Issued: October 27, 2005

CLIMAS Southwest Climate Outlook

October Climate Summary

Drought – Abnormally dry conditions to moderate drought continue in the western half of New Mexico, as well as in northeastern and southeastern Arizona.

- Pasture and range land conditions continue to degrade in Arizona.
- Large Colorado River reservoirs and Elephant Butte Reservoir in New Mexico remain considerably below average.

Temperature – The past 30 days were mainly warmer than average across the Southwest region.

Precipitation – Much of the Southwest received below-average precipitation during the past 30 days. North-central New Mexico and western Arizona were notable exceptions.

Climate Forecasts – Models indicate increased chances of above-average temperatures in the Southwest through April 2006. Forecasters predict slightly increased chances of drier-than-average conditions across most of the region for the fall and early winter.

El Niño – ENSO-neutral conditions are expected to continue through spring 2006.

The Bottom Line – Drought should persist along parts of the Arizona-New Mexico border. Hydrological drought is still a concern for managers of some large surface water supplies in the Southwest.

The climate products in this packet are available on the web:
http://www.ispe.arizona.edu/climas/forecasts/swoutlook.html

Water News

As Southwest managers and policy makers prepare for the 2006 water year, water supply issues are once again in the forefront of Southwest newspapers. In New Mexico, planners are working on projects to utilize Gila River water allocated through the Arizona Water Settlements Act and the Ute Water Project to augment Ogallala Aquifer supplies in northeastern New Mexico. Recent Arizona water concerns include fallout from a plan to line the All-American Canal, which brings Colorado River water to California irrigators; the canal lining will deprive Mexican farmers of much-needed water. Districts in northwest Tucson have been in the news because rapid groundwater aquifer depletion and subsidence are forcing earlier-than-planned acquisition of Central Arizona Project water.

In this issue:

The Southwest Climate Outlook is jointly published each month by the Climate Assessment for the Southwest project and the University of Arizona Cooperative Extension.

Ben Crawford, *Assistant Research Scientist*
Mike Crimmins, *Extension Specialist*
Stephanie Doster, *Information Specialist*
Gregg Garfin, *CLIMAS Program Manager*
Alex McCord, *Research Associate*
Kristen Nelson, *Associate Editor*
Rick Brandt, *Graduate Research Assistant*
Melanie Lenart, *Research Associate*

THE UNIVERSITY OF ARIZONA.

2005 SWCO Water Year in Review

Introduction

The Southwest Climate Outlook 2005 Water Year in Review offers a synthesis of the information presented in each month's outlook during the 2005 water year. This review provides an overview of precipitation, temperature, reservoir levels, drought, wildfire, and El Niño conditions. Each of these topics is described with textual descriptions and figures.

The water year begins on October 1 and ends on September 30 of the following year, so this review covers October 1, 2004 through September 30, 2005. As of October 1, 2005 we are in the 2006 water year. The water year is a more hydrologically sound measure of climate and hydrological activity than the standard calendar year.

Overall, above-average precipitation during the winter improved the reservoir conditions and drought situation in Arizona and New Mexico in what was a relatively warm water year. While most reservoirs in the region are near to above 2004 water year storage, some of the largest remain well below average and most are below maximum capacity.

The monsoon started late and brought below-average rain to Arizona and New Mexico. Lightning during the monsoon and dry invasive grasses in the desert contributed to a record-setting wildfire season in Arizona with more than 776,000 acres burned. New Mexico fared better, with approximately 23,000 acres scorched.

The Southern Oscillation Index, which is strongly associated with winter climate effects in the Southwest, was negative throughout most of the water year, alternating between weak El Niño and neutral ENSO conditions. Neutral El Niño Southern Oscillation conditions have persisted since mid-spring 2005.

continued on page 3

Top 5 headlines of the water year

1. Above-average precipitation in the Southwest during the winter and spring was due to an anomalous jet stream pattern caused by the Madden-Julian Oscillation. This led to improved reservoir conditions region-wide. Statewide storage in Arizona and New Mexico was 120 percent and 180 percent of 2004, respectively. Winter precipitation also led to flooding and tragic deaths in northern Arizona.

2. The wetter-than-average conditions also resulted in significant improvement in drought conditions over much of the Southwest. In early October 2004, nearly the entire region ranged from abnormally dry to extreme hydrological drought. By the end of Water Year 2005, drought coverage diminished to include the Colorado River between Lakes Mead and Powell, northeastern and southeastern Arizona, and western and central New Mexico. Intensity decreased to only abnormally dry to moderate drought.

3. Approximately 776,000 acres burned in Arizona and New Mexico during the water year, almost all of it in Arizona lowlands. The 2005 wildland fire season established a record with 753,000 acres burned in Arizona's Southwest region, surpassing the previous mark of 629,876 acres in 2002. Another roughly 160,000 acres burned in the northern corner of Arizona that falls in the Great Basin fire management district. Meanwhile, 23,000 acres burned in New Mexico.

4. In July, federal water officials began a two-year series of public meetings to gather input about current and future management of the Colorado River (*Rocky Mountain News*, July 20, and *Las Vegas Review-Journal*, July 27). The ability of the Colorado River to support the growing population in the West is one of the main concerns for the region.

5. The monsoon onset was later than average, as predicted by the NOAA Climate Prediction Center and the NOAA Climate Diagnostics Center. The official start date in both Phoenix and Tucson was July 18, the second latest start on record.

WYIR, continued

Precipitation

Drought conditions in the Southwest improved in what was a wetter-than-average water year for the region. The relief was mainly due to heavy winter precipitation. Precipitation amounts for the water year varied across the region. Stations in northwestern Arizona experienced 12–20 inches above average precipitation while areas in southeastern Arizona and a band extending from east-central Arizona into northwest New Mexico experienced precipitation amounts 0–4 inches below average (Figure 1a). Western Arizona and some areas of New Mexico received 150–300 percent above average precipitation, though southeast and east-central Arizona and northwest New Mexico received only 70–90 percent of average (Figure 1b).

Above average precipitation during the winter (December 2004–February 2005) was associated with the Madden-Julian Oscillation (MJO) in the tropical Pacific and led to a reduction of the drought status in Arizona and New Mexico. The MJO is characterized by a 30–60 day cycle in tropical Pacific precipitation. This in turn affects global circulation patterns, including the jet stream over North America, which influences precipitation patterns and amounts in the Southwest.

Several precipitation records were set during January and February. Las Vegas logged its record for maximum daily rainfall for the month (0.81 inches) on January 3. El Paso recorded its wettest February with 1.92 inches of total precipitation. Albuquerque experienced the second wettest January since record-keeping began in 1892, receiving 1.38 inches of precipitation. January precipitation in Tucson was above-average for the first time in four years.

High precipitation and heavy rain led to mudslides in California and flooding in Arizona. The Arizona Division of Emergency Management estimated flood damage at approximately $3 million in December and January alone.

Figure 1a. Water year 2004–2005 through September 30, 2005 departure from normal precipitation.*

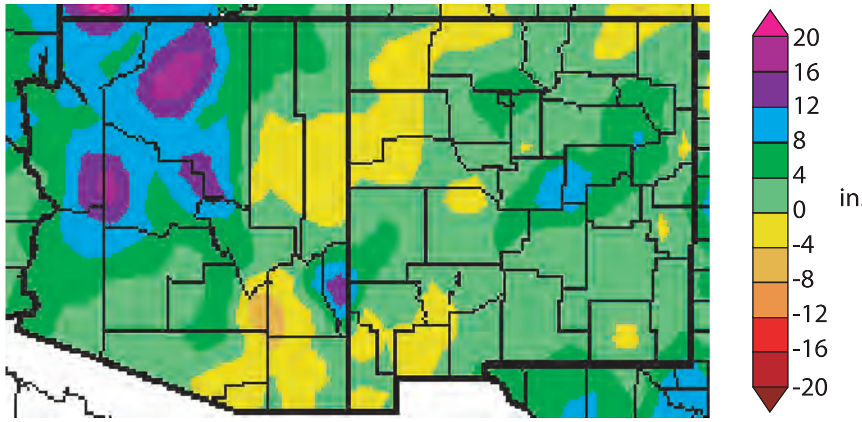
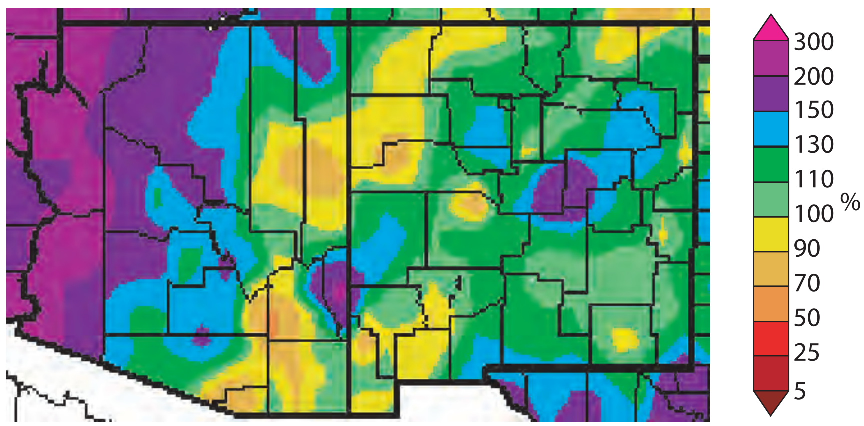


Figure 1b. Water year 2004–2005 through September 30, 2005 percent of average precipitation.*



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

Wet conditions continued into the spring for parts of the Southwest. Southeastern Arizona experienced unusual rainfall patterns in late May. In Tucson, record rainfall from a storm system on May 27 accounted for more than three-quarters of the monthly total. Most other locations in southeastern Arizona, however, received below average precipitation.

Drier conditions returned to many parts of the Southwest in June and July. Most areas received less than 50 percent of average precipitation.

The official start of the monsoon in both Phoenix and Tucson was July 18, approximately two weeks later than average and the second latest start on record. The latest monsoon start was July 25 in 1987. The 2005 monsoon lasted until September 13 and accounted for 5.31 inches of rain in Tucson, approximately 0.75 inches below average.

In New Mexico, the monsoon brought considerably less than average rainfall. August was the ninth driest month on record since 1931 with only 0.49 inches of rain, 1.24 inches below average, according to the Albuquerque National Weather Service.

continued on page 4

WYIR, continued

Temperature

The 2005 water year was the sixteenth warmest on record for the Southwest region, which includes Arizona, Colorado, New Mexico, and Utah, according to the National Climatic Data Center. The water year began with cooler-than-average temperatures for much of the Southwest from October to November 2004, due to late October cold fronts passing through Arizona and New Mexico.

The Southwest saw warmer-than-average temperatures at the beginning of 2005, during the eighth warmest winter (December–February) on record for the region. Albuquerque recorded the third warmest January since 1931 with a monthly average of 41.7 degrees Fahrenheit. In Flagstaff, January was 7 degrees F warmer than average.

Warmer winter temperatures could have significant impacts on water resources in the Southwest. For example, unusually warm storms in late January in Tucson and New Mexico caused more precipitation to fall as rain, which led to limited snow accumulation at higher altitudes.

The region experienced record-setting maximum temperatures during July (Table 1) with deadly consequences. At least 18 deaths were attributed to heat in Phoenix. The Southwest saw the twenty-seventh warmest summer (June–August) on record for the region since 1896.

Average water year temperatures ranged from the high 30 degrees F in north-central New Mexico to the high 70 degrees F near Yuma (Figure 2a). Generally, eastern Arizona and New Mexico were 1–2 degrees F above-average, with stations in north-central New Mexico along the Colorado border showing the largest departures from average (3–4 degrees F) (Figure 2b). Most of western Arizona has been -1–0 degrees F cooler than average during the water year.

continued on page 5

Table 1. Summer temperature extremes

Location	Record Description	Date	Record	Old Record	Old Record Date
Kingman, AZ	Highest maximum temperature	7/17/05	113°F	111°F	7/10/03
Big Bear Lake, CA	Highest maximum temperature	7/18/05	94°F	94°F	8/15/72
Las Vegas, NV	Highest maximum temperature	7/19/05	117°F	117°F	7/24/42
	Highest daily average temperature	7/19/05	106°F	105°F	7/17/05
	Highest minimum temperature	7/19/05	95°F	93°F	7/17/05
Tucson, AZ	Highest number of consecutive days with over 100° F	6/14/05–7/22/05	39 days	39 days	6/7/87–8/15/87
	Highest average July temperature	2005	90.6°F	90.4°F	1994

Figure 2a. Water year 2004–2005 through September 30, 2005 average temperature.*

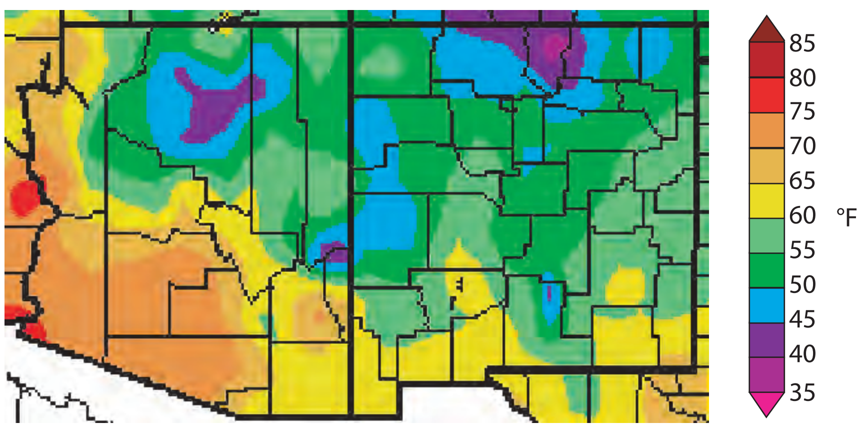
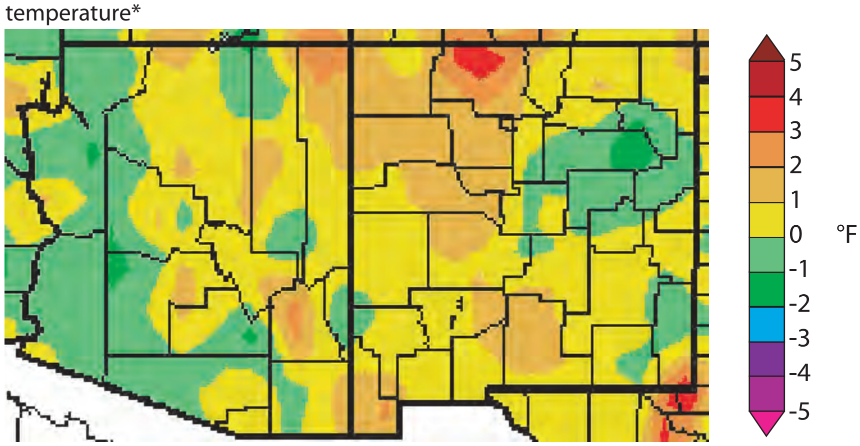


Figure 2b. Water year 2004–2005 through September 30, 2005 departure from normal temperature*



** See "Notes" section on page 9 for more information on interpreting these figures.*

continued on page 4

WYIR, continued

Reservoirs

Arizona

Reservoir storage in Arizona improved considerably during Water Year 2005. The Madden-Julian Oscillation contributed to an anomalous jet stream pattern, which resulted in above-average precipitation throughout much of the state during the winter and spring. All reservoirs were near to above 2004 storage, ranging from 94 percent to 1,421 percent of 2004 values. Statewide storage is 120 percent of Water Year 2004.

Despite the increase since last year, the drought over the past five years means that statewide reservoir storage is 69 percent of average capacity and 56 percent of maximum capacity. The percentages represent 11- and 9-point increases, respectively, over 2004.

Lakes Powell and Mead are at only 49 percent and 58 percent of capacity, respectively. Because they make up 90 percent of the state's maximum storage, low levels in Powell and Mead more adversely affect the statewide storage percentage than low levels in other reservoirs. The lowest storage in Lake Mead was on October 1 (Figure 3a). The maximum on March 27–28 resulted from the high release rates at Glen Canyon Dam from early January through April 8 (approximately 14,000 cubic feet per second [cfs]; not shown). The decrease in storage at Mead through the end of the water year was due to water use despite some high release rates (12,500—15,200 cfs) from Powell from late May through August.

Minimum storage at Lake Powell on April 8 (Figure 3a) coincided with the end of the period of high release at Glen Canyon Dam. The July 12 and 14 maximum storage corresponds to the decrease of inflow (less than 20,000 cfs) due to much-diminished runoff from snowmelt and spring precipitation.

Figure 3a. Water year 2005 storage at Lakes Mead (pink) and Powell (brown) in Arizona.

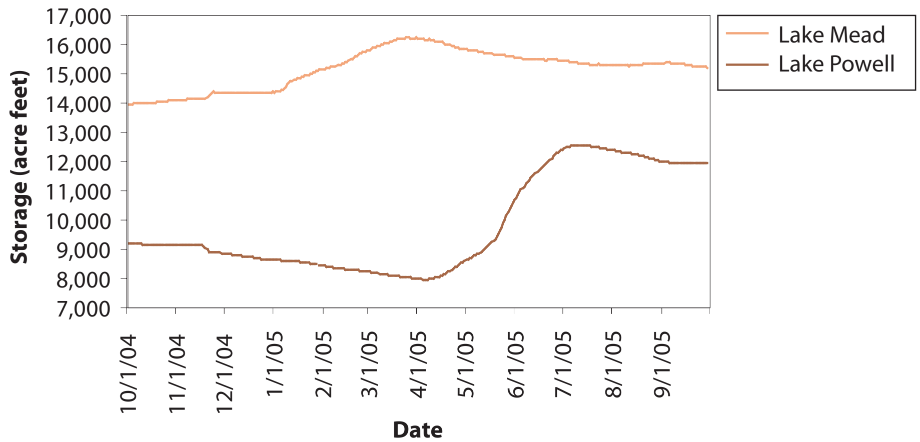
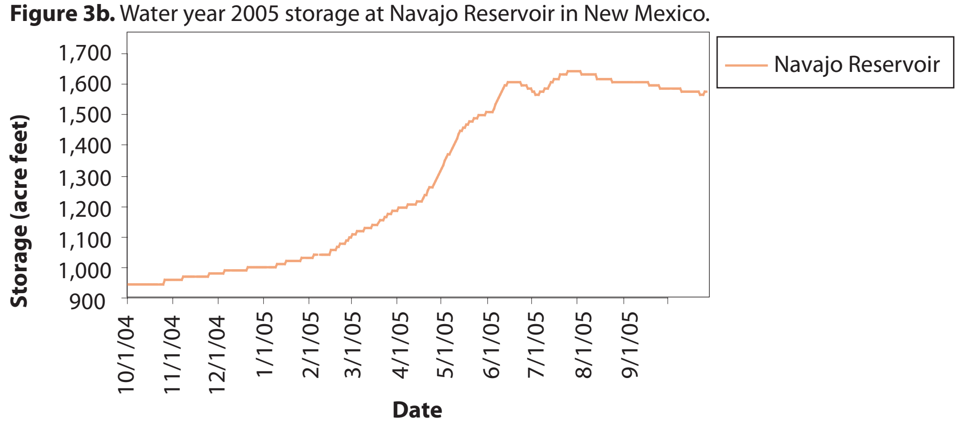


Figure 3b. Water year 2005 storage at Navajo Reservoir in New Mexico.



The unexpected rapid recovery of Arizona's Salt-Verde-Tonto reservoir system alleviated potential drought impacts for the metro Phoenix area. As a result, the Salt River Project rescinded an unprecedented third year of cutbacks of surface water deliveries to metro Phoenix from the Salt-Verde-Tonto reservoir system.

New Mexico

New Mexico reservoir storage also generally improved due to above-average winter and spring precipitation. The state's lakes ranged from 90 percent (Abiquiu) to 1,050 percent (Sumner) of 2004 values.

The exception is Caballo Reservoir, which is at only 58 percent of Water Year 2004 storage. Statewide storage is 180 percent of 2004, but it is only 76 percent of average capacity and 41 percent of maximum capacity. The latter quantities are 33 percent and 18 percent higher, respectively, than one year ago.

Navajo Reservoir was at its lowest point at the beginning of the water year (Figure 3b) due to the extremely dry conditions before some recharge began from late summer and fall precipitation. The winter and spring precipitation, snow melt, and subsequent runoff led to the maximum storage on July 8. Through the end of the water year, irrigation and other water use caused a decrease in storage levels.

continued on page 6

WYIR, continued

Drought

The drought in the Southwest has diminished considerably over the 2005 water year, due to abundant and well-spaced rain and snow during the winter. Most of the relief fell in the northern and western parts of Arizona where a persistent storm track brought several large winter storms across the northern half of the state.

Precipitation amounts were more than four times the long-term average for January and February across northwest Arizona. Southeastern Arizona did not benefit from the enhanced northern winter storm activity. This area received 70–90 percent of average winter precipitation in 2005 and still has below-average streamflows and poor range conditions from long-term drought conditions.

Much of the region was categorized in severe or extreme drought at the beginning of the water year, according to the U.S. Drought Monitor (Figure 4a). Areas most impacted by extreme drought conditions were northern and central Arizona, the southeast corner of Arizona, and a portion of northern New Mexico, as well as the extreme southwest corner of New Mexico.

South-central Arizona and eastern New Mexico were in moderate drought to abnormally dry conditions, while New Mexico east of the Pecos River was not experiencing drought conditions.

By September 2005 portions of the region had improved to moderate or abnormally dry conditions, and about half of the area was categorized as not in drought (Figure 4b). Moderate drought or abnormally dry conditions still linger in the far northern and southeastern portions of Arizona, and in most of New Mexico, except in the far eastern and southeastern parts of the state.

Figure 4a. Drought Monitor released September 16, 2004.*

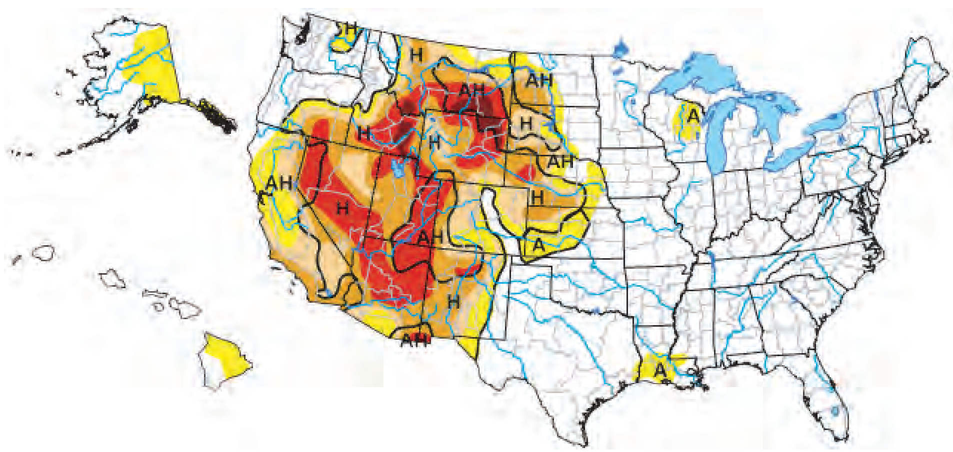
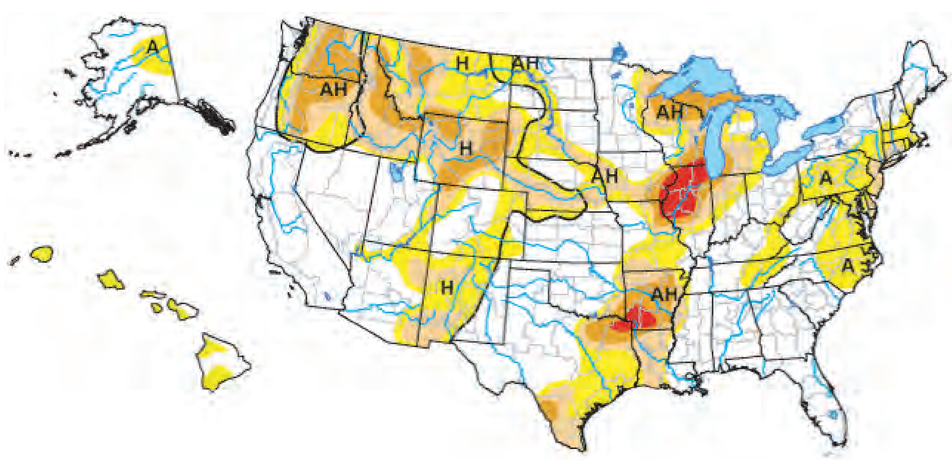


Figure 4b. Drought Monitor released September 15, 2005.*



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

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

The governor of Arizona has left the state's indefinite duration drought declaration in effect, according to the Arizona Division of Emergency Management. Pasture and range land conditions improved somewhat in Arizona during 2005, but deteriorated slightly in New Mexico. In Arizona, 43 percent of the pastures and range lands were in poor to very poor condition, down 14 percent from last year. In New Mexico, 28 percent of those lands were in poor to very poor condition, up 7 percent from last year.

continued on page 7

WYIR, continued

Wildfire

Arizona's wildfire season this year topped historical records, with more than 753,000 acres burned by the end of September, including about a quarter of a million acres on the outskirts of Phoenix in mainly desert ecosystems unaccustomed to fire (Figure 5).

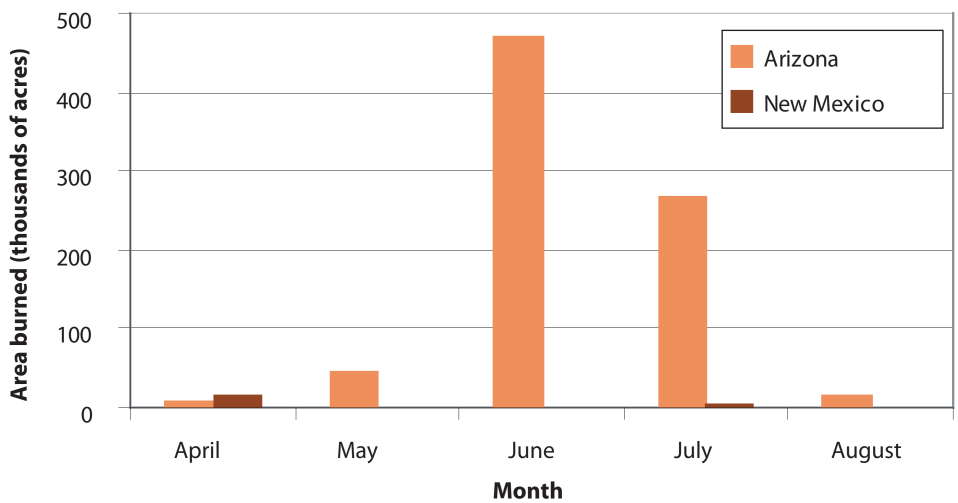
Meanwhile, New Mexico's fire season fell below average, with only about 23,000 acres burned unintentionally by wildfires. Another 160,000 acres burned in the northern Arizona area managed by the Great Basin coordination centers.

New Mexico's land managers intentionally allowed 106,462 acres to burn in its program to reintroduce surface fires into southwestern forests. Surface fires in the right conditions can clear some of the leaf litter and brush that could otherwise fuel hard-to-control fires during dry years. Arizona similarly used prescribed and natural fires to clear brush on about 23,761 acres.

The fire season generally reflected forecasts made in March by the Southwest Coordination Center (SWCC) at a National Seasonal Assessment Workshop co-organized by the Climate Assessment for the Southwest, the program for Climate, Ecosystem and Fire Applications, and the National Interagency Coordination Center. Charles Maxwell, fire weather program manager for SWCC, and others had forecast an above-average season in low elevation systems in southern Arizona and New Mexico and a below-average season in southwestern high-elevation forests. A relative lack of fires in southern New Mexico represented the only major difference between the forecast (above-normal) and the season outcome (below-normal) for that area.

A sputtering monsoon onset this summer proved more detrimental than beneficial to Arizona's grasslands and grass-invaded deserts because large amounts of lightning preceded rainfall.

Figure 5. Wildfires during the peak fire season of the water year are shown below for Arizona and New Mexico.



"Basically the monsoon caused a massive outbreak of fires," Maxwell said. Lightning strikes associated with the monsoon were particularly concentrated during the third week of June and the second week of July, he said. Meanwhile, only about 5 to 25 percent of the usual amount of rainfall fell between mid-May and July 20 in much of Arizona, including the area burned by the Phoenix-area fire known as the Cave Creek Complex. Monsoon clouds finally started bringing the long-promised rains in late July.

New Mexico fared a bit better than Arizona from mid-May to mid-June, but also registered rainfall tallies 5 to 25 percent of normal from mid-June to mid-July in much of the western half of the state, according to data from the High Plains Regional Climate Center. Still, the dry summer created less havoc on New Mexican ecosystems.

The Cave Creek Complex involved three separate wildfires that merged into one blaze that burned about 248,300 acres between June 21 and July 11. After briefly threatening to move into the populated Phoenix suburbs of Scottsdale and Carefree, the fire traveled north into the Tonto National Forest. There, saguaro-dominated desert ecosystems burned alongside oak, juniper, and chaparral vegetation. While bark often shields trees and shrubs from the effects of low-intensity fires, even mild surface fires can be fatal for saguaros.

Desert ecosystems usually lack the ground cover needed to carry fire into saguaro habitat. But this water year's plentiful moisture and warm spring temperatures allowed invasive grasses to take over much of the desert, making it a prime target for wildfires.

Restoring the fire-damaged desert presents some unique challenges and raises questions about how the charred areas will rebound. Saguaro and other cactus do not have the ability of grasses to regenerate annually. For instance, it may take 50 years before a saguaro becomes mature enough to form branches. Managers are not sure how to restore scorched desert lands, so they are planning to leave the burned areas alone to see if they can regenerate on their own.

continued on page 8

WYIR, continued

El Niño

Sea Surface Temperatures

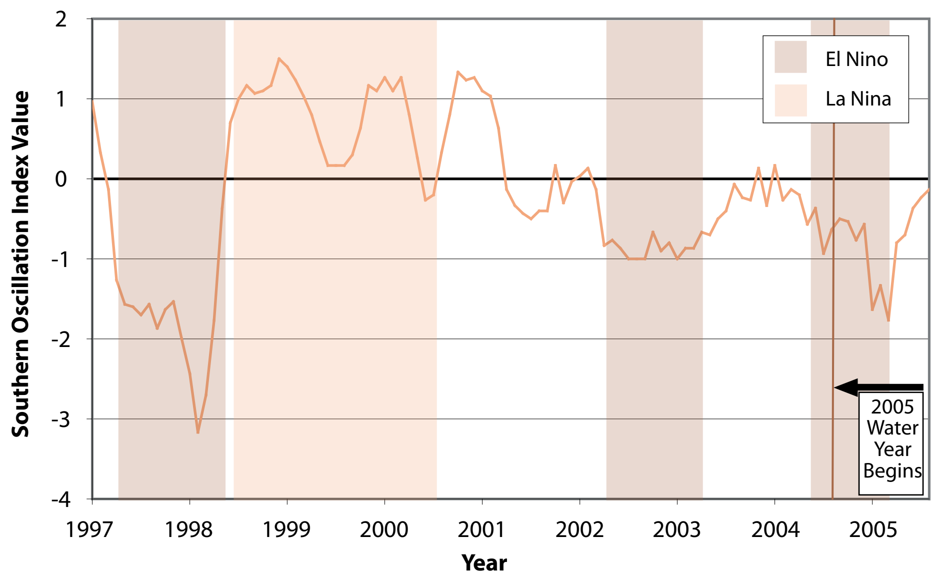
Weak El Niño conditions were present in the tropical Pacific Ocean at the beginning of the 2005 water year. These conditions developed in mid-summer 2004 and continued until mid-spring 2005. Positive Sea Surface Temperature (SST) anomalies greater than 0.5 degrees C (approximately 1 degree F) in the El Niño monitoring region initially persisted across most of the equatorial Pacific. Slightly above average SSTs extended across the central Pacific from New Guinea to the South American coast. This pattern continued and intensified slightly into December. SSTs decreased somewhat across the central Pacific in January, but remained slightly above average.

By mid-spring, SSTs in the El Niño monitoring region had cooled to less than 0.5 degrees C above average, which signaled an end to the weak El Niño episode and a return to neutral El Niño Southern Oscillation (ENSO) conditions. SSTs warmed somewhat again in late spring in the eastern equatorial Pacific, where anomalously warm water appeared along the coast of equatorial South America. The slightly warmer than average water in the El Niño monitoring region lingered until late summer, but was not warm enough to be defined as an El Niño event. By the end of the water year, SSTs across most of the equatorial Pacific had returned to near-average temperatures and cooler water (0.5 to 1.5 degrees C below average) had reappeared along parts of the South American coast. ENSO-neutral conditions have persisted since mid-spring, and are expected to continue for the next three to six months.

Southern Oscillation Index

The SOI measures the atmospheric response to SST changes across the Pacific Ocean Basin and 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 6. Southern Oscillation Index values from January 1997 through August 2005.



The Southern Oscillation Index (SOI) was negative throughout most of the water year, alternating between weak El Niño (negative SOI) and neutral ENSO conditions (Figure 6).

The SOI is a good indicator of the atmospheric response to SST anomalies generated during El Niño and La Niña events. Large negative (El Niño) or positive (La Niña) SOI values are indicative of large atmospheric responses to warm or cold SST anomalies. Circulation anomalies that can impact winter precipitation patterns in Arizona usually develop when SOI values are very negative or positive.

SOI values were only slightly negative during fall 2004 and winter 2005, indicative of a weak atmospheric response to a weak El Niño event. The circulation anomalies expected with an El Niño event did not develop during winter 2005. The above normal winter precipitation was due to other circulation anomalies.

Temperature (through 10/19/05)

Source: High Plains Regional Climate Center

A new water year started October 1, so the temperatures and departure from average temperatures reflect only the first three weeks of the month (Figures 1a and 1b). Average temperatures for the 2006 water year range from the low 40 degrees Fahrenheit in northern New Mexico to the low 80s in southwestern Arizona. Most of the region has been 1–3 degrees F above average, with the largest positive anomalies in central Arizona. East-central New Mexico has experienced temperatures 1–3 degrees F cooler than average so far for the water year. As predicted by the NOAA-Climate Prediction Center, temperatures over the past 30 days were about 2–4 degrees F warmer than average over most of Arizona and New Mexico, except for a few stations in western Arizona and northern New Mexico, where temperatures were slightly cooler than average (Figures 1c and 1d).

Figure 1a. Water year '05–'06 (through October 19, 2005) average temperature.

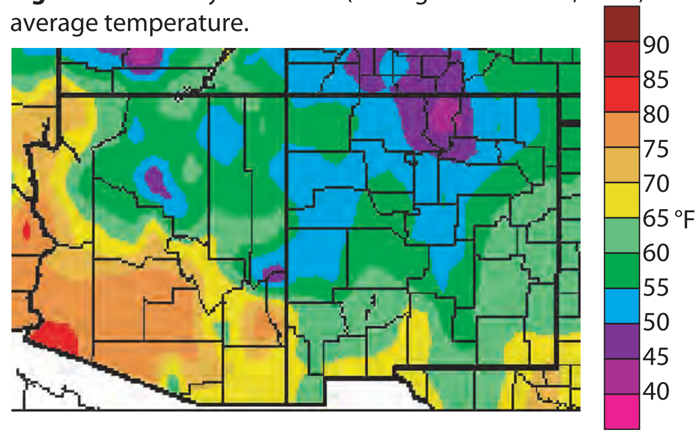


Figure 1b. Water year '05–'06 (through October 19, 2005) departure from average temperature.

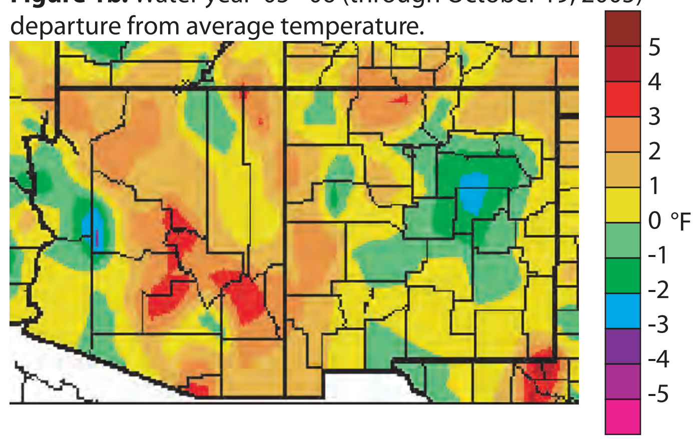


Figure 1c. Previous 30 days (September 20–October 19, 2005) departure from average temperature (interpolated).

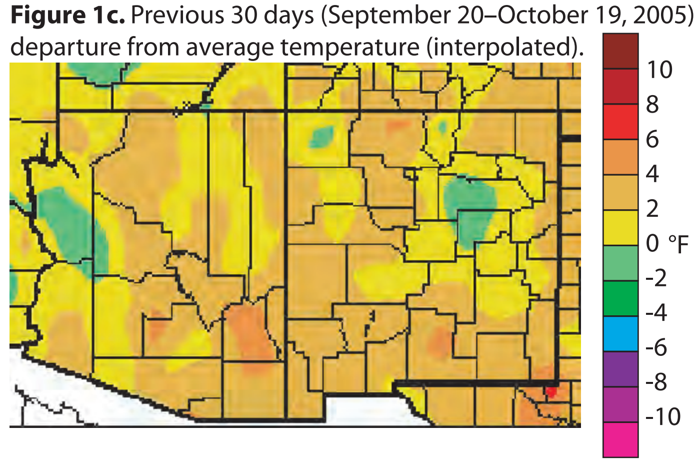
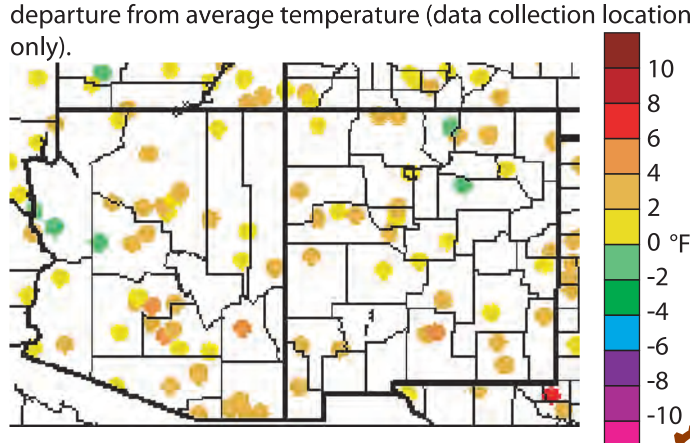


Figure 1d. Previous 30 days (September 20–October 19, 2005) departure from average temperature (data collection locations only).



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/products/current.html

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

Precipitation (through 10/19/05)

Source: High Plains Regional Climate Center

The new water year has been wetter than average in western Arizona and in southern New Mexico, adjacent parts of Arizona, and portions of central and northern New Mexico (Figure 2a and 2b). Most of central and eastern Arizona and portions of northern New Mexico are below average with total precipitation 75 percent of average or less. Western Arizona shows departures of up to 400 percent above average or greater. North-central New Mexico and far western Arizona received above-average precipitation over the past 30 days (Figure 2c and 2d). Most of central and eastern Arizona was below average, with some areas receiving only 25 percent of average or less. Much of New Mexico was above average, particularly in north-central New Mexico, which received 200 percent of average or greater.

Figure 2a. Water year '05–'06 through October 19, 2005 percent of average precipitation (interpolated).

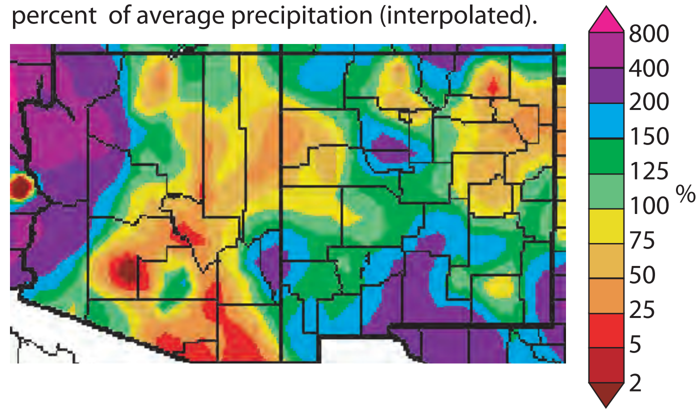


Figure 2b. Water year '04–'05 through October 19, 2005 percent of average precipitation (data collection locations only).

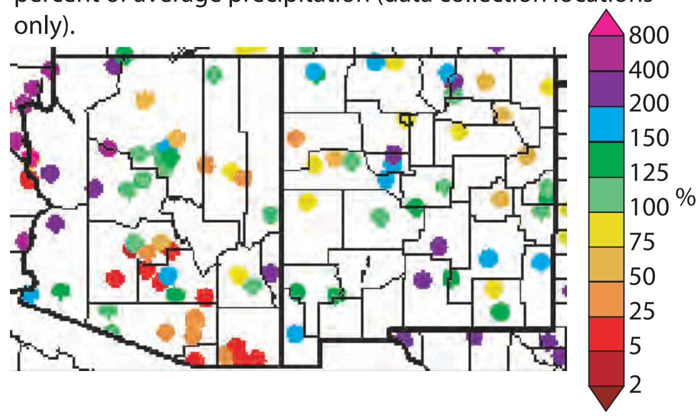


Figure 2c. Previous 30 days (September 20–October 19, 2005) percent of average precipitation (interpolated).

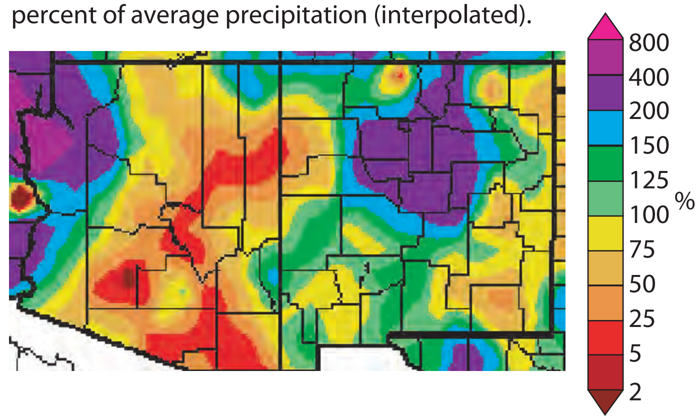
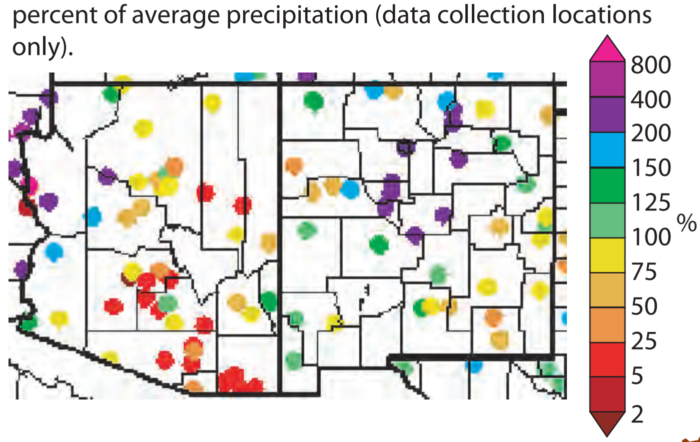


Figure 2d. Previous 30 days (September 20–October 19, 2005) percent of average precipitation (data collection locations only).



Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2005 we are in the 2006 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/products/current.html

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

U.S. Drought Monitor

(released 10/20/05)

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

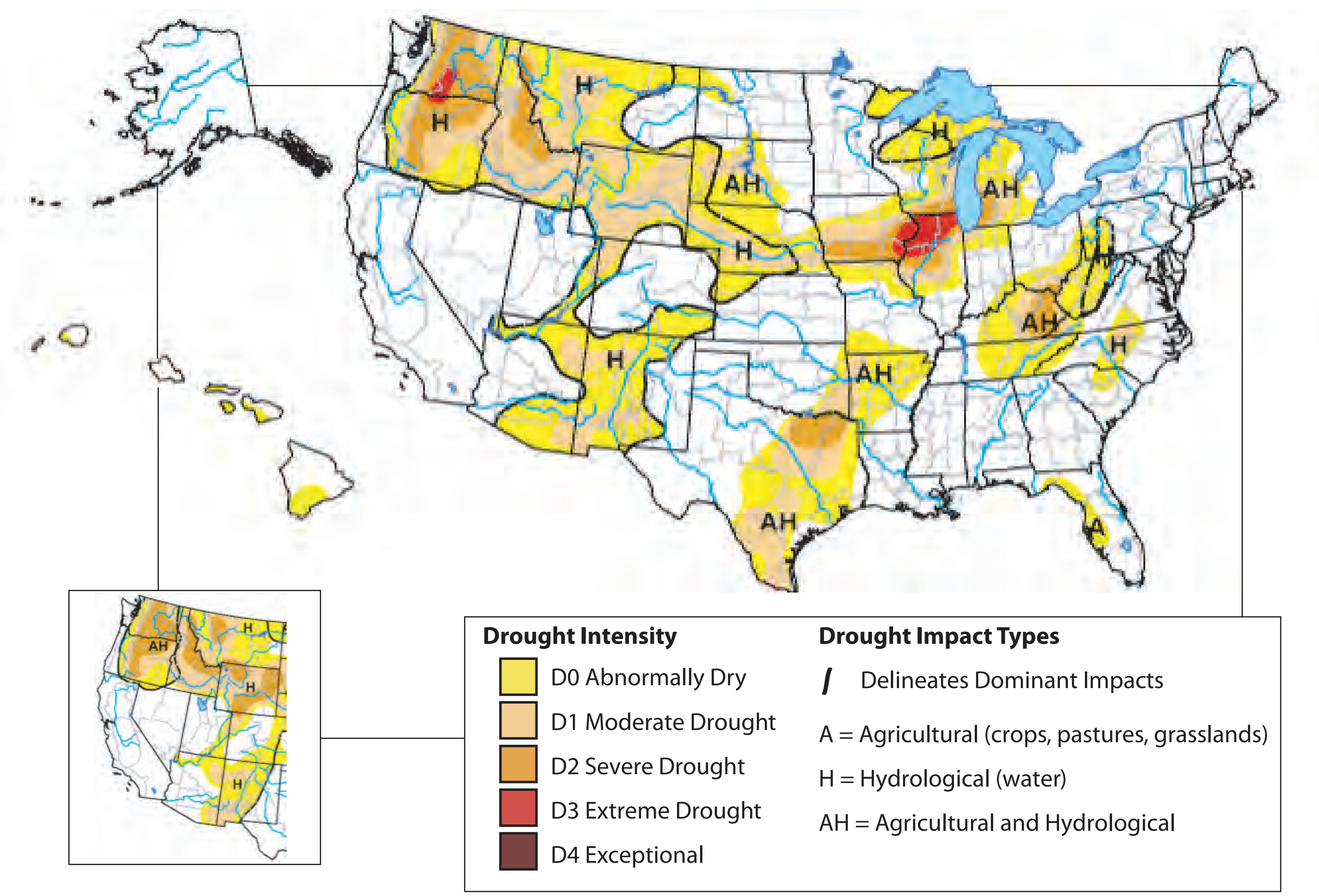
Drought conditions in the Southwest and across the country have changed only slightly since a month ago (Figure 3). The areas that still show moderate drought or abnormally dry conditions in the Southwest are generally those areas that have experienced long-term precipitation deficits over the last 12 months or longer. Most of the region has shown marked improvement since a year ago (see page 6). Moderate drought or abnormally dry conditions still linger in central and western New Mexico, southeast Arizona, and in northeast and far northwest Arizona. Abnormally dry conditions have expanded somewhat in southeastern Arizona, farther west into areas that were not in drought last month, due to lower-than-average rainfall in western Pima County. Most of central Arizona and far southwestern Arizona, along with eastern New Mexico, are not in drought, due to abundant winter and spring rains. Officials rate 52 percent of the pasture and range land in Arizona as poor to very poor, and 24 percent in New Mexico as poor to very poor. The poor pasture and range land conditions are due mostly to reduced summer grass production in response to low monsoon rainfall and to the late onset of the monsoon.

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 David Miskus, JAWF/CPC/NOAA.

Figure 3. Drought Monitor released October 20, 2005 (full size) and September 15, 2005 (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

New Mexico Drought Status

(through 10/16/05)

Source: New Mexico Natural Resources Conservation Service

Parts of northeast and part of central New Mexico are free of drought, as are the east-central and south-central portions of the state (Figure 4a). Advisory, alert (mild), or warning (moderate) drought status exists elsewhere in the state. Drought conditions have expanded somewhat to mild or moderate in north-central and parts of northwest New Mexico, as well as in a portion of the southwest part of the state. The most extensive area of moderate drought is centered in Rio Arriba, Sandoval, Los Alamos, Santa Fe, and San Miguel counties. Moderate drought status also exists in portions of McKinley, Cibola, Lincoln, and Otero counties. Although above-average precipitation fell in parts of New Mexico over the past month, it was insufficient to alleviate the long-term (48 months) deficiencies (figure 4b).

One-quarter of pasture and range land in New Mexico is in poor or very poor condition. This represents deteriorating conditions since early May. Above-average temperatures and lack of adequate summer precipitation have exacerbated drought conditions in New Mexico. Many of the reservoirs on New Mexico rivers are well below average levels. Elephant Butte, the largest reservoir in the state, is at 17 percent of capacity.

Notes:

The New Mexico drought status maps are produced monthly by the New Mexico Drought Monitoring Workgroup. When near-normal conditions exist, they are updated quarterly. 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 shortfalls (e.g., many months to years) on water supplies (i.e., streamflow, reservoir and lake levels, groundwater). This map is organized by river basins—the white regions are areas where no major river system is found.

On the Web:

For the most current New Mexico drought status map, visit:
http://www.nm.nrcs.usda.gov/snow/drought/drought.html

Information on Arizona drought can be found at:
http://www.azwater.gov/dwr/default.htm

Figure 4a. Short-term drought map based on meteorological conditions as of September 16, 2005.

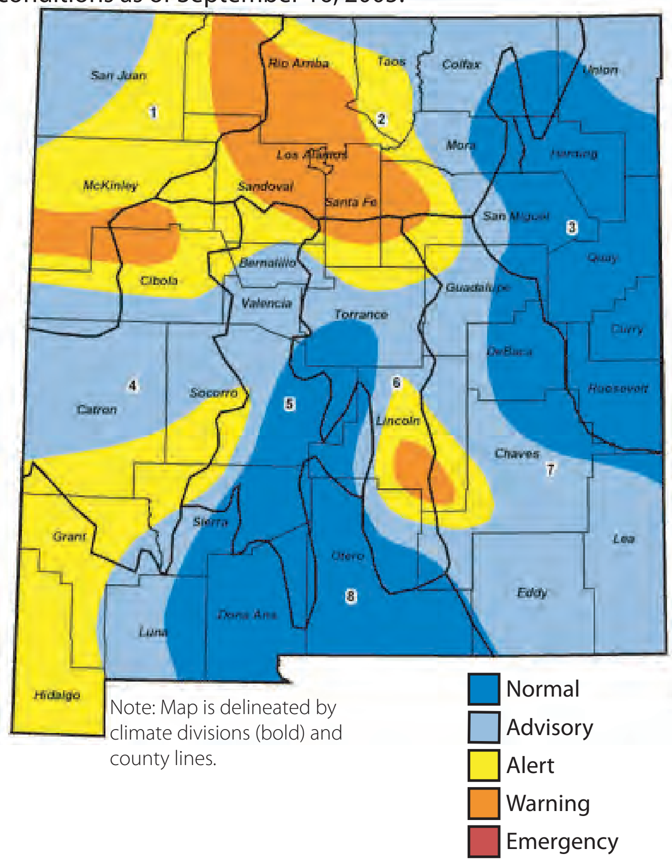
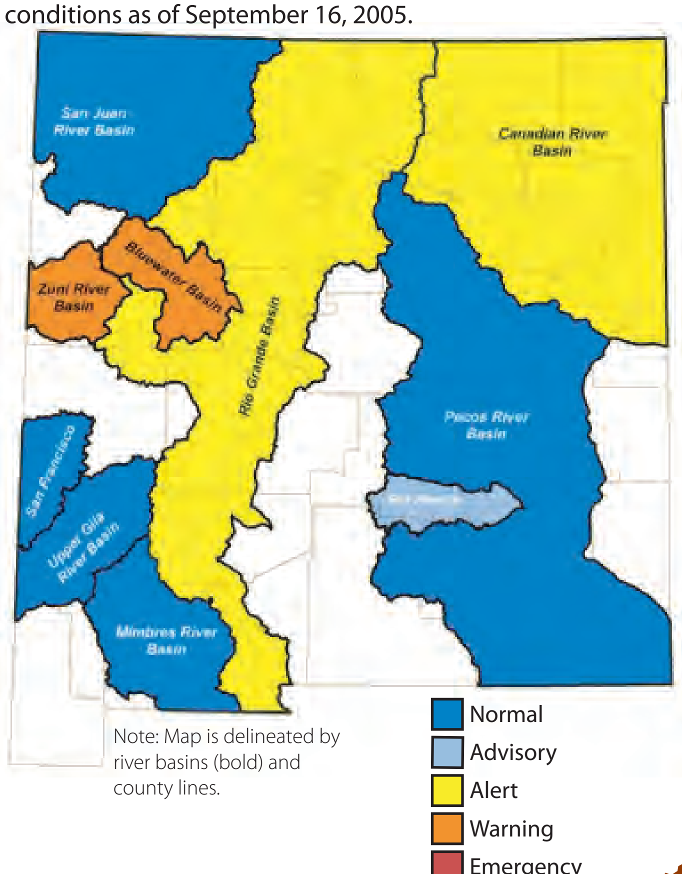


Figure 4b. Long-term drought map based on hydrological conditions as of September 16, 2005.



Arizona Reservoir Levels

(through 9/30/05)

Source: National Water and Climate Center

Most reservoirs in Arizona declined slightly from August to September, except for Show Low Lake, which remains full. Most of the state's reservoirs remain well below capacity, except the Salt River System (85 percent), Show Low Lake (100 percent), Lake Havasu (90 percent), and Lake Mohave (87 percent), as shown in Figure 5. The current statewide storage continues to remain well above levels experienced one year ago. Most reservoirs are near to well above last year's levels, due to the abundant winter and spring precipitation, except for Lake Havasu and Lake Mohave, which have declined slightly. The two largest reservoirs, Lake Mead and Lake Powell, remain above the storage recorded at the end of August 2004, but they are both still well below their average storage levels.

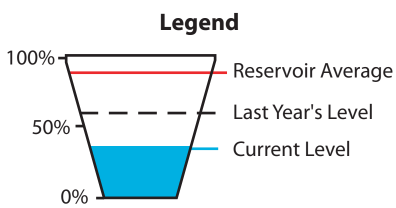
Notes:

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).

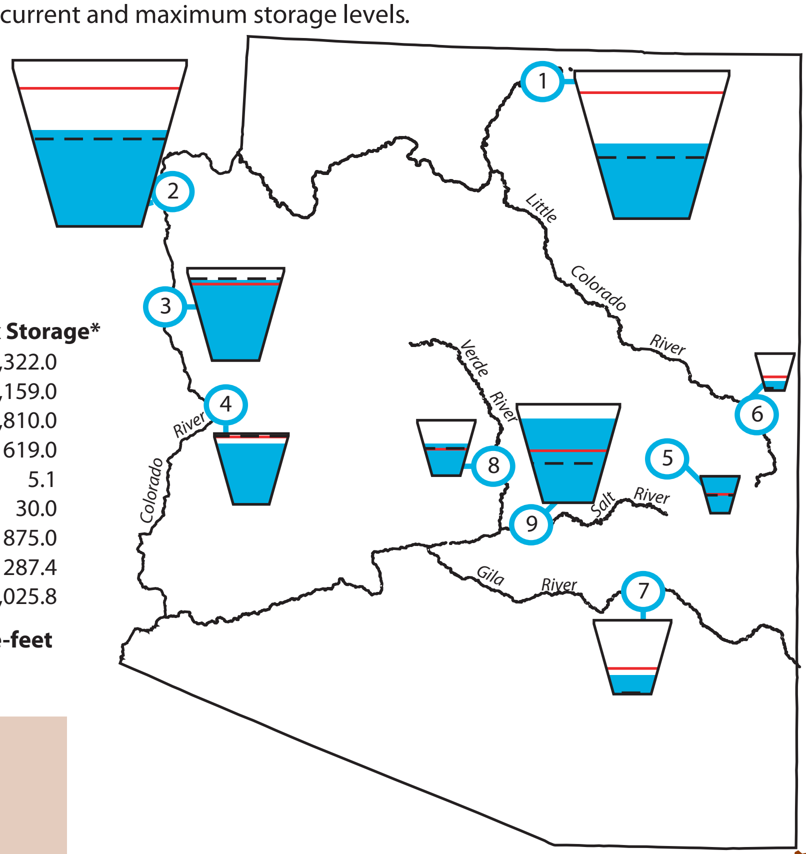
The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels are given in thousands of acre-feet for each reservoir.

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. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) or Larry Martinez, Natural Resource Conservation Service, 3003 N. Central Ave, Suite 800, Phoenix, Arizona 85012-2945; 602-280-8841; Larry.Martinez@az.usda.gov).

Figure 5. Arizona reservoir levels for September 2005 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.



size of cups is representational of reservoir size, but not to scale



Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Lake Powell	49%	11,939.0	24,322.0
2. Lake Mead	58%	15,219.0	26,159.0
3. Lake Mohave	87%	1,572.7	1,810.0
4. Lake Havasu	90%	554.3	619.0
5. Show Low Lake	100%	5.1	5.1
6. Lyman Reservoir	26%	7.8	30.0
7. San Carlos	26%	231.7	875.0
8. Verde River System	58%	165.4	287.4
9. Salt River System	85%	1,714.0	2,025.8

*** 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 9/30/05)

Source: National Water and Climate Center

Most reservoirs in New Mexico are still well below capacity as of the end of September (Figure 6). All of the reservoirs except Navajo, Heron, and El Vado were at or below 50 percent capacity. Most other lakes in the state declined or remained steady during the last month, except for Santa Rosa, which rose by 1 percent of capacity. The largest drop occurred at El Vado in the Rio Grande basin, where the level fell from 74 to 59 percent of capacity. Most of the reservoirs in the Rio Grande basin are below average levels, due to long-term precipitation deficits. Elephant Butte, the largest reservoir in the state, has dropped from 23 to 17 percent of capacity in the last month. Caballo reservoir dropped to only 3 percent of capacity after declining every month since the end of May when it was at 15 percent of capacity. Abiquiu and Cochita are at 20 and 10 percent of capacity, respectively. Thanks to the abundant precipitation in the winter and spring, most of the reservoirs in New Mexico gained in storage compared to this time last year, as is the case in Arizona.

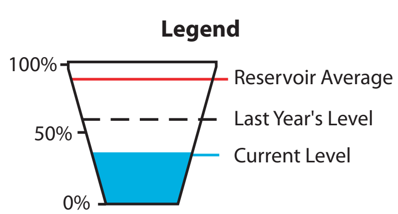
Notes:

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.

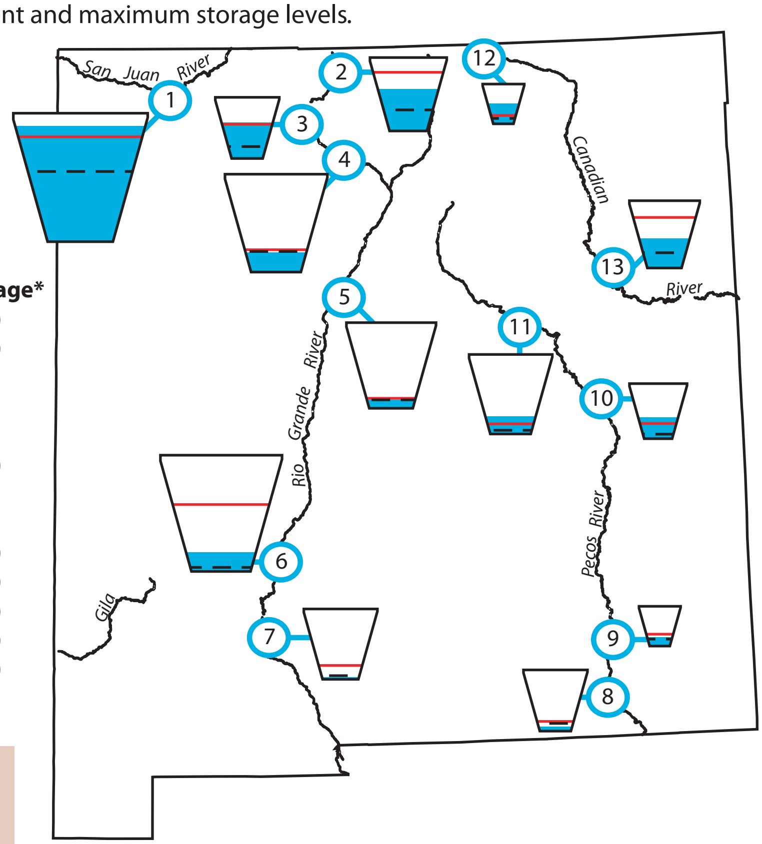
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) or Dan Murray, NRCS, USDA, 6200 Jefferson NE, Albuquerque, NM 87109; 505-761-4436; Dan.Murray@nm.usda.gov).

Figure 6. New Mexico reservoir levels for September 2005 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Navajo	89%	1,516.4	1,696.0
2. Heron	57%	226.3	400.0
3. El Vado	59%	110.4	186.3
4. Abiquiu	20%	112.3	554.5
5. Cochiti	10%	49.3	502.3
6. Elephant Butte	17%	344.8	2,065.0
7. Caballo	3%	11.2	331.5
8. Brantley	8%	12.3	147.5
9. Lake Avalon	22%	1.3	6.0
10. Sumner	39%	39.4	102.0
11. Santa Rosa	22%	96.3	447.0
12. Costilla	50%	8.0	16.0
13. Conchas	42%	107.4	254.0

*** 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

Southwest Fire Summary

(updated 10/19/05)

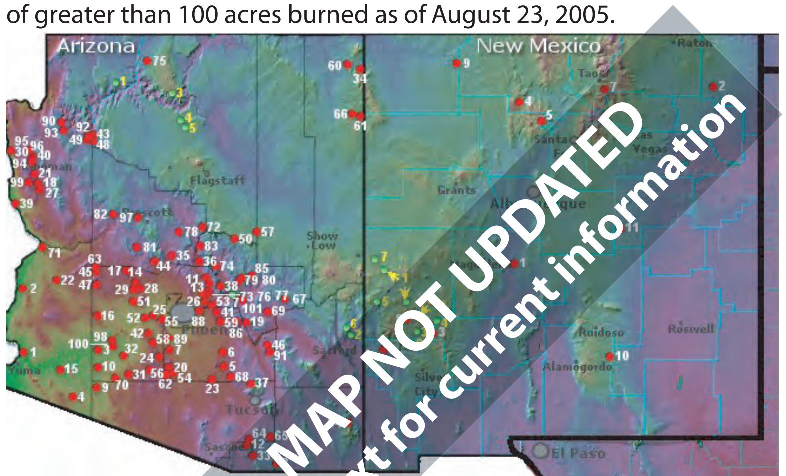
Source: Southwest Coordination Center

Southwest large fire activity for 2005 is largely over, though above-normal fire potential exists for limited regions of Arizona and New Mexico (see Wildland Fire Outlook, Figure 11a). The Southwest Coordination Center (SWCC) reports 20 prescribed burns in Arizona approved as of October 26, and more than a half dozen prescribed burns in progress throughout New Mexico. Less than ideal prescribed burn conditions exist throughout much of the Southwest due to precipitation in late September and during October. This is the final month that the Southwest Fire Summary will be included in the *Southwest Climate Outlook* in 2005.

Figure 7a. Year-to-date fire information for Arizona and New Mexico as of October 19, 2005.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	2,530	196,960	1,173	556,690	3,703	753,650
NM	402	18,434	684	4,680	1,086	23,114
Total	2,932	215,394	1,857	561,370	4,789	776,764

Figure 7b. Year-to-date wildland fire location. Map depicts large fires of greater than 100 acres burned as of August 23, 2005.



Wildland Fires

Arizona
1. Hidden
2. Bosque
3. Oatman Flat
4. Camino
5. Foster
6. Chapman
7. Haley Hills
8. Sunday
9. Growler Peak
10. 2000
11. St. Clair
12. Salero
13. Bart
14. Vulture
15. Getting
16. Eagle
17. Nuke
18. Sacramento
19. Skunk
20. Top
21. Shiner
22. Brenda
23. Green
24. Vekol
25. Goodyear
26. Memorial
27. Secret
28. Yoda
29. Bobby
30. Hulet
31. Goldwater
32. Theba
33. Aztec
34. Red Valley 1
35. Sunset Point
36. Cave Creek Complex
37. Cottonwood
38.Three Complex
39. Marsh
40.Perkins Complex
41. Boulder
42. Drain
43. Hindu
44. Humbug
45. Jane
46. Saddle
47. Bighorn
48. Matuck
49. Plain Tank
50. Zane
51. Bute
52. Buck
53. Ghost
54. Sand Tank Complex
55. West Estrella
56. Home
57. Line
58. Tracks
59. Liberty
60. Round Rock 3
61. Sawmill 2
62. Eagle Eye
63. Agro
64. Florida
65. Empire
66. Fluted Rock
67. Bear
68. Missle
69. Dude
70. Crater
71. Enas
72. Bull Run
73. Mesquite
74. Oak
75. Ridge Complex
76. Edge
77. Valentine
78. Butte
79. Salome
80. Greenback
81. J. Canyon
82. SH Ranch Complex
83. Black
84. Barfoot
85. Knoles
86. Peachville
87. ?
88. Tomahawk
89. Ak Chin
90. Jeff
91. Holy Joe
92. Diamond
93. Clay Tank
94. Twin Mills
96. Expo
97. Double L
98. Sycamore
99. Hopper
100. Guacamole
101. Henderson

New Mexico
1. Mitchell
2. Gladstone
3. East Fork
4. Mesa Camino
5. Valle
6. Bar Y Ranch
7. Osha Park
8. Cooper
9. Romine
10. Brush
11. Indian

Wildland Fire Use

Arizona
1. Tuweep,
2. Snake Ridge
3.Dragon Complex
4. Mudersbach
5. North-Skinner
6. Sunflower
7. Two Bar
8. Miles
9. Big Dry

New Mexico
1. North Fork
2. Black Range
3. Ring
4. Wahoo
5. Willow
6. Brush
7. Jones WFU

Notes:

The fires discussed here have been reported by federal, state, or tribal agencies during 2005. The figures include information both for current fires and for fires that have been suppressed. Figure 7a shows a table of year-to-date fire information for Arizona and New Mexico. Prescribed burns are not included in these numbers. Figure 7b indicates the approximate location of past and present "large" wildland fires and prescribed burns. A "large" fire is defined as a blaze covering 100 acres or more in timber and 300 acres or more in grass or brush. The red symbols indicate wildfires ignited by humans or lightning. The green symbols are prescribed fires started by fire management officials. The name of each fire is provided next to the symbol.

On the Web:

These data are obtained from the Southwest Area Wildland Fire Operations website:

http://gacc.nifc.gov/swcc/predictive/intelligence/daily/ytd-daily-state.htm

http://gacc.nifc.gov/swcc/predictive/intelligence/daily/ytd-large-map.jpg

Temperature Outlook

(November 2005–April 2006)

Source: NOAA Climate Prediction Center (CPC)

NOAA-CPC temperature forecasts indicate increased chances of above-average temperatures for much of the West, including most of Alaska, through April 2006 (Figures 8a–d). Throughout the winter, the greatest likelihood for warmer weather is centered on Arizona and New Mexico. As the forecasts progress, the probabilities for above-average temperatures in Arizona and New Mexico increase from 40 percent in November 2005–January 2006 to more than 60 percent in northwestern Arizona in February–April 2006. These forecasts are based on recent temperature trends as well as statistical forecast models.

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 2005–January 2006.

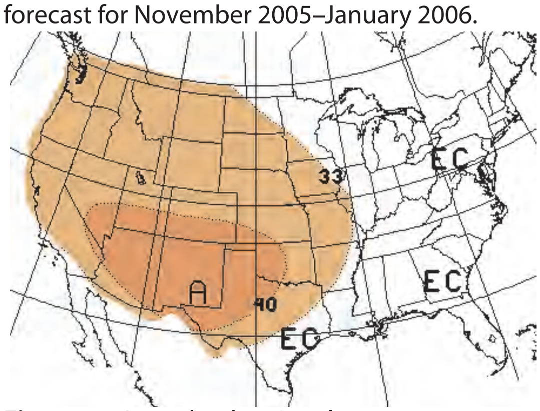


Figure 8b. Long-lead national temperature forecast for December 2005–February 2006.

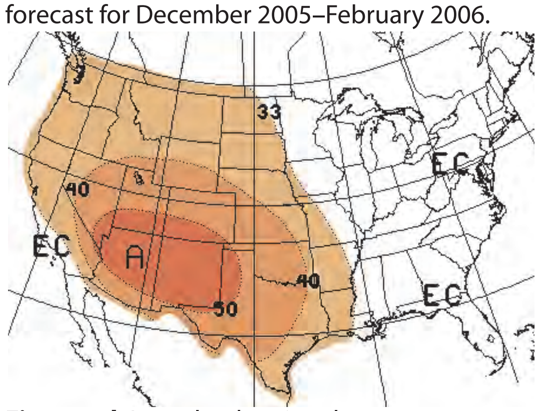


Figure 8c. Long-lead national temperature forecast for January–March 2006.

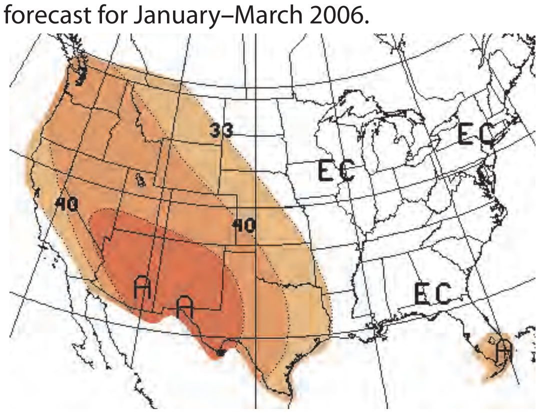
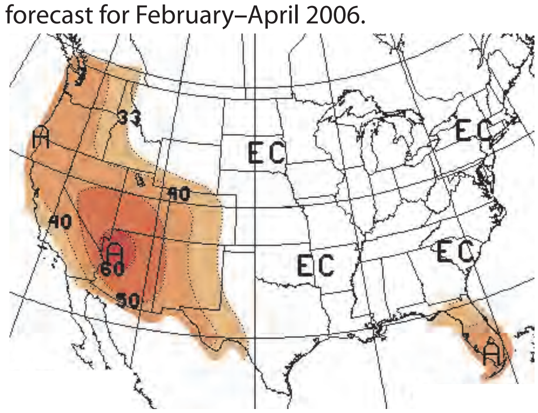


Figure 8d. Long-lead national temperature forecast for February–April 2006.



A= Above

- 60.0–69.9%
- 50.0–59.9%
- 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/

Precipitation Outlook
(November 2005–April 2006)
Source: NOAA Climate Prediction Center (CPC)

For the Southwest region, NOAA-CPC precipitation forecasts show increased chances of drier-than-average conditions for the next three months (Figure 9a). Eastern Texas and Oklahoma and western Arkansas and Louisiana have greater chances for above-average precipitation through March 2006 (Figure 9a–c). For the rest of the country, forecasters have reserved judgment (Figure 9a–d) because precipitation forecasts are generally more uncertain during neutral ENSO conditions (see Figures 12a–b).

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 2005–January 2006.

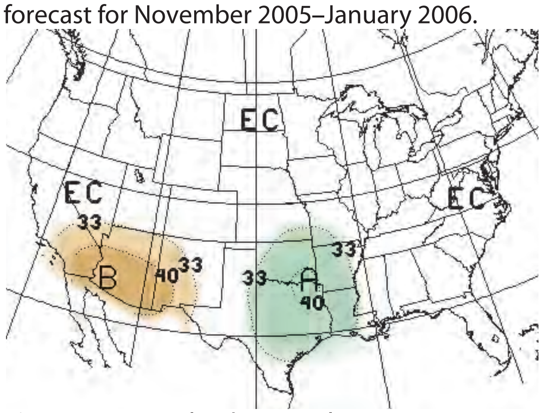


Figure 9b. Long-lead national precipitation forecast for December 2005–February 2006.

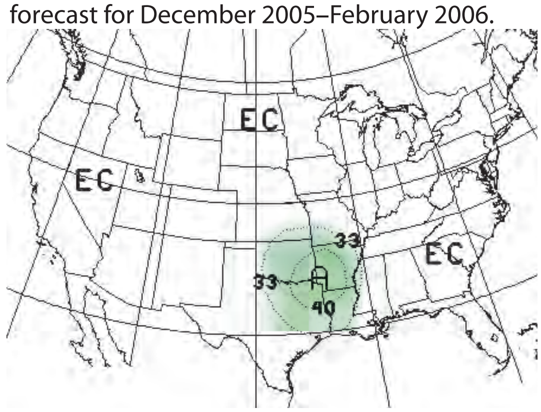


Figure 9c. Long-lead national precipitation forecast for January–March 2006.

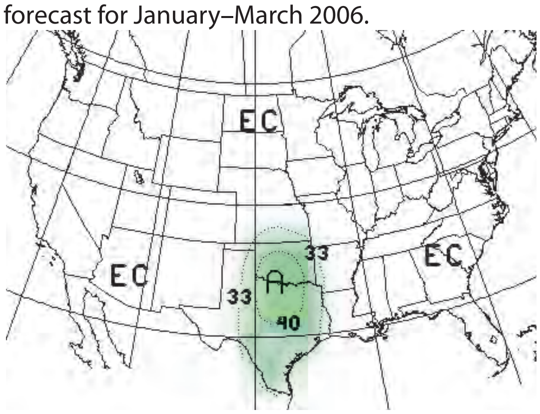
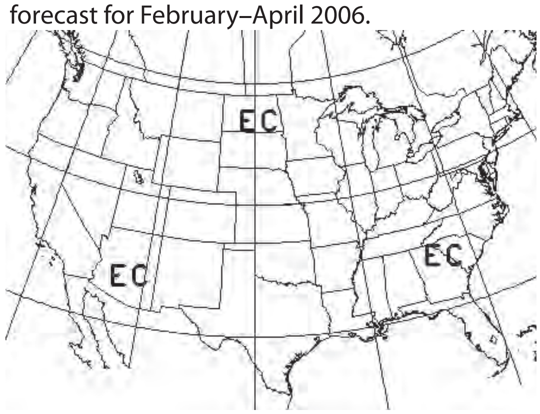


Figure 9d. Long-lead national precipitation forecast for February–April 2006.



A= Above: 40.0–49.9%; 33.3–39.9%

B= Below: 33.3–39.9%; 40.0–49.9%

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 2006)

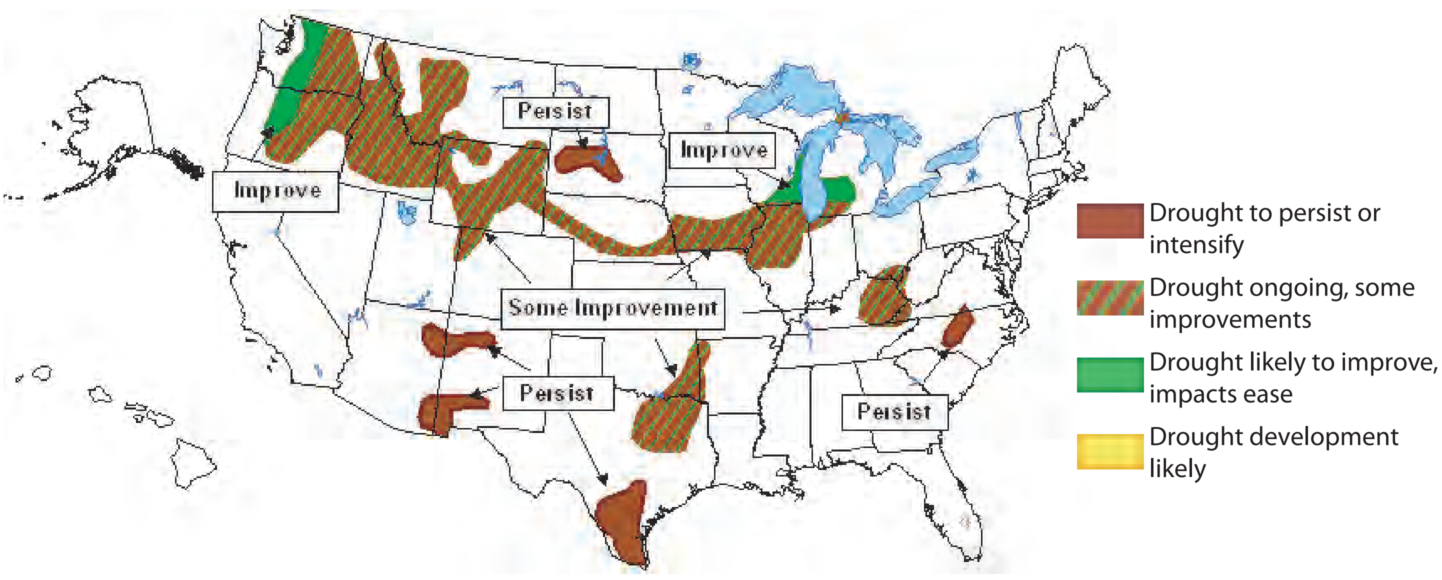
Source: NOAA Climate Prediction Center (CPC)

The seasonal drought outlook from the NOAA-CPC shows little change from last month. The CPC forecasts that drought will persist along parts of the Arizona and New Mexico border (Figure 10). Fall in the Southwest is usually a dry season, and despite some rain in mid-October, those areas are not likely to receive enough rain to improve their current drought status this season. The late onset and below-average rainfall amount of the monsoon contributed to the deficits in those areas. Continuing above-average temperatures and below-average rainfall over much of the Southwest since the end of the monsoon has led to the persistence of drought along the Arizona-New Mexico border. The CPC outlook also calls for increased chances of below-average precipitation and above-average temperatures to continue in the region for the next few months, making drought improvement unlikely.

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 2006 (release date October 20, 2005).



On the Web:

For more information, visit:
http://www.drought.noaa.gov/

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

The National Wildland Fire Outlook (Figure 11a) indicates above-normal fire potential in western Arizona and south-eastern New Mexico between October 1 and 31. This is due chiefly to a rapid retreat of the monsoon, followed by warm, dry conditions in some Southwest locations. Abundant fine fuels remain in much of the Southwest, following exceptional winter and spring precipitation. The November Southwest Monthly Fire Weather/Fire Danger Outlook (not shown), a product of the Southwest Coordination Center (SWCC), indicates normal- to above-normal potential for serious or critical fire problems. A region of particular concern is south-central New Mexico in and around the Sacramento and Capitan mountain ranges, where dry conditions, expected during early November, could exacerbate fire danger. Enhanced fire potential is expected in situations when relative humidity remains below 20 percent for two or more days. SWCC fire experts expect conditions for prescribed burning to improve by the middle and end of November. SWCC experts caution that much of eastern Arizona into far western New Mexico has been relatively dry during September and October. Thus, if the area lacks ample precipitation during November and December, dry conditions could very well combine with below-normal precipitation to lead to a dry beginning to the 2005/2006 winter season.

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces monthly wildland fire outlooks. The forecasts (Figure 11a) consider climate forecasts and surface-fuels conditions in order to assess fire potential for fires greater than 100 acres. They are subjective assessments, based on synthesis of regional fire danger outlooks.

The Southwest Area Wildland Fire Operations produces monthly fuel conditions and outlooks. Fuels are any live or dead vegetation that are capable of burning during a fire. Fuels are assigned rates for the length of time necessary to dry. Small, thin vegetation, such as grasses and weeds, are 1-hour and 10-hour fuels , while 1000-hour fuels are large-diameter trees. The top portion of Figure 11b indicates the current condition and amount of growth of fine (small) fuels. The lower section of the figure shows the moisture level of various live fuels as percent of average conditions.

On the Web:

National Wildland Fire Outlook web page:
http://www.nifc.gov/news/nicc.html

Southwest Area Wildland Fire Operations (SWCC) web page:
http://gacc.nifc.gov/swcc/

Figure 11a. National wildland fire potential for fires greater than 100 acres (valid October 1–31, 2005).

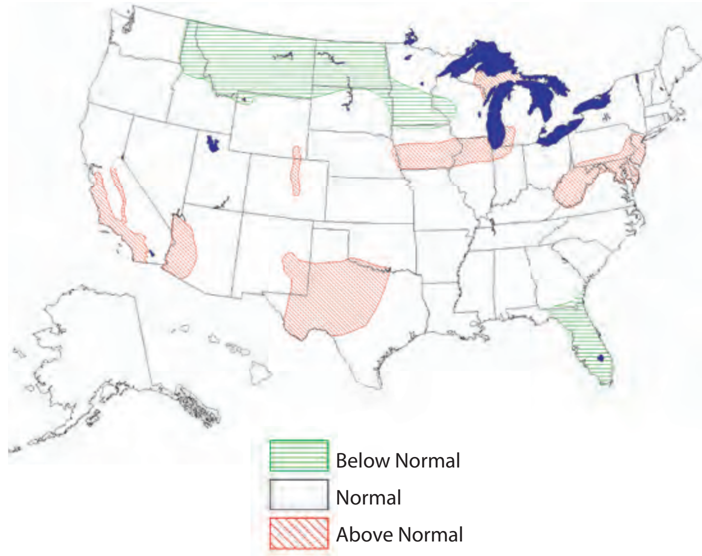


Figure 11b. Current fine fuel condition and live fuel moisture status in the Southwest.

Current Fine Fuels						
Grass Stage	Green		Cured	x		
New Growth	Sparse		Normal		Above Normal	x

Live Fuel Moisture	
	Percent of Average
Ponderosa Pine	90–100
Douglas Fir	85–95
Piñon	80–95
Juniper	85–100
Sagebrush	200–240
1000-hour dead fuel moisture	**8–13**
Average 1000-hour fuel moisture for this time of year	**8–14**

TABLE NOT UPDATED
see text for current information

El Niño Status and Forecast

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

Atmospheric pressure, Sea Surface Temperature (SST) conditions, and wind patterns across the equatorial Pacific Ocean remain near average. Although the Southern Oscillation Index (an indication of atmospheric response to Pacific Ocean temperatures) has increased slightly over the past several months, ENSO conditions remain neutral (Figure 12b). Forecasts from the IRI predict that it is approximately 98 percent likely that neutral conditions will prevail through December and will remain neutral throughout early 2006 (Figure 12a). Forecasts also show chances for El Niño conditions increasing to 30 percent in summer 2006.

According to the IRI, there has been little change in SSTs indicative of El Niño conditions over the past several months. Though there is considerable variability between prediction models, none forecast a chance of reaching even weak El Niño levels through the end of 2005, though probabilities will increase to 25 percent by late spring 2006. The IRI also reports that the probability of a La Niña event developing between now and the end of 2005 is approximately 1 percent.

Notes:

Figure 12a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through September 2005. 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 12b shows the International Research Institute for Climate Prediction (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/

Although positive El Niño conditions are associated with increased precipitation in the Southwest, neutral conditions generally have little effect.

Figure 12a. The standardized values of the Southern Oscillation Index from January 1980–September 2005. 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).

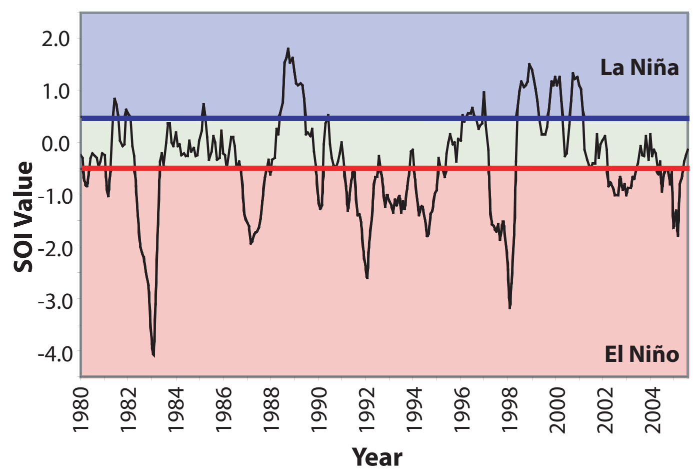
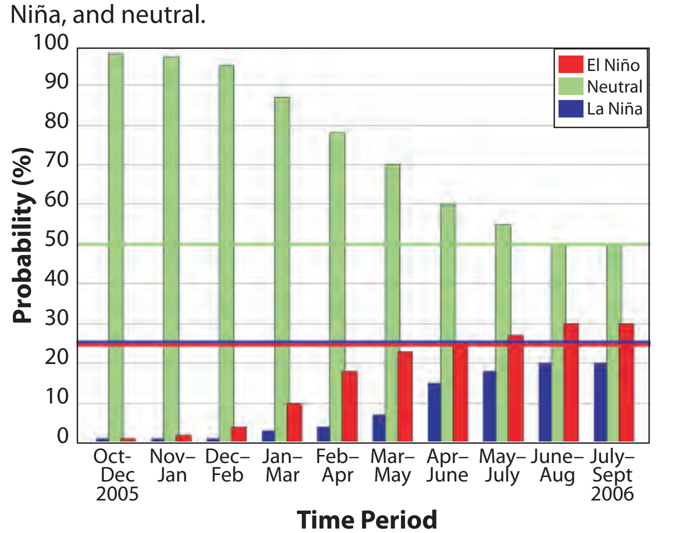


Figure 12b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released October 20, 2005). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Temperature Verification
(July–September 2005)
Source: NOAA Climate Prediction Center (CPC)

The long-range temperature forecast issued by the NOAA-CPC for July through September predicted chances for warmer-than-average temperatures for much of the western and southern United States (Figure 13a). The highest probabilities were predicted in the Southwest region, especially in western and central Arizona, southern Nevada, and southeastern California. No probabilities for cooler-than-average temperatures were forecast. Most observed temperatures throughout the nation were 0–5 degrees F above average, with maximum departures of 5–10 degrees F in southeastern Arizona and upstate New York (Figure 13b). Temperatures were 0–5 degrees F cooler than average in patches throughout the West. Generally, the forecast performed well in predicting warmer temperatures in the South and West, though western temperatures were not as spatially consistent as predicted. Notable exceptions to forecast accuracy include cooler temperatures in northeastern Arizona and along the California coast.

Figure 13a. Long-lead U.S. temperature forecast for July–September 2005 (issued June 2005).

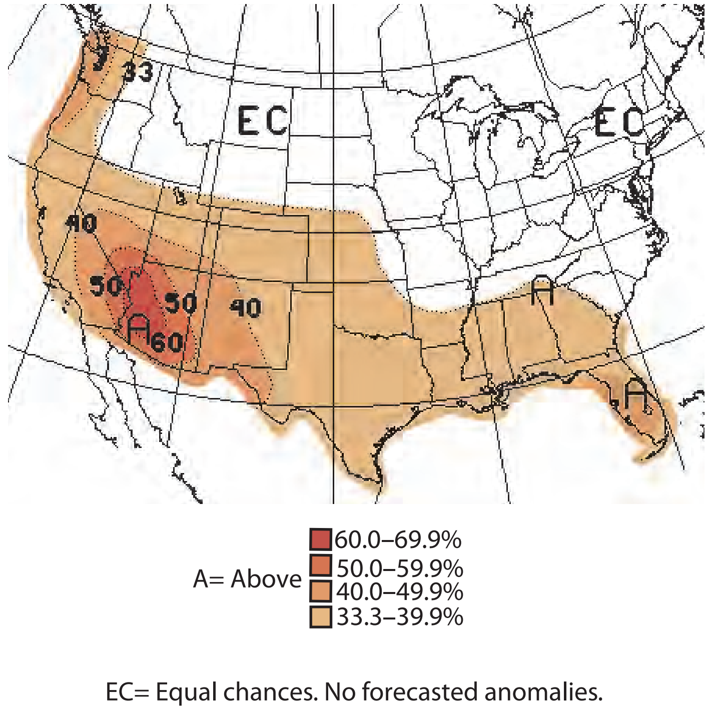
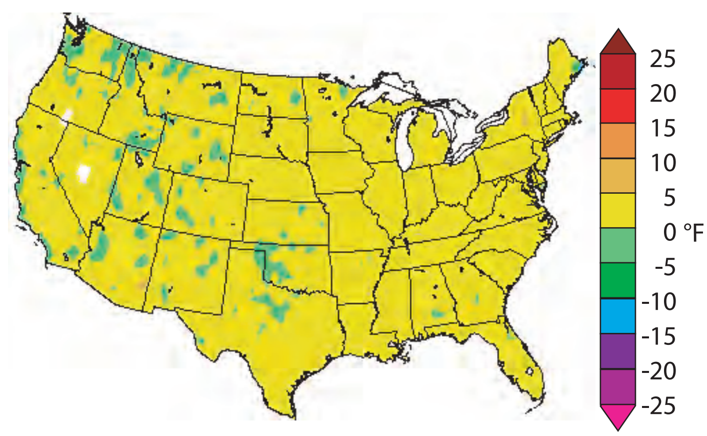


Figure 13b. Average temperature departure (in degrees F) for July–September 2005.



Notes:
Figure 13a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months July–September 2005. This forecast was made in June 2005.

The July–September 2005 NOAA CPC 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. Care should be exercised when comparing the forecast (probability) map with the observed temperature maps described below.

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 13b shows the observed departure of temperature (°F) from the average for July–September 2005 period.

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 2005)

Source: NOAA Climate Prediction Center (CPC)

NOAA-CPC precipitation forecasts for July through September showed increased chances for above-average precipitation throughout the Southeast, Montana, eastern Wyoming, and western portions of North and South Dakota and Nebraska. Chances of drier-than-average conditions were forecast for much of the Southwest, with the greatest probabilities centered directly over Arizona (Figure 14a).

Precipitation was extremely variable throughout the country from July through September (Figure 14b). The East Coast and large areas in the West received below-average precipitation, while areas in northern and central California received only 2 percent of average. Regions in southern California, central Nevada, and the Four Corners area received more than 200 percent of normal precipitation. Parts of north-central Texas and the Mississippi and Ohio River Valleys also received above-average precipitation. Generally, forecast models perform best at predicting precipitation for large regions, but do not perform as well in predicting variability at finer scales. While the forecast performed well in predicting drier conditions in most of Arizona, eastern New Mexico, and northern California and Nevada, it failed to predict the large areas with above-average precipitation in California, Nevada and the Four Corners region.

Notes:

Figure 14a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months July–September 2005. This forecast was made in June 2005.

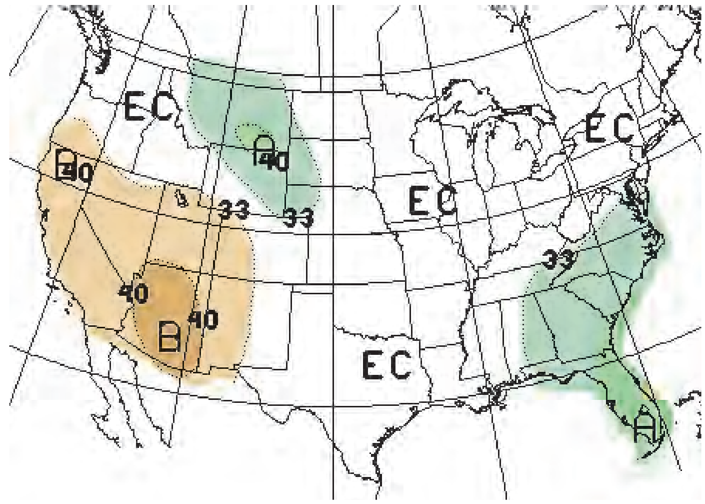
The July–September 2005 NOAA CPC outlook predicts the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps do not refer to inches of precipitation. Care should be exercised when comparing the forecast (probability) map with the observed precipitation maps described below.

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 14b shows the observed percent of average precipitation for July–September 2005.

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 14a. Long-lead U.S. precipitation forecast for July–September 2005 (issued June 2005).

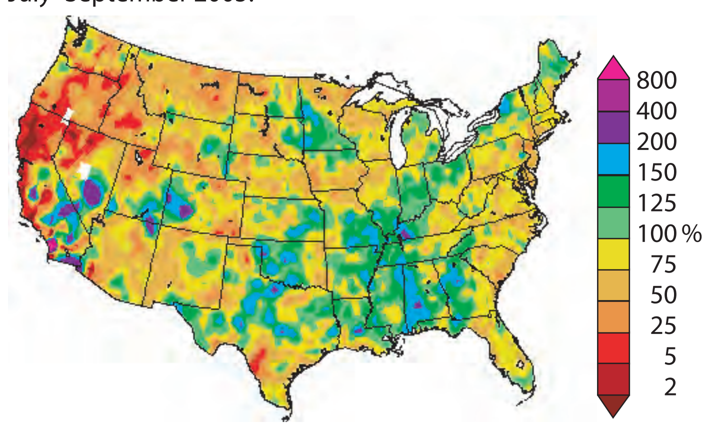


A= Above: 40.0–49.9%; 33.3–39.9%

B= Below: 40.0–49.9%; 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

Figure 14b. Percent of average precipitation observed from July–September 2005.



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