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Southwest Climate Outlook

Vol. 11 Issue 10

Credit: CLIMAS

The issue features the summaries of the 2012 water year, which began on October 1, 2011 and ended on September 30, 2012. It was marked by changes in reservoir storage, drought, and many other climate and weather conditions.

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In this issue...

October Climate Summary

Drought- Drought conditions remain virtually unchanged from one month ago; all of Arizona and New Mexico are classified with at least moderate drought.

Temperature- Temperatures have been above average in nearly the entire Southwest in the last month; the warmest regions in both states have been 2–4 degrees F above average.

Precipitation- Dry conditions reigned during the last month in the Southwest. Southern Arizona and western New Mexico, where the monsoon ended early, have been the driest.

ENSO- A once-budding El Niño event faltered further this past month. While El Niño still has a greater than 50 percent chance of developing, if it does form it will likely be weak and short-lived.

Climate Forecasts- Temperatures will likely be warmer than average in coming months, while precipitation forecasts do not point to any trends one way or another.

The Bottom Line- Since the monsoon ended in September, rainfall has been scant across most of the Southwest, notably in southern portions of Arizona and western New Mexico. This is not unexpected as September and October are often dry, and recent dry weather has reinforced the widespread and intense drought in both Arizona and New Mexico. Currently, most of the Southwest is classified with at least moderate drought, and about 31 and 63 percent of Arizona and New Mexico, respectively, are classified with at least severe drought. In the last year, precipitation has also been below average in most of the Southwest and upper Rio Grande and Colorado River basins, which has contributed to an expansion of drought during this period. It is not all bad news, however. Drought in many areas is not as extreme compared to one year ago. Looking forward, a wet winter is needed to help mitigate widespread impacts, which include low reservoir levels across both states. In New Mexico, 10 of 13 reporting reservoirs have storage less than 18 percent of capacity, including Elephant Butte, which now sits at only 5 percent full. Only a few months ago, the prospect of a wet winter was rosy because conditions in the tropical Pacific Ocean favored the development of an El Niño event; El Niños increase chances for wet winter weather in the Southwest. But in the last few months, odds for an El Niño have declined, and the current forecast is that El Niño has a slightly better than 50 percent chance of forming. Even if it does materialize, it is expected to be weak and short-lived and play a minor role in the winter weather. Without a strong El Niño signal, there are equal chances for above- or below-average precipitation during the November–January period. On the other hand, due in part to recent warming trends, temperatures will likely be above average in coming months, which may cause more precipitation to fall as rain rather than snow at mid-elevations this winter.

Higher Temperatures Linked to Tree Die-offs

In recent years, the southwest U.S. has been smothered in widespread and intense drought, which has been stressing forests. As a result, large fires erupted in the record-setting 2011 summer when more than one million acres burned in each of Arizona and New Mexico. Bark beetles have also torn through the landscapes and caused widespread tree mortality in recent years. While the cause of tree stress is often attributed to scant precipitation, temperatures also play a role. In fact, temperatures are as influential as rain in stressing trees, according to a new study published in *Nature Climate Change* in September.

The article's co-authors compared the tree-ring record to climate data collected in the Southwest over the 1896–2007 period, and identified two climate variables that estimate annual southwestern tree-growth variability with high accuracy: total winter precipitation and average summer and fall vapor pressure deficit (VPD). VPD is a measure of the dryness of the environment and is influenced by temperature. The warm-season VPD was determined to be at least as important as winter precipitation in influencing forest stress. This finding has implications for the future. The authors wrote: if the Southwest becomes warmer and drier, as projected by many climate models, widespread tree death is likely and would cause substantial changes in the distribution of forests and of species. The recent wildfires and bark beetle outbreaks may be evidence that this is already occurring, the authors note.

For more information, visit: http://www.sciencedaily.com/releases/2012/09/120930142106.htm

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2012 Water Year in Review

Introduction

The 2012 Water Year in Review is a summary of the information presented in the Southwest Climate Outlook between October 1, 2011, and September 30, 2012. The water year is a standard period of measurement used in hydrology because the natural seasonal ground recharge and discharge cycles are more aligned with the October–September period than the calendar year due to precipitation and evaporation patterns. This review highlights precipitation, temperature, reservoir levels, drought, wildfire, and El Niño-Southern Oscillation (ENSO) conditions over this 12-month period.

Heat and drought defined the water year, smothering the Midwest, in particular, during the spring and early summer. Temperatures during the water year were among the top five warmest on record in 39 of the 48 contiguous states, ranking as the 19th and fifth warmest on record in Arizona and New Mexico, respectively, out of 117 years. These conditions conspired with scant precipitation to cause many of the nation's fertile farmlands to wilt.

Warmer-than-average temperatures and below-average precipitation across nearly all of Arizona and New Mexico characterized the water year (see pages 4 and 5). Consequently, moderate or more severe drought covers almost the entire Southwest and drought conditions are now more widespread, though less intense, than they were at the beginning of the water year (see page 7). The fact that drought has persisted in many parts of the Southwest during the last two years is not surprising given the occurrence of a La Niña event during back-to-back winters (see page 9); La Niña conditions often deflect winter storms north of the Southwest. It was also a relatively dry winter in the headwaters of the Colorado River and Rio Grande in Colorado, where scant rain and snow contributed to storage declines in many reservoirs on these rivers (see page 6). Dry conditions also set the stage for wildland fires in the Southwest. Although this water year's fire season did not surpass the record number of acres burned last year, New Mexico's largest wildland fire on record—the Whitewater-Baldy Complex fire—tore across 298,000 acres in the west-central part of the state in and around the Gila National Forest, nearly doubling the size of the state's previously largest fire (see page 8).

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Top 5 headlines of the water year

1 Back-to-back La Niña Events A La Niña event re-emerged in September 2011, marking the second consecutive winter in which a La Niña influenced weather in the Southwest. The statewide November 2011–April 2012 precipitation for Arizona was 66 percent of average, while New Mexico fared slightly better, recording 91 percent of average.

2 Widespread but less intense drought Moderate drought now covers nearly 100 percent of Arizona and New Mexico, an increase of about 30 and 4 percent, respectively, since the water year began on October 1. Although drought has expanded, it has become less severe. Extreme or exceptional drought covered about 6 percent of Arizona on October 2, down from about 15 percent one year ago, and less than 1 percent of New Mexico, a decrease of about 34 percent from one year ago.

3 Monsoon: A tale of two states The position of the subtropical high pressure area allowed moist air to waft into Arizona. Southern areas of the state and the Mogollon Rim benefited the most, receiving above-average rainfall totaling 6.5 to 9.5 inches between July and September. The position of the high, however, limited rain in New Mexico and nearly all of the state received below-average rainfall.

4 Elephant Butte Reservoir nearly empty Winter rain and snow in the Upper Rio Grande Basin in Colorado, from which most of the water flowing in the Rio Grande originates, was below average for the fifth time in the last 10 years. Consequently, Elephant Butte Reservoir, which provides irrigation water to New Mexico's most productive agricultural region, stood at less than 5 percent of capacity and water available to farmers is now completely exhausted.

5 Colorado River streamflows tank Combined storage in Lakes Mead and Powell stood at 54 percent of capacity as of September 1, which is 7 percent lower than it was one year ago. Based on preliminary data, flow into Lake Powell for October 2011 to September 2012 was 5 million acre-feet (maf), or about 46 percent of average, making it the lowest inflow volume since 2002. Also, inflow between April and July was 2.06 maf, or 29 percent of average, which was the third smallest April to July volume since the closure of Glen Canyon Dam in 1963.

WYIR, continued

Temperature

Temperatures during the 2012 water year were 1 to 3 degrees Fahrenheit warmer than average across large swaths of both Arizona and New Mexico, with temperatures in Arizona generally slightly cooler than in New Mexico (*Figure 1a*). The warmest regions were northeastern New Mexico and Gila County in Arizona, where temperatures were 2 to 4 degrees F warmer than average (*Figure 1b*). The La Niña event, which prevailed during the winter, kept most of the cold winter storms north of both states. Those storms that crossed the region tended to waft over northern Arizona, bypassing southern regions and New Mexico. This helped cause temperatures to be well above average in New Mexico. In Arizona, most areas also experienced above-average temperatures, although they were slightly cooler than New Mexico. The one exception, where temperatures were below average, was in south-central Arizona. In this area, several cold winter storm and strong summer thunderstorm activity delivered significant rainfall and lowered temperatures. In the Southwest, a strong positive correlation exists between the amount of precipitation and temperature.

The dry winter and spring weather gave way to an active monsoon season in Arizona. Summer storm activity was more frequent in the western part of the state, bringing copious rain to the lower Colorado River valley and across central Arizona and cooling air temperatures there. The general position of the tropical high pressure area, however, prevented moist air from rolling into New Mexico; consequently the state was dry and warmer than average during the monsoon.

A view of the average temperatures for the water year reveals the impact topography has on temperature, with higher elevations cooler than lower areas (*Figure 1a*). Average temperatures on the Colorado Plateau, for example, were between 50 and 60 degrees F, with the highest mountains averaging between 40 and 50 degrees F. Southeastern New Mexico recorded average temperatures of 55 to 65 degrees F, while the southwestern deserts of Arizona were warmest, at 65 to 75 degrees F.

Figure 1a. Water year 2012 (October 1, 2011 through September 30, 2012) average temperature.*

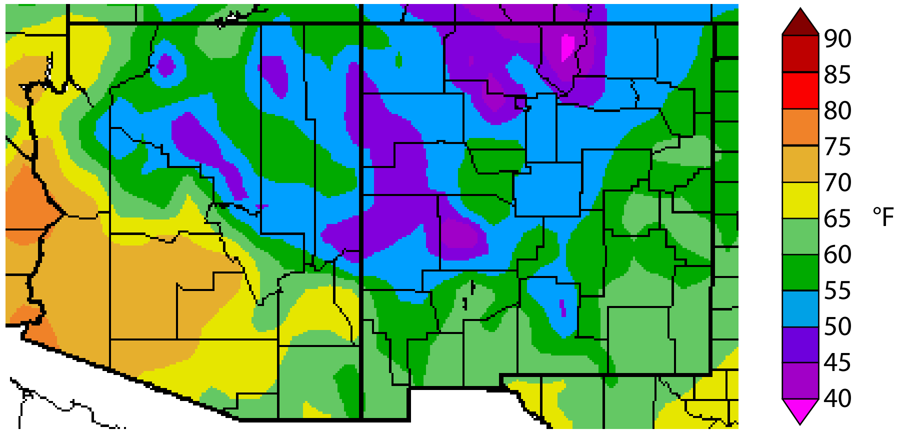
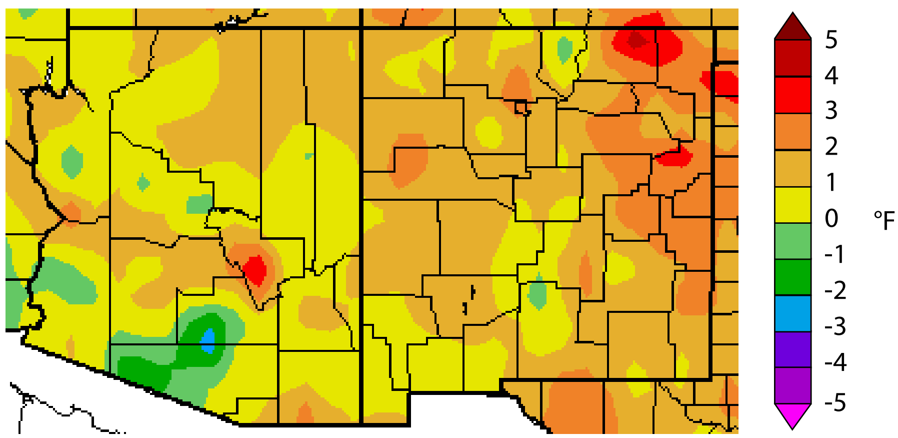


Figure 1b. Water year 2012 (October 1, 2011 through September 30, 2012) departure from average temperature*



** See "Notes" section on page 10 for more information on interpreting these figures.*

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WYIR, continued

Precipitation

Precipitation across most of Arizona and New Mexico during the 2012 water year was below average (*Figures 2a–b*). Precipitation deficits ranged from 0 to 8 inches in most regions of both states and up to 12 inches in a few locations in northern New Mexico. Deficits in Flagstaff were more than 6 inches (*Table 1*). There were a few exceptions in western Arizona. Above-average precipitation fell in central Mohave County, for example, bolstered by a few wet monsoon storms, and western Pima County also benefited from a few strong monsoon storms as well as a large winter storm. Departures from average precipitation can be misleading. Small departures may not seem significant, but in arid environments like the desert Southwest, a 2-inch rainfall deficit may equate to a 25- to 50-percent decrease in rainfall.

The La Niña event, which began in September 2011 and persisted through April 2012, helped push most storms north of Arizona and New Mexico. The winter was followed by an active monsoon that tended to favor the western half of Arizona, leaving eastern Arizona and most of New Mexico very dry. Southwestern Maricopa County and the Four Corners area have been the two driest locations in Arizona, as both winter and summer storm activity bypassed them. In New Mexico, precipitation in eastern regions has been less than 70 percent of average in the last 12 months. In the southwestern corner of the state, scant monsoon rainfall contributed to precipitation amounts of less than 50 percent of average. Overall, the below-average rain and snow in Arizona and New Mexico helped sustain drought conditions, which are both widespread and intense across the region. All of the Southwest is currently experiencing at least moderate drought, with severe and extreme conditions covering the areas that have experienced the driest conditions in the last year (see page 7).

Figure 2a. Water year 2012 (October 1, 2011 through September 30, 2012) departure from normal precipitation.*

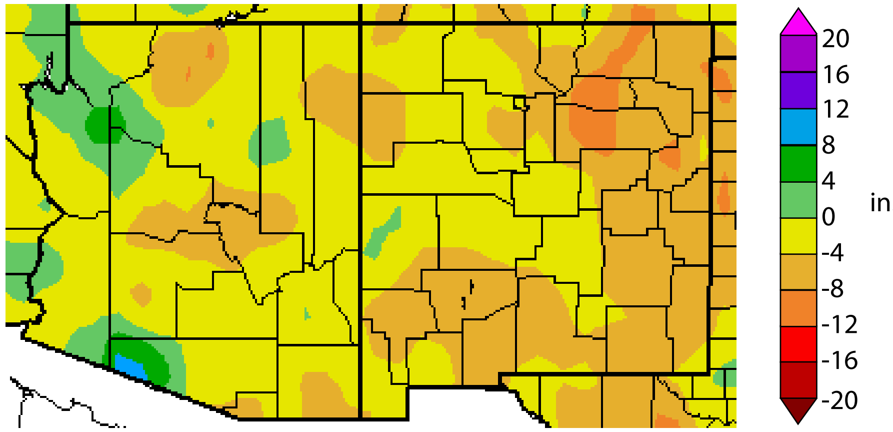
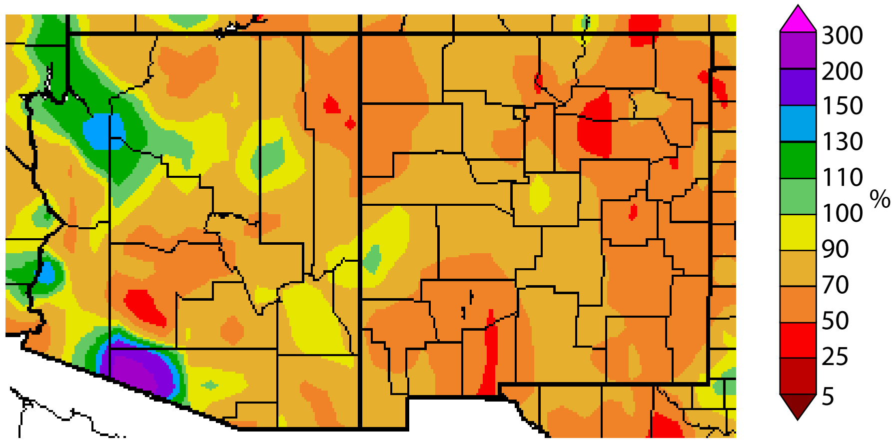


Figure 2b. Water year 2012 (October 1, 2011 through September 30, 2012) percent of average precipitation.*



** See "Notes" section on page 11 for more information on interpreting these figures.*

Table 1. Water year 2012 precipitation values (in inches) for select cities.

City	WY 2012 Precipitation	Average WY Precipitation	2012 Departure from Average	2011 Departure from Average
Phoenix, AZ	5.38	8.03	-2.65	-3.65
Tucson, AZ	9.76	12.17	-2.41	-2.08
Douglas, AZ	9.17	13.76	-4.59	-6.64
Albuqu.,NM	8.04	9.47	-1.43	-6.21
Winslow, NM	6.95	8.03	-1.08	-1.99
Flagstaff, AZ	16.73	22.91	-6.18	-0.09
Yuma, AZ	3.92	3.05	+0.87	-1.38
El Paso, TX	6.81	9.43	-2.62	-4.80

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WYIR, continued

Reservoirs

Arizona. Storage in most reservoirs across the Southwest declined in the last 12 months as a result of lower-than-average precipitation and above-average temperatures. In Arizona, total reservoir storage in San Carlos Reservoir on the Gila River and in the Salt and Verde river reservoir systems decreased by about 305,700 acre-feet during the 2012 water year (*Table 2*). The La Niña event, which began in September 2011 and persisted through April 2012, robbed Arizona watersheds of much-needed winter snow. That event also affected the Colorado River, where combined storage in Lakes Powell and Mead decreased by 3.65 million acre-feet (maf; *Figure 3*). The 2012 water year inflow to Lake Powell was 4.91 maf, or about 46 percent of average, placing 2012 as the third driest water year on record—only 2002 and 1977 registered lower inflows.

New Mexico. In New Mexico, total reservoir storage was about 431,700 acre-feet less than it was one year ago, not including changes in storage for El Vado and Heron reservoirs, which did not report storage values in October 2011. Like in Arizona, back-to-back La Niña events in the 2011 and 2012 winters helped steer storms north of the state, starving headwaters of snow and contributing to substantially lower reservoir levels than those recorded in 2010 prior to the onset of La Niña conditions. In New Mexico's largest reservoir, Elephant Butte, storage decreased by 95,000 acre-feet, halving the amount of water that was stored in the reservoir at the beginning of the water year. As a result of low reservoir levels, irrigators in the lower Rio Grande Valley received only 10 inches of surface water—a full allotment is 36 inches. It was the ninth time in the last 10 years irrigation allotments were low. In the Navajo Reservoir in the San Juan River Basin, the state's second-largest reservoir, storage declined by more than 293,000 acre-feet, or about 17 percent (*Table 3*). Reservoir storage on the Pecos River also fell by more than one-third during the water year, dropping by 6,800 acre-feet.

Figure 3. Combined storage in Lakes Mead and Powell

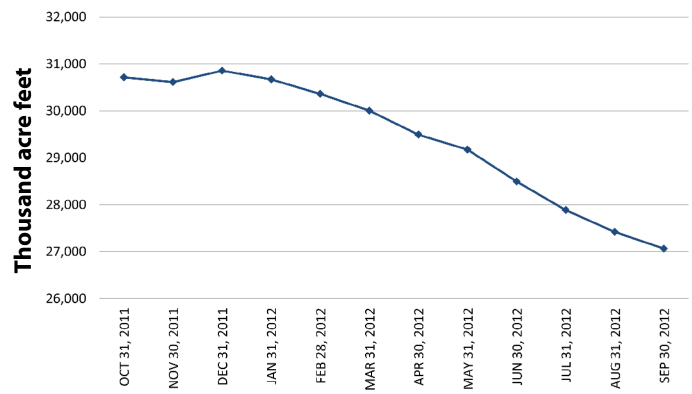

Table 2. Selected Arizona reservoirs' water year statistics.

Reservoir	Oct. 11 Percent full	Sept. 12 Percent full	WY Peak Percent	Peak Month
Powell	71	57	71	October
Mead	51	50	57	February
Gila	1	1	3	March
Verde	30	31	31	September
Salt	71	55	72	March

Table 3. Selected New Mexico reservoirs' water year statistics.

Reservoir	Oct. 11 Percent full	Sept. 12 Percent full	WY Peak Percent	Peak Month
Navajo	78	61	79	April
Heron	57*	48	66	June
Elephant Butte	9	5	18	March
Conchas	7	2	7	December
Santa Rosa	2	1	4	April
Brantley	1	0	3	April

* based on estimated value

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WYIR, continued

Drought

The moderate-to-strong La Niña event that persisted during the 2010–2011 winter led to record low precipitation across the Southwest. This led to rapidly intensifying and expanding drought conditions across much of Arizona and New Mexico that the ensuing mediocre monsoon did not alleviate. By the beginning of the 2012 water year, the drought was widespread and intense in the Southwest, with extreme or exceptional drought covering more than 30 and 63 percent of Arizona and New Mexico, respectively. Dry conditions persisted through October and November, further helping to entrench drought conditions that covered most of Arizona and New Mexico (*Figure 4a*). In December an unusually wet weather pattern delivered above-average precipitation in Arizona, despite the formation of a second consecutive La Niña event. New Mexico, however, received less moisture. Drought conditions improved to moderate levels across Arizona by mid-February, but severe to exceptional drought continued to cling to much of New Mexico (*Figure 4b*).

The 2011–12 La Niña, albeit a weaker event than the one in the preceding winter, brought the return of dry weather to the Southwest between January and April. Very little precipitation fell during this period, leading to the reemergence of severe drought conditions in many parts of Arizona and western New Mexico. By mid-May, some level of drought blanketed all of Arizona and New Mexico, with most areas classified with at least severe drought (*Figure 4c*). Monsoon precipitation hit the region in late June and early July, slightly earlier than average. By the end of the summer, monsoon precipitation was close to normal for much of Arizona but below average for most of New Mexico. The monsoon helped improve short-term drought conditions in Arizona, but led to the intensification of drought in some parts of New Mexico (*Figure 4d*). The water year ended with at least moderate drought covering all of Arizona and New Mexico.

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Figure 4a. Drought Monitor released November 22, 2011.*

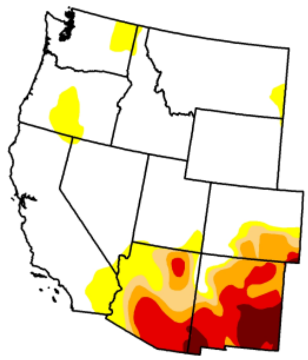


Figure 4b. Drought Monitor released February 21, 2012.*

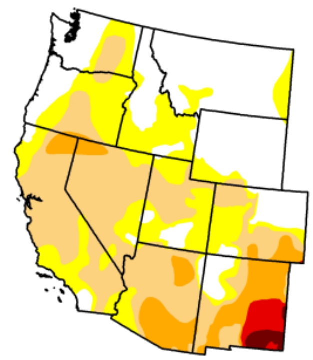


Figure 4c. Drought Monitor released May 22, 2012.*

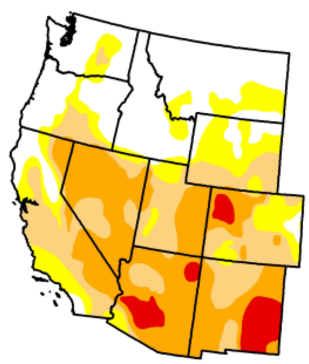
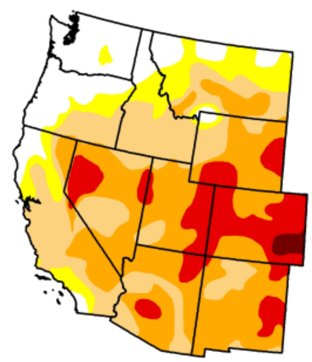
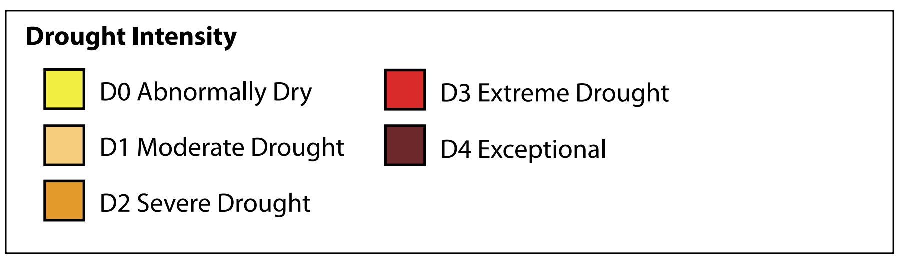


Figure 4d. Drought Monitor released August 21, 2012.*





** See "Notes" section on page 12 for more information on interpreting these figures.*

WYIR, continued

Wildfire

The number of wildland fires between January 1 and October 4, the period that includes the bulk of the fires and acres burned in the 2012 water year, was below average in Arizona but above average in New Mexico. The fire season this year followed the typical timeline, with wildfires beginning in earnest in May and peaking in June to early July. The onset of the monsoon in early July helped extinguish fires and increased soil and fuel moisture levels, reducing the number of new fire starts thereafter. The fire season began with similar conditions as last year, as above-average temperatures and below-average precipitation during the winter and spring months elevated fire risk by reducing moisture levels in soils and live fuels such as grasses, shrubs, and trees. This year, however, was not as damaging as the 2011 fire season, when approximately one million acres—the most on record in Arizona and New Mexico—burned in each state.

In Arizona, majority of the fires burned in the Southeast corner of the state (*Figure 5a*), with fires charring about 163,250 acres—about 50,000 acres less than the 1990–2011 average. In New Mexico, nearly 372,500 acres burned, which was about 105,000 more acres than the 1990–2011 average. The majority of these acres burned in 22 fires (*Figure 5b*). New Mexico's largest wildfire this year, the Whitewater Baldy Complex fire, torched about 298,000 acres, or about 80 percent of the total acres burned in the state (*Table 4*). The blaze was caused by two lightning strikes on May 16 in the Gila National Forest near Glenwood and nearly doubled the state wildfire record set by last year's Las Conchas fire, which burned more than 150,000 acres. The second largest fire in the region was the Little Bear fire, which burned more than 44,330 acres beginning on June 4 in the Lincoln National Forest, northwest of Ruidoso, NM. The Grapevine fire, the largest in Arizona this year, tore through the Coronado National Forest near Safford on June 28. This lightning-caused fire burned 19,100 acres.

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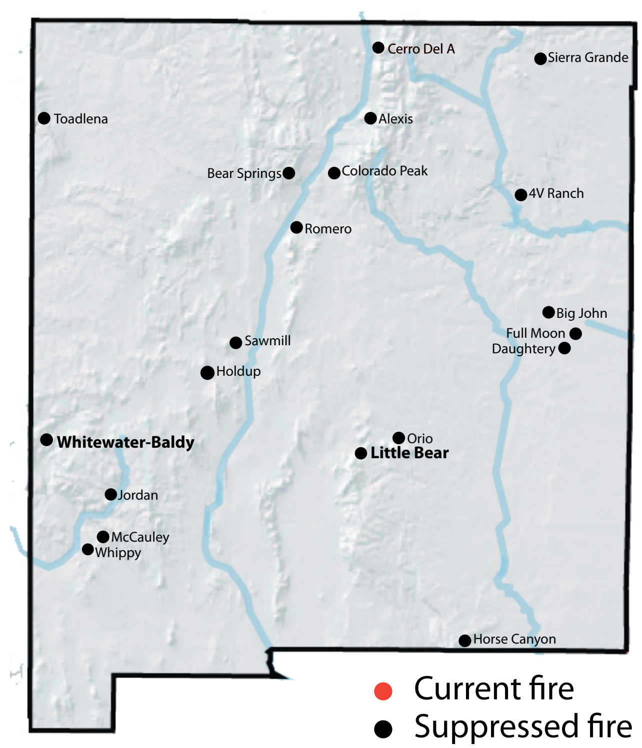
Table 4. Ten Largest Southwest fires in 2012.

Fire Name	State	Acres Burned
Whitewater-Baldy	NM	297,845
Little Bear	NM	44,330
Grapevine	AZ	19,100
Black Canyon	AZ	18,300
Sunflower	AZ	17,446
Gladiator	AZ	16,240
Poco	AZ	11,950
Canyon	AZ	8,716
Fox	AZ	7,500
Cooks Complex	AZ	7,446

Figure 5a. Arizona large fire incidents as of September 30, 2012.

Figure 5b. New Mexico large fire incidents as of September 30, 2012.



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El Niño

Sea Surface Temperatures

La Niña dominated the headlines again this water year, and the event sent shockwaves across the atmosphere that helped bring drier-than-average conditions to the Southwest. It was the second consecutive winter in which La Niña was present; back-to-back La Niña events often occur if the first one is relatively strong, like it was in the winter of 2010–2011.

The 2012 water year began with weak La Niña conditions returning to the equatorial Pacific Ocean in September after brief hiatus between May and August (*Figures 6a–b*). During the early winter months, sea surface temperatures (SSTs) in the eastern Pacific Ocean along the equator continued to cool and the event peaked in February, reaching weak to moderate strength. The La Niña began to dissipate thereafter and officially ended in April. Even though this La Niña was relatively weak compared to the previous year's event, it had a substantial impact on weather patterns across the western U.S. throughout the winter. During the January–March period, for example, the winter storm track took on a more northerly route, dumping above-average precipitation on the Pacific Northwest but leaving much of the Southwest with below-average rain and snow, which is the typical pattern during La Niña events. This was the second winter in a row with below-average precipitation, leading to worsening drought conditions across the region.

ENSO-neutral conditions in April and May gave way to borderline El Niño conditions in June as SSTs warmed. This rapid increase in temperature gave rise to forecasts that an El Niño event would emerge during the late summer. By August, however, the eastern Pacific Ocean began to cool. The water year ended with ENSO-neutral conditions in control and the prospects of a developing El Niño event uncertain.

Figure 6a. Map of the El Niño 3.4 region. The yellow box outlines the region. Graphic credit: International Research Institute for Climate and Society.

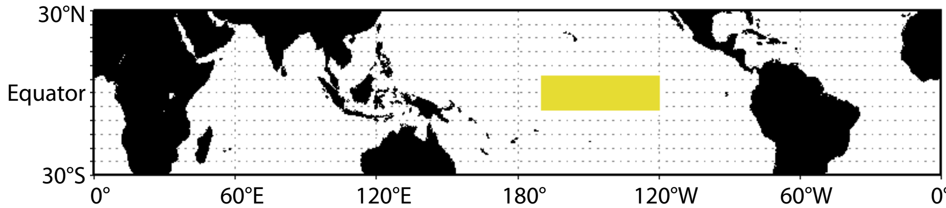
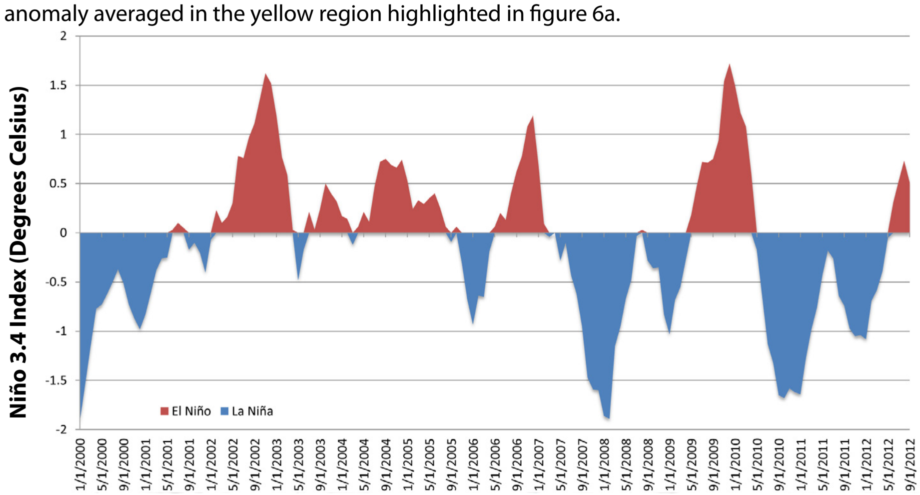


Figure 6b. Monthly values of the Niño 3.4 index, which is computed as the temperatures anomaly averaged in the yellow region highlighted in figure 6a.



Southern Oscillation Index

The Southern Oscillation Index (SOI), a measure of the atmospheric response to El Niño or La Niña conditions, showed positive values that are characteristic of La Niña events for the duration of the event. SOI values rose to moderate levels as La Niña conditions developed early in the water year, then peaked in December and quickly decreased throughout the winter and early spring as the La Niña event weakened. SOI values returned to close to zero by May and even became slightly negative in early summer, when SSTs warmed slightly in the eastern Pacific Ocean. This was the first sign that the atmosphere was being shifted by a developing El Niño event. That El Nino event never fully materialized and the water year ended with SOI values reflecting ENSO-neutral conditions.

Temperature (through 10/18/12)

Data Source: High Plains Regional Climate Center

Temperatures since the water year began on October 1 have averaged between 65 and 80 degrees Fahrenheit in the southwest deserts and along the Arizona-California border, 50 to 60 degrees F across the Colorado Plateau in Arizona, and 45–60 degrees F across most of New Mexico (*Figure 1a*). This temperature pattern is typical of the early fall season where the transition from summer to fall temperatures occurs much more slowly in the deserts than in the higher elevations. Nighttime temperatures in the high elevations have already dipped below freezing, while the deserts have still had high temperatures in the low 100s and upper 90s. Since October 1, average temperatures in Southern Arizona and most of New Mexico have been 0 to 2 degrees F warmer than average, while the northern half of Arizona and central New Mexico have been 2 to 4 degrees F warmer than average so far this year (Figure 1b). Only eastern New Mexico is starting the water year with cooler-than-average temperatures. In the last month, temperatures have similarly been above average in nearly all the Southwest (*Figures 1c–d*). The map of the past 30 days shows the water year is beginning with the same warm pattern as the last water year ended.

Looking ahead, warmer-than-average conditions are forecast to continue through winter and into spring for the Southwest (see page 17). If warmer-than-average conditions occur, they will have a significant impact on the western snowpack by causing more rain to fall instead of snow at the elevations largely below 8,500 feet above sea level. This would, in turn, reduce the spring runoff.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2012, we are in the 2013 Water year. Water year is more commonly used in association with precipitation; water year temperature can be used to measure the temperatures associated with the hydrological activity during the water year.

Average refers to the arithmetic mean of annual data from 1971–2000. Departure from average temperature is calculated by subtracting current data from the average. The result can be positive or negative.

The continuous color maps (Figures 1a, 1b, 1c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. The dots in Figure 1d show data values for individual stations. Interpolation procedures can cause aberrant values in data-sparse regions.

These are experimental products from the High Plains Regional Climate Center.

On the Web:

For these and other temperature maps, visit
http://www.hprcc.unl.edu/maps/current/

For information on temperature and precipitation trends, visit
http://www.cpc.ncep.noaa.gov/trndtext.shtml

Figure 1a. Water year 2013 (October 1 through October 18) average temperature.

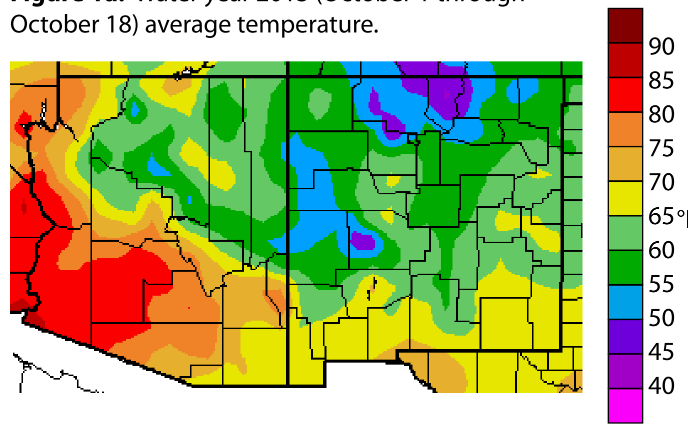


Figure 1b. Water year 2013 (October 1 through October 18) departure from average temperature.

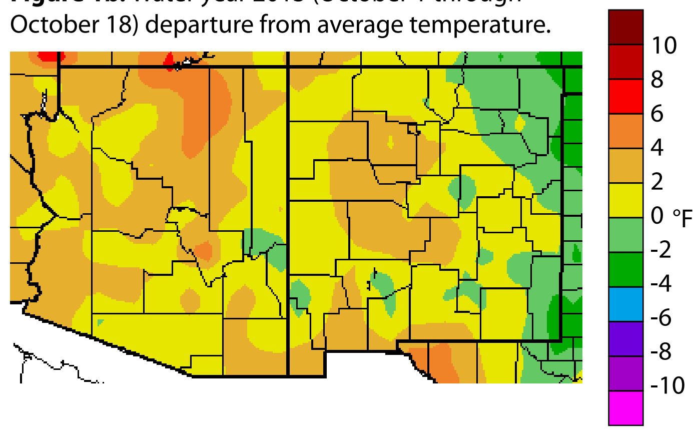


Figure 1c. Previous 30 days (September 19–October 18 departure from average temperature (interpolated).

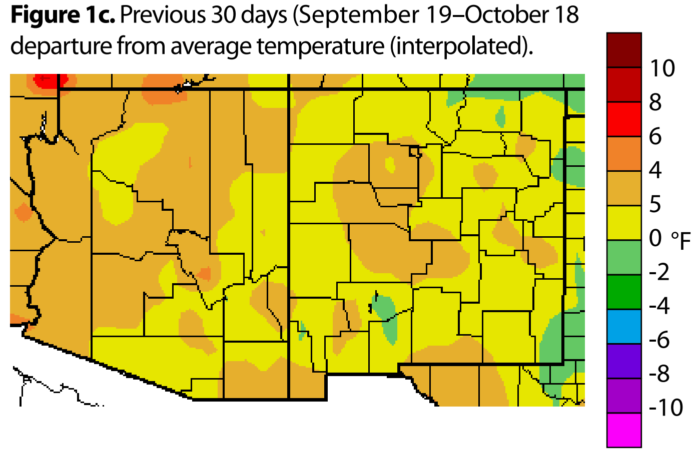
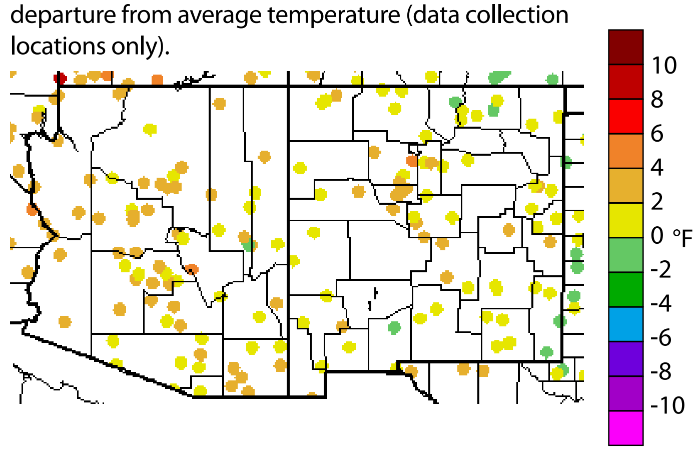


Figure 1d. Previous 30 days (September 19–October 18 departure from average temperature (data collection locations only).



Precipitation (through 10/17/12)

Data Source: High Plains Regional Climate Center

While precipitation since the water year began on October 1 is much wetter than average across southern Nevada and the western border of Arizona, the wet pattern stops at the western counties of Arizona (*Figures 2a–b*). The driest conditions have been in western New Mexico and southern Arizona where rainfall has been virtually absent. However, this is only an 18-day period and it is not unexpected to have dry conditions in October. Elsewhere, northern Arizona is faring a little better than southern regions of the state, but precipitation is still well below average for October, as it is in east-central New Mexico.

An active monsoon in some regions, particularly southern and western Arizona, helped make up for precipitation deficits in these regions. However, the monsoon ended early in September and storms during the second half of the monsoon were more common in Arizona than New Mexico, leaving New Mexico very dry. Fortunately a few storms pushed across Texas into southeastern New Mexico in late September, and this area also benefitted from moisture from Hurricane Paul (*Figures 2c–d*). Also, in the last month, northeastern New Mexico benefitted from an early winter storm.

Looking ahead, precipitation forecasts do not provide any indication whether rain and snow will be above average or not in coming months (see page 18). While an El Niño event is still likely on the horizon—which would increase chances for a wet winter—the state of ENSO has been looking more like ENSO-neutral in recent months. If neutral conditions persist, the region would still experience normal yearly variability in the number and intensity of winter storms.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2012, we are in the 2013 water year. The water year is a more hydrologically sound measure of climate and hydrological activity than is the standard calendar year.

Average refers to the arithmetic mean of annual data from 1971–2000. Percent of average precipitation is calculated by taking the ratio of current to average precipitation and multiplying by 100.

The continuous color maps (Figures 2a, 2c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. Interpolation procedures can cause aberrant values in data-sparse regions.

The dots in Figures 2b and 2d show data values for individual meteorological stations.

On the Web:

For these and other precipitation maps, visit http://www.hprcc.unl.edu/maps/current/

For National Climatic Data Center monthly state of the climate reports, visit http://www.ncdc.noaa.gov/sotc/

Figure 2a. Water year 2013 (October 1 through October 17) percent of average precipitation (interpolated).

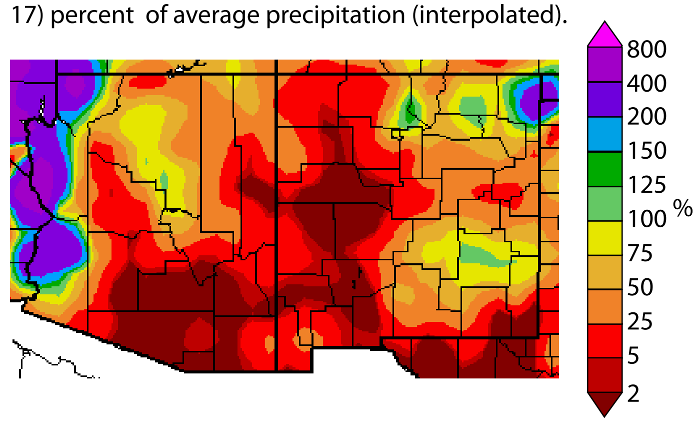


Figure 2b. Water year 2013 (October 1 through October 17) percent of average precipitation (data collection locations only).

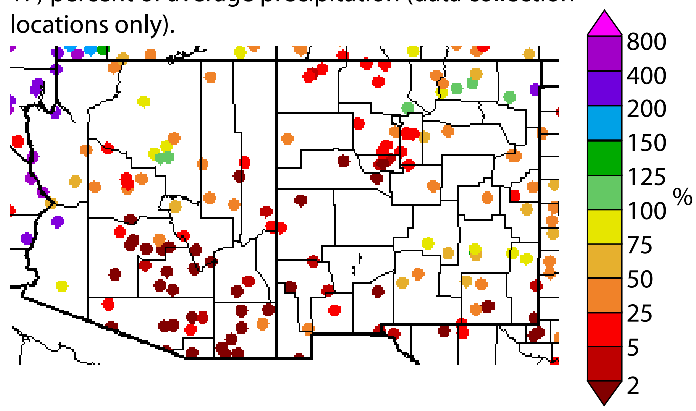


Figure 2c. Previous 30 days (September 18–October 17) percent of average precipitation (interpolated).

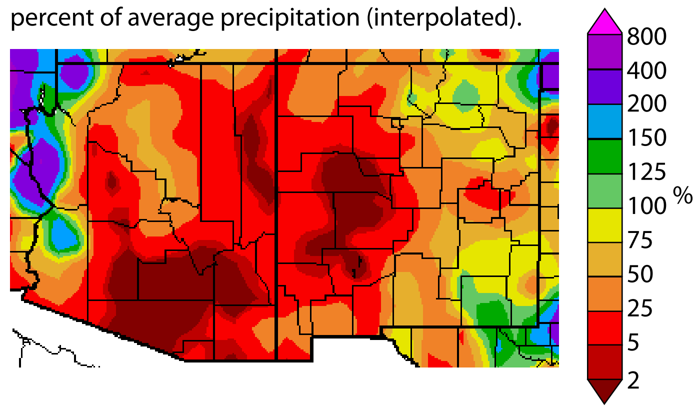
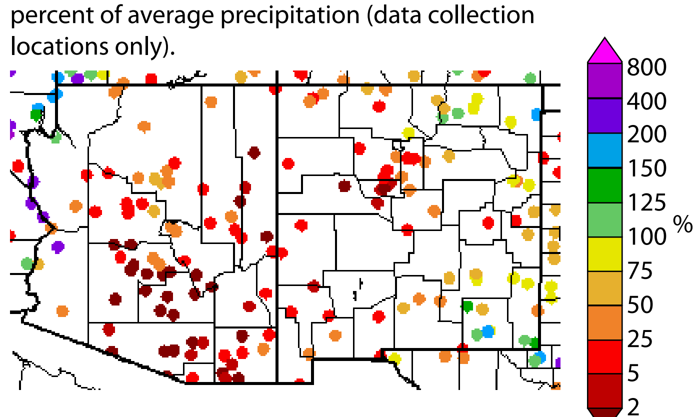


Figure 2d. Previous 30 days (September 18–October 17) percent of average precipitation (data collection locations only).



U.S. Drought Monitor (data through 10/16/12)

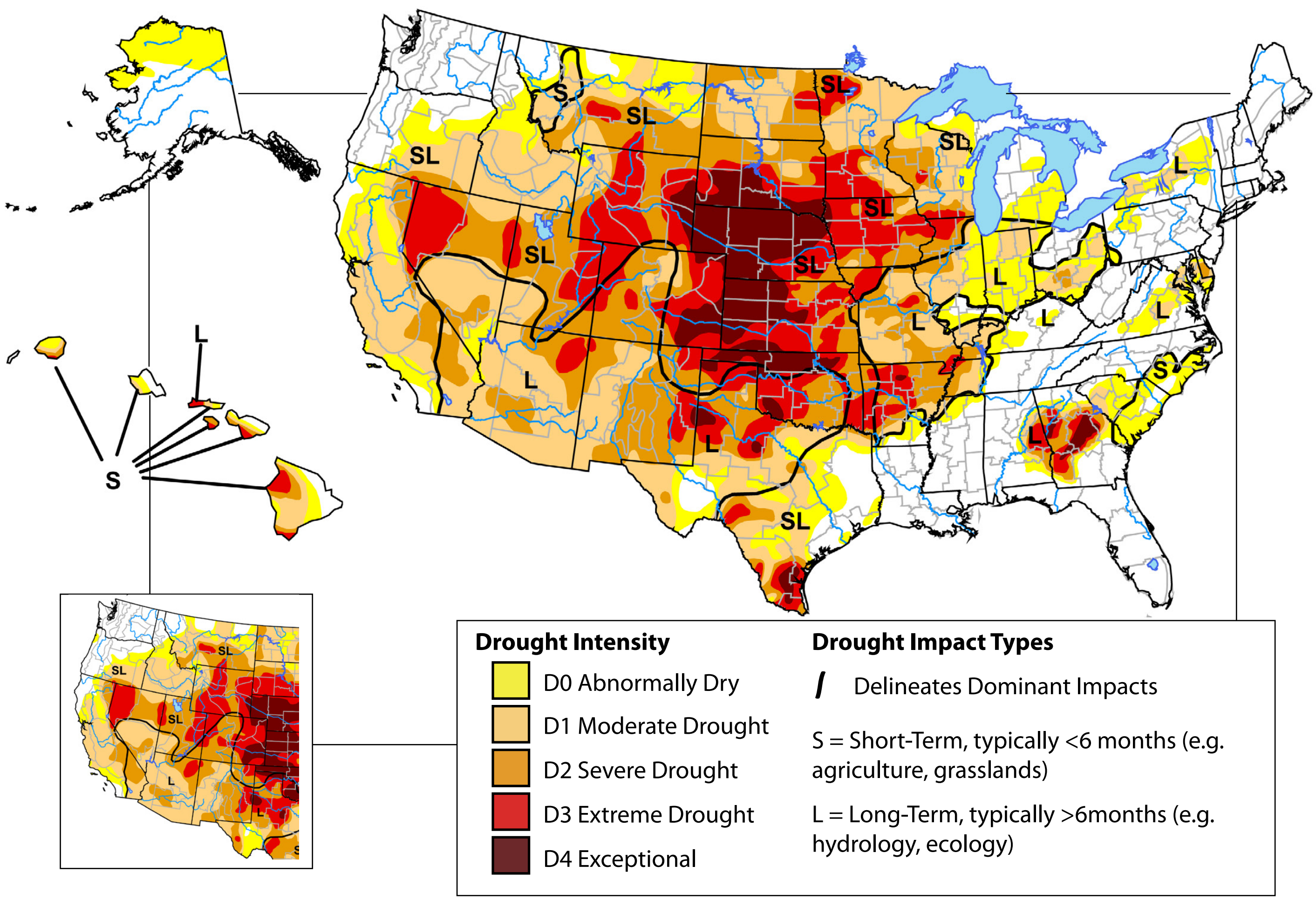
Data Sources: U.S. Department of Agriculture, National Drought Mitigation Center, National Oceanic and Atmospheric Administration

Most of the western U.S. is suffering under drought conditions, according to the October 16 update of the U.S. Drought Monitor (*Figure 3*). More than 76 percent of the 11 continental western states are experiencing moderate or more severe drought conditions, almost identical to last month. Parts of Nevada, Utah, Wyoming, and Colorado continue to endure the most intense drought conditions due to increasing precipitation deficits over the past several months. Very small and isolated improvements have occurred in the last month in southern Nevada where conditions improved from moderate drought to abnormally dry due to above-average precipitation in late September. The Pacific Northwest is the only region generally void of drought conditions, the result of copious precipitation that fell last winter. However, compared to one year ago, the severity and geographic extent of drought has substantially increased in most of the West. On October 18, 2011, for example, 18 percent of the continental western states was classified as having at least moderate drought and only about 13 percent was pegged with severe or extreme drought; these conditions were almost entirely confined to Arizona and New Mexico. Currently, about 41 percent of the West is covered in severe and extreme conditions. The dry winter and hot summer played a leading role in expanding and intensifying drought across the West.

Notes:

The U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The inset (lower left) shows the western United States from the previous month's map. The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of several agencies.

Figure 3. Drought Monitor data through October 16, 2012 (full size), and September 18, 2012 (inset, lower left).



On the Web:

The best way to monitor drought trends is to pay a weekly visit to the U.S. Drought Monitor website http://www.drought.gov

Arizona Drought Status

(data through 10/16/12)

Data Source: U.S. Drought Monitor

Dry conditions over the past thirty days kept moderate to severe drought conditions firmly entrenched across most of Arizona (*Figures 4a–b*). Above-average temperatures during this period also did little to help alleviate short- and long-term drought impacts to vegetation and water resources that are present across the state. Currently, all of Arizona continues to experience some level of drought and 98 percent of the state is experiencing moderate or worse drought conditions, according to the October 16 update of the U.S. Drought Monitor. A very slight improvement occurred along the Colorado River valley in Mohave County in the last month where conditions upgraded from moderate drought to abnormally dry conditions due to above average precipitation falling in late September. Otherwise, the pattern of drought is identical to one month ago.

Compared to one year ago, however, moderate or a more severe drought category covers about 30 percent more of Arizona. On the positive side, about 10 percent less area is now afflicted with extreme and exceptional drought compared to mid-October, 2011.

The Vegetation Drought Index (VegDRI) produced by the National Drought Mitigation Center also shows widespread drought conditions across the state. This index measures the 'greenness' of vegetation using satellites imagery. On October 15, VegDRI indicated that vegetation in much of southeast and northeast Arizona is experiencing moderate to severe drought stress.

Notes:

The Arizona section of the U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of several agencies.

On the Web:

For the most current drought status map, visit http://droughtmonitor.unl.edu/DM_state.htm?AZ,W

For monthly short-term and quarterly long-term Arizona drought status maps, visit http://www.azwater.gov/azdwr/StatewidePlanning/Drought/default.htm

Figure 4a. Arizona drought map based on data through October 16.

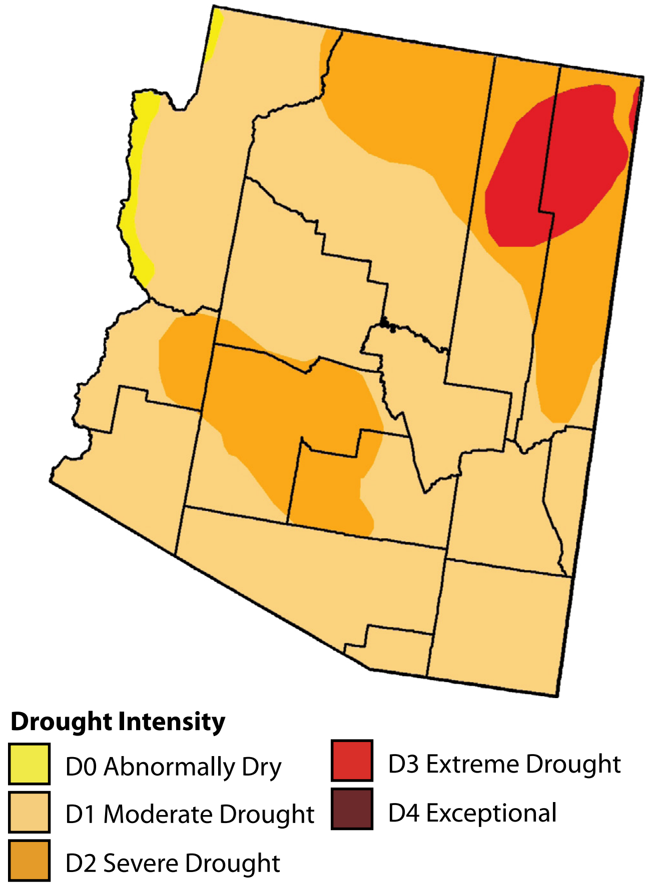


Figure 4b. Percent of Arizona designated with drought conditions based on data through October 16.

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	98.66	31.28	5.67	0.00
Last Week (10/09/2012 map)	0.00	100.00	100.00	31.42	5.67	0.00
3 Months Ago (07/17/2012 map)	0.00	100.00	100.00	94.07	26.33	0.00
Start of Calendar Year (12/27/2011 map)	16.70	83.30	60.34	36.56	2.78	0.00
Start of Water Year (09/25/2012 map)	0.00	100.00	100.00	31.93	5.67	0.00
One Year Ago (10/11/2011 map)	0.89	99.11	69.11	42.81	15.12	1.24

New Mexico Drought Status

(data through 10/16/12)

Data Source: New Mexico State Drought Monitoring Committee, U.S. Drought Monitor

Drought conditions remained virtually unchanged across New Mexico over the past thirty days. Some parts of eastern New Mexico received average to above-average precipitation over this period, but it wasn't enough to substantially improve short- and longer-term drought conditions, which continue to persist. All of the state continues to experience some level of drought with almost 100 percent at the moderate level or worse, according to the October 16 update of the U.S. Drought Monitor (*Figures 5a–b*). More than 66 percent of the state is experiencing drought conditions at the severe level, with 12 percent at the extreme level or worse. Compared to one year ago, drought conditions have substantially improved, however. On October 18, 2011, the U.S. Drought Monitor classified 63 percent of the state with extreme or exceptional drought. Currently, this number is about 11.5 percent. However, whereas the northwest corner of the state was drought-free at the end of 2011, it is now experiencing severe or extreme drought.

In drought-related news, dire drought conditions in Texas and New Mexico have driven up the occurrence of grass thefts across the region (Associated Press, October 3). This includes stealing hay, cutting fences, and leaving gates open so cattle can move into other pastures. One incident in Colorado resulted in the theft of more than $5,000 in hay from a ranch.

Figure 5a. New Mexico drought map based on data through October 16.

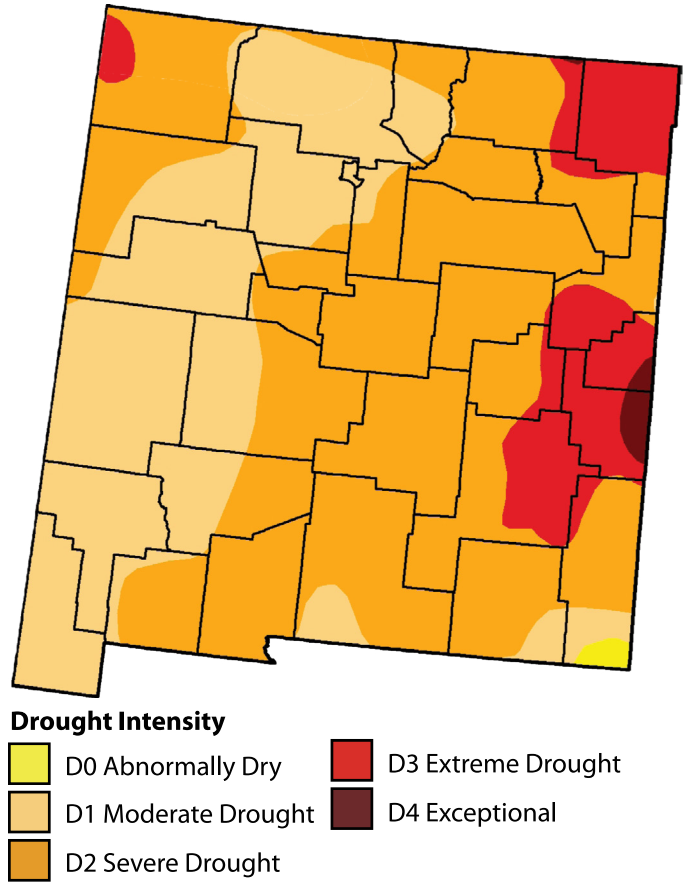


Figure 5b. Percent of New Mexico designated with drought conditions based on data through October 16.

	Drought Conditions (Percent Area)					
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	99.63	66.52	11.45	0.68
Last Week (10/09/2012 map)	0.00	100.00	99.84	62.37	12.28	0.68
3 Months Ago (07/17/2012 map)	0.00	100.00	99.78	79.57	25.98	0.00
Start of Calendar Year (12/27/2011 map)	8.63	91.37	87.60	72.15	23.37	7.57
Start of Water Year (09/25/2012 map)	0.00	100.00	100.00	62.56	12.25	0.66
One Year Ago (10/11/2011 map)	2.44	97.56	93.25	87.07	63.02	26.35

Notes:

The New Mexico section of the U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of several agencies.

This summary contains substantial contributions from the New Mexico Drought Working Group.

On the Web:

For the most current drought status map, visit http://droughtmonitor.unl.edu/DM_state.htm?NM,W

For the most current Drought Status Reports, visit http://www.nmdrought.state.nm.us/MonitoringWorkGroup/wk-monitoring.html

Arizona Reservoir Levels

(through 9/30/12)

Data Source: National Water and Climate Center

Combined storage in Lakes Mead and Powell is at 53.6 percent of capacity, a slight decrease from last month (*Figure 6*). The 2012 water year inflow to Lake Powell was only 45.3 percent of average, the third-lowest inflow since the closure of Glen Canyon Dam in 1963, according to the Bureau of Reclamation. The low inflow was primarily due to a lack of winter snowpack in the Upper Colorado River Basin. Scant precipitation was related to the La Niña event, which helped push storms north of the region. Aside from lakes Mohave and Havasu in the Lower Colorado River Basin, the Salt River Basin reservoir system is the only other location in the state with above-average storage reported.

In water-related news, the Gila River Indian Community (GRIC) will be partnering with Salt River Project (SRP) to restore Gila River riparian habitat and create water storage credits that the community can eventually sell to finance future infrastructure development and other projects (*Ahwatukee Foothills News*, October 5). GRIC secured more than 311,000 acre-feet of Central Arizona Project water in the 2004 Arizona Water Settlements Act.

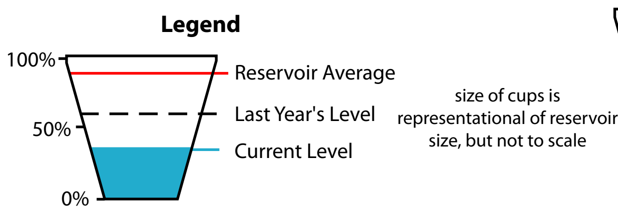
Notes:

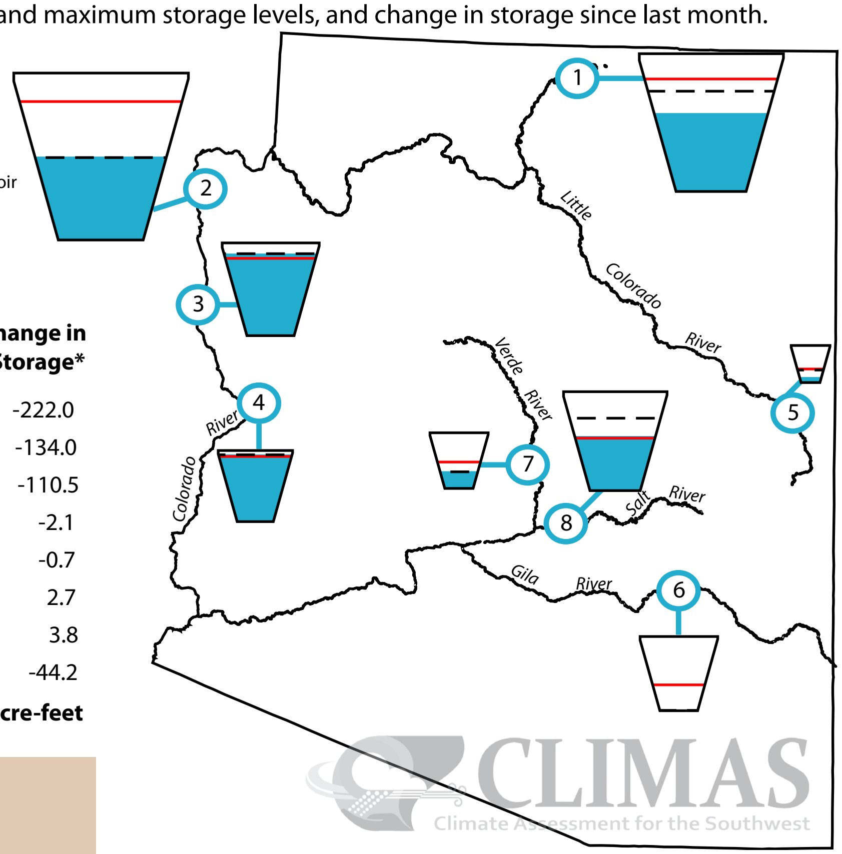
The map gives a representation of current storage levels for reservoirs in Arizona. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total 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 level (dotted line) and the 1971–2000 reservoir average (red line).

The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels 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 list 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).

Figure 6. Arizona reservoir levels for September as a percent of capacity. The map depicts the average level and last year's storage for each reservoir. The table also lists current and maximum storage levels, and change in storage since last month.





Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Lake Powell	57%	13.929.0	24,322.0	-222.0
2. Lake Mead	50%	13,135.0	26,159.0	-134.0
3. Lake Mohave	89%	1605.5	1,810.0	-110.5
4. Lake Havasu	95%	587.4	619.0	-2.1
5. Lyman Reservoir	15%	4.6	30.0	-0.7
6. San Carlos	1%	7.1	875.0	2.7
7. Verde River System	31%	90.5	287.4	3.8
8. Salt River System	55%	1,119.0	2,025.8	-44.2

*** thousands of acre-feet**

On the Web:

Portions of the information provided in this figure can be accessed at the NRCS website
http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html

New Mexico Reservoir Levels

(through 9/30/12)

Data Source: National Water and Climate Center

Storage in most New Mexico reservoirs remains well below average (*Figure 7*). Only Navajo reservoir has water storage above 50 percent capacity. In the last month, Navajo and Heron reservoirs experienced the greatest declines, amounting to about 67,000 and 32,000 acre-feet, respectively. The combined storage in Elephant Butte and Caballo reservoirs, located on the Rio Grande in central New Mexico, declined by about 6,000 acre-feet in September. Storage in nearly all reservoirs declined since the beginning of the water year in October 2011 as a result of below-average winter precipitation in most regions. Summer monsoon rain was also scant, bypassing most of New Mexico and limiting contributions to reservoir storage. USGS monthly streamflow for New Mexico basins (not shown) indicates that September flows were mostly in the lowest 25 percent of historic flows, even for this dry time of the year.

In water-related news, a group of New Mexico farmers in the Rio Grande valley filed suit against the Middle Rio Grande Conservancy Water District for unfair cuts to their water allocations during recent drought years (*Western Farm Press*, October 10). The water district reduced allocations equally to all members without regard to the senior water rights of some members.

Notes:

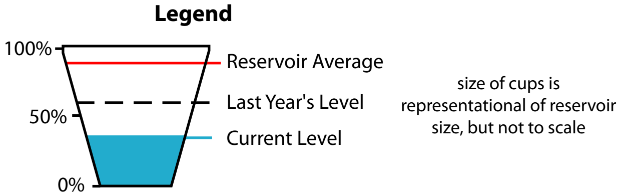
The map gives a representation of current storage levels for reservoirs in New Mexico. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total 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 level (dotted line) and the 1971–2000 reservoir average (red line).

The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels 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 list an increase or decrease in storage since last month. A line indicates no change.

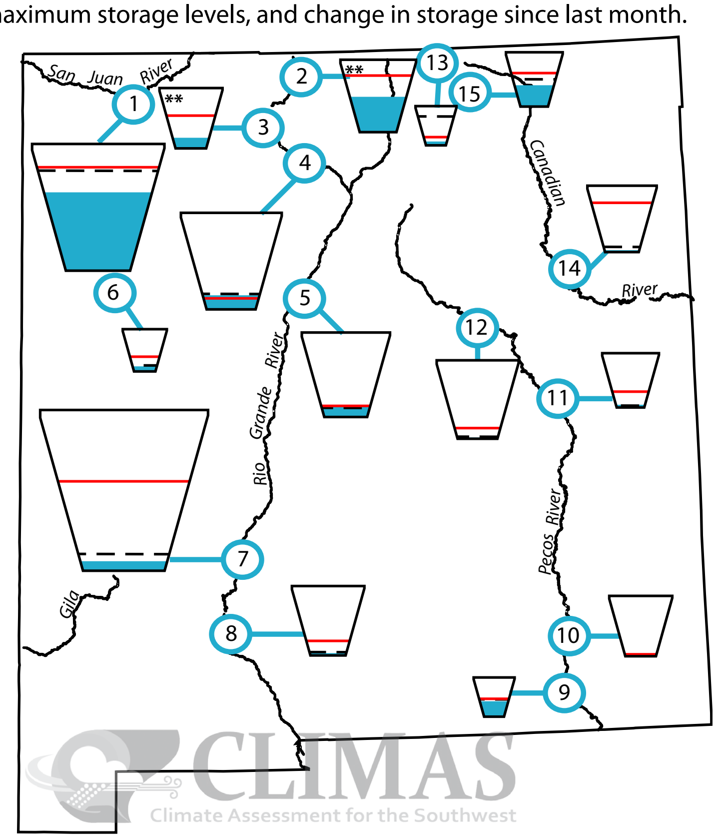
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's

Figure 7. New Mexico reservoir levels for September as a percent of capacity. The map depicts the average level and last year's storage for each reservoir. The table also lists current and maximum storage levels, and change in storage since last month.

Legend



Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Navajo	61%	1,033.1	1,696.0	-67.4
2. Heron	48%	192.0	400.0	-30.4
3. El Vado	17%	32.9	190.3	-1.8
4. Abiquiu	14%	163.5	1,192.8	15.9
5. Cochiti	11%	53.0	491.0	0.0
6. Bluewater	11%	4.1	38.5	0.0
7. Elephant Butte	5%	113.1	2,195.0	1.3
8. Caballo	2%	5.2	332.0	-7.5
9. Lake Avalon	38%	1.5	4.0	N/A
10. Brantley	0%	2.6	1008.2	N/A
11. Sumner	4%	3.9	102.0	N/A
12. Santa Rosa	1%	4.8	438.3	0.1
13. Costilla	9%	1.4	16.0	N/A
14. Conchas	2%	6.0	254.2	1.2
15. Eagle Nest	38%	30.3	79.0	-1.8



*** thousands of acre-feet**

N/A cooresponds to reservoirs that did not report storage values this month

**** Last year's level was not reported**

On the Web:

Portions of the information provided in this figure can be accessed at the NRCS website
http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html

Temperature Outlook
(November 2012–April 2013)

Data Source: NOAA-Climate Prediction Center (CPC)

The seasonal temperature outlooks issued by the NOAA-Climate Prediction Center (CPC) in October call for slightly increased chances that temperatures will be similar to the warmest 10 years in the 1981–2010 period for the three-month seasons spanning November–April (*Figures 8a–d*). Recent warming trends during these periods influence the forecasts, as do a suite of dynamical models. The CPC notes that a few wildcards remain in the deck that could influence temperatures in coming months. First, the fate of ENSO remains in doubt. While many forecast models were predicting an El Niño a few months ago, the chances for an event have been declining and the expectation is that even if one forms, it will be weak and short-lived. El Niño events often bring the Southwest wetter conditions, which, in turn, can cause generally cooler weather. The other uncertainty will be in the general character of the Arctic Oscillation (AO). A weak AO can allow cold Arctic air to spill south, and when entrained in storm tracks, can deliver very cold weather to the Southwest. The AO, however, is hard to forecast more than two weeks in advance.

Notes:

These outlooks predict the likelihood (chance) of above-average, average, and below-average temperature, but not the magnitude of such variation. The numbers on the maps do not refer to degrees of temperature.

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1981–2010 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the “average” category is preserved at 33.3 likelihood, unless the forecast is very strong.

Thus, using the NOAA-CPC temperature outlook, areas with light brown shading display a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average temperature. A shade darker brown indicates a 40.0–50.0 percent chance of above-average, a 33.3 percent chance of average, and a 16.7–26.6 percent chance of below-average temperature, and so on.

Equal Chances (EC) indicates areas where no forecast skill has been demonstrated or there is no clear climate signal; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a “default option” when forecast skill is poor.

Figure 8a. Long-lead national temperature forecast for November 2012–Jaunary 2013.

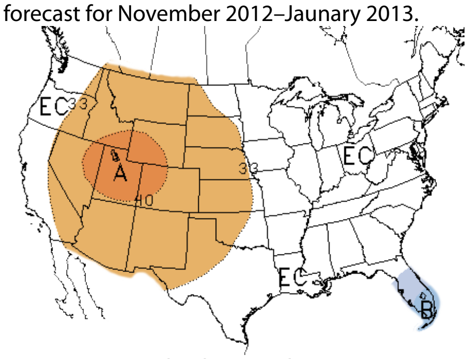
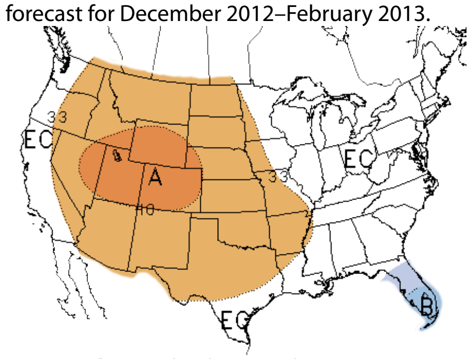


Figure 8b. Long-lead national temperature forecast for December 2012–February 2013.



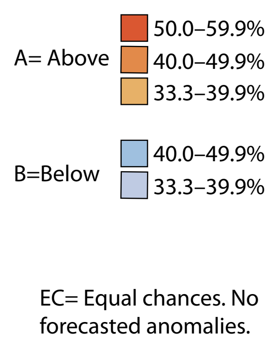


Figure 8c. Long-lead national temperature forecast for January–March 2013.

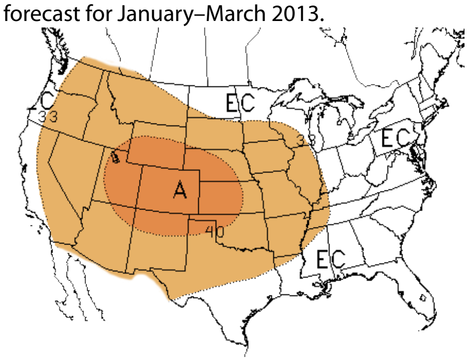
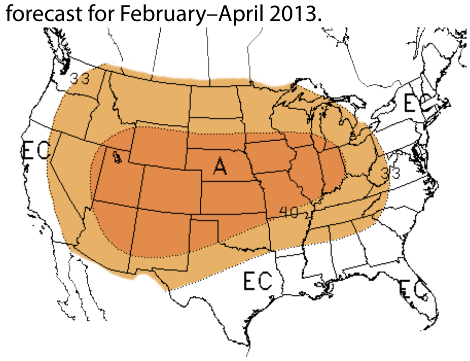


Figure 8d. Long-lead national temperature forecast for February–April 2013.



On the Web:

For more information on CPC forecasts, visit http://www.cpc.ncep.noaa.gov/products/predictions//multi_season/13_seasonal_outlooks/color/churchill.php

For seasonal temperature forecast downscaled to the local scale, visit http://www.weather.gov/climate/l3mto.php

For IRI forecasts, visit http://iri.columbia.edu/climate/forecast/net_asmt/

Precipitation Outlook
(November 2012–April 2013)

Data Source: NOAA-Climate Prediction Center (CPC)

The seasonal precipitation outlooks issued by the NOAA-Climate Prediction Center (CPC) in November call for equal chances that precipitation during the three-month seasons spanning the November–April period will be above-, below-, or near average (*Figures 9a–d)*. Equal chances mean that forecasts do not have any evidence in their decision support tools that allow them to alter the probabilities toward either above or below average—in other words, forecast skill is no better than flipping a coin. A major reason for equal chances is that the ultimate fate of ENSO is in doubt. A few months ago, the expectation was that an El Niño event would develop. However, recent indications suggest that ENSO may remain in neutral or, even if an El Niño does materialize, it will likely be weak and short-lived. Without a strong ENSO signal or any clear decadal trends in precipitation for the Southwest, there is little insight about this winter's precipitation. Uncertainties aside, with widespread and intense drought across the Southwest (see page 12), many resource managers are hoping for wet conditions.

Notes:

These outlooks predict the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps do not refer to inches of precipitation.

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1981–2010 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the "average" category is preserved at 33.3 likelihood, unless the forecast is very strong.

Thus, using the NOAA-CPC precipitation outlook, areas with light green shading display a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation. A shade darker green indicates a 40.0–50.0 percent chance of above-average, a 33.3 percent chance of average, and a 16.7–26.6 percent chance of below-average precipitation, and so on.

Equal Chances (EC) indicates areas where no forecast skill has been demonstrated or there is no clear climate signal; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a "default option" when forecast skill is poor.

Figure 9a. Long-lead national precipitation forecast for November 2012–Jaunary 2013.

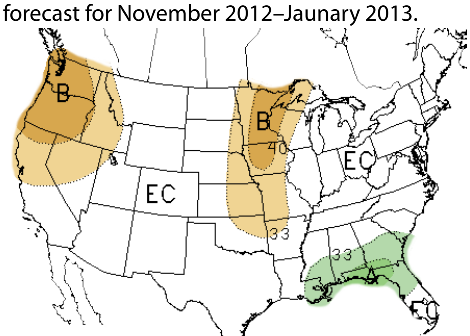
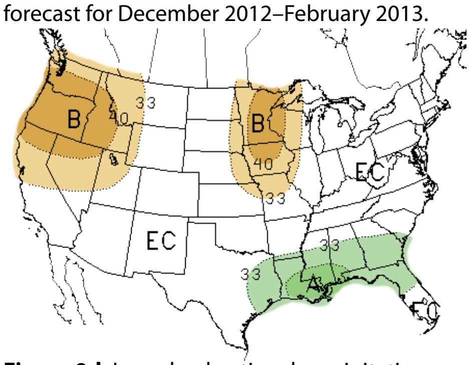


Figure 9b. Long-lead national precipitation forecast for December 2012–February 2013.



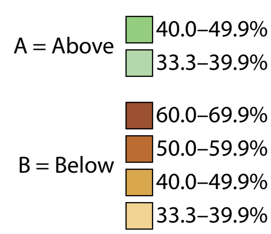


Figure 9c. Long-lead national precipitation forecast for January–March 2013.

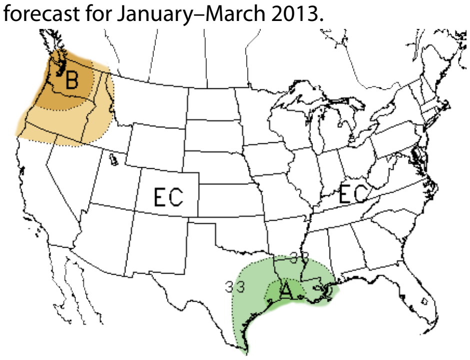
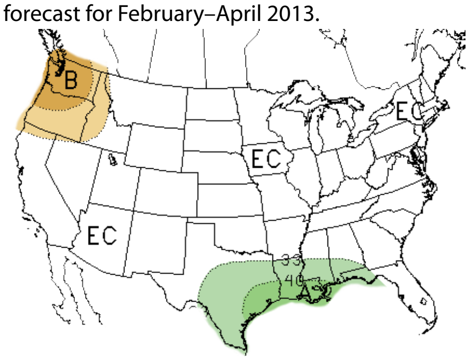


Figure 9d. Long-lead national precipitation forecast for February–April 2013.



EC = Equal chances. No forecasted anomalies.

On the Web:

For more information on CPC forecasts, visit http://www.cpc.ncep.noaa.gov/products/predictions//multi_season/13_seasonal_outlooks/color/churchill.php (note that this website has many graphics and March load slowly on your computer)

For IRI forecasts, visit http://iri.columbia.edu/climate/forecast/net_asmt/

Seasonal Drought Outlook

(through January 2013)

Data Source: NOAA–Climate Prediction Center (CPC)

This summary is partially excerpted and edited from the October 18 Seasonal Drought Outlook technical discussion produced by the NOAA-Climate Prediction Center (CPC) and written by forecaster A. Allgood.

Drought is expected to persist or intensify in Arizona and most of New Mexico in coming months (*Figure 10*). The NOAA-Climate Prediction Center (CPC) seasonal precipitation outlook calls for equal chances that rain and snow amounts will be above, below, or near average in the Southwest. The drought forecast for Arizona and New Mexico is in part based on the inability to forecast precipitation with very much confidence this year, which is, in turn, related to the uncertainty in the El Niño Southern Oscillation (ENSO) forecast. ENSO currently is projected to evolve into an El Niño, which typically would enhance rain and snow in the Southwest, but the signal of ENSO has been waning in recent months, leading to increased uncertainty about expected winter precipitation.

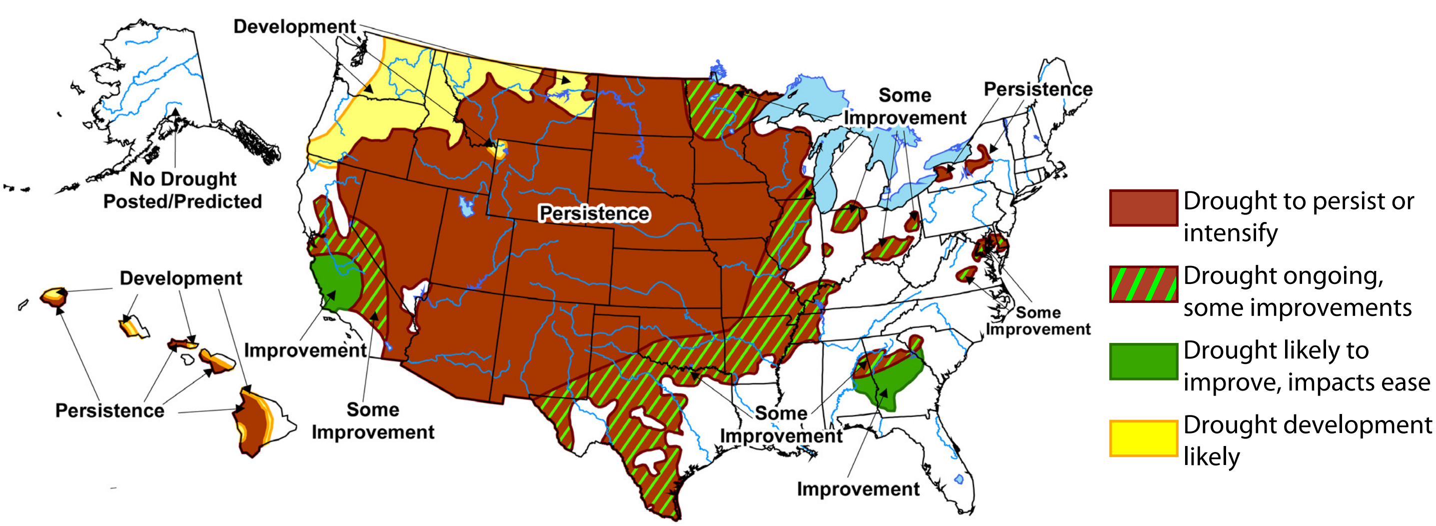
In California, drought is expected to improve in many regions as a result of recent precipitation and the expectation for more rain and snow. The November–January period historically is wet throughout much of California, and coastal regions receive more than 50 percent of their annual rainfall during this period. Even though California is also influenced by ENSO, the forecast for improved drought conditions is based more strongly on the historical occurrence of rain during coming months.

In the Rocky Mountains, 28-day streamflows remain generally below average across the central Rockies. The CPC 6–10- and 8–14-day forecasts indicate enhanced chances of below-average precipitation for the central and southern Rockies, while the monthly and seasonal outlooks depict equal chances for above-, below-, or near-average conditions. Based on current conditions and the outlooks, drought persistence is expected in the Rockies, but CPC states that confidence in this forecast is low.

Notes:

The delineated areas in the Seasonal Drought Outlook are defined subjectively and are based on expert assessment of numerous indicators, including the official precipitation outlooks, various medium- and short-range forecasts , models such as the 6-10 day and 8-14 day forecasts, soil moisture tools, and climatology.

Figure 10. Seasonal drought outlook through Jaunary 2013 (released October 18).



On the Web:

For more information, visit http://www.drought.gov/portal/server.pt

For medium- and short-range forecasts, visit http://www.cpc.ncep.noaa.gov/products/forecasts/

For soil moisture tools, visit http://www.cpc.ncep.noaa.gov/soilmst/forecasts.shtml

El Niño Status and Forecast

Data Sources: NOAA-Climate Prediction Center (CPC), International Research Institute for Climate and Society (IRI)

The shift towards El Niño conditions continued to slow during the past thirty days, introducing some doubt on when and if an official El Niño event would develop this fall. While the NOAA Climate Prediction Center (CPC) continues to issue an 'El Niño watch,' meaning an El Niño is expected to materialize in coming months, discussions among forecasters indicate that the expectation is for a weak event at best. Forecasters cite evidence that the sea-surface temperature (SST) pattern across the equatorial Pacific Ocean has cooled to near-average conditions over the past month. The CPC also notes that atmospheric circulation patterns do not look characteristic of the beginning of an El Niño event, and the pattern is not helping to jumpstart warming SSTs across the eastern Pacific Ocean—the Southern Oscillation Index (SOI) remains in ENSO-neutral values (*Figure 11a*). One favorable sign pointing toward the development of an El Niño is the existence of thunderstorm activity along the equator near the International Date Line. There is a small chance that this activity could spread eastward and help strengthen the El Niño event.

Official forecasts issued jointly by CPC and the International Research Institute for Climate and Society (IRI) show declining chances of an El Niño event forming in the next several months, but they still remain above 50 percent (*Figure 11b*). In the October–December period, forecasts call for a 56 percent chance that El Niño will occur, down from 69 percent issued last month. If El Niño does take hold, it is expected to be short-lived, and neutral conditions are expected to be back in control by mid-winter. The bottom line is that even if El Niño does materialize, it will likely not be a big player in weather across the Southwest this winter.

Figure 11a. The standardized values of the Southern Oscillation Index from January 1980–September 2012. La Niña/El Niño occurs when values are greater than 0.5 (blue) or less than -0.5 (red), respectively. Values between these thresholds are relatively neutral (green).

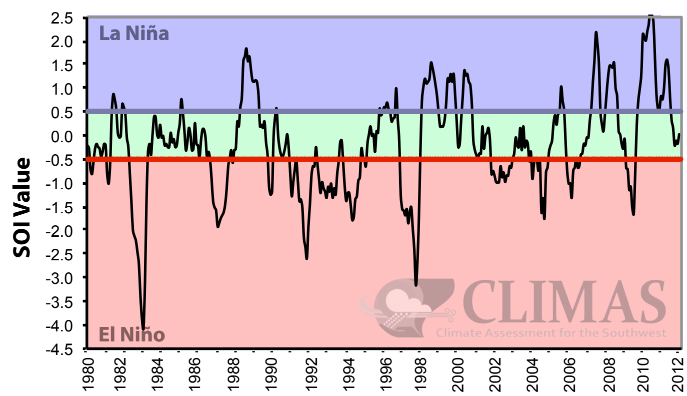
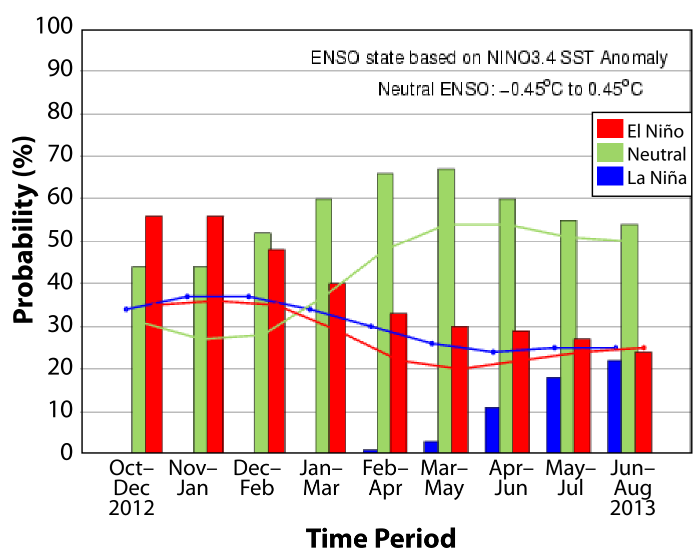


Figure 11b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released October 18). Colored lines represent average historical probability of El Niño, La Niña, and neutral conditions.



Notes:

The first figure shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through September 2012. The SOI measures the atmospheric response to SST changes across the Pacific Ocean basin. The SOI is strongly associated with climate effects in the Southwest. Values greater than 0.5 represent La Niña conditions, which are frequently associated with dry winters and sometimes with wet summers. Values less than -0.5 represent El Niño conditions, which are often associated with wet winters.

The second figure shows the International Research Institute for Climate and Society (IRI) probabilistic El Niño-Southern Oscillation (ENSO) forecast for overlapping three month seasons. The forecast expresses the probabilities (chances) of the occurrence of three ocean conditions in the ENSO-sensitive Niño 3.4 region, as follows: El Niño, defined as the warmest 25 percent of Niño 3.4 sea-surface temperatures (SSTs) during the three month period in question; La Niña conditions, coolest 25 percent of Niño 3.4 SSTs; and neutral conditions where SSTs fall within the remaining 50 percent of observations. The IRI probabilistic ENSO forecast is a subjective assessment of current model forecasts of Niño 3.4 SSTs that are made monthly. The forecast takes into account the indications of the individual forecast models (including expert knowledge of model skill), an average of the models, and other factors.

On the Web:

For a technical discussion of current El Niño conditions, visit http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/

For more information about El Niño and to access graphics similar to the figures on this page, visit http://iri.columbia.edu/climate/ENSO/