Issued: July 26, 2006

Southwest Climate Outlook

THE UNIVERSITY OF ARIZONA.

Source: Arizona Webcam, UA Department of Computer Science

Photo Description: This photograph shows a monsoon rainstorm over the Santa Catalina Mountains to the north of Tucson, Arizona. It was taken on July 18 at 5 p.m. from The University of Arizona webcam located in an office on the ninth floor of the Gould-Simpson building. The webcam is operated by Gregg Townsend in the UA Department of Computer Science. New images are updated hourly and can be accessed online at http://www.cs.arizona.edu/camera.

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...

NM Drought

page 10

Some level of drought exists for the entire state of New Mexico, according to the New Mexico State Drought Monitoring Committee. Eastern and southeastern New Mexico is in mild drought status, while two bands, stretching from the southwestern border...

Monsoon

page 14

The monsoon season arrived early in 2006, reaching dewpoint temperature criteria June 28 in Tucson. The average monsoon start is July 3 in Tucson and July 7 in Phoenix. Albuquerque does not have any dewpoint temperature criteria for the start of monsoon season...

Fire Outlook

page 18

Since the start of the monsoon the fire danger has lessened considerably in the Southwest. Fire potential indices have dropped to average throughout the region except for a narrow strip in far northern Arizona along the Utah border, where the fire potential remains above average...

CLIMAS

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

SAHRA

Water Sustainability
THE UNIVERSITY OF ARIZONA.

July Climate Summary

Drought – Drought conditions persist in the Southwest despite an early start to the monsoon season.

- Much of eastern and southern Arizona is in extreme or exceptional drought. Drought status for most of the remainder of the Southwest is severe.
- Reservoir levels in Arizona and New Mexico have declined since this time last year. From last month, Arizona reservoirs are at approximately the same level, while New Mexico's have declined 11 percent.

Fire Danger – Fire danger in the Southwest has decreased due to precipitation and increased humidity associated with the monsoon season.

Temperature – Since the water year began October 1, 2005, temperatures for most of the Southwest have been 0–4 degrees Fahrenheit above average.

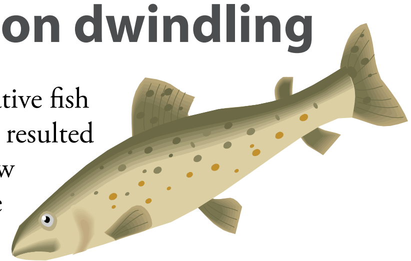
Precipitation – Precipitation has been far below average since the water year began, though during the previous month some areas have received above-average rainfall from monsoon thunderstorms.

Climate Forecasts – Forecasters predict increased probabilities of warmer-than-average temperatures through 2006. There are no forecasted precipitation anomalies.

El Niño – Currently, ENSO conditions are neutral and are forecast to remain so for at least the next three months.

The Bottom Line – An early monsoon start has put a damper on the fire season and provided some short-term drought relief, but drought conditions are expected to persist.

NM native fish population dwindling



The record drought in New Mexico is putting native fish in danger. Last winter's pitifully low snowfall has resulted in extremely low runoff in many of northern New Mexico's high country streams. The low flows are threatening dwindling populations of the native Rio Grande cutthroat trout, the state fish.

The cutthroat trout, which now occupies less than 10 percent of its historic range, has been hybridized over the years by nonnative rainbow trout, and pushed out of much of its habitat by nonnative brown trout. In a survey on the Rio Puerco this year, no fish at all were found in a 1,000-meter stretch of the river that had produced a tally of 285 Rio Grande cutthroats a year ago, according to a June 26 article in the *Albuquerque Journal*. The Forest Service, the state Game and Fish Department, and conservation groups are working to improve former cutthroat habitats in order to repopulate them with fish from other streams. Biologists are hoping for a productive monsoon to generate enough runoff to tide over the trout through until the cool season.

For more info on New Mexico water storage see page 12…

Table of Contents:

2 July 2006 Climate Summary
3 Feature: Monsoon impact on society: the good and the bad

Recent Conditions
6 Temperature
7 Precipitation
8 U.S. Drought Monitor
9 Arizona Drought Status
10 New Mexico Drought Status
11 Arizona Reservoir Levels
12 New Mexico Reservoir Levels
13 Southwest Fire Summary
14 Monsoon Summary

Forecasts
15 Temperature Outlook
16 Precipitation Outlook
17 Seasonal Drought Outlook
18 Wildland Fire Outlook
19 El Niño Status and Forecast

Forecast Verification
20 Temperature Verification
21 Precipitation Verification

SWCO Staff:

Ben Crawford, *CLIMAS Research Associate*
Mike Crimmins, *UA Extension Specialist*
Stephanie Doster, *ISPE Information Specialist*
Gregg Garfin, *CLIMAS Program Manager*
Alex McCord, *CLIMAS Technical Specialist*
Kristen Nelson, *ISPE Associate Editor*
Melanie Lenart, *CLIMAS Research Associate*

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.

Monsoon impact on society: the good and the bad

By Melanie Lenart

In a land marked by dry heat, people welcome the summer rains with songs, sales, and special events celebrating the monsoon season.

For better or worse, the monsoon brings changes to the Southwest and provides a break in soaring summer temperatures.

This year's monsoon officially reached Tucson on June 28, five days earlier than average, based on records back to 1949 compiled by Arizona's state climatologist, Andrew Ellis. His research has shown that stronger-than-average monsoons tend to arrive early and stay late (Figure 1). The longest seasons tend to bring the most rainfall (Figure 2).

Many hope the rains in the Southwest between the start of the monsoon and July 8 will be a sign of more relief to come. Few climatologists expect any long-term relief from the drought that has settled into the region for nearly a decade, but the region's drought status shows that this year's monsoon is putting a dent in the moisture deficit.

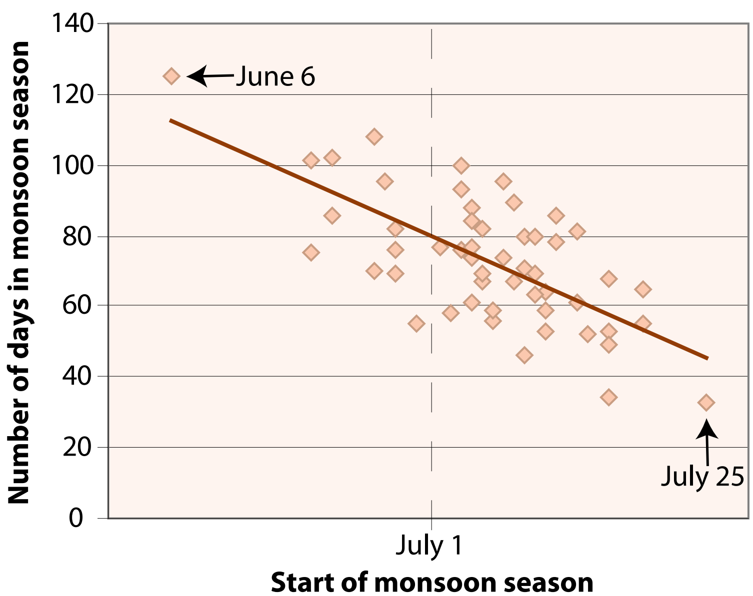


Figure 1. In general, the earlier the monsoon season starts in the Southwest, the longer it lasts. Each point above represents a monsoon season between 1949 and 2001. Data from state climatologist Andrew Ellis.

Wildfire

The monsoon heralds the beginning of the end of the burning season, a dangerous time for homes and businesses and the firefighters who protect them.

Southwestern wildfires came to a standstill in early July, their power dampened by a couple of weeks of rainfall that doubled, and even quadrupled, the average weekly tally for late June and early July. By July 4 in Arizona and July 6 in New Mexico, firefighters and rainfall had suppressed existing wildfires in the region. A few more Arizona fires have started since mid-July, when record-high temperatures drove humidities down in some lower-elevation areas below the Mogollon Rim.

"We're done in terms of widespread large fire potential," said Charles Maxwell, fire weather program manager for the Southwest Coordination Center (SWCC). "The season wound down between one and two weeks after the monsoon was declared in Tucson on June 28."

Although fires in the middle of the monsoon season can start between local rains, they have little chance of developing into raging conflagrations.

"As dry or hot as it might be in one day, it will only be three or four days before another rain," Maxwell said. It takes about 40 days to really dry out some of the larger fuels.

The number of acres burned totaled about 515,000 in New Mexico and roughly 137,000 in Arizona, according the SWCC's website on July 25. This compares to the average of roughly 400,000 acres for the Southwest region. Most of the tally resulted from grasslands, with some exceptions that included the Oak Creek area near Sedona, Arizona, and several fires in the Gila National Forest in New Mexico.

In many years, the monsoon can actually herald an increase in the number of wildfires in the first week or two of its arrival. The number of fire-causing lightning strikes usually rises well before monsoonal rains and general humidity levels dampen the branches and vegetation known as "fuels" to firefighters.

Usually, rain falls spottily around the Southwest from the storms carried in with the wind shift that defines the monsoon. This year, though, weak upper-level winds allowed clouds to linger across the region for days on end. Maxwell compared the resulting thunderclouds to "bumper cars" jostling each other into releasing their moisture across much of New Mexico and Arizona.

Ranching and Agriculture

The monsoon also ushers in summer grasses, which can make or break southwestern ranchers struggling to eke out a living in harsh desert lands.

July 4 and subsequent storms have already greened up some parts of the Southwest. Grasses had reached about

continued on page 4

Monsoon, continued

four inches high on a part of Dennis Moroney's ranch, the CrossU Cattle Company, in southeastern Arizona just north of Bisbee, he reported by telephone in mid-July.

When asked if he had time to talk about the monsoon, he responded, "There's nothing more important in the whole wide world. When the monsoons begin to bring moisture, it's fabulous."

Moroney said he was still waiting for "the big Chubasco" to signal the start of the monsoon on most of his ranch. But he and many of his neighbors were excited about the early monsoon start.

An earlier climate forecast issued by the National Oceanic and Atmospheric Administration's Climate Prediction Center had him and some of his neighbors anticipating the relief of summer rains, he said. Given the lack of prediction for below-average summer rainfall, Moroney arranged to graze his cattle on some pastures near his ranch.

The ongoing drought had shriveled up most of his range, and he had been hauling gasoline out to the field every day to fuel the water pumps filling the otherwise-empty stock tanks.

"If we had had an outlook for a poor prospect for a monsoon, we probably would have started liquidating cows," he noted.

While ranchers depend on rainfall for their livelihoods, many commercial farmers in the Southwest irrigate their crops with groundwater. However, monsoon rains remain important to farmers who depend on natural rainfall, such as many Navajo, Hopi, and Tohono O'odham farmers on tribal lands.

Even some of the southwestern farmers with access to irrigation depend on reservoirs, such as New Mexico's Elephant Butte, which benefits from the monsoon.

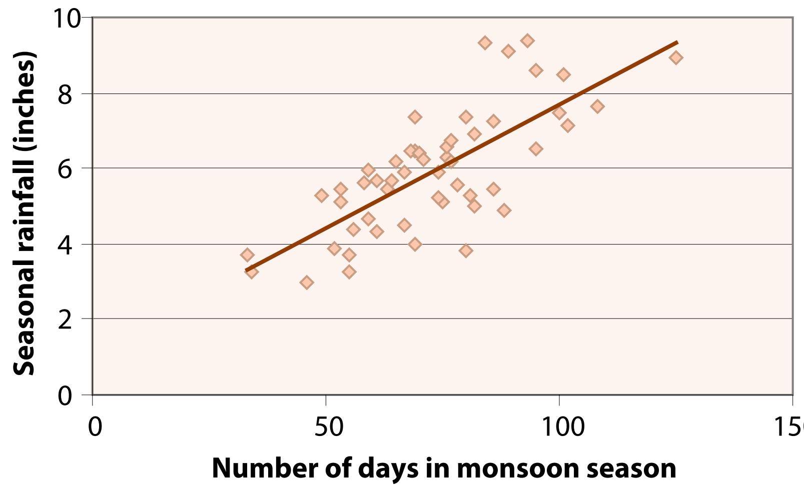


Figure 2. The number of days during the Southwest's monsoon season largely influences seasonal rainfall tallies. Each point represents a season between 1949 and 2001. Data from Andrew Ellis.

Water reservoirs

The monsoon brings rains that can help reverse the downward draw from reservoirs. Although, high summertime evaporation rates make the influence of the monsoon on water supplies smaller than one might expect. About one-third to nearly two-thirds of annual rainfall in many southwestern towns comes during the summer monsoon season.

Given those tallies, one might expect reservoirs to reach their highest points following summer rainfall events. Instead, monsoon storms do relatively little to balance out summertime withdrawals by farmers irrigating crops, people watering lawns and gardens, and hydroelectric dams powering air-conditioners.

Data provided by Tom Pagano, water supply forecaster at the National Water and Climate Center in Oregon, showed Arizona and New Mexico reservoirs typically receive slightly less than their average monthly inflow during July and August.

A few notable exceptions—gauges that usually register 30 percent or more of their annual flow during July and August—feed into a small reservoirs in New Mexico, the Little Colorado in Arizona, near Woodruff, Arizona, and the San Pedro near Charleston, Arizona.

The Charleston records indicated that at least this stretch of the protected San Pedro River typically receives about half of its annual inflow during July and August. This presumably reflects the stronger influence of the monsoon across the border, as the San Pedro flows north from its headwaters in Cananea, Mexico.

Additionally, unlike those along the Mogollon Rim and the Sangre de Cristo Mountains, the San Pedro lacks the pulse of winter and spring streamflow that comes from melting snow. But the river represents an important rest stop for hundreds of species of migratory birds flying both north and south, who thus depend in large part on monsoon rains for their sanctuary.

This year, the Gila River gauge at Clifton on the border of Arizona and New Mexico registered a dramatic response to the monsoon, Pagano said. After the river flow bottomed out at about 25 cubic feet per second (cfs) on July 6, it peaked at about 5,000 cfs for a few days following the rush of monsoonal rains.

"It was a huge flash of runoff. But it's unsustainable," he added, noting the rivers levels had plummeted again.

continued on page 5

Monsoon, continued

All of that drama added only a couple of inches to the San Carlos Reservoir downstream, which powers Coolidge Dam in Arizona. Also, the Elephant Butte Reservoir on the Rio Grande in New Mexico gained only nine inches from the July storms after having dropped about 37 feet since March.

These flashy summer rains also bring floods, however, which can damage property and even cause deaths. Water in normally dry riverbeds can rise quickly, taking people by surprise (see the September 2002 *Southwest Climate Outlook*). Lightning, too, can be dangerous for those caught unawares.

Health concerns

Monsoon rains and the grass growth that follows help keep down dust particles, which otherwise pollute the air and potentially transport the spores that cause valley fever, as research by Andrew Comrie, a climatology professor and dean at The University of Arizona, and his colleagues has shown.

The monsoon brings standing water that spawns mosquitoes, which can lead to the spread of West Nile disease and perhaps the eventual appearance of dengue.

So far, Arizona has only documented cases of dengue in people returning from travels to the tropics. But the warm, humid conditions marking the monsoon create conditions suitable for the arrival of dengue, a viral disease that potentially lasts for weeks and involves serious headaches and joint pain.

"All we need is one sick traveler to come back in an area at a time when we have active *Aedes aegypti* mosquitoes," said said Craig Levy, program manager for the Arizona Department of Health Services' vector-borne disease program.

The *Culex* mosquitoes that are behind the spread of West Nile virus, which has similar symptoms as dengue, have already killed 20 people and caused serious illness in more than 500 residents since it first appeared in the state in 2003. The department registered 113 cases in 2005, mostly during monsoon season, and 391 cases in 2004. The first sign of West Nile virus this year turned up in mosquito samples collected in Arizona's La Paz County on June 27, just as the monsoon was about to become official in Tucson.

"When the monsoon kicks in, you'll see those increasing as well," Levy said of the *Culex* mosquitoes. "Flowing water is not going to breed mosquitoes. But when that water settles in and stops flowing, then you've got pockets of water that might allow breeding."

The monsoon influences disease rates and dust pollution, river flow and lake levels. It generally dictates when the southwestern wildfire season ends, whether farmers outside of the irrigation belt will celebrate summer crops, and if on-the-edge ranchers will decide to hang in for another year.

Given the monsoon's impact on life in the Southwest, it's no surprise the rains are the subject of songs, celebrations, and millions of conversations.

Melanie Lenart is a postdoctoral research associate with the Climate Assessment for the Southwest (CLIMAS). The SWCO feature article archive can be accessed at the following link: http://www.ispe.arizona.edu/climas/forecasts/swarticles.html

Figuring out monsoon season

BY BEN CRAWFORD

102.4 degrees Fahrenheit (F): Average Tucson, Arizona daily high temperature for June 2006, **2.2** degrees F above normal. **91.3** degrees F: Average Albuquerque, New Mexico daily high temperature for June 2006, **1.1** degrees F above normal. **88.4** degrees F: Average Tucson June temperature, **4.3** degrees F above average and the **3RD** warmest on record. **78.1** degrees F: Average Albuquerque June temperature, **3.3** degrees F above normal. **74.3** degrees F: Average Tucson daily low temperature for June 2006, **6.3** degrees F above normal and the warmest on record. **65.0** degrees F: Average Albuquerque daily low temperature for June 2006, **5.6** degrees F above normal. **55** degrees F: Monsoon dewpoint temperature threshold for Phoenix, Arizona. **54** degrees F: Monsoon dewpoint temperature threshold for Tucson. **28TH** of June: official start date of the 2006 monsoon season in Tucson, the first June start since 2000. **26**: Number of June days with highs over **100** degrees F in Tucson. **3RD** of July: Average start of monsoon season in Tucson. **7TH** of July: Average start of monsoon season in Phoenix. **5.9** inches: Average July–September rainfall in Tucson. **2.8** inches: Average July–September rainfall in Phoenix. **3.8** inches: Average July–September rainfall in Albuquerque.

Temperature (through 7/19/06)

Source: High Plains Regional Climate Center

Since the water year began October 1, 2005, temperatures in the Southwest have generally been 0–4 degrees Fahrenheit (F) above average (Figure 1b). Average temperatures range from the mid 70s in southwestern Arizona to the 30s in the higher elevations of northern New Mexico and Arizona (Figure 1a). Since June 20, temperatures in the region have been 2–6 degrees F above normal throughout most of Arizona and 0–2 degrees F above normal in most of New Mexico (Figure 1c). According to the National Weather Service, June 2006 was the third warmest on record in Tucson with an average temperature of 88.4 degrees F, 4.3 degrees F above average. The average daily minimum temperature in Tucson was 74.3 degrees F, 6.3 degrees F above average and the warmest on record. Tucson also experienced 26 days in June with daily highs greater than 100 degrees F, eight days above average. In Albuquerque, the average daily June temperature was 78.1 degrees F, 3.3 degrees F above normal, while the minimum average temperature of 65.0 degrees F was 5.6 degrees F above normal. Strong trends in increasing minimum temperatures have been observed across the Southwest over the past 10 years. These trends are likely associated with interactions between local land use changes (e.g. urban heat islands) and global scale trends in increasing temperatures.

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

Figure 1a. Water year '05–'06 (through July 19, 2006) average temperature.

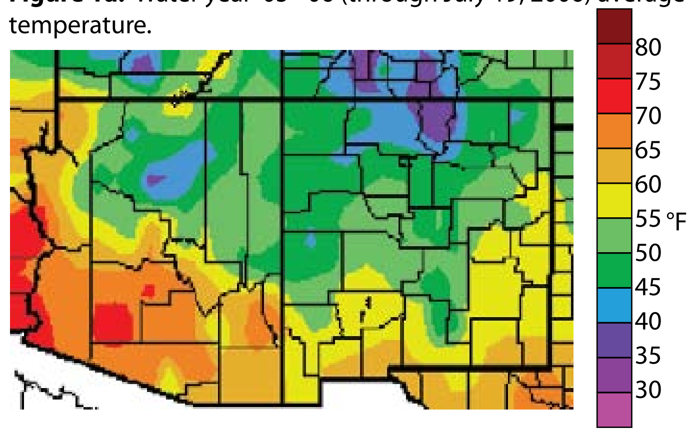


Figure 1b. Water year '05–'06 (through July 19, 2006) departure from average temperature.

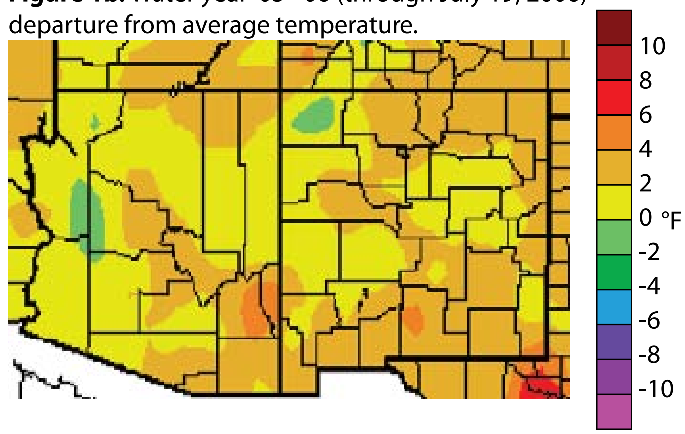


Figure 1c. Previous 30 days (June 20–July 19, 2006) departure from average temperature (interpolated).

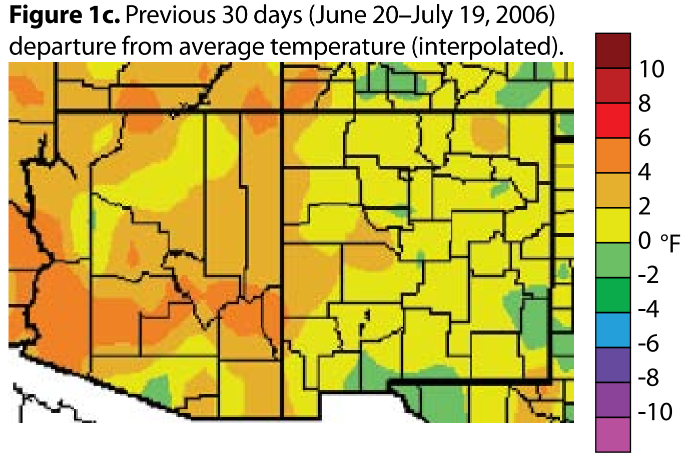
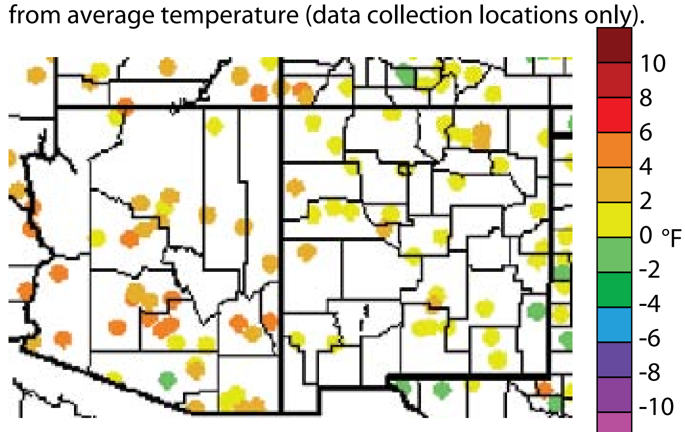


Figure 1d. Previous 30 days (June 20–July 19, 2006) departure from average temperature (data collection locations only).



Precipitation (through 7/19/06)

Source: High Plains Regional Climate Center

Despite the start of monsoon season in late June, precipitation in the Southwest remains far below average since the beginning of the water year on October 1, 2005 (Figure 2a). Areas with the greatest precipitation deficits (5–25 percent of average) are located in Arizona's Navajo and western Maricopa counties. Since June 20, precipitation has been above average for large portions of the Southwest due to an early onset of the monsoon (Figure 2c). Although this has brought much needed precipitation to the region, this has not alleviated long-term, multi-year precipitation deficits and drought conditions. Precipitation has also been spatially variable (Figure 2c) with areas in northern and southwestern Arizona receiving greater than 300 percent of average, while other areas in central Arizona have received less than 5 percent of average. June, July, and August are important in terms of contributions to yearly precipitation totals in the Southwest. Tucson receives approximately 51 percent of its annual precipitation during these months and Albuquerque receives approximately 44 percent.

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

Figure 2a. Water year '05–'06 through July 19, 2006 percent of average precipitation (interpolated).

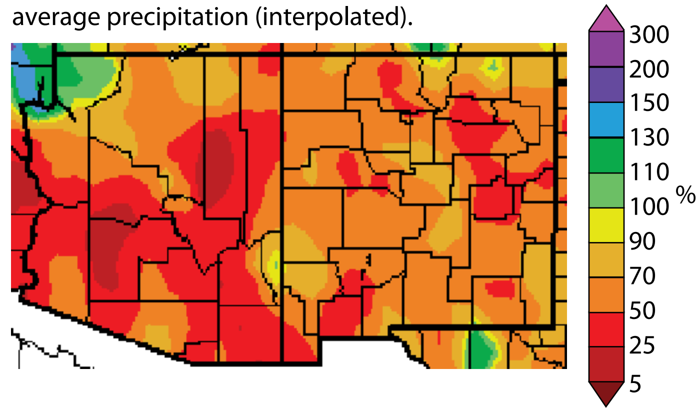


Figure 2b. Water year '05–'06 through July 19, 2006 percent of average precipitation (data collection locations only).

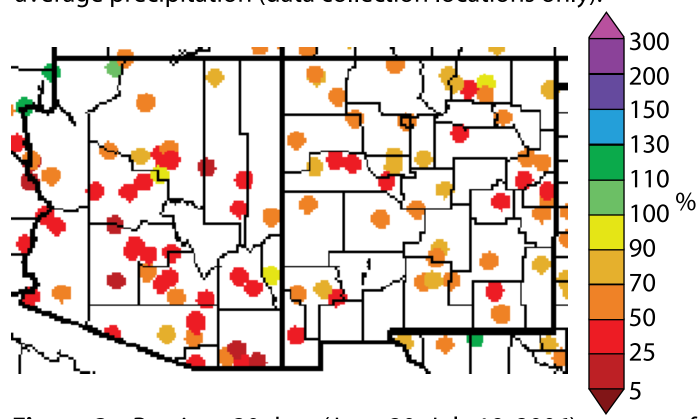


Figure 2c. Previous 30 days (June 20–July 19, 2006) percent of average precipitation (interpolated).

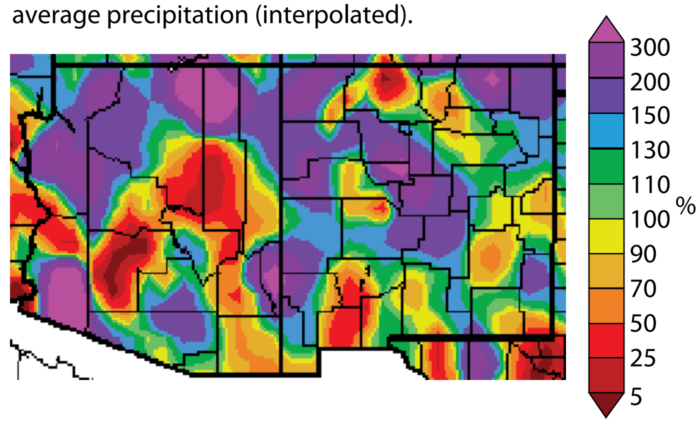
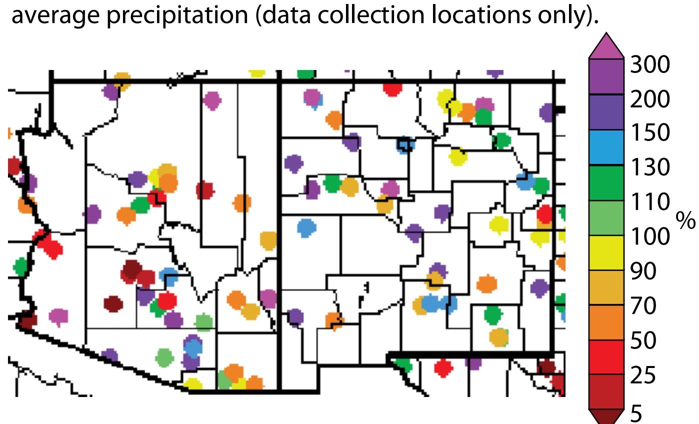


Figure 2d. Previous 30 days (June 20–July 19, 2006) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(released 7/20/06)

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

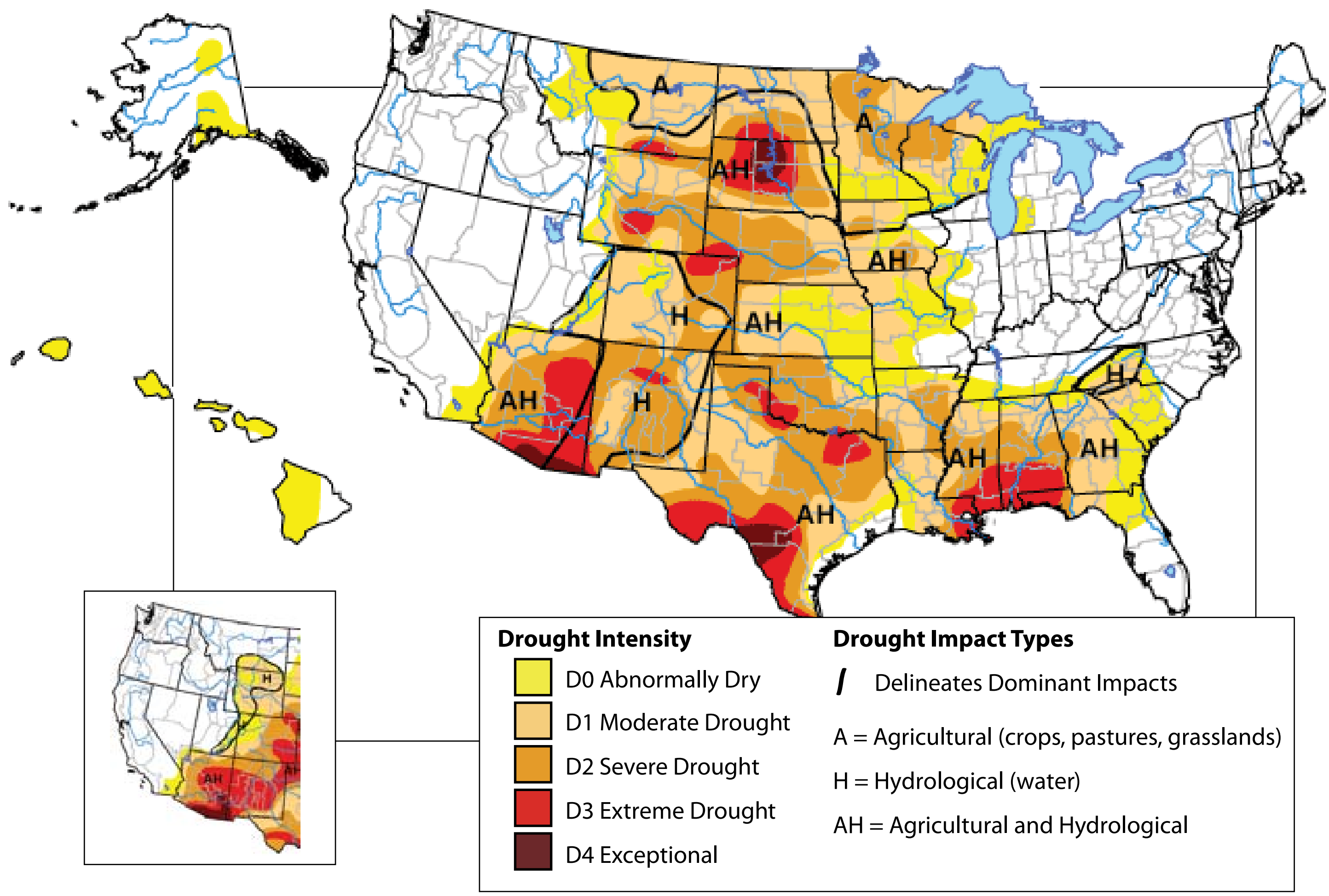
The U.S. Drought Monitor shows some improvements to drought conditions in the Southwest. Much of the improvements are due to short-term relief from summer thunderstorms. It should be noted that although conditions have improved in some areas due to the recent precipitation, this is not enough to overcome the effects of long-term, multiyear drought conditions. In Arizona, the eastern portion of the U.S.-Mexico border region is classified as being in Exceptional drought and much of eastern and southern Arizona are categorized as Extreme. The majority of New Mexico is classified as Severe, though portions of eastern and western New Mexico are classified as Moderate. Elsewhere, most of the South, Great Plains, Rocky Mountains, and upper Midwest are experiencing some level of drought. As a result of somewhat improved conditions, fire restrictions have been lifted for many national forests in the Southwest, including the Tonto, Prescott, Santa Fe, Lincoln, Gila, and Cibola. Additionally in Arizona, Bureau of Land Management field offices in Safford have lifted fire restrictions.

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 authors of this monitor are Richard Heim and Liz Love-Brotak, NOAA/NESDIS/NCDC.

Figure 3. Drought Monitor released July 20, 2006 (full size) and June 15, 2006 (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

(through 6/30/06)

Source: Arizona Department of Water Resources

Short-term drought conditions have changed only slightly in Arizona since last month, with most of the state remaining in severe drought status (Figure 4a). In the San Pedro watershed conditions deteriorated from moderate to severe.

Extreme drought still exists in the Agua Fria River watershed in central Arizona, and across parts of southern Arizona. Since the start of the water year on October 1, 2005, precipitation has been much below average over virtually the entire state (see Figure 2a–b). The long-term drought situation deteriorated from severe to extreme in the Willcox Playa basin, but is otherwise unchanged since last month, ranging from abnormally dry to extreme over most of the state (Figure 4b). Like last month, virtually all of the state is in some level of drought or abnormal dryness, except for some areas in the southwestern parts of the state in Yuma and La Paz Counties near the Colorado River. Abnormally-dry conditions exist in parts of the western half of the state. Most of the eastern half of the state is in severe long-term drought status. The Santa Cruz watershed in southern Arizona remains in extreme drought, while the Verde River basin in central Arizona is in moderate status.

Figure 4a. Arizona short term drought status for June 2006.

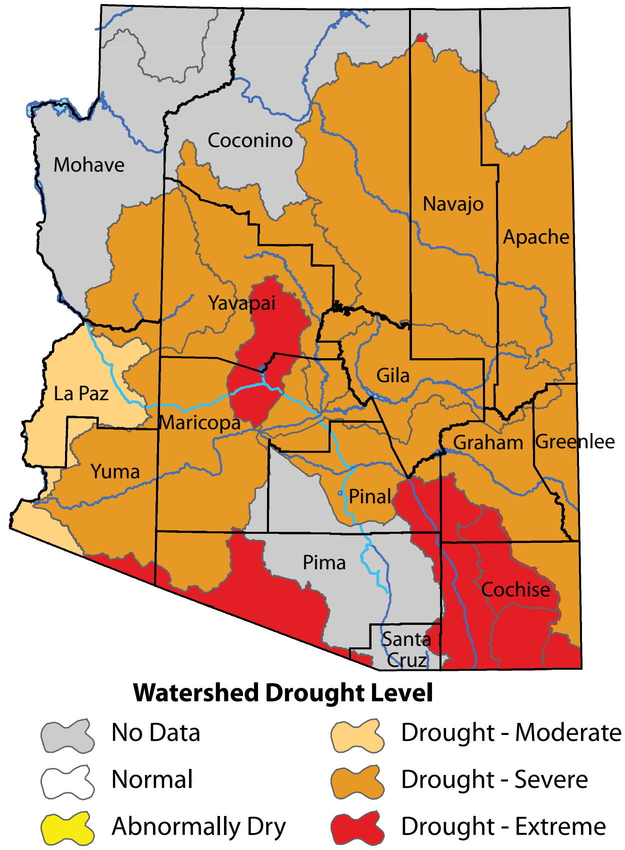
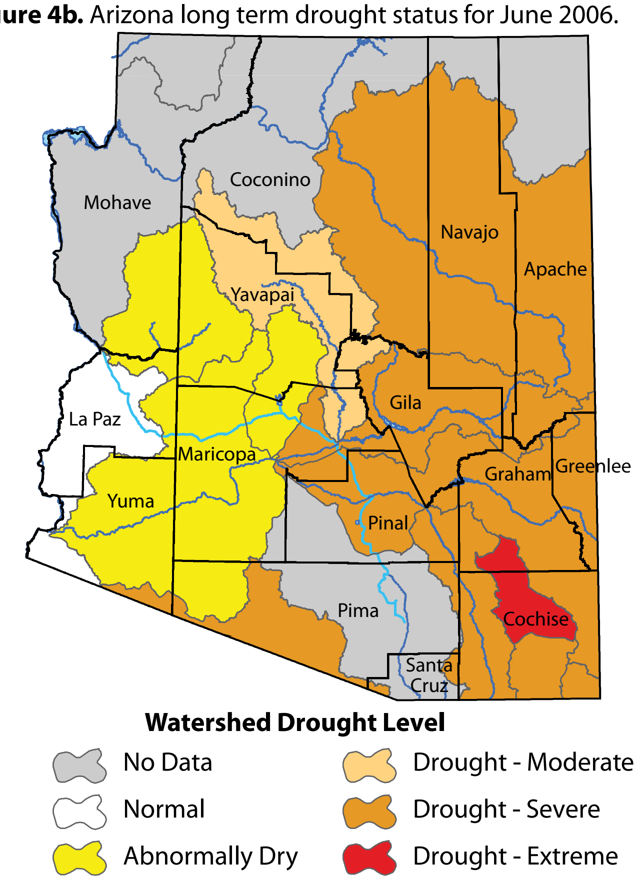


Figure 4b. Arizona long term drought status for June 2006.



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/Content/Hot_Topics/Agency-Wide/Drought_Planning/

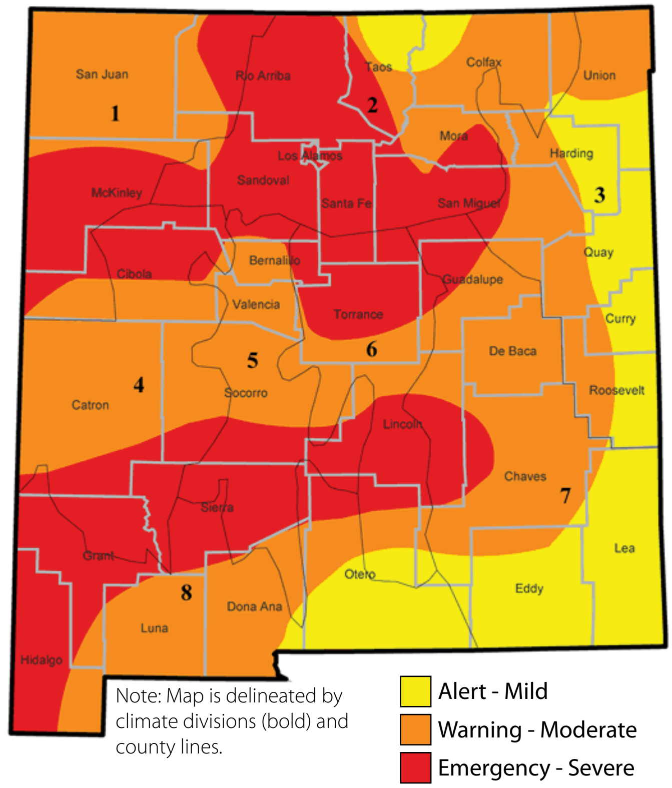
New Mexico Drought Status
(through 06/30/06)

Source: New Mexico Natural Resources Conservation Service

Some level of drought exists for the entire state of New Mexico, according to the New Mexico State Drought Monitoring Committee (Figure 5). Eastern and southeastern New Mexico is in mild drought status, while two bands, stretching from the southwestern border with Arizona through Lincoln County and from the northwestern border with Arizona to San Miguel County, are classified as severe. The remainder of the state is in moderate drought. This map reflects short-term drought status based on meteorological conditions.

Although monsoon precipitation arrived early in the western half of the state, it has not made up for precipitation deficits accumulated since 2000, according to the National Weather Service. Precipitation received from monsoon season storms has also been spatially variable. For the month of June, central New Mexico received above-normal precipitation amounts while the northwest quarter of the state received amounts well below average. Since the water year began on October 1, 2005, the state-wide average precipitation is 55 percent of normal, with the Central Valleys (climate division 5) receiving 45 percent of normal and the Central Highlands (climate division 6) receiving 66 percent of normal.

Figure 5. Short-term drought map based on meteorological conditions as of July 19, 2006.



Notes:

The New Mexico drought status maps are produced monthly by the New Mexico State Drought Monitoring Committee. 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 5 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).

On the Web:

For the most current New Mexico drought status map, visit:
http://www.srh.noaa.gov/abq/feature/droughtinfo.htm

Arizona Reservoir Levels

(through 6/30/06)

Source: National Water and Climate Center

Five of the eight reservoirs in Arizona are reporting at less than 60 percent of capacity (Figure 6). According to the U.S. Bureau of Reclamation, Upper Colorado Region, runoff into Lake Powell from the Upper Colorado River will be below average this year. Snowpack in the upper basin in April and May was only about 65 and 35 percent of average, respectively. Warm and dry conditions in the spring combined to cause the snowmelt runoff to occur earlier than usual. Since the water year began on October 1, 2005, inflow to Lake Powell has been about 89 percent of average. The April through July forecast is for only 74 percent of average. The Upper Colorado River experienced five consecutive years of extreme drought in water years 2000 through 2004, when inflow to Lake Powell was only about 50 percent of average. The drought eased somewhat in 2005 with inflow at 105 percent of average, but inflow will almost certainly be below average again in water year 2006. The drought on the Colorado River may not be over. Analysis of historical climate data across the Colorado River basin shows that it is common to have one or two above-average years during sustained multi-year droughts.

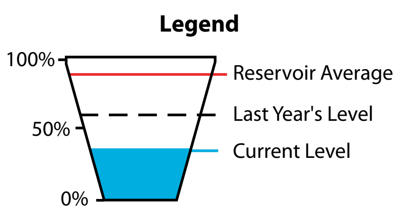
Notes:

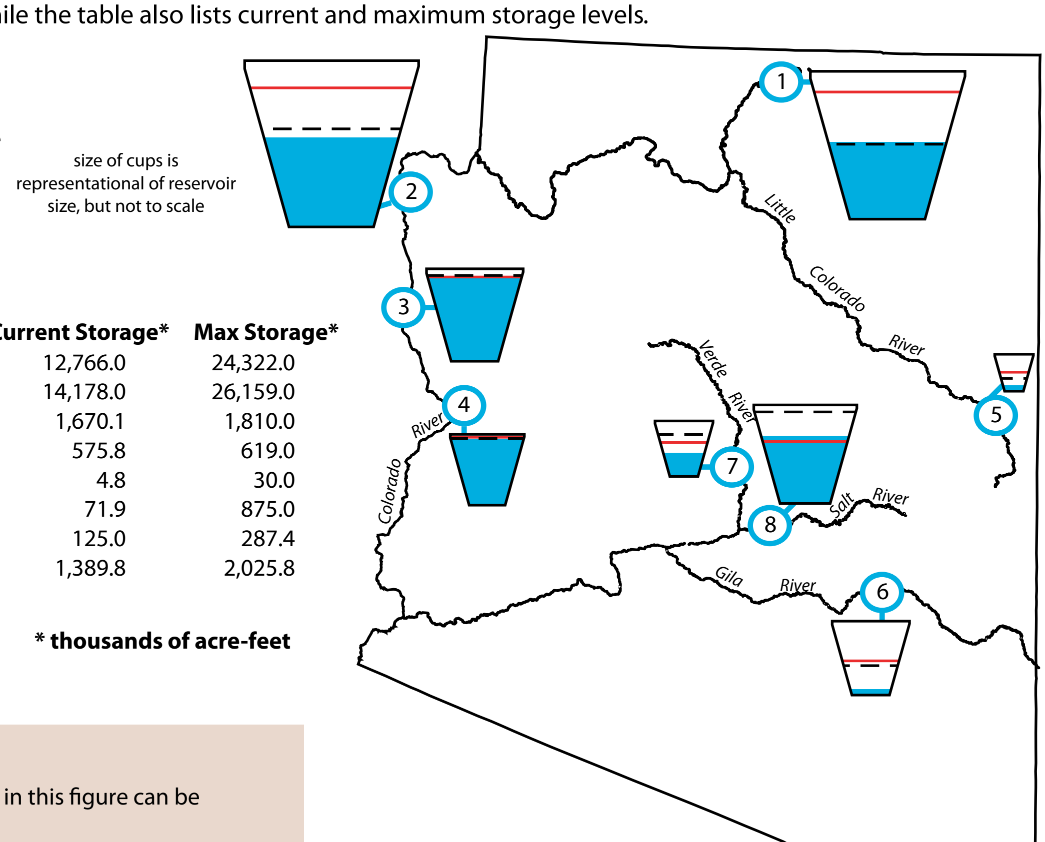
The map gives a representation of current storage levels for reservoirs in Arizona. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total 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 (tom.pagano@por.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 6. Arizona reservoir levels for June 2006 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. Lake Powell	52%	12,766.0	24,322.0
2. Lake Mead	54%	14,178.0	26,159.0
3. Lake Mohave	92%	1,670.1	1,810.0
4. Lake Havasu	93%	575.8	619.0
5. Lyman Reservoir	16%	4.8	30.0
6. San Carlos	8%	71.9	875.0
7. Verde River System	43%	125.0	287.4
8. Salt River System	69%	1,389.8	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 6/30/06)

Source: National Water and Climate Center

Total in-state storage in New Mexico reservoirs is down by 11 percent from last month (Figure 7). Virtually all reservoirs recorded a drop in levels, most notably on the Rio Grande where El Vado and Elephant Butte Reservoirs declined by 35 percent and 28 percent, respectively. On the Pecos River, Brantley Reservoir had a storage gain of 73 percent, while in northern New Mexico, Heron Reservoir showed a gain of 3 percent. These statistics reflect changes relative to previous reservoir levels, not total reservoir capacity.

On June 27, the Bureau of Reclamation increased release from Navajo Reservoir on the San Juan River in northwest New Mexico by 250 cubic feet per second (cfs) to 750 cfs. Current runoff in the Upper San Juan River Basin to the reservoir is 45 percent of normal, mostly due to extremely low snowpack from the previous winter. Precipitation for the month of June in the basin was recorded at 75 percent of average and inflow to Navajo Reservoir was 21 percent of average, or 54,000 acre-feet.

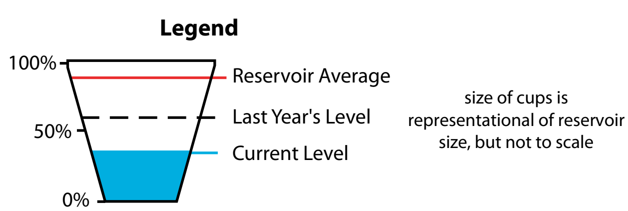
Notes:

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.

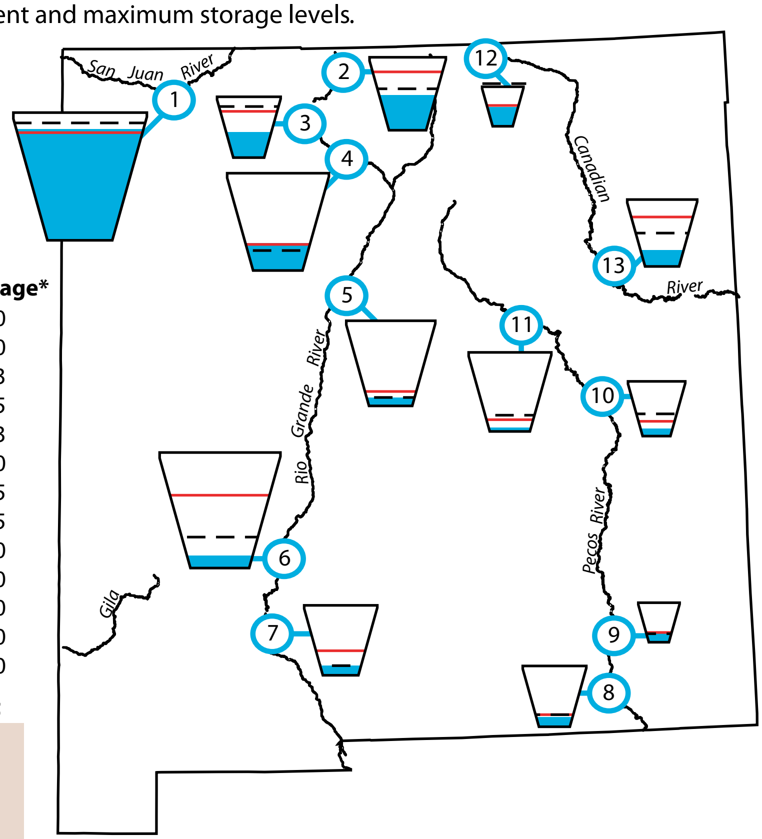
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tom.pagano@por.usda.gov; 503-414-3010)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

Figure 7. New Mexico reservoir levels for June 2006 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	87%	1,467.3	1,696.0
2. Heron	48%	191.0	400.0
3. El Vado	42%	77.6	186.3
4. Abiquiu	28%	153.1	554.5
5. Cochiti	10%	48.6	502.3
6. Elephant Butte	11%	220.6	2,065.0
7. Caballo	14%	47.7	331.5
8. Brantley	16%	23.3	147.5
9. Lake Avalon	22%	1.3	6.0
10. Sumner	14%	14.7	102.0
11. Santa Rosa	5%	23.5	447.0
12. Costilla	49%	7.9	16.0
13. Conchas	25%	63.4	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 7/19/06)

Source: Southwest Coordination Center

As of July 11, there have been 4,086 fires in Arizona and New Mexico, burning 660,058 total acres (Figure 8a). Approximately equal numbers of fires have been started by humans and by lightning, although fires started by human have burned nearly 100,000 more acres. According to the National Interagency Fire Center, the largest fire in Arizona to date has been the lightning caused Warm Fire, started June 8 and contained July 4, which burned 58,630 acres in northern Arizona. In New Mexico, the largest fire of 2006 so far has been the McDonald Fire, burning 92,390 acres from March 12 to March 14 in eastern New Mexico. Current large fires in the region include the Cibola Fire in southwestern Arizona and the West Fire in New Mexico (Figure 8b–8c).

Since summer thunderstorms have arrived in the Southwest, the proportion of lightning caused fires has increased, but overall fire risk has decreased due to greater precipitation and humidity. As a result, many areas in the Southwest have lifted fire restrictions including the Tonto, Prescott, Santa Fe, Lincoln, Gila, and Cibola National Forests.

Figure 8a. Year-to-date fire information for Arizona and New Mexico as of July 11, 2006.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	1,194	28,552	675	37,124	1,869	65,676
NM	860	350,876	1,357	243,506	2,217	594,382
Total	2,054	379,428	2,032	280,630	4,086	660,058

Figure 8b. Arizona large fire incidents as of July 18, 2006.

Figure 8c. New Mexico large fire incidents as of July 18, 2006.

Notes:
The fires discussed here have been reported by federal, state, or tribal agencies during 2006. 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. Figures 7b and 7c indicate the approximate locations of past and present "large" wildland fires and prescribed burns in Arizona and in New Mexico. A "large" fire is defined as a blaze covering 100 acres or more in timber or 300 acres or more in grass or brush. 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/situation/swa_fire.htm

Monsoon Summary
(through 7/18/06)

Source: Western Regional Climate Center

The monsoon season arrived early in 2006, reaching dewpoint temperature criteria on June 28 in Tucson. The average monsoon start is July 3 in Tucson and July 7 in Phoenix. Albuquerque does not have any dewpoint temperature criteria for the start of monsoon season. Since July 1, precipitation in the Southwest has been variable with amounts ranging from less than 0.10 inches in southwestern and central Arizona to over 6 inches in northeastern New Mexico (Figure 9a). Areas in central and western New Mexico and central and northern Arizona have received above-average precipitation (Figure 9b–c), though the monsoon appears to have, so far, missed drought-stricken areas in Arizona's Maricopa and Navajo counties and Chaves, Eddy, and Rio Arriba Counties in New Mexico. It should be noted that although monsoon precipitation will bring short-term drought relief, much more is needed to overcome the long-term, multi-year precipitation deficits facing much of the Southwest.

The early monsoon rains and increased humidity have also put a damper on the fire season with many national forests and Bureau of Land Management offices lifting fire restrictions. Along with the much needed precipitation, the monsoon has blown in a number of pelicans from the Gulf of California to southern Arizona. Agencies such as the Tucson Wildlife Center, Arizona Department of Game and Fish, and the Arizona-Sonora Desert Museum rehabilitate the pelicans before sending them to Sea World in San Diego to be released.

Figure 9a. Total precipitation in inches July 1–July 18, 2006.

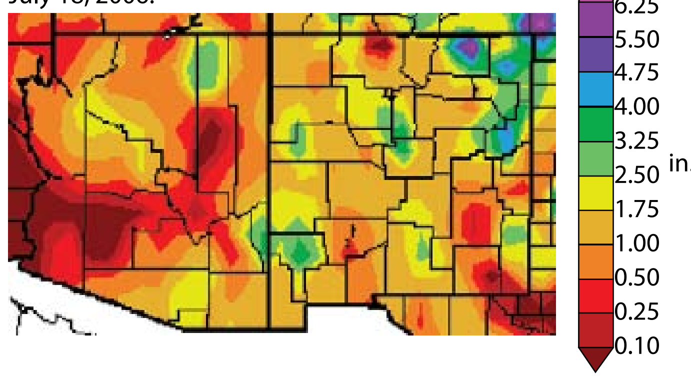


Figure 9b. Departure from average precipitation in inches July 1–July 18, 2006.

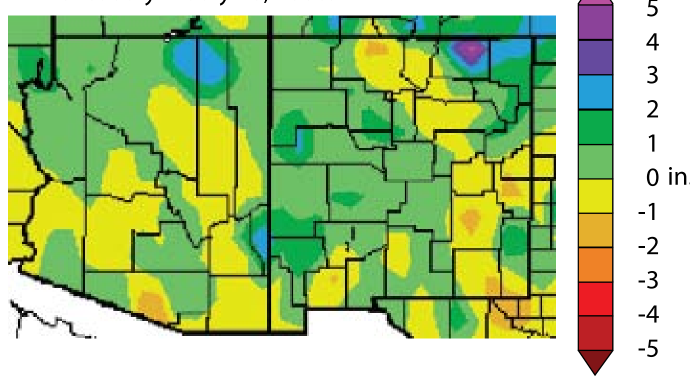
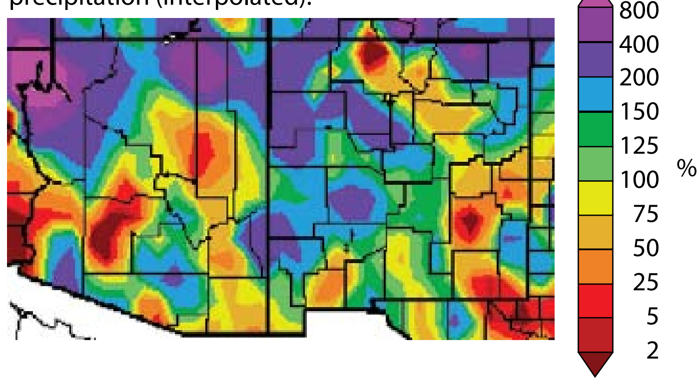


Figure 9c. July 1–July 18, 2006 percent of average precipitation (interpolated).



Notes:

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. Departure from average precipitation is calculated by subtracting the average from the current precipitation.

The continuous color maps (Figures 9a–c) 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 data used to create these maps is provisional and have not yet been subjected to rigorous quality control.

On the Web:

These data are obtained from the Western Regional Climate Center: http://www.wrcc.dri.edu

Temperature Outlook
(August 2006–January 2007)
Source: NOAA Climate Prediction Center (CPC)

The NOAA-Climate Prediction Center (CPC) forecasts increased chances for above-average temperatures in the Southwest through January 2007 (Figures 10a–10d). The greatest likelihood for warmer-than-average temperatures (greater than 60 percent) for August–October exists across northwestern Arizona, southern Nevada, eastern California, and southwestern Utah (Figure 10a). Throughout the rest of the forecast periods, the greatest probabilities for above-average temperatures in the United States (greater than 50 percent) exist in the Southwest. Higher temperatures through the remainder of 2006 have the potential to increase evaporation rates of precipitation from summer thunderstorms and worsen already existing drought conditions.

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 10a. Long-lead national temperature forecast for August–October 2006.

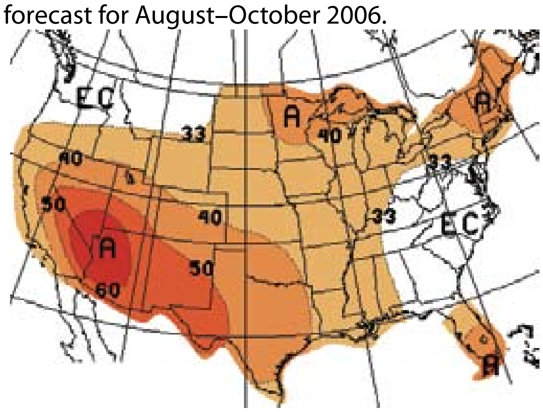


Figure 10b. Long-lead national temperature forecast for September–November 2006.

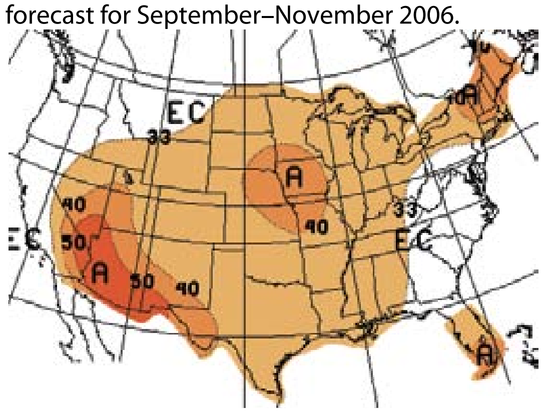


Figure 10c. Long-lead national temperature forecast for October–December 2006.

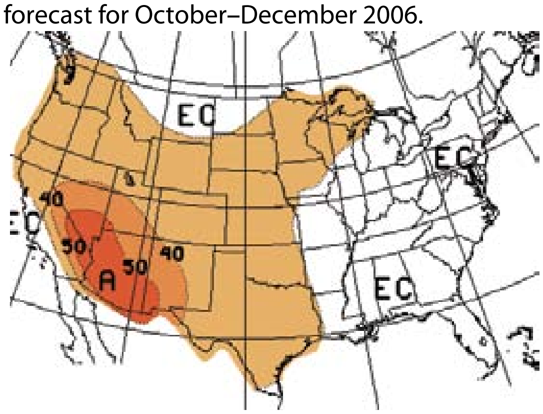
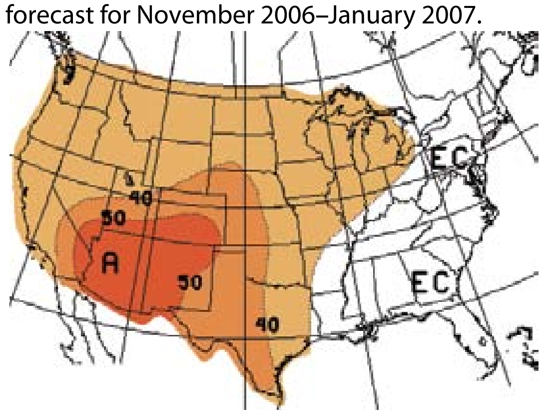


Figure 10d. Long-lead national temperature forecast for November 2006–January 2007.



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

(August 2006–January 2007)

Source: NOAA Climate Prediction Center (CPC)

NOAA-CPC is predicting equal chances of above-average, below-average, or average precipitation for the Southwest and much of the United States through January 2007 (Figure 11a–11d). Elsewhere, northern California, northern Nevada, and parts of the Midwest are forecast to have increased chances for below-average precipitation through October, while Florida and the southern Atlantic coast are anticipating above-average precipitation (Figure 11a). The Midwest is expected to have increased chances for drier conditions from September to December 2006 (Figure 11b–11c). Florida is forecast to have greater chances for wetter conditions through November, but drier weather is forecast for the south Atlantic states and northern Florida during late 2006 and early 2007 (Figure 11c–11d).

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 11a. Long-lead national precipitation forecast for JAugust–October 2006.

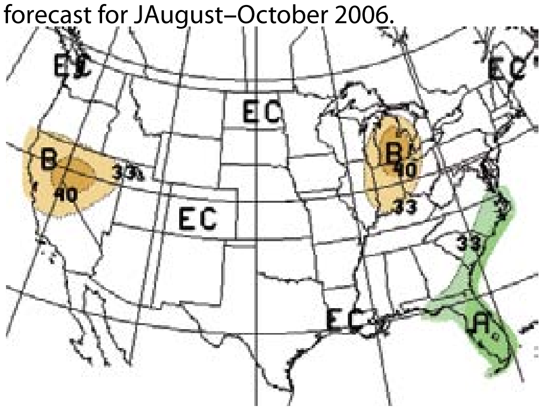


Figure 11b. Long-lead national precipitation forecast for September–November 2006.

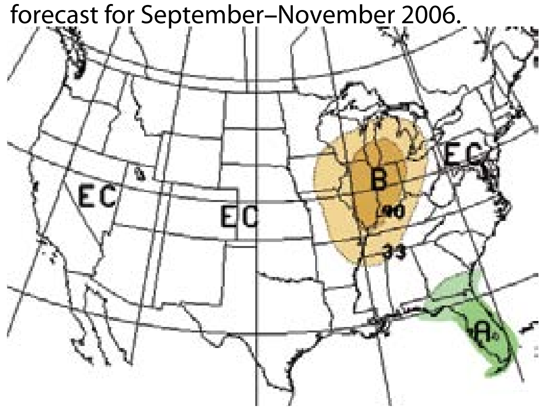


Figure 11c. Long-lead national precipitation forecast for October–December 2006.

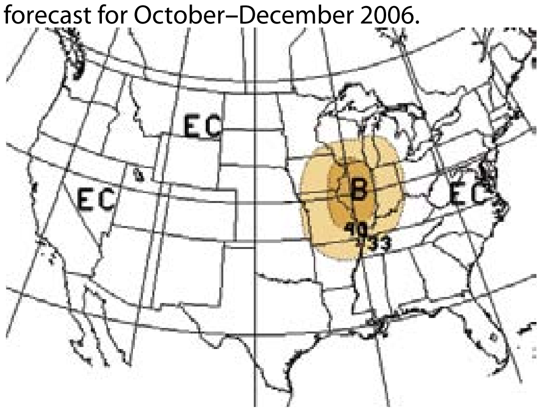
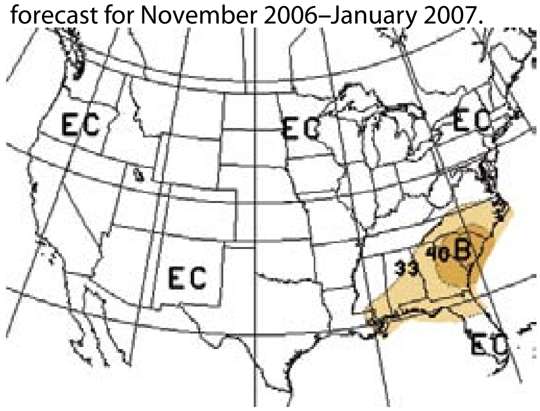


Figure 11d. Long-lead national precipitation forecast for November 2006–January 2007.



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 October 2006)

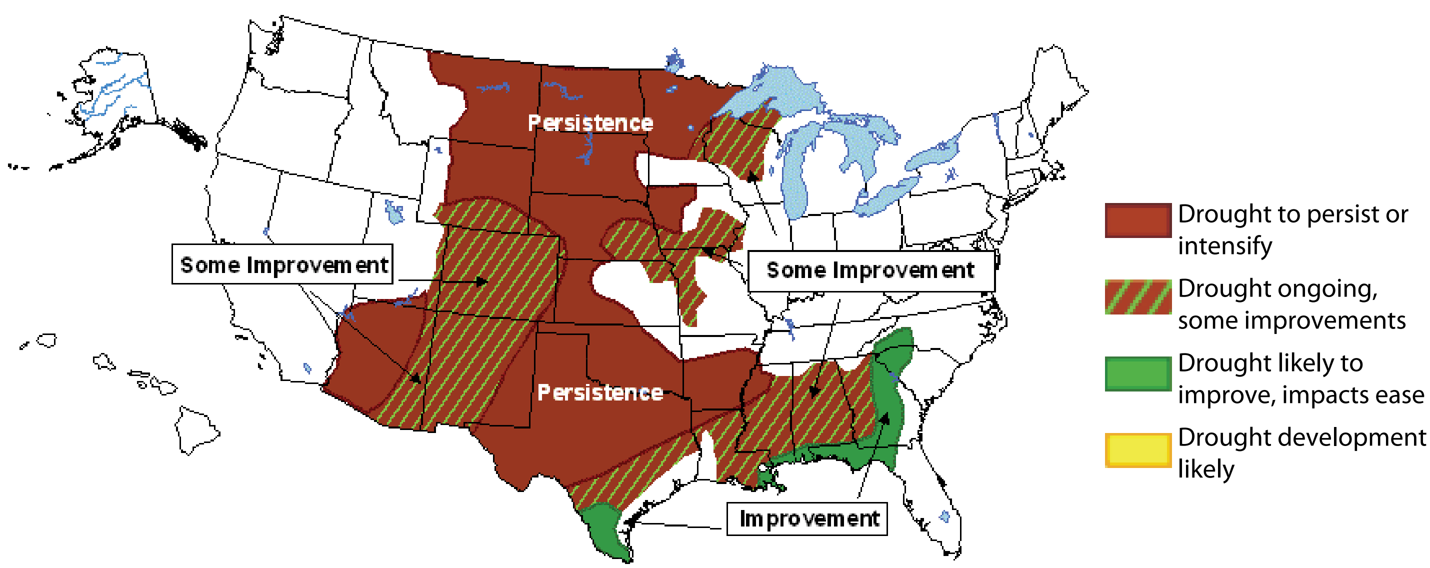
Source: NOAA Climate Prediction Center (CPC)

Drought conditions are expected to improve somewhat through most of New Mexico and eastern and southern Arizona, mainly due to summer thunderstorms (Figure 12). In other areas of the Southwest, drought conditions are forecast to persist or intensify. Although storms will bring much needed precipitation to many areas in the Southwest, drought relief will be limited due to the accumulated effects of long-term, multi-year precipitation deficits. Elsewhere, drought is expected to persist through much of Texas, the Great Plains, and Rocky Mountain states, though some areas in Colorado, Nebraska, Iowa, Kansas, Minnesota, Missouri, Wyoming, southern Texas, and Wisconsin could see improvement. Most of the areas in the South affected by drought are also expected to see improvement.

Notes:

The delineated areas in the Seasonal Drought Outlook (Figure 12) are defined subjectively and are based on expert assessment of numerous indicators, including outputs of short- and long-term forecasting models.

Figure 12. Seasonal drought outlook through October 2006 (release date July 20, 2006).



On the Web:

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

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

Since the start of the monsoon the fire danger has lessened considerably in the Southwest (Figure 13a). Fire potential indices have dropped to average throughout the region except for a narrow strip in far northern Arizona along the Utah border, where the fire potential remains above average. The recent influx of moisture has improved fuel moisture conditions for most of the region (Figure 13b). Higher relative humidity has caused lowering of the energy release component (ERC), a composite measure of fuel loading and fuel moisture, which serves as a useful indicator of the potential for large fires to develop and spread quickly. According to the Southwest Coordination Center, ERC values have now dropped to average levels at most reporting stations, except for some stations in northern and northeastern Arizona and far northwestern New Mexico. With the expectation of continued moisture inflow to the region, the outlook is for average fire danger for most of the Southwest through July. However, any areas that may experience a week or more of drying could see an increase in fire danger. The threat for both human and lightning ignitions will remain high during the period of summertime land use, but the potential for large fires is expected to be low.

Figure 13a. National wildland fire potential for fires greater than 100 acres (valid July 1–31, 2006).

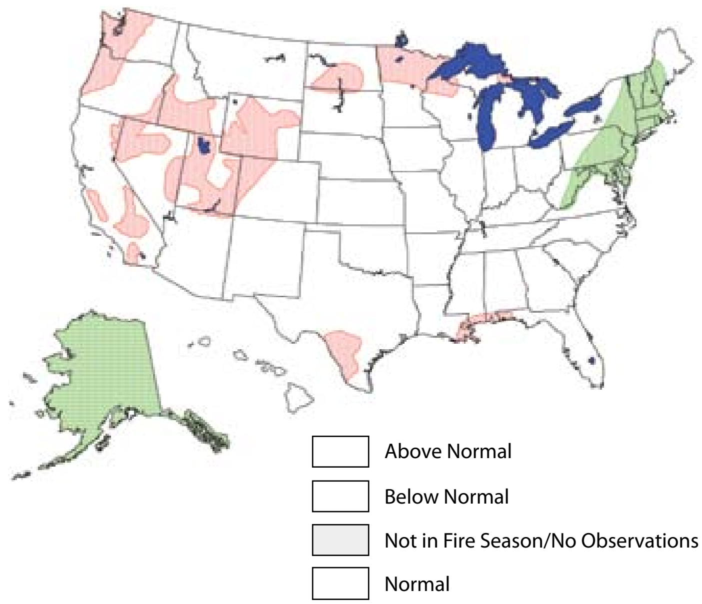


Figure 13b. Current fine fuel condition and live fuel moisture status in the Southwest.

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

Live Fuel Moisture	
	Percent of Average
Ponderosa Pine	106
Douglas Fir	111
Piñon	104
Juniper	79
Sagebrush	107
1000-hour dead fuel moisture	**9–18**
Average 1000-hour fuel moisture for this time of year	**8–18**

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces monthly wildland fire outlooks. The forecasts (Figure 13a) 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 13b 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://www.fs.fed.us/r3/fire/

El Niño Status and Forecast

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

Currently, neutral ENSO conditions exist in the tropical Pacific (Figure 14a) and, according to IRI and NOAA-CPC predictions, are forecast to persist through October 2006. During June, positive sea surface temperature (SST) anomalies in the tropical Pacific expanded eastward, and beginning in February 2006 upper ocean heat content has increased. Most statistical models predict slightly positive SST anomalies in the eastern tropical regions which are consistent with the heat buildup along the equator. These slightly positive anomalies indicate neutral or extremely weak El Niño conditions. The spread of forecasts (not shown) for periods beyond three months in the future indicate uncertainty in predictions for late 2006 and early 2007. Probabilistic models from IRI (Figure 14b) indicate that neutral conditions are most likely to persist through spring 2007 (greater than 60 percent chance), although likelihoods are above the historical average for El Niño conditions to develop (greater than 25 percent chance). Generally, winter El Niño conditions in the Southwest are associated with increased precipitation amounts.

Notes:

Figure 14a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through June 2006. 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 14b 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/

Figure 14a. The standardized values of the Southern Oscillation Index from January 1980–June 2006. 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).

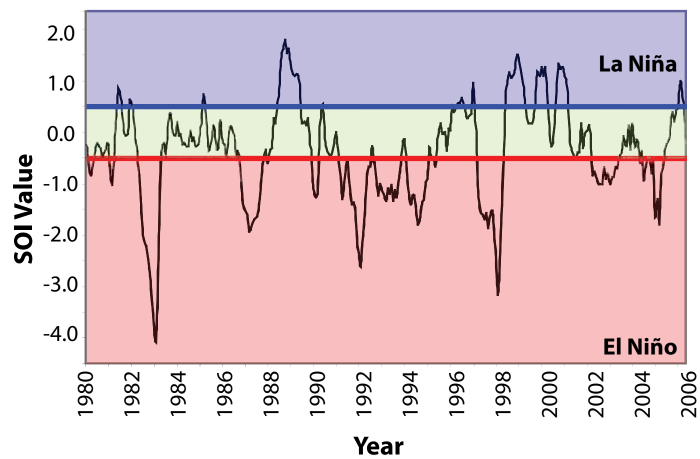
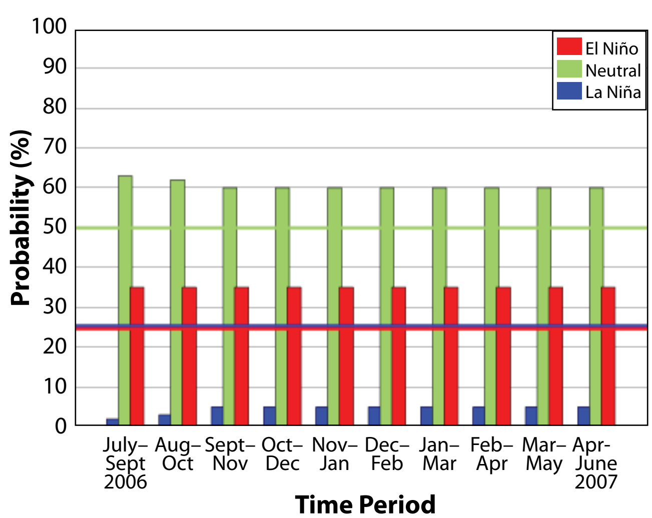


Figure 14b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released July 20, 2006). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Temperature Verification
(April–June 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range outlook for April–June 2006 from the NOAA-CPC predicted above-average temperatures across the southern tier of states from California to the southern Atlantic states. The areas of highest probability were over the Southwest, from southern Nevada across most of Arizona and New Mexico into central Texas (Figure 15a). In the north, cooler-than-average temperatures were forecast from Washington to northwestern Minnesota. Observed temperatures across most the country were 0–6 degrees Fahrenheit above average, with the warmest anomalies in the Southwest, where some areas were up to 10 degrees F above average (Figure 15b). Some areas in the Northeast were 0-2 degrees F below average. The outlook performed well in predicting the above-average temperatures across the southern tier of states, particularly in the Southwest, but poorly in predicting below-average temperatures in the north, where generally slightly warmer-than-average temperatures prevailed.

Figure 15a. Long-lead U.S. temperature forecast for April–June 2006 (issued March 2006).

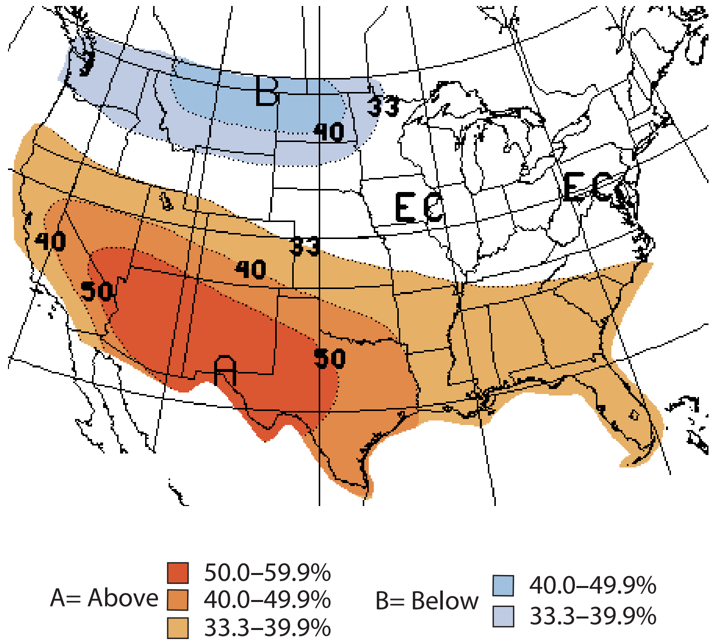
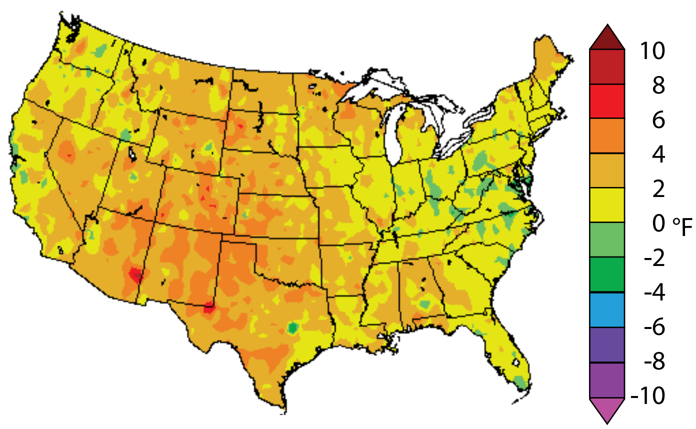


Figure 15b. Average temperature departure (in degrees F) for April–June 2006.



Notes:

Figure 15a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months April–June 2006. This forecast was made in March 2006.

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 15b shows the observed departure of temperature (degrees F) from the average for the April–June 2006 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

(April–June 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range outlook from the NOAA-CPC for April–June 2006 called for increased chances for below-average precipitation in the south-central part of the country, including Texas, Louisiana, and Oklahoma, and most of New Mexico, Colorado, Kansas, and Arkansas (Figure 16a). Below-average precipitation was also forecast along the southern part of the Atlantic Coast from southern Virginia to southern Mississippi, and including the entire Florida peninsula. The highest probabilities (greater than 40 percent) were over western Oklahoma and eastern North Carolina. An area of above-average precipitation was predicted, along the Canadian border from eastern Montana to Michigan. Observed precipitation during the period matched the forecast fairly well in the southern states, where below-average precipitation occurred almost everywhere, except for the eastern Carolinas, which experienced above-average precipitation (Figure 16b). Results were less successful in the North, where below-average precipitation prevailed from western Montana into Minnesota. Southern Minnesota and Michigan received above-average precipitation, as predicted.

Figure 16a. Long-lead U.S. precipitation forecast for April–June 2006 (issued March 2006).

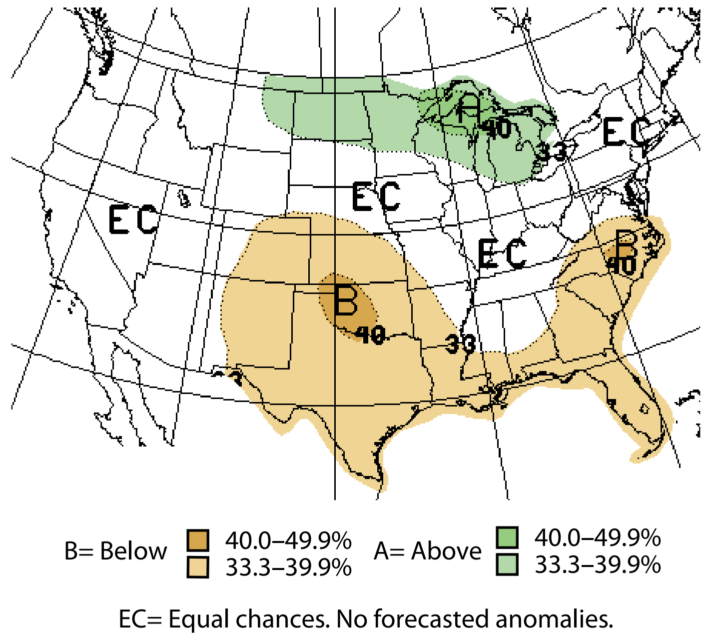
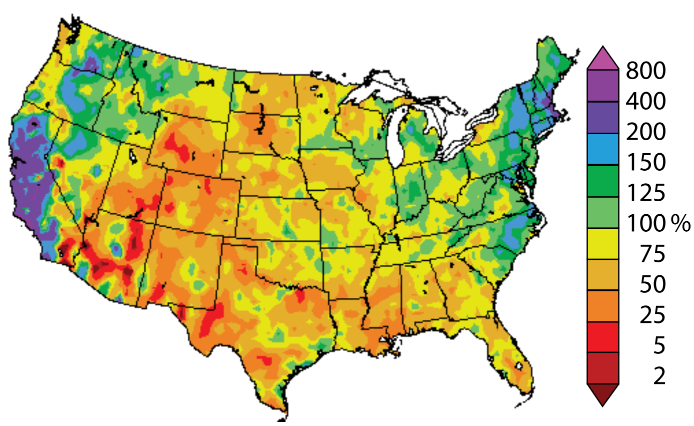


Figure 16b. Percent of average precipitation observed from April–June 2006.



Notes:

Figure 16a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months April–June 2006. This forecast was made in March 2006.

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 16b shows the observed percent of average precipitation for April–June 2006. 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.

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