Issued: February 21, 2006

Southwest Climate Outlook

Published by the Climate Assessment for the Southwest project and the University of Arizona Cooperative Extension

February Climate Summary

Drought – Extreme drought conditions have developed in southeast Arizona and southwest New Mexico.

- Drought conditions are expected to persist throughout the Southwest, due to winter forecasts of above-average temperatures and below-average precipitation.
- The extreme lack of snowpack in most of the basins in Arizona and southern New Mexico has led to a streamflow forecast of well below average for 2006.
- Drought conditions improved from last year, but the large Colorado River reservoirs, Elephant Butte, and other reservoirs in New Mexico remain below average.

Fire Danger – The abundant grass crop produced last winter has cured into fine dry fuel in the Southwest, raising the prospect of an early start to a very active fire season.

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

Precipitation – Almost all of the Southwest has been drier than average since the start of the water year, especially during the last three months.

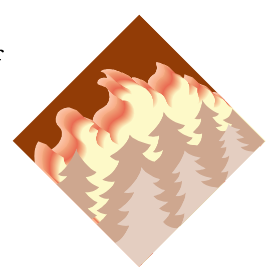
Climate Forecasts – Experts predict increased chances of warmer-than-average temperatures through August 2006, and below-average precipitation through May 2006.

El Niño – Weak La Niña conditions are expected over the next three to six months.

The Bottom Line – Drought is likely to persist over most of the Southwest.

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

Drought & Fire Danger in the Southwest



The ongoing drought strengthened its grip on the Southwest over the past winter—a winter that's shaping up to be one of the driest and warmest on record. Last year's wet winter and spring gave most of the Southwest some needed, but temporary, relief, as reservoir levels increased and forests revived somewhat. Last year's moisture produced an abundant crop of grasses, which is rapidly curing in this year's warm dry weather. The grass crop has become a blanket of fine dry fuel, very easily ignited, and capable of carrying fire rapidly from rangeland into timber country and urban areas. This year Arizona's "February Fire" burned over 4,000 acres near Payson, raising the specter of an early and active Southwest fire season.

See page 7 for more information on the drought...

In this issue:

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Grassland dynamics shift with climate fluctuations

By Melanie Lenart

As the drought deepened, ranchers and others at a January workshop brainstormed ways to keep southwestern grasslands resilient despite rising temperatures and pendulum-like swings in rainfall.

"I make my living when it rains," rancher Dennis Moroney of the CrossU Cattle Company told the group of about 130 ranchers, range managers, and natural resources specialists gathered for the two-day Climate and Rangeland workshop and Society for Range Management (SRM) meeting held near San Carlos, Arizona. "Last spring I said, 'If this is global warming, I'll take it.' I'm not so sure today,"said Moroney.

Plentiful rainfall during the winter and usually bone-dry southwestern spring in 2004–2005 put a dent in the drought that has plagued Arizona and New Mexico since at least 1998, but a dearth of rainfall since October has plunged much of the Southwest back into drought over the last few months. On the first day of the January 25 workshop, Phoenix had not received a drop of rain in 98 days, and Tucson had only received about 0.1 inches during that same period. Meanwhile, northern Arizona was still without snowpack.

"As we left town, we were getting our first significant snowfall of the year," noted Northern Arizona University (NAU) Professor George Koch, who drove up from Flagstaff on the morning of January 26. "This is shaping up to be the driest winter since the driest winter a couple of years ago," he added. On February 7, Flagstaff's National Weather Service office announced that the 2.49 inches of precipitation received between September 1 and February 6 represented a new record low in 109 years.

Gregg Garfin, program manager for the University of Arizona's (UA) Climate Assessment for the Southwest (CLIMAS), noted that El Niño exerts a tremendous influence on regional winter precipitation tallies. When El Niño reigns, sea surface temperatures run higher than average in the eastern Pacific Ocean. Often this helps pull jet stream moisture down to this region for the winter and sometimes through the spring, as it did last year. But things have changed.

"This winter's temperatures in the eastern Pacific, although not officially a La Niña, are cooler than average. We think that's what initiating this dry episode," Garfin told the group. Conditions officially met National Oceanic and Atmospheric Administration standards for a La Niña event the following week, after eastern Pacific sea surface temperatures had remained cooler than average for the required three months. This suggests the drought is likely to continue through the winter at least, Garfin indicated.

Garfin had worse news to convey. He is among the climatologists who suspect that a related influence commonly known as the Pacific Decadal Oscillation (PDO) switched in the late 1990s into a phase that spells long-term drought for the Southwest. While El Niño works at the seasonal scale with phases that typically last only a year or two, the PDO can stay in one phase for 20 years or more.

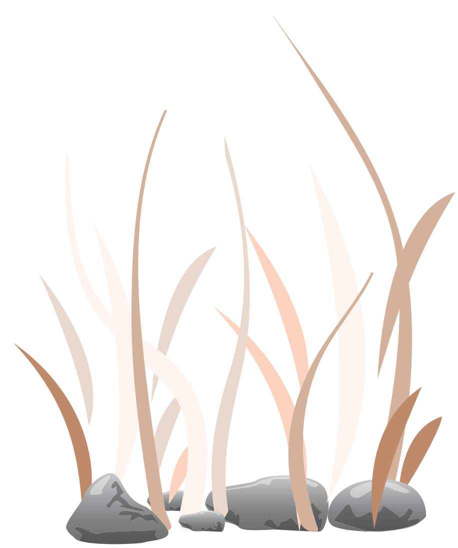
El Niño variations represent one of three processes influencing PDO phases, Garfin told the group, referring to research by Niklas Schneider and Bruce Cornuelle (*Journal of Climate*, November 2005). The other two influences are the Aleutian low, an atmospheric measure of sea level pressure that fluctuates much faster than El Niño; and the Kuroshio-Oyashio Extension, an ocean current that responds to El Niño phases but fluctuates much more slowly. At this point, skill in predicting the influences affecting the PDO is limited to a few years, the authors indicated in their paper.

Global warming's influence falls on top of fluctuations of El Niño, the PDO and other climate patterns. It launches a relatively predictable rise in temperatures accompanied by largely unpredictable changes in precipitation patterns. Following the ongoing trend for increasing temperatures, globally 2005 registered as the hottest or second-hottest year on record, depending on the analytical method used.

In time, the Southwest might experience more heat waves and record-breaking highs and fewer frost days, Garfin explained, citing a research paper by Noah Diffenbaugh and others (*Proceedings of the National Academy of Sciences*, November 2005).) Precipitation is also likely to become more extreme, in effect featuring more droughts and floods as the water cycle speeds up along with evaporation rates.

Grassland thresholds

The one-two combination of rising temperatures and more drought can really impact grasslands and other ecosystems. Grasslands rank among the most sensitive ecosystems to climate fluctuations,



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Grassland dynamics, continued

whether from natural variability or climate change.

"We're working with an ecosystem that has very quick responses to climate variability," noted Michael Crimmins, a UA Cooperative Extension climatologist who helped organize the workshop along with others from cooperative extension, CLIMAS, and SRM. Climate influences act along with past management actions, soil type, competition between species, and environmental disturbances, he added. "These increasing temperatures, even if precipitation remains the same, are going to change things."

Changes in climate can push a grassland system over a "threshold" into a new state, NAU Professor Thomas Sisk said. He showed an image of an idealized conceptualization of thresholds (Figure 1). A ball resting in the bottom of a pit represents one ecosystem state. Drought, global warming, or related disturbances can metaphorically lift the ball out of this "steady state" and shift it up and over the edge of a threshold into an entirely different steady state.

"Where are those thresholds? That's sort of the $64,000 question," Sisk told the group. "It's chaotic, unpredictable. That's why we're here today."

Protecting grasslands

Sisk is working with the Diablo Trust, a collaborative rangeland management group in northern Arizona, to monitor how selected plots respond to different grazing approaches. Monitoring involves keeping track of rangeland conditions by systematically measuring variables such as soil moisture and the percentage of desirable vs. undesirable plants within a specific area. This can help ranchers understand when they are risking a threshold change.

Ranchers may need to remove some grazing animals from shriveling grasslands during times of drought, Sisk noted, with or without a dictate from the government agencies that issue grazing permits. Often, people have a tendency to "wait, hope, and pray" rather than reduce livestock numbers, he observed.

"If it's really late, or we pray for a really long time, then we may cross that threshold," he added. The field of decision theory weighs the costs of changing management against the risks of inaction or of making a bad decision. In an acknowledgement of the difficulty in making decisions based on an uncertain future, Sisk noted that the best decision sometimes can be to wait out a dry spell—if it does rain in time to save the ranch.

"The response when it rains is phenomenal," said Moroney, whose ranch in McNeal reacts rapidly to rain, like most southwestern grasslands. "You see change take place in three or four days."

Summer rains can make or break a rancher's fiscal year. Yet the success of climate predictions for southwestern summer rainfall—largely dependent on the monsoon circulation that drives in the rain—lags far behind the skill in forecasting winter precipitation, mainly because of El Niño's influence on the latter. Arizona state climatologist Andrew Ellis, though, has found that late monsoons often equate to weak monsoons (*International Journal of Climatology*, February 2004). The 2005 monsoon fit the bill on both counts.

The larger spatial coverage of winter storms eases predictability, Crimmins explained. Winter storms often extend across the state for several days, he indicated, while summer thunderstorms pop up almost randomly over small areas.

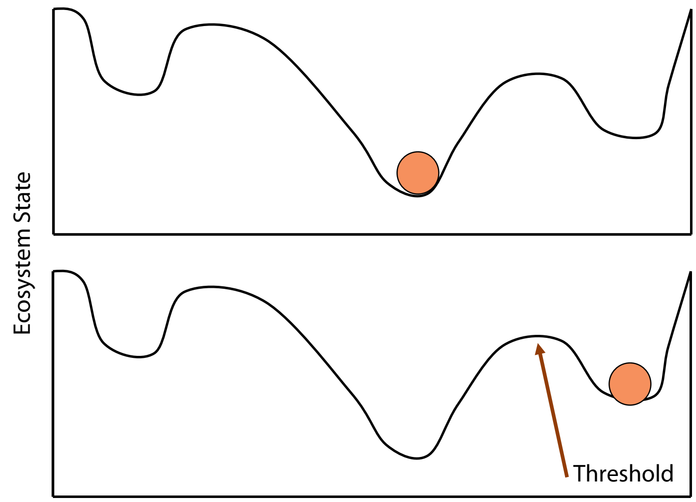


Figure 1. Grasslands and other ecosystems have "thresholds" relevant to specific states, such as forage production. Changes in climate can theoretically shift the grassland from one stable state (top) into a different stable state (bottom). Once the system has passed the threshold, it is difficult for it to return to its pre-existing state. Source: Thomas Sisk, NAU.

During years when the monsoon falters and sputters, like last summer, ranchers face a tough decision about whether to buy feed while hoping for rain, seek out greener pastures for a few months, or prematurely sell some of their carefully bred herd. If large-scale drought leads ranchers to flood the market with cattle, prices will drop for everybody.

A greener pasture

"Grass banking" can help ease the risk of running out of forage before the calves are fatted. For instance, a group of ranchers might set aside a common field for times of trouble, or individual ranchers can use their own land in ways that lessen the impact of grazing in any one spot, Moroney suggested.

"I moved my cows 11 times last year. We do that to shorten up the amount of time they spend in a pasture," he said. "Then we're always feeling pretty good that we have feed ahead of us and

continued on page 4

Grassland dynamics, continued

behind us in case rain doesn't come through."

He noted that he favors pastures with mesquite trees—generally considered undesirable by ranchers—during the season when dangling bean pods serve as a protein supplement for cows.

Moroney also suggested that adaptive management ideas could include putting cattle out in the desert when grasses encroach, as they did in 2005. The spread of grasses into the desert during last year's plentiful spring rains caused trouble. The grasses quickly cured into fuel for summer fires that sparked a record number of acres burned in Arizona. A quarter of a million of these acres burned outside Phoenix in the Cave Creek Complex fire, killing many of the Sonoran Desert's signature cactus, the saguaro.

Fire in grasslands

While fire spells disaster for saguaros, it can help grasslands win the competition against other woody plants like juniper, mesquite, and creosote.

Grasses "expressed themselves dramatically" after Moroney worked with the Natural Resource Conservation Service to fight off mesquite trees by spraying several hundred acres with herbicides. In recent decades, mesquite trees have been invading his ranch, along with grasslands throughout the Southwest. But the chemical treatments cost too much and are fairly ineffective without a follow-up by fire, he said, so the plan is to conduct some prescribed burns to further control the mesquite invasion.

The proper fire regime can maintain grasslands facing invasions from woody plants such as juniper as well, UA Professor Steven Archer told the group.

Based on research about how long it takes juniper to establish and grow in similar Texas and Oklahoma grasslands, ranchers need to have a fire at least every 10 years to keep juniper off highly productive, non-grazed landscapes, Archer reported. On grazed sites, the window of opportunity to prevent juniper encroachment can shorten to five years, he explained. His research has shown that cattle grazing can help woody plants invade by removing the grasses, known as fine fuels, needed to carry fires capable of suppressing trees and shrubs. Less productive sites or more heavily grazed sites may need to be burned even more often because the sparser ground cover translates to reduced fuel loads and hence patchier fires with lower intensities, he indicated.

Other factors

Drought, global warming, fire, and woody plant encroachment all can change grassland dynamics. So can invasive grasses and weeds, insects, and carbon dioxide. Grassland insect invasions often track the ups and downs of rainfall. Invasive plants, too, can respond to plentiful rainfall, as Sahara mustard and red brome did when colonizing desert lands last spring.

The greenhouse gas carbon dioxide, responsible for about 60 percent of the ongoing warming, also affects invasive plants, insects, and other factors influencing rangelands dynamics. For instance, woody plants such as trees and shrubs tend to grow more quickly than grasses in experiments exposing them to the carbon dioxide levels expected by about mid-century. Desert landscapes have undergone "reverse desertification" when exposed to these elevated levels of carbon dioxide, with 40 to 50 percent increases in productivity, Sisk pointed out. (For more information, see the 2004 review paper by Robert Nowak and colleague in *New Phytologist*.)

Even among grasses, the extra carbon dioxide in the air will favor some species more than others. It provides a bigger boost to plants that use the "C3" pathway to photosynthesize, such as trees and many cool-season grasses including bromes and cheatgrass. So-called C4 plants, which include most warm-season grasses and invasive species like lovegrass and buffelgrass, are not as affected.

The rising levels of carbon dioxide offer a high note that may interest farmers as well as ranchers: Most crops are C3 species, while most "nasty weeds" are C4 species, Sisk noted. However, there's also some evidence that insects need to eat more when dining on plants grown under higher carbon dioxide levels.

Increasing resiliency

A growing list of disturbances join drought in impacting grasslands. Grassland dynamics are likely to become more complex with the changing climate and related factors, increasing the risk of crossing a vegetation threshold, with major shifts in the species composition and productivity of rangelands.

Although rancher Richard Collins mentioned he was having a difficult time maintaining his natural optimism when faced with the workshop news, Garfin compared the growing understanding of the climate risks facing grassland managers to the awareness that had grown in Louisiana over the past couple of decades that a major hurricane could devastate New Orleans.

"We did not reduce vulnerability and increase resilience," Garfin noted. "And I think that's the task. We've got the information. The challenge is to take climate change information … and try to translate that into something that converts into a real and practical management plan."

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

Temperature (through 2/15/06)

Source: High Plains Regional Climate Center

Temperatures in most of the Southwest have been 0–4 degrees Fahrenheit above average since the start of the water year on October 1, 2005 (Figure 1a–b). Average temperatures ranged from the middle to upper 60 degrees F in southwest Arizona to the low 30s in north-central New Mexico and a small patch of northern Arizona. Temperatures over the last 30 days have been generally 0–3 degrees F above average over most of the region, although an area in northwest New Mexico and northeast Arizona experienced temperatures from 0–3 degrees cooler than average, as have some smaller areas in southwest Arizona and eastern New Mexico (Figure 1c–d).

According to the National Oceanic and Atmospheric Administration, January 2006 was the warmest January on record for the United States, with an average temperature across the nation of 39.5 degrees F, which is 8.5 degrees F above the 1895-2005 mean of 31.0 degrees F. The warm temperatures resulted in lower residential energy demands for the nation. Here in the Southwest, the warmth coupled with exceptionally dry conditions has caused an increase in the wildland fire potential, with the drying of the abundant fine fuels left from the wet winter of 2004–2005. One large fire, the "February Fire," has already burned more than 4,000 acres near Payson, Arizona.

Figure 1a. Water year '05–'06 (through February 15, 2006) average temperature.

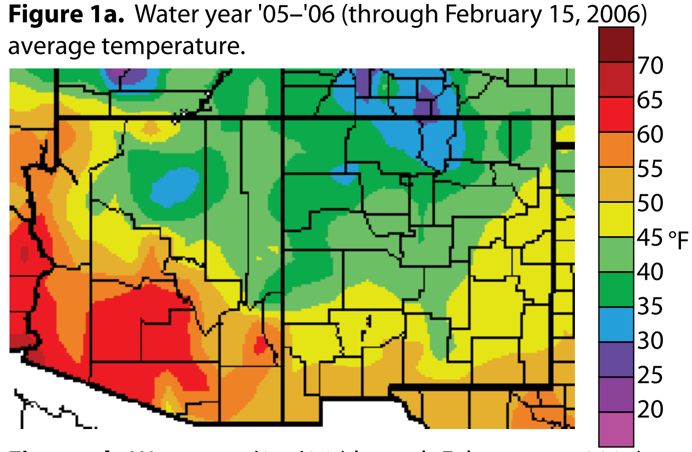


Figure 1b. Water year '05–'06 (through February 15, 2006) departure from average temperature.

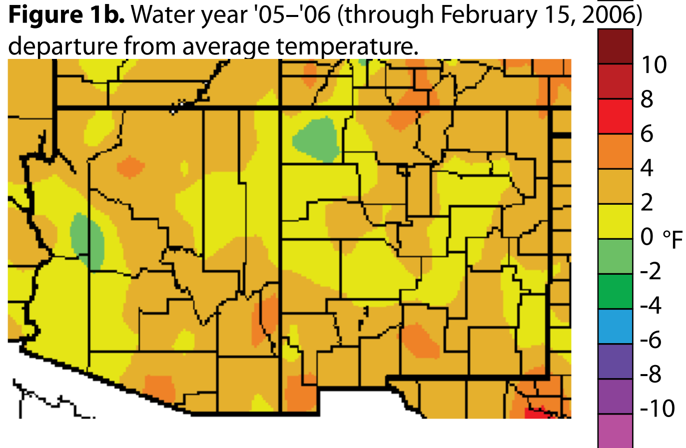


Figure 1c. Previous 30 days (January 17–February 15, 2006) departure from average temperature (interpolated).

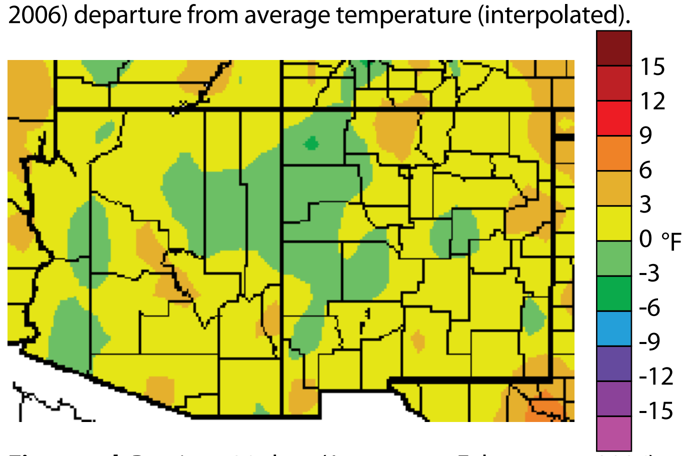
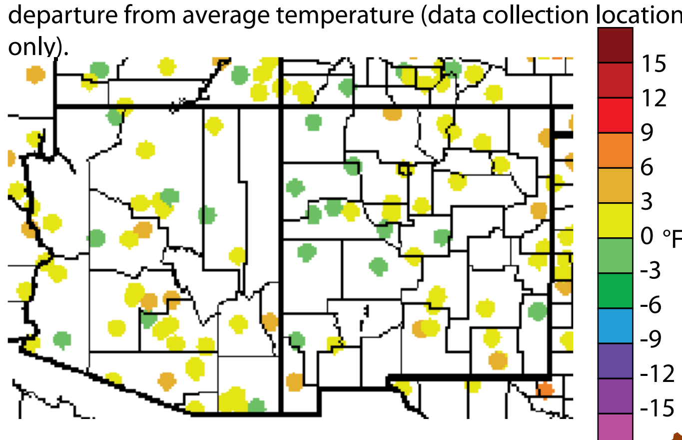


Figure 1d. Previous 30 days (January 17–February 15, 2006) departure from average temperature (data collection locations only).



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 2/15/06)

Source: High Plains Regional Climate Center

Since the start of the water year on October 1, 2005, precipitation all across the Southwest has been below average, with most of the region receiving less than 50 percent of average (Figures 2a–d). Most of southern and western Arizona and parts of eastern New Mexico received less than 25 percent of average, while some parts of southern Arizona experienced only 5 percent or less of average. Over the last 30 days the situation has deteriorated even more, with most of the Southwest receiving 25 percent or less of average, except along the central and northern portion of the Arizona-New Mexico border, and a narrow strip along the Colorado border in northeastern New Mexico. In New Mexico a portion of Catron County recorded slightly more than average precipitation. Most of the western half of Arizona and much of eastern New Mexico received only 2 percent or less of average.

According to the National Weather Service, no precipitation has been recorded at Phoenix Sky Harbor Airport since October 18, 2005, a record 122 consecutive days without even a trace of rain as of February 17, 2006. The previous record was 101 consecutive days from September 23, 1999 through January 1, 2000.

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 February 15, 2006 percent of average precipitation (interpolated).

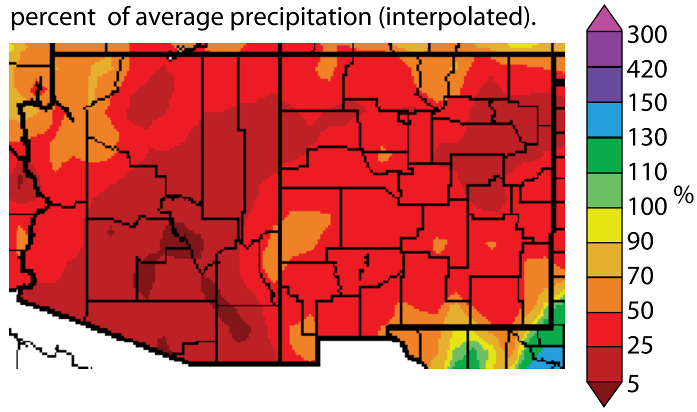


Figure 2b. Water year '05–'06 through February 15, 2006 percent of average precipitation (data collection locations only).

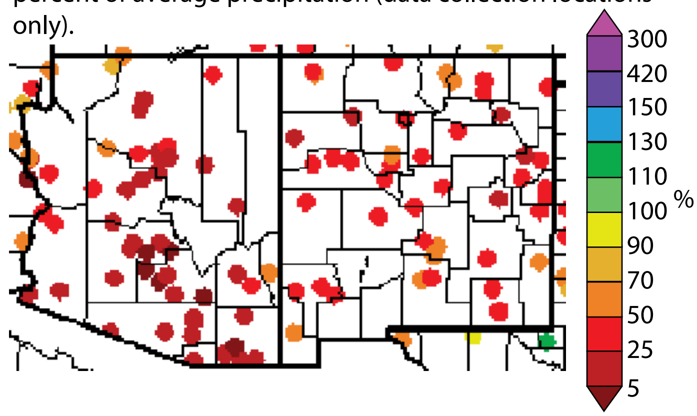


Figure 2c. Previous 30 days (January 17–February 15, 2006) percent of average precipitation (interpolated).

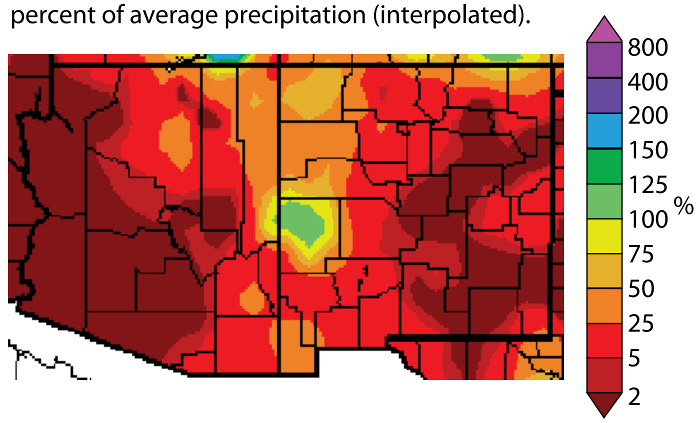
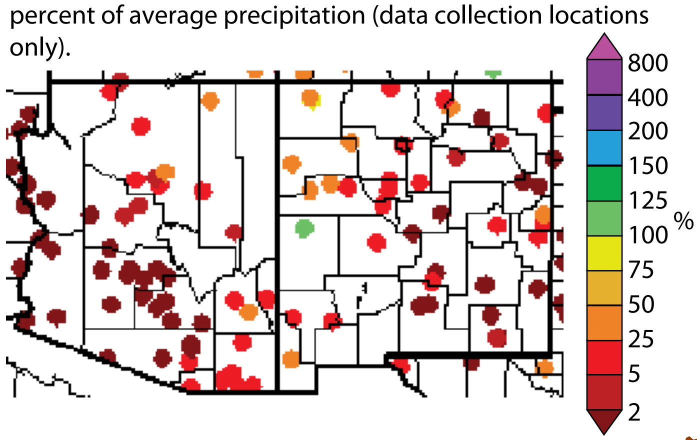


Figure 2d. Previous 30 days (January 17–February 15, 2006) percent of average precipitation (data collection locations only).



U.S. Drought Monitor
(released 2/16/06)

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

Drought conditions have continued to worsen in the Southwest since this time last month (Figure 3). Extreme drought conditions were introduced in southeastern Arizona in late January and have expanded to include most of southeastern and east-central Arizona, along with part of extreme southwestern New Mexico. The entire Southwest has had much below-average precipitation since the water year began. Since last month severe drought conditions have expanded from southeast Arizona and southwest New Mexico and now extend into southwestern, central, and parts of northern Arizona, and include much of western New Mexico. The rest of the Southwest is now experiencing moderate drought, except for extreme western and northwestern Arizona, which are abnormally dry.

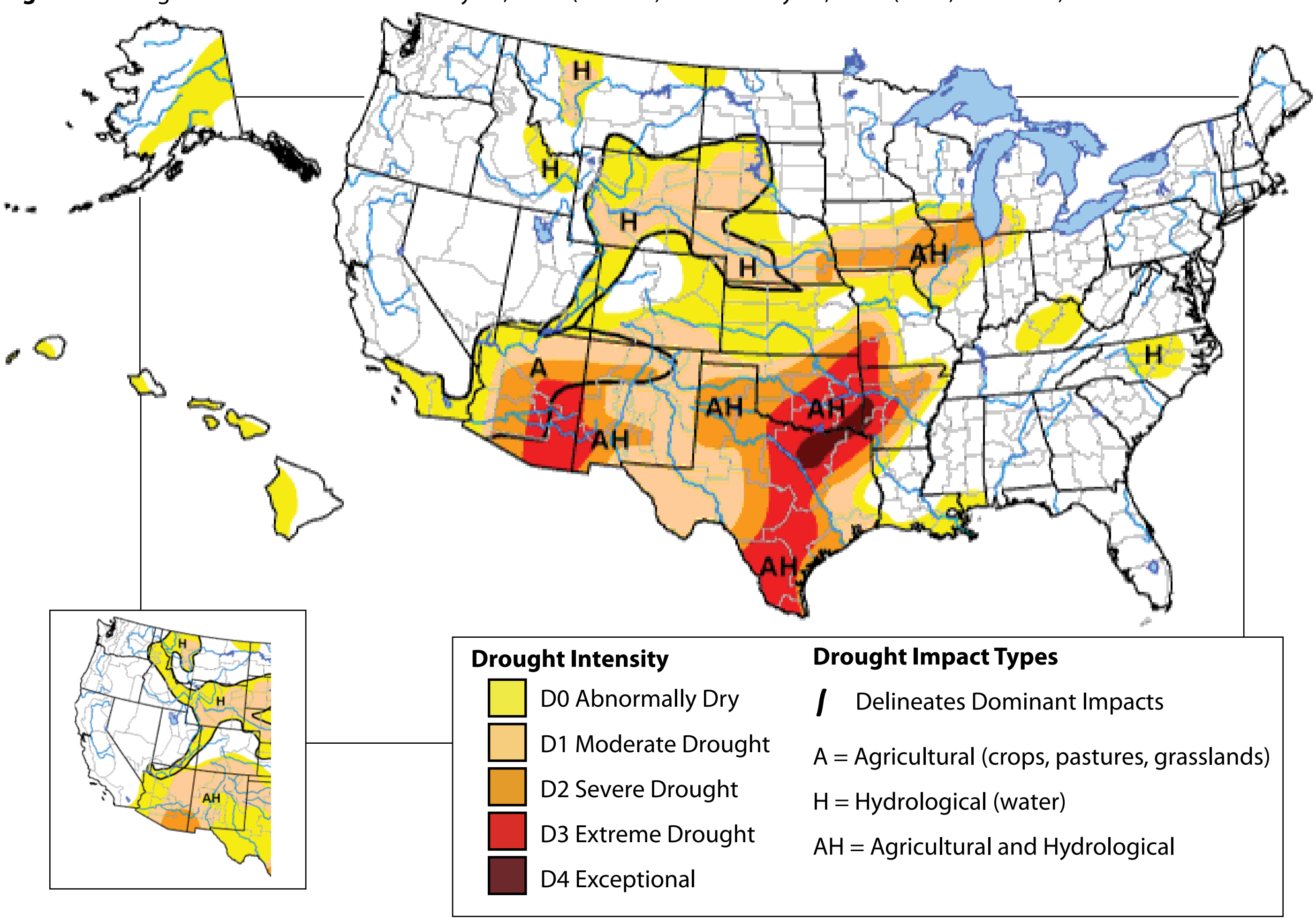
Fire danger is high in the Southwest, especially for this time of year. The combination of severe drought, abundant fine fuels produced by the wet winter of 2004–2005, and the warmer-than-average temperatures have created the prospect of what may become a very active fire season. Fire officials expect an early start to the fire season with a high likelihood for early season timber fires.

Notes:

The U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The inset (lower left) shows the western United States from the previous month's map.

The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of the several agencies; the author of this monitor is David Miskus, JAWF/CPC/NOAA.

Figure 3. Drought Monitor released February 16, 2006 (full size) and January 19, 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

New Mexico Drought Status

(through 2/16/06)

Source: New Mexico Natural Resources Conservation Service

Drought conditions have continued to deteriorate in New Mexico. As of February 14 all of the state was in moderate or higher drought status, with much of the western part in severe drought, and a portion of extreme southwestern New Mexico in extreme drought (see Figure 3). Nearly all of New Mexico has experienced exceptionally dry weather since mid-October. The average precipitation for the state in January was only 28 percent of the long-term average, with much of southeastern New Mexico receiving less than 10 percent of average. According to the National Weather Service (NWS), parts of southern New Mexico may not have experienced a drier winter in recorded history. Agricultural drought exists over the entire state, and hydrologic drought exists in all but the northwestern part of New Mexico. Reservoir storage is better than it was last year because of the wet winter of 2004–2005. Storage in most of the reservoir systems near the Colorado border is above average, but systems in the central and southern portions of the state are below average.

Fire danger is high in New Mexico, especially for this time of year, as is the case throughout the Southwest. According to the NWS, the combination of short-term and long-term drought, coupled with the abundant fine fuel produced during the previous wet winter, will create the prospect of a severe, extended fire season in 2006. The greatest threat in February and March will be over the grasslands, spreading into higher terrain from April into early summer.

Notes:

The New Mexico drought status maps are produced monthly by the New Mexico Drought Monitoring Workgroup. When near-normal conditions exist, they are updated quarterly. The maps are based on expert assessment of variables including, but not limited to, precipitation, drought indices, reservoir levels, and streamflow.

Figure 4a shows short-term or *meteorological* drought conditions. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) over a relatively short duration (e.g., months). Figure 4b refers to long-term drought, sometimes known as *hydrological* drought. Hydrological drought is associated with the effects of relatively long periods of precipitation shortfalls (e.g., many months to years) on water supplies (i.e., streamflow, reservoir and lake levels, groundwater). This map is organized by river basins—the white regions are areas where no major river system is found.

On the Web:

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

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

Figure 4a. Short-term drought map based on meteorological conditions as of January 13, 2006.

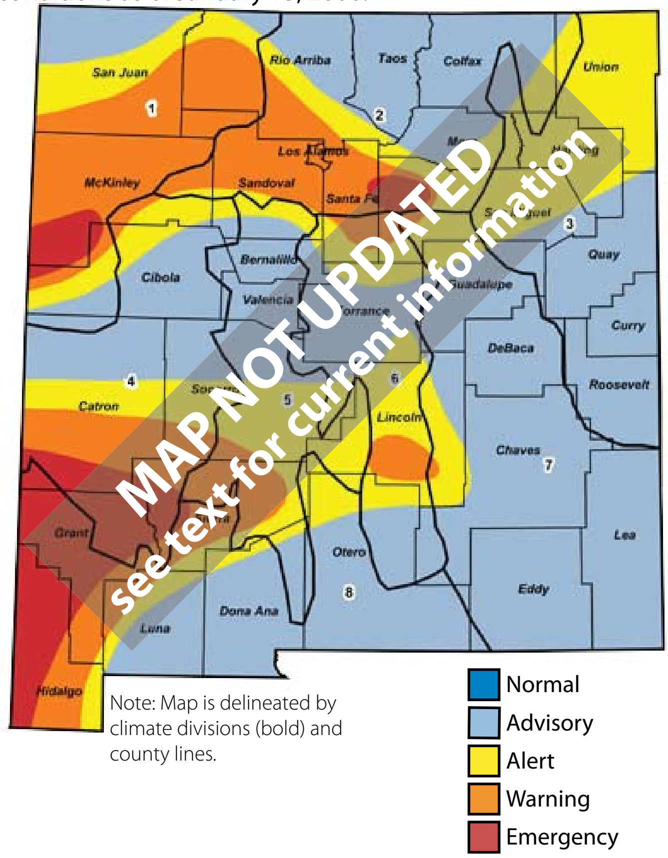
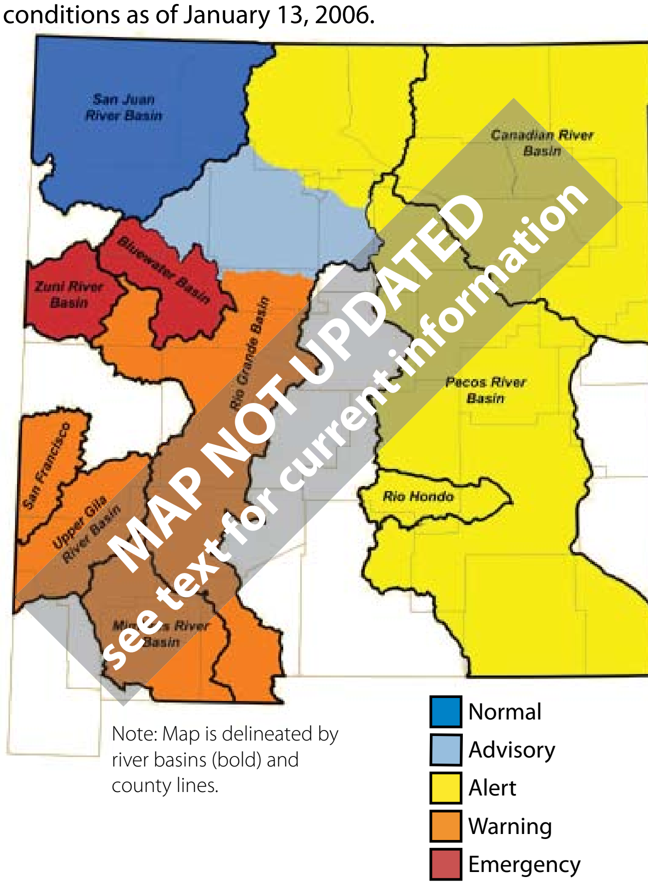


Figure 4b. Long-term drought map based on hydrological conditions as of January 13, 2006.



Arizona Reservoir Levels

(through 1/31/06)

Source: National Water and Climate Center

Arizona reservoir storage has changed only slightly since last month. Most Arizona reservoirs are at above-average levels, thanks to the abundant rain and snow received during the wet winter and spring of 2004–2005, but the two large reservoirs on the Colorado River, Lake Powell and Lake Mead, remain at below-average levels due to long-term precipitation deficits in the Upper Colorado River Basin. Storage on the Salt River and in the San Carlos reservoir (Gila River) declined by one percent of capacity each, while Lyman Reservoir rose by one percent of capacity. Show Low Lake and the Verde River system held steady at 100 and 53 percent of capacity, respectively. On the Colorado River, Lake Powell and Lake Havasu declined by 2 and 3 percent of capacity, respectively, while Lake Mohave remained steady, and Lake Mead rose by 1 percent of capacity.

According to the *Arizona Republic* (February 7), water officials from the seven states that share the Colorado River reached an agreement at the end of January on a comprehensive drought plan for the river. The 1922 Colorado River Compact divided up the estimated annual flow between those states, and a subsequent treaty allowed for additional water to be delivered to Mexico. Experts now believe that the long-term flow of the river is not capable of meeting those demands. Growth in the West and the present drought have created the necessity for a new management plan. Subject to final approval by the Department of the Interior, the agreement is expected to provide a comprehensive plan to manage water allocations on the river during droughts and in wet periods, and to avoid legal battles between the states. The seven Colorado River states are Arizona, New Mexico, Colorado, Utah, Wyoming, Nevada, and California.

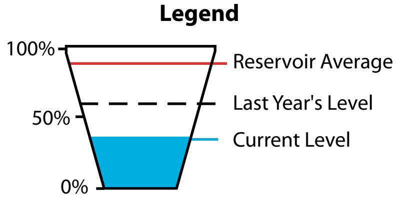
Notes:

The map gives a representation of current storage levels for reservoirs in Arizona. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total capacity. Note that while the size of each cup varies with the size of the reservoir, these are representational and not to scale. Each cup also represents last year's storage level (dotted line) and the 1971–2000 reservoir average (red line).

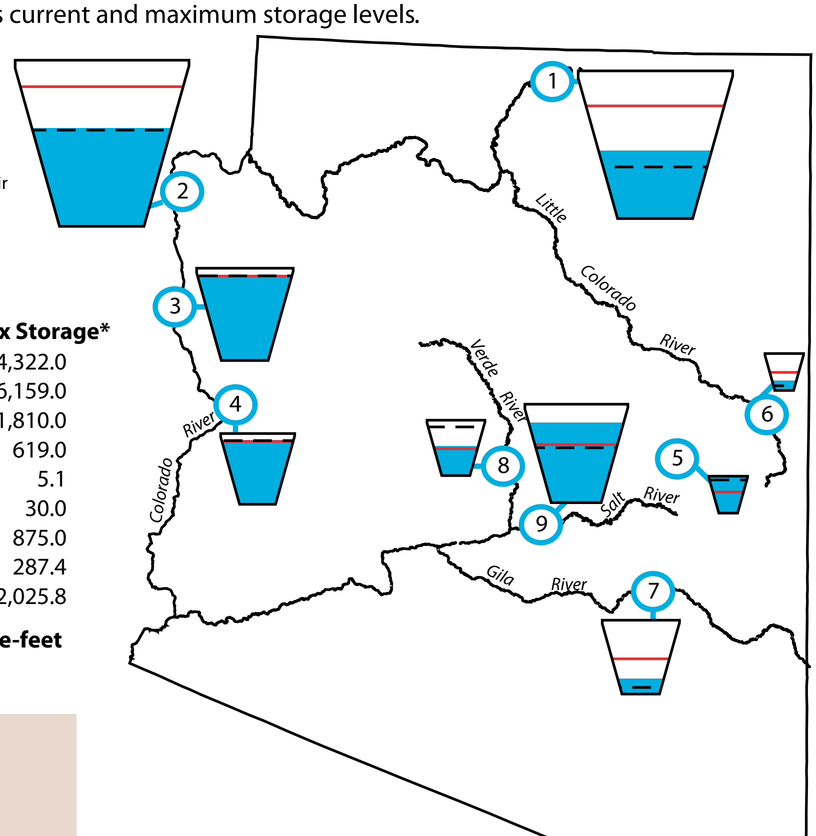
The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels are given in thousands of acre-feet for each reservoir.

These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) or Larry Martinez, Natural Resource Conservation Service, 3003 N. Central Ave, Suite 800, Phoenix, Arizona 85012-2945; 602-280-8841; Larry.Martinez@az.usda.gov).

Figure 5. Arizona reservoir levels for January 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	46%	11,206.0	24,322.0
2. Lake Mead	59%	15,335.0	26,159.0
3. Lake Mohave	90%	1,631.5	1,810.0
4. Lake Havasu	91%	561.9	619.0
5. Show Low Lake	100%	5.1	5.1
6. Lyman Reservoir	27%	8.0	30.0
7. San Carlos	21%	183.7	875.0
8. Verde River System	53%	151.0	287.4
9. Salt River System	81%	1,644.6	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 1/31/06)

Source: National Water and Climate Center

Reservoir storage in New Mexico remained fairly steady over the last month. Lake Avalon rose by 9 percent of capacity, while most other reservoirs rose slightly, from 1 to 4 percent of capacity. Santa Rosa, Caballo, and Cochiti were unchanged, while Heron fell by 4 percent of capacity. Statewide storage increased slightly from 40 to 41 percent of capacity. Thanks to the moisture and snowpack from the winter and spring of last year, New Mexico's reservoir storage is substantially better throughout most of the state than at this time last year. The total reservoir storage is currently 78 percent of the long-term average, compared to only 50 percent of average a year ago. Most of the systems near the Colorado border are currently above average. These include Navajo on the San Juan River, and El Vado, Abiquiu, and Costilla on the Rio Grande. Santa Rosa on the Pecos River is also higher than average. In central and southern New Mexico the major storage systems are all below the long-term average. Caballo and Elephant Butte on the lower Rio Grande are at 18 and 36 percent of average, respectively. Elephant Butte, the largest reservoir in the state with a total storage capacity of slightly more than two million acre-feet, is at only 23 percent of capacity.

According to the *Alamogordo Daily News* (February 1), Otero County has declared a county-wide drought emergency with the hope of obtaining state assistance to reduce the adverse impacts of the drought. Officials report significant reductions in springs supplying water to the Cloudcroft area, and reductions in irrigation water flow. The city of Alamogordo reports that Bonito Lake Reservoir is 16 vertical feet below its average level. In addition, the abundant dried grasses have created an increased fire danger.

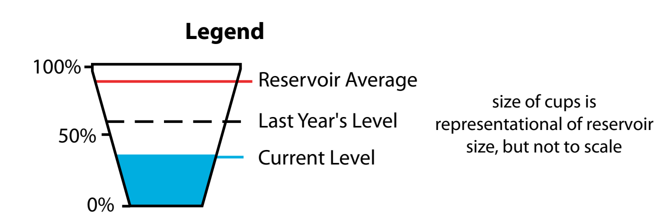
Notes:

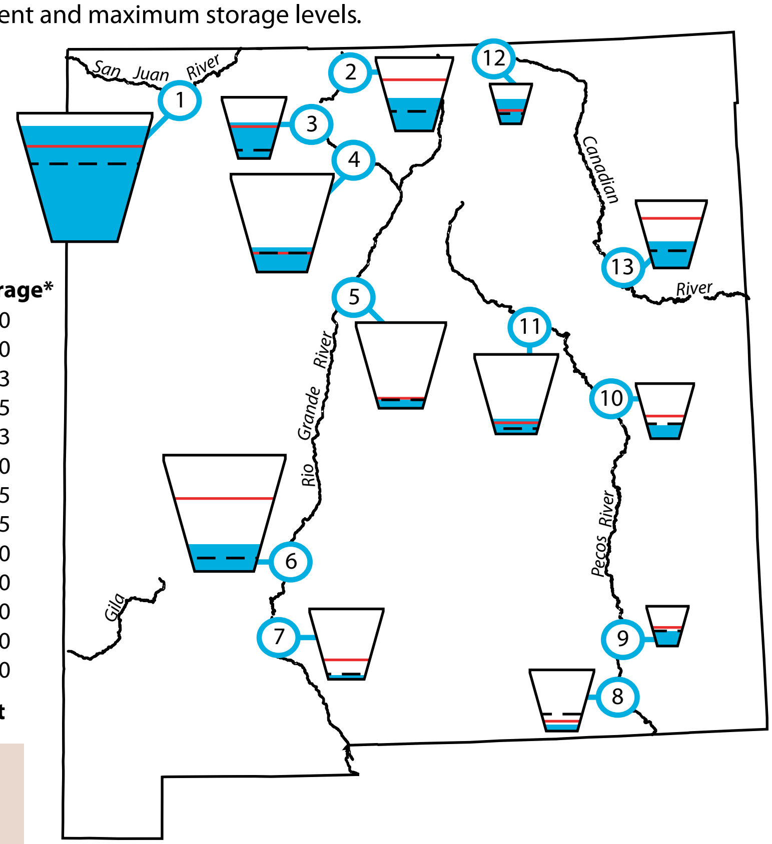
The map gives a representation of current storage levels for reservoirs in New Mexico. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total capacity. Note that while the size of each cup varies with the size of the reservoir, these are representational and not to scale. Each cup also represents last year's storage level (dotted line) and the 1971–2000 reservoir average (red line).

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

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

Figure 6. New Mexico reservoir levels for January 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	90%	1,520.9	1,696.0
2. Heron	45%	180.0	400.0
3. El Vado	59%	109.2	186.3
4. Abiquiu	26%	144.6	554.5
5. Cochiti	10%	50.0	502.3
6. Elephant Butte	23%	467.8	2,065.0
7. Caballo	5%	16.8	331.5
8. Brantley	10%	14.7	147.5
9. Lake Avalon	37%	2.2	6.0
10. Sumner	24%	24.4	102.0
11. Santa Rosa	19%	83.5	447.0
12. Costilla	62%	9.9	16.0
13. Conchas	39%	99.5	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

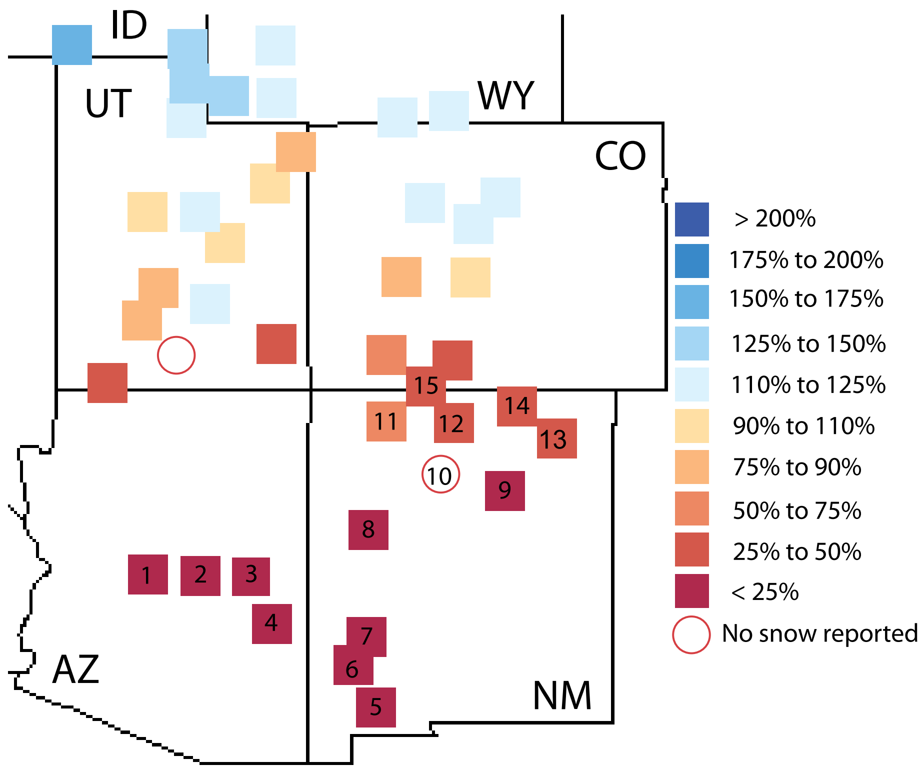
Southwest Snowpack

(updated 2/16/06)

Sources: National Water and Climate Center, Western Regional Climate Center

Snowpack in the Southwest continues to be well below average throughout the region, with most SNOTEL sites in Arizona and New Mexico reporting less than 50 percent of average snow water content (SWC) as of February 16 (Figure 7). According to officials at the National Resources Conservation Service and the National Weather Service, the winter of 2005–2006 may set a record for the least amount of snowpack across the Southwest. All of the basins in Arizona and southern New Mexico have recorded less than 10 percent of average SWC. Snow measurements conducted in February show very little snow to exist across the mountain watersheds of north-central Arizona. Snowpack across the northern New Mexico mountains is in somewhat better shape, but even there it is generally well below average. The skimpy snowpack in New Mexico has been further depleted by early spring winds. Because a La Niña event is currently in progress in the equatorial Pacific Ocean, it is unlikely that much more snow will fall in Arizona and New Mexico this season (see Figure 9a). La Niña events are typically associated with dry weather in the Southwest, especially during the winter and spring.

Figure 7. Average snow water content (SWC) in percent of average for available monitoring sites as of February 16, 2006.



Arizona Basins
1 Verde River Basin
2 Central Mogollon Rim
3 Little Colorado - Southern Headwaters
4 Salt River Basin

New Mexico Basins
5 Mimbres River Basin
6 San Francisco River Basin
7 Gila River Basin
8 Zuni/Bluewater River Basin
9 Pecos River
10 Jemez River Basin
11 San Miguel, Dolores, Animas, and San Juan River Basins
12 Rio Chama River Basin
13 Cimarron River Basin
14 Sangre de Cristo Mountain Range Basin
15 San Juan River Headwaters

Ski resorts in Arizona and New Mexico have been struggling with the lack of snow. Some ski areas have made artificial snow, but others are relying on winter entertainment such as restaurant, lodge, and gift shop trade to maintain their business. *Alamogordo Daily News* (February 12) reports that the Mount Taylor Quadrathlon will still be held, but organizers will likely replace the ski events with running.

On the Web:

For color maps of SNOTEL basin snow water content, visit: http://www.wrcc.dri.edu/snotelanom/basinswe.html

For a numeric version of the map, visit: http://www.wrcc.dri.edu/snotelanom/basinswen.html

For a list of river basin snow water content and precipitation, visit: http://www.wrcc.dri.edu/snotelanom/snotelbasin

Notes:

Snowpack telemetry (SNOTEL) sites are automated stations that measure snowpack depth, temperature, precipitation, soil moisture content, and soil saturation. A parameter called snow water content (SWC) or snow water equivalent (SWE) is calculated from this information. SWC refers to the depth of water that would result by melting the snowpack at the SNOTEL site and is important in estimating runoff and streamflow. It depends mainly on the density of the snow. Given two snow samples of the same depth, heavy, wet snow will yield a greater SWC than light, powdery snow.

Figure 7 shows the SWC for selected river basins, based on SNOTEL sites in or near the basins, compared to the 1971–2000 average values. The number of SNOTEL sites varies by basin. Basins with more than one site are represented as an average of the sites. Individual sites do not always report data due to lack of snow or instrument error.

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

The NOAA-CPC forecasts above-average temperatures for the Southwest through August 2006 (Figures 8a–8d). The March–May outlook calls for increased chances of warmer-than-average temperatures throughout the South and West and increased chances for cooler-than-average temperatures in the northern Rockies and Great Plains (Figure 8a). Areas with highest probabilities for above-average temperatures include central and southeastern Arizona, and central and southwestern New Mexico. As forecasts progress through the spring and summer, the greatest likelihoods for warm temperatures are in northwest Arizona, southern Nevada, and southeastern California. Warmer temperatures in spring and summer could hasten the mountain snow runoff and could also increase the risk of early season fire danger.

Notes:

These outlooks predict the likelihood (chance) of above-average, average, and below-average temperature, but not the magnitude of such variation. The numbers on the maps do not refer to degrees of temperature.

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1971–2000 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the "average" category is preserved at 33.3 likelihood, unless the forecast is very strong.

Thus, using the NOAA-CPC temperature outlook, areas with light brown shading display a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average temperature. A shade darker brown indicates a 40.0–50.0 percent chance of above-average, a 33.3 percent chance of average, and a 16.7–26.6 percent chance of below-average temperature, and so on.

Equal Chances (EC) indicates areas where the reliability (i.e., 'skill') of the forecast is poor; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a "default option" when forecast skill is poor.

Figure 8a. Long-lead national temperature forecast for March–May 2006.

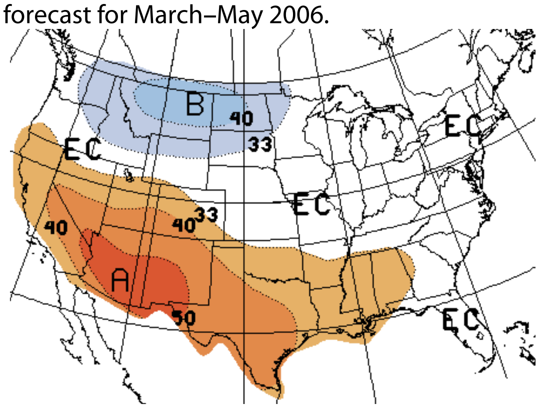


Figure 8b. Long-lead national temperature forecast for April–June 2006.

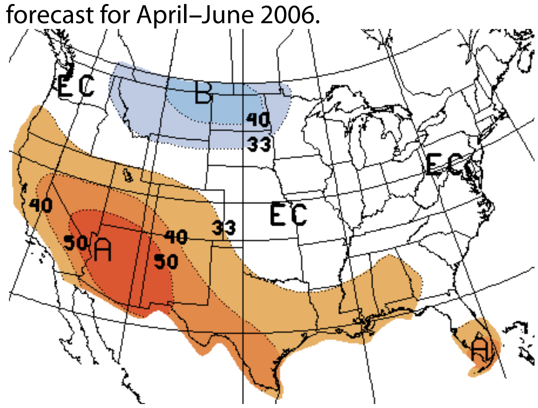


Figure 8c. Long-lead national temperature forecast for May–July 2006.

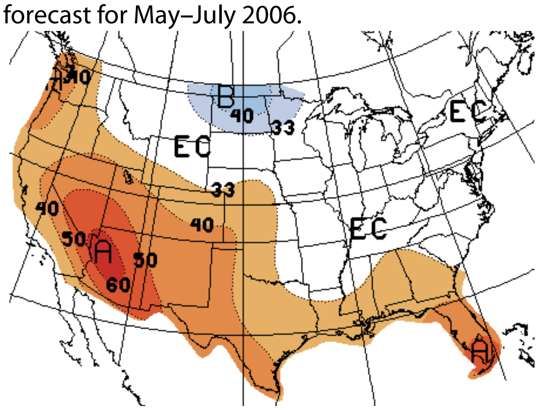
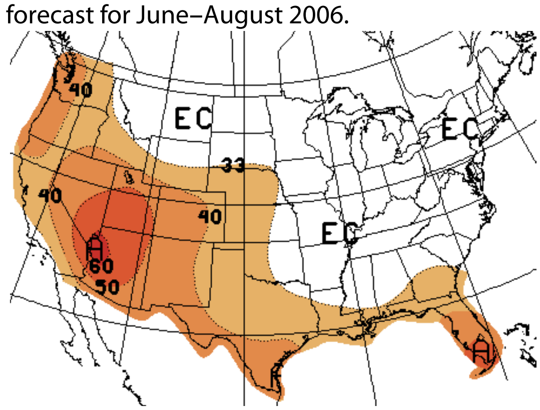


Figure 8d. Long-lead national temperature forecast for June–August 2006.



A= Above
- 60.0–69.9%
- 50.0–59.9%
- 40.0–49.9%
- 33.3–39.9%

B= Below
- 40.0–49.9%
- 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

On the Web:

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

(March–August 2006)

Source: NOAA Climate Prediction Center (CPC)

Forecasters from NOAA-CPC predict below average precipitation for the Southwest and Southeast during March–May (Figure 9a). Some minor drought relief could come to parts of the Southwest during the early summer period into the monsoon season as models predict increased chances for above-average precipitation in southern Arizona (Figure 9c). Eastern New Mexico could have below-average precipitation during this same period. Forecasts through August predict increased chances for above-average precipitation in southeastern Arizona, though forecasters have reserved judgment for most of New Mexico (Figure 9d). Precipitation forecasts are closely tied to cycles of the El Niño Southern Oscillation (ENSO). During the La Niña phase of ENSO, winter to early spring precipitation is likely to be suppressed. Currently, Pacific Ocean conditions are in a weak La Niña phase (Figure 12).

Notes:

These outlooks predict the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps do not refer to inches of precipitation.

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1971–2000 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the "average" category is preserved at 33.3 likelihood, unless the forecast is very strong.

Thus, using the NOAA-CPC precipitation outlook, areas with light green shading display a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation. A shade darker green indicates a 40.0–50.0 percent chance of above-average, a 33.3 percent chance of average, and a 16.7–26.6 percent chance of below-average precipitation, and so on.

Equal Chances (EC) indicates areas where the reliability (i.e., 'skill') of the forecast is poor; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a "default option" when forecast skill is poor.

Figure 9a. Long-lead national precipitation forecast for March–May 2006.

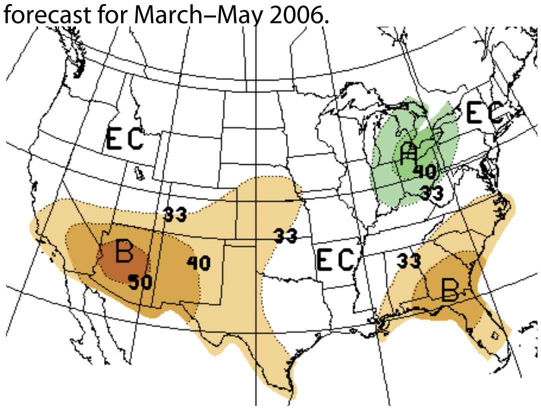


Figure 9b. Long-lead national precipitation forecast for April–June 2006.

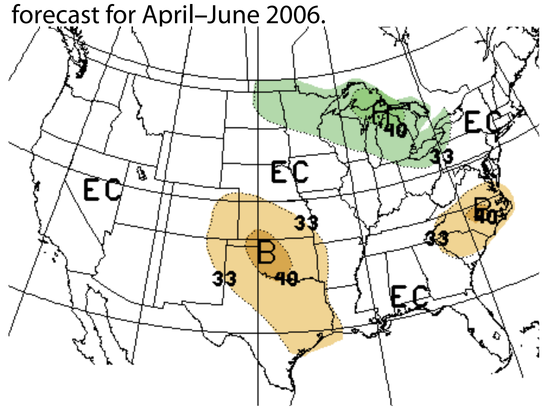


Figure 9c. Long-lead national precipitation forecast for May–July 2006.

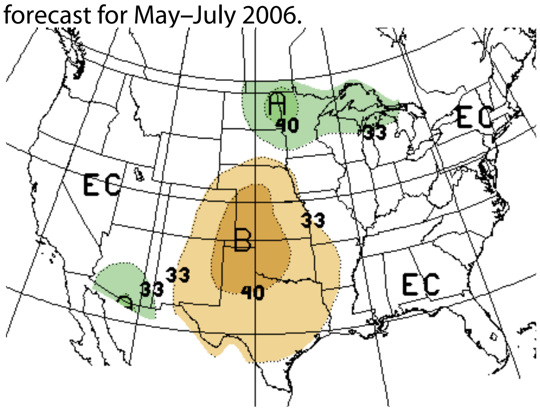
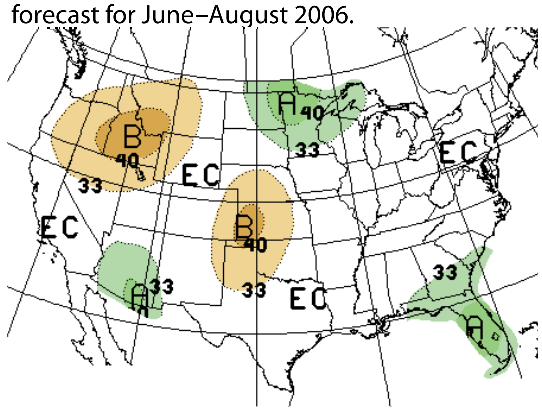


Figure 9d. Long-lead national precipitation forecast for June–August 2006.



A= Above: 40.0–49.9%; 33.3–39.9%

B= Below: 33.3–39.9%; 40.0–49.9%

EC= Equal chances. No forecasted anomalies.

On the Web:

For more information on CPC forecasts, visit:
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html
(note that this website has many graphics and may load slowly on your computer)

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

Seasonal Drought Outlook
(through May 2006)

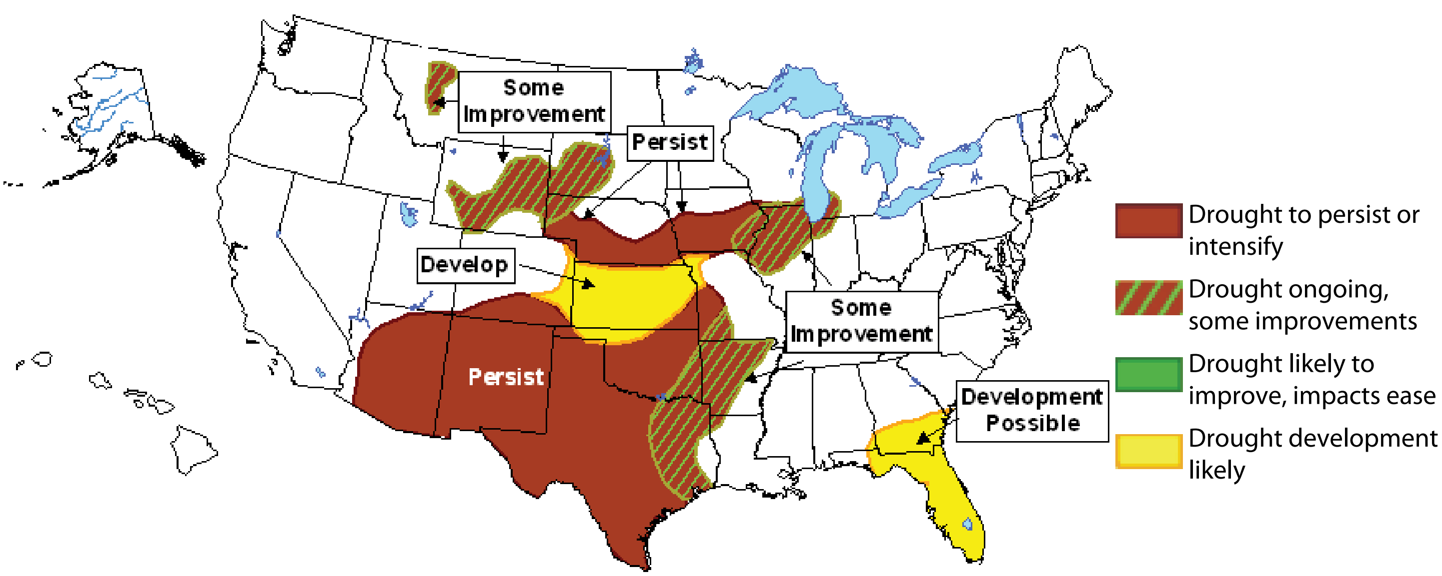
Source: NOAA Climate Prediction Center (CPC)

The U.S. drought outlook through May 2006 calls for persistent drought conditions throughout most of Arizona and New Mexico (Figure 10). Contributing to this forecast are concurrent predictions for above-average temperatures and below-average precipitation in the Southwest (Figures 8–9). Drought conditions are also expected to persist throughout the Great Plains from Nebraska and Iowa south to Texas. Drought development is forecasted in Florida and Kansas, while conditions are expected to ease in Wyoming, northern Illinois, Arkansas, and east Texas. Persistence or intensification of drought conditions could contribute to elevated fire risks across the Southwest through the spring and into the summer season.

Notes:

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

Figure 10. Seasonal drought outlook through May 2006 (release date February 16, 2006).



On the Web:

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

Streamflow Forecast
(for spring and summer)

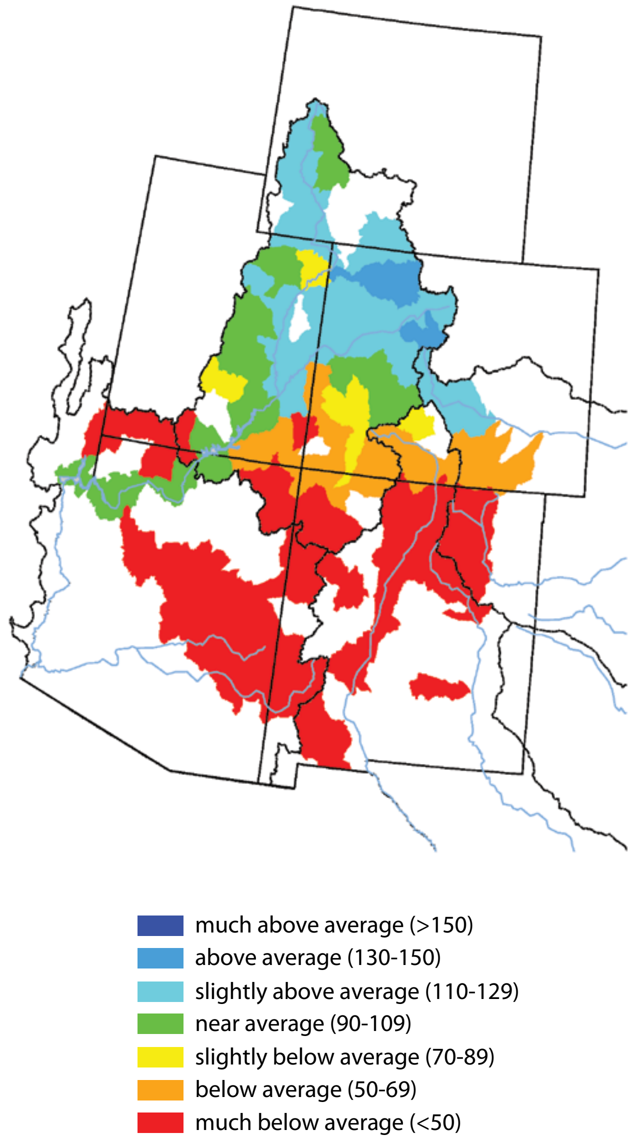
Source: National Water and Climate Center

The streamflow forecast for rivers in the Southwest is well below average during the spring and summer (Figure 11), while flow on the Colorado River is expected to be near average. Snowpack levels have continued to be very low in northern New Mexico and nearly non-existent in Arizona and southern New Mexico, leading to streamflow forecasts of less than 50 percent of average for most of the Southwest's rivers. Dry and windy conditions over the last month have further depleted much of the meager snow. Many of the basins in Arizona and New Mexico are expected to produce only 25 to 40 percent of average streamflow. There is slightly more snowpack in the northern mountains of New Mexico (see Figure 7), where streamflow is expected to be somewhat better but still well below average. The recent development of La Niña conditions makes it unlikely that much more snow or rain will fall in Arizona or New Mexico over the next few months, increasing the probability of a very poor runoff season for the Southwest.

The situation is better along the Colorado River in Arizona. The snowpack in the Upper Colorado River Basin is generally above average for this time of year, and the inflow to Lake Powell is expected to be about 102 percent of average.

Since much of the water in western rivers is from snowmelt, the amount of snowfall in the coming months will greatly influence the actual streamflow. Also tied to the streamflow forecast are temperature and precipitation forecasts. The long-lead outlook for the Southwest is for continued below-average precipitation and above-average temperatures over the next few months. Continued measurement of these factors that influence runoff leads to improved streamflow forecasts later in the season. Therefore the Natural Resources Conservation Service, which produces the forecasts, cautions that early forecasts generally undergo greater changes than late-season forecasts.

Figure 11. Spring and summer streamflow forecast as of February 1, 2006 (percent of average).



On the Web:

For state river basin streamflow probability charts, visit:
http://www.wcc.nrcs.usda.gov/cgibin/strm_cht.pl

For information on interpreting streamflow forecasts, visit:
http://www.wcc.nrcs.usda.gov/factpub/intrpret.html

For western U.S. water supply outlooks, visit:
http://www.wcc.nrcs.usda.gov/water/quantity/westwide.html

Notes:

The forecast information provided in Figure 11 is updated monthly by the National Water and Climate Center, part of the U.S. Department of Agriculture's Natural Resources Conservation Service. Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences, such as reservoirs and diversions. The USDA-NRCS only produces streamflow forecasts for Arizona between January and April, and for New Mexico between January and May.

The NWCC provides a range of forecasts expressed in terms of percent of average streamflow for various statistical exceedance levels. The streamflow forecast presented here is for the 50 percent exceedance level, and is referred to as the most probable streamflow. This means there is at least a 50 percent chance that streamflow will occur at the percent of average shown in Figure 11..

El Niño Status and Forecast

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

According to the NOAA-CPC, La Niña conditions have developed in the equatorial Pacific Ocean and are expected to continue for the next three to six months. Sea surface temperatures (SST) are cooler than average by more than 0.5 degrees Celsius across much of the central equatorial Pacific Ocean, and persistent stronger-than-average low-level equatorial easterly winds are being observed over the central Pacific.

The Southern Oscillation Index (SOI) has shown a generally steady increase since last spring, and is now registering La Niña conditions (Figure 12a). According to experts at CPC and IRI, these and other conditions in the Pacific Ocean support the continuation of weak La Niña conditions in the tropical Pacific during the next few months. Probabilistic forecasts issued by the IRI predict that there is a 65 percent chance that La Niña conditions will continue through April 2006, after which there is an increasing probability of returning to ENSO-neutral conditions (Figure 12b). There is some variation among different ENSO model forecasts (not shown), mainly for the longer-lead seasons, but experts think that most of the evidence favors maintenance of La Niña conditions through May. The majority of the models indicate a return to neutral conditions in early summer.

Historically, La Niña conditions tend to favor a northward shift of the jet stream over the eastern Pacific during the wintertime, with the mean jet position entering North America near the US-Canadian border, rather than over California. As a result, the Southwest experiences less storminess and precipitation, and warmer-than-normal temperatures. Snowfall during La Niña winters in Arizona and New Mexico averages several inches less than during ENSO-neutral winters.

Notes:

Figure 12a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through January 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 12b shows the International Research Institute for Climate Prediction (IRI) probabilistic El Niño-Southern Oscillation (ENSO) forecast for overlapping three month seasons. The forecast expresses the probabilities (chances) of the occurrence of three ocean conditions in the ENSO-sensitive Niño 3.4 region, as follows: El Niño, defined as the warmest 25 percent of Niño 3.4 sea-surface temperatures (SSTs) during the three month period in question; La Niña conditions, the coolest 25 percent of Niño 3.4 SSTs; and neutral conditions where SSTs fall within the remaining 50 percent of observations. The IRI probabilistic ENSO forecast is a subjective assessment of current model forecasts of Niño 3.4 SSTs that are made monthly. The forecast takes into account the indications of the individual forecast models (including expert knowledge of model skill), an average of the models, and other factors.

On the Web:

For a technical discussion of current El Niño conditions, visit:
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/

For more information about El Niño and to access graphics similar to the figures on this page, visit:
http://iri.columbia.edu/climate/ENSO/

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

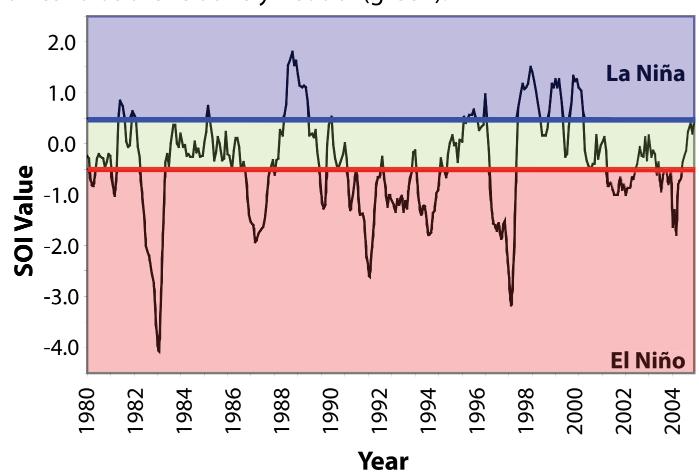
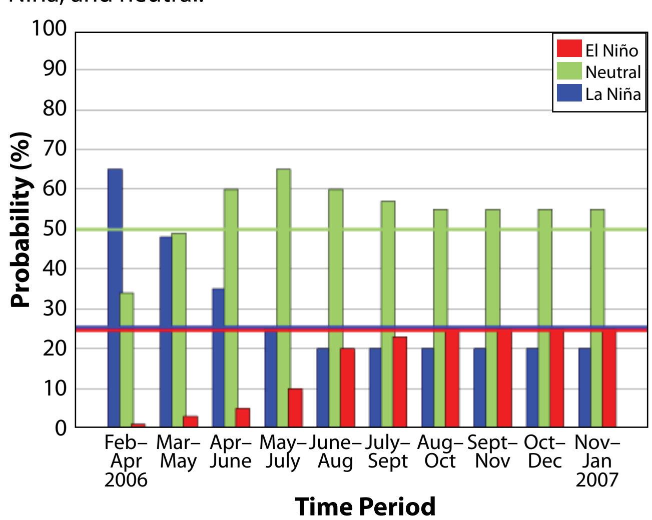


Figure 12b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released February 15, 2006). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Temperature Verification

(November 2005–January 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range forecast for November 2005–January 2006 from the NOAA-CPC predicted increased chances of above-average temperatures throughout almost the entire West, from central Texas to Canada. The highest probability was centered over the Southwest, including New Mexico and most of Arizona, and adjacent parts of California, Texas, Oklahoma, Kansas, Colorado, Utah, and Nevada (Figure 13a). No temperature forecast was made for the rest of the country. Observed temperatures across most of the nation ranged from 0–10 degrees Fahrenheit above average, with some small scattered areas of 0–2 degrees F below average. The warmest temperatures were in the Upper Midwest and West near the Canadian border, centered over the Dakotas. Temperatures in the Southwest ranged generally from 0–6 degrees F above average, with a few small areas of 0–2 degrees F below average. The forecast performed quite well in predicting the above-average temperatures across the West, although the placement of the major anomalies did not quite match the observed temperatures.

Figure 13a. Long-lead U.S. temperature forecast for November 2005–January 2006 (issued October 2005).

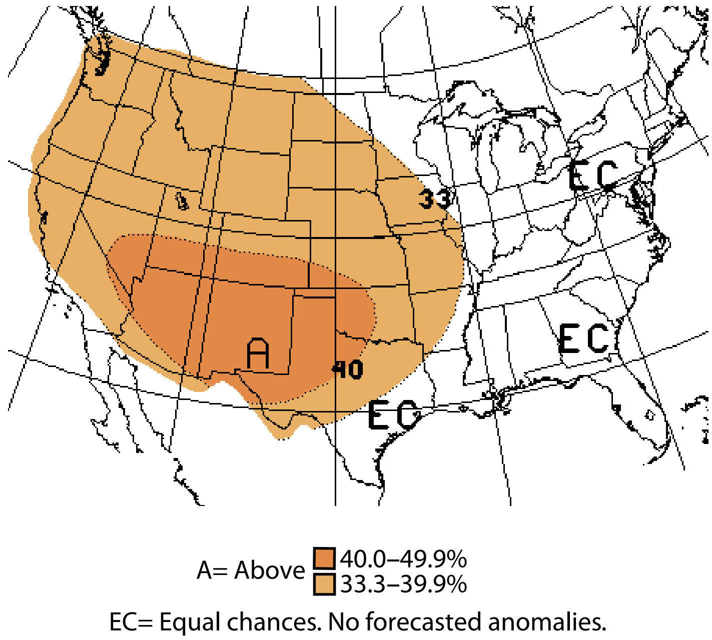
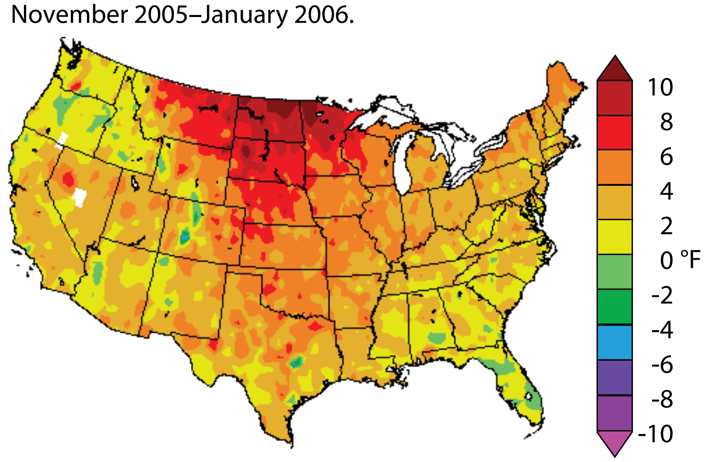


Figure 13b. Average temperature departure (in degrees F) for November 2005–January 2006.



Notes:

Figure 13a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months November 2005–January 2006. This forecast was made in October 2005.

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 13b shows the observed departure of temperature (degrees F) from the average for the November 2005–January 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

(November 2005–January 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range outlook from the NOAA-CPC for November 2005–January 2006 predicted increased chances of below-average precipitation in Arizona, western New Mexico, southern California, and southern Nevada, with the area of highest probability centered over southern Arizona, and extending into adjacent parts of southwestern New Mexico and southern California (Figure 14a). Above-average precipitation was predicted in east Texas, Louisiana, Arkansas, and Oklahoma, and parts of Kansas and Missouri. Precipitation across the country during the period was generally well below average in most of the southern tier of states, but generally above average in the Northwest and North, and along much of the East Coast. Observed precipitation all across the Southwest was much below average, generally ranging from 0 to less than 25 percent of average. The forecast performed well predicting the dry conditions in the Southwest, but did poorly in predicting wet conditions in east Texas and surrounding states, where below-average precipitation occurred.

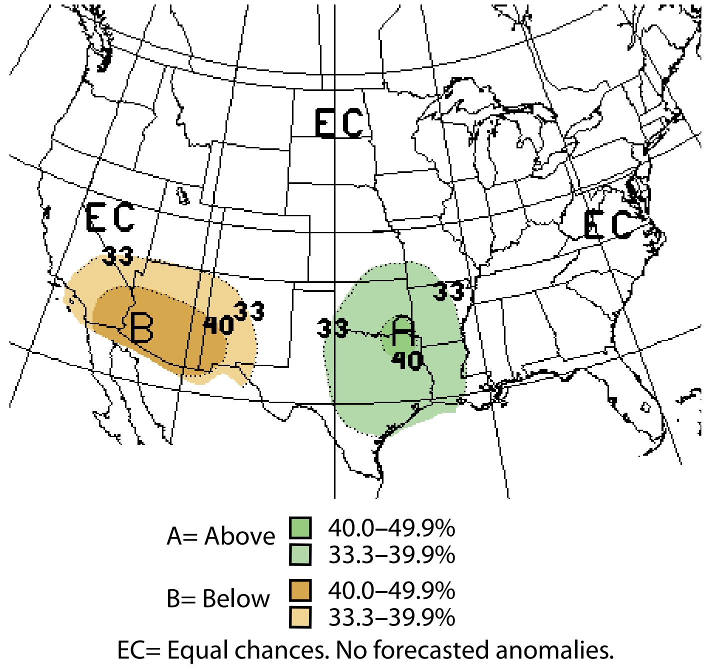


Figure 14a. Long-lead U.S. precipitation forecast for November 2005–January 2006 (issued October 2005).

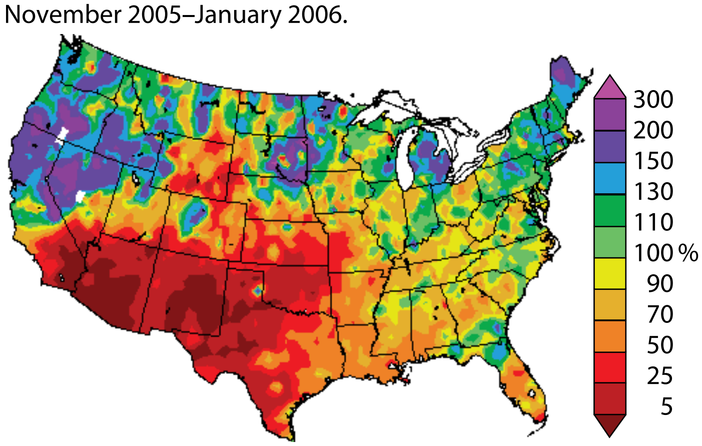


Figure 14b. Percent of average precipitation observed from November 2005–January 2006.

Notes:

Figure 14a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months November 2005–January 2006. This forecast was made in October 2005.

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 14b shows the observed percent of average precipitation for November 2005–January 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