Issued: May 24, 2006

Southwest Climate Outlook

The University of Arizona.

Source: Doug Duncan

Photo Description: This pool in Sharp Spring in the San Rafael Valley has dried back due to drought leaving the water level stage gauge high and dry. Sharp Spring contains, or at least used to contain the endangered fish, the Gila topminnow. The endangered plant, the Huachuca water umbel still occurs there.

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

CLIMAS

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

SAHRA

WaterSustainability
THE UNIVERSITY OF ARIZONA.

In this issue...

U.S. Drought — page 8

Drought conditions in the Southwest have deteriorated since this time last month, with exceptional drought conditions introduced in parts of southeastern Arizona and southwestern New Mexico. The Southwest has experienced much-below-average precipitation...

SW Snowpack — page 13

The 2005–2006 snowpack season in the Southwest has wound up being one of the worst on record. Despite some temporary improvement from precipitation in March and April, snowpack levels in almost all basins throughout Arizona and New Mexico were much below average...

Verification — page 22

Observed precipitation in the Southwest and surrounding regions was a near-perfect match with the predicted anomaly. Precipitation was from 90 percent to less than 25 percent of average in a wide band extending from southern California across Arizona and New Mexico...

May Climate Summary

Drought – Drought has intensified in the Southwest, with most of the region in severe or extreme status and some areas in exceptional drought.

- Southwest drought conditions are expected to persist or intensify, but improvements are expected in western New Mexico and southeastern Arizona.
- The exceptionally low snowpack in most of the basins in Arizona and New Mexico has led to a streamflow forecast of much below average for 2006.
- Reservoirs in Arizona have declined since last year. New Mexico reservoirs are better than last year, but the large Colorado River reservoirs, Elephant Butte, and other important reservoirs remain below average.

Fire Danger – The long-term moisture deficits and the abundant fine dry fuels produced by last year's wet winter point to an active and severe fire season.

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

Precipitation – The Southwest has been much drier than average since the start of the water year, with less than 50 percent of average precipitation in most areas.

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

El Niño – ENSO-neutral conditions have returned and are expected to continue over the next three to six months.

The Bottom Line – Drought is like to persist or intensify over most of the Southwest Hydrological drought continues to affect streamflow and some large reservoir levels, and agricultural drought conditions have persisted throughout the region.

Southwest fire season

The Southwest is facing a potentially very active and intense fire season, particularly in the timber fuel types in the middle to higher elevations, beginning in late May and early June. Fine fuels across Arizona and New Mexico, mostly grasses produced by the wet winter of 2004–2005, and larger fuel types have been dried to a near-continuous carpet of very low moisture content by the severe to extreme drought conditions in the region. The warmer-than-average temperature outlook, coupled with the dry conditions almost always to be expected in May and June in the Southwest, will combine with the unusually dry fuel conditions to produce very high fire potential across the region. No relief is in sight until the arrival of monsoon moisture in June in New Mexico and July in Arizona.

For more information on fire see pages 14 and 19…

Table of Contents:

2 May 2006 Climate Summary
3 Features: Southwest drought can pack a hefty punch and Putting the AZ drought plan into action

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

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

Forecast Verification
21 Temperature Verification
22 Precipitation Verification

SWCO Staff:

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

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

Southwest drought can pack a hefty punch

By Stephanie Doster

The bare slopes in Arizona's high country this winter said it all.

In the grip of one of the state's worst droughts on record, business for Arizona's ski resorts dried up with the weather for much of the 2005–06 season, financially squeezing the industry and some of its snow-dependent communities.

While the ski industry is one of the most visible victims of a dry spell that has taken hold of the Southwest, researchers at the University of Arizona (UA) say the drought likely will cost many millions of dollars if it persists, with the financial fallout extending to agriculture, tourism, recreation, fire suppression, and property values in the months ahead.

"Unlike a tornado, drought is not flashy or obvious," said Gregg Garfin, program manager of the Climate Assessment for the Southwest (CLIMAS) project at UA. "It relentlessly wears away at us and impacts the natural amenities we value and the water supplies we depend on. Tallying drought impacts is like watching a building collapse, only in slow motion."

Before rain and snow pushed through the region on March 11–12, prompting Arizona ski resorts to re-open briefly, some areas of the Southwest had logged a record-breaking dry stretch. The recent precipitation provided a brief respite from drought and La Niña-induced dry conditions, and could

put a damper on the fire season, "but we still have a ways to go for even average streamflow," Garfin said. Streamflow is the total amount of water that flows through river systems that helps replenish the water supply. La Niña, which developed late in the season, is a sustained cooling of sea surface temperatures in the eastern and central tropical Pacific Ocean and is associated with drier winters in the Southwest.

Pinning a dollar amount on the economic effects of drought can be difficult because researchers have to tease out climate variability from a number of other factors that play a role in the market, said George Frisvold, a professor in the UA Department of Agriculture and Resource Economics.

But Frisvold, a CLIMAS investigator, has shown that drought exacts a significant toll on revenue from nature-based tourism and water-recreation in the national parks in the Southwest, where roughly 26 million people annually converge to take advantage of the great outdoors, spending more than $1.3 billion in the surrounding communities in the process.

In a recent study, Frisvold and UA graduate student Srinivasa Ponnaluru found that lake levels, which are tied to drought, influenced the number of visitors to lakes in the region, including Lake Powell in the Glen Canyon National Recreation Area straddling southern Utah and northern Arizona.

continued on page 4

Putting the AZ drought plan into action

By Stephanie Doster

Slumped prickly pear cacti in the desert lowlands. Shuttered ski slopes in the high country. Dead mesquite trees in the rangelands. And charred forest along the Mogollon Rim.

The one-two punch of warm temperatures and a record-breaking dry spell—coming roughly 10 years into a stubborn drought—is sapping life out of the environment in Arizona, while reviving threats of a busy wildfire season, dwindling water supplies, and economic losses in the state.

To better prepare Arizona for such a dry stretch, university researchers, public agencies, citizens, and other water users have been working together to transform the state drought plan into a living, breathing monitoring system that combines science with detailed information about how livestock, rangelands, forests, vegetation, and agriculture are faring, starting in Cochise County.

"The drought plan is being implemented. It's not just sitting there gathering dust," said Gregg Garfin, program manager for the Climate Assessment for the Southwest (CLIMAS) at the University of Arizona who helped create the monitoring system. "I really credit the Arizona Department of Water Resources and Gov. Janet Napolitano with keeping a focus on the situation."

Arizona's drought plan, approved in October 2004, outlines steps for responding to drought, assessing its toll, and preparing for future water shortages. The

continued on page 5

Southwest drought, continued

Between 1999 and 2003, the level of Lake Powell fell 78 feet, and the number of hikers, boaters, anglers, and others who typically visit the park plunged with the shoreline, Frisvold said.

While only a relatively small percentage of the entire Arizona economy, Frisvold points out, "this employment and spending is quite important to local, rural economies, and there's the multiplier effect. You put money into the pockets of people who live there, and they turn around and spend it. You're generating more income than the original dollar spent."

The researchers estimated that the decline from the 1999 lake levels cost the park about 212,000 visitors in 2003, leading to a $14 million reduction in local sales and a loss of about 300 jobs.

Drought-related wildfires also can pack an economic punch, beyond the obvious costs of battling the blazes. The Cerro Grande Fire in New Mexico, which began as a prescribed burn amid drought conditions in 2000, burned through 47,000 acres, cost nearly $570 million in disaster expenses and claims, and displaced more than 400 families, according to the Federal Emergency Management Agency. Frisvold and Ponnaluru estimate that 66,000 fewer people visited Bandelier National Monument because of the fire.

Other wildfires that have erupted during drought years have proven staggeringly expensive: The combined estimated cost of wildfires that tore through Arizona between 2002 and 2004 is $196.8 million.

Long term drought that kills native trees also can dampen property values, said Bonnie Colby, a professor in the UA Department of Agriculture and Resource Economics and CLIMAS investigator. In a study that looked at the quality of vegetation in Tucson's washes, Colby found that homebuyers are willing to pay a 5 to 10 percent premium

Figure 1. Lake Powell with low water levels in November 2004. Credit: R. A. Taylor

for houses near "ribbons of green," riparian areas lush with healthy, large trees like cottonwoods and mesquites.

Colby, who also studies how drought influences the market price of water, said cities sometimes turn to leasing water from farmers during extended dry spells, when demand and prices are higher. Some southwestern urban interests, which can include water providers, developers, multi-city water districts, golf courses, and other businesses, are negotiating to lease water from agricultural areas.

Leasing also has economic implications for farm communities and related agricultural jobs; it leaves less water for growing crops and reduced economic activities linked to crop production, she said.

Within the agriculture sector, livestock bears the brunt of the drought because ranchers depend on rangeland conditions to graze cattle, explained Brian Hurd, an assistant professor in Agricultural Economics and Agricultural Business at New Mexico State University.

"For the state and rural economies, the livestock and ranching sectors are going to be hit pretty good as far as I can tell." Hurd said, adding that he has not crunched the numbers. "When a drought happens, it hits the range grass really hard and reduces the amount of stocking that can be done. That puts upward pressure on supplemental feeding operations, like bringing hay and alfalfa out to the cattle. It gets expensive and it encourages ranchers to thin the herd."

That creates a market surplus, which drives down the price of beef for ranchers. But once conditions improve and the ranchers want to replenish their stock, cattle are in short supply and more expensive, Frisvold said.

"So they are selling low and buying high," Frisvold said. "The dynamics of that can really hit ranchers."

Cities and farmers have been buffered a bit from the effects of drought because they can pull from ground water and river basins. But if the drought intensifies and temperatures climb, hauling water to rural communities, leasing water from farmers, and generating power through a reduced Colorado River could carry a hefty price tag, researchers say.

"Big changes are coming if we continue on this trajectory. We won't be able to do business as usual," Garfin said. "Drought is a wake-up call. We don't want to hit the snooze button because if we're living like we're waiting for climate change to happen, when it happens it's going to be too late. We have to pay attention and use our water and resources wisely."

This article was originally published on March 14, 2006 by the Institute for the Study of Planet Earth. It was updated on May 11, 2006. For more articles in an ongoing ISPE series on drought, go to: http://www.ispe.arizona.edu/news/archive.html

Drought plan, continued

plan creates a five-tier drought monitoring system that ranges from normal to extreme conditions. It also establishes two state-level committees that report to the governor—the Interagency Coordinating Group and a science and data-oriented monitoring committee—and a number of local-level groups to help track conditions and coordinate drought response.

“The local groups are a big deal because the monitoring committee comes in with stream flow, temperature, and numbers,” said Garfin. “But now we get to hear from Arizona citizens that, yes, we’re having prickly pear that should be robust this time of year all dying. That is tangible evidence, that wouldn’t show up in climate data, that the drought is hurting us.”

As a co-chairman of the monitoring committee, Garfin helps assess the state’s drought strategy and brainstorm ways to improve it, and watches for signs of drought. Through his work in CLIMAS, Garfin also provides reservoir data and other information to the monthly drought status reports posted online and is involved in setting up the local groups.

Mike Crimmins, a climate science extension specialist with the UA Cooperative Extension, is helping to organize a pilot local group in Cochise County. He said it is his job to figure out how to systematically collect the information from the local groups, taking into account varying topographies and ecosystems, and apply it to the drought report.

“It has to have some connection back to people’s lives,” Crimmins said. “If the monitoring committee’s report doesn’t accurately reflect the information, it isn’t useful.”

The Cochise group, made up of local water providers, city and county managers, ranchers, concerned citizens, the Cooperative Extension, and representatives from various state and federal agencies, has met several times since October and formed a steering committee to hash out how they will send a description of drought conditions in their area to the monitoring committee.

“This kind of well-organized local and county-level reporting of drought impacts and county-level coordination of drought response is a cutting-edge effort,” Garfin said. “Ideally, all 15 counties would be marching forward together, but realistically to have a pilot program up and running and learning from that as we move ahead to other counties is as a good a situation as we can hope for.”

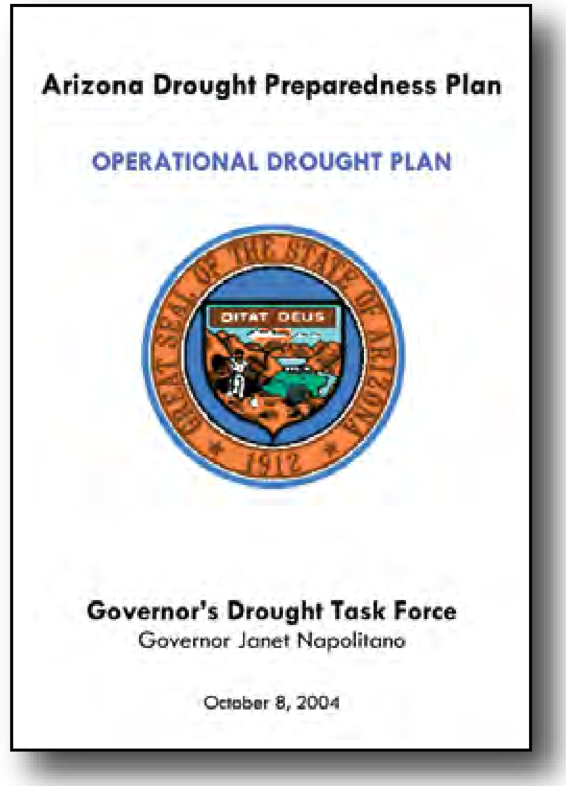


Figure 2. Arizona Drought Preparedness Plan, which is available for download at http://www.azwater.gov.

Given the current conditions, launching a working drought plan throughout the state can’t come a moment too soon. The dry spell has ratcheted much of Arizona up from abnormally dry to extreme drought status, the highest level in the alert system. In February, the lack of precipitation also sparked Gov. Napolitano to convene for the first time the new Interagency Coordinating Group to discuss how to deal with the parched conditions.

According to the National Weather Service, 2005 was the third warmest year in Tucson since record-keeping began in the city in 1894. And with a record-breaking dry stretch since last fall, forest and rangeland conditions have deteriorated to severe drought classification.

Only 0.79 inches of rain were recorded at the Tucson International Airport from September2005 through April 2006. The Phoenix Sky Harbor Airport had a record-setting 143 days without a trace of rain, a stretch that ended March 11. And the Flagstaff Airport recorded a mere 44.6 inches of snow during the winter season. The normal amount is around 108 inches.

“I think things are only going to get worse as time goes on” in terms of lack of precipitation, said Tony Haffer, a meteorologist with the National Weather Service in Phoenix who co-chairs the monitoring committee. “We really need to be looking seriously at what is facing us in the coming months and potentially years and organize ourselves to take advantage of the water we have in a more efficient way.”

This article was originally published on March 14, 2006 by the Institute for the Study of Planet Earth. It was updated on May 11, 2006. For more articles in an ongoing ISPE series on drought, go to: http://www.ispe.arizona.edu/news/archive.html

Temperature (through 5/21/06)

Source: High Plains Regional Climate Center

Temperatures continue to be above average across the Southwest. Since the start of the water year on October 1, 2005, temperatures throughout most of the region have been 0–4 degrees Fahrenheit above average (Figure 1a–b). However, some small areas in northwestern New Mexico and western Arizona have been cooler than average by about 0–2 degrees F. Average temperatures have ranged from the low to upper 60 degrees F in southwest Arizona to the low to middle 30s F in north-central New Mexico and north-central Arizona. Temperatures over the last 30 days have been generally 2–6 degrees F above average over most of Arizona (Figures 1c–d). Some areas in northern and southeastern Arizona have been warmer than average by 6–10 degrees F, while much of southwest Arizona has been warmer than average by only 0–2 degrees F. Most of New Mexico has been 0–4 degrees F above average, with some areas in the central and western parts of the state ranging up to 8 degrees above average. Parts of northwestern New Mexico were somewhat cooler, but still measured 0–2 degrees F above average.

Figure 1a. Water year '05–'06 (through May 21, 2006) average temperature.

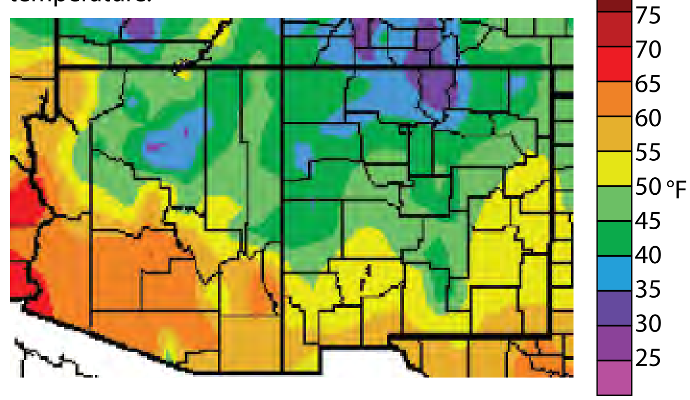


Figure 1b. Water year '05–'06 (through May 21, 2006) departure from average temperature.

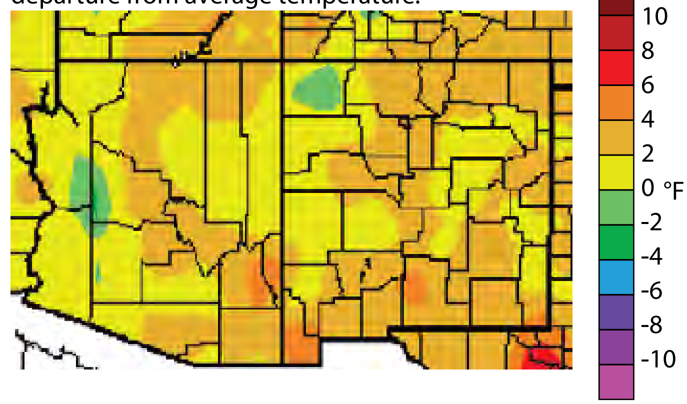


Figure 1c. Previous 30 days (April 22–May 21, 2006) departure from average temperature (interpolated).

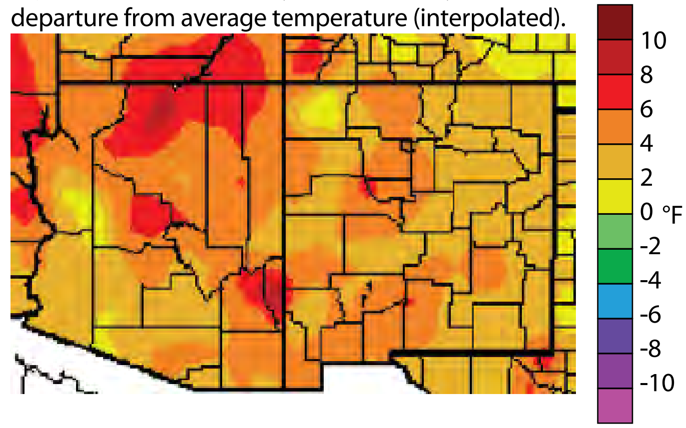
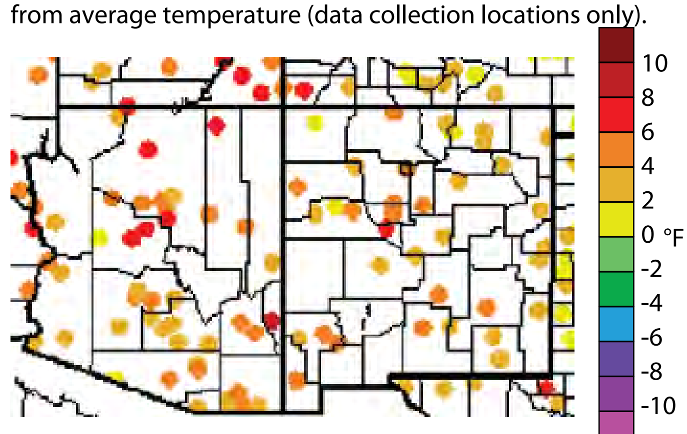


Figure 1d. Previous 30 days (April 22–May 21, 2006) departure from average temperature (data collection locations only).



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 5/21/06)

Source: High Plains Regional Climate Center

Lack of moisture continues to desiccate the Southwest, where precipitation across the region remains far below average since the start of the water year on October 1, 2005 (Figures 2a–d). Precipitation has been less than 50 percent of average for most of the Southwest, and portions of the area are below 25 percent of average. In Tucson, October 1–April 30 ranks as the driest such period on record. In New Mexico, more than two dozen localities around the state reported the period of November through April as the driest on record, including Las Cruces, Ruidoso, and Chaco Canyon. Albuquerque and Santa Fe reported the same period as the second driest on record. Precipitation for the last 30 days has also been well below average, with most of the Southwest receiving less than 50 percent of average (Figures 2c–d). Much of the area has received less than 25 percent of average, with less than 5 percent of average precipitation falling in significant areas of southern and western Arizona, northeastern Arizona, and northwestern New Mexico. Some small areas in northeastern and southwestern New Mexico and in far southern Arizona received above-average rainfall during the last 30 days.

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 May 21, 2006 percent o average precipitation (interpolated).

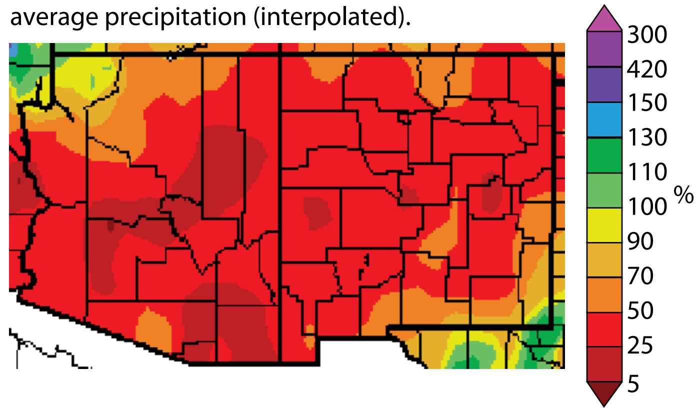


Figure 2b. Water year '05–'06 through May 21, 2006 percent of average precipitation (data collection locations only).

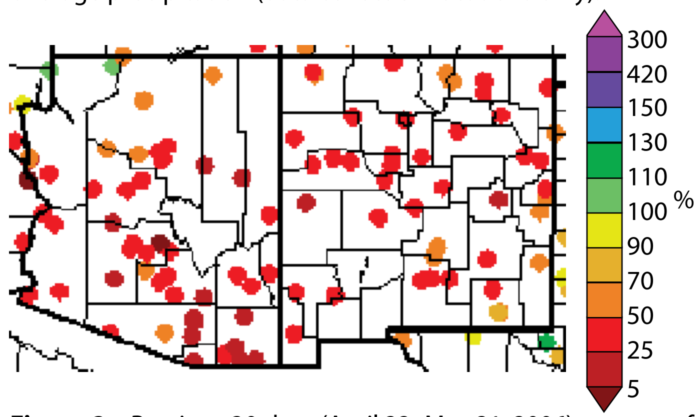


Figure 2c. Previous 30 days (April 22–May 21, 2006) percent of average precipitation (interpolated).

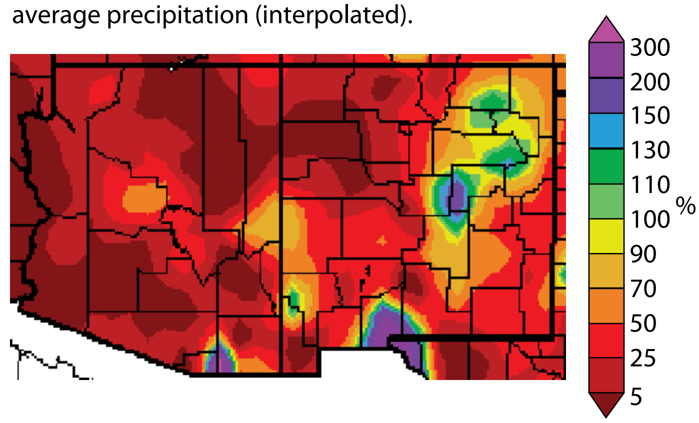
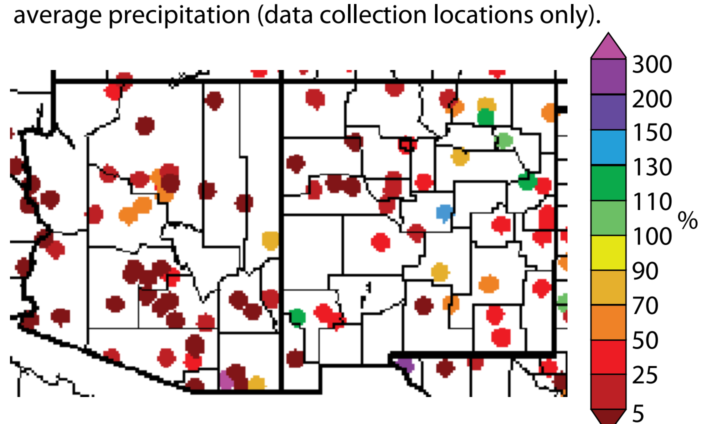


Figure 2d. Previous 30 days (April 22–May 21, 2006) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(released 5/18/06)

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

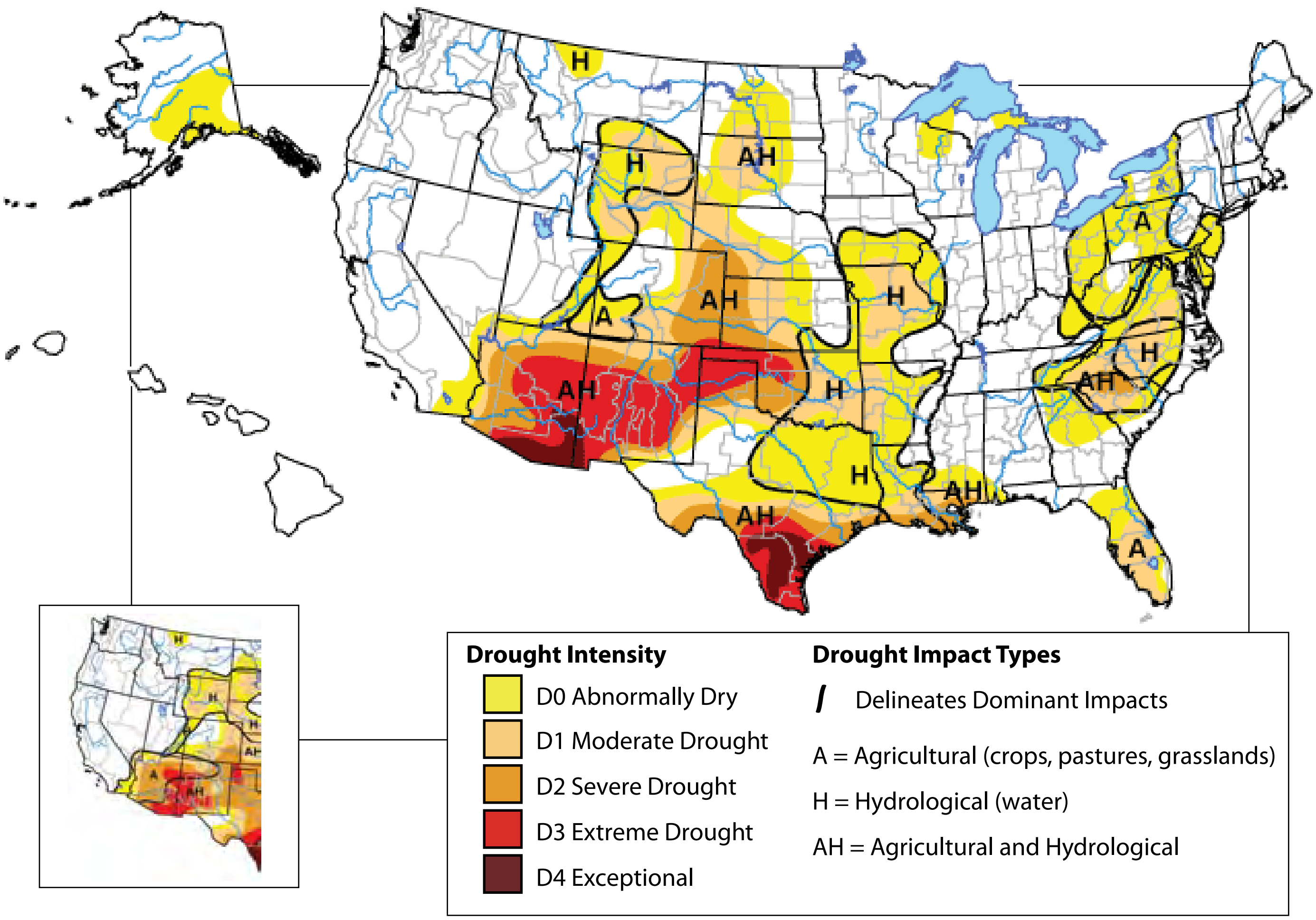
Drought conditions in the Southwest have deteriorated since this time last month, with exceptional drought conditions introduced in parts of southeastern Arizona and southwestern New Mexico (Figure 3). The Southwest has experienced much-below-average precipitation since the water year began on October 1, 2005, with many areas in Arizona and New Mexico setting record low precipitation amounts for the water year to date (see Figure 2a–d). Some precipitation was received in March, April, and early May, but not enough to overcome the long-term snow and rain deficits. Due to the very low precipitation received during the winter and spring, the entire Southwest remains in some level of drought or abnormal dryness, except for a small area in extreme southeastern New Mexico. The area of extreme drought has expanded to include most of southern and eastern Arizona and most of New Mexico. Most of western and far northern Arizona and a strip of northern New Mexico along the Colorado border are in severe drought. The Southwest is considered to be in agricultural drought, with impacts on crops, pastures, and grasslands, and in hydrologic drought, which leads to decreased river discharges and declining water levels in lakes and groundwater aquifers.

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/NCEP/NOAA.

Figure 3. Drought Monitor released May 18, 2006 (full size) and April 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 3/31/06)

Source: Arizona Department of Water Resources

Short-term drought conditions continue to be extreme throughout most of the state, although conditions have eased somewhat along the western and northern borders, where severe drought exists (Figure 4a). Since the start of the water year on October 1, 2005, precipitation has been much below average over almost all of the state, except in some small areas in the extreme northwest corner (see Figure 2a–b). The exceptionally dry winter, coupled with the previous long-term moisture deficit, has led to deterioration of the long-term drought picture for Arizona. Virtually all of the state is in some level of drought or abnormal dryness, except for some areas in the southwestern parts of the state in Yuma and La Paz counties near the Colorado River (Figure 4b). Abnormally dry conditions exist in most of the western half of the state and all along the northern border with Utah. Most of the eastern half of the state is in severe long-term drought status, while the Santa Cruz River Basin in southern Arizona is in extreme drought. The Verde River basin in central Arizona is in moderate long-term drought status, along with Whitewater Draw in far southeastern Arizona. Soil moisture is very low in the state, with 76 percent the pasture and range land rated in "poor" to "very poor" condition. In southeastern Arizona the long-term drought conditions are beginning to show serious impact on the Sonoran vegetation. Even though this vegetation normally thrives in the arid climate, it is dependent on winter precipitation, which was nearly nonexistent this year. Significant tree die-back is occurring in the dry spring weather, and there has been a decrease and failure in the blooming of desert vegetation and cactus fruits, which are sources of food to desert wildlife.

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/

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

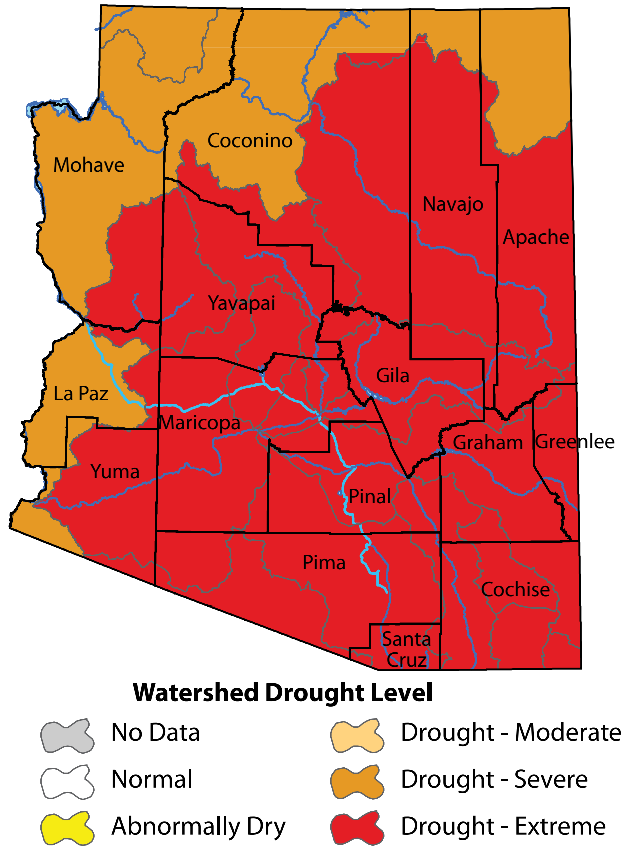
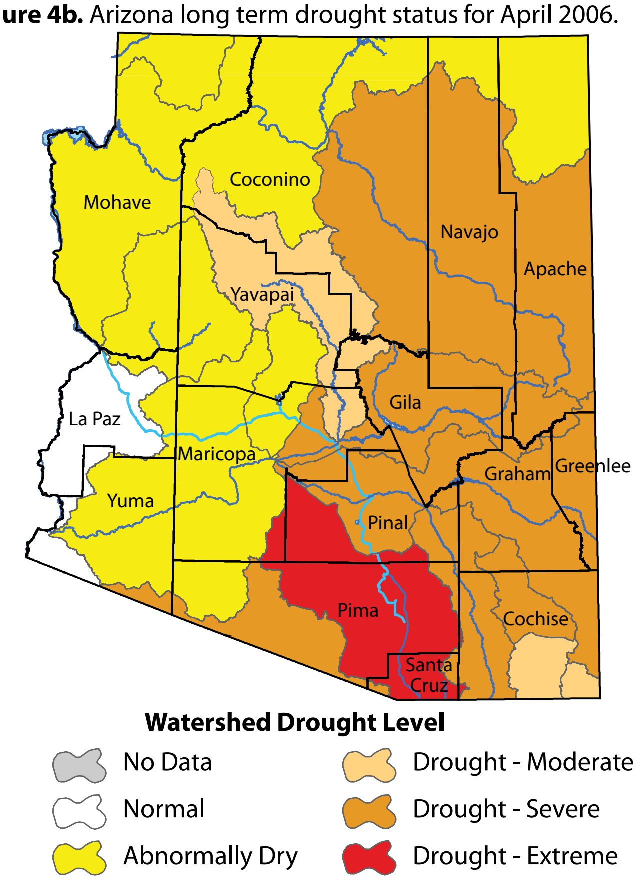


Figure 4b. Arizona long term drought status for April 2006.



New Mexico Drought Status

(through 5/22/06)

Source: New Mexico Natural Resources Conservation Service

Drought conditions have continued to deteriorate throughout most of New Mexico, due to the very low winter and spring precipitation. As of May 12 almost all of the state is in some level of short-term (meteorological) drought, except for a small area in the extreme southeastern part of the state, which is in drought advisory condition. Most of central and western New Mexico is in moderate drought status, with much of the area in severe status. Most of the state has received less than 50 percent of average precipitation since the water year began on October 1, 2005 (see Figure 2a–b).

According to the National Weather Service, Albuquerque, April was the sixth consecutive month of extremely dry conditions for the majority of New Mexico, and has been the record driest such period in many locations throughout the state. The extremely dry winter months, coupled with the longer-term dryness have produced both short-term and long-term drought in New Mexico. Long-term drought is lingering in a 100-mile wide band from Grants to Gallup, in another band from Las Vegas to Cuba, and in a band from near Lincoln and Hondo to Truth or Consequences. Pasture and rangeland conditions have suffered in New Mexico as well, with soil moisture considered short or very short over 92 percent of the state. In New Mexico 62 percent of the pasture and range land is in poor or very poor condition. This is significantly worse than at this time last year, when only 11 percent was in poor or very poor condition.

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 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 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 5a. Short-term drought map based on meteorological conditions as of March 17, 2006.

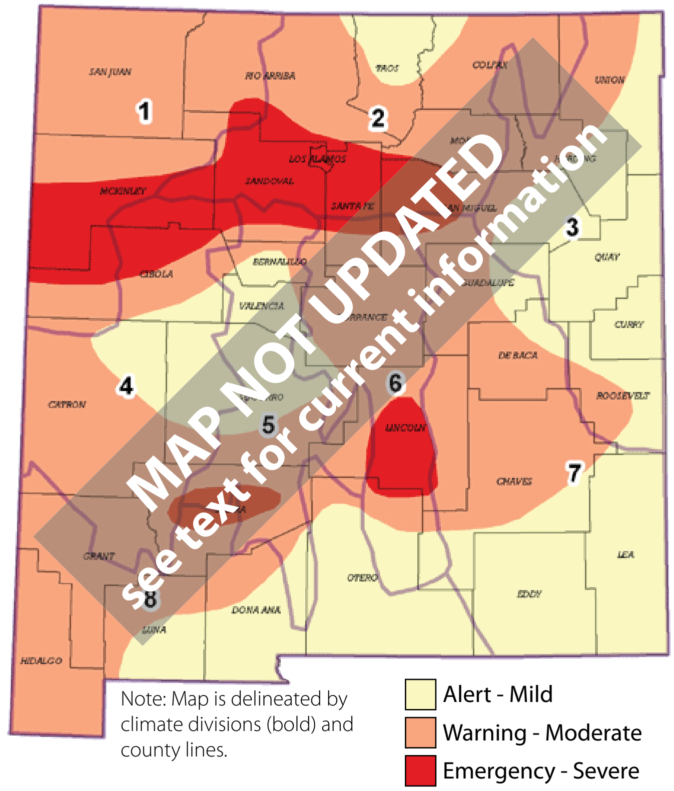
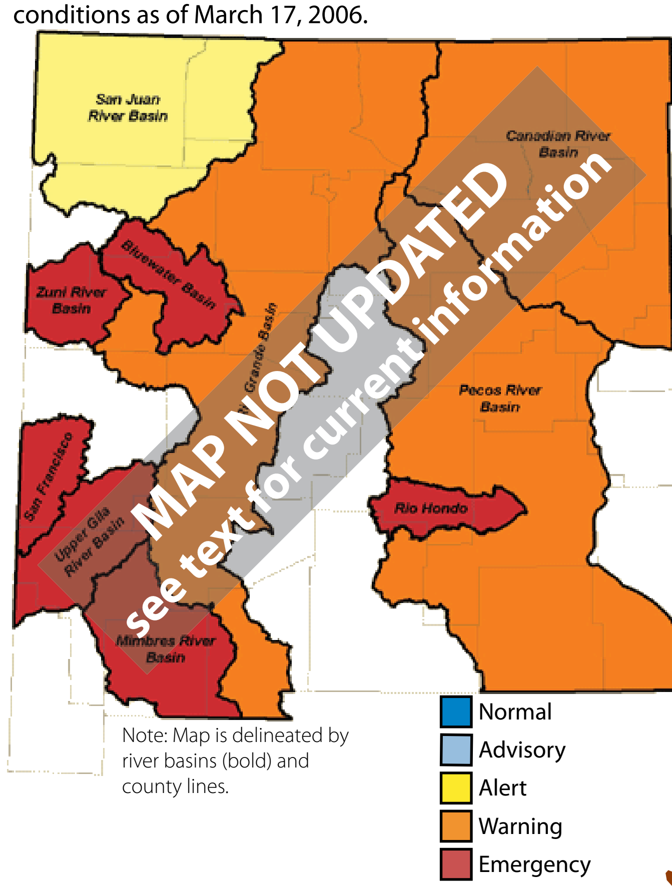


Figure 5b. Long-term drought map based on hydrological conditions as of March 17, 2006.



Arizona Reservoir Levels

(through 4/30/06)

Source: National Water and Climate Center

Arizona's total in-state reservoir storage declined slightly over the last month by about 2 percent of capacity, while the total storage on the Colorado River remained steady. The Salt River system and San Carlos reservoir on the Gila River both declined by 3 percent of capacity, while Lyman Lake again remained steady at 27 percent of capacity. Storage on the Verde River system rose by 2 percent. Note that the cup that reflects Show Low Lake (Figure 6) is colored gray because no data were reported at that site in April. On the Colorado River, Lake Havasu fell by 1 percent, while Lake Mohave remained constant. Of the two largest reservoirs, Lake Mead fell by 2 percent of capacity, while Lake Powell rose by 2 percent, resulting in no overall change in total storage.

Storage on the Colorado River remains at below-average levels due to long-term precipitation deficits in the Upper Colorado River Basin, even though Lake Powell has risen by 11 percent of capacity relative to last year. Storage on the three largest Arizona reservoirs has continued to decline since this time last year, as the result of the ongoing severe drought conditions that followed the wet winter and spring of 2004–2005. The Salt River system has declined by 18 percent of capacity since a year ago, but remains above average level. On the Verde River system storage is down from 99 percent of capacity a year ago to 45 percent, or about 61 percent of the long-term average. The San Carlos reservoir now holds less than a third the amount of water it did a year ago, having declined by 32 percent of capacity to only 16 percent of capacity, about 29 percent of average.

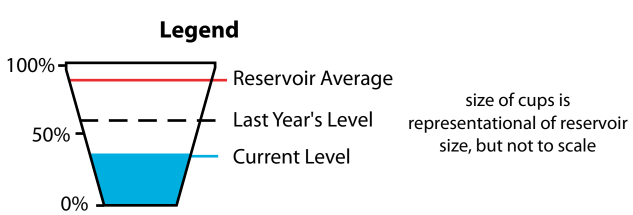
Notes:

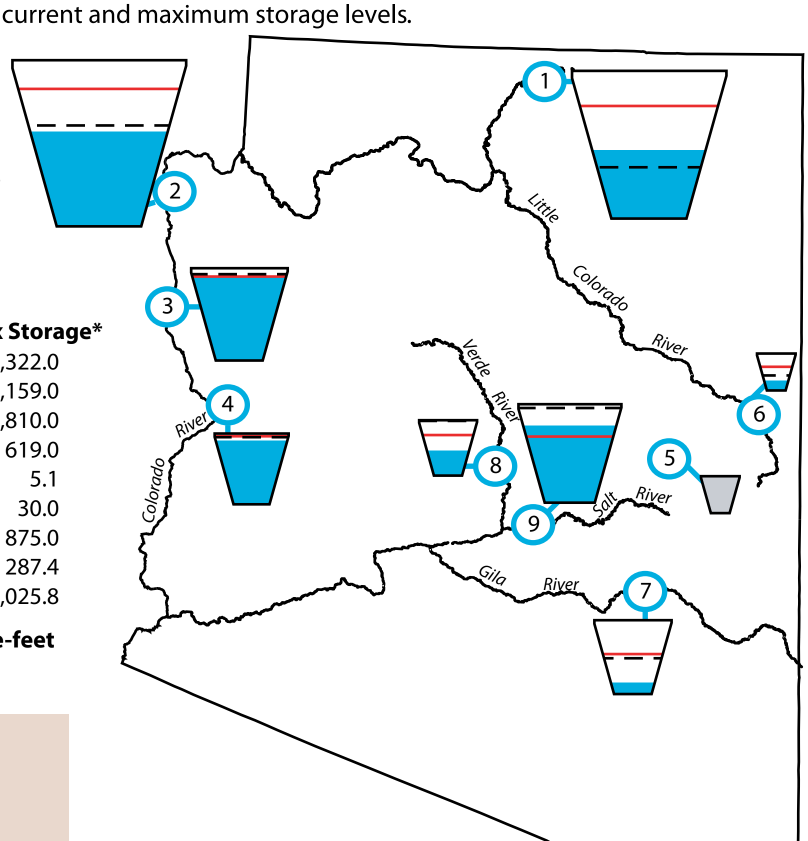
The map gives a representation of current storage levels for reservoirs in Arizona. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total 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 6. Arizona reservoir levels for April 2006 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.





Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Lake Powell	46%	11,093.0	24,322.0
2. Lake Mead	57%	14,957.0	26,159.0
3. Lake Mohave	92%	1,662.5	1,810.0
4. Lake Havasu	90%	558.0	619.0
5. Show Low Lake	NO DATA REPORTED FOR APRIL		5.1
6. Lyman Reservoir	27%	8.1	30.0
7. San Carlos	16%	138.4	875.0
8. Verde River System	45%	128.8	287.4
9. Salt River System	78%	1,578.5	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 4/30/06)

Source: National Water and Climate Center

Reservoir storage in New Mexico declined only slightly since last month. Like last month, some reservoirs rose by a few percent of capacity, while others fell slightly (Figure 7). The largest increases were on the Rio Grande, where Costilla and El Vado rose by 7 and 8 percent of capacity, respectively. Caballo also increased slightly, by 5 percent, while Elephant Butte declined by 3 percent. The largest decline was on Lake Brantley on the lower Pecos River, which fell by 5 percent of capacity. Also on the Pecos, Sumner fell by 2 percent, Lake Avalon rose by 3 percent, while Santa Rosa again held steady at 15 percent of capacity. Navajo Reservoir on the San Juan River gained by 2 percent of capacity. Conchas on the Canadian River fell by 2 percent.

Overall storage in New Mexico continues to be somewhat better than it was a year ago because of the abundant moisture and snowpack received during the wet winter and spring of 2004–2005. That surplus is now being depleted, but total storage statewide is still at about 114 percent of the level it was this time last year. The current reservoir storage is 76 percent of the long-term average, compared to 67 percent a year ago. Storage in most of the systems near the Colorado border is above average or near-average, including Navajo, Abiquiu, El Vado, and Costilla reservoirs. In the east, storage in Lake Avalon, Santa Rosa, and Brantley is still near average, but all other major storage systems in central and southern New Mexico remain well below average. Elephant Butte, which was at only 15 percent of capacity a year ago, has improved somewhat, but is still at only 19 percent of capacity, or about 30 percent of the long-term average.

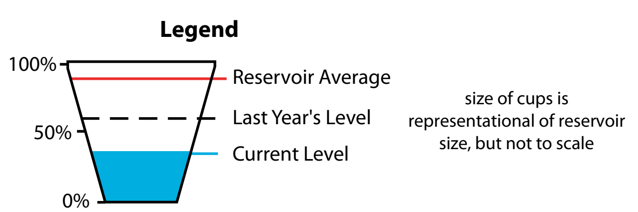
Notes:

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.

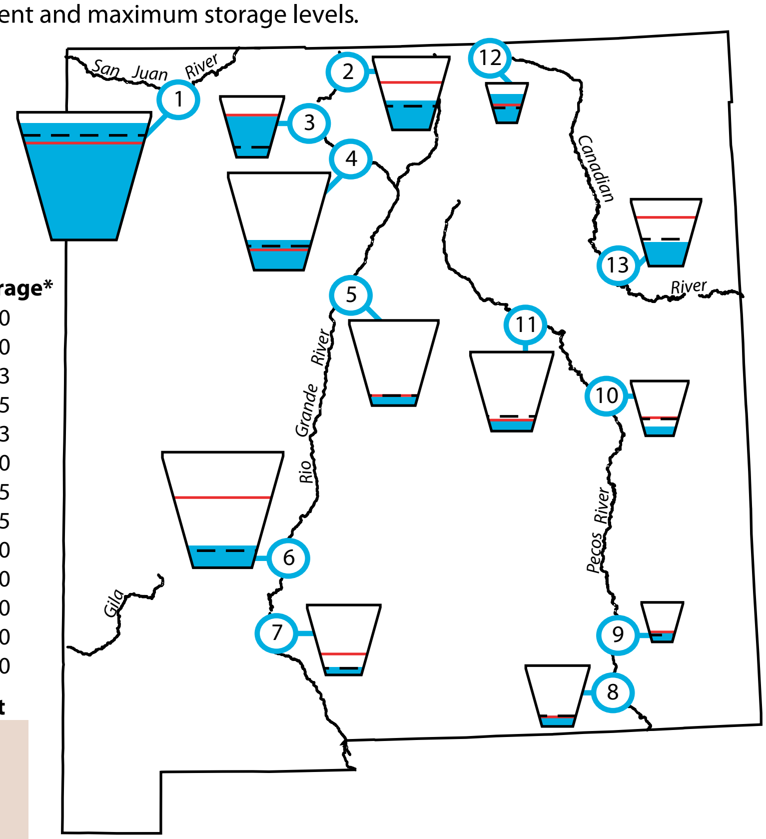
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010)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

Figure 7. New Mexico reservoir levels for April 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	91%	1,538.2	1,696.0
2. Heron	40%	160.2	400.0
3. El Vado	67%	124.8	186.3
4. Abiquiu	31%	171.0	554.5
5. Cochiti	10%	50.2	502.3
6. Elephant Butte	19%	385.8	2,065.0
7. Caballo	11%	35.4	331.5
8. Brantley	18%	25.9	147.5
9. Lake Avalon	25%	1.5	6.0
10. Sumner	17%	17.5	102.0
11. Santa Rosa	15%	65.0	447.0
12. Costilla	73%	11.7	16.0
13. Conchas	36%	90.5	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

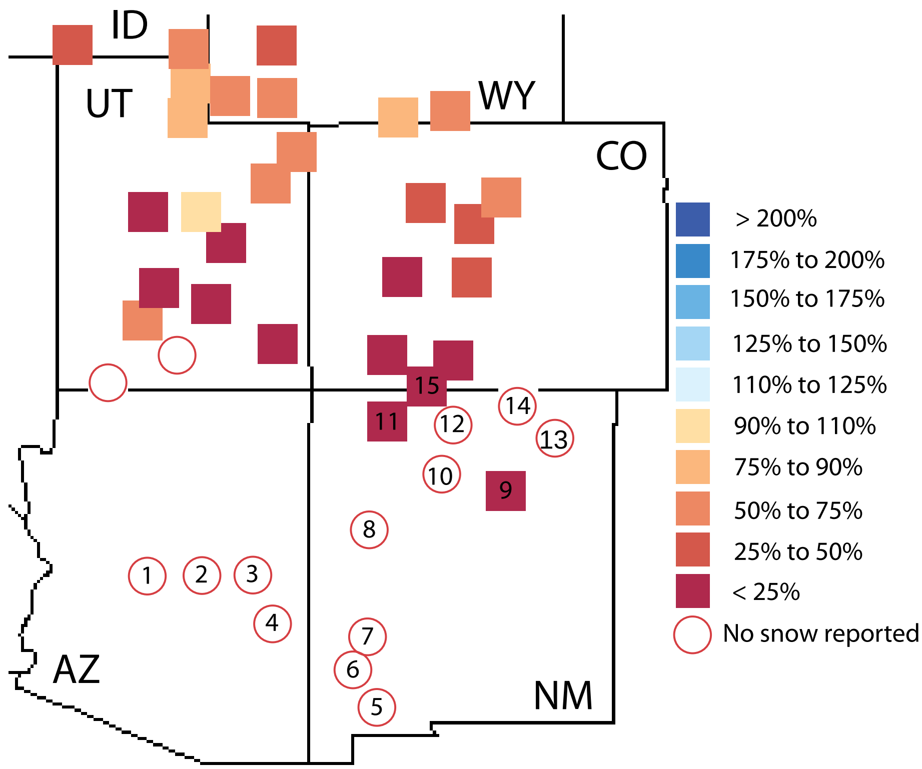
(updated 5/22/06)

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

The 2005–2006 snowpack season in the Southwest has wound up being one of the worst on record. Despite some temporary improvement from precipitation in March and April, snowpack levels in almost all basins throughout Arizona and New Mexico were much below average throughout the season, and many had record low amounts. In New Mexico the Rio Hondo basin did not receive any snow at all this season. As of May 1 in New Mexico, snowpack in the San Juan basin was the very best in the state, at only 51 percent of average, down dramatically from last year's 136 percent. Most of the meager snowpack that did develop has already melted, leaving very little snow—if any at all—only in the highest mountain elevations (Figure 8).

According to the National Weather Service Albuquerque Office, the peak flows already have passed on most streams in New Mexico that depend on snowmelt, except from the highest mountain areas. The lack of snow during the winter and spring makes it extremely unlikely that much runoff will be generated to refill the region's dwindling reservoirs. Despite the dismally low flows forecast for rivers in the Southwest, recreational rafting is still expected to be thriving in many of New Mexico's rivers this summer, according to the *Santa Fe New Mexican* (April 21). Even though rafting areas may not be as exciting as they are at high flow, there will be enough low flows to provide tamer thrills for rafters on many streams and rivers. Even with the low flows, there are five times as many applicants for weekend rafting on the Rio Chama than there are available spots.

Figure 8. Average snow water content (SWC) in percent of average for available monitoring sites as of May 22, 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

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 8 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.

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

Southwest Fire Summary
(updated 5/21/06)

Source: Southwest Coordination Center

The Southwest Coordination Center (SWCC) reports that 1,427 fires—most of them caused by humans—have burned 301,942 acres of land so far this year in Arizona and New Mexico (Figure 9a). This is nearly twice the average number of fires by the end of May, and more than five times the average acreage by this time of year. More than half of these fires occurred in New Mexico, accounting for 88 percent of the acreage burned. The numbers above do not reflect prescribed fires, which are set to prevent larger fire potential or for ecosystem health, nor wildland fire use, in which natural fires are allowed to burn as long as they pose no threats. Agencies have reported 139 prescribed fires burning 71,900 acres, and one wildland fire use burning 1,656 acres, according to SWCC.

To date, 53 large fires (greater than 100 acres) have accounted for the vast majority of the acreage burned so far this year (Figure 9b). Arizona has had 12 large fires compared to 47 in New Mexico. The seven largest fires to date, all more than 10,000 acres in New Mexico, have accounted for 207,755 acres—more than two-thirds of the total acreage burned in the Southwest. All of those very large fires were in the eastern plains region of New Mexico, where the combination of abundant dried grasses, high temperatures, and low rainfall has caused severe fire conditions. The largest fire in Arizona so far has been the February fire, which charred 4,243 acres.

Notes:

The fires discussed here have been reported by federal, state, or tribal agencies during 2005. The figures include information both for current fires and for fires that have been suppressed. Figure 9a shows a table of year-to-date fire information for Arizona and New Mexico. Prescribed burns are not included in these numbers. Figure 9b indicates the approximate location of past and present "large" wildland fires and prescribed burns. A "large" fire is defined as a blaze covering 100 acres or more in timber and 300 acres or more in grass or brush. The red symbols indicate wildfires ignited by humans or lightning. The green symbols are prescribed fires started by fire management officials. The name of each fire is provided next to the symbol.

On the Web:

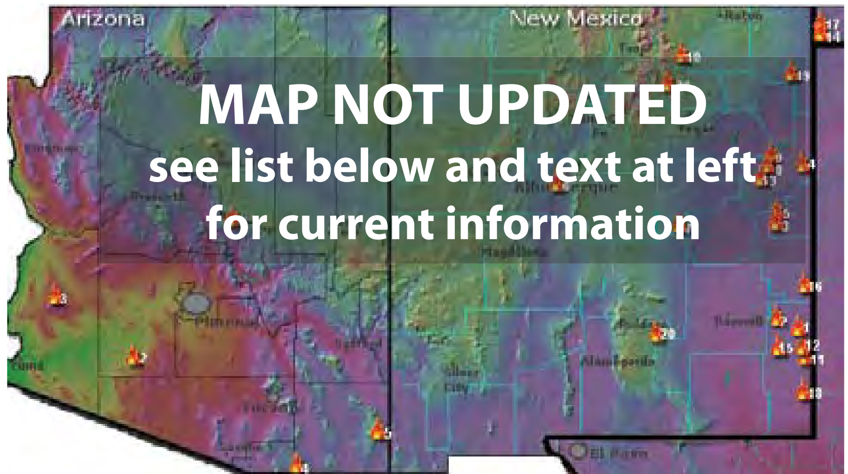
These data are obtained from the Southwest Area Wildland Fire Operations website:

http://www.fs.fed.us/r3/fire/swapredictive/swaintel/daily/ytd-daily-state.htm
http://www.fs.fed.us/r3/fire/swapredictive/swaintel/daily/ytd-large-map.jpg

Figure 9a. Year-to-date fire information for Arizona and New Mexico as of May 21, 2006.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	562	10,482	82	422	642	10,883
NM	658	255,749	127	35,310	785	291,059
Total	1,220	266,231	209	35,732	1,427	301,942

Figure 9b. Year-to-date wildland fire location. Map depicts large fires of greater than 100 acres burned as of April 13, 2006.



Wildland Fires

Arizona
1. February, 2/6–2/19
2. Saddle, 2/11–2/13
3. Hope, 2/18–2/20
4. Montezuma 1, 2/27–3/1
5. Burro, 3/25–4/1
6. N. 105th Ave., 4/9–4/16
7. Senator, 4/14–4/15
8. Sand, 4/22–4/27
9. Shiprock #5, 5/04–5/07
10. Purcell, 5/18–5/19
11. North Taylor, 5/18–
12. Lost, 5/18–

New Mexico
1. Tatum East, 1/01
2. Tatum West, 1/01
3. Buckey, 1/014
4. 76mm6, 1/11
5. Bowen, 2/05
6. Jones, 2/05
7. Isleta, 2/13–2/15
8. Anderson, 2/15–2/16
9. Sheep, 2/16
10. Walker, 2/16
11. Casa, 3/01–3/03
12. Flowers, 3/10
13. Harkey #1, 3/10
14. Hudson, 3/11
15. Newby, 3/12–3/14
16. McDonald, 3/12–3/14
17. Lingo, 3/12
18. Windy, 3/12–3/13
19. Billywalker3/12
20. Clapham, 3/12–3/13
21. Meeks, 3/17
22. Red Lake, 4/05–4/07
23. Marley, 4/06
24. Ojo Feliz, 4/12–4/18
25. Lumbre, 4/15–4/16
26. Quay, 4/12/06
27. Singleton, 4/13–4/14
28. Cowden, 4/13–4/14
29. Singleton, 4/13–4/19
30. Purcel, 4/11/06
31. Gordon, 4/23–4/24
32. Brown, 4/27–4/28
33. Meeks, 3/17
34. Marcial, 5/01–5/06
35. Triple M, 5/08
36. Soldier (TX), 5/09–5/10
37. Centennial, 5/17–5/18
38. Seven, 5/18–5/19
39. Eppers, 5/18–5/19
40. Pipeline, 5/18–
41. Adobe, 5/18–
42. Levi, 5/20–
43. Rabbit, 5/20
44. Brilliant, 5/21–
45. 78, 5/20–
46. Cabra, 5/21
47. Garley, 5/19–

Temperature Outlook

(June–November 2006)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC temperature outlook calls for above-average temperatures for the Southwest through November 2006 (Figures 10a–d). The June–August outlook indicates increased chances of warmer-than-average temperatures throughout most of the West and along the Gulf Coast states and the southern part of the Atlantic Seaboard (Figure 10a). The area with highest probabilities for above above-average temperatures (greater than 50 percent) is centered over northwestern Arizona, southwestern Utah, and southeastern Nevada and California. As the outlook period progresses through summer into October, the warmer-than-average anomaly in the Southwest (greater than 50 percent) expands to include most of Arizona, Utah, and Nevada, and southwestern New Mexico (Figure 10c). No areas of cooler-than-average temperatures are included in the outlook through November.

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 June–August 2006.

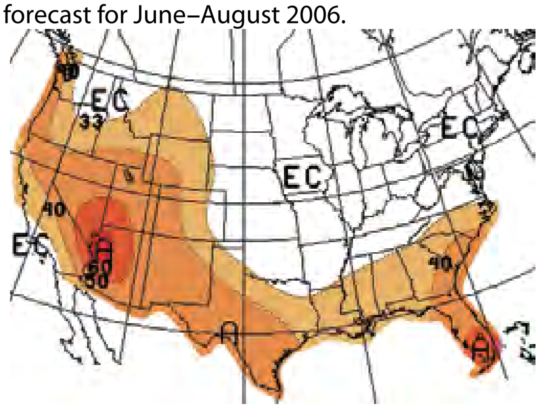
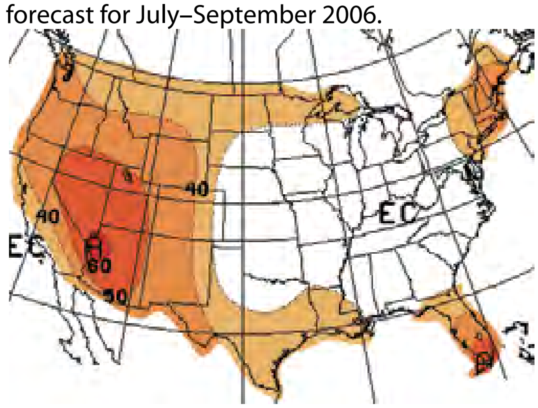
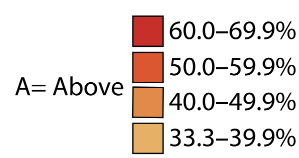


Figure 10b. Long-lead national temperature forecast for July–September 2006.





EC= Equal chances. No forecasted anomalies.

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

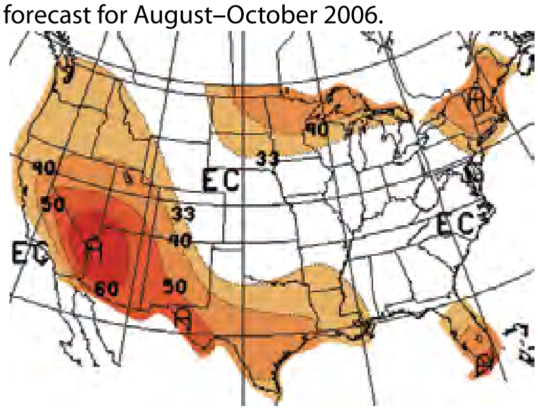
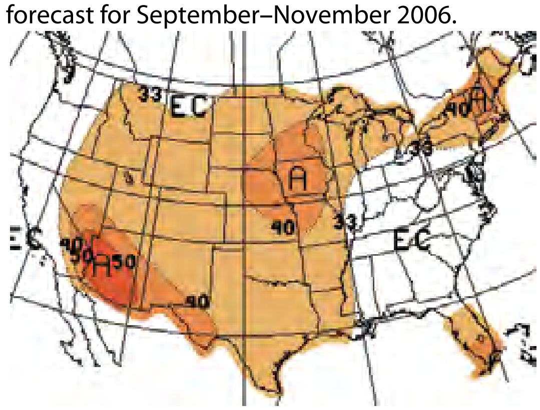


Figure 10d. Long-lead national temperature forecast for September–November 2006.



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
(June–November 2006)
Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC precipitation outlook for June–November 2006 is for equal chances of below-average, average, or above-average precipitation for all of the Southwest (Figure 11a–d). Summer precipitation forecasts are difficult to make for the Southwest during ENSO-neutral conditions because of the lack of a statistical connection with the southwestern monsoon. The outlook calls for some parts of the Northwest to be drier than average through September, and for Florida to have increased chances of receiving higher-than-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 June–August 2006.

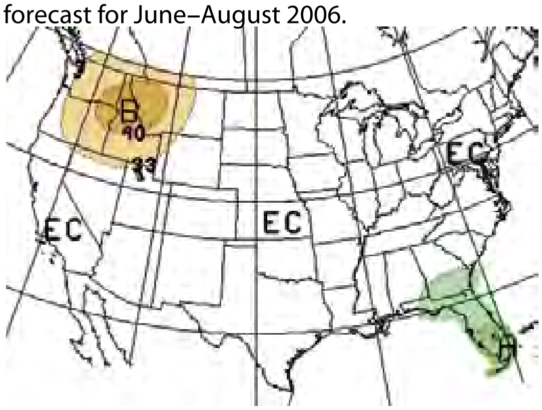


Figure 11b. Long-lead national precipitation forecast for July–September 2006.

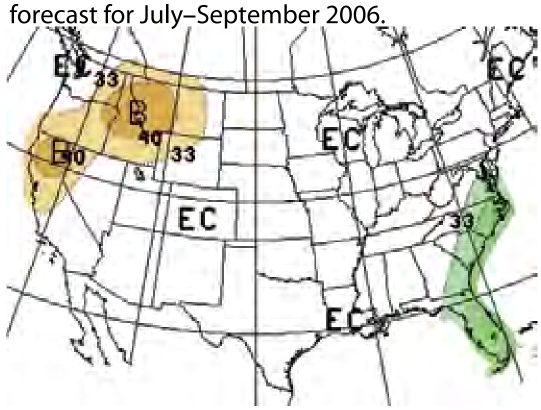


Figure 11c. Long-lead national precipitation forecast for August–October 2006.

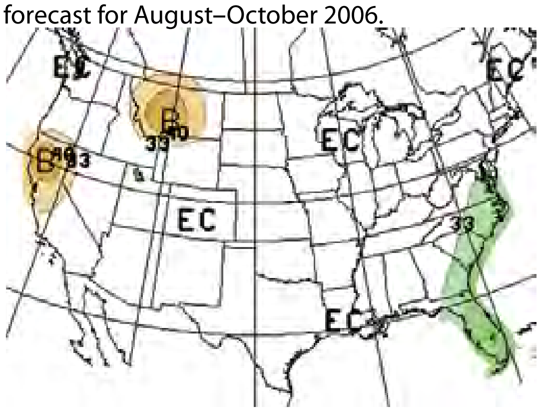


Figure 11d. Long-lead national precipitation forecast for September–November 2006.

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 August 2006)

Source: NOAA Climate Prediction Center (CPC)

The U.S. drought outlook through August 2006 calls for drought conditions to persist throughout nearly all of Arizona and New Mexico, and from northern Texas northward through most of Oklahoma, southern and eastern Colorado, western Kansas and Nebraska, and into parts of eastern Wyoming (Figure 12). Drought is expected to persist in southern Texas and to develop in central Texas. Some improvement is expected in the ongoing drought areas in southeastern Arizona, and southwestern and central New Mexico to the Colorado border, contingent upon adequate rains during the monsoon thunderstorm season. Additional areas of ongoing drought with some improvement include the Texas Gulf Coast, eastern Oklahoma and northwestern Arkansas, northern Missouri, and parts of South Dakota, northern Wyoming and southeastern Montana. Elsewhere, improvement in drought conditions is expected in southern Florida, along the Gulf Coast from east Texas through Mississippi, and in the Appalachian and Piedmont region from South Carolina into Virginia.

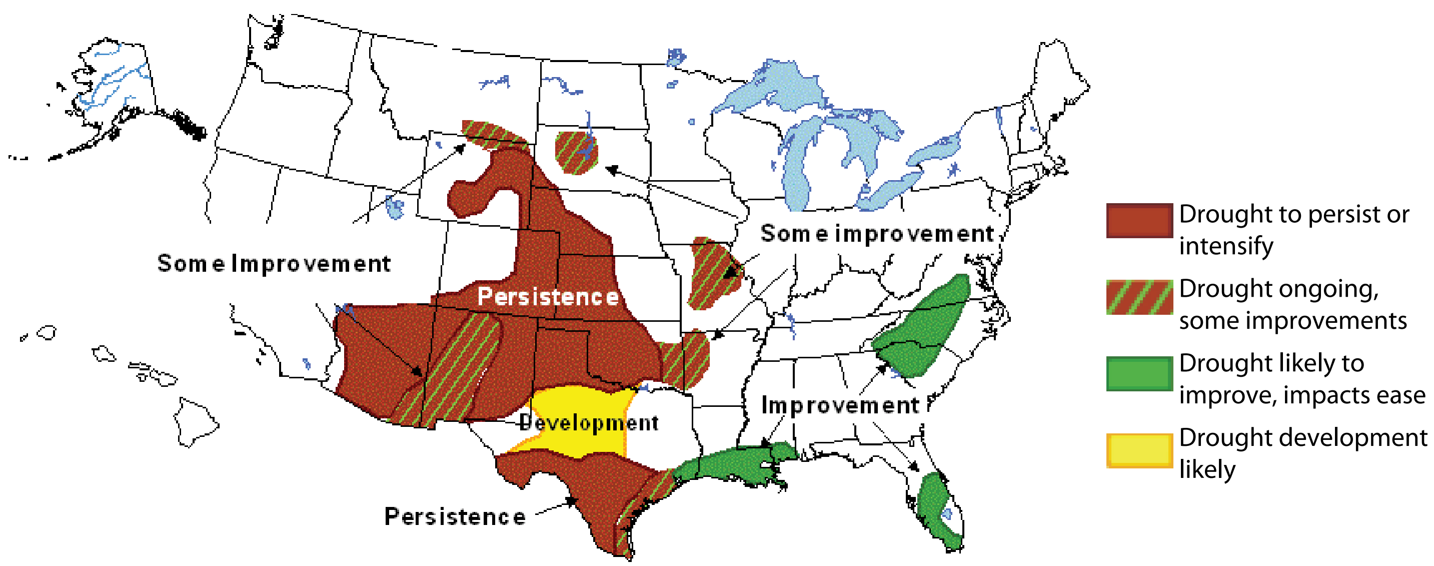
Some rain and snow received in the Southwest from storms in the spring provided temporary drought relief, but because of the near-failure of winter precipitation in the region, no long-term relief is in sight. The late spring and early summer is characteristically very dry in Arizona and New Mexico, and the Southwest is unlikely to see much more precipitation before the monsoon rainy season. The ongoing drought conditions will likely contribute to elevated fire risks across the Southwest through the spring and into the summer season.

The Southwest Coordination Center reports that the fire danger through May is higher than average across most of the Southwest. There is an abundance of fine dead fuels across the region, combined with below-average moisture levels in existing larger dead and live fuels. There is high potential in particular, in the higher elevation timber fuel types.

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 August 2006 (release date May 18, 2006).



On the Web:

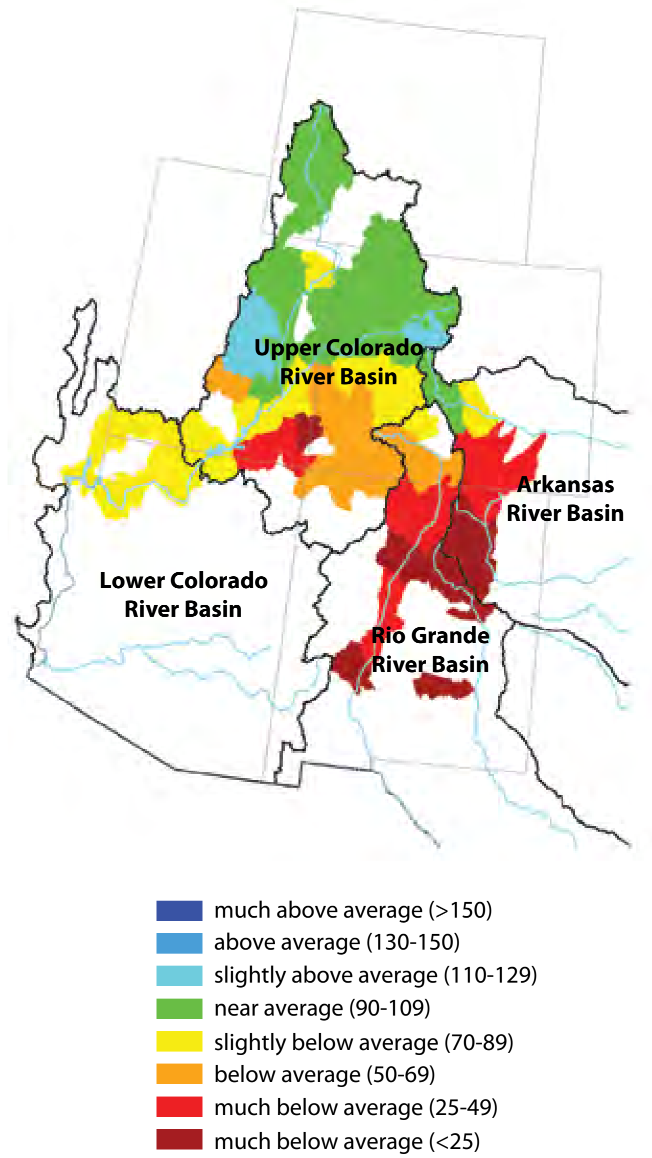
For more information, visit:
http://www.drought.noaa.gov/

Streamflow Forecast
(for spring and summer)
Source: National Water and Climate Center (NWCC)

The streamflow forecast for rivers in the Southwest is for extremely low runoff for the spring and summer in all Arizona and New Mexico rivers (Figure 13), while flow on the Colorado River is expected to be slightly below average. The very poor snowpack across the region is expected to produce runoff of much less than 50 percent of average in most Southwestern rivers, and less than 70 percent of average near the Colorado border in northwest New Mexico, where some late season snowpack finally developed. Many of the basins in Arizona and New Mexico are expected to produce less than 30 percent of average streamflow. Much of the snowmelt that does occur will be absorbed by the very dry soils, leading to greatly reduced runoff reaching the streams and declining reservoirs. The Southwest has been in the predictably dry period of late spring and early summer for several weeks, making it unlikely that the region will receive any more snow or significant rain until the start of the monsoon season. There is no official NWCC forecast for streamflow this month for central Arizona and western New Mexico, but it is clear from previous forecasts and current climate conditions in those areas that runoff will be much below average. In New Mexico forecasts range from less than 70 percent to less than 25 percent of average.

According to the National Weather Service Albuquerque Office, the peak flows from snowmelt have already occurred on most rivers and streams in the state, except those from the higher mountain areas in the north. The total snow melt volume is expected to range generally from 50 to 70 percent of average over northwest New Mexico to less than 50 percent nearly everywhere else. Most of the snowmelt volume over southern New Mexico will be less than 20 percent of average.

Figure 13. Spring and summer streamflow forecast as of May 1, 2006 (percent of average).



Notes:
The forecast information provided in Figure 13 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 13.

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

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

Most of the Southwest is facing the prospect of a very active and intense fire season, as shown in the outlook issued by the National Interagency Coordination Center (Figure 14a). Fire potential outlooks are closer to average in eastern New Mexico and southwestern and far northern Arizona. The abundant fine fuels in the Southwest, mostly grasses produced by the wet winter of 2004–2005, and larger dead and live fuel classes have been dried to very low moisture contents by the severe to extreme drought conditions in the region (Figure 14b). The warmer-than-average temperature outlook, coupled with the dry conditions almost always to be expected in May and June in the Southwest, will combine with the unusually dry fuel conditions to produce a rapid escalation of fire potential in all fuel classes in mid-May and June. The potential for fires in the timber fuel types in the middle to higher elevations will be particularly high relative to average. Moisture is expected to begin increasing east of the Continental Divide in New Mexico by late May or early June. Fire activity in Arizona is expected to remain high through mid-July but should be mitigated by seasonal monsoon moisture in New Mexico by that time.

Figure 14a. National wildland fire potential for fires greater than 100 acres (valid May 1–31, 2006).

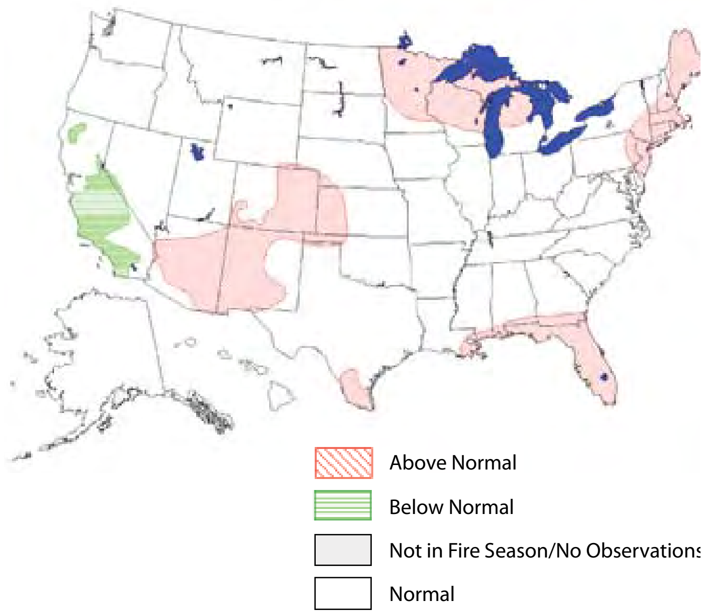


Figure 14b. Current fine fuel condition and live fuel moisture status in the Southwest.

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

Live Fuel Moisture	
	Percent of Average
Ponderosa Pine	103
Douglas Fir	107
Piñon	94
Juniper	82
Sagebrush	136
1000-hour dead fuel moisture	**10**
Average 1000-hour fuel moisture for this time of year	**8–14**

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces monthly wildland fire outlooks. The forecasts (Figure 14a) 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 14b 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)

ENSO-neutral conditions are expected to prevail over the next three to six months, despite the persistence of the Southern Oscillation Index (SOI) above the value of 0.5 (Figure 15a). Slightly stronger-than-average low-level equatorial easterly winds have persisted over the central Pacific, but they are weaker than in previous months, and are considered to be simply lingering effects of the recent weak La Niña conditions. The recent patterns of sea surface temperatures and upper-ocean heat content indicate a return to near-average conditions in the tropical Pacific Ocean. Since February the basin-wide upper-ocean heat content has increased, becoming slightly positive in April. Collectively, these atmospheric and oceanic features signal the demise of La Niña and a return to ENSO-neutral conditions, according to the NOAA-CPC. Most of the climate models predict ENSO-neutral conditions in the tropical Pacific through the end of 2006, but the variation among different ENSO model forecasts (not shown), from weak La Niña to weak El Niño, indicate considerable uncertainty in the outlooks for the latter half of the year, according to experts at CPC. The probabilistic forecast issued by the IRI is in agreement with CPC, predicting a 90 percent chance of return to ENSO-neutral conditions during the next three months, and lower but still above-average chances for ENSO-neutral conditions for the foreseeable future (Figure 15b).

Historically, ENSO-neutral conditions do not provide any strong predictive signal for summer precipitation forecasts for the southwestern United States. The NOAA-CPC outlook for precipitation in the Southwest is for equal chances for below-average, average, or above-average precipitation in the Southwest for the next six months (see Figures 11a–d).

Notes:

Figure 15a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through April 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 15b 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 15a. The standardized values of the Southern Oscillation Index from January 1980–April 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).

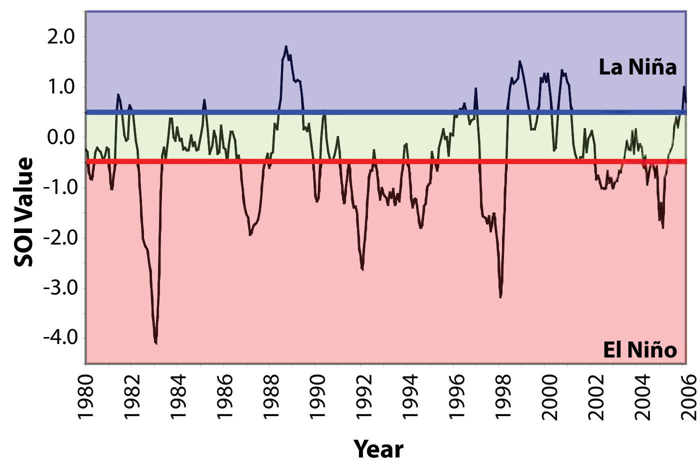
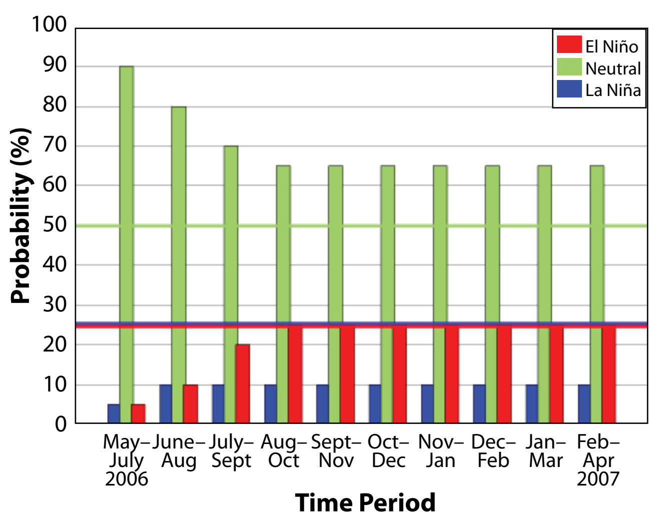


Figure 15b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released May 18, 2006). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



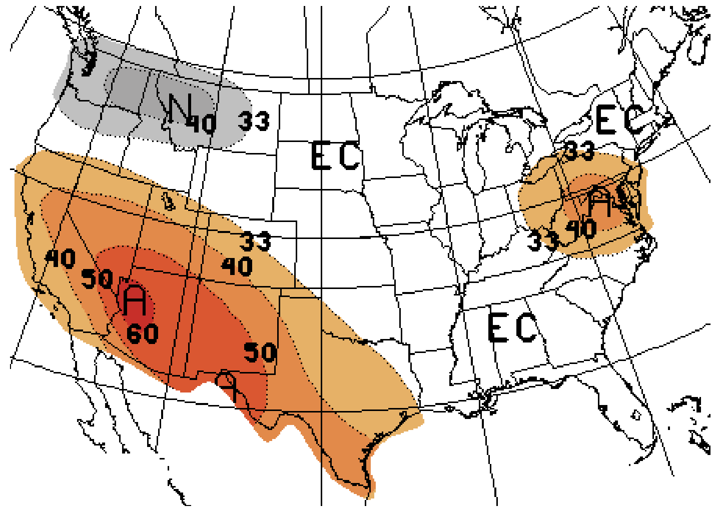
Temperature Verification

(February–April 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range outlook for February–April 2006 from the NOAA-CPC predicted above-average temperatures from California to the Texas Gulf Coast. The areas of highest probability were over the Southwest, from Arizona and southern Nevada through southwestern New Mexico into west Texas (Figure 16a). In the East, an area of warmer-than-average temperatures was predicted to be centered over Virginia. In an unusual move, the CPC predicted an area of near-average temperatures in the Northwest from Washington to Montana. Observed temperatures across most of the central states were 0–6 degrees Fahrenheit above average (Figure 16b). Most of the far western states ranged from 0–4 degrees F below average. The outlook performed well in predicting the above-average temperatures from New Mexico across Texas, but poorly in predicting above-average temperatures from Arizona to the West Coast, where cooler-than-average temperatures prevailed. The results were mixed in the Virginia area, but below-average temperatures occurred in the Northwest where near average was the prediction.

Figure 16a. Long-lead U.S. temperature forecast for February–April 2006 (issued January 2006).



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

N= Near Normal: 40.0–49.9%, 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

Notes:

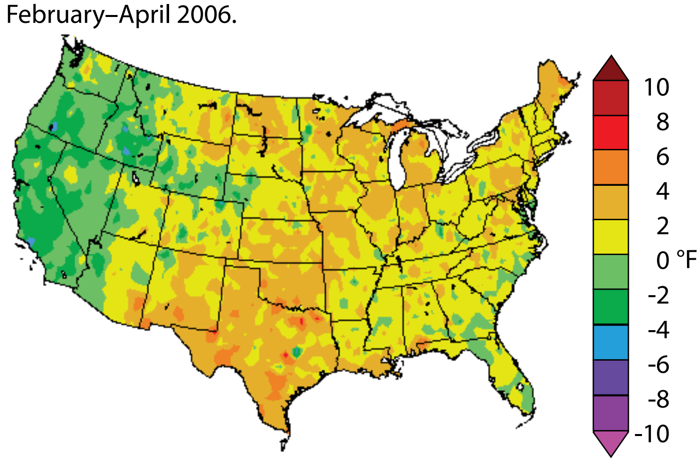
Figure 16a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months February–April 2006. This forecast was made in January 2006.

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 16b shows the observed departure of temperature (degrees F) from the average for the February–April 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.

Figure 16b. Average temperature departure (in degrees F) for February–April 2006.



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

(February–April 2006)

Source: NOAA Climate Prediction Center (CPC)

The long-range outlook from the NOAA-CPC for February–April 2006 predicted increased chances for below-average precipitation from southern California through Arizona and New Mexico into central Texas and north to Nebraska, and in another area in Florida and the extreme Southeast (Figure 17a). The highest probabilities were centered over Arizona, Kansas, and Florida. An area of above-average precipitation was predicted in the Ohio River Valley region, centered over northern Kentucky and southern Indiana and Ohio.

Observed precipitation in the Southwest and surrounding regions was a near-perfect match with the predicted anomaly (Figure 17b). Precipitation was from 90 percent to less than 25 percent of average in a wide band extending from southern California across Arizona and New Mexico, and northward into Colorado, Oklahoma, and Kansas. Results were also good in Florida and Georgia, where below-average precipitation prevailed as predicted. And the observed above-average precipitation centered over Indiana was a fair match for the predicted anomaly.

Figure 17a. Long-lead U.S. precipitation forecast for February–April 2006 (issued January 2006).

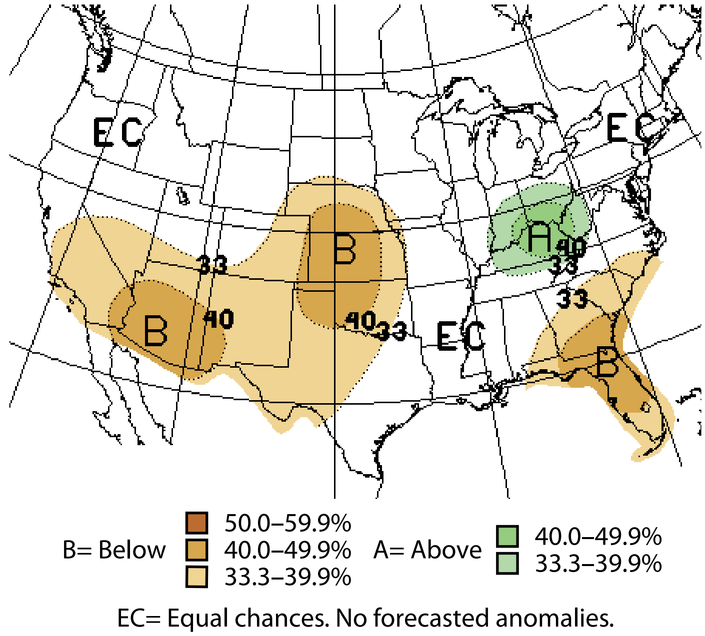
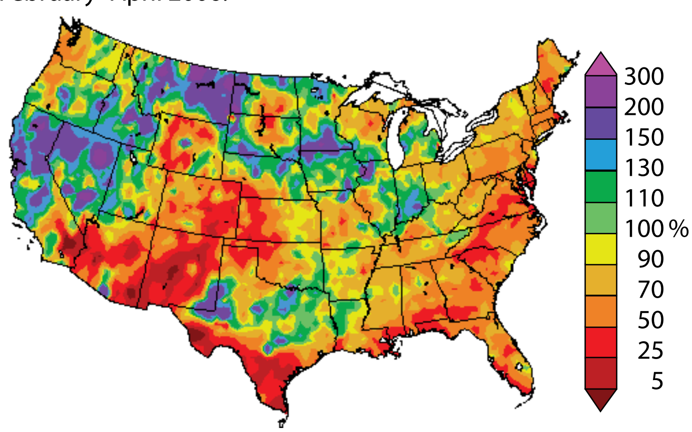


Figure 17b. Percent of average precipitation observed from February–April 2006.



Notes:

Figure 17a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months February–April 2006. This forecast was made in January 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 17b shows the observed percent of average precipitation for February–April 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