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Source: Rebecca Macaulay, CLIMAS.

Photo Description: The 2010 water year began on October 1, 2009 and ended on September 30, 2010. It was marked by changes in reservoir storage, drought, and many other climate and weather conditions.

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CLIMAS Climate Assessment for the Southwest

ARIZONA COOPERATIVE EXTENSION
THE UNIVERSITY OF ARIZONA • COLLEGE OF AGRICULTURE AND LIFE SCIENCES

ARIZONA

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October Climate Summary

Drought– Some welcome October precipitation has kept drought at bay across much of Arizona and New Mexico and has helped improve some areas of northern Arizona. Abnormally dry conditions still continue to linger across much of western and northern Arizona and parts of northwest New Mexico.

Temperature– Temperatures in the past 30 days have been 2–6 degrees Fahrenheit warmer than average for the entire Southwest.

Precipitation– Two rain storm events in the last month have dropped large amounts of precipitation across the Southwest. Northwest Arizona and north-central New Mexico have been the principal beneficiaries of these storms. Southern portions of both states have been relatively dry.

ENSO– A La Niña Advisory remains in effect. Moderate to strong La Niña conditions are expected to persist through next spring.

Climate Forecasts– The seasonal temperature forecasts call for increased chances for temperatures to be warmer than average through the winter; the precipitation outlooks suggest drier-than-average conditions for most of the fall and winter in all of Arizona and western New Mexico.

The Bottom Line– Several unseasonably wet storms drifted into the Southwest during late September and early October, adding valuable moisture that could become increasingly scarce as the winter progresses. The La Niña event that currently is classified as moderate to strong is the driving force behind expected dry conditions. During La Niña events since 1950, winters in the southwestern U.S. have been dry between 60 and 80 percent of the time. Temperatures have been as much as 6 degrees F above average in the last month. Forecasts suggest these warmer-than-average conditions will continue in part because of the historical warming trend and the La Niña event.

La Niña Drought Tracker: A new monthly CLIMAS publication

When sea surface temperatures in the tropical Pacific Ocean cool anomalously and signify a La Niña event, climate around the globe is affected. In the Southwest, these events almost always bring drier-than-average conditions, which then impact ecosystems and human behavior. Scant winter rain and snow, for example, primes the landscape for fires in the spring and low mountain snowpacks reduce streamflows and cause reservoir storage to decline.

As a result of the current moderate to strong La Niña event, winter precipitation forecasts call for increased chances that the Southwest will be dry, with the greatest odds occurring in the December–April months. CLIMAS will help the region stay abreast of the current drought conditions, drought impacts, and precipitation forecasts by offering a new monthly publication and several webinars with climatologists and El Niño–Southern Oscillation experts.

The first publication—the La Niña Drought Tracker—will be issued around the first of December and will continue as long as the La Niña event persists. The first of several webinars also will occur around this time.

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2010 SWCO Water Year in Review

Introduction

The 2010 Water Year in Review offers a summary of the information presented in the *Southwest Climate Outlook* during the 2010 water year, which began October 1, 2009, and ended September 30, 2010. This review provides an overview of precipitation, temperature, reservoir levels, drought, wildfire, and El Niño–Southern Oscillation (ENSO) conditions.

In general, the 2010 water year was marked by a wet winter, a dip in drought conditions, and the influence of both El Niño and La Niña events. In the beginning of the water year, drought conditions covered all of Arizona, reflecting the record-dry 2009 monsoon season. Drought relief finally came in January, as a cavalcade of soppy winter storms rolled into the region. By May 18, less than 37 percent of the state was classified as having some drought conditions. By the end of the winter, many regions had received above-average precipitation. The wet winter was in part due to an El Niño event, which helped pull the westerly jet stream south and over the Southwest and resulted in a higher frequency of Pacific Ocean storms drifting into the region.

The El Niño event peaked in the winter, followed by a rapid transition to a La Niña. This quick switch likely influenced the summer monsoon season, which was characterized by a late start, a one-month wet period, and a relatively early departure. While many regions experienced near-average rainfall for the monsoon season, there were notable dry areas, including the Colorado River Corridor in western Arizona.

The following highlights present in more detail the evolution and characteristics of the 2010 water year.

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Top 5 headlines of the water year

1 Lake Mead water elevation approaches 1,075 Lake Mead's water levels declined by 10 feet during the 2010 water year, inching to within 9 feet of the 1,075 elevation line that will trigger water rationing in the Lower Colorado River Basin. However, joint management of Lakes Powell and Mead stipulate extra water releases from Lake Powell to Lake Mead if that threshold is breached. An extra pulse of about 3 million acre-feet (MAF) is likely in 2011, increasing the water level in Lake Mead by about 30 feet and temporarily delaying water rationing.

2 Copious winter rains drenched the Southwest Arizona received about 140 percent of the 1971–2000 average between November and March, while New Mexico received about 110 percent of average. Precipitation was most intense between the mid-January and mid-February, when a series of storms set precipitation records for single day and multi-day accumulations in many watersheds.

3 Mercurial El Niño–Southern Oscillation Sea surface temperatures in the tropical Pacific Ocean waffled between moderate El Niño conditions and moderate La Niña conditions. The El Niño event began in the summer of 2009, peaked in December, and then rapidly transitioned into a La Niña event in the spring of 2010.

4 Monsoon a one-month wonder The dry start and end to the 2010 monsoon season sandwiched frequent and intense rains in July. The monsoon arrived about two weeks late. Storms finally exploded in many parts of the region in mid-July, and the one-month spurt was enough to deliver near-average rainfall totals to many parts of the Southwest.

5 Warm Summer Summer was warmer than average over Arizona and New Mexico due to a short monsoon that had high humidity and nighttime cloudiness but relatively few precipitation events. The lack of cooling rainfall helped to increase average temperatures, which exceeded long-term averages in both states during the summer. September was the second warmest on record in both Phoenix and Tucson.

WYIR, continued

Precipitation

The October–September 2010 water year was mixed across Arizona and New Mexico (Figures 1a–b). Most locations received within 3 inches of their normal precipitation, including northern and south-central Arizona and the western half of New Mexico. The regions that experienced below-average precipitation ranged between 50 to 100 percent of average precipitation, while the wetter areas received 110 to 200 percent of average. The wetter-than-average conditions were generally related to the winter precipitation, which had an El Niño pattern. Winter storms took a southerly track across the eastern Pacific Ocean, picking up subtropical moisture as they moved across Southern California, Arizona, and New Mexico. However, winter was not uniformly wet, as the El Niño frequently had little moisture. Also, many of the storms missed the Colorado Plateau just above the Mogollon Rim. Instead, the storms dumped most of the precipitation on the White Mountains of eastern Arizona and left little precipitation to fall on western New Mexico. Eastern New Mexico fared much better during the winter in part because moisture moved westward across Texas. Typically, cold winter storms have relatively uniform precipitation, with deeper snowfall at the highest elevations. During many of the 2010 winter storms, the lower elevations of Arizona received no precipitation, leading to larger-than-average variability in precipitation with elevation. Table 1 shows that most cities had a drier-than-average water year, but not nearly as dry as the 2009 water year.

Spring and early summer were relatively dry, but the monsoon did bring near-average precipitation to southeastern Arizona and southeastern New Mexico. Higher elevations in both states benefitted more from the monsoon than the southern deserts. The lower Colorado River basin was very dry all summer and received most of its rain during the winter storms. While the 2010 water year was relatively dry in many locations, it was significantly wetter than 2009, when precipitation deficits ranged from 2 to 9 inches and only Yuma was wetter than average (due to a tropical storm). Water year 2010 had a few extreme precipitation events, an anticipated result of regional warming.

Figure 1a. Water year 2010 (October 1, 2009 through September 30, 2010) departure from normal precipitation.*

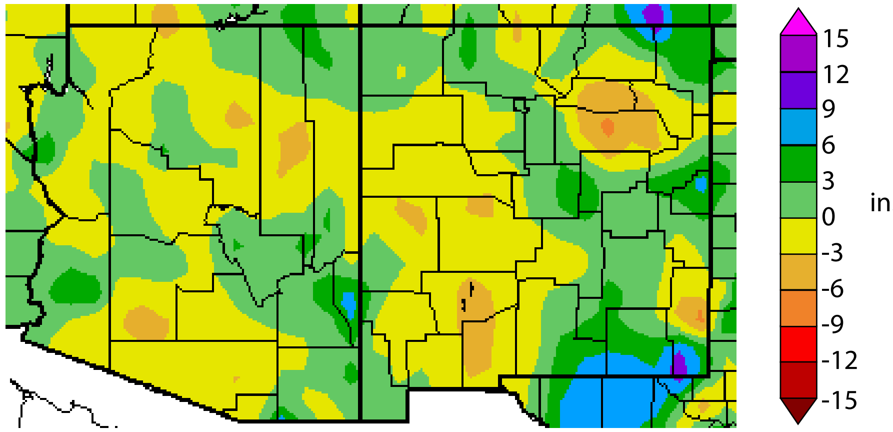
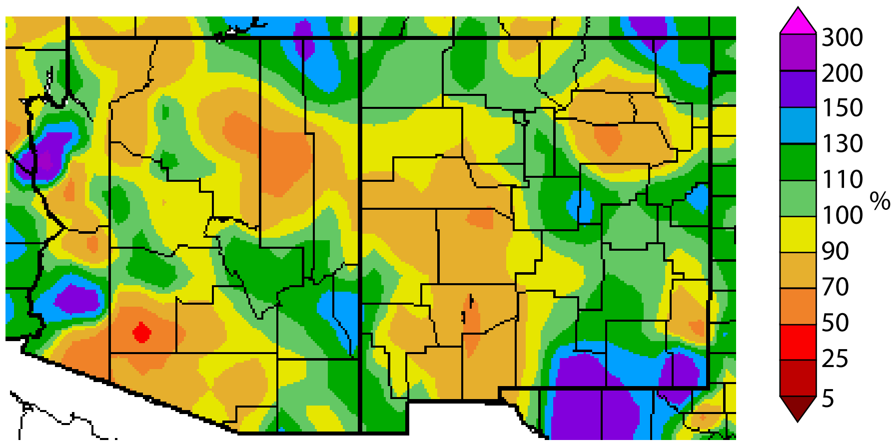


Figure 1b. Water year 2010 (October 1, 2009 through September 30, 2010) percent of average precipitation.*



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

Table 1. Water Year 2010 precipitation values (in inches) for select cities.

City	WY 2010 Precipitation	Average WY Precipitation	2010 Departure from Average	2009 Departure from Average
Phoenix, AZ	7.88	8.29	-0.41	-4.05
Tucson, AZ	10.69	12.17	-1.48	-5.66
Douglas, AZ	13.08	13.76	-0.68	-8.03
Albuqu., NM	9.31	9.47	-0.16	-2.24
Winslow, NM	5.72	8.03	-2.31	-4.66
Flagstaff, AZ	23.71	22.91	+0.80	-9.53
Yuma, AZ	4.41	3.05	+1.36	+2.14
El Paso, TX	8.35	9.43	-1.08	-2.17

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WYIR, continued

Temperature

Temperatures during the 2010 water year were 1–2 degrees Fahrenheit below average for most of northern and western Arizona and eastern and southwestern New Mexico (Figures 2a–b). The regions with above-average temperatures were southeastern Arizona and south-central and northeastern New Mexico, where temperatures were between 0 and 3 degrees F above average. The temperature pattern in Arizona is a result of near-average temperatures the whole water year. In New Mexico, the pattern showing temperatures between 2 degrees above and 2 degrees below average is due to the averaging of a colder-than-average winter with a warmer-than-average summer.

The El Niño event helped increase cloud cover and deliver colder arctic air, playing a large role in keeping winter temperatures cooler than recent years. Across New Mexico and northern and eastern Arizona, winter was generally colder than average. December through March ranged from 1.4 to 2.2 degrees F colder than average for Albuquerque and El Paso, although January in Albuquerque was 0.7 degrees F warmer than average. In Arizona, Flagstaff had near-average to slightly cooler-than-average temperatures from October through June. Phoenix and Tucson had near-average temperatures throughout the year, except in November and January, which were much warmer than average.

Summer was warmer than average in both Arizona and New Mexico due to a short monsoon that had high humidity and nighttime cloudiness but relatively few precipitation events. The lack of cooling rainfall helped increase average temperatures, which exceeded long-term averages in both states during the summer. For example, July, August, and September were the fifth, sixteenth, and second warmest summer months on record in Phoenix, respectively, and the seventh, fourth, and second warmest summer months on record in Tucson. In New Mexico, June and September had average temperatures 3.1 to 5.0 degrees F above average for Albuquerque and El Paso. Those months were extremely dry, as the monsoon began late and ended early with little rainfall to cool New Mexico.

Figure 2a. Water year 2010 (October 1, 2009 through September 30, 2010) departure from average temperature*

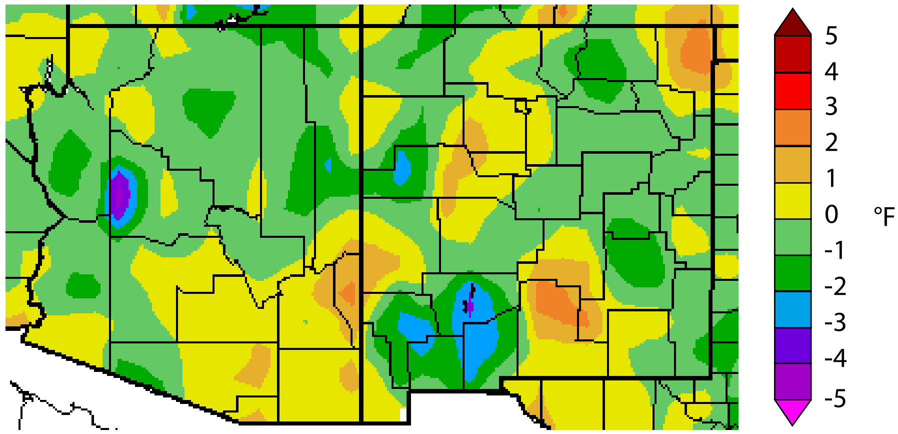
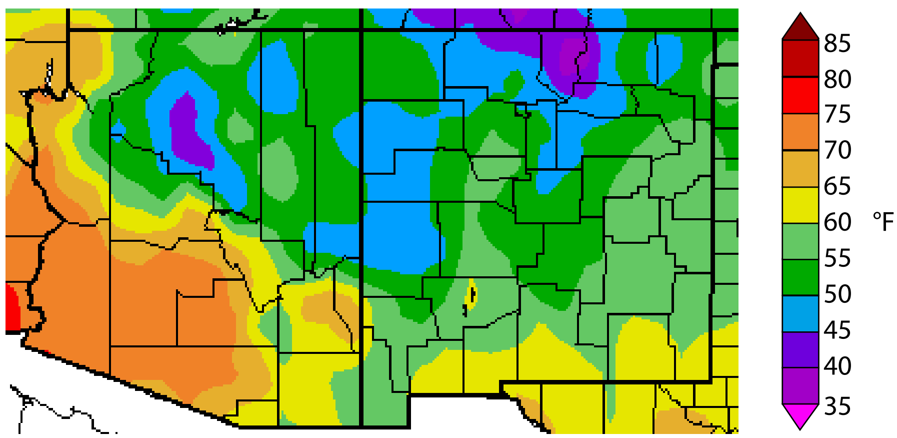


Figure 2b. Water year 2010 (October 1, 2009 through September 30, 2010) average temperature.*



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

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WYIR, continued

Reservoirs

Arizona. Total reservoir storage in the three large reservoir systems within Arizona's borders, San Carlos Reservoir on the Gila River and the Salt and Verde river reservoir systems, increased by about 340,000 acre-feet during the 2010 water year. Levels in the San Carlos Reservoir increased substantially during the water year (Table 2). Salt and Verde river system storage rose to completely full in the spring, getting a major pulse of runoff during the winter months. On the Colorado River, combined total storage in Lake Powell and Lake Mead decreased by 1.04 million acre-feet, with Lake Mead dropping in September to an elevation of less than 1,084 feet above sea level (ASL)—a level not experienced since 1956 (Figure 3a). Implementation of the Colorado River Interim Guidelines for lower basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead will keep Mead from triggering shortage in the Lower Basin. However, if Mead drops below 1,075 feet ASL, a substantial release of water from Lake Powell will be required.

New Mexico. New Mexico total reservoir storage decreased by approximately 11,000 acre-feet during the 2010 water year. Total Pecos River reservoir storage increased by more than 32,000 acre-feet. However, storage in these reservoirs remains below historic averages. Storage declined by 126,000 acre-feet in the Rio Grande Basin (Table 3) during a winter characterized by average to below-average snowpack in most Rio Grande headwater sub-basins. Consequently, the level in New Mexico's largest reservoir, Elephant Butte, declined by almost 83,000 acre-feet. Combined storage in Elephant Butte and Caballo Reservoirs—a trigger for Rio Grande Compact Article VII restrictions—declined to within about 10,000 acre-feet of levels that will cause water rationing (Figure 3b). Article VII restrictions were last implemented in December 2007. Navajo Reservoir, in the San Juan River Basin, gained about 98,000 acre-feet. The 2009–2010 El Niño winter delivered plentiful precipitation to the Mimbres and Gila river basins in southern New Mexico, and these streams had well above-average flows during the spring months.

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

Reservoir	Oct. 09 Percent full	Sept. 10 Percent full	WY Peak Percent	Peak Month
Navajo	76	83	91	May
Heron	68	64	83	July
Elephant Butte	21	17	27	May
Conchas	10	8	16	May
Santa Rosa	5	9	14	May
Brantley	1	2	3	July

Figure 3a. Elevation of Lake Mead in Arizona during the 2010 water year. The line at 1,075 feet is the threshold for Colorado River Lower Basin shortage.

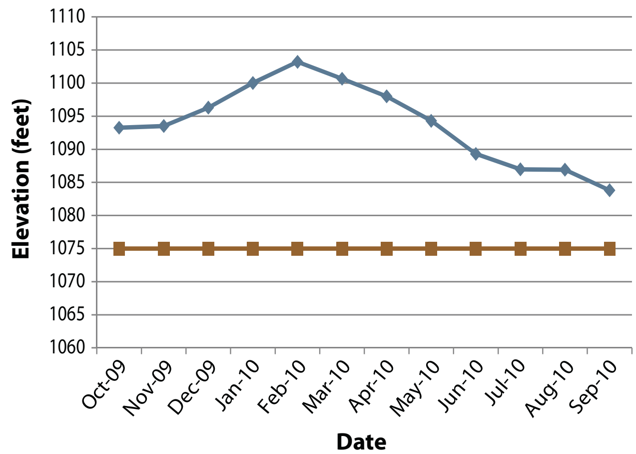
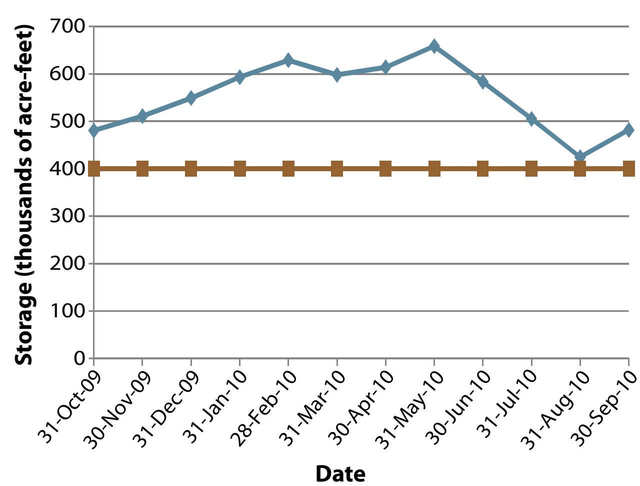


Table 2. Selected Arizona reservoirs' water year statistics.

Reservoir	Oct. 09 Percent full	Sept. 10 Percent full	WY Peak Percent	Peak Month
Powell	63	63	65	June
Mead	42	39	44	March
Gila	1	15	34	April
Verde	36	58	100	April
Salt	80	92	100	April

Figure 3b. Combined water storage of Elephant Butte and Caballo reservoirs in New Mexico during the 2010 water year. The line at 400,000 acre-feet is the threshold for Rio Grande Compact Article VII restrictions.



WYIR, continued

Drought

Much of Arizona was gripped by moderate to severe drought at the beginning of the water year, while most of New Mexico was drought free (Figure 4a). At the beginning of the water year, drought conditions across Arizona were the result of a poor 2009 monsoon season, which was one of the driest on record. A lack of rain created numerous impacts to rangeland and water resources and led to the rapid development of moderate to severe drought across the state by the end of the summer. Unusually dry conditions persisted through October and November, leading to an expansion of severe drought that covered the eastern half of Arizona by the beginning of December. New Mexico remained largely drought free through this early period of the water year.

Relief began arriving in Arizona in January. Pacific storms drifted into the region, in part as a result of the El Niño event, which often causes the winds of the Pacific jet stream to flow over the region. These storms brought copious amounts of rain and high-elevation snow. Drought conditions dramatically improved across central and southern Arizona, where the bulk of the precipitation fell (Figure 4b). Winter storms continued to push improvements across Arizona and helped keep New Mexico in the clear through March and April. By the end of May, only a small area of moderate to severe drought remained in northeastern Arizona, where winter precipitation totals were slightly less and longer-term drought impacts continued to linger (Figure 4c).

A sluggish start to the summer monsoon season caused drought conditions to expand across northern New Mexico in early July. These largely subsided as monsoon rains began in earnest late in the month. Not all areas received near- or above-average rains, and some areas experienced expansion in drought conditions (Figure 4d). At the close of the monsoon season and the water year, drought conditions were confined to northern New Mexico and northern and western Arizona, where monsoon season rains were light and spotty.

Figure 4a. Drought Monitor released November 17, 2009.*

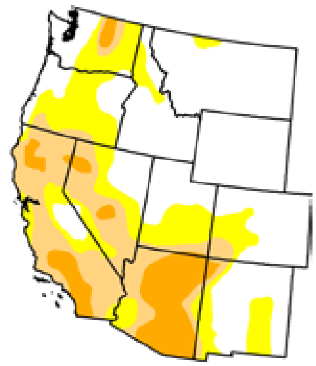


Figure 4b. Drought Monitor released February 16, 2010.*

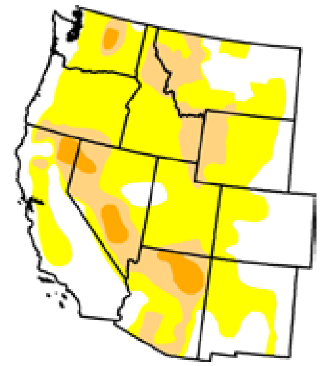


Figure 4c. Drought Monitor released May 18, 2010.*

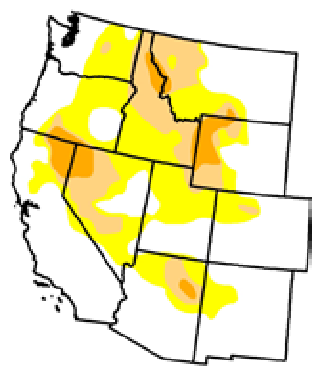
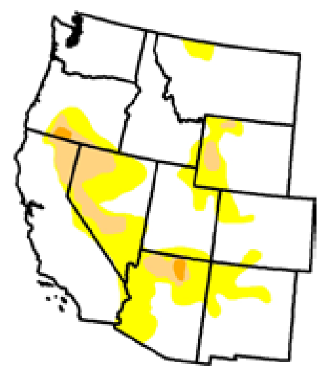


Figure 4d. Drought Monitor released August 17, 2010.*



Drought Intensity

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

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

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WYIR, continued

Wildfire

The fire season in the Southwest typically ramps up after the winter months, beginning in earnest around March and April and typically peaking in June and July before the monsoon rains begin. During the 2010 water year, copious winter storms produced heavy rain and snow in many parts of the Southwest and caused the Predictive Services at the Southwest Coordination Center (SWCC) to forecast below-normal fire potential for the higher elevations of the Colorado Plateau in northern New Mexico and Arizona. These areas experienced 100–200 percent of average snowpack and above-normal fire potential for southern Arizona, where winter rains helped quick-drying grasses flourish.

The late start to the monsoon season and weaker-than-average summer rains in some parts of the region allowed for increased fire activity in June and July. Overall, however, total acres burned in Arizona and New Mexico between January 1 and August 5 were well below average. Only about 62,000 acres burned in Arizona this year, about one-third of the 1990–2008 state yearly average of about 180,000 acres. The majority of the fires in Arizona occurred in the Mogollon Rim area and in the Sky Islands in southeast Arizona (Figure 5a). The largest blaze in Arizona was the Schultz fire, located four miles north of Flagstaff in the Coconino National Forest. The fire was caused by an abandoned campfire and scorched more than 15,000 acres from June 20 through July 14.

More than 98,000 burned in New Mexico, falling below the 1990–2008 state yearly average of around 235,000 acres. Most fires occurred in the southeast (Figure 5b). The largest fires charred more than 17,000 acres (Table 4).

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Table 4. Ten Largest Southwest fires in 2010.

Fire Name	State	Acres Burned
New	NM	17,309
South Fork	NM	17,100
Schultz	AZ	15,075
Etchevery	NM	6,772
Paradise	AZ	6,355
Brushy	AZ	5,935
Flintlock	NM	5,342
Ft. Bliss 2	NM	5,160
H12	NM	5,074
Rocky	AZ	3,827

Figure 5a. Locations of Arizona fires larger than 100 acres as of August 5, 2010.

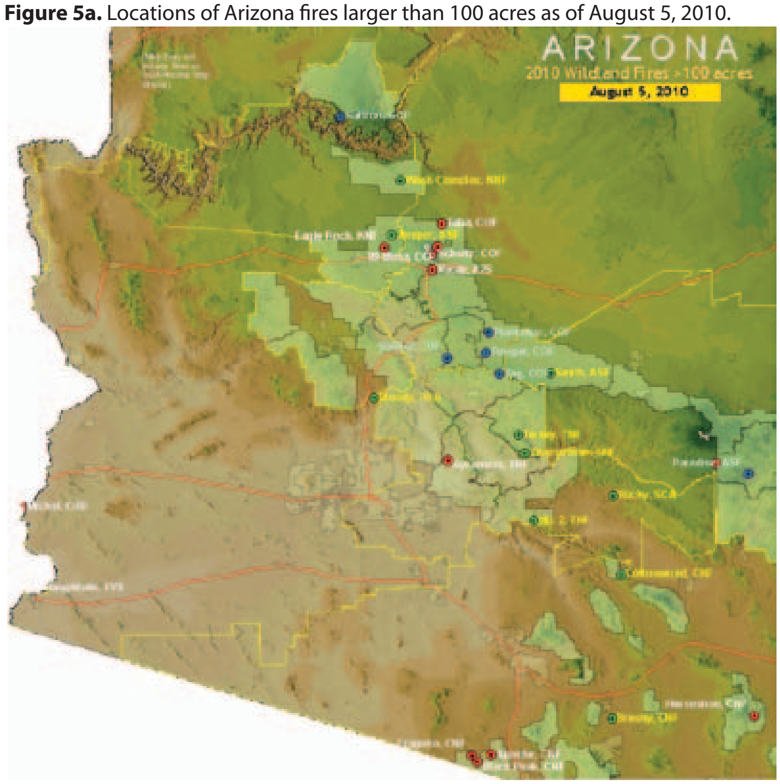
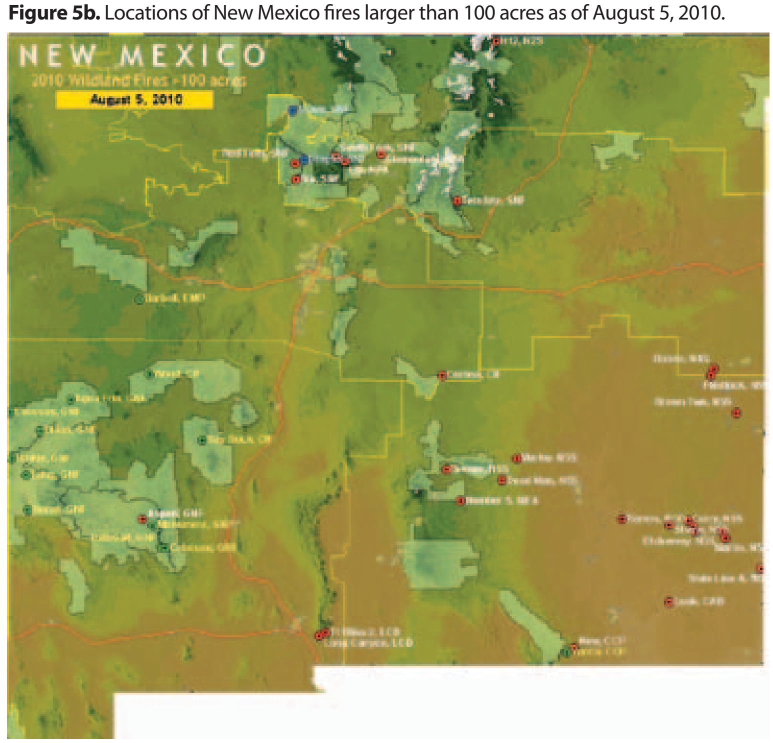


Figure 5b. Locations of New Mexico fires larger than 100 acres as of August 5, 2010.



WYIR, continued

El Niño

Sea Surface Temperatures

At the beginning of the water year, an El Niño was already brewing as above-average sea surface temperatures (SSTs) were emerging in the eastern Pacific Ocean. In October 2009, the pattern and amount of warm water pooling in the eastern Pacific indicated that at least a weak El Niño was in the process of forming. Through November and December, trade winds blowing east along the equator slackened in response to the weak El Niño event, allowing more warm water to accumulate near the coast of South America. This coupling between the ocean and atmosphere intensified the El Niño event and by the end of December, El Niño was classified as moderate to strong. SSTs peaked in late January and early February at more than 2 degrees Celsius above average in the central Pacific. The El Niño event induced a strong subtropical jet stream over the northern mid-latitudes that delivered numerous and strong winter storms to the desert Southwest. By March, SSTs were decreasing and the 2009–2010 El Niño event began to wane. El Niño and La Niña events often peak in the early winter and fade soon thereafter.

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.

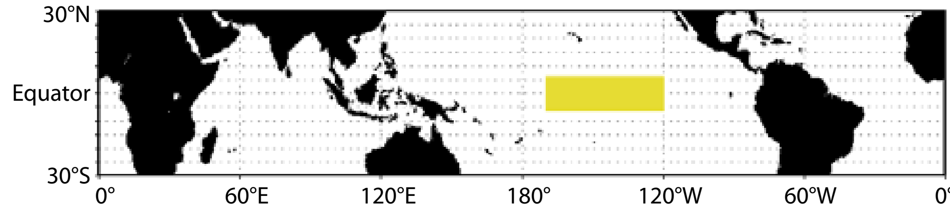
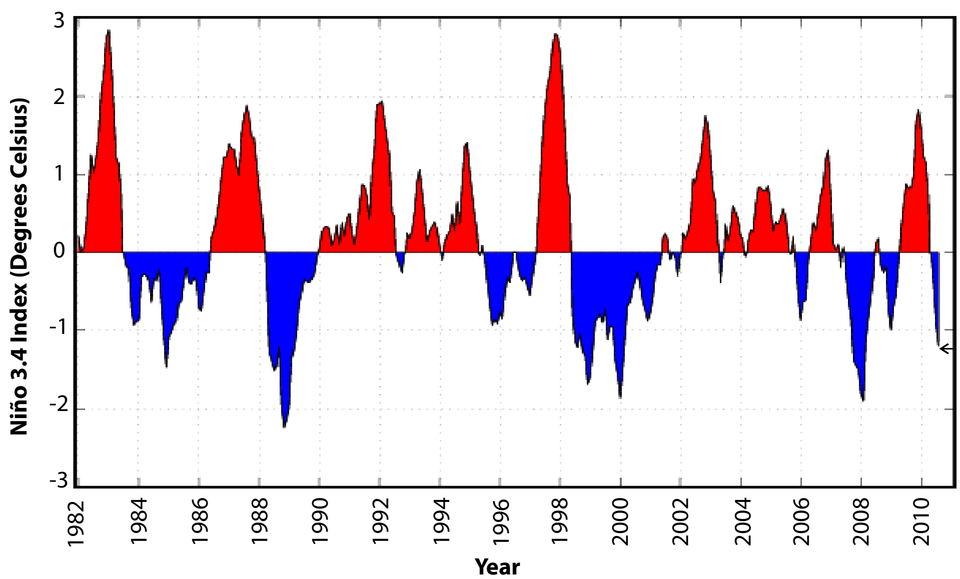


Figure 6b. Sea surface temperature anomaly index from Niño 3.4 region. Red areas indicate positive or warm SST anomalies while blue indicates negative or cool anomalies. Graphic credit: International Research Institute for Climate and Society.



ENSO-neutral conditions returned by May but didn't last long. SSTs entered La Niña territory by mid-summer, marking a rapid transition from El Niño to La Niña conditions. By September, a strong La Niña event had materialized. It continues to gain strength, and most models suggest that the event will persist through at least early winter.

Southern Oscillation Index

The Southern Oscillation Index (SOI) reflected the roller coaster ENSO ride experienced during the 2010 water year. SOI values were very negative (<-1.5) in October 2009 and were persistently negative through the winter season, indicating a strong atmospheric response to the warming SSTs. SOI values reached their lowest level in February, which was consistent with a strong teleconnection pattern that shifted the western U.S. winter storm track south over Arizona and New Mexico.

As the El Niño event began to wane in March and April, SOI values responded quickly and rose to positive values by the end of April. Values continued to increase for the rest of the water year, while SSTs continued to cool. SOI values climbed to more than 2.5 in the last month of the water year, indicating a strong La Niña event was in place.

Temperature (through 10/20/10)

Data Source: High Plains Regional Climate Center

Temperatures since the water year began on October 1 have been between 45 and 60 degrees Fahrenheit across northern New Mexico, the eastern border of Arizona, and much of the Colorado Plateau (Figure 1a). Southern and eastern New Mexico and the Mogollon Rim in Arizona experienced temperatures between 60 and 70 degrees F, while southeastern Arizona has been between 65 and 70 degrees F. The southwest deserts and lower Colorado River in Arizona have been between 75 and 85 degrees F. These temperatures are unseasonably warm for October, running 0–6 degrees F warmer than average across Arizona and New Mexico (Figure 1b).

The past 30 days have been similarly warm, generally measuring 0–6 degrees F warmer than average across the entire Southwest except one small area in southwestern New Mexico (Figure 1c). However, this spot appears to be an interpolation error as all the closest measuring stations depicted in Figure 1d record above-average temperatures. The warm temperatures are due to high pressure and generally clear skies, but with greater-than-average humidity across the Southwest. Subtropical moisture has been streaming into the region for the past 30 days, causing dew points to rise, which in turn elevates temperatures. Without the two major cold storm systems that came across the region between September 21 and 24 and October 3 and 8, temperatures would have been much higher across the region. The storms finally brought fall conditions to the Southwest, and temperatures in the 90s are not expected to return until spring.

Notes:

The water year begins on October 1 and ends on September 30 of the following 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 2011 (October 1 through October 20) average temperature.

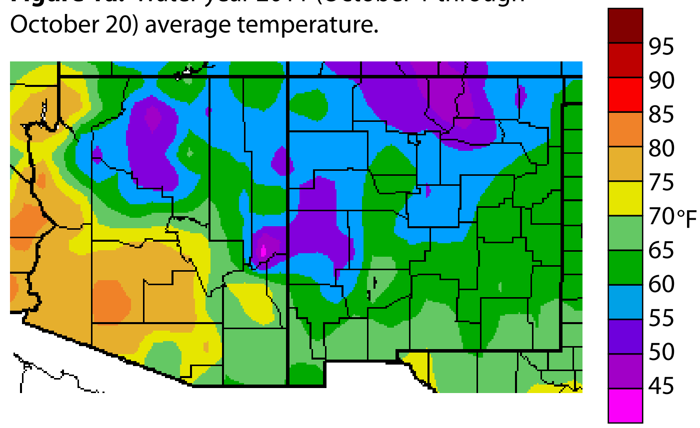


Figure 1b. Water year 2011 (October 1 through October 20) departure from average temperature.

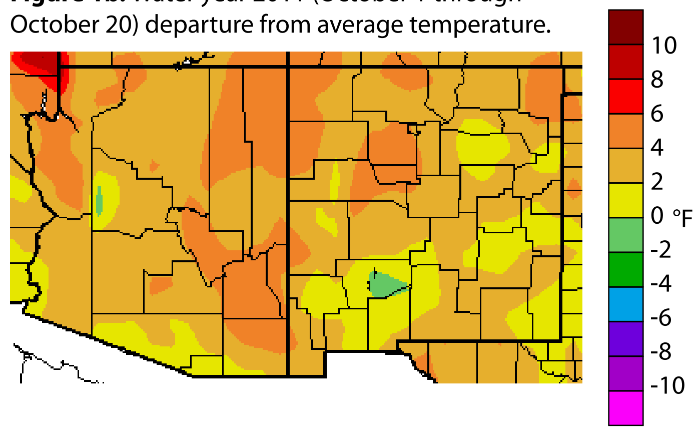


Figure 1c. Previous 30 days (September 21–October 20) departure from average temperature (interpolated).

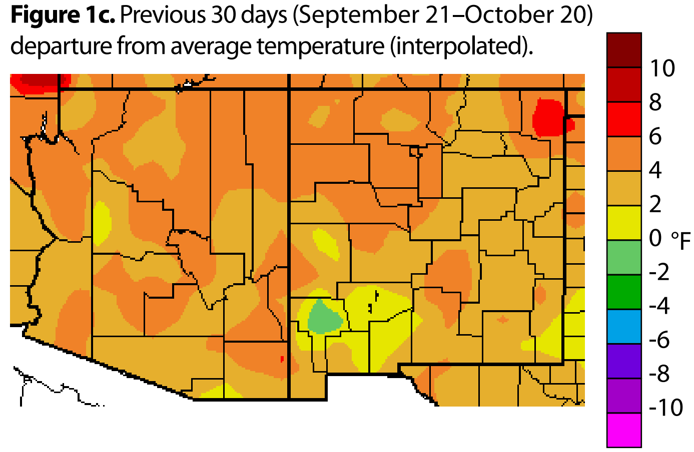
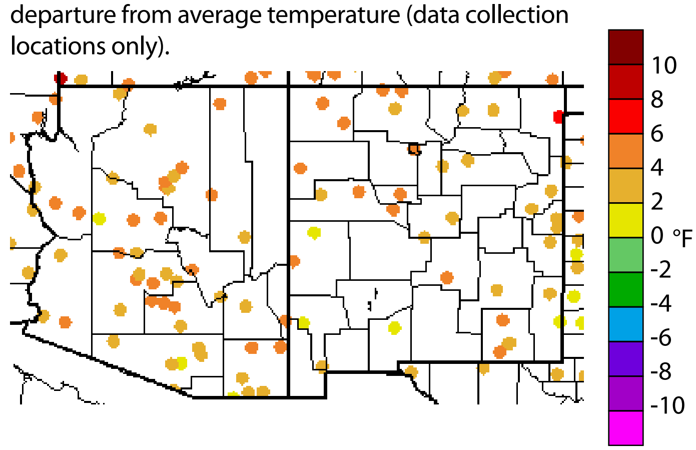


Figure 1d. Previous 30 days (September 21–October 20) departure from average temperature (data collection locations only).



Precipitation (through 10/20/10)

Data Source: High Plains Regional Climate Center

The 2011 water year has had a wet start in the northwestern quarter of Arizona, and Mohave, Yavapai, Coconino, and La Paz counties have received 150–1,200 percent of average precipitation (Figures 2a–b). Western Pima and Pinal counties in south-central Arizona have received 100–200 percent of average precipitation. This was the result of a single, very cold upper-level low pressure system that moved quickly across Southern California and western Arizona in early October. In New Mexico, eastern Torrance, western Guadalupe, and northern Lincoln counties experienced 150–800 percent of average precipitation as a result of a fairly localized storm.

During the past 30 days, precipitation has been more widespread as the low pressure system of September 21–24 moved slower across the region and covered a broader area. The northeastern quarter of New Mexico received significant precipitation from this event, and rainfall totals in this area measured between 100–400 percent of average (Figures 2c–d). The southern New Mexico-Texas border east of El Paso had 100–200 percent of average precipitation, while east-central Arizona and the northern New Mexico-Arizona border received 100–400 percent of average precipitation. Unfortunately, these two storms missed large areas of both states, leaving southwestern Arizona and southwestern New Mexico with less than 75 percent of average precipitation. The storms helped increase soil moisture, but the fall dry season is beginning and with a strong La Niña developing, drier-than-average conditions are anticipated for the winter.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2010, we are in the 2011 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 precipitation and drought reports for Arizona, New Mexico, and the Southwest region, visit: http://lwf.ncdc.noaa.gov/oa/climate/research/2003/perspectives.html#monthly

Figure 2a. Water year 2011 (October 1 through October 20) percent of average precipitation (interpolated).

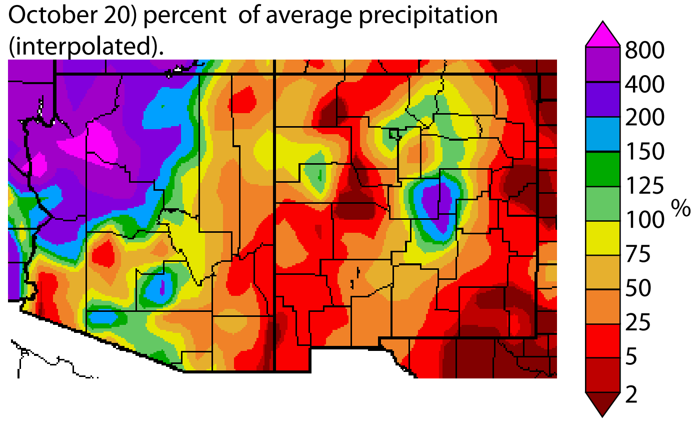


Figure 2b. Water year 2011 (October 1 through October 20) percent of average precipitation (data collection locations only).

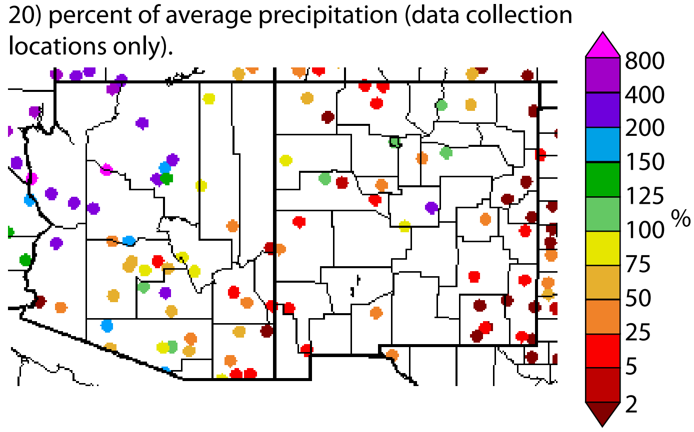


Figure 2c. Previous 30 days (September 21–October 20) percent of average precipitation (interpolated).

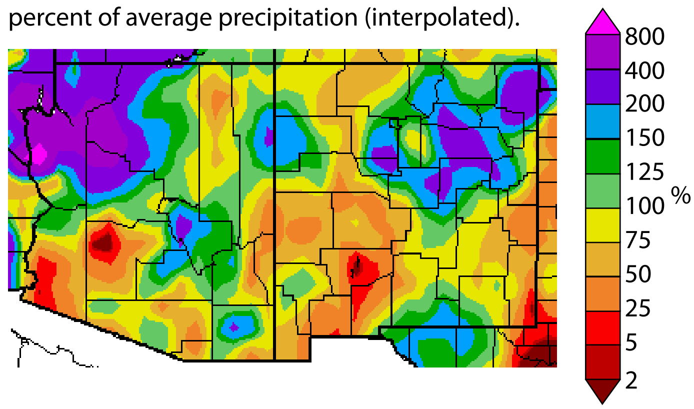
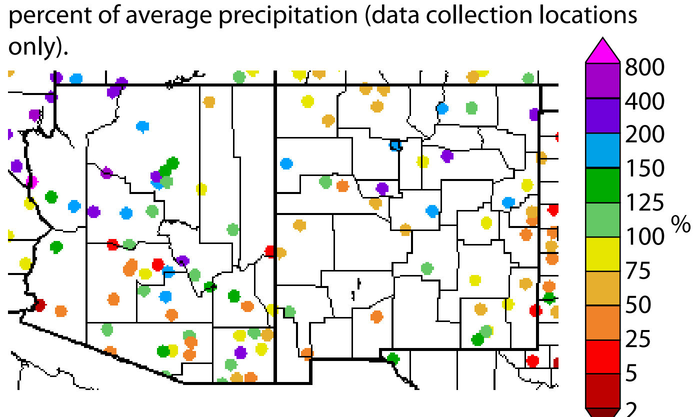


Figure 2d. Previous 30 days (September 21–October 20) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(data through 10/19/10)

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

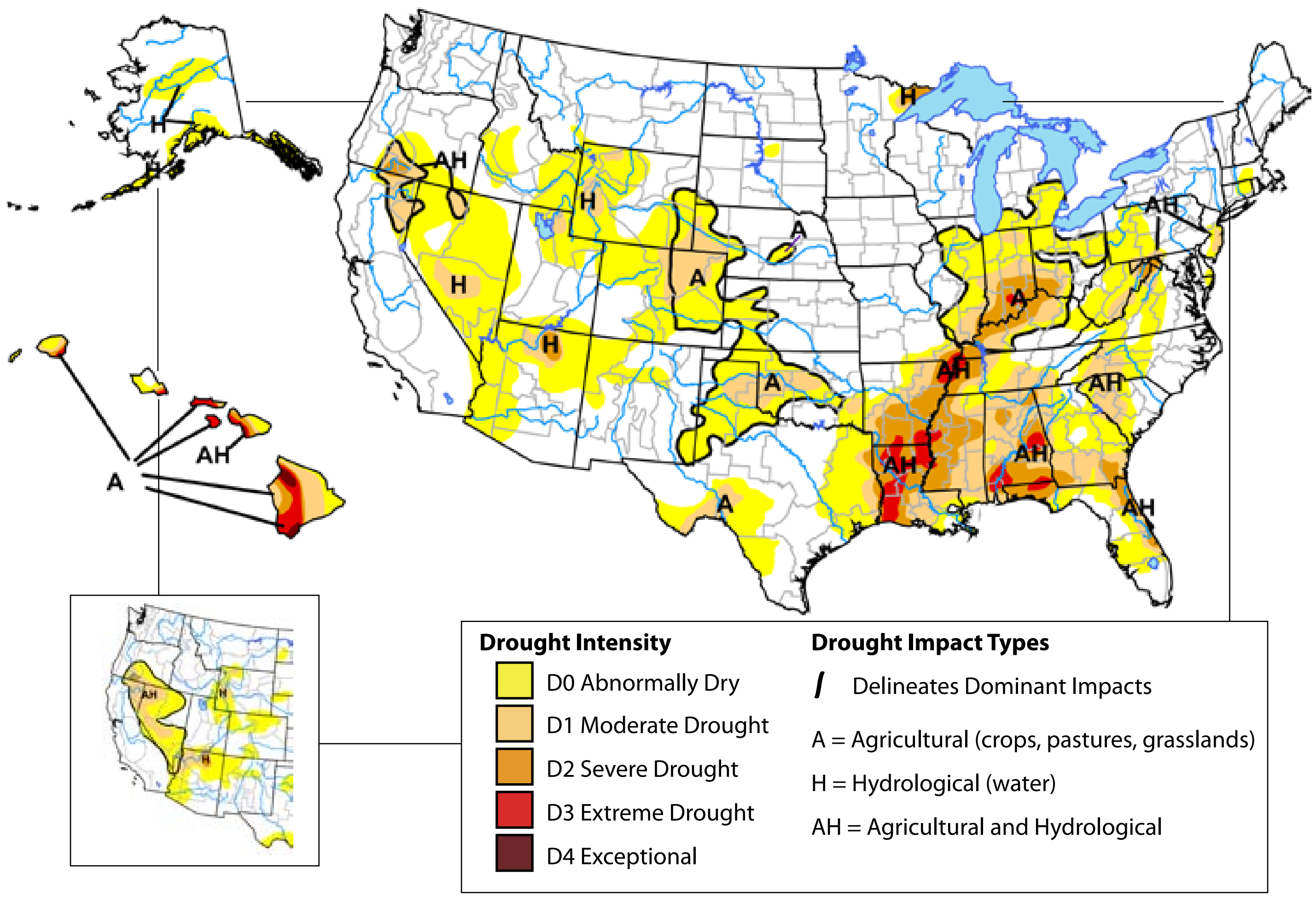
Drought conditions improved in some areas but increased in overall extent across the western U.S. over the past 30 days, according to the October 19 update of the U.S. Drought Monitor (Figure 3). The large area of moderate drought across eastern Nevada and northern California shrunk dramatically after receiving a couple of good pulses of precipitation during October. These areas received 200–400 percent of average precipitation over the past 30 days. In contrast, abnormally dry and moderate drought conditions expanded across parts of the northern Rockies in Idaho, Wyoming, and Colorado. The southerly track of the last couple storms left these areas unusually dry in October, with precipitation amounts totaling less than 50 percent of average.

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; the author of this monitor is Eric Luebehusen, U.S. Department of Agriculture.

Figure 3. Drought Monitor data through October 19 (full size), and September 14 (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/portal/server.pt/community/current_drought/208

Arizona Drought Status

(data through 10/19/10)

Data Source: U.S. Drought Monitor

Unusually wet weather for October has helped alleviate some short-term drought conditions across northern Arizona over the past 30 days. Abnormally dry conditions remain across western and northern Arizona, but moderate drought has retreated to a small area in north-central Arizona, according to the October 19 update of the U.S. Drought Monitor (Figure 4a). Several early winter-like storm systems brought 1–2 inches of rainfall to northwest Arizona, helping push back moderate drought conditions in this region. Moderate to severe drought now only covers slightly more than 8 percent of Arizona, a decline from 18 percent in mid-September (Figure 4b). Drought conditions in Arizona are not as severe as they were one year ago. This reflects a relatively average 2010 monsoon season. Drought conditions may expand, however, if typical La Niña weather patterns prevail. La Niña events often bring drier-than-average winters to the region.

Drought impacts reported by Arizona DroughtWatch indicate that rangelands are still in poor shape across northwestern Arizona from a lack of summer rainfall. This also suggests that the recent rains may have limited benefit in improving range conditions because of the late timing. Nonetheless, rains have helped improve impacts to local water resources, including streamflows and springs. More drought impact reports can be viewed on Arizona DroughtWatch's webpage at http://azdroughtwatch.org/.

Figure 4a. Arizona drought map based on data through October 19.

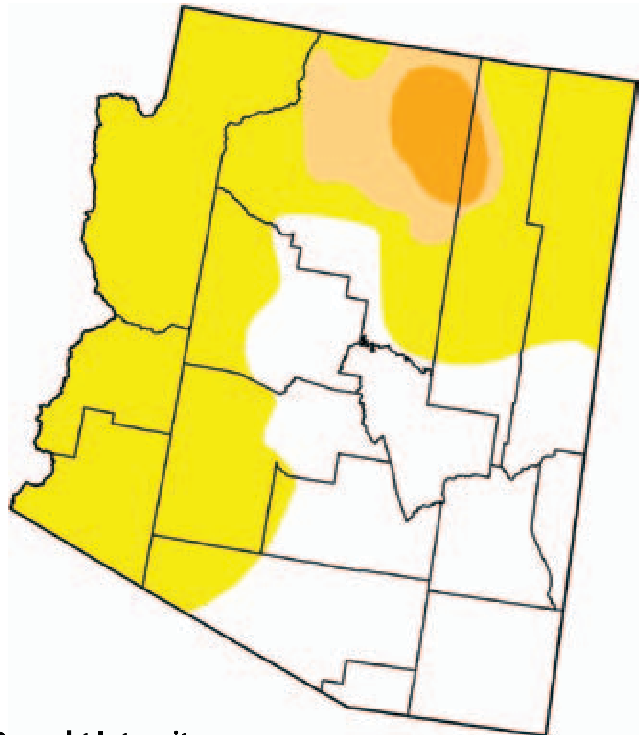


Figure 4b. Percent of Arizona designated with drought conditions based on data through October 19.

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	39.8	60.2	8.7	3.2	0.0	0.0
Last Week (10/12/2010 map)	39.8	60.2	8.7	3.2	0.0	0.0
3 Months Ago (07/27/2010 map)	28.8	71.2	28.6	5.1	0.0	0.0
Start of Calendar Year (01/05/2010 map)	0.0	100.0	97.2	71.1	5.1	0.0
Start of Water Year (10/05/2010 map)	40.0	60.0	18.6	3.2	0.0	0.0
One Year Ago (10/20/2009 map)	0.0	100.0	84.6	53.5	0.0	0.0

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://www.drought.unl.edu/dm/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/DroughtStatus.htm

New Mexico Drought Status

(data through 10/19/10)

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

Average to above-average precipitation over the past 30 days across New Mexico has kept short-term drought conditions at bay again this month. There are virtually no changes in drought status across the state from one month ago, according to the October 19 update of the U.S. Drought Monitor (Figure 5a). The southeast corner of the state, in Lea County, is the only region that has experienced an expansion of abnormally dry conditions.

Overall, 76 percent of New Mexico is drought free; no regions are experiencing drought conditions worse than abnormally dry (Figure 5b). The relatively drought-free conditions have been aided by several wet storm systems that moved across the Southwest in the past month. Parts of the eastern half of New Mexico observed 150 to more than 200 percent of average precipitation with these storms over the past 30 days. The drought situation may change dramatically over the next six months, as the current La Niña event is expected to disrupt winter weather across the western U.S., producing dry conditions across the Southwest.

Figure 5a. New Mexico drought map based on data through October 19.

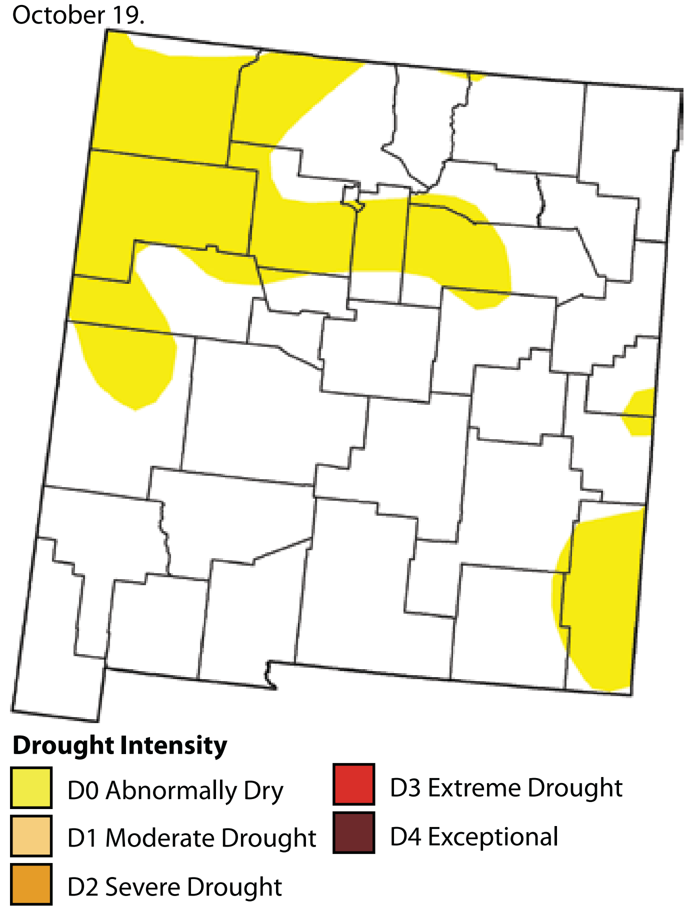


Figure 5b. Percent of New Mexico designated with drought conditions based on data through October 19.

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	76.1	23.9	0.0	0.0	0.0	0.0
Last Week (10/12/2010 map)	76.7	23.3	0.0	0.0	0.0	0.0
3 Months Ago (07/27/2010 map)	65.8	34.2	12.1	0.0	0.0	0.0
Start of Calendar Year (01/05/2010 map)	56.9	43.1	10.1	2.3	0.0	0.0
Start of Water Year (10/05/2010 map)	76.7	23.3	0.0	0.0	0.0	0.0
One Year Ago (10/20/2009 map)	62.1	37.9	5.5	2.7	0.0	0.0

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://www.drought.unl.edu/dm/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 9/30/10)

Data Source: USDA-NRCS, National Water and Climate Ctr.

During the last month, combined storage in Lake Mead and Lake Powell decreased by 364,000 acre-feet. As of October 1, the two large reservoirs had a combined storage of 50.2 percent of capacity (Figure 6), which is about 2 percent (1.04 million acre-feet) less than a year ago. The total storage in reservoirs within Arizona's borders, excluding Lakes Powell and Mead, decreased in September by about 109,400 acre-feet. Storage in the Salt and Verde river basins is greater than average and greater than it was last year. This is important because La Niña events usually bring dry winters to Arizona. Currently, La Niña is classified as moderate to strong. In water-related news, Navajo Nation lawmakers will meet to discuss a bill to settle water rights from the Colorado River on November 4 (Associated Press, October 19). The proposed settlement would give Navajo Nation 31,000 acre-feet of Colorado River water, some additional surface water from the Little Colorado River, and access to groundwater beneath the reservation.

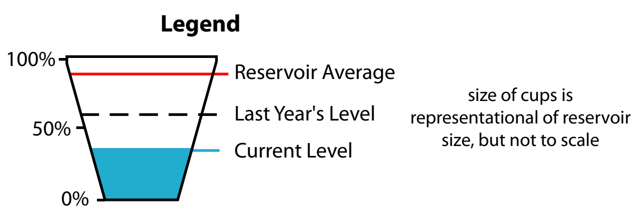
Notes:

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 4 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.

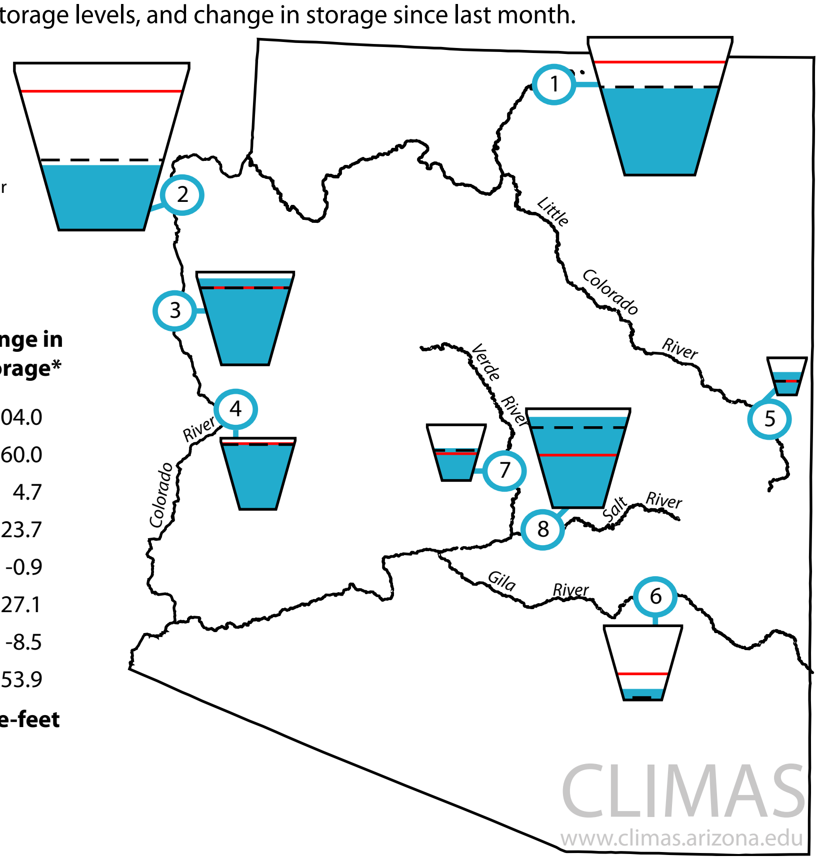
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Dino DeSimone, Dino.DeSimone@az.usda.gov.

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	63%	15,267.0	24,322.0	-104.0
2. Lake Mead	39%	10,092.0	26,159.0	-260.0
3. Lake Mohave	93%	1,674.8	1,810.0	4.7
4. Lake Havasu	91%	560.2	619.0	-23.7
5. Lyman Reservoir	62%	18.7	30.0	-0.9
6. San Carlos	15%	133.5	875.0	-27.1
7. Verde River System	58%	166.4	287.4	-8.5
8. Salt River System	92%	1,865.2	2,025.8	-53.9

*** 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 9/30/10)

Data Source: USDA-NRCS, National Water and Climate Ctr.

The total reservoir storage in New Mexico decreased by about 143,000 acre-feet in September (Figure 7). Storage in the two largest New Mexico reservoirs—Navajo and Elephant Butte—decreased by about 52,000 acre-feet. Despite the storage declines, which are typical for this time of year, combined storage in Pecos River reservoirs (reservoirs 9–12) is approximately 32,000 acre-feet more than it was one year ago. Also, combined storage in Canadian River reservoirs (reservoirs 13–15) is up by more than 16,000 acre-feet compared to one year ago.

In water-related news, the Bernalillo County Water Authority (BCWA) is requesting that water customers reduce usage, limiting outdoor water use to no more than twice weekly for 15 minutes at a time (kob.com, October 19). The BCWA noted that October water usage already exceeds the October water use target by more than 300 million gallons.

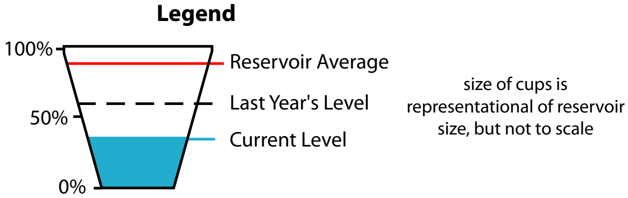
Notes:

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 4 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.

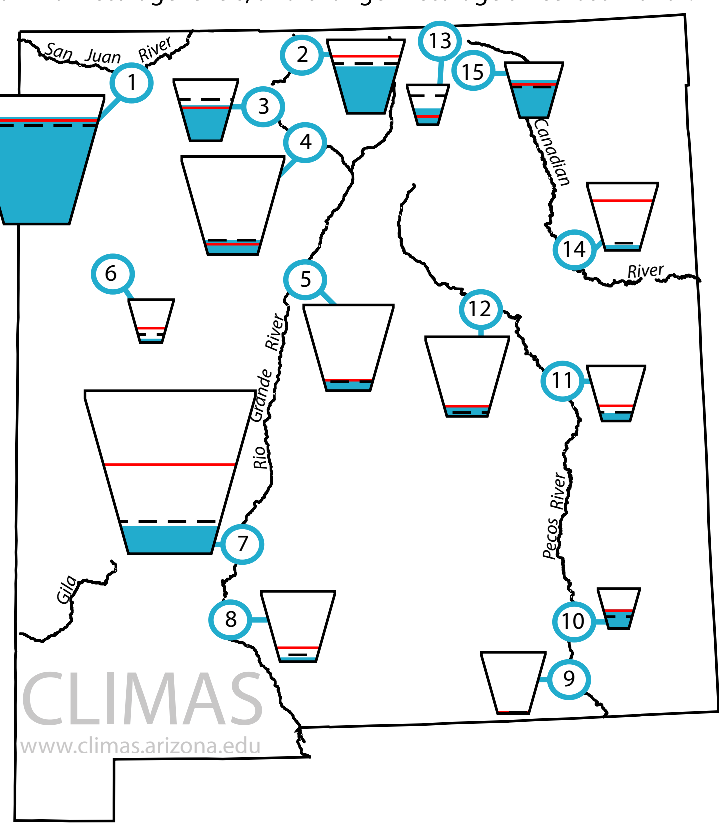
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Wayne Sleep, wayne.sleep@nm.usda.gov.

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.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Navajo	83%	1,412.3	1,696.0	-33.7
2. Heron	64%	256.6	400.0	-45.3
3. El Vado	58%	111.3	190.3	-7.1
4. Abiquiu	15%	178.0	1,192.8	3.2
5. Cochiti	11%	51.6	491.0	-0.6
6. Bluewater	9%	3.6	38.5	-0.2
7. Elephant Butte	17%	365.9	2,195.0	-18.0
8. Caballo	6%	21.4	332.0	-19.2
9. Brantley	2%	18.3	1,008.2	2.6
10. Lake Avalon	48%	1.9	4.0	0.2
11. Sumner	15%	14.9	102.0	-2.5
12. Santa Rosa	12%	53.4	438.3	-3.0
13. Costilla	41%	6.5	16.0	-3.1
14. Conchas	8%	20.6	254.2	-13.1
15. Eagle Nest	68%	53.4	79.0	-3.0

*** 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

Temperature Outlook

(November 2010–April 2011)

Data Source: NOAA-Climate Prediction Center (CPC)

The seasonal temperature outlooks issued by the NOAA–Climate Prediction Center (CPC) in October call for increased chances for temperatures to be similar to the warmest 10 years during the 1971–2000 period through the winter. For the November–January period, CPC outlooks call for greater than a 50 percent chance that temperatures will resemble the warmest years in the climatological record in all of New Mexico and eastern Arizona (Figure 8a). For the December–February outlook, temperatures in southern New Mexico have greater than a 50 percent probability of being similar to the warmest 10 years in the climatological record, while probabilities diminish in Arizona and northern New Mexico (Figure 8b). The probabilities for elevated temperatures remain at more than 33 percent later in the winter (Figures 10c–10d). Both the expectation of a persistent La Niña event and decadal warming trends contribute to the enhanced probability of above-average temperatures in the West.

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 1971–2000 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 2010–January 2011.

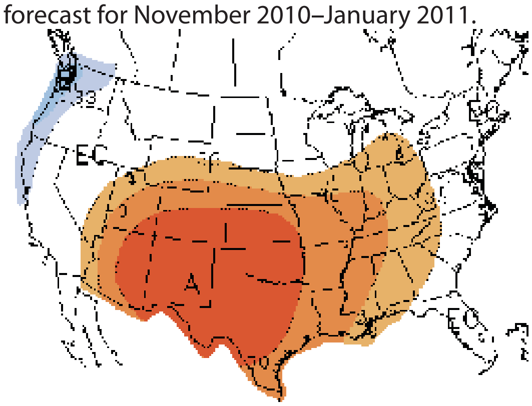


Figure 8b. Long-lead national temperature forecast for December 2010–February 2011.

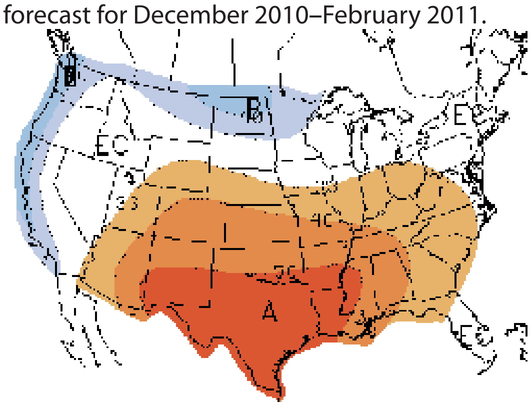


Figure 8c. Long-lead national temperature forecast for January–March 2011.

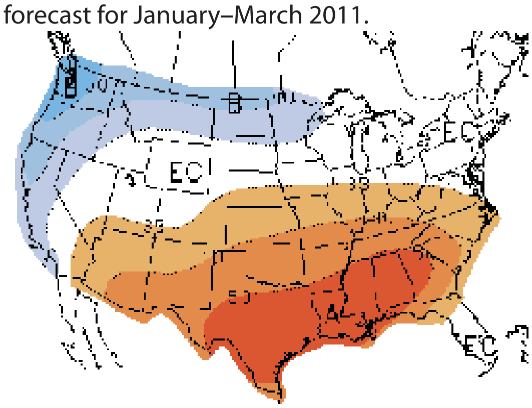
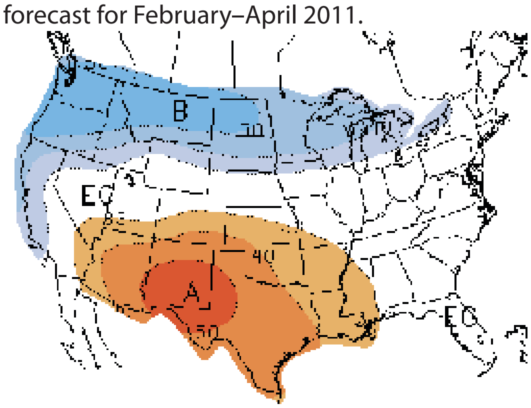


Figure 8d. Long-lead national temperature forecast for February–April 2011.



A= Above: 50.0–59.9%, 40.0–49.9%, 33.3–39.9%

B=Below: 40.0–49.9%, 33.3–39.9%

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

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 2010–April 2011)

Data Source: NOAA-Climate Prediction Center (CPC)

The NOAA–Climate Prediction Center (CPC) precipitation outlooks suggest drier-than-average conditions for most of the fall and winter in all of Arizona and western New Mexico (Figures 9a–d). These outlooks are influenced heavily by the strong La Niña event. Chances that Arizona and New Mexico will receive drier-than-average conditions are highest in the January–March and February–April periods because that is when La Niña events are strongest and the atmosphere has had time to adjust to cooling sea surface temperatures. During La Niña events since 1950, winters in the southwestern U.S. and particularly Arizona have been dry between 60 and 80 percent of the time.

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 1971–2000 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 2010–January 2011.

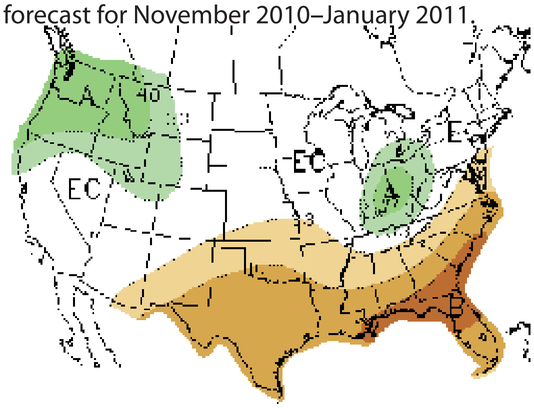


Figure 9b. Long-lead national precipitation forecast for December 2010–February 2011.

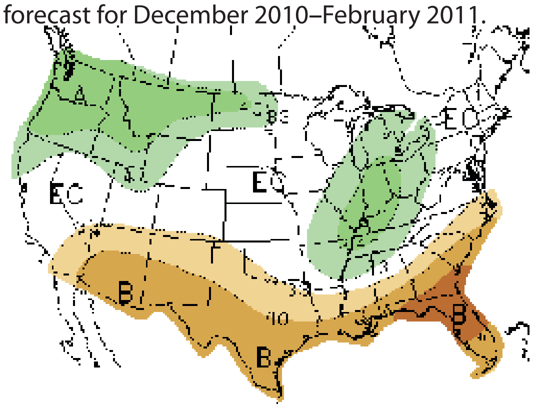


Figure 9c. Long-lead national precipitation forecast for January–March 2011.

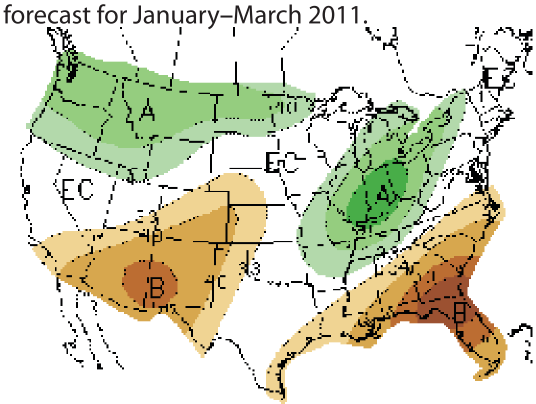
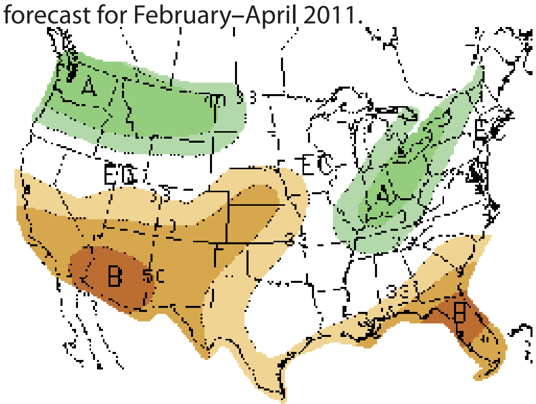


Figure 9d. Long-lead national precipitation forecast for February–April 2011.



B= Below: 33.3–39.9%, 40.0–49.9%

A=Above: 40.0–49.9%, 33.3–39.9%

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 October load slowly on your computer)

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

Seasonal Drought Outlook

(through January)

Data Source: NOAA-Climate Prediction Center (CPC)

This summary is excerpted and edited from the October 21 Seasonal Drought Outlook technical discussion produced by the NOAA–Climate Prediction Center and written by forecasters D. Miskus and B. Pugh.

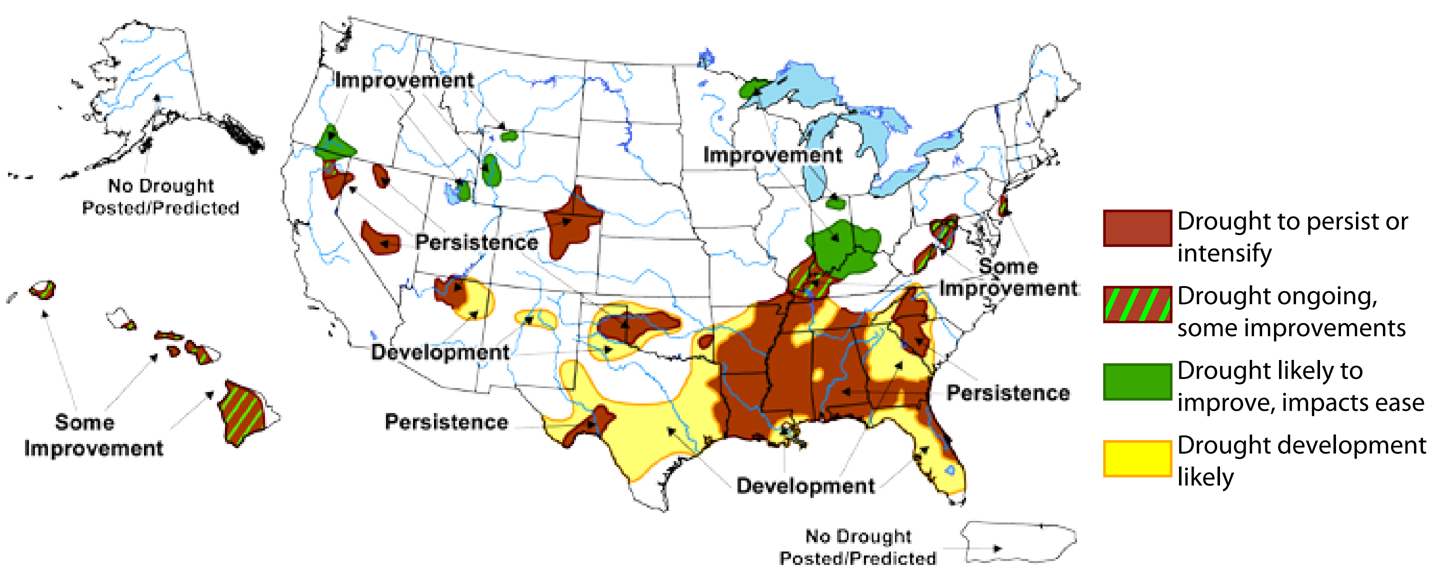
In the Southwest, an upper-air low pressure system in early October brought severe weather, including tornadoes and unseasonably heavy rains, to the Southwest. Northern Arizona was hit the hardest and several tornadoes caused damage west of Flagstaff. Two to six inches of rain fell on northern Arizona, southern Utah, and California's Sierra Nevada Mountains. The early winter rains were enough to diminish drought conditions in parts of Arizona, Nevada, Utah, and California. The monthly and seasonal outlooks, however, depict enhanced chances for dry conditions, largely because models incorporating La Niña conditions favor dry conditions and warm temperatures in the Southwest for the November–January period. While some slight improvement to drought conditions is possible in Arizona in the short-term, more significant improvement is not likely given the increasingly dry long-range forecasts. Drought is forecasted to persist and develop in the Four Corners region of Arizona and in parts of northern and eastern New Mexico that didn't receive the early October rains and have much lower soil moisture (Figure 10). The NOAA-Climate Prediction Center (CPC) has moderate confidence in this forecast for the Southwest.

Elsewhere in the West, the 2011 water year started wet in the Sierra Nevada Mountains and Great Basin. Unseasonably heavy early October precipitation was generated by a strong upper-air low that tracked northwestward from the Southwest. There was enough precipitation to diminish drought and abnormal dryness in this region. As winter approaches, the atmospheric response to La Niña shifts the Pacific storm track northwestward, bringing increased precipitation to the Northwest. The CPC monthly and seasonal outlooks indicate enhanced chances of above-median precipitation extending from the Pacific Northwest eastward into Wyoming.

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 January (released October 21).



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 La Niña event that emerged earlier this summer has continued to gain strength and is currently classified as moderate to strong. A La Niña Advisory issued by the NOAA–Climate Prediction Center several months ago remains in effect, signifying that a La Niña event is being observed and is expected to continue. A large area of below-average sea surface temperatures (SSTs) extends west from the South American coast, past the International Date Line in the middle of the Pacific Ocean; some SSTs are more than 2 degrees Celsius below-average. Southern Oscillation Index (SOI) values also have exceeded a value of 2 for the first time in several years, indicating a strong atmospheric response to the cool water in the eastern Pacific Ocean (Figure 11a). SSTs, the SOI, and other metrics, including stronger-than-average easterly winds along the equatorial Pacific, are evidence that the ocean and atmosphere are working together to support and sustain the current La Niña event at moderate to strong levels over the next several months.

Forecasts issued by the International Research Institute for Climate and Society (IRI) depict a 99 percent chance that La Niña conditions will persist over the next three months (Figure 11b). There is greater than a 90 percent chance that La Niña will persist through next March. La Niña is expected to weaken and possibly exit the scene by later in the spring. In the meantime, La Niña will have a strong impact on the winter season by disrupting the normal winter storm track, pushing it north away from Arizona and New Mexico. Seasonal forecasts reflect this situation and call for increased chances of below-average precipitation from October through March.

Notes:

The first figure shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through August 2010. 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, the 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/

Figure 11a. The standardized values of the Southern Oscillation Index from January 1980–August 2010. 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).

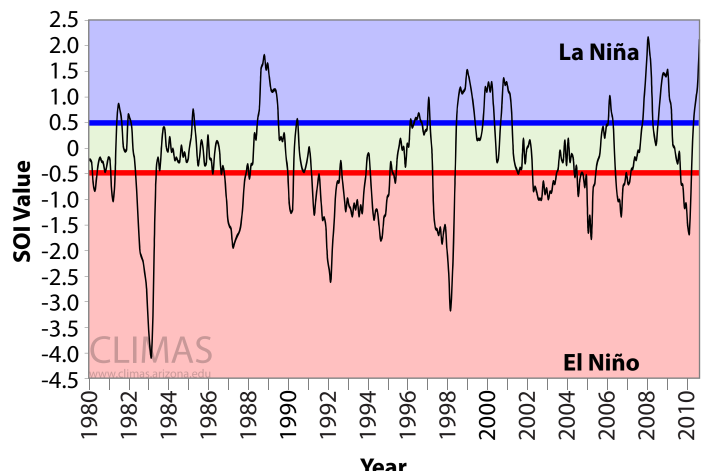
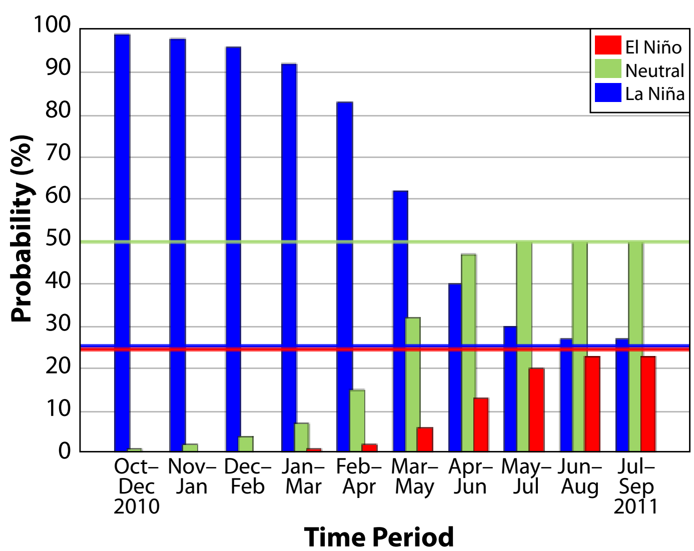


Figure 11b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released October 21). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Temperature Verification

(November 2010–April 2011)

Data Source: Forecast Evaluation Tool

For a thorough description of the interpretation of these maps, see the feature article, "Evaluating forecasts with the RPSS," in the April 2009 issue of the Southwest Climate Outlook.

Comparisons of observed temperatures for November–January to forecasts issued in October for the same period suggest that forecasts have been more accurate than forecasting equal chances (i.e., 33 percent chance that temperature will be above-, below-, or near-average) only in southeast and northwest Arizona and southwest New Mexico (Figure 12a). Outside of southern Arizona and New Mexico and northwest Arizona, forecast skill—a measure of the accuracy of the forecast—is similar to an equal chances forecast. For the December–February period, forecasts outside of northwest Arizona have not been better than equal chances in all of Arizona and New Mexico (Figure 12b). For the three-month and four-month lead times, forecasts issued in October have been more accurate than equal chances in many areas of the Southwest (Figures 12c–d). While bluish hues suggest that CPC historical forecasts have been more accurate than equal chances, caution is advised to users of the seasonal forecasts for regions with reddish colors.

Notes:

These maps evaluate the historical performance of the one- to four-month long-lead forecasts made by NOAA's Climate Prediction Center (CPC). The maps convey the historical accuracy of the CPC forecasts in relation to the reference forecast, which assigns a 33 percent chance to the three CPC categories, "above," "below," and "neutral." These categories indicate whether conditions are predicted to be similar to the warmest, coolest, or normal temperatures for 1971 to 2000. The maps are generated from the Forecast Evaluation Tool, which was developed by The University of Arizona in partnership with NOAA, NASA, NSF, and the University of California-Irvine.

The maps display the Ranked Probability Skill Score (RPSS). The more the forecasts and actual weather match, the bluer the color. A bluish or reddish RPSS indicates the forecast is more accurate or less accurate, respectively, than assigning a 33 percent chance to each of the three CPC categories.

The RPSS is calculated by comparing all the forecasts made since December 1994 for particular seasons and specified lead times to the actual weather of the season.

Figure 12a. RPSS for November 2010–January 2011.

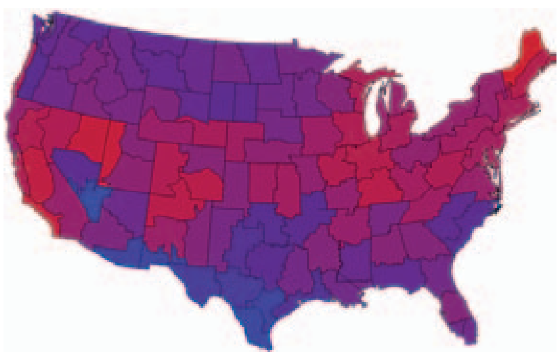


Figure 12b. RPSS for December 2010–February 2011.

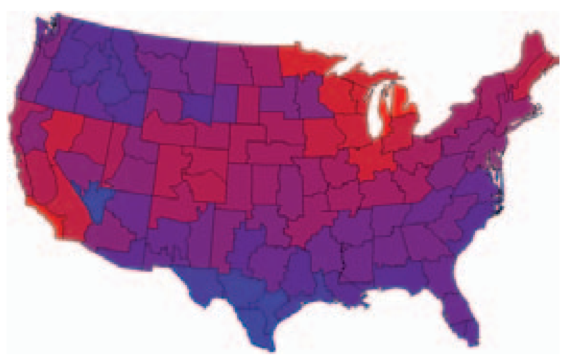


Figure 12c. RPSS for January–March 2011.

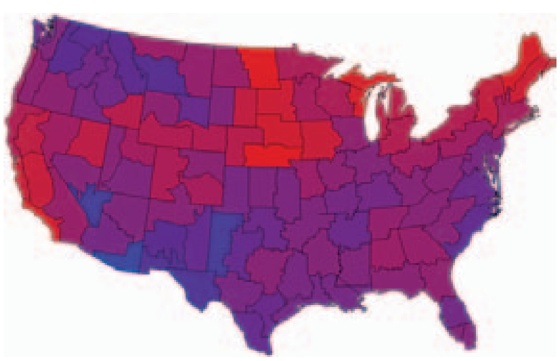
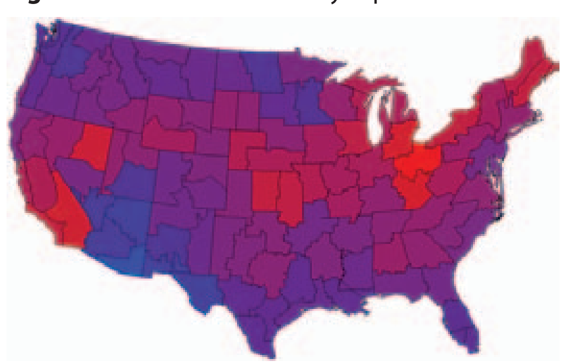


Figure 12d. RPSS for February–April 2011.



On the Web:

For more information on the Forecast Evaluation Tool, visit
http://fet.hwr.arizona.edu/ForecastEvaluationTool/

For a CLIMAS publication that explains how to use the Forecast Evaluation Tool, visit
http://www.climas.arizona.edu/feature-articles/november-2005

Precipitation Verification
(November 2010–April 2011)

Data Source: Forecast Evaluation Tool

For a thorough description of the interpretation of these maps, see the feature article, "Evaluating forecasts with the RPSS," in the April 2009 issue of the Southwest Climate Outlook.

Comparisons of observed precipitation for November–January to forecasts issued in October for the same period suggest that forecasts in all regions of Arizona and northern New Mexico have been similar to an equal chances forecast (Figure 13a). Forecast skill—a measure of the accuracy of the forecast—is highest in southwest New Mexico for the November–January period. Forecast skill for the two-month lead time shows slight improvements in accuracy (Figure 13b). For the three- and four-month lead times, forecast accuracy increases and forecasts have been more accurate than simply using an equal chances forecast (Figures 13c–d). While bluish hues denote more accurate forecasts, caution is advised to users of the seasonal forecasts for regions with reddish colors.

Notes:

These maps evaluate the historical performance of the one- to four-month long-lead forecasts made by NOAA's Climate Prediction Center (CPC). The maps convey the historical accuracy of the CPC forecasts in relation to the reference forecast, which assigns a 33 percent chance to the three CPC categories, "above," "below," and "neutral." These categories indicate whether conditions are predicted to be similar to the wettest, driest, or normal precipitation for 1971 to 2000. The maps are generated from the Forecast Evaluation Tool, which was developed by The University of Arizona in partnership with NOAA, NASA, NSF, and the University of California-Irvine.

The maps display the Ranked Probability Skill Score (RPSS). The more the forecasts and actual weather match, the bluer the color. A bluish or reddish RPSS indicates the forecast is more accurate or less accurate, respectively, than assigning a 33 percent chance to each of the three CPC categories.

The RPSS is calculated by comparing all the forecasts made since December 1994 for particular seasons and specified lead times to the actual weather of the season.

Figure 13a. RPSS for November 2010–January 2011.

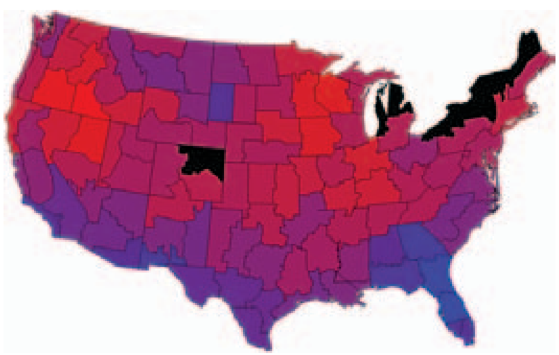


Figure 13b. RPSS for December 2010–Febuary 2011.

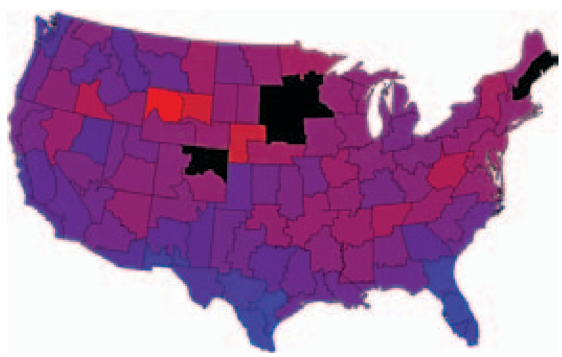


Figure 13c. RPSS for January–March 2011.

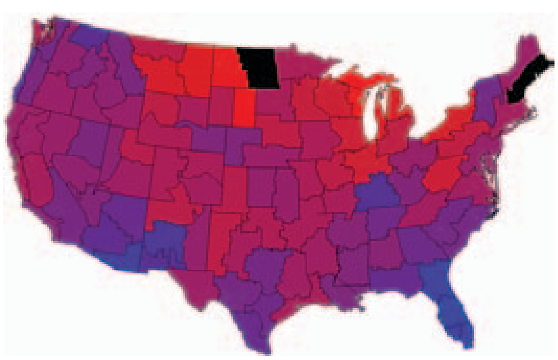
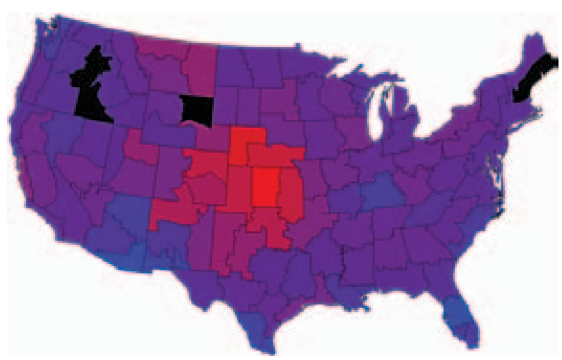


Figure 13d. RPSS for February–April 2011.



On the Web:

For more information on the Forecast Evaluation Tool, visit http://fet.hwr.arizona.edu/ForecastEvaluationTool/

For a CLIMAS publication that explains how to use the Forecast Evaluation Tool, visit http://www.climas.arizona.edu/feature-articles/november-2005