavez, Water Policy Manager  
**SUBJECT:** Quarterly Drought Update – August 2015

As requested by the Board last summer, attached is an update on the status of drought in Pima County. The previous update was prepared in April 2015. Several key points are noted since April's update.

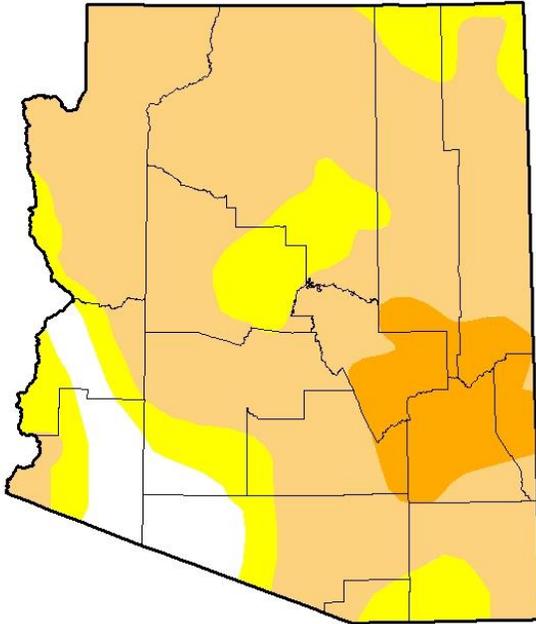
- The drought status in Pima County remains unchanged according to the US Drought Monitor. Eastern Pima County remains designated in Moderate Drought
- The summer monsoon season has been wetter than normal in some localized areas, but overall has generated average precipitation
- The National Weather Service reports precipitation of 7.85 inches to date since January 1. Normal precipitation for this same time period is 7.65 inches indicating 0.20 inches above normal for the year
- Pacific weather systems brought the first recorded rainfall in April since 2004. These systems continued in May and brought cooler temperatures, but little precipitation.
- Pacific tropical storms in June ushered in an early monsoon season with severe thunderstorms and hail
- Statewide Arizona experienced typical monsoon weather patterns, but overall Pima County's rainfall was near to below average
- In May, heavy rainfall in Colorado produced substantial storm flows to the Colorado River Basin and Lake Mead postponing a shortage declaration in Lake Mead
- As Pima County entered its wildfire season, the U.S Forest Service forecasted a high fire danger. Three lightning-caused wildfires have burned 2,710 acres in the Santa Catalina and Santa Rita mountains.
- In August, the Bureau of Reclamation reported there will no shortage declared for Lake Mead in 2016 and a 15% probability of a shortage declaration in 2017. A *significant* probability of a shortage exists in 2018. A shortage declaration will primarily impact CAP deliveries to agriculture. A Colorado River shortage is declared when the elevation of Lake Mead falls below 1075 feet; the elevation as of July 9 was 1075.64 feet.
- Lake Powell is 53 percent full and Lake Mead is 38 percent full
- The Climate Prediction Center advises there is a 90% probability that El Niño conditions will remain through the winter 2015-16. The impact to the Colorado River water supply is guarded however. Of the last nine El Niño years since Glen Canyon Dam's construction one third of the years have been wet, one third were dry and one third were average

Should you have any questions, please feel free to let me know.

Attachment

**DROUGHT: US Drought Monitor (USDM)**

**U.S. Drought Monitor  
 Arizona**



**August 11, 2015**  
 (Released Thursday, Aug. 13, 2015)  
 Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	7.04	92.96	74.94	9.57	0.00	0.00
<b>Last Week</b> 8/4/2015	7.04	92.96	74.94	9.57	0.00	0.00
<b>3 Months Ago</b> 5/12/2015	7.04	92.96	80.21	29.48	0.00	0.00
<b>Start of Calendar Year</b> 12/31/2014	0.00	100.00	83.05	35.34	3.84	0.00
<b>Start of Water Year</b> 8/30/2014	0.00	100.00	84.58	37.92	3.76	0.00
<b>One Year Ago</b> 8/12/2014	0.00	100.00	97.88	69.74	12.90	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

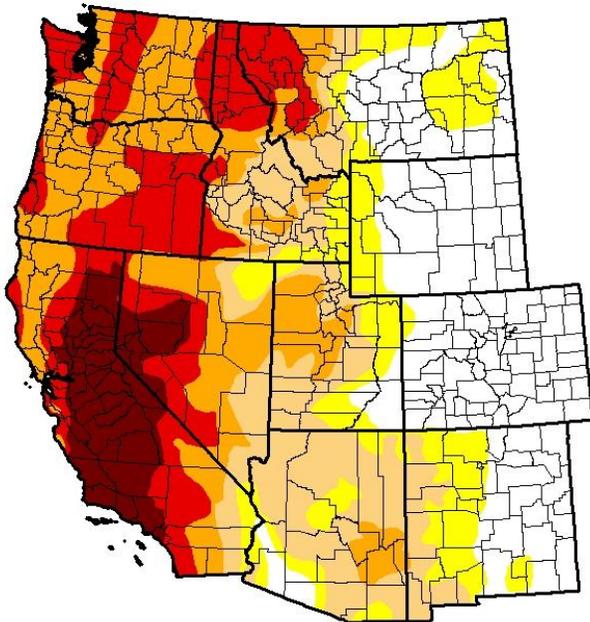
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

**Author:**  
 Brian Fuchs  
 National Drought Mitigation Center



<http://droughtmonitor.unl.edu/>

**U.S. Drought Monitor  
 West**



**August 11, 2015**  
 (Released Thursday, Aug. 13, 2015)  
 Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	26.53	73.47	59.95	42.43	23.22	7.62
<b>Last Week</b> 8/4/2015	26.53	73.47	60.09	42.99	22.24	7.17
<b>3 Months Ago</b> 5/12/2015	22.69	77.31	63.10	38.04	17.54	7.95
<b>Start of Calendar Year</b> 12/31/2014	34.76	65.24	54.48	33.50	18.68	5.40
<b>Start of Water Year</b> 8/30/2014	31.48	68.52	55.57	35.65	19.95	8.90
<b>One Year Ago</b> 8/12/2014	27.11	72.89	59.80	43.63	21.43	8.90

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

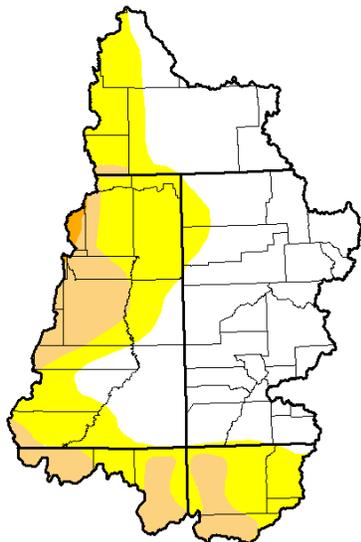
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 Brian Fuchs  
 National Drought Mitigation Center



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**U.S. Drought Monitor**  
**Upper Colorado Watershed**



**August 11, 2015**  
 (Released Thursday, Aug. 13, 2015)  
 Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
<b>Current</b>	53.06	32.10	14.37	0.47	0.00	0.00
<b>Last Week</b> 8/4/2015	53.06	30.65	15.83	0.47	0.00	0.00
<b>3 Months Ago</b> 5/2/2015	2.93	8.62	50.71	37.74	0.00	0.00
<b>Start of Calendar Year</b> 12/31/2014	56.43	13.17	12.24	14.02	4.14	0.00
<b>Start of Water Year</b> 9/30/2014	56.35	12.64	12.84	9.21	8.95	0.00
<b>One Year Ago</b> 8/12/2014	35.71	14.25	25.92	15.69	8.42	0.00

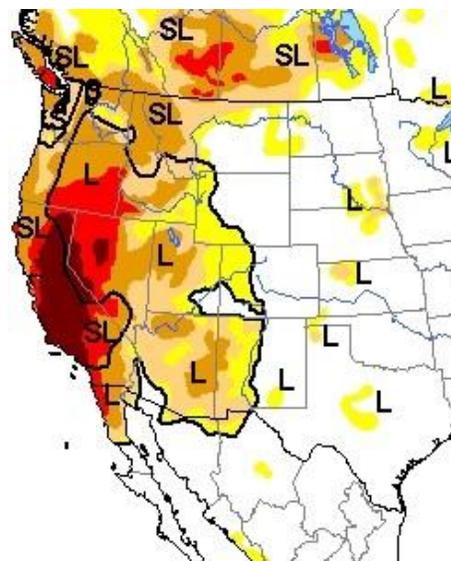
**Intensity:**  
 D0 Abnormally Dry      D3 Extreme Drought  
 D1 Moderate Drought    D4 Exceptional Drought  
 D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions.  
 Local conditions may vary. See accompanying text summary  
 for forecast statements.

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 National Drought Mitigation Center



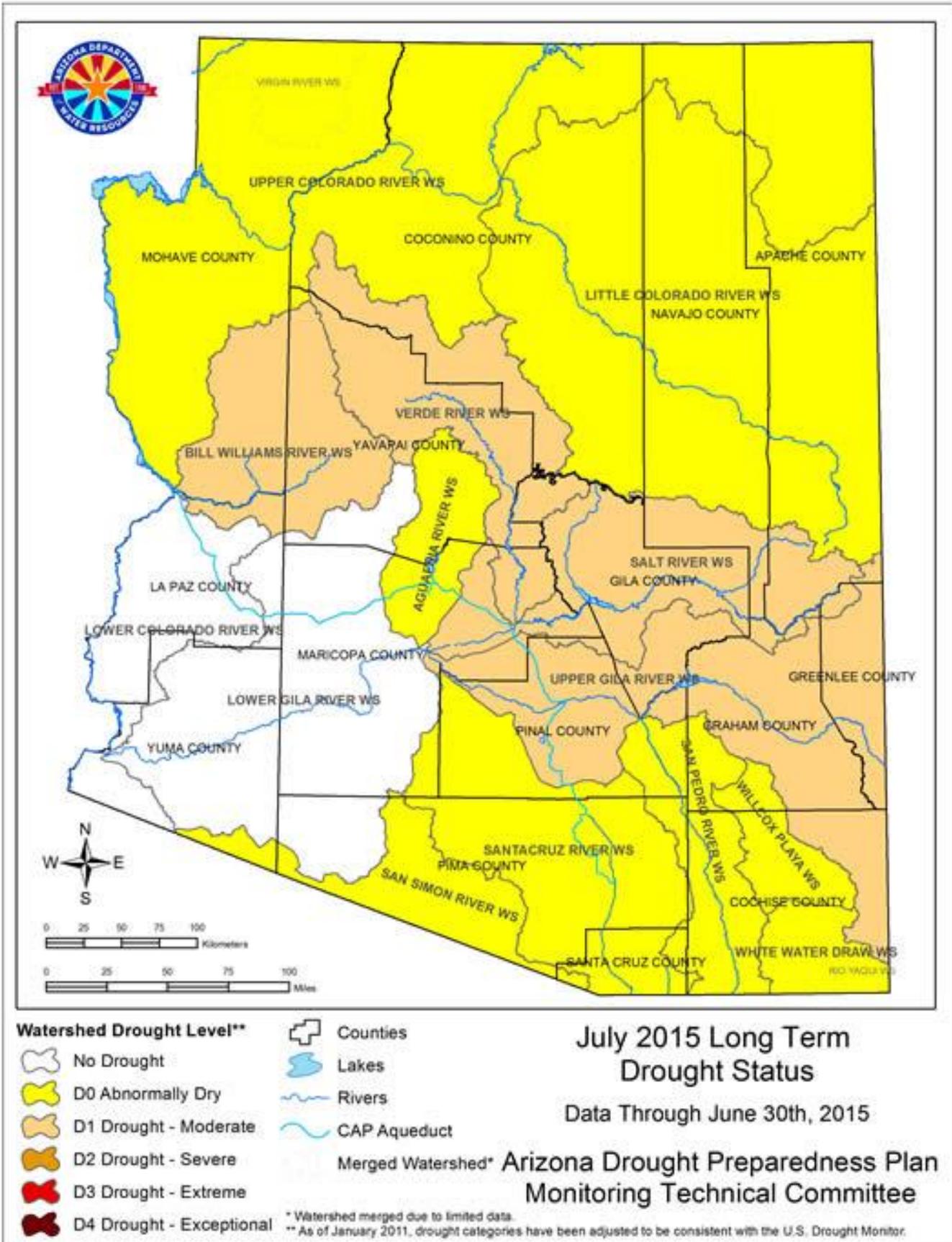
<http://droughtmonitor.unl.edu/>



**Arizona Drought Monitoring Technical Committee (MTC)**  
**Drought Summary**

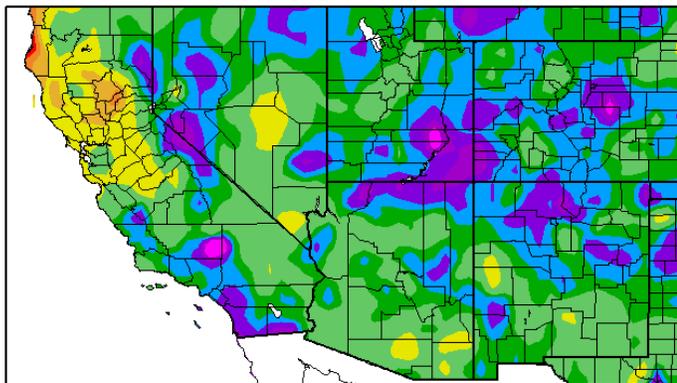
**USDM Arizona Short Term Map-** July was near average for monsoon activity and precipitation, so there has not been much change in the short-term drought situation, and most of the state remains in moderate drought. The heavy rainfall has been highly localized, but northeastern Arizona has received relatively consistent moderate rainfall from the convective activity this summer. As a result, severe drought has been downgraded to moderate drought in northern Coconino and Mohave counties and in central Apache County. Prepared by the Arizona Drought Monitoring Technical Committee, August 7, 2015, reflects changes from July 1 to July 30, 2015.

**MTC Arizona Long Term Map-** Drought Status Update April-June 2015: There has been slow improvement across the eastern half of the state over the past 4 months, finally resulting in changes to the long term drought map. Seven watersheds in the eastern half of the state have improved from moderate drought to abnormally dry, while the Upper and Lower Colorado and Lower Gila have remained in either abnormally dry or no drought. The Salt and Upper Gila remain at moderate drought even though stream flow has been above average recently. The longer term water resource condition for these watersheds is still a significant long-term deficit. Much of the improvement is due to spring precipitation, and even the Upper Colorado system in Colorado has several very late snowstorms, which will help alleviate the poor run-off into Lakes Powell and Mead from the dry winter. So far the monsoon has been a little wetter than normal in some parts of the state, but very localized. There are two more months of monsoon left, and the eastern Pacific Ocean is still quite warm, so there are good prospects for more moisture to be drawn into the monsoon circulation. Prepared by the MTC August 7, 2015, next update in November will reflect condition of July, August and September.



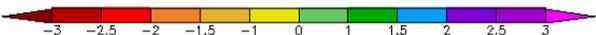
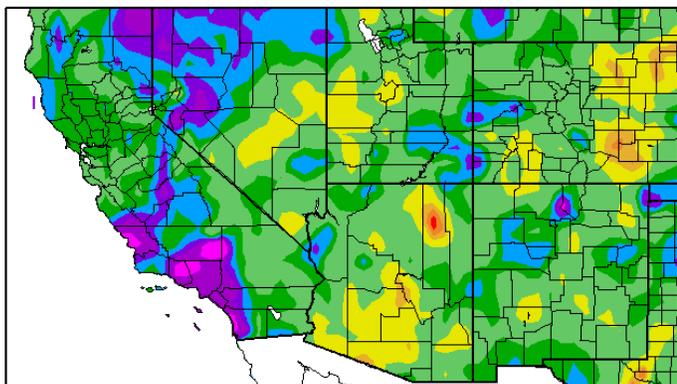
**PRECIPITATION & TEMPERATURE**

3-Month SPI  
5/1/2015 - 7/31/2015



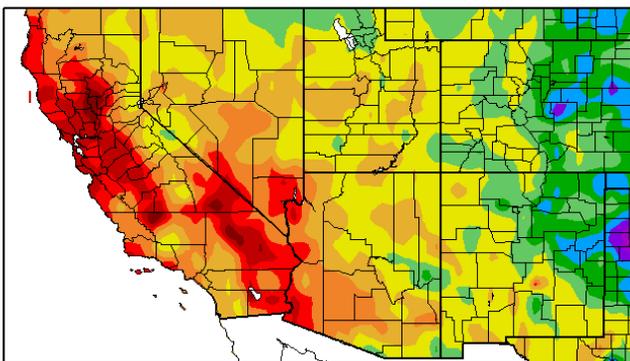
Generated 8/11/2015 at HPRCC using provisional data. Regional Climate Centers

Monthly SPI  
7/1/2015 - 7/31/2015



Generated 8/11/2015 at HPRCC using provisional data. Regional Climate Centers

Precipitation (in)  
5/1/2015 - 7/31/2015



Generated 8/11/2015 at HPRCC using provisional data. Regional Climate Centers

**RAIN**

The first quarter of 2015 ranked as the 24<sup>th</sup> wettest period on record, ending April with a surplus of 0.77” and a Water Year to date (Oct-Apr) of +1.88” though April itself was slightly drier than average. Pacific weather systems in April produced the first recorded rainfall for that month since 2004. Systems continued into May, bringing cooler temperatures but little precipitation until June, when two Pacific tropical storms brought on an early monsoon with severe thunderstorms including hail. June was the 14<sup>th</sup> wettest on record. July’s typical monsoon weather pattern was interrupted by upper level winds, causing sporadic storm activity and below normal rainfall. A third tropical storm and a significant storm July 28<sup>th</sup> (1.49”, 14<sup>th</sup> wettest July day) pushed rainfall total near average. Overall across Pima County, rain was near to below average.

For the Colorado River Basin and Lake Mead water supply, May was deemed “miraculous”. Heavy rain and snow in Colorado produced inflow into the Basin substantial enough to forestall shortage at Lake Mead likely for the next two years.

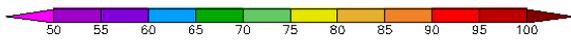
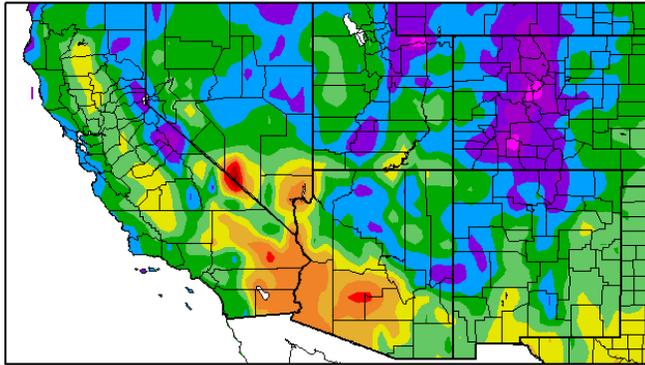
	Rain	+/- Avg
<b>April</b>	0.16	- 0.15
<b>May</b>	0.09	- 0.14
<b>June</b>	0.56	+ 0.36
<b>July</b>	2.08	- 0.17
	2.89	- 0.10

**TEMPERATURE**

Alternating Pacific weather systems interrupted by periods of strong high pressure and upper level winds caused below normal temperatures mixed with occasional heat waves. April reversed the year’s hottest on record trend, though still 2° above normal. May was the coolest on record since 1998 (-2.6°) followed by heat waves in June, pushing that month to the 4<sup>th</sup> warmest on record (+3°). July cooling kept daily highs below average and overall trended 0.3° above average.

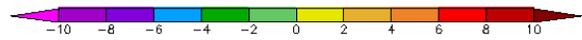
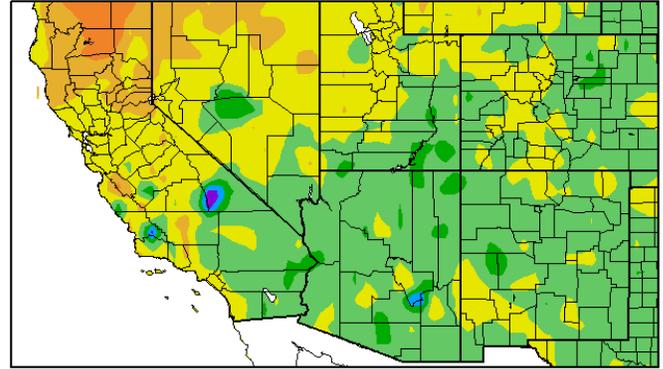
Pima County Local Drought Impact Group (LDIG)  
 Quarterly Drought Update August 2015

Temperature (F)  
 5/1/2015 – 7/31/2015



Generated 8/11/2015 at HPRCC using provisional data.

Departure from Normal Temperature (F)  
 5/1/2015 – 7/31/2015



Regional Climate Centers Generated 8/11/2015 at HPRCC using provisional data.

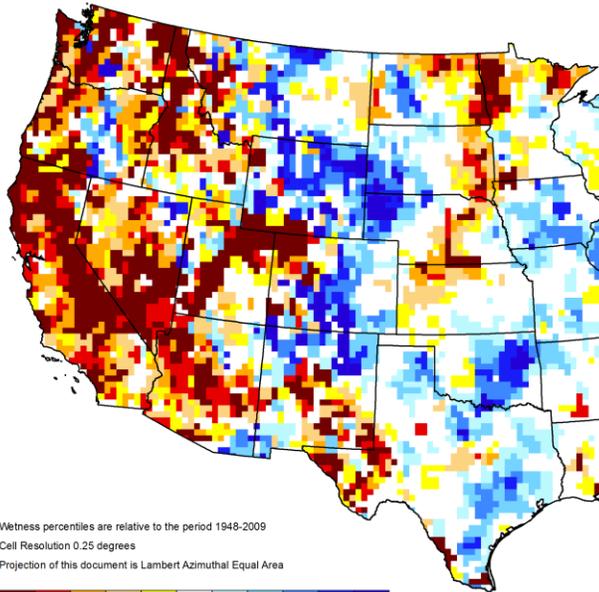
Regional Climate Centers

NASA GRACE Satellite

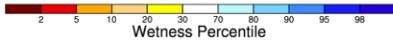


GRACE-Based Shallow Groundwater

August 17, 2015



Wetness percentiles are relative to the period 1948-2009  
 Cell Resolution 0.25 degrees  
 Projection of this document is Lambert Azimuthal Equal Area

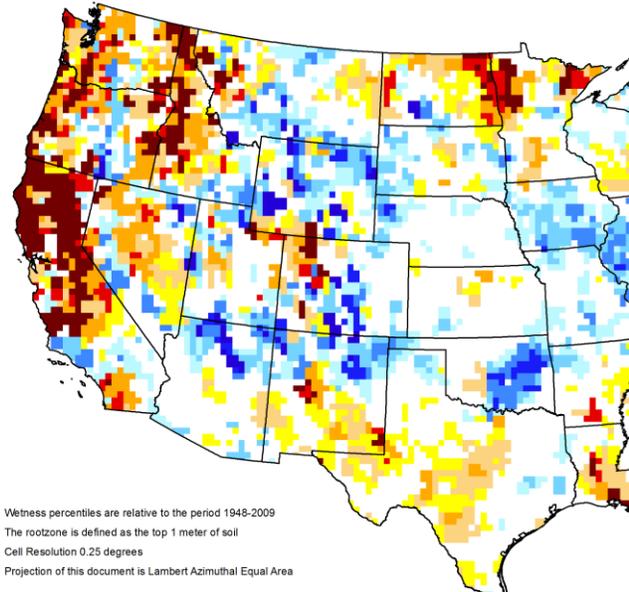


<http://drought.unl.edu/>



GRACE-Based Root Zone Soil Moisture

August 17, 2015

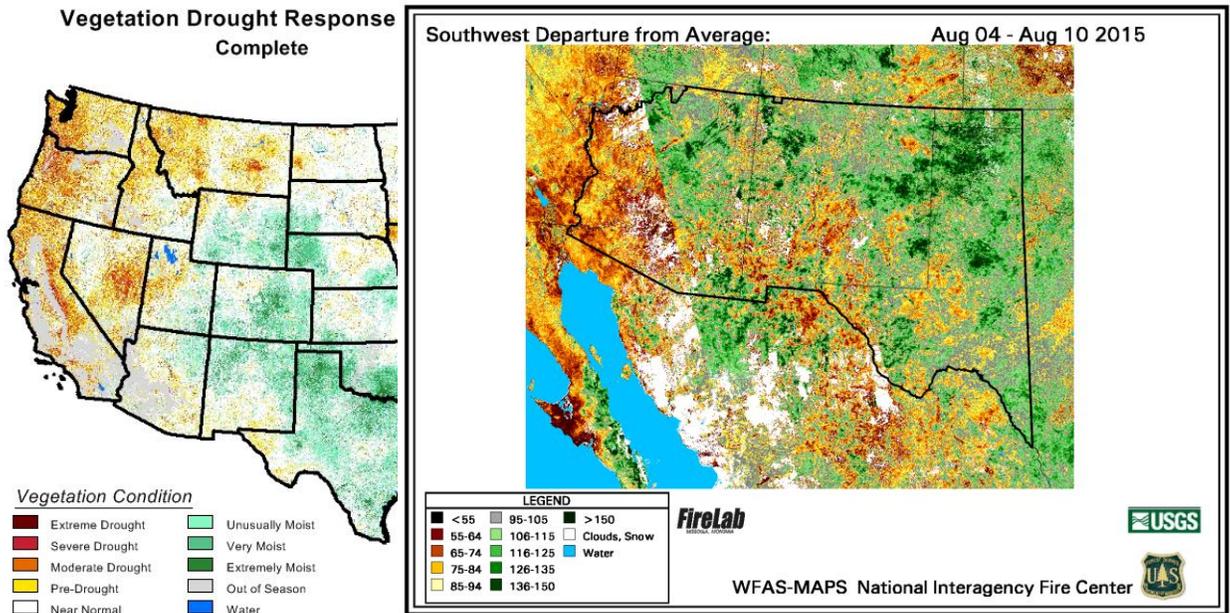


Wetness percentiles are relative to the period 1948-2009  
 The rootzone is defined as the top 1 meter of soil  
 Cell Resolution 0.25 degrees  
 Projection of this document is Lambert Azimuthal Equal Area



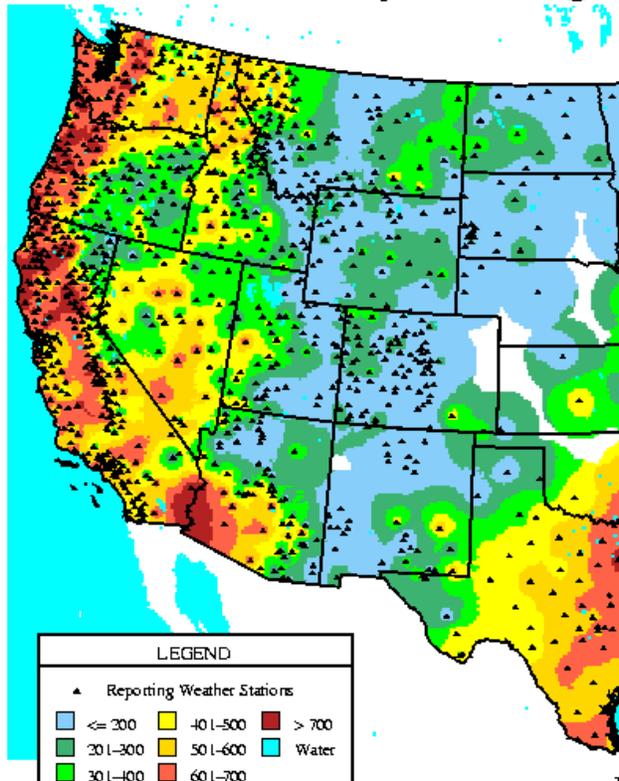
<http://drought.unl.edu/Moi>

**VEGETATION: USGS NDVI Greenness/VegDRI**



**WILDFIRE: USFS KBDI**

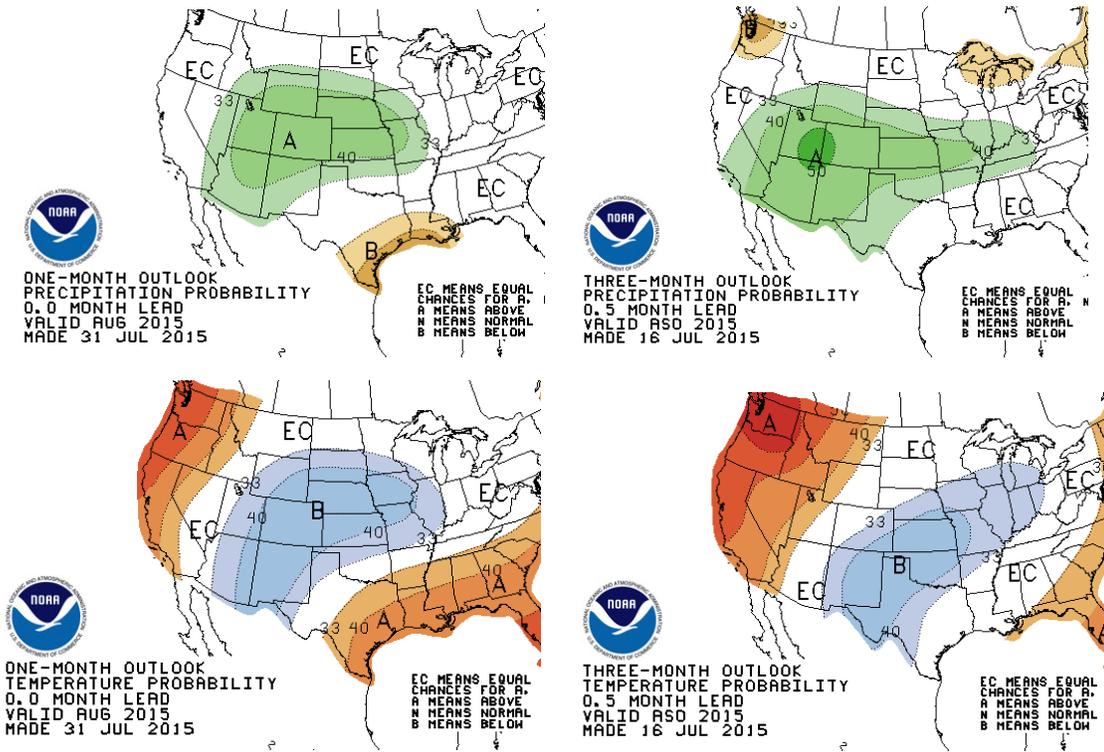
**Keetch-Byram Drought**



The Keetch-Byram Drought Index (KBDI) assesses fire potential by quantifying the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in duff and upper soil layers. Blue areas indicate high soil moisture; soil is drying in green areas and orange represents area impacted by severe drought where live fuels can burn actively.

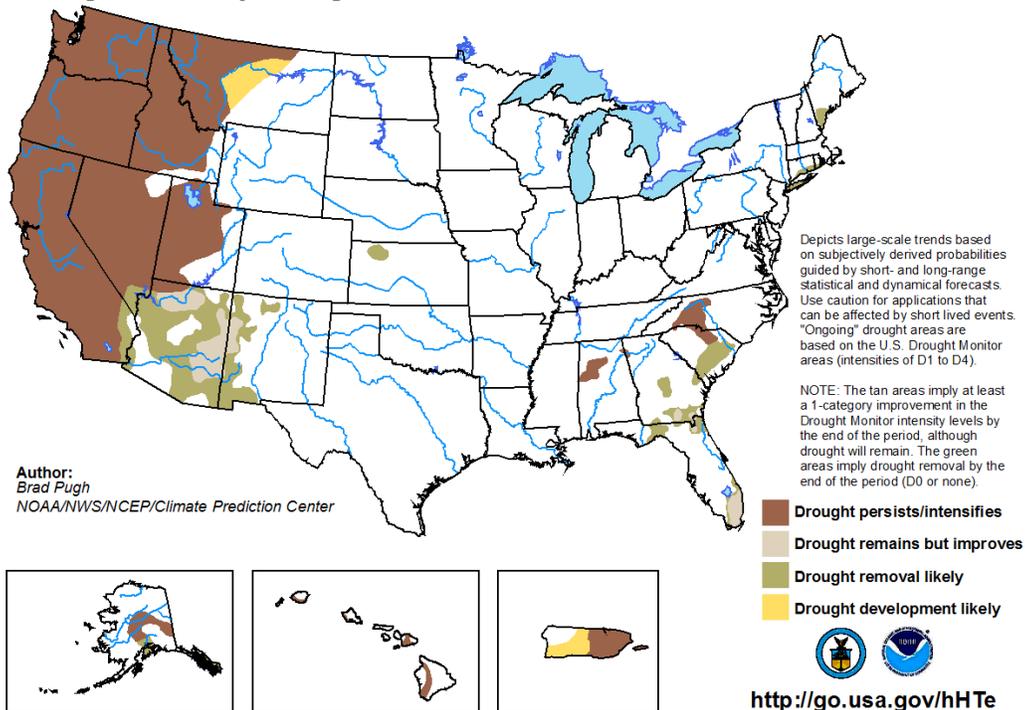
Current fire danger class for Pima County is Moderate with forecast for High.

**FORECAST: NWS Climate Prediction Center**



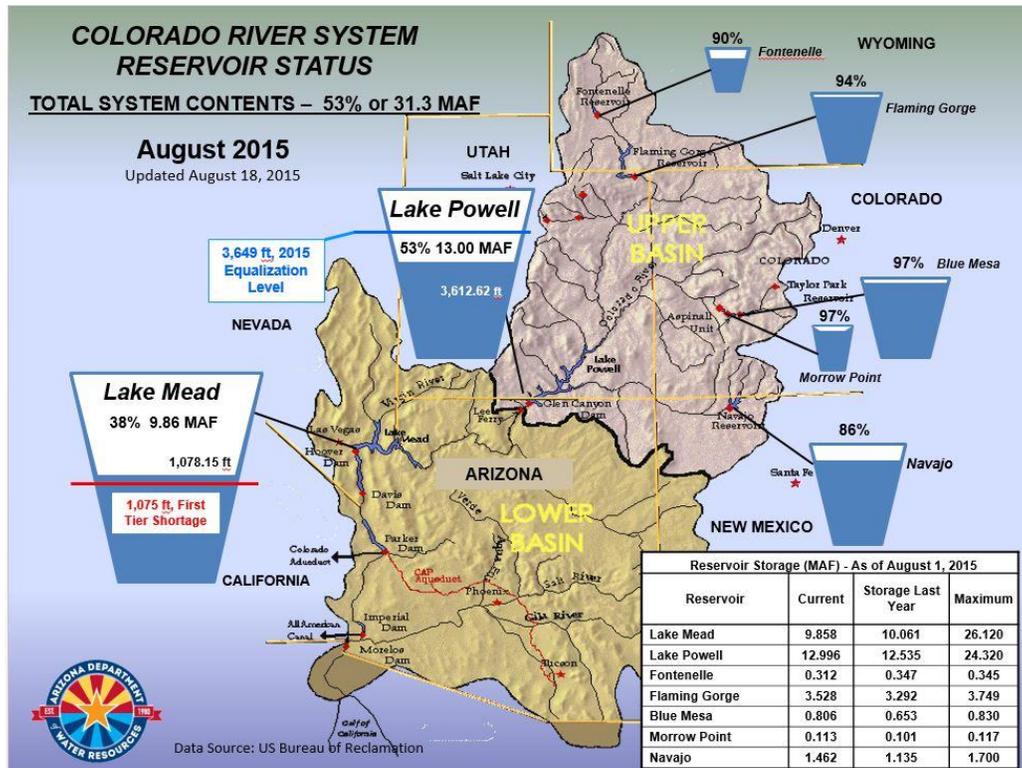
**U.S. Seasonal Drought Outlook**  
 Drought Tendency During the Valid Period

Valid for July 16 - October 31, 2015  
 Released July 16, 2015



**CAP WATER SUPPLY**

Official report from the Bureau of Reclamation is that there will be NO shortage declared for Lake Mead in 2016 and a small chance (15%) of shortage in 2017, decreasing from 47% chance. However, a “significant” probability still exists for shortage in 2018. Dependent on the weather, probabilities continually change- a decision on 2017 shortage will not be official until analysis of the August 2017 Bureau report. May’s weather pattern produced the inflow into the Colorado Basin needed to avert shortage and save the CAP from a 320,000 acre foot reduction.



Lake Mead is at 1,078’ elevation with 9.87 million af of storage, or 38% full. Mead is operating in Normal-Intentionally Created Surplus Condition. Mead will receive a 9 million af release from Powell.

Lake Powell is at 3,611’ elevation with 12.86 million af of storage, or 53% full. Powell is operating in the Upper Elevation Balancing Tier. Forecasted total Water Year 2015 inflow is 10.3 million af (95% of average) with observed April-July inflow of 6.7 million af (94%)- more than the forecasted Maximum Possible the Bureau expected, a result of significant May precipitation.

In the Upper Colorado Basin, Water Year 2015 to date total precipitation is 93% of average. Total Basin system content is 53% with 31.3 million af of storage.

**EL NINO: NOAA/NWS Climate Prediction Center (CPC)**

CPC has issued an El Nino Advisory; there is greater than 90% probability that El Nino will continue through the winter 2015/2016 and an 85% chance of extending into the spring 2016. Earlier predictions of a weak event have been recanted as a strong El Nino is now expected, peaking late fall/early winter.

Impact on Colorado water supply is guarded however; CAP reports- *El Nino Southern Oscillation (ENSO) & the Colorado River Basin Climate forecasts have suggested a strong El Nino signal beginning in Fall 2015 and lasting into early 2016. However, correlations between annual ENSO signals (El Nino, La Nina, or neutral) with annual Spring natural inflow into Lake Powell indicate that ENSO by itself is a poor predictor of streamflow conditions in the Colorado River Basin. Of the nine El Nino years since Lake Powell's construction in 1963, a third of the years were wet, a third were dry, and a third were similar to the historical average. Additionally, the driest and second wettest years during this period were El Nino years.*

An increase in Pacific hurricanes is expected with El Nino signal. Numerous Pacific storm systems have contributed to storm activity locally, such as Norbert and Odile in 2014.