Issued: August 23, 2006

Southwest Climate Outlook

THE UNIVERSITY OF ARIZONA.

Source: Steve Novy, UA Institute for the Study of Planet Earth

Photo Description: A roiling Rillito River reached record flow levels and spilled over its banks in some places in Tucson, Arizona, on July 31, 2006 after heavy rains filled normally dry washes and rivers. At one location, the Rillito was rushing at about 30,000 cubic feet per second, according to local news reports.

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...

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August Climate Summary

Drought – The monsoon rains have brought some drought relief to the Southwest, but the relief is likely to be temporary due to long-term moisture deficits.

- Drought conditions are expected to improve in the short-term in New Mexico and Arizona.
- Reservoirs in Arizona and New Mexico have declined since this time last year.

Fire Danger – Heavy rainfall and high humidities since the start of the monsoon season have reduced the fire danger considerably, virtually ending the active fire season.

Temperature – Since the start of the water year on October 1, 2005, temperatures over most of the Southwest have been above average.

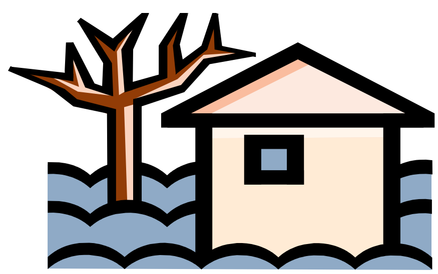
Precipitation – Since the start of the monsoon season precipitation has been above average across most of the Southwest. Heavy rainfall has caused extensive flooding in many areas in Arizona and New Mexico.

Climate Forecasts – Experts predict increased chances of warmer-than-average temperatures and equal chances of precipitation through November 2006.

El Niño – ENSO-neutral conditions are expected to continue through February 2007.

The Bottom Line – Some drought relief has occurred due to the abundant rain since the start of the monsoon season, but that relief may be limited to short-term impacts due to the accumulated effects of long-term, multiyear precipitation deficits.

Monsoon brings floods to the Southwest



The monsoon season has brought much-needed precipitation, but even in the Southwest sometimes the summer rains can be too much of a good thing. This year monsoon season brought extensive flooding to many areas. The floods have caused millions of dollars of damage in both New Mexico and Arizona. Hundreds of families in both states were forced to evacuate their residences, and extensive damage occurred to homes, businesses, farms, roads, canals, and other infrastructure. Governors Bill Richardson in New Mexico and Janet Napolitano in Arizona have both requested federal disaster assistance from President Bush. A few of the hardest hit areas in New Mexico were Las Cruces, Albuquerque, and Hatch, the "chilli-growing capital" of the Southwest. In Arizona Pima and Pinal Counties and the Havasupai reservation were severely impacted.

For more on flooding see Recent Precipitation page 7...

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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.

NWS new local three-month temperature outlook

NOAA's National Weather Service releases new climate product on the web

By Andrea Bair, Marina Timofeyeva, Jenna Meyers, and Annette Hollingshead

On the third Thursday of every month, researchers, farmers, ranchers, and a multitude of others with an interest in climate turn to the national three-month temperature and precipitation outlook issued by NOAA's Climate Prediction Center for a glimpse at what conditions to expect (see pages 15 and 16). Now, thanks to a new product that went online last month, they have the option of zooming in on climate prediction information at a local level.

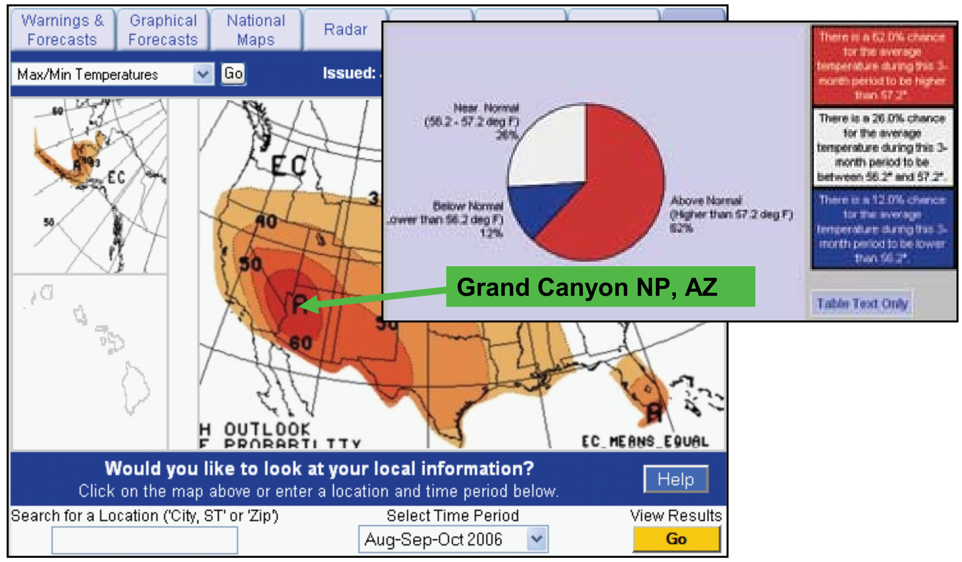

Figure 2. The CPC 3-month temperature outlook and the Grand Canyon local site where the L3MTO is available. The L3MTO provides not only the most likely category, but also the probability for the other two categories to occur, in pie chart format with supportive text for interpretation. The national 3-month temperature shows only the most likely category. Source: National Map, http://www.weather.gov/climate/l3mto.php; and Pie Chart http://www.weather.gov/ climate/calendar_outlook.php?redir=1&wfo=fgz&site=23596&lead=1

On July 21, NOAA's National Weather Service (NWS) introduced the Local Three-Month Temperature Outlook (L3MTO), the first in a series of online local climate products to be released by the NWS over the next two years. The L3MTO is available on all NWS Weather Forecast Office (WFO) climate webpages, offering users pie charts, tables, and text to help interpret the outlook for local climate conditions. The local climate pages can be easily accessed from a national map at http://www.weather.gov/climate/. The NWS hopes to unveil a downscaled Local 3-Month Precipitation Outlook (L3MPO) in 2008.

Phoenix Sky Harbor Intl Apt, AZ
Maricopa County, Coop ID: 26481

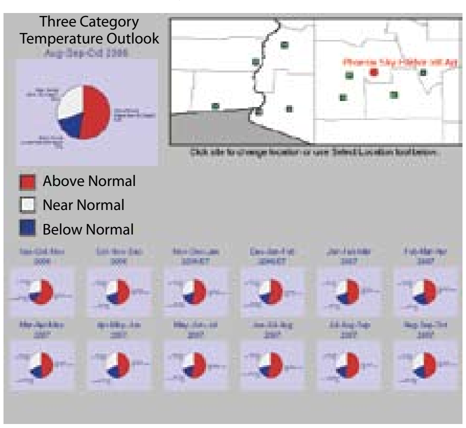

Figure 1. Map of the area near Phoenix, Arizona where the L3MTO is available. On the map, the name of the site will be displayed as the mouse moves over the site. Source: http://www.weather.gov/climate/calendar_outlook.php?wfo=psr

The L3MTO is downscaled or translated from the three-month national temperature outlook, but contains the same type of information: the likelihood (chance) of above-average, average, and below-average temperature, and the probability of exceedance—the expected chance for a certain temperature to be exceeded during a given time. The difference is that the L3MTO extracts more spatial detail, presents the product information in several different formats, and provides interpretation information.

The L3MTO is available for about 1,160 locations nationwide, although the number of locations could increase to approximately 4,000 sites in the future, depending upon user requirements. The product's web interface includes clickable maps and text options to help navigate from one location to another. For example, Figure 1 displays all the locations around Phoenix, AZ, where the L3MTO is available. Users can move within and between states by using the arrow feature above the map.

While the national three-month outlook allows users to gain quick at-a-glance information for the entire country, it does not provide enough detail to be useful at the local level (Figure 2). The L3MTO is presented in several different formats to meet a wide range of user needs. The first product format you will encounter online is a series of pie charts. The pie chart provides the most likely category, as well as the probability for the other two categories to occur, while the national outlook only provides the most likely category.

The next product format of the L3MTO suite is the temperature range graph (Figure 3), which displays all 13 future 3-month forecast periods for an entire year. The climatological median is plotted between five different user-selected confidence intervals (or levels of

continued on page 4

L3MTO, continued

expected chance), which include 99, 95, 90, 75, and 50 percent. Supportive text is available by clicking in the confidence interval for any one of the three-month periods, to help with interpretation. The median value means that during the present climatological reference period (1971–2000), 50 percent of the year's temperature was greater than and 50 percent was less than the median.

The Probability of Exceedance component appears as a chart or a table, with the chart also displaying the observed three-month temperature for the previous five years, for comparison (Figure 4).

As with all long term outlooks and forecasts, limitations exist with the L3MTO. For example, the L3MTO cannot provide a high confidence outlook for an exact three-month temperature value or a departure from that value; the product is in probabilistic format. To help the user assess the skill of the L3MTO, every product component includes a link to a verification tool that was developed by CLIMAS and expanded to include local climate outlook hindcast information and requirements. The outlook hindcast information is available from December 1994 to 2003. A hindcast is a method of assessing forecast or model prediction accuracy in which forecasts or model results are compared with a known period in the past. The requirements include a selection of forecast target seasons and specific years for computation of verification statistics. New users are encouraged to visit the "Questions and Feedback" tab to offer suggestions on the L3MTO.

The next local outlook product, scheduled for release in the summer of 2007, is the Three-Month Outlook of Local El Niño/La Niña Impacts on temperature and precipitation. Eventually, additional meteorological parameters will be added.

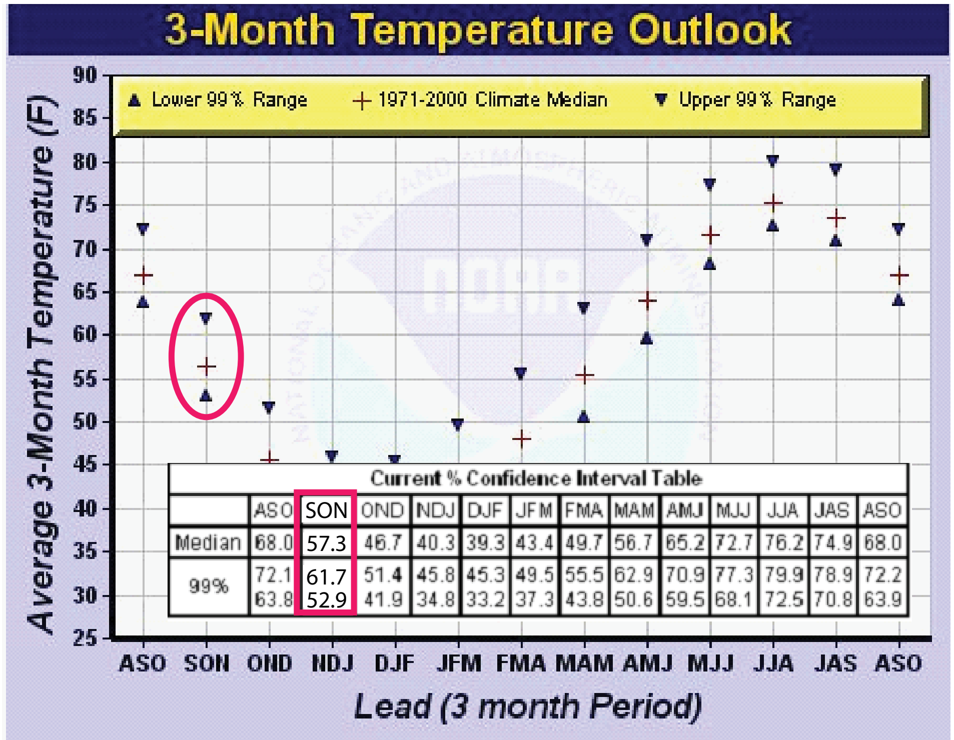

Figure 3. The average temperature outlook for Albuquerque, New Mexico (issued July 2006), suggests that during September–November 2006 there is a 99 percent chance that the average 3-month temperature will be within the range of 52.9 and 61.7 degrees F. There is a greater chance (71 percent) that the temperature will be higher than the climatological median of 56.5 degrees F, and a lesser chance (29 percent) that the temperature will be lower. Source: http://www.weather.gov/climate/temp_range.php?redir=1&wfo=abq&site=290234&lead=1

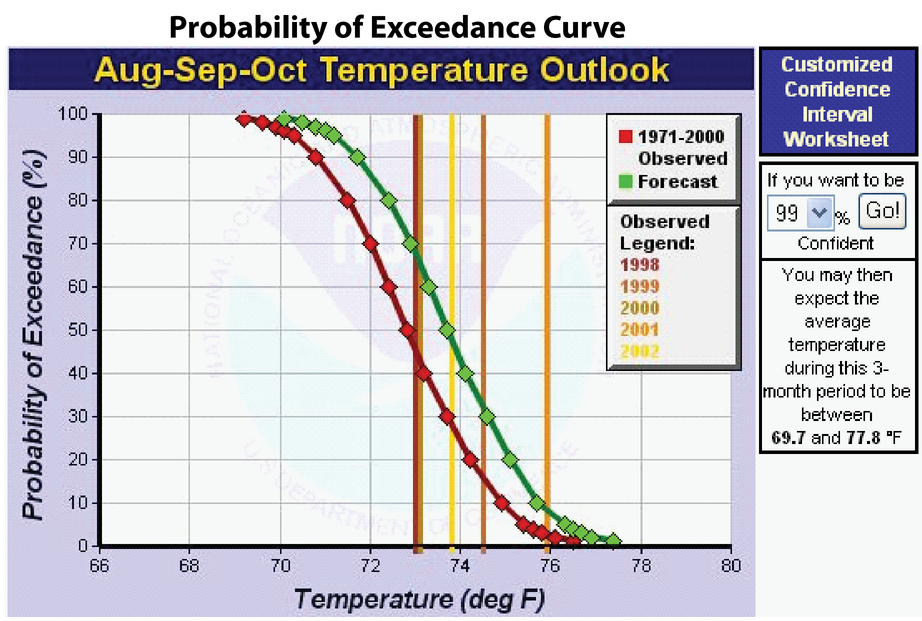

Figure 4. Probability of exceedance curve for Kingman, Arizona during June–August 2006. The Probability of non-exceedance and the probability of exceedance with the axis switched can also be displayed. Source: http://www.weather.gov/climate/calendar_probability.php?wfo=vef&site=24645

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East Pacific hurricanes bring rain to Southwest

By Melanie Lenart

Pacific hurricanes and tropical cyclones can have a profound influence even on the landlocked Southwest—and, arguably, their impact may increase as the oceans warm.

"It turns out that there's quite a lot of tropical cyclone activity that actually impacts the Southwest," explained Elizabeth Ritchie, a climatologist who joined The University of Arizona faculty this summer. September is the peak month for this activity, which has resulted in some serious floods in years past.

An average of 2.2 remnants from East Pacific hurricanes and named tropical cyclones ventured into the Southwest each year between 1992 and 2004, representing 15 percent of the region's named storms, Ritchie found in an analysis she conducted with a colleague. A tropical cyclone must reach sustained wind speeds of 39 miles per hour (mph) to qualify for a name, and 74 mph to attain hurricane status.

All but two of the 29 cyclones brought at least some rain to the Southwest. The researchers defined the Southwest as Arizona, California, and New Mexico.

"The main story is Albuquerque really does the best out of all these sites," Ritchie noted, adding, "Tucson is not far behind."

During this 13-year time frame, Albuquerque received a total of 20 inches of rainfall from tropical cyclone remnants, while Tucson received 12 inches and Phoenix collected 4 inches. Compared to the annual average rainfalls for these three cities, the values amount to half a year's worth for Phoenix, a year's worth for Tucson, and more than two years' worth for Albuquerque.

About 1.3 tropical cyclone remnants affected the Southwest each year during the time frame 1966–1984, according to an earlier analysis by Walter Smith of the National Oceanic and Atmospheric Administration (NOAA) that was published in 1986 as a NOAA Technical Memorandum.

However, it's unlikely the studies by Ritchie and Walter are directly comparable. Detecting remnants of tropical cyclones remains more of an art than a science, researchers noted, as official long-term tracking data ends when wind speeds fall below tropical storm status.

From 1974 through 2004, the number of intense East Pacific hurricanes increased by about a third, according to a study by Peter Webster of the Georgia Institute of Technology and several colleagues. Intense hurricanes have sustained winds above 130 mph. Webster and his colleagues compared data based on satellite imagery and found 49 intense hurricanes forming from 1990 through 2004 compared to 36 forming from 1974 through 1989.

Their finding and its perceived link to global warming via rising sea surface temperatures remains controversial among some researchers (see June 2006 *Southwest Climate Outlook*). Although climate experts agree rising ocean temperatures strengthen individual hurricanes, they disagree on whether past data is reliable enough to reveal a trend directly connected to global warming.

More intense East Pacific hurricanes won't directly translate into more rainfall in the Southwest, at any rate, as David Gutzler, a climatologist at the University of New Mexico, pointed out. That's because storms are more likely to become intense when contacting the warm waters of the open sea, he noted, while those heading into the Southwest must swing toward cooler coastal waters. The current from Alaska typically keeps U.S. coastal sea surface temperatures in the 70s and below even in August.

Figure 5. Satellite image of hurricane Javier on September 13, 2004 approximately 610 miles southeast of Cabo San Lucas, Mexico. Source: Jesse Allen, NASA Earth Observatory, data from the MODIS Rapid Response team

Tropical storms generally must encounter sea surface temperatures (SSTs) of 83 degrees Fahrenheit or more to attain the sustained 111 mph wind speeds of major hurricanes, based on a study of 270 Atlantic hurricanes and corresponding SSTs by Patrick Michaels and colleagues from the University of Virginia (*Geophysical Research Letters*, May 2006).

The tropical storms that do reach the Southwest can provide drought relief or cause floods, sometimes both. The remnants of Hurricane Javier (Figure 5) helped break a string of dry years in September 2004, ushering in a wet winter by gently soaking parts of drought-parched Arizona and New Mexico.

Too much of a good thing led to flooding in the autumn of 1983, when four cyclone remnants visited the Southwest. The storm from former Hurricane Octave created the most havoc, causing $500 million in flooding damage to Arizona with its days-long rains.

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

Temperature (through 8/16/06)

Source: High Plains Regional Climate Center

Since the start of the water year on October 1, 2005, temperatures across most of the Southwest have been 0–4 degrees Fahrenheit (F) above average (Figure 1b). Average temperatures have ranged from the mid 70s F in southwest Arizona to the low 40s F and upper 30s F in higher elevations of northern New Mexico and Arizona (Figure 1a). Over the last 30 days temperatures have been closer to average, ranging from 0–2 degrees F below average over most of southeastern Arizona and southwestern New Mexico, and from 0–2 degrees above average over most of the rest of the region (Figure 1c–d). Some small areas in the far western, northern, and eastern parts of the region were up to 4 degrees above average, while some small areas in the south were 4 degrees F below average due to monsoon precipitation and cloud cover.

In Phoenix the mercury reached a daily record of 118 degrees F on July 21. Several records for high minimum temperatures were set in July. Tucson reported an all-time record high minimum temperature of 89 degrees on July 22, and experienced 12 days of minimum temperatures of 80 degrees or higher. Phoenix experienced 11 days in July when the nighttime minimum temperature never dipped below 90 degrees.

Figure 1a. Water year '05–'06 (through August 16, 2006) average temperature.

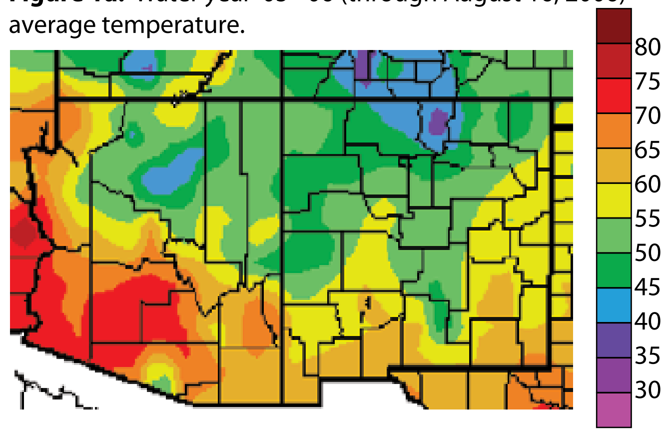


Figure 1b. Water year '05–'06 (through August 16, 2006) departure from average temperature.

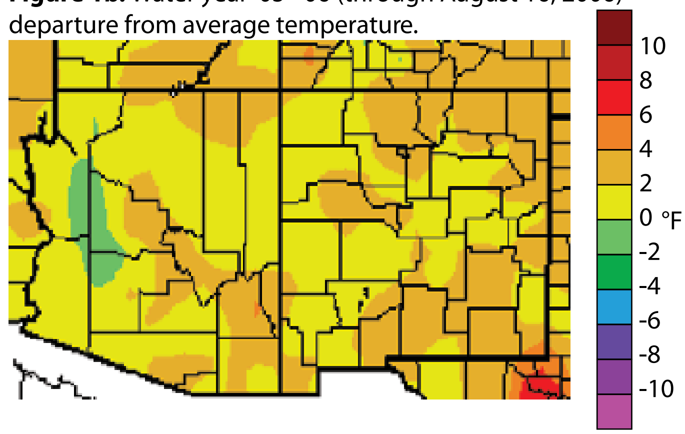


Figure 1c. Previous 30 days (July 18–August 16, 2006) departure from average temperature (interpolated).

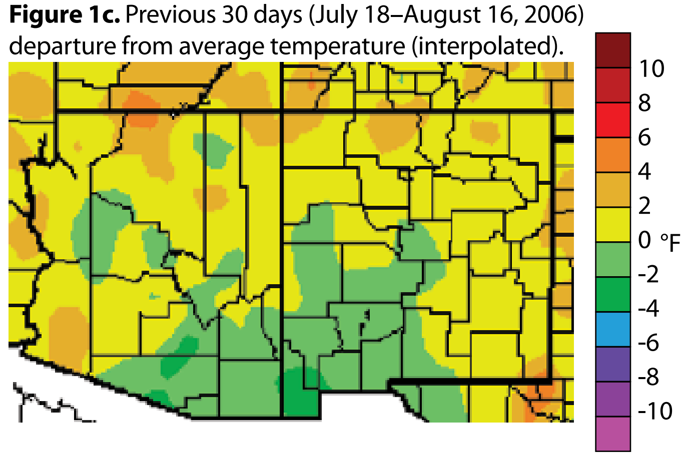
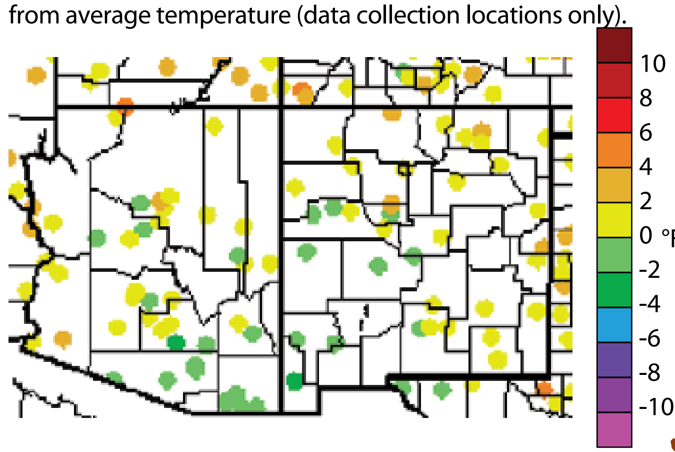


Figure 1d. Previous 30 days (July 18–August 16, 2006) departure from average temperature (data collection locations only).



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 8/16/06)

Source: High Plains Regional Climate Center

The monsoon season has brought much-needed precipitation—and extensive flooding—to the Southwest. Despite the abundant rain, precipitation across most of the region remains below average since the start of the water year on October 1, 2005 (Figures 2a–b). Areas with the greatest precipitation deficits (5–50 percent of average) are in central and western Arizona and in northern New Mexico's Rio Arriba County. In contrast, much of southwestern New Mexico has now received above-average amounts of precipitation since the water year began, loosening the drought's grip there. During the last 30 days precipitation has been well above average for most of the Southwest, especially for central and southeastern Arizona and central and southwestern New Mexico, where rainfall totals have ranged generally from 150 to more than 800 percent of average (Figure 2c–d). The rains, however, brought too much of a good thing to many places in Arizona and New Mexico; flooding forced the evacuation of hundreds of families and caused millions of dollars in damage to homes, roads, canals, and other infrastructure. A few of the hardest hit areas were Hatch, Las Cruces, and Albuquerque in New Mexico, and Pima and Pinal counties and the Havasupai reservation in Arizona.

Figure 2a. Water year '05–'06 through August 16, 2006 percent of average precipitation (interpolated).

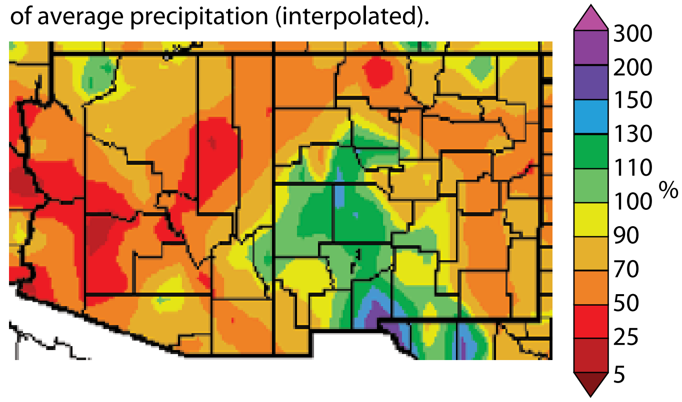


Figure 2b. Water year '05–'06 through August 16, 2006 percent of average precipitation (data collection locations only).

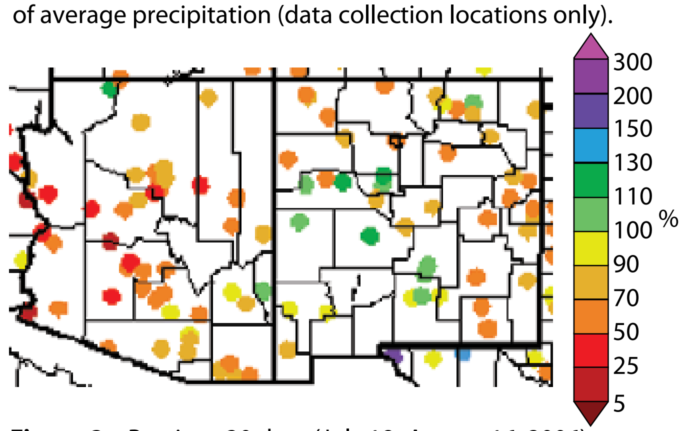


Figure 2c. Previous 30 days (July 18–August 16, 2006) percent of average precipitation (interpolated).

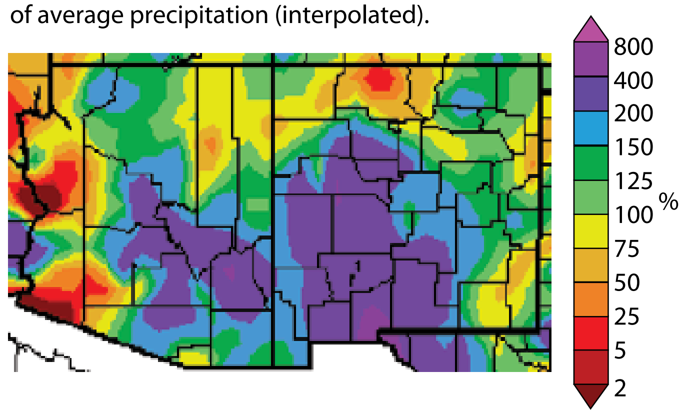
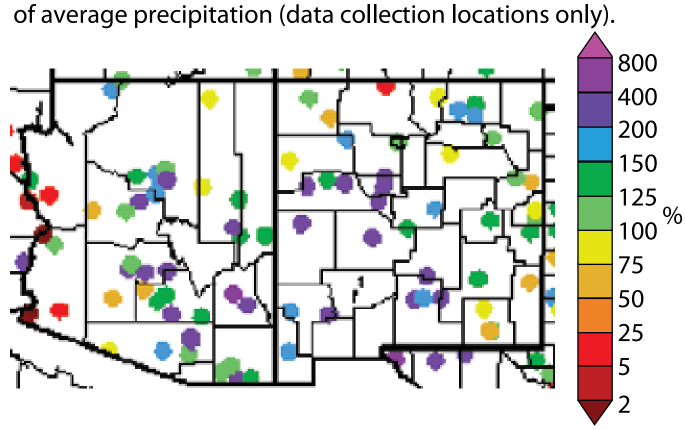


Figure 2d. Previous 30 days (July 18–August 16, 2006) percent of average precipitation (data collection locations only).



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 8/17/06)

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

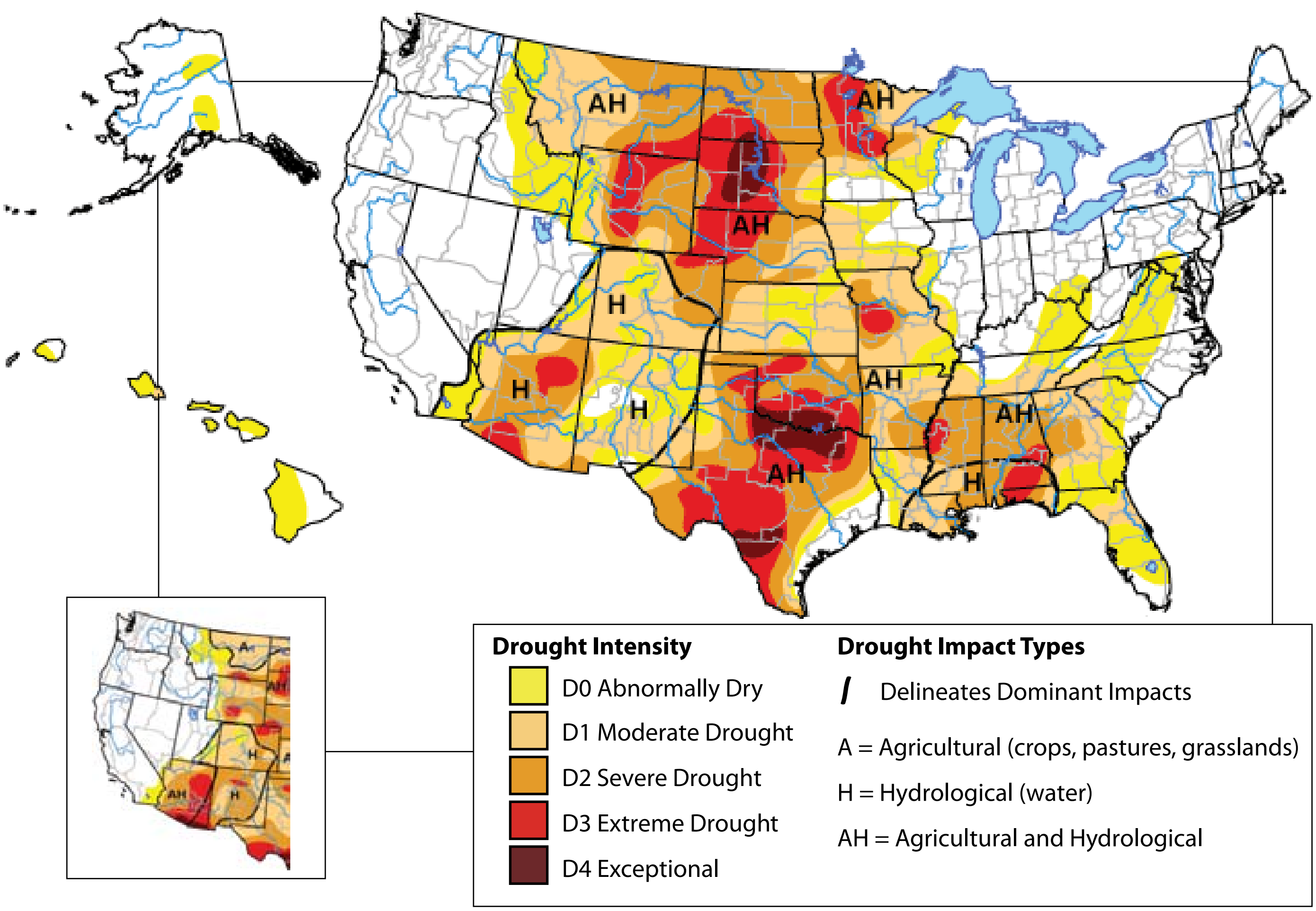
The U.S. Drought Monitor shows improvement across much of the Southwest (Figure 3). Like last month, much of the improvements are due to short-term relief from summer thunderstorms, but the recent precipitation has not been sufficient to overcome the effects of long-term, multi-year drought conditions. Nearly the entire region remains in some level of drought or abnormal dryness, except for part of west-central New Mexico and the extreme northwest corner of Arizona. In Arizona, a band extending from the southwestern to the northeastern part of the state is classified as being in severe drought, with some areas classified as extreme. Most of the remainder of the state is classified in moderate drought. The state of drought in New Mexico is considerably better. Most of the state is classified in moderate drought or as abnormally dry, and a band stretching from central New Mexico to the Arizona border is classified as being drought-free. Some small areas in the far southeastern, southwestern, and northwestern corners of New Mexico are classified in severe drought. Elsewhere, drought has deepened in Texas and Oklahoma, and in the northern Great Plains and the upper Midwest, where severe to exceptional drought holds sway in much of the area.

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 Mark Svoboda, National Drought Mitigation Center.

Figure 3. Drought Monitor released August 17, 2006 (full size) and July 20, 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 7/31/06)

Source: Arizona Department of Water Resources

Short-term drought conditions have eased in some parts of Arizona, but have worsened in others (Figure 4a). Severe drought exists in most of central Arizona and in the northern half of the state. Conditions in the Agua Fria watershed have improved from extreme to severe. Southwestern Arizona has generally improved from severe to moderate drought, while much of south-central and southeastern Arizona have shown some improvement from extreme to severe drought. The Gila and San Simone watersheds have deteriorated from severe to extreme drought. Much of the drought improvements are due to precipitation received during the monsoon season (see Figures 9a–c). Total precipitation in Arizona since the water year began on October 1, 2005, remains well below average (see Figures 2a–b) and has not been sufficient to alleviate the effects of long-term, multi-year precipitation deficits. The long-term drought picture looks similar to that of the last few months, with some improvement in the south (Figure 4b). The northern part of the state has shown no change, while much of southwestern Arizona has improved from abnormally dry to drought-free conditions. Since last month's report, the San Pedro watershed has deteriorated from severe to extreme drought status. Range conditions in Arizona have improved slightly since last month, with 73 percent of the pasture and range land rated in "poor" to "very poor" condition, down by eight percent from last month. Despite the improvement, only 9 percent is in "good" or "excellent" condition. This time one year ago only 56 percent of the pasture and range land was in "poor" to "very poor" condition.

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

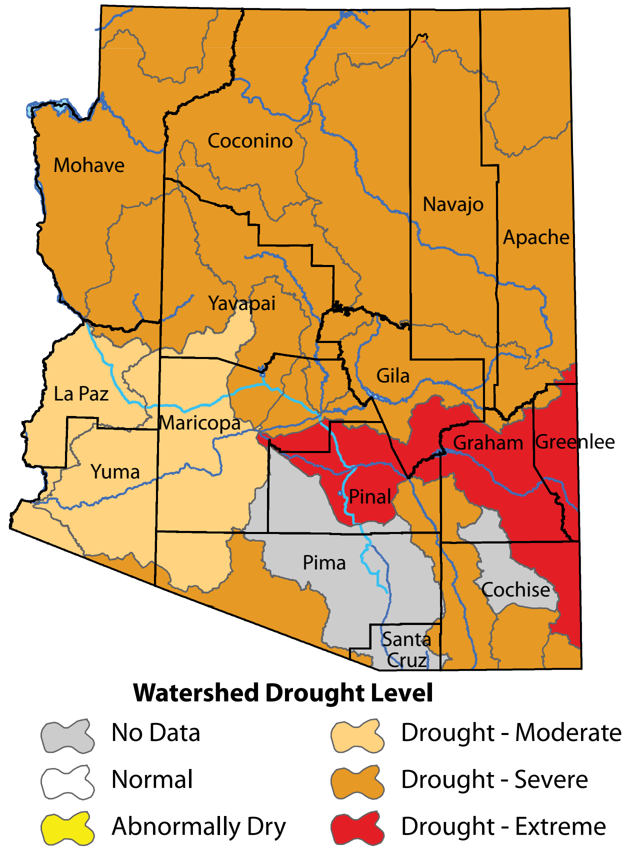
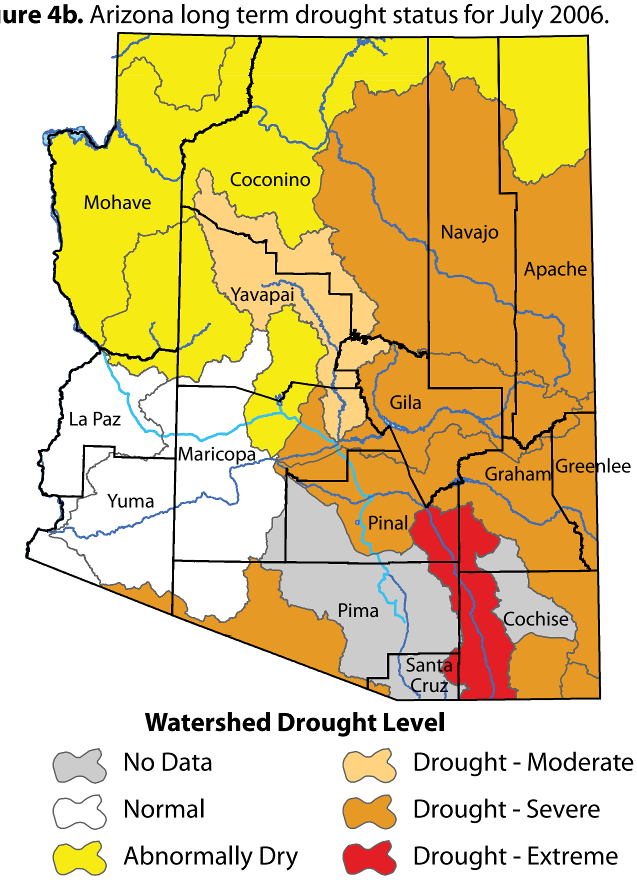


Figure 4b. Arizona long term drought status for July 2006.



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 07/31/06)

Source: New Mexico Natural Resources Conservation Service

The short-term drought status has improved considerably in New Mexico since last month (Figure 5a), thanks largely to the abundant monsoon season rains (see Figures 9a–c). Virtually all of the state has seen some improvement. July precipitation averaged across the state was 139 percent of the long-term average, ranging from more than 300 percent in much of the state to only 22 percent near Clovis. Along with the welcome rain, flash flooding caused serious problems, particularly along the Rio Grande Valley. The short-term drought map still shows some level of drought throughout the state, ranging from "advisory" to "emergency." Moderate drought exists along much of the northern part of the state, along the Arizona border, and in a band extending from southwestern New Mexico eastward to De Baca and Chaves counties. Severe drought exists in parts of the southwest and western border with Arizona and from Sandoval to San Miguel counties in the north. Most of the rest of the state is in mild drought status, with parts of central, northwestern and eastern New Mexico in advisory status. The long-term drought status map (Figure 5b) shows much of northeastern and western New Mexico in moderate drought status, along with the Rio Hondo watershed in the southeast. Much of the Pecos and San Juan river basins, along with some parts of the upper Rio Grande basin, are in mild drought status.

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 5a 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 5b 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 meteorological drought status map, visit:
http://www.srh.noaa.gov/abq/feature/droughtinfo.htm

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

Figure 5a. Short-term drought map based on meteorological conditions for July 2006.

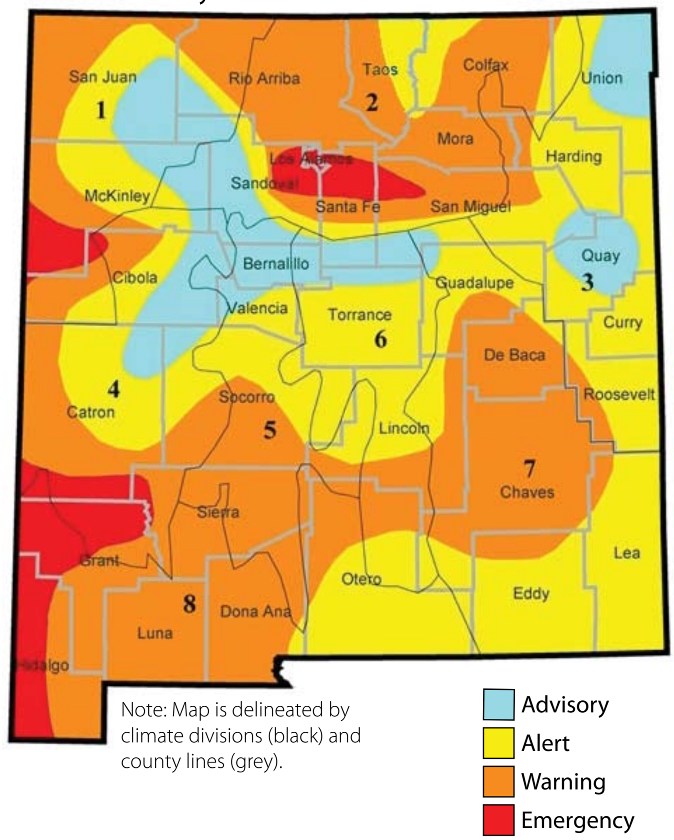
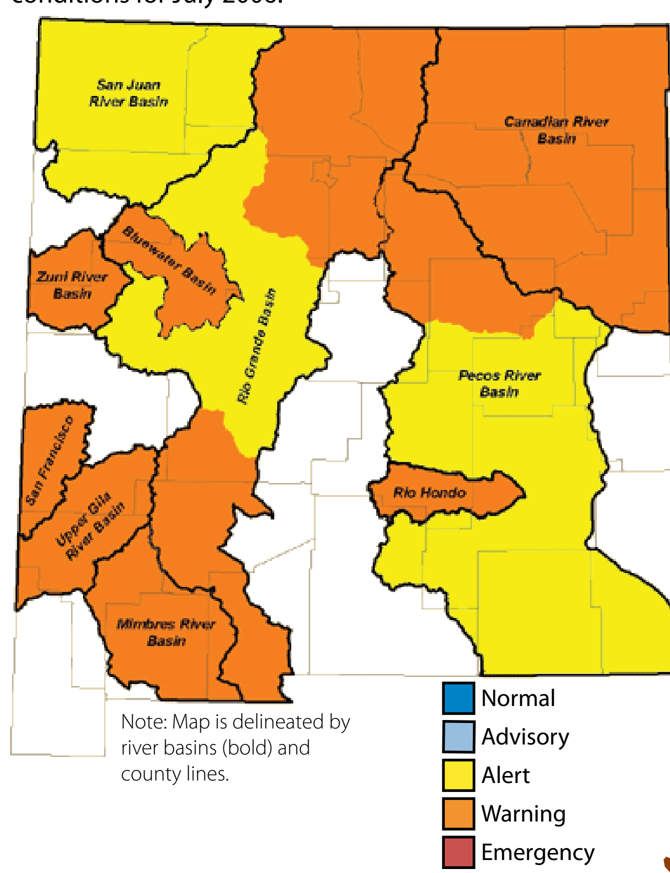


Figure 5b. Long-term drought map based on hydrological conditions for July 2006.



Arizona Reservoir Levels

(through 7/31/06)

Source: National Water and Climate Center

Storage in Arizona reservoirs changed only slightly since last month, with five of the eight reservoirs holding less than 60 percent of capacity (Figure 6). The total in-state storage (San Carlos, Salt River system, and Verde River system reservoirs) declined slightly from 50 to 48 percent. The two largest reservoirs on the Colorado River, lakes Powell and Mead, each fell by 1 percent, while the smaller lakes Havasu and Mohave rose slightly. The total storage on the four Colorado River reservoirs declined slightly from 55 to 54 percent of capacity. According to figures released by the National Weather Service's Colorado Basin River Forecast Center in Salt Lake City, Utah, the total inflow into Lake Powell from the upper Colorado River from April through July was only 67 percent of average. Storage on the Colorado River is only slightly less than it was at this time last year, when it stood at 57 percent. But due to the almost complete lack of rain and snowpack over the past winter, the in-state storage has declined considerably since this time one year ago, when it stood at 72 percent of capacity.

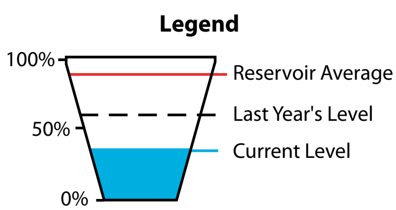
Notes:

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).

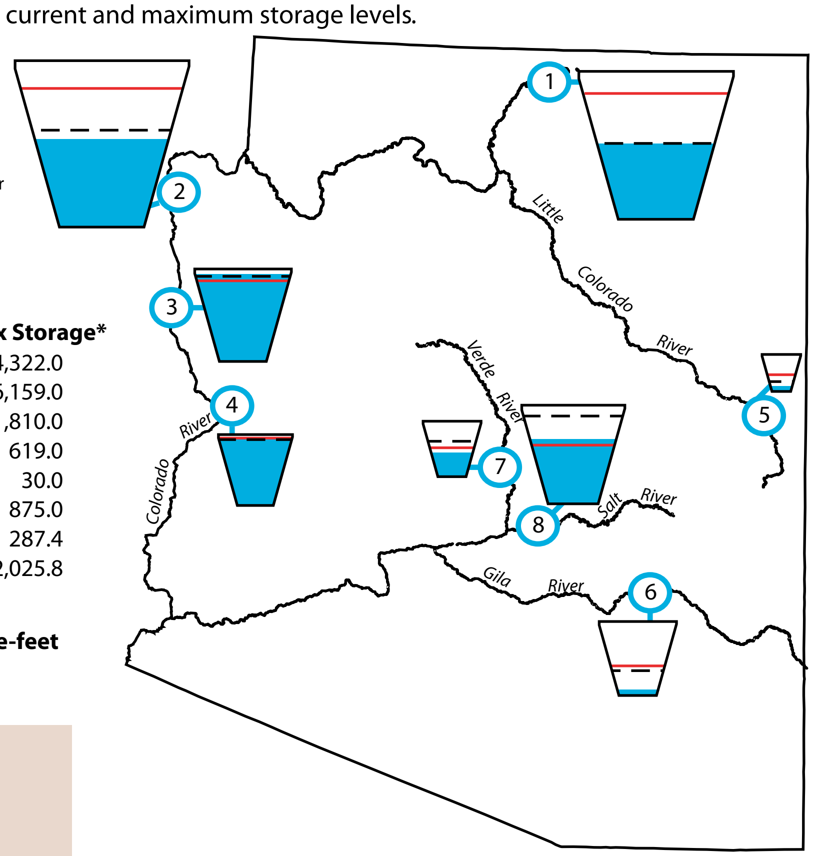
Figure 6. Arizona reservoir levels for July 2006 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.



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

Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Lake Powell	51%	12,416.0	24,322.0
2. Lake Mead	53%	13,993.0	26,159.0
3. Lake Mohave	94%	1,694.6	1,810.0
4. Lake Havasu	94%	584.3	619.0
5. Lyman Reservoir	15%	4.5	30.0
6. San Carlos	8%	73.8	875.0
7. Verde River System	43%	124.6	287.4
8. Salt River System	65%	1,324.9	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 7/31/06)

Source: National Water and Climate Center

Total in-state reservoir storage in New Mexico is down only slightly from last month, declining from 35 to 33 percent of capacity (Figure 7). The abundant summer rainfall since the start of the monsoon season has helped streamflow and storage, especially in the smaller systems, according to the National Weather Service Albuquerque Office. In northern New Mexico storage on three reservoirs is at or near the long-term average level. Navajo Reservoir on the San Juan is at 101 percent of average, and Abiquiu and Costilla are at 110 and 95 percent of average, respectively. El Vado showed a large decline from 42 to 30 percent of capacity, while Heron is unchanged at 48 percent, or about 60 percent of average. Elephant Butte, the largest reservoir in the state, fell from 11 to only 9 percent of capacity. Heavy rainfall in the Rio Grande Valley provided some inflow to Elephant Butte, but it is currently at only 15 percent of average. On the Pecos, Avalon and Santa Rosa showed gains of 3 and 1 percent of capacity, respectively, but storages are still mostly below average, with Sumner and Santa Rosa at 49 and 48 percent of average, respectively. Conchas Reservoir on the Canadian River dropped from 25 to 22 percent of capacity.

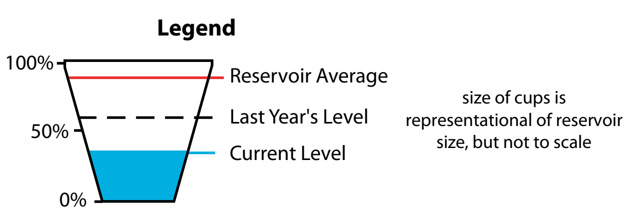
Notes:

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.

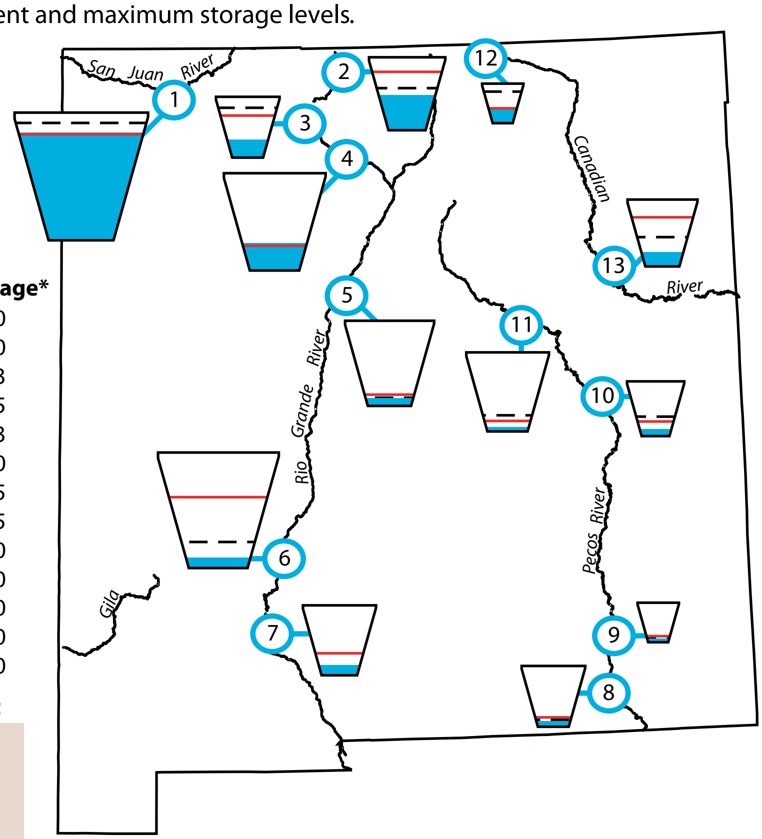
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tom.pagano@por.usda.gov; 503-414-3010) 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 July 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	84%	1,427.0	1,696.0
2. Heron	48%	190.8	400.0
3. El Vado	30%	56.0	186.3
4. Abiquiu	28%	152.5	554.5
5. Cochiti	10%	48.5	502.3
6. Elephant Butte	9%	189.0	2,065.0
7. Caballo	14%	45.5	331.5
8. Brantley	10%	14.7	147.5
9. Lake Avalon	25%	1.5	6.0
10. Sumner	13%	13.3	102.0
11. Santa Rosa	6%	28.2	447.0
12. Costilla	36%	5.7	16.0
13. Conchas	22%	55.7	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 8/17/06)

Source: Southwest Coordination Center

The abundant rainfall and high relative humidity since the arrival of the monsoon season have put a damper on the 2006 fire season. By August 16, only one large fire was being reported in the Southwest: the Walter fire in southwestern Arizona, where conditions are less moist (Figure 8b). No fires were being reported in New Mexico (Figure 8c).

As of August 16, there have been 5,093 fires in Arizona and New Mexico, accounting for 743,843 acres (Figure 8a). About 58 percent of those fires were caused by lightning, although the fires caused by humans accounted for slightly more than half of the total acres. About 95 percent of the fires started since last month were caused by lightning, which is typical of the early part of the monsoon season, when thunderstorms and accompanying lightning become abundant. Overall fire risk has decreased greatly due to the greater precipitation and higher humidity. Since July 11, a total of 74,785 acres of land have burned in Arizona and New Mexico, which is slightly less than the average of 89,171 acres for the month of July.

Figure 8a. Year-to-date fire information for Arizona and New Mexico as of August 16, 2006.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	1,261	33,133	1,400	106,149	2,661	139,282
NM	879	350,900	1,553	244,661	2,432	595,561
Total	2,140	384,033	2,953	350,810	5,093	734,843

Figure 8b. Arizona large fire incidents as of August 16, 2006.

Figure 8c. New Mexico large fire incidents as of August 11, 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 8/15/06)

Source: Western Regional Climate Center

Since July 1, most of the Southwest has received above-average precipitation, with areas in central New Mexico and central Arizona receiving 200–400 percent of normal amounts (Figure 9c). Exceptions are areas in western Arizona; Arizona's central Navajo County; and small sections of southwest, western, and northern New Mexico where precipitation has been 0–4.5 inches below average (Figure 9b). As usual, summer thunderstorm precipitation has been spatially variable, with amounts ranging from less than 0.10 inches in southwestern Arizona to more than 16 inches in western Arizona (Figure 9a). Partially as a result of the above-average precipitation, drought status in the Southwest has seen improvements in recent weeks (see Figure 3), though virtually all of the region remains at some level of drought.

In Tucson, July 2006 ranked as the 5th wettest July on record, with 5.40 inches, well below the record 6.21 inches received in 1921, according to the National Weather Service. July 31 was the 4th wettest July day on record, with 1.90 inches of precipitation that resulted in large flows in area washes, creeks, and rivers. For New Mexico, July ranks as the 27th wettest on record, receiving 139 percent of average precipitation. August 13 also saw significant rain that caused flooding in the downtown area of Albuquerque.

Figure 9a. Total precipitation in inches July 1–August 15, 2006.

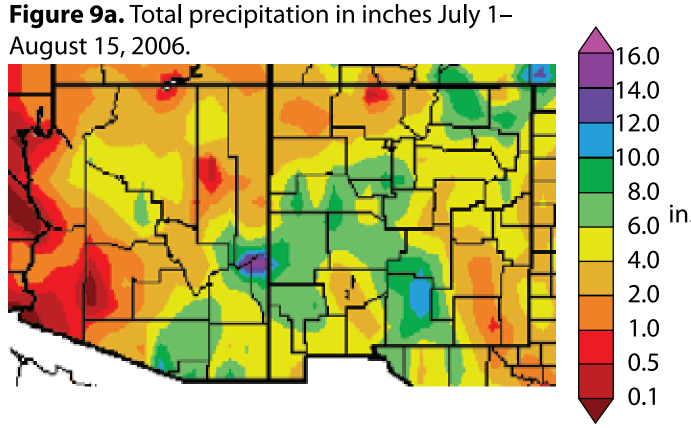


Figure 9b. Departure from average precipitation in inches July 1–August 15, 2006.

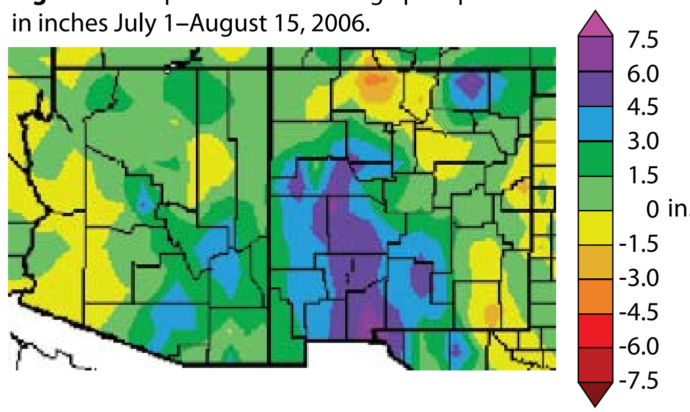
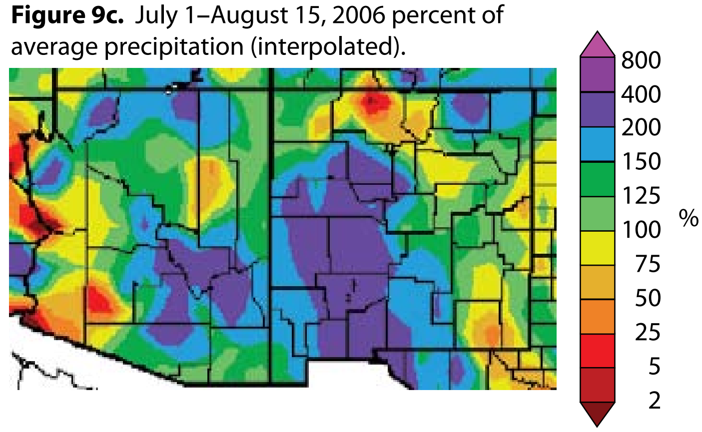


Figure 9c. July 1–August 15, 2006 percent of average precipitation (interpolated).



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

(September 2006–February 2007)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC temperature outlook calls for increased chances of above-average temperatures for the Southwest through February 2007 (Figures 10a–d). The outlook for September–November is for warmer-than-average temperatures throughout most of the nation except for parts of the Pacific Coast and the Southeast. The area with the highest probability for warmer-than-average temperatures (greater than 50 percent) is centered over southern and western Arizona, extending into southwestern New Mexico and into far southern California and Nevada (Figure 10a). As the forecast period progresses, high probabilities for above-average temperatures (greater than 50 percent) continue to exist in much of Arizona, and also in the upper Midwest during December 2006–February 2007. Higher temperatures through the remainder of the year have the potential to increase evaporation rates 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 September–November 2006.

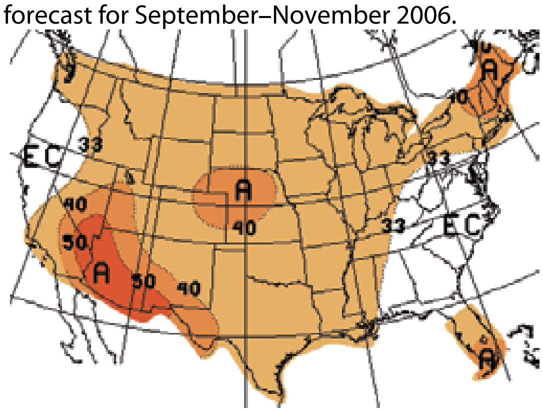
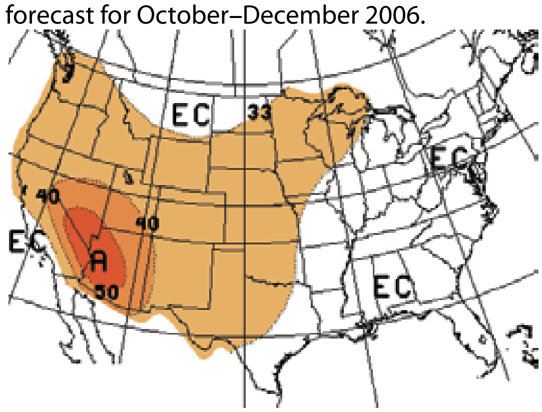


Figure 10b. Long-lead national temperature forecast for October–December 2006.



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

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

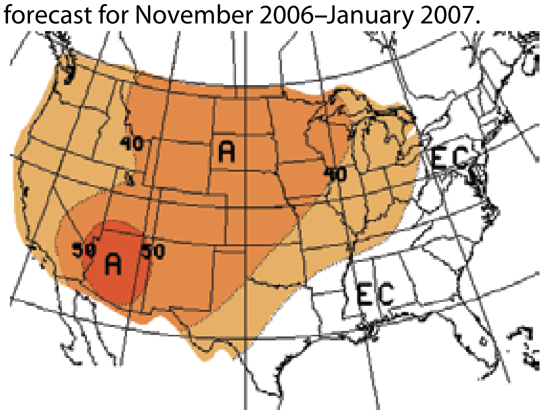
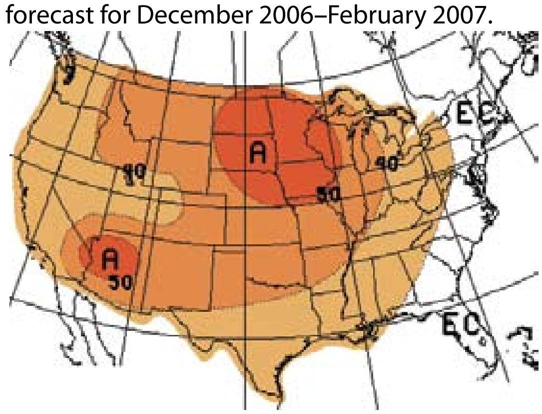


Figure 10d. Long-lead national temperature forecast for December 2006–February 2007.



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
(September 2006–February 2007)
Source: NOAA Climate Prediction Center (CPC)

Long-lead precipitation outlooks from the NOAA-CPC call for equal chances of below-average, average, or above-average precipitation for the Southwest (Figure 11a) from September–November. For the period October 2006–January 2007, the outlook is for somewhat increased chances of below-average precipitation for Arizona, far western New Mexico, and parts of southern California, Nevada, and Utah. The highest probabilities (greater than 40 percent) are in southern Arizona. Increased chances for above-average precipitation are called for in southern Texas for October 2006–January 2007, expanding to include Oklahoma and most of New Mexico during December 2006–February 2007. Elsewhere, the Pacific Northwest and the Midwest are expected to have increased chances for drier conditions through December, while Florida and parts of the northern Great Plains are likely to experience above-average precipitation through November.

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 September–November 2006.

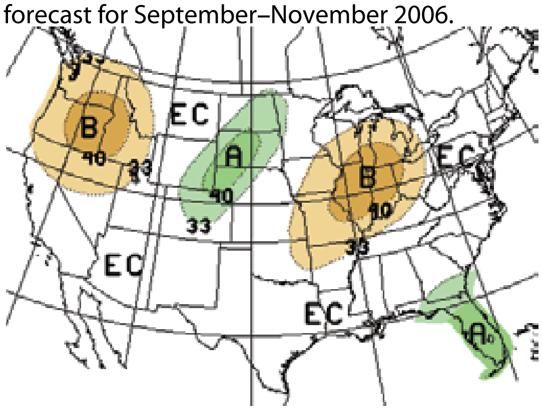


Figure 11b. Long-lead national precipitation forecast for October–December 2006.

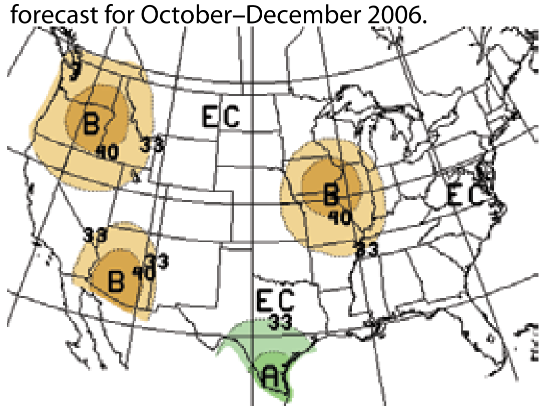


Figure 11c. Long-lead national precipitation forecast for November 2006–January 2007.

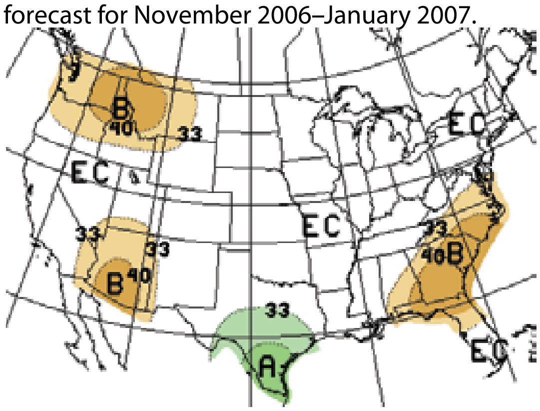
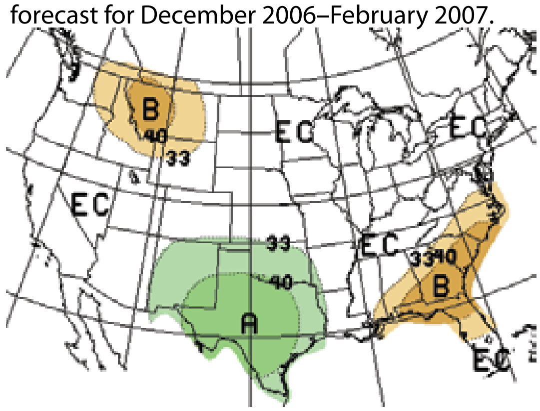


Figure 11d. Long-lead national precipitation forecast for December 2006–February 2007.



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 November 2006)

Source: NOAA Climate Prediction Center (CPC)

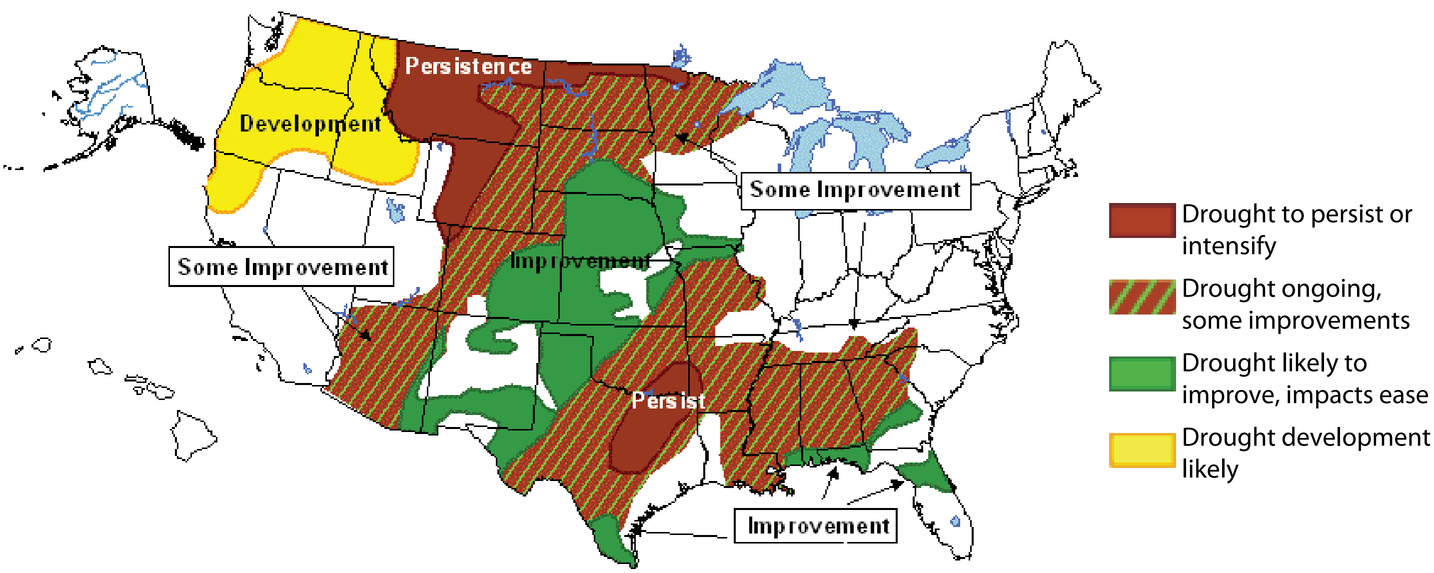
The U.S. drought outlook through November 2006 calls for drought conditions to improve in New Mexico and to show some improvement in Arizona (Figure 12) due mainly to the abundant moisture received since the start of the monsoon season. Although thunderstorms have brought much-needed precipitation to much of the Southwest, drought relief will likely be limited due to the accumulated effects of long-term, multiyear precipitation deficits. The outlook for increased chances of warmer-than-average temperatures in the Southwest during the fall (see Figures 10a–d) means that evaporation rates may increase, lessening the benefits of the summer rains and increasing the likelihood of further deterioration of drought conditions in the long term.

Elsewhere, drought improvement is expected in a band from New Mexico and west Texas northeastward through eastern Colorado, much of Kansas and Nebraska, and into parts of southern South Dakota, western and southern Iowa, and northern Missouri. Some improvement is also expected in much of Texas, Oklahoma, Missouri, and through most of the areas in the Southeast that are currently affected by drought, with the best chances for relief occurring in far southern Texas, the Gulf Coast, and Florida. In contrast, little or no improvement in drought conditions is expected over northeastern Texas and adjacent portions of Oklahoma and Arkansas. The outlook calls for some improvement to occur from southeastern Utah and western Colorado northeastward through eastern Wyoming and parts of the northern Great Plains states to the Canadian border in eastern Minnesota. Drought is expected to persist or intensify in western Wyoming, central and western Montana, and in a narrow strip along the Canadian border from Montana to western Minnesota. Drought development is likely in the Pacific Northwest from northern California through much of Oregon and Washington to the Canadian border, and eastward through much of Idaho.

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 November 2006 (release date August 17, 2006).



On the Web:

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

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

For the month of August, fire potential is normal for the Southwest except for extreme northwest Arizona (Figure 13a). Moisture from an above-average summer thunderstorm season has diminished fire potential and most public lands in the region have lifted fire restrictions. The recent moisture also has improved fuel moisture conditions (Figure 13b) and lowered the energy release component (ERC). ERC is a composite measure of fuel loading and fuel moisture that 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 dropped below average for most of the region (not shown). Though continued moisture is expected for the region, periods of drying could see an increase in fire danger, but the potential for large fires is expected to be low.

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

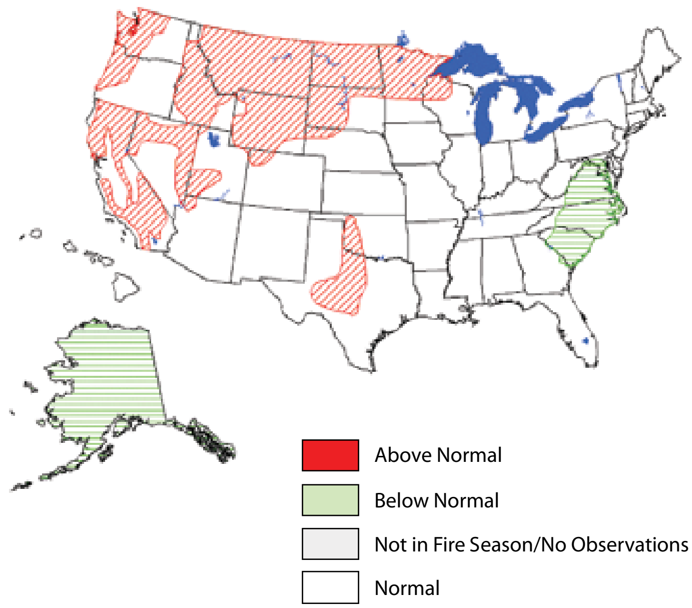


Figure 13b. Current fine fuel condition and live fuel moisture status in the Southwest.

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

Live Fuel Moisture	
	Percent of Average
Ponderosa Pine	109
Douglas Fir	117
Piñon	99
Juniper	84
Sagebrush	109
1000-hour dead fuel moisture	**16**
Average 1000-hour fuel moisture for this time of year	**14–20**

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)

The current ENSO-neutral conditions are expected to persist over the next one to three months, consistent with the decrease of the Southern Oscillation Index (SOI) to the value of –0.8 (Figure 14a). Equatorial sea surface temperature (SST) anomalies increased during July, and positive SST anomalies were observed in all of the Niño regions. Low-level easterly winds were weaker than average across most of the equatorial Pacific, and the SOI was negative for the third consecutive month. The basin-wide upper ocean heat content has been increasing since February 2006, and positive anomalies have been observed since early April. According to CPC, positive upper-ocean heat content anomalies are usually a precursor to warm (El Niño) episodes, and a continued slow trend toward warm-episode conditions is expected. The spread of forecasts among different ENSO models (not shown) ranging from ENSO-neutral to weak warm (El Niño) conditions indicate some uncertainty in the forecast. However, the different forecasts are consistent with the recent buildup in upper-ocean heat along the equator, indicating a trend toward warm-episode conditions. The probabilistic forecast issued by the IRI is in general agreement with CPC, predicting an approximately 60 percent chance of ENSO-neutral conditions through February 2007(Figure 14b). CPC forecasts a 50 percent chance that weak El Niño conditions will return by the end of 2006, while the IRI forecast is for a slightly less than 40 percent chance of El Niño by the end of the year. Both forecasts are for increased chances of El Niño compared to the historical probability of 25 percent.

Historically, ENSO-neutral conditions don't provide strong climate predictive information for precipitation in the Southwest. El Niño conditions are associated with increased amounts of precipitation in the Southwest during the cooler parts of the year and La Niña is associated with warmer and drier winters.

Notes:

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

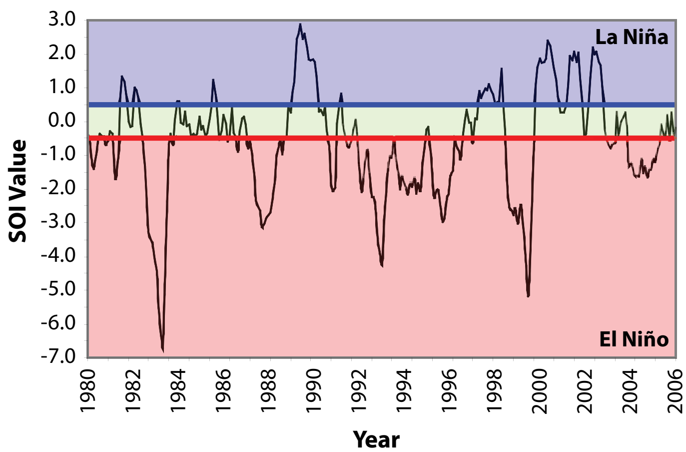
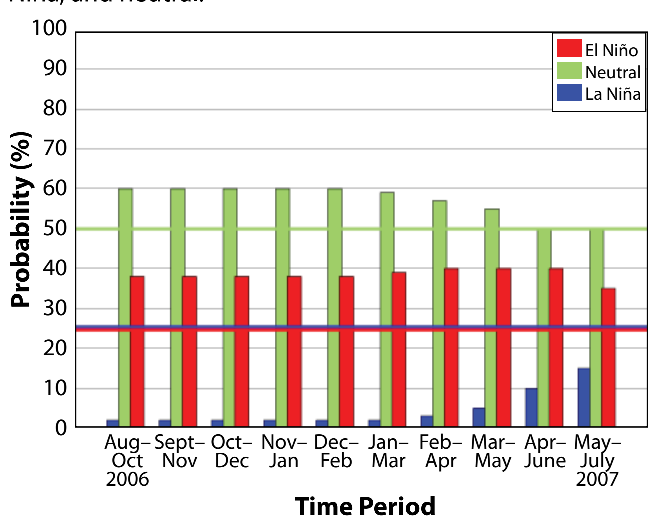


Figure 14b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released August 17, 2006). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Temperature Verification

(May–July 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range outlook for May–July 2006 from the NOAA-CPC predicted above-average temperatures in a wide band extending diagonally across the country from the West Coast to Florida (Figure 15a). The areas of highest probability were over the Southwest, from West Texas across most of New Mexico and Arizona to adjacent parts of southern California, Nevada, Utah, and Colorado. Cooler-than-average temperatures were predicted in the Upper Midwest from the Dakotas to Wisconsin and south to Iowa. Observed temperatures across most of the western and central states were 0–6 degrees F above average, with the warmest anomalies over Nevada, California, Arizona, Idaho, Utah, and South Dakota (Figure 15b). Much of the eastern part of the country was 0–2 degrees cooler than average or 0–2 degrees warmer than average. The forecast performed well in predicting warmer-than-average temperatures from the West Coast through most of Texas, although temperatures in the Southeast were closer to average. The forecast did not perform as well in the upper Midwest, where above-average temperatures generally prevailed.

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

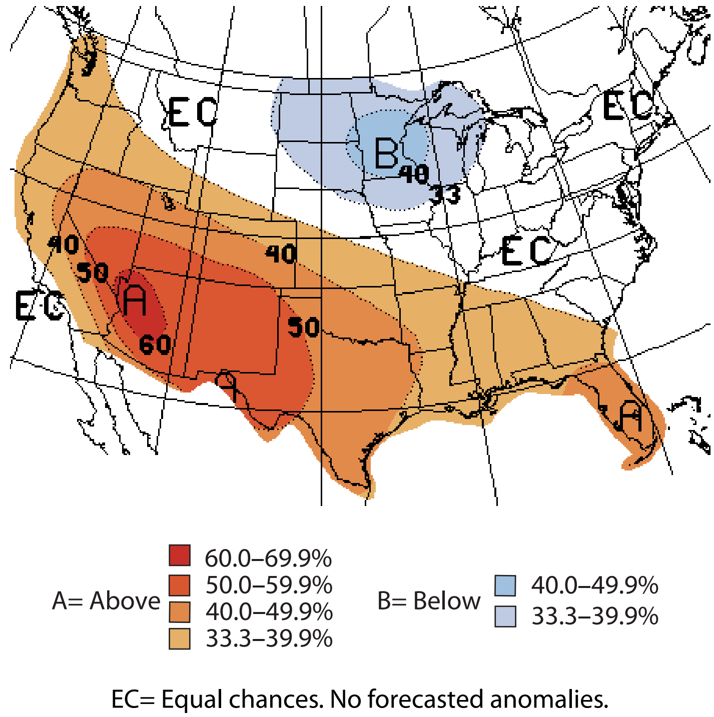
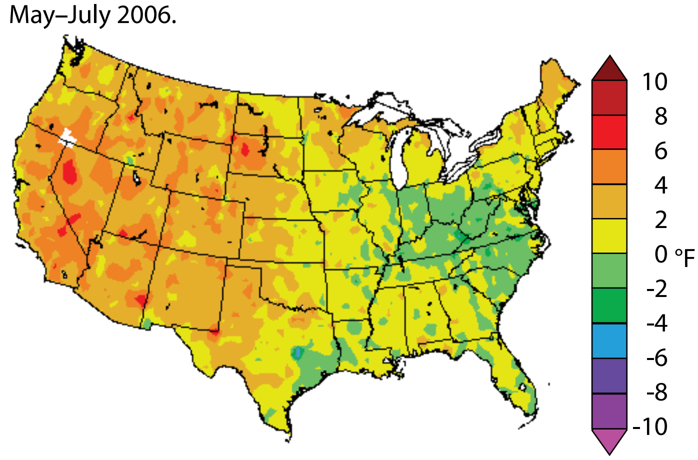


Figure 15b. Average temperature departure (in degrees F) for May–July 2006.



Notes:

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

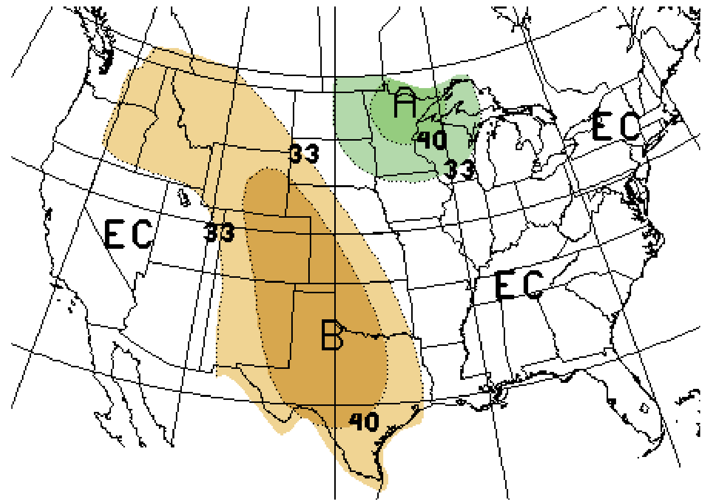
Precipitation Verification

(May–July 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range outlook from the NOAA-CPC for May–July 2006 called for below-average precipitation in a band from Texas and New Mexico northward and westward to the Canadian border, across much of Oklahoma, Colorado, Wyoming, Idaho, Montana, and parts of the surrounding states. The area of highest probability extended from central Texas to southeastern Wyoming, and included eastern New Mexico. Above-average rainfall was expected in the upper Midwest, with the anomaly centered in Minnesota and including Michigan and adjacent parts of the Dakotas, Wisconsin, and northern Iowa. Observed precipitation matched the forecast well in the West, where below-normal rainfall was generally observed in the forecast area, although some areas on the periphery received above-average rainfall, including the Texas Coast, western and central New Mexico, and central Oregon and Washington. In the Upper Midwest results were less successful, with parts of eastern Wisconsin receiving above-average rainfall, but with drier-than-average conditions prevailing in the rest of the forecast area.

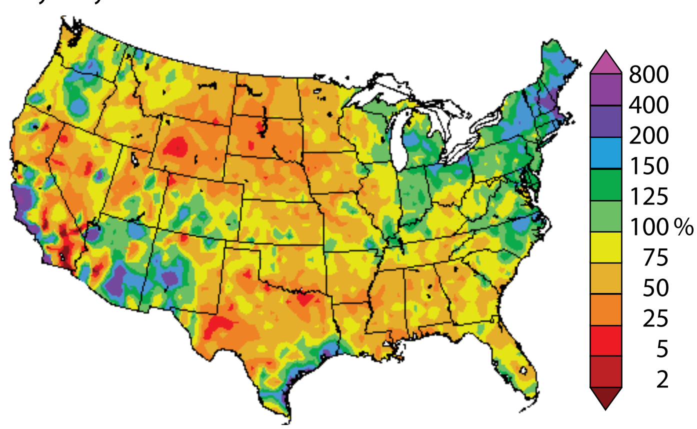
Figure 16a. Long-lead U.S. precipitation forecast for May–July 2006 (issued April 2006).



B= Below: 40.0–49.9%, 33.3–39.9%
A= Above: 40.0–49.9%, 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

Figure 16b. Percent of average precipitation observed from May–July 2006.



Notes:

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