Issued: October 23, 2008

Southwest Climate Outlook

THE UNIVERSITY OF ARIZONA.
Arizona's First University.

Source: Zack Guido

Photo Description: Caltocumulus clouds in a mackerel pattern, which forebode rain, over Baboquivari Peak Wilderness in Southern Arizona. This photo was taken in February 2008.

Would you like to have your favorite photograph featured on the cover of the *Southwest Climate Outlook*? For consideration send a photo representing Southwest climate and a detailed caption to: knelson7@email.arizona.edu

In this issue...

CLIMAS

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

OFFICE OF THE STATE CLIMATOLOGIST

NM STATE UNIVERSITY

October Climate Summary

Drought – Summer monsoon thunderstorm activity through late August helped improve short-term drought conditions across much of southern Arizona.

Temperature – The new water year has begun with temperatures 2–4 degrees Fahrenheit cooler than average across all of Arizona and western New Mexico.

Precipitation – The beginning of New Mexico's water year has been very wet, while Arizona's has been very dry.

ENSO – ENSO-neutral conditions are once again the dominant pattern across the Pacific basin; the probability continues to increase of ENSO-neutral conditions persisting through this fall and into the winter.

Climate Forecasts – Temperatre forecasts call for equal chances of above-, below-, and near-normal temperatures in most of the region west of the Rockies throughout the remainder of 2008 and into early 2009. Precipitation forecasts call for slightly increased chances of below-average precipitation for the same period.

The Bottom Line – New Mexico's soil moisture is favorable for crops, due in part to recent wet conditions, while dry conditions in Arizona have made soils extremely dry. With respect to water storage, Lakes Powell and Mead declined by 236,000 acre-feet during September 2008. Although the combined levels fell in the last month, they are significantly higher than they were one year ago. Reservoir storage in New Mexico also slightly declined in September.

Eastern Pacific Tropical Storms

Hurricane Norbert veered east in the Eastern Pacific Ocean on October 11 and sliced through central Baja California Peninsula, destroying thousands of homes and sending a surge of moist air northeastward into Arizona. This year, Norbert is not the only storm to batter towns and impact southwestern weather. Since the onset of the tropical hurricane season on May 15, Tropical Storm Julio on August 30, and Tropical Storm Lowell on September 6, also pushed moist air into the Southwest.Although Norbert, Julio, and Lowell dissipated over land before reaching the U.S. Southwest, decaying tropical storms pass over the region about once in every five years, according to the National Weather Service.

The evolution of the 2008 tropical storm season largely has mirrored predictions by experts. In mid-May, the National Oceanic and Atmospheric Administration (NOAA) predicted that the Eastern Pacific would experience 11 to 16 named storms and five to eight hurricanes. By October 16, 15 storms had been named and seven of them had become hurricanes. The hurricane season will end on November 30.

Table of Contents:

SWCO Staff:

Mike Crimmins, *UA Extension Specialist*
Stephanie Doster, *ISPE Information Specialist*
Dan Ferguson, *CLIMAS Program Manager*
Gregg Garfin, *ISPE Deputy Director of Outreach*
Zack Guido, *CLIMAS Associate Staff Scientist*
Kristen Nelson, *ISPE Associate Editor*
Nancy J. Selover, *Arizona State Climatologist*

This work is published by the Climate Assessment for the Southwest (CLIMAS) project and the University of Arizona Cooperative Extension; and is funded by CLIMAS, Institute for the Study of Planet Earth, and the Technology and Research Initiative Fund of the University of Arizona Water Sustainability Program through the SAHRA NSF Science and Technology Center at the University of Arizona.

2008 SWCO water year in review

Introduction

The 2008 Water Year in Review offers a summary of the information presented in each month's outlook during the 2008 water year. This review provides an overview of precipitation, temperature, reservoir levels, drought, wildfire, and El Niño conditions. The water year begins on October 1 and ends on September 30 of the following year, so this review covers October 1, 2007 through September 30, 2008.

The La Niña event htat developed at the beginning of the 2008 water year persisted until the summer months, influencing precipitation, streamflows, reservoir storage, and drought conditions. This La Niña, however, had an interesting twist: in parts of Arizona, New Mexico, and the San Juan Mountains of Colorado, the La Niña winter felt more like an El Niño as rains and snows soaked these regions from late November to early March.

The wet winter in many parts of the Rockies, including the San Juan Mountains, helped elevate streamflows and increase water storage in Lakes Powell and Mead for only the second time since 2000. Short-term drought conditions in many parts of the Southwest also faded during the winter. They returned, however, in the spring, with dry conditions sparking an active fire season for New Mexico.

The summer monsoon appeared right on cue in late June, dampening the fire season with characteristic thunderstorms and delivering above-average summer precipitation to many regions. Despite these frequent thunderstorms, the 2008 water year was generally drier than normal for most of Arizona and New Mexico. Temperatures during the water year were only slightly higher than average across Arizona and much of New Mexico.

continued on page 4

Top 5 headlines of the water year

1) **La Niña produced an El Niño-like winter in the Southwest:** The onset of winter snow and rain in the Southwest came abruptly at the end of November and delivered copious precipitation. Although La Niña conditions historically deliver less precipitation to Colorado's San Juan Mountains and southern Arizona, both areas were wet.

2) **Increase in the Lake Powell water level:** Lake Powell's water level rose about 26 feet during the water year, equal to approximately 2.6 million acre-feet. Although the actual water level increase was 14 feet less than the projection made in April, the boost in storage is crucial and marks only the second year since 2000 when the reservoir's water level rose.

3) **Copious monsoon rains:** Monsoon thunderstorms drenched most regions in Arizona and New Mexico with above-average precipitation. Although the monsoon started slowly, with spotty rains in June delivering above-average rainfall to only a few regions, July thunderstorms came in droves. July rains, aided in part by several decaying tropical storms, helped bump the average precipitation in southern Arizona and the southwest corner of New Mexico above 150 percent of normal.

4) **Fire season vigorous in New Mexico but weak in Arizona:** Dry and windy conditions prevailed in New Mexico as the winter transitioned into spring. This helped dry out fuels, and by the time the monsoon rains drenched the landscape in July more than 360,000 acres had burned, nearly twice the historic average. Fires in Arizona, on the other hand, burned approximately 96,000 acres, about half the historic average.

5) **Innovative water management adopted for Colorado River:** The U.S. Department of the Interior signed a historic Record of Decision (RD) on December 13, to implement water management strategies for the Colorado River. The new guidelines include preparing for future droughts and stimulating water conservation. The RD was hailed as the most important agreement among the seven basin states since the original 1922 Colorado River Compact.

WYIR, continued

Precipitation

The 2008 water year was generally drier than average for most of Arizona and New Mexico, with a few high elevation areas receiving much greater-than-average precipitation (Figure 1a–1b). The Colorado Plateau in Arizona had 25–90 percent of average precipitation while northern New Mexico ranged from 50 to 100 percent of average precipitation. The highest elevations in northern and southern New Mexico and along the Mogollon Rim in Arizona had 110–150 percent of average precipitation. The low elevation exception was Phoenix, which had a wetter-than-average winter and summer.

Winter began with La Niña conditions, which tend to bring dry winter weather, and the predictions were for a drier and warmer-than-average winter. As it turned out, winter was unusually wet across most of the Southwest from October through February. A few very wet winter storms brought heavy rain and snowfall to northern and central Arizona and New Mexico. By March, the wet winter became dry in both states. Spring was also dry and warm, which led to an early spring snowmelt. One exception to the dry spring was that Phoenix had the ninth wettest May on record.

Summer began with relatively early monsoon activity, particularly in central Arizona. Southeastern Arizona had a fairly wet monsoon, but it finished the water year slightly drier than average. Southwestern New Mexico finished the water year with slightly above-average precipitation. Phoenix was the only major city that finished the year significantly above average for rainfall. Albuquerque, which ended the 2007 water year on the plus side, was dry. Flagstaff Pulliam Airport received less than half it's average precipitation, reporting a decrease of 13.44 inches—the greatest precipitation departure from the city's historical average.

continued on page 5

Figure 1a. Water year 2007–2008 through September 30, 2008 departure from normal precipitation.*

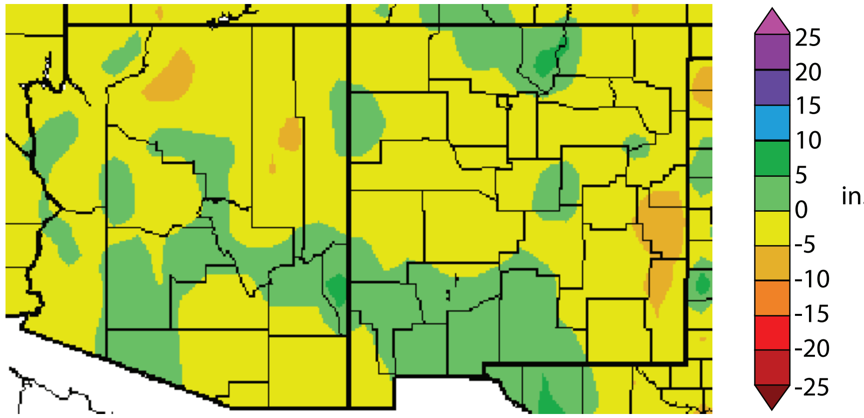
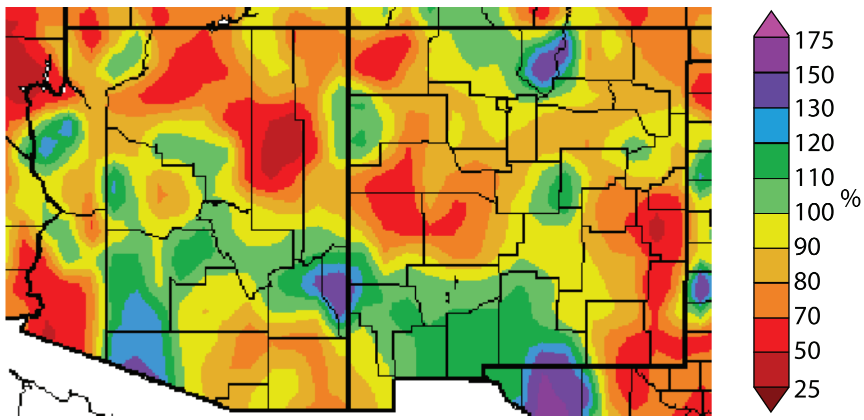


Figure 1b. Water year 2007–2008 through September 30, 2008 percent of average precipitation.*



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

Table 1. Water Year 2008 precipitaion values (in inches) for select cities.

City	WY 2008 Precipitaion	Average WY Precipitaion	2008 Departure from Average	2007 Departure from Average
Phoenix, AZ	10.50	8.29	2.21	-5.06
Tucson, AZ	8.93	12.17	-3.24	-3.08
Douglas, AZ	9.45	13.76	-4.31	-1.28
Albuquerque, NM	7.65	9.47	-1.82	2.33
Winslow, NM	4.66	8.03	-3.37	-2.03
Flagstaff, AZ	9.77	22.91	-13.14	-8.32
Yuma, AZ	2.14	3.05	-0.91	-1.81
Roswell, NM	12.27	13.34	-1.07	-0.01

WYIR, continued

Temperature

Temperatures over the 2008 water year were only slightly higher than average across most of Arizona and New Mexico (Figure 2a–2b). A few high elevation areas in north central and central New Mexico were slightly cooler than average.

Several cold, wet winter storms moved across Arizona and the northwestern half of New Mexico, keeping winter temperatures near or below average. November average temperature ranged from the second to the seventh warmest on record for west central, central, and southwestern New Mexico, while October was the seventh to tenth warmest on record in eastern New Mexico. In Arizona, winter was only slightly warmer than average, although November was the warmest on record for Phoenix.

Phoenix set or tied many daily temperature records during the past water year, mainly due to high minimum temperatures resulting from the urban heat island effect (UHI). The UHI is caused by asphalt, stone, or concrete-covered urban landscapes that retain heat at night.

The White Mountains in east central Arizona were 1–3 degrees F warmer than average, even while receiving heavier-than-average snowfall in the winter and rainfall during the monsoon. Overall, this past water year has continued the trend toward warmer temperatures across the southwestern United States.

Figure 2a. Water year 2007–2008 through September 30, 2008 average temperature.*

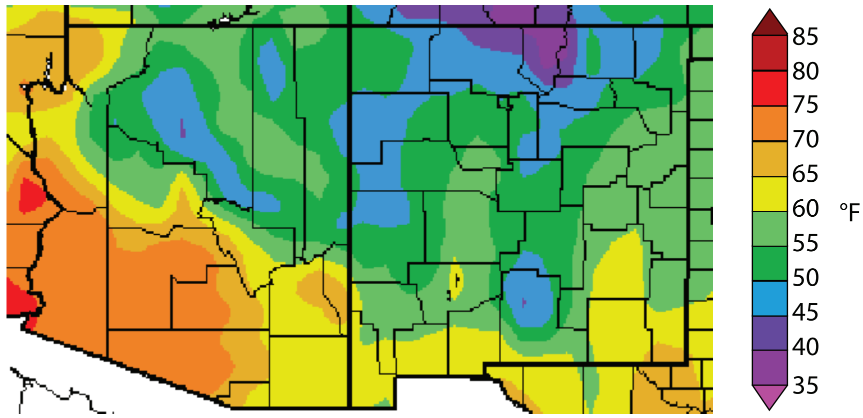
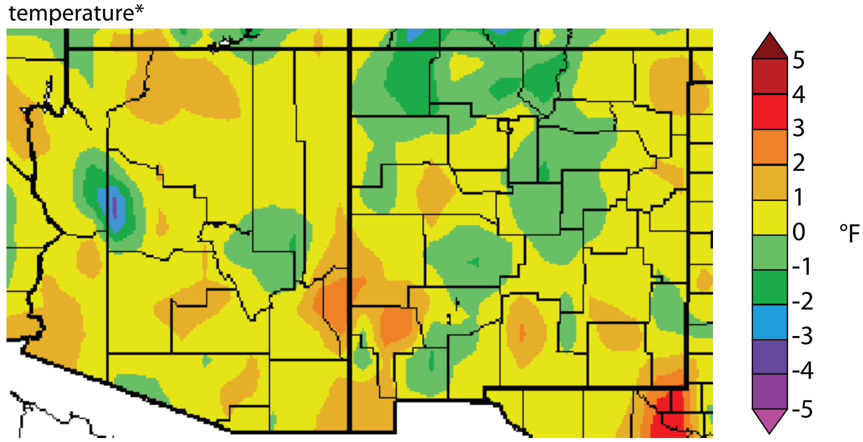


Figure 2b. Water year 2007–2008 through September 30, 2008 departure from normal temperature*



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

continued on page 6

WYIR, continued

Reservoirs

Arizona

Arizona reservoir storage increased substantially during the 2008 water year. Beginning with late November 2007 rain and snow, storage increased in most in-state reservoirs until the last of the spring snow melted. At the end of the water year, the large reservoirs contained almost double the volume of water as they did one year ago (Table 2).

Colorado River reservoir storage increased for only the second time in the last 10 years. Combined total storage in Lake Powell and Lake Mead started the water year at 24,303,000 acre-feet (48 percent of capacity) and ended the water year at 26,522,000 acre-feet (52.4 percent of capacity; Figure 3a).

New Mexico

Compared with one year ago, New Mexico total reservoir storage increased by approximately 84,200 acre-feet. New Mexico's largest reservoir, Elephant Butte, is still well below average but the water level increased substantially from the beginning of the water year in October 2007 (Figure 3b). Storage declined at Navajo Reservoir in the San Juan River Basin. In fact, storage increased during the water year in most Rio Grande reservoirs, thanks to significant winter snowpack in the headwaters region.

However, on the dry side of the wet/dry La Niña line that crossed the state diagonally during the winter months, storage declined in reservoirs like Conchas, Brantley, and Santa Rosa within the Canadian and Pecos river basins (Table 3).

Figure 3a. Combined water storage of Lakes Powell and Mead in Arizona during the 2008 water year.

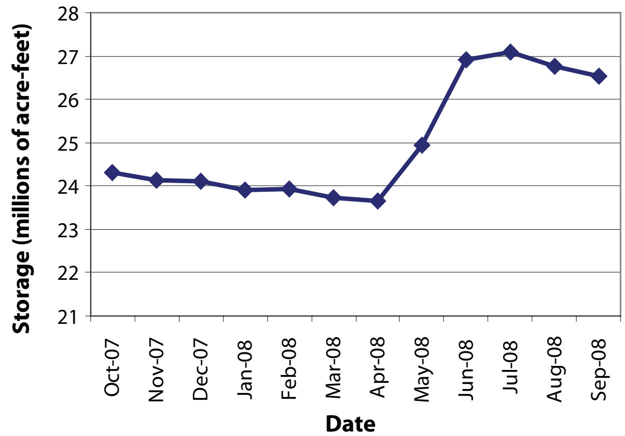


Figure 3b. Water storage contained in the Navajo and Elephant Butte reservoirs in New Mexico during the 2008 water year.

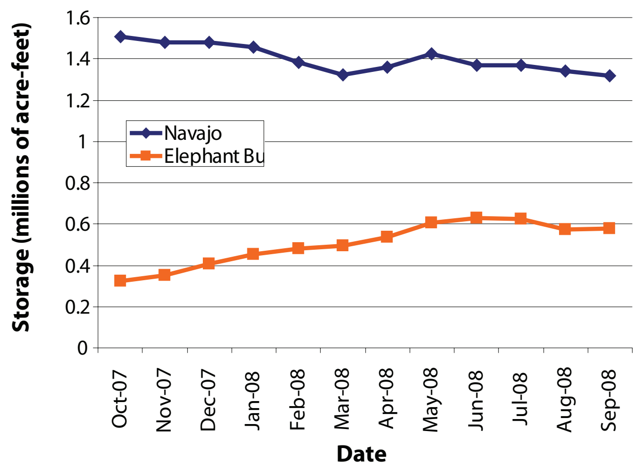


Table 2. Selected Arizona reservoirs' water year statistics.

Reservoir	Oct. 07 Percent full	Sept. 08 Percent full	WY Peak Percent	Peak Month
Powell	49	60	62	June
Mead	48	46	49	March
Gila	15	26	41	February
Verde	27	59	100	March
Salt	53	90	98	April

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

Reservoir	Oct. 07 Percent full	Sept. 08 Percent full	WY Peak Percent	Peak Month
Navajo	89	60	89	October
Heron	56	76	80	July
Elephant Butte	15	26	29	June
Conchas	17	11	17	October
Santa Rosa	11	7	12	February
Brantley	12	3	22	March

continued on page 7

WYIR, continued

Drought

Figure 4a. Drought Monitor released November 13, 2007.

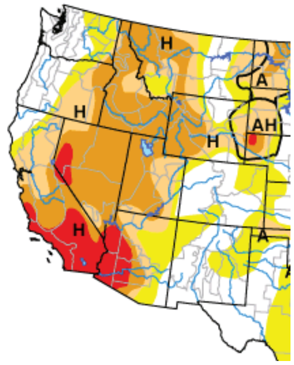


Figure 4b. Drought Monitor released February 12, 2008.

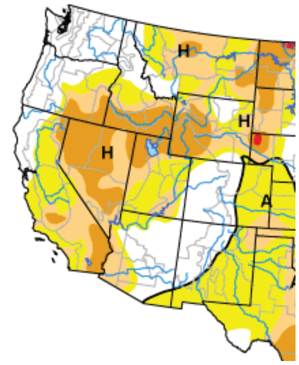


Figure 4c. Drought Monitor released May 13, 2008.

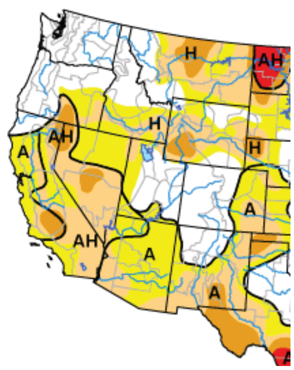
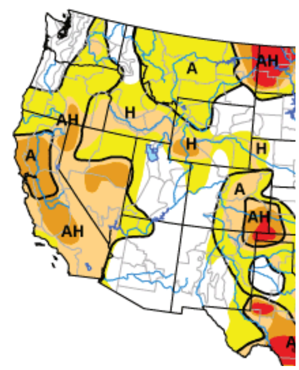


Figure 4d. Drought Monitor released August 12, 2008.



Drought Intensity

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

Drought Impact Types

/ Delineates Dominant Impacts

A = Agricultural (crops, pastures, grasslands)

H = Hydrological (water)

AH = Agricultural and Hydrological

Extreme to severe drought conditions gripped much of Arizona at the beginning of the 2007–2008 water year while much of New Mexico was drought free. The November 13 National Drought Monitor depicted extreme drought across the western third of Arizona, with severe and moderate drought covering much of the rest of the state (Figure 4a). Only extreme southeast Arizona was drought free at this time. New Mexico was the mirror opposite; much of the state was drought free, with only a small northeastern portion seeing abnormally dry conditions. Luckily for Arizona, unusually wet and cool conditions settled in across the region in late November and continued through December and January. A persistent trough across the western U.S. brought a parade of wet winter storms and above-average precipitation right across Arizona through December and January.

A dramatic retreat in short-term drought conditions across Arizona was evident by mid-February, when the National Drought Monitor depicted drought-free conditions across much of the state and only moderate drought along the lower Colorado River valley (Figure 4b). New Mexico was on the dry side of the persistent storm track that left above-average precipitation across Arizona. By mid-February, abnormally dry conditions had expanded across much of southern and eastern New Mexico.

The wet winter pattern for Arizona quickly dried out in March, leading to a rapid deterioration in short-term drought conditions across both Arizona and New Mexico. By mid-May, all of Arizona was under abnormally dry or moderate drought and much of New Mexico was under moderate or extreme drought (Figure 4c). Dry and windy late season storms continued to push across the Southwest through much of the spring, raising fire danger to extreme levels in New Mexico.

The summer monsoon appeared right on cue in late June, with thunderstorms pushing up into New Mexico and southern Arizona and bringing welcome rains. Several tropical storms from the Pacific and Atlantic were pulled up and across the Southwest, enhancing thunderstorm activity and precipitation across the region. Overall precipitation was above average for the season across much of Arizona and New Mexico. The August 12 National Drought Monitor reflects this above-average summer precipitation in the rapid retreat of short-term drought conditions over the Southwest (Figure 4d). Most of Arizona and New Mexico were drought free by mid-August and have remained so through the end of the water year, with only portions of northeast New Mexico and northwest Arizona observing abnormally dry conditions.

continued on page 8

WYIR, continued

Wildfire

In April 2008, the Southwest Coordination Center's Predictive Services predicted above-normal fire potential for most of Arizona and New Mexico outside the Four Corners region. The elevated fire potential was due to fine fuel crops (e.g., grass) that built up during previous monsoon seasons and from a dry winter that occurred in southeastern Arizona and most of southern and eastern New Mexico. With very few exceptions, the forecast of the locations of the high risk areas was right on target (Figures 5a and 5b).

During the 2008 fire season (through September 15, 2008), a mere 93,583 acres burned in Arizona. Arizona's largest fires were all less than 10,000 acres. The single largest Arizona fire, the Lane 2 Fire in the Prescott National Forest, burned 9,629 acres between late June and mid-July. In contrast, more than 362,157 acres burned in New Mexico. New Mexico's largest fire, the Stiles Complex, burned 67,008 acres near Hobbs in March. The second largest fire, the Rocky, burned over 49,000 acres in Lincoln National Forest in June. Other very large fires burned mostly in April and June and were concentrated in the southern half of the state (Table 4).

Through September 1, 2008, fire managers have been able to apply prescribed fires to more than 350,000 acres to improve forest health and reduce the risk of dangerous forest-decimating fires.

Table 4. Top 10 2008 Southwest fires.

Fire Name	State	Acres Burned
Stiles Complex	NM	67,008
Rocky	NM	49,132
Bonney	NM	25,360
Center Peak	NM	25,234
Four Lakes	NM	23,000
Buckeye 4	NM	16,837
Trigo	NM	13,709
Cholla	NM	12,624
4-83	NM	10,500
Lane 2	AZ	9,629

Figure 5a. Locations of Arizona fires larger than 50 acres as of September 15, 2008.

Figure 5b. Locations of New Mexico fires larger than 50 acres as of September 20, 2007.

continued on page 9

WYIR, continued

El Niño

Sea Surface Temperatures

A strong La Niña event developed at the beginning of the 2008 water year and persisted through the spring before finally retreating over the summer months. Stronger-than-average low-level easterly winds helped below-average sea surface temperatures (SSTs) spread across the equatorial region of the Pacific Ocean early in the water year. SSTs in the Niño 3.4 monitoring region (Figure 6a) quickly fell from near-average temperatures in the summer of 2007 to about 2 degres C below-average by the winter of 2008 (Figure 6b). The large and cold pool of water reflected in the Niño 3.4 SSTs was indicative of a strong and mature La Niña event that developed by mid-winter 2008. Temperatures began to rebound thereafter; the 2008 La Niña event weakened through the spring and was officially over by late summer 2008. SSTs across much of the eastern Pacific had warmed considerably by mid-summer, and by that time Niño 3.4 temperatures were close to zero, signaling the end of the La Niña event.

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

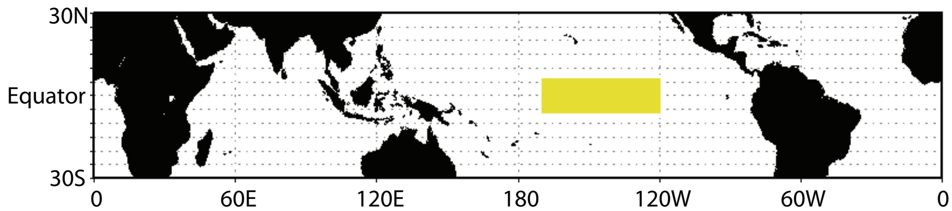
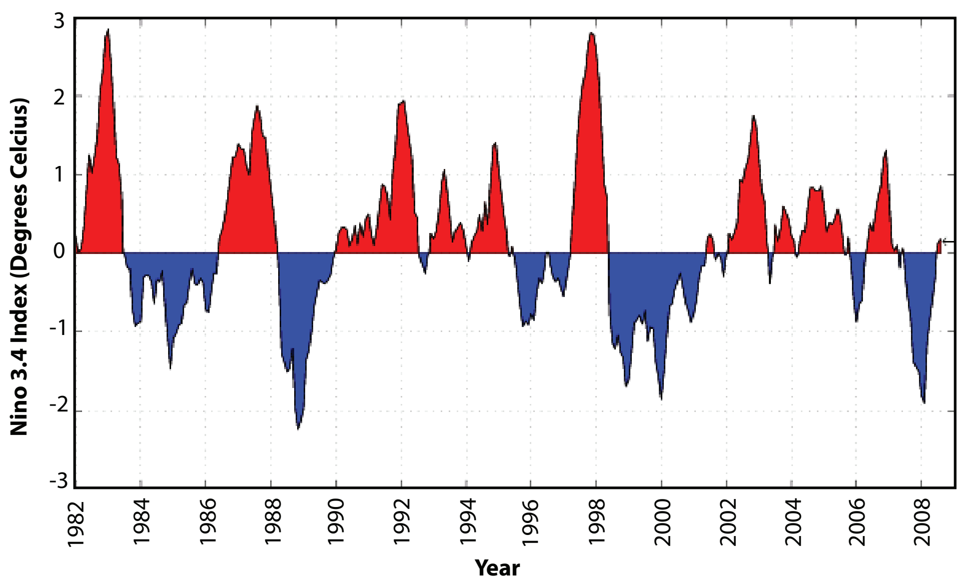


Figure 6b. Sea surface temperature anomaly index from Niño 3.4 region. Red areas indicate positive or warm SST anomalies while blue indicates negative or cool anomalies. Graphic credit: International Research Institute for Climate and Society.



Southern Oscillation Index

Monthly values of the Southern Oscillation Index (SOI), an index of the atmospheric component of El Niño and La Niña activity, reflected the strong La Niña event that developed through early water year. SOI values were on the rise in late fall 2007 in response to the cooling SSTs across the equatorial Pacific Ocean. Positive SOI values indicate an atmospheric response to below-average SSTs that are characteristic of a La Niña event. SOI values continued to climb through the early winter and peaked at 2.7, indicating a strong atmospheric response to the ongoing La Niña event. As SSTs rose through the early spring of 2008, SOI values fell to about zero by May. Although SSTs returned to near normal by mid-summer 2008, the SOI values rebounded slightly to a value of about 1.0 by August. This bounce upward in the SOI index indicated that the impact of the La Niña event was lingering in the atmospheric circulation patterns across the Pacific Ocean during the summer and early fall of 2008.

SOI and Niño 3.4 SST values indicated that the La Niña of the 2008 water year was the strongest event since 2000–2001, but delivered an unexpected shot of above-average precipitation to much of Arizona during the 2007–2008 winter season. La Niña events typically bring below-average precipitation to Arizona and New Mexico due to a northward shift in the winter storm track. An unusually strong trough of low-pressure persisted through the winter, leaving much of central and northern Arizona in the crosshairs of a parade of wet winter storms. Below-average precipitation did materialize south and east of this persistent storm track. Southeast Arizona and much of New Mexico observed less than 50 percent of average precipitation and experienced a dramatic worsening in short-term drought conditions through the winter season into early spring, which is a more typical La Niña impact on the Southwest.

Temperature (through 10/15/08)

Source: High Plains Regional Climate Center

Temperatures since October 1 have averaged between 45 and 65 degrees Fahrenheit across nearly all of New Mexico and the northeastern half of Arizona (Figure 1a). The southwestern half of Arizona has averaged between 65 and 80 degrees F. The dividing line between the warm and cool temperatures is the Mogollon Rim in Arizona, which separates winter-like temperatures at the higher elevations from summer-like temperatures in the deserts. The highest elevations have been between 40 and 50 degrees F. Temperatures at the start of the new water year have been between 0 and 4 degrees F below average across nearly all of Arizona and the western half of New Mexico (Figure 1b). Eastern New Mexico generally has been 0–2 degrees F warmer than average. The cooler weather across Arizona and western New Mexico is due to the first winter storm of the year that brought colder temperatures but little precipitation to Arizona and western New Mexico. Eastern New Mexico had some tropical moisture that generated rainfall and warmer temperatures in early October.

During the past 30 days, most of Arizona has been 0–2 degrees F warmer than average, with some isolated locations seeing temperatures slightly cooler than average (Figures 1c–d). New Mexico has been 0–2 degrees cooler than average in the south and 0–4 degrees warmer than average in the north.

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 '07–'08 (through October 15, 2008) average temperature.

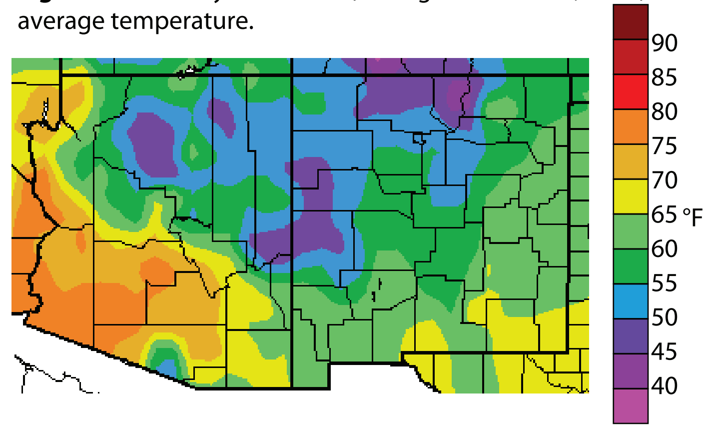


Figure 1b. Water year '07–'08 (through October 15, 2008) departure from average temperature.

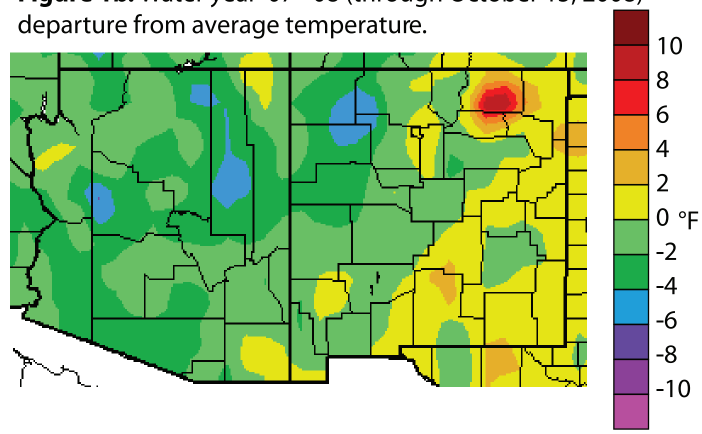


Figure 1c. Previous 30 days (September 16–October 15, 2008) departure from average temperature (interpolated).

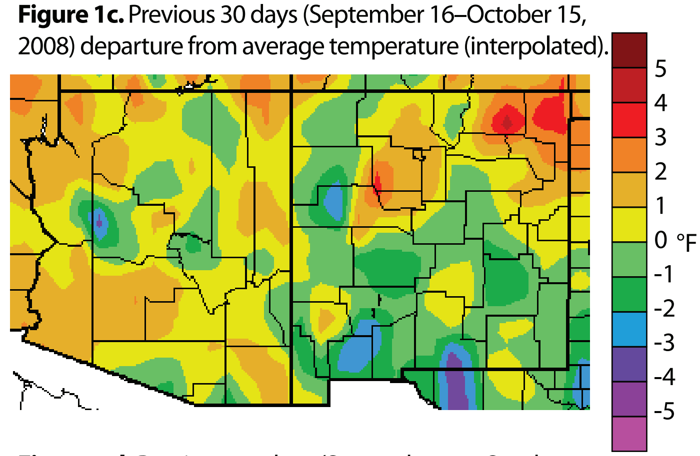
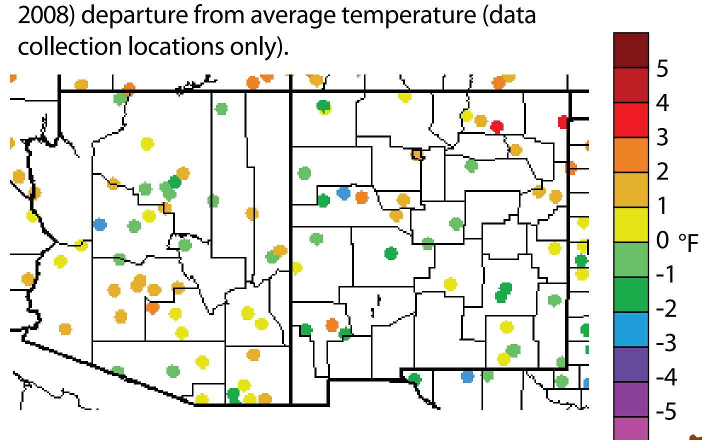


Figure 1d. Previous 30 days (September 16–October 15, 2008) departure from average temperature (data collection locations only).



Precipitation (through 10/15/08)

Source: High Plains Regional Climate Center

The new water year that began October 1 has been very dry in Arizona and very wet in New Mexico (Figures 2a–b). The winter storm that moved across the western United States in early October brought little precipitation to Arizona. A westerly flow of air across Arizona kept most of the tropical moisture east of the state. Western Arizona has had less than 5 percent of average precipitation, while eastern Arizona has received 5–150 percent of average precipitation. New Mexico has also seen a large range in precipitation, with 5–100 percent of average in the south central deserts and 100–400 percent of average in the northern half of the state. Eastern New Mexico has been extremely wet, with 400–800 percent of average, due to moisture from Tropical Storm Norbert.

In the past 30 days, almost all of Arizona has received 25 percent or less of average precipitation (Figures 2c–d). Although the monsoon season has been defined as June 15 through September 30, thunderstorm activity ended early this year in Arizona, making September unusually dry. Southern New Mexico was also dry, but central and northern New Mexico received 50–200 percent of average precipitation, including some early snowfall. Eastern New Mexico has had 110 to more than 300 percent of average precipitation.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2008, we are in the 2009 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 '07–'08 (through October 15, 2008) percent of average precipitation (interpolated).

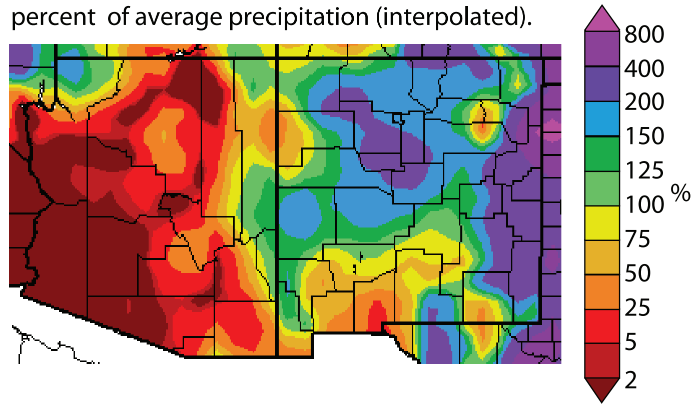


Figure 2b. Water year '07–'08 (through October 15, 2008) percent of average precipitation (data collection locations only).

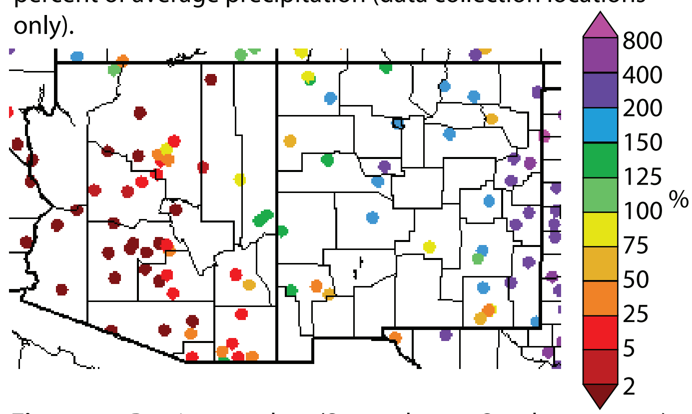


Figure 2c. Previous 30 days (September16–October 15, 2008) percent of average precipitation (interpolated).

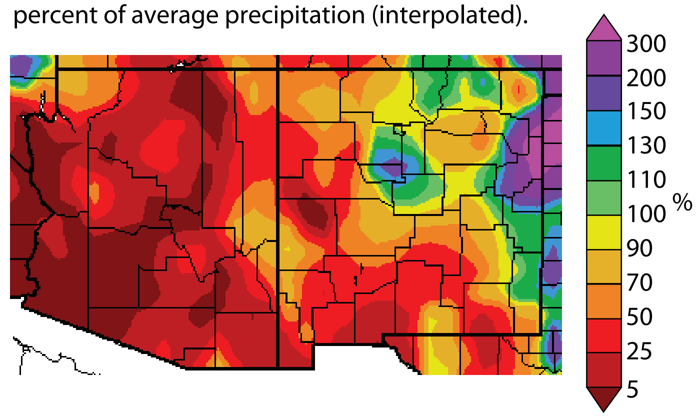
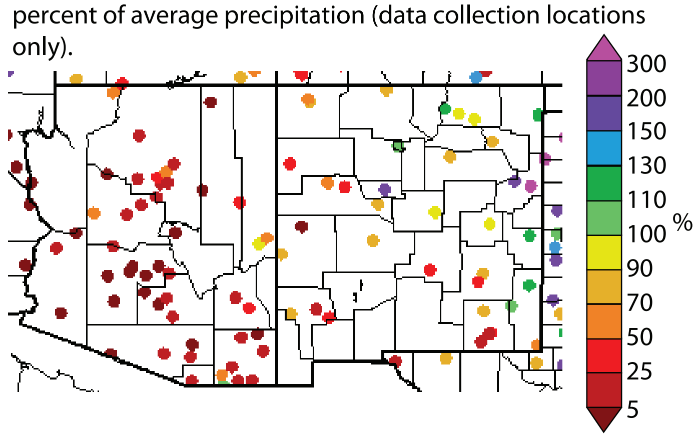


Figure 2d. Previous 30 days (September16–October 15, 2008) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(released 10/16/08)

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

Drought severity in both New Mexico and Arizona remained virtually the same this month as the conditions reported in September (Figure 3). Abnormally dry conditions linger in northeast New Mexico and in Arizona's northwest corner, although a slight improvement occurred in parts of this region. The above-average monsoon precipitation in many areas of the region helped reduce drought impacts; more than 83 percent of Arizona and 80 percent of New Mexico are not in drought. The broader drought picture is that approximately 60 percent of the U.S. is not in drought, while about 24 percent is designated as abnormally dry.

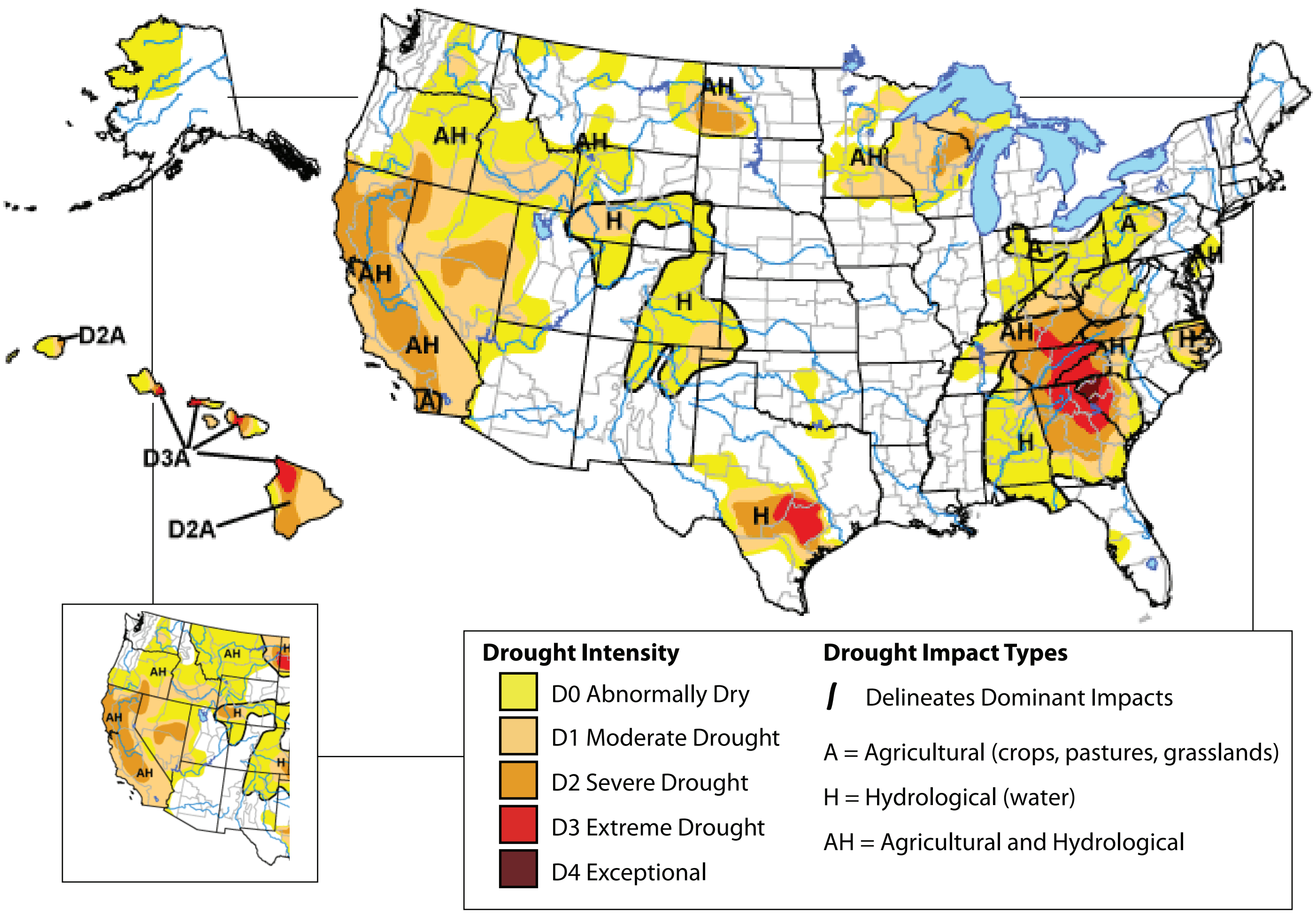
In drought-related news for the Southwest, the Bureau of Reclamation started drilling a new well to help the southern New Mexico community of Eunice deal with water shortages due to the ongoing, long-term drought (*Las Cruces Sun*, October 8). The well is being drilled under the authority of the Reclamation States Emergency Drought Relief Act and is one of 11 other drought relief wells approved last year for New Mexico and Arizona.

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 the several agencies; the author of this monitor is Rich Tinker, CPC/NOAA.

Figure 3. Drought Monitor released October 16, 2008 (full size), and September 18, 2008 (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.unl.edu/dm/monitor.html

Arizona Drought Status

(data through 8/31/08)

Source: Arizona Department of Water Resources

Summer monsoon thunderstorm activity through late August continued to help improve short-term drought conditions across much of southern Arizona (Figure 4a). In the September update of the Arizona Drought Monitor Report, above-average precipitation in July and August pushed the Santa Cruz, San Pedro, Willcox Playa, and White Water Draw watersheds out of abnormally dry conditions and into normal conditions. However, summer precipitation was below-average for much of northern Arizona, leading to a continuation of abnormally dry status across many watersheds including the Upper Colorado, Bill Williams, Verde, and Agua Fria. The Little Colorado River watershed joined this list in September, slipping from normal status in August to abnormally dry conditions, primarily due to the drier-than-average summer conditions.

The lingering long-term drought conditions across Arizona (Figure 4b) appear to be impacting sensitive wildlife populations. The number of Mt. Graham red squirrels declined by 12 percent in the past year, according to a recent survey conducted by the Arizona Game and Fish Department (Associated Press, October 16). The red squirrel is an endangered species found only on Mt. Graham, a sky island mountain range in southeast Arizona. Drought leading to a reduction in food sources and habitat changes is being blamed as a factor in the population decline.

Figure 4a. Arizona short-term drought status for September 2008.

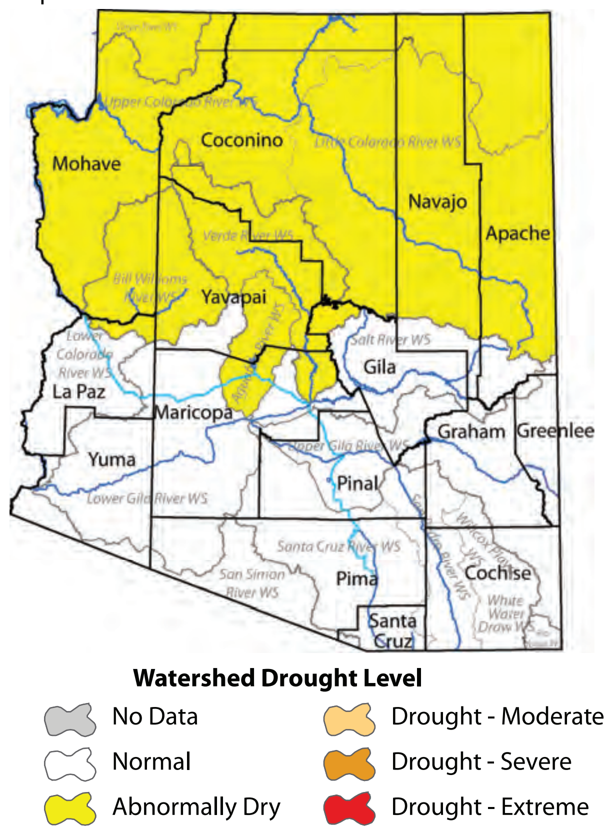
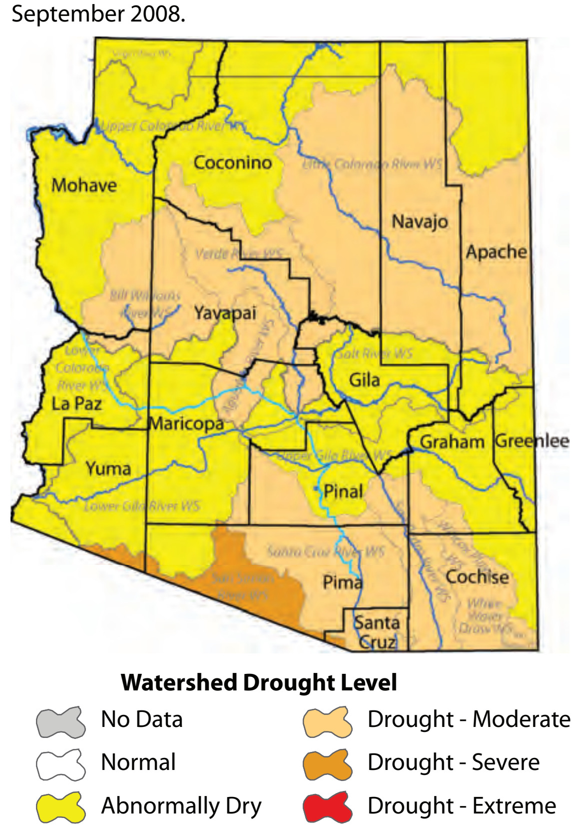


Figure 4b. Arizona long-term drought status for September 2008.



Notes:

The Arizona drought status maps are produced monthly by the Arizona Drought Preparedness Plan Monitoring Technical Committee. The maps are based on expert assessment of variables including, but not limited to, precipitation, drought indices, reservoir levels, and streamflow.

Figure 4a shows short-term or meteorological drought conditions. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) over a relatively short duration (e.g., months). Figure 4b refers to long-term drought, sometimes known as hydrological drought. Hydrological drought is associated with the effects of relatively long periods of precipitation shortfall (e.g., many months to years) on water supplies (i.e., streamflow, reservoir and lake levels, and groundwater). These maps are delineated by river basins (wavy gray lines) and counties (straight black lines).

On the Web:

For the most current Arizona drought status maps, visit:
http://www.azwater.gov/dwr/drought/DroughtStatus.html

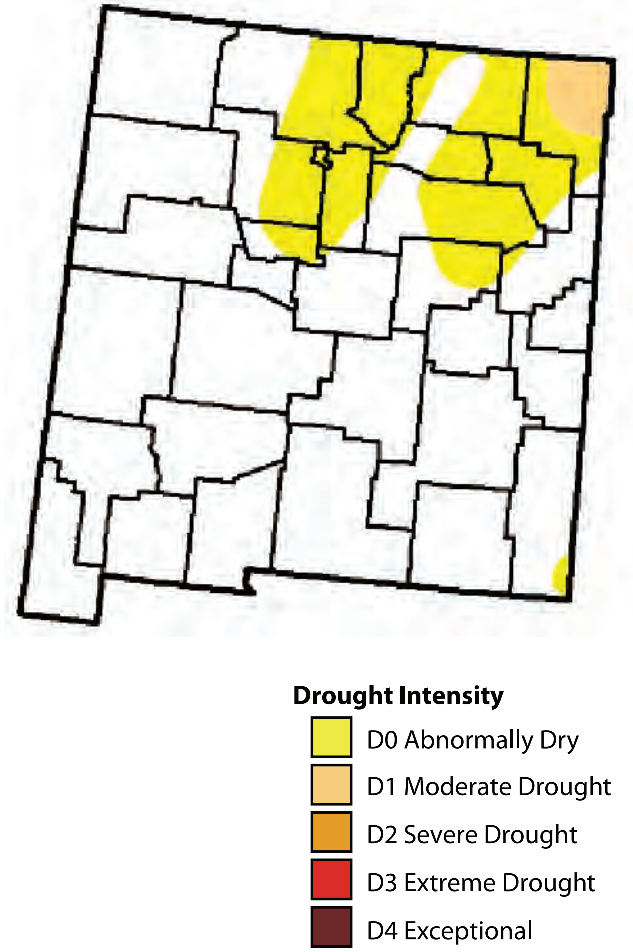
New Mexico Drought Status
(released 10/16/08)

Source: New Mexico State Drought Monitoring Committee

Drought conditions improved again this month across northeastern and southeastern New Mexico, according to the October 14 update of the National Drought Monitor map (Figure 5). Most of the state is drought free. Approximately 80 percent of the area has no drought status, while only 19.4 percent is classified as abnormally dry and 1.6 percent is deemed moderately dry. The areas that are impacted by drought include a small sliver in the southeastern corner of the state and larger areas in northeastern New Mexico. Below-average precipitation over this northern region in September supported the persistence of short-term drought conditions. Above-average summer precipitation over much of southern and eastern New Mexico helped erase moderate to severe drought conditions that were present in late spring due to below-average precipitation in the 2007–2008 winter season.

The October USDA Weekly Weather and Crop Bulletin indicated that soil moisture conditions were in good shape, with 46 percent of the state experiencing adequate conditions for current crop needs. Range and pasture conditions were also relatively good for this time of the year, with 45 percent of the state range areas classified as fair and 34 percent as good.

Figure 5. New Mexico drought map based on data through October 14.



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

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 the several agencies.

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

Arizona Reservoir Levels

(through 9/30/08)

Source: National Water and Climate Center

Combined reservoir storage in Lake Powell and Lake Mead declined by 236,000 acre-feet during September (Figure 6). Nevertheless, compared with last year, combined levels have risen significantly (see page 6). During September, storage in the Salt and Verde River watersheds declined slightly, though levels are substantially higher than they were one year ago.

In Arizona water news, the Tucson City Council voted to require rainwater harvesting in commercial developments. The regulations go into effect in 2010 and require that 50 percent of a development's landscaping water come from rainfall (*Arizona Daily Star*, October 15). The Salt River Project, along with state and federal agencies, is appealing to Arizona boaters to help prevent the spread of quagga mussels and other aquatic organisms. Their public awareness campaign is called "Don't move a mussel" (*East Valley Tribune*, October 11). Quagga mussels can clog and damage infrastructure, costing tens of thousands of dollars.

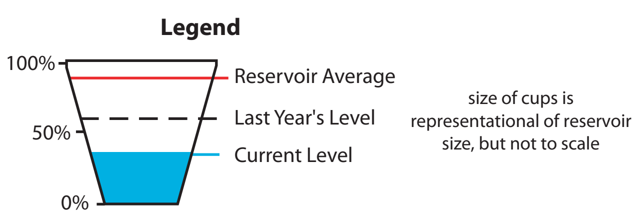
Notes:

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.

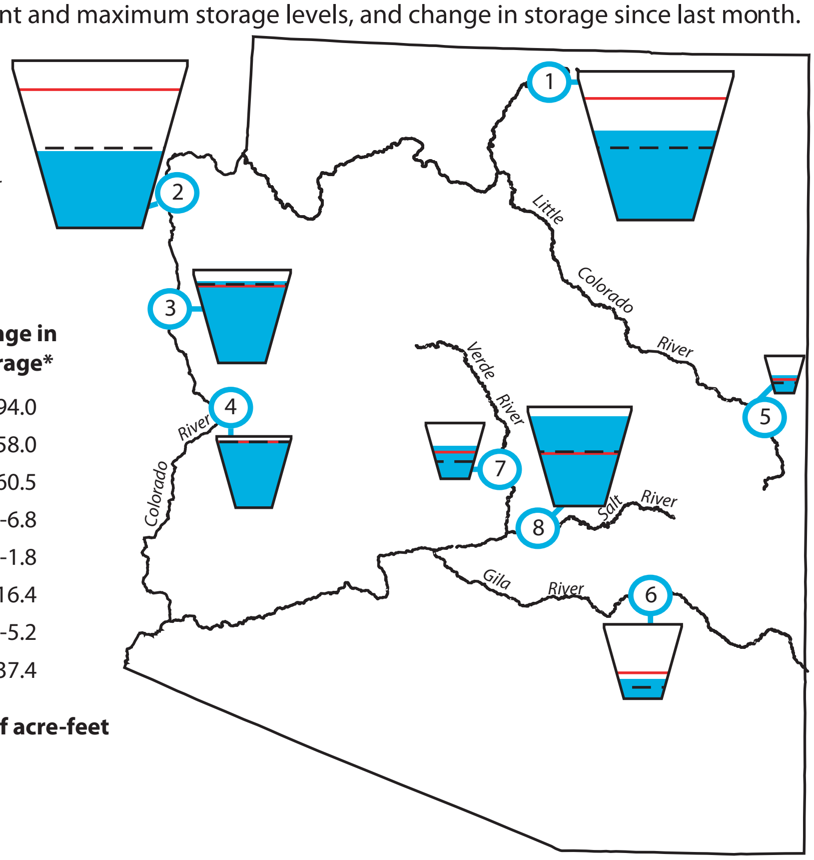
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Dino DeSimone, Dino.DeSimone@az.usda.gov.

Figure 6. Arizona reservoir levels for September 2008 as a percent of capacity. The map also 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	60%	14,509.0	24,322.0	-294.0
2. Lake Mead	46%	12,013.0	26,159.0	58.0
3. Lake Mohave	88%	1585.5	1,810.0	-60.5
4. Lake Havasu	94%	583.7	619.0	-6.8
5. Lyman Reservoir	48%	14.5	30.0	-1.8
6. San Carlos	26%	224.4	875.0	-16.4
7. Verde River System	59%	169.7	287.4	-5.2
8. Salt River System	90%	1,815.1	2,025.8	-37.4

*** 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 9/30/08)

Source: National Water and Climate Center

New Mexico total reservoir storage declined slightly during September (Figure 7). During the last month only Elephant Butte, Brantley, and Santa Rosa reservoirs showed increases. Despite declines, Heron and Navajo reservoirs are above 75 percent of capacity.

In water-related news, The New Mexico Environment Department reported a bloom of Didymosphenia geminata, referred to as "didymo" or "rock snot," in the Pecos River. Didymo is an aquatic nuisance species transferred on boats, fishing equipment and footwear. Massive algal blooms of didymo, in the form of dense mats, can impact the native food sources for native and sport fish, change water chemistry, and reduce hydroelectric power production (*Carlsbad Current-Argus*, October 8).

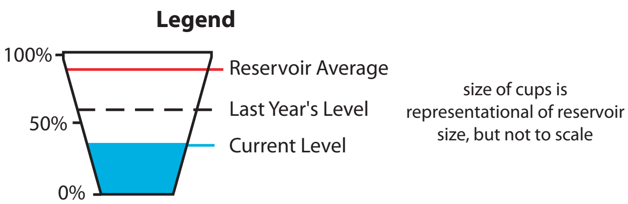
Notes:

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.

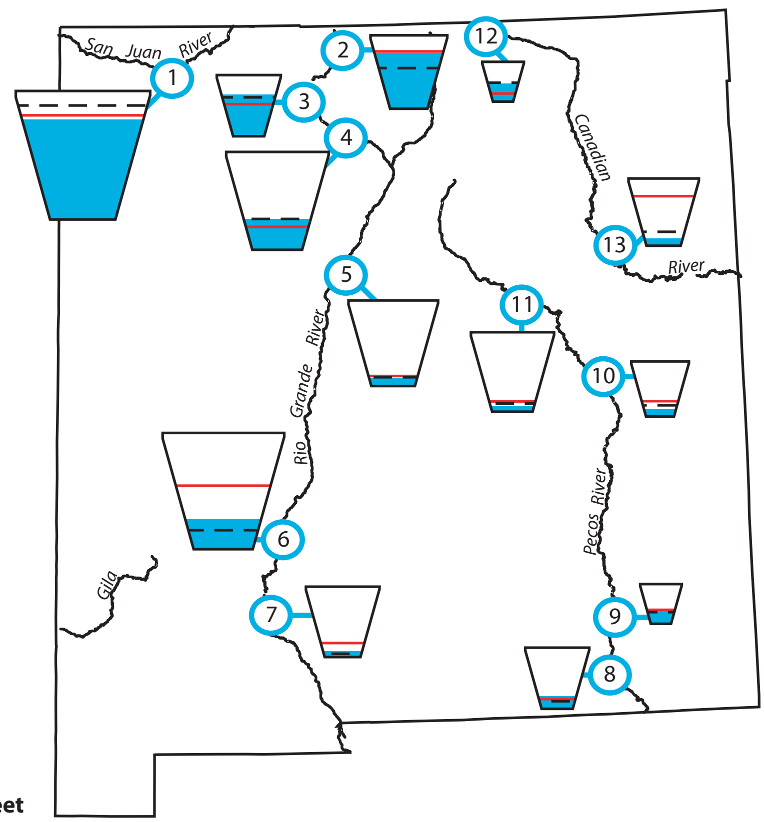
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Richard Armijo, Richard.Armijo@nm.usda.gov.

Figure 7. New Mexico reservoir levels for September 2008 as a percent of capacity. The map also 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	78%	1,319.3	1,696.0	-21.7
2. Heron	76%	303.5	400.0	-12.1
3. El Vado	68%	132.9	195.0	-23.2
4. Abiquiu	32%	177.0	554.5	-0.2
5. Cochiti	10%	50.0	491.0	-0.6
6. Elephant Butte	26%	576.2	2,195.0	1.1
7. Caballo	8%	25.6	332.0	-31.3
8. Brantley	21%	30.7	147.5	0.2
9. Lake Avalon	28%	1.1	4.0	-0.2
10. Sumner	13%	13.0	102.0	-2.9
11. Santa Rosa	7%	29.0	438.3	4.0
12. Costilla	46%	7.4	16.0	-1.6
13. Conchas	11%	27.9	254.2	-5.6

*** 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 2008–April 2009)
Source: NOAA Climate Prediction Center (CPC)

The NOAA Climate Prediction Center (CPC) long-lead temperature forecasts for the Southwest show equal chance of above-, below-, and near-normal temperatures for much of the West through the winter, with a slightly increased chance of above-average temperatures for New Mexico, Colorado, most of the Midwest, and South. (Figures 8a–d). The highest chances of above-average temperatures occur during February through April in Arizona and most of New Mexico. The forecasts are based primarily on long-term temperature trends. Atmosphere and ocean conditions in the equatorial Pacific Ocean are settling in to ENSO-neutral conditions, which means these temperature predictions are unrelated to the ENSO phenomenon.

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 the reliability (i.e., 'skill') of the forecast is poor; 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 2008–January 2009.

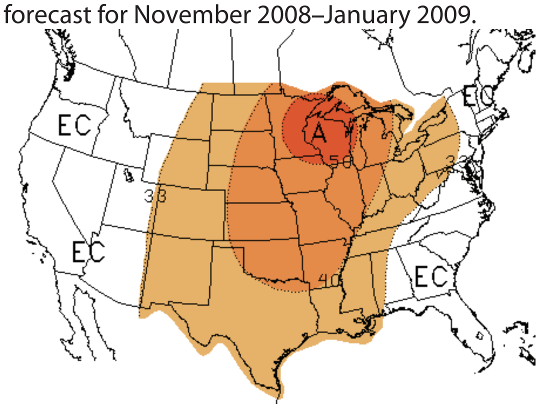
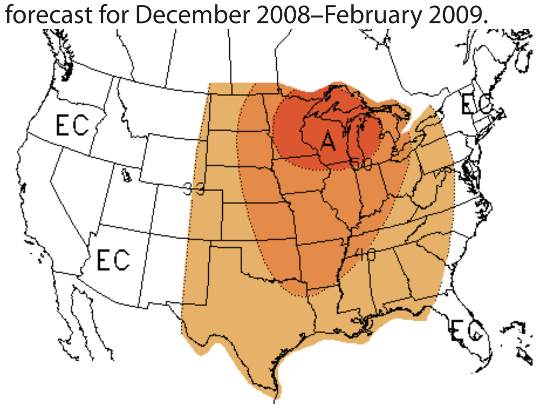


Figure 8b. Long-lead national temperature forecast for December 2008–February 2009.



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

B=Below
40.0–49.9%
33.3–39.9%

Figure 8c. Long-lead national temperature forecast for January–March 2009.

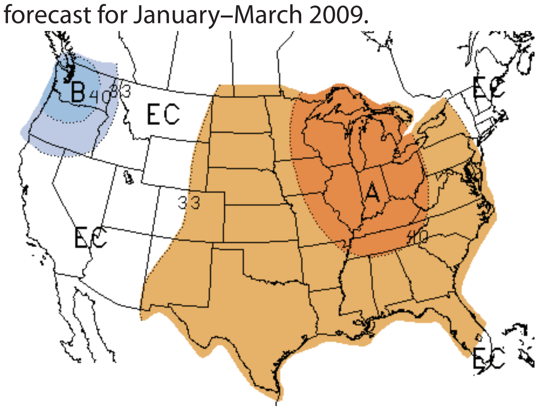
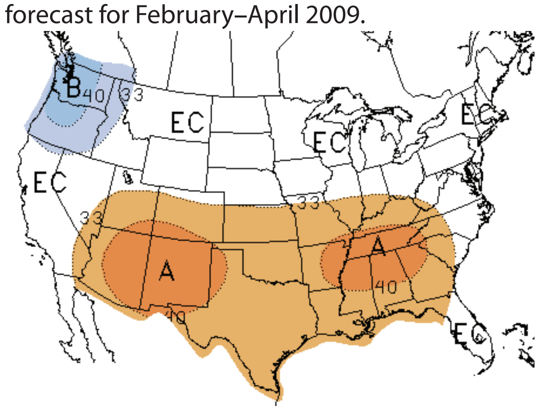


Figure 8d. Long-lead national temperature forecast for February–April 2009.



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.html
(note that this website has many graphics and may load slowly on your computer)

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

Precipitation Outlook
(November 2008–April 2009)
Source: NOAA Climate Prediction Center (CPC)

The NOAA Climate Prediction Center (CPC) long-lead precipitation forecasts for the Southwest show slightly increased chances of below-average precipitation for Arizona and New Mexico during the fall and early winter (Figures 9a–d). Forecasters expect the atmospheric and ocean situation in the equatorial Pacific to remain near neutral ENSO conditions, which means these forecasts do not rely heavily on ENSO trends. These precipitation forecasts are based on the consolidation forecast, which relies on a suite of forecast tools that have proven to be statistically robust. However, research by Greg Goodrich (Western Kentucky University) and Andrew Ellis (Arizona State University) shows that Arizona winter precipitation during the period of historic records is usually less than average during the ENSO-neutral phase if the Pacific Decadal Oscillation (PDO) is in its cold phase, which matches current 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 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 the reliability (i.e., 'skill') of the forecast is poor; 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 2008–January 2009.

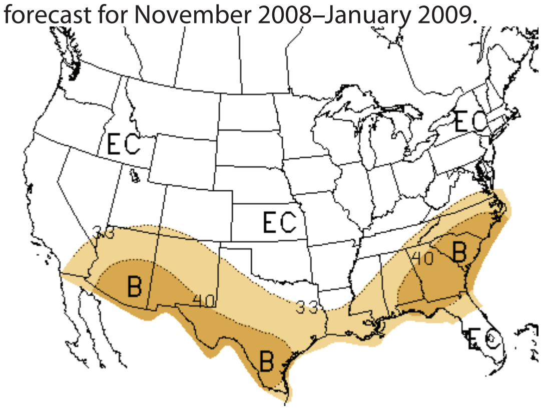


Figure 9b. Long-lead national precipitation forecast for December 2008–February 2009.

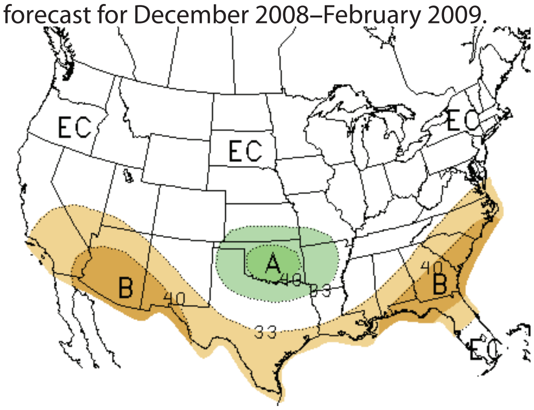


Figure 9c. Long-lead national precipitation forecast for January–March 2009.

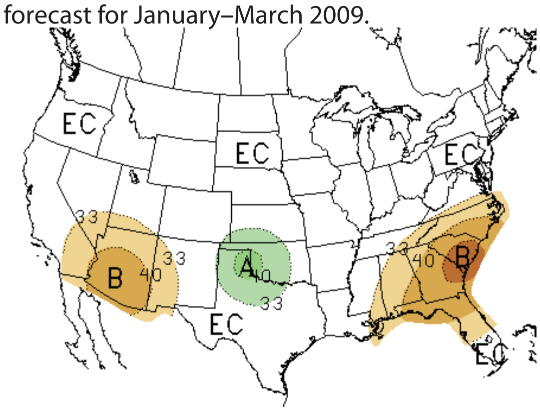
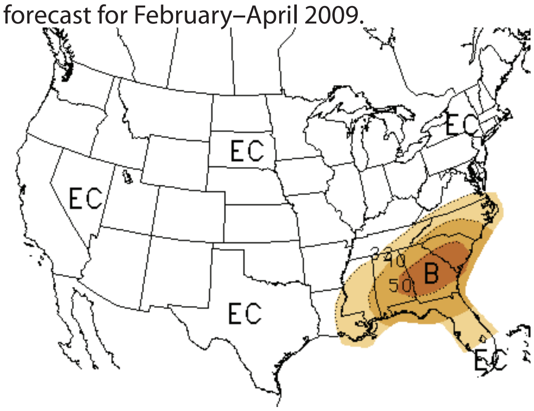


Figure 9d. Long-lead national precipitation forecast for February–April 2009.



B= Below: 33.3–39.9% | 40.0–49.9% | 50.0–59.9%

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.html
(note that this website has many graphics and may load slowly on your computer)

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

Seasonal Drought Outlook
(through January 2009)

Source: NOAA Climate Prediction Center (CPC)

Drought conditions will generally persist in southern Texas, Nevada, southern California, Hawaii, and parts of the Southeast (Figure 10). Numerous areas in the U.S. will experience improvements in drought conditions, including the northeast corner of New Mexico, northern California, and Michigan. On the other hand, drought development is likely in Florida and on the smaller Hawaiian Islands. This outlook is based predominantly on subjective synthesis of recent conditions and two-week and seasonal forecasts.

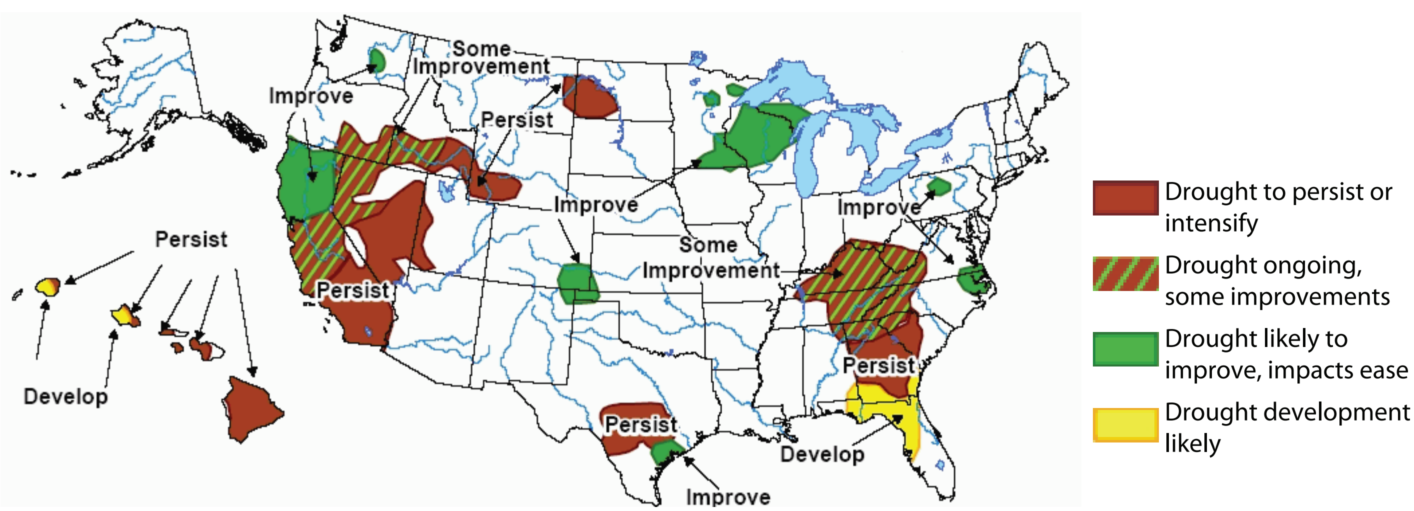
Similar to last month, this month's U.S. Seasonal Drought Outlook, forecasts no drought for most of Arizona and New Mexico. Dought improvement in the northeastern corner of New Mexico and in southwestern Colorado is forecasted based on recent rains. The National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Center assigns high confidence that improvement will occur in these areas.

In Texas, the dry seasonal forecast is the driving force behind the drought persistence outlook. However, the first few days of the period will likely deliver considerable rainfall to at least the coastal areas. As a result, drought improvement is forecasted along the Texas coast. NOAA assigns a moderate confidence to this forecast.

The West is entering a climatologically dry time of year. In California, the forecast is similar to last month's outlook, with some expansion of improvement based on historical precipitation trends going into January. Confidence for northern California's forecast is high, while confidence is moderate for the remainder of the state.

Notes:
The delineated areas in the Seasonal Drought Outlook (Figure 10) are defined subjectively and are based on expert assessment of numerous indicators, including outputs of short- and long-term forecasting models.

Figure 10. Seasonal drought outlook through January 2009 (released October 16, 2008).



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

El Niño Status and Forecast

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

ENSO-neutral conditions are once again the dominant pattern across the Pacific basin. Sea-surface temperatures (SSTs) were slightly below-average in the central Pacific and slightly above-average in the eastern portion of the basin. Overall, this averages out to near-average temperatures, or ENSO-neutral conditions. Southern Oscillation Index (SOI), a measure of the atmospheric component of El Niño and La Niña activity, rose to approximately 1.5 in September (Figure 11a). This value typically indicates a strengthening atmospheric response to La Niña SST patterns across the Pacific. However, the International Institute for Climate and Society (IRI) notes that this rise in the SOI value is most likely related to inter-seasonal variability in circulation patterns across the Pacific, rather than a response to changing SSTs. The lack of La Niña-like cold SSTs over much of the eastern Pacific gives support that a rebound in the SOI value in recent months is indeed related to circulation patterns.

The probability of ENSO-neutral conditions persisting through this fall and into the winter season continues to increase. ENSO forecasts made this month by IRI indicate a 90 percent chance of ENSO-neutral conditions continuing through the remainder of 2008 and into early 2009, up from 85 percent in September's forecast (Figure 11b). The chance of a La Niña or El Niño event developing over this period remains very low. The forecast discussion produced by IRI notes that statistical and dynamical ENSO models are having a difficult time determining how long ENSO neutral conditions may last beyond the winter 2009 season. Very few and conflicting signals are being observed in SST and low-level wind patterns across the equatorial Pacific, complicating long-lead forecasts. Stay tuned over the upcoming winter season to monitor potentially rapid changes in ENSO conditions.

Notes:

Figure 11a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through September 2008. 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.

Figure 11b 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.

Figure 11a. The standardized values of the Southern Oscillation Index from January 1980–September 2008. 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).

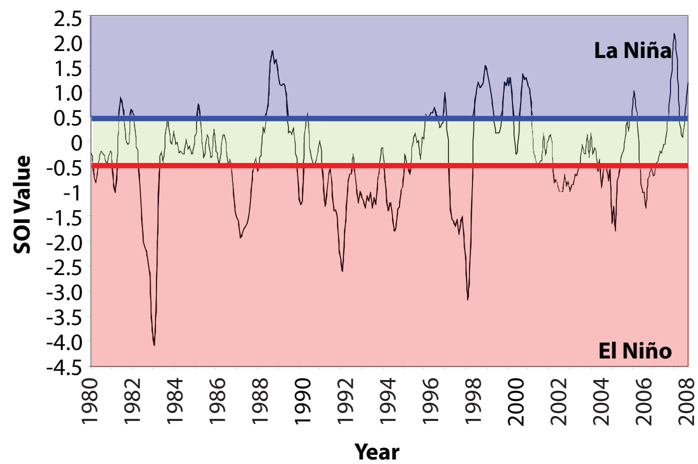
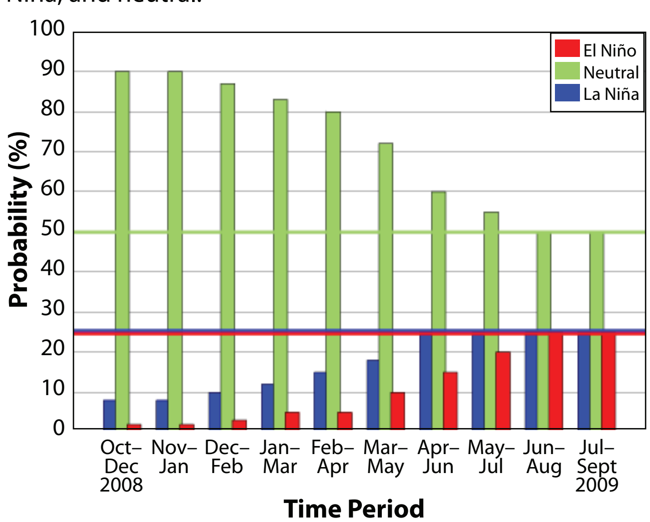


Figure 11b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released October 16, 2008). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



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/

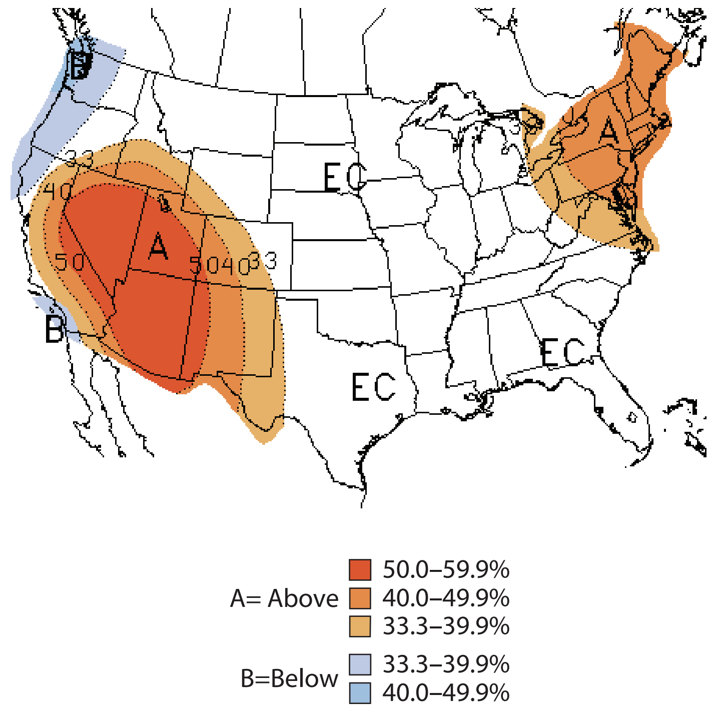
Temperature Verification

(July–September 2008)

Source: NOAA Climate Prediction Center (CPC)

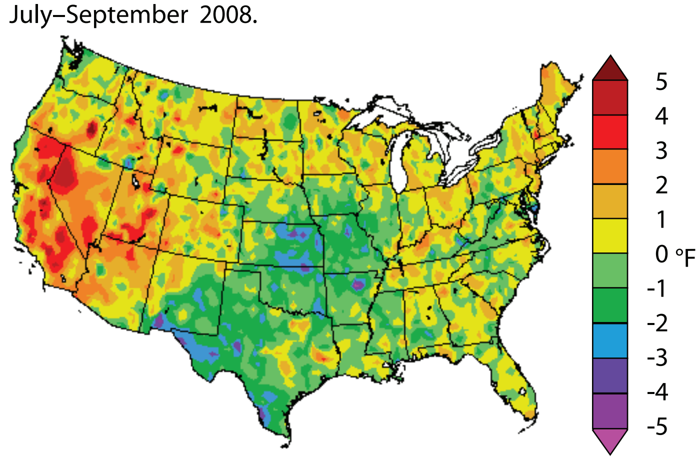
The NOAA-Climate Prediction Center (CPC) seasonal temperature outlook for July–September 2008 predicted increased chances of above-average temperatures for much of the western United States, including fairly high probabilities of above-average temperatures throughout Arizona, Utah, and Nevada and a slight chance of below-average temperatures along the Washington and Oregon coasts (Figure 12a). The forecast also predicted warmer-than-average temperatures in New England. These predictions were based primarily on long-term temperature trends. The overall observed pattern of temperatures from July through September was quite consistent with the CPC prediction, with temperatures slightly above average in much of the West and New England and near average to slightly below average along the Washington, Oregon, and northern California coasts (Figure 12b).

Figure 12a. Long-lead U.S. temperature forecast for July–September 2008 (issued June 2008).



EC= Equal chances. No forecasted anomalies.

Figure 12b. Average temperature departure (in degrees F) for July–September 2008.



Notes:

Figure 12a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months July–September 2008. This forecast was made in June 2008.

The outlook predicts 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.

Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average temperature. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is 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. Equal Chances (EC) indicates areas where reliability (i.e., the skill) of the forecast is poor and no prediction is offered.

Figure 12b shows the observed departure of temperature (degrees F) from the average for the July–September 2008 period. Care should be exercised when comparing the forecast (probability) map with the observed temperature maps. The temperature departures do not represent probability classes as in the forecast maps, so they are not strictly comparable. They do provide us with some idea of how well the forecast performed. In all of the figures on this page, the term average refers to the 1971–2000 average. This practice is standard in the field of climatology.

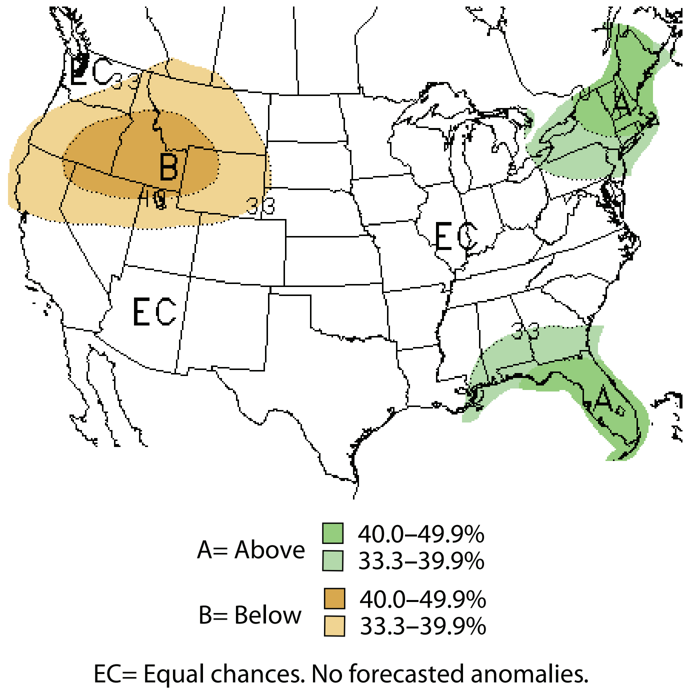
On the Web:

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

Precipitation Verification
(July–September 2008)
Source: NOAA Climate Prediction Center (CPC)

The NOAA-Climate Prediction Center (CPC) seasonal precipitation outlook for July–September 2008 predicted equal chances of near-, above-, and below-average precipitation throughout the Southwest (Figure 13a). The outlook also predicted a slightly increased chance of below-average precipitation for much of the Pacific Northwest. Slightly increased chances of above-normal precipitation was forecast for most of the Gulf of Mexico and New England. Observed precipitation revealed very dry conditions through most of the California, much of the Pacific Northwest, the northern Rockies, and the northern plains (Figure 13b).Much of the Gulf of Mexico region experienced slightly above-average precipitation, as did most of New England. The Southwest generally experienced near-average precipitation throughout the summer, with some areas, particularly parts of southeast Arizona and southwest New Mexico, exceeding the long-term average. Overall, the observed precipitation pattern in the Pacific Northwest and New England is close to what the NOAA-CPC outlook predicted.

Figure 13a. Long-lead U.S. precipitation forecast for July–September 2008 (issued June 2008).



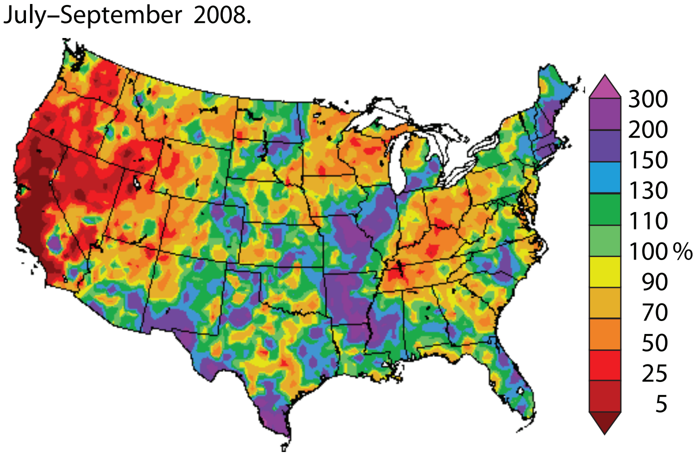
Notes:
Figure 13a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months July–September 2008. This forecast was made in June 2008.

The outlook predicts 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. Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average precipitation. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is 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. Equal Chances (EC) indicates areas where reliability (i.e., the skill) of the forecast is poor and no prediction is offered.

Figure 13b shows the observed percent of average precipitation for July–September 2008. Care should be exercised when comparing the forecast (probability) map with the observed precipitation maps. The observed precipitation amounts do not represent probability classes as in the forecast maps, so they are not strictly comparable, but they do provide us with some idea of how well the forecast performed.

In all of the figures on this page, the term average refers to the 1971–2000 average. This practice is standard in the field of climatology.

Figure 13b. Percent of average precipitation observed from July–September 2008.



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.html