Issued: September 20, 2005

CLIMAS
Southwest Climate Outlook

September Climate Summary

Drought – Abnormally dry conditions to moderate drought continue in southeastern and northeastern Arizona and western and central New Mexico.

- Drought status has improved in portions of eastern Arizona and central New Mexico.
- Most reservoirs are above last year's storage, but they remain below average.

Temperature – Average temperatures during the water year range from several degrees below average to several degrees above average. The past 30 days were mainly warmer than average.

Precipitation – Water year precipitation continues to show much variation with some locations reporting more than 130 percent of average, while other areas have received only 70–90 percent of average. Much of the Southwest was below 70 percent of average during the past 30 days.

Climate Forecasts – Models indicate increased chances of above-average temperatures in the Southwest through March 2006. Increased chances of drier-than-average conditions exist through February 2006 across most of the region.

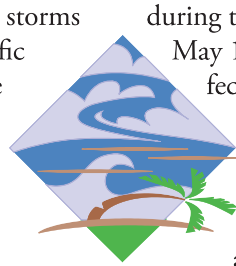
El Niño – Output from probabilistic forecast models shows that neutral conditions are most likely to continue through August 2006.

The Bottom Line – Drought should persist along the Arizona-New Mexico border, and wildland fire potential is above average in some areas as the Southwest enters the typically dry fall season.

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

Hurricanes in the Southwest

While the Southwest is not associated with the destruction caused by major hurricanes like Katrina, it is important to note that numerous tropical storms form in the eastern North Pacific Ocean each year. Most of these storms move westward over open water, but sometimes tropical storms track toward the southwestern United States. The official East Pacific Hurricane Season Outlook from the NOAA-CPC calls for increased chances of below-average tropical storm activity during the 2005 season, which lasts from May 15–November 30. A "seesaw effect" is typically observed between the East Pacific and North Atlantic hurricane activity. The factors that lead to increased activity in one region will stifle activity in the other region.



See Precipitation Outlooks (page 14) for more details...

In this issue:

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

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Nature's clock ringing in earlier springs

Plant and animal cycles show earlier and longer warm-weather seasons

by Melanie Lenart

Nature's biological clock measures time with the arrival of birds, the greening of leaves, and the budding of flowers. Now it seems the clock has sped up when it comes to spring's arrival, a leap that many view as a response to global warming.

"I have heard that the mayflower should now be called 'aprilflower' because it's switching its bloom time," said Elisabeth Beaubien, national coordinator of the Canadian program PlantWatch. Similarly, her research has shown quaking aspen trees, admired for their white bark and yellow fall leaves, are blooming about eight days earlier on average in Edmonton since the mid-1930s (*International Journal of Biometeorology*, August 2000). Aspen thrives in many U.S. states as well, although its bloom times in this country generally go unrecorded.

Concern over these changes in time, and the lack of a U.S. network to systematically monitor them, drew about three dozen scientists to Tucson for a late August workshop sponsored by the Institute for the Study of Planet Earth at The University of Arizona (UA) with funding support from five federal agencies. The group hopes to launch a nationwide monitoring project soon, explained workshop organizer Julio Betancourt of the U.S. Geological Survey and UA. "This is probably something we can get going by the next growing season," Betancourt said.

Co-organizer Mark Schwartz of the University of Wisconsin-Milwaukee has already set up a prototype website where anyone can sign up to submit their own national and regional observations (See sidebar on page 4).

Citizen networks

During the workshop, Beaubien and other program managers shared advice about setting up citizen networks to observe phenology, the timing of annual life cycle events. Although the word itself sounds unfamiliar to many people, the practice of phenology stretches back to the last ice age, Beaubien reported. She noted that ancestors of the Blackfoot tribe used the blooming of buffalo bean as a sign to hunt bison bulls.

In the Southwest, the monsoon's arrival has long been hailed as an opportunity for growth, by Hohokam farmers who planted beans and squash on floodplains thousands of years ago through modern-day gardeners who collect rain in barrels. But while climatological records pinpointing the monsoon's arrival show up in scientific literature and on the web, biological records documenting nature's response to seasonal climate events remain rare for this country.

One of these rare bloom records involves a lilac network launched in 1957 by Joseph Caprio of Montana State University, who also shared insights at the workshop. At its peak, more than 2,500 volunteers from 12 western states, were posting information on the location and blooming times for lilac shrubs. Caprio also distributed cloned honeysuckle bushes to a smaller group of volunteers. Dan Cayan of Scripps' Climate Research Division and colleagues including Caprio recently reported that the observations show lilac and honeysuckle flowers in the West were blooming 5 to 10 days earlier on average in the second half of the 1957–1994 record compared to the first half (*Bulletin of the American Meteorological Society*, March 2001). Unfortunately, the number of volunteers dropped precipitously since Caprio retired in the early 1990s.

In a more comprehensive study, Terry Root and her colleagues at Stanford University compared phenological records for 145 species including trees, insects, flowers, and birds from sites in Europe, Asia, and North America. They found that four out of five species examined had shifted their seasonal timing in a way that appeared related to temperature increases from human-influenced global warming (*Proceedings of the National Academy of Sciences*, May 2005). During the assessed time frame, which varied by species and record but averaged 28 years, the measured seasonal events for birds and trees shifted ahead about five days, while herbaceous plants like grasses and wildflowers were starting about two days earlier.

Although the earlier springs may sound good to snowbound northerners who see robins as a sign of pending release from winter's grip, these phenological shifts can signal problems ranging from earlier allergy attacks to potential missing links in the food chain.

Potential problems

An earlier start to the pollen season seems to be one consequence of warming temperatures, based on research in the Netherlands by Arnold van Vliet of Wageningen University and colleagues (*International Journal of Climatology*, November 2002). This should concern the roughly 15 percent of the

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Nature's clock, continued

population who suffer from hay fever, and could be problematic for those with asthma as well, noted van Vliet, who attended the workshop.

The Netherlands study also found trees were responding more rapidly than grasses, with juniper and oak releasing pollen nearly three weeks earlier in the 1990s than they had in the 1970s. In this case, that's good news for allergy sufferers, as grass pollens tend to aggravate allergies the most.

However, ecologists worry that disjointed shifts by different species could break food chain links and create other problems. Plants overall are responding more quickly to temperature than birds, and insects are reacting fastest of all, explained Jill Attenborough, program director of a project that collects phenology data from more than 21,000 regular observers in the United Kingdom.

"It helps people understand that the synchrony of the natural world is being threatened," Attenborough suggested. The U.K. network is supported by the efforts of The Woodland Trust, a nonprofit group that in 2000 joined efforts to recruit volunteer observers after identifying climate change as the single biggest threat to ancient forests.

Insect response

Scientists who studied insect outbreaks in southwestern forests have been working to document how warm temperatures contributed to recent attacks.

"The probability of outbreaks will increase as temperature increases because insects are cold-blooded," as Neil Cobb of Northern Arizona University explained during a water summit in Flagstaff last month. Freezing winter temperatures help keep insects in check.

Although drought clearly contributed to a recent bark beetle outbreak, entomologists suspect warmer-than-usual winter temperatures may have influenced its scale. Beetles devastated about 2.7 million acres of southwestern pine forests from 2001 through 2004, according to estimates from the U.S. Forest Service's Southwestern Region.

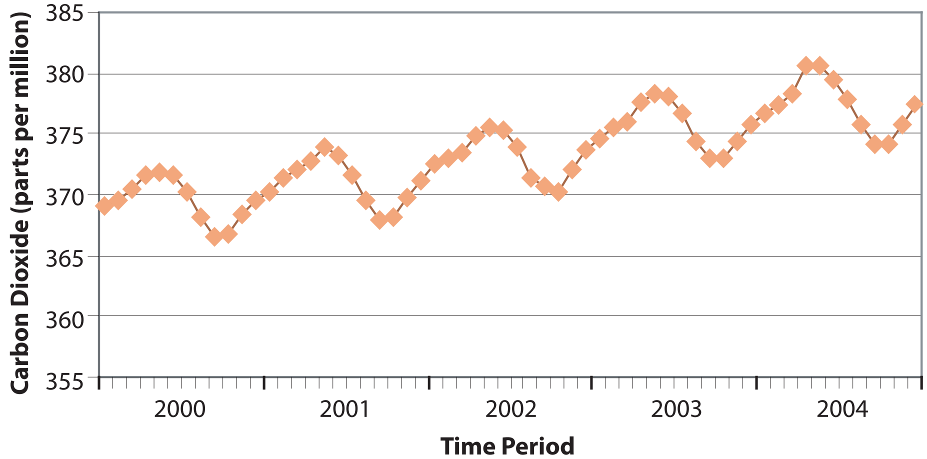

Figure 1. Carbon dioxide levels from Mauna Loa, Hawaii, fluctuate with northern hemispheric plant growth in spring and die-back in fall. Values for this atmospheric greenhouse gas are shown here by month based on data compiled by C.D. Keeling and T.P. Whorf.

Workshop participants were focused on the collection of phenology data to improve society's understanding of climate variablity as well as change. For many, the ultimate goal would be to produce more skillful climate forecasts and better predict response to climate swings.

"Basically we see phenology as an indicator of climate impacts, whether it's from natural variability or human-induced," van Vliet said. He noted that the latter includes the urban heat island effect that occurs as paved areas expand from city centers.

Temperature vs. rainfall

In the Southwest, plants often respond to rainfall variability more dramatically than to temperature, as the greening of the desert this past year dramatically demonstrated.

"Many of the showiest species require large amounts of rainfall when temperatures are cool but not cold," said Janice Bowers, a USGS researcher. Her research found the best wildflower years in the Sonoran Desert resulted when rainfall rates were about 50 percent higher than usual from September through March. What's more, these higher rainfall years tended to occur when the July–December index signaled an El Niño pattern was active in the tropical Pacific Ociean. (*Journal of the Torrey Botanical Society*, January 2005).

The El Niño this past year ushered in red brome, cheatgrass, and other invasive grasses that helped spark a record fire year in Arizona. As of September 15, most of the state's 725,903 acres impacted by fire this year burned in grasslands and grass-covered desert rather than forests, indicated Chuck Maxwell of the Southwest Coordination Center. (Meanwhile, only 23,097 acres burned in New Mexico.)

Rainfall certainly encouraged the extensive grass cover, but warmer spring temperature may help give invasive grasses a foothold over native species, some researchers suspect (*Southwest Climate Outlook*, February 2005). Unlike the more sparse cover of native wildflowers, a continuous grass cover can spread fire throughout desert ecosystems. Brushes with fire can be fatal to the Southwest's poster cactus, the saguaro.

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Nature's clock, continued

The phenology network actually could help battle the problem of invasive grasses leading fires into the saguaro's realm, noted Betancourt. For instance, a citizen network reporting the growing presence of buffelgrass could alert officials to take action, such as spraying herbicides before the grass consumed the landscape. Word of buffelgrass reaching the flowering stage could inspire officials to release a natural enemy like the yellow starthistle seedfly, he added. These actions could become more important as rising temperatures dry out grasses earlier in the season.

The longer warm weather seasons showing up in records could translate into longer and more severe fire seasons as soils once covered by snow face the harsh light of day for extended periods. The litany of problems this would bring includes the release of more carbon dioxide back into the atmosphere.

Carbon fluctuations

The dry mass of land plants and trees amounts to about half carbon—all of it drawn at some point from carbon dioxide in the air. Because carbon dioxide is the main greenhouse gas implicated in the acceleration of global warming, its ups and downs affect the amount of heat the atmosphere retains at the Earth's surface. Northern hemisphere carbon dioxide levels rise and fall with the seasons as plants draw down this greenhouse gas in summer, then release much of it via decay when they die or drop their leaves in winter (Figure 1).

Like much plant growth itself, the seasonal timing of the carbon dioxide "drawdown" had shifted forward by up to a week as of the mid-1990s compared to the early 1970s, as reported by a longtime carbon dioxide record-keeper, the late Charles Keeling, and colleagues (*Nature*, July 11, 1996). In a follow-up paper, Keeling, lead author Ranga Myneni of Boston University, and others found satellite evidence to support their argument that this carbon dioxide shift reflected increased plant growth during a longer growing season (*Nature*, April 17, 1997). They estimated that the northern growing season increased by roughly 12 days between 1982 and 1990, with two-thirds of the change attributed to an early spring and the remainder from a delayed autumn.

The opportunity to calibrate satellite "green-up" imagery with documented on-the-ground leafing out was touted as another important reason for a continental-scale phenology network in this country. More of these comparisons will help scientists understand how organisms that form the planet's biosphere are responding to climate variability and change.

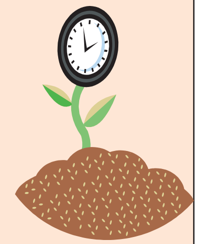
With more than 150 countries and a growing number of U.S. states vowing to reduce the input of carbon dioxide into the atmosphere, the helpful role of plants is destined to receive much attention by those trying to monitor the year-to-year changes in the carbon cycle. The implications for global warming go beyond carbon dioxide dynamics, as vegetation cover can also increase the Earth's retention of direct solar radiation, especially when compared to snow cover.

In addition, farmers, ranchers, tourists, doctors, teachers, biologists, journalists, gardeners, land managers, and many other members of society also stand to benefit from continental-scale information linking climate fluctuations to the seasonal cycles of plants and animals, participants pointed out. With so many potential beneficiaries, the message from the workshop rang out loud and clear: It's time for U.S. residents to synchronize their watches and clock nature's biological cycles.

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

Observing nature's clock

By Melanie Lenart



Workshop planners and others are working to set up phenology observation sites at select weather stations and long-term ecological research sites, as well as citizen observer networks. Although a national phenology network is still evolving, opportunities exist to contribute information on a national and international level:

USA National Phenology Network
http://www.uwm.edu/Dept/Geography/npn/
Allows observers to contribute sightings of seasonal events.

Sonoran Desert Phenology Network
Contact: crimmins@u.arizona.edu
UA extension specialist Michael Crimmins and other UA researchers are working to develop phenology protocol for plants in the National Park Service's Sonoran Desert Network. Citizen observers can volunteer.

Project FeederWatch
http://www.birds.cornell.edu/pfw/
A national phenology effort for bird-watchers

GLOBE Program
http://www.globe.gov/globe_flash.html
Hands-on scientific endeavors for students including the collection of phenology data

Canadian NatureWatch
http://www.naturewatch.ca/english/

European Nature's Calendar
http://www.dow.wau.nl/msa/epn/index.asp

U.K. Phenology Network
http://www.phenology.org.uk/

Temperature (through 9/14/05)

Sources: High Plains Regional Climate Center

Average temperatures for the 2005 water year range from the upper 30 degrees Fahrenheit in New Mexico to the upper 70 degrees Fahrenheit in southwestern Arizona (Figure 1a). Most of the region has been 1–3 °F above average, with the largest positive temperature difference in northern New Mexico (Figure 1b). Western Arizona has exhibited temperatures 1–4 °F cooler than average for the water year. During the previous 30 days, most areas were slightly warmer than average. Figures 1c–d show that recording stations in south-central Arizona, near the southern Arizona and New Mexico border, and in north-central New Mexico had the warmest temperature anomalies (3–4 °F). A small section of southwestern New Mexico had the coolest anomalies (2-4 °F).

Recent high temperatures have declined in contrast to high temperatures prior to the onset of the monsoon. According to the National Climatic Data Center, the 2005 summer (June–August) was the tenth warmest on record for the contiguous United States, though the summer ranked a more modest twenty-seventh for the Southwest.

Figure 1a. Water year '04–'05 (through September 14, 2005) average temperature.

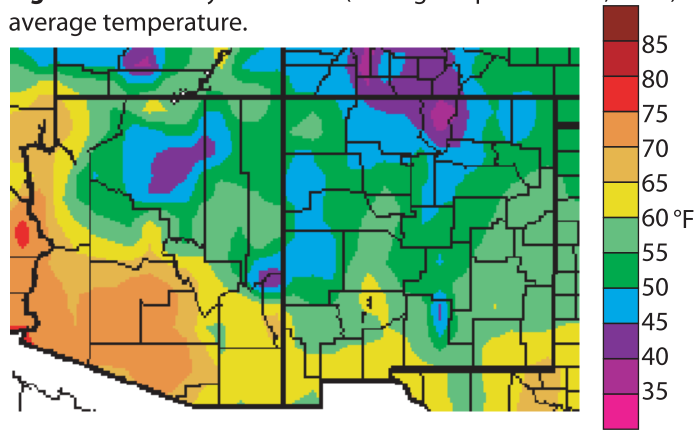


Figure 1b. Water year '04–'05 (through September 14, 2005) departure from average temperature.

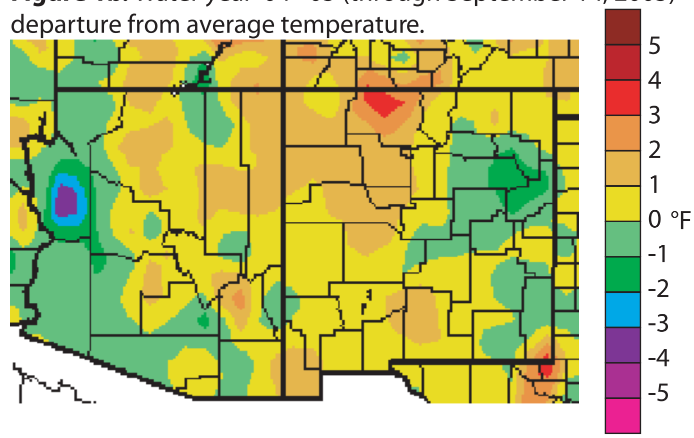


Figure 1c. Previous 30 days (August 16–September 14, 2005) departure from average temperature (interpolated).

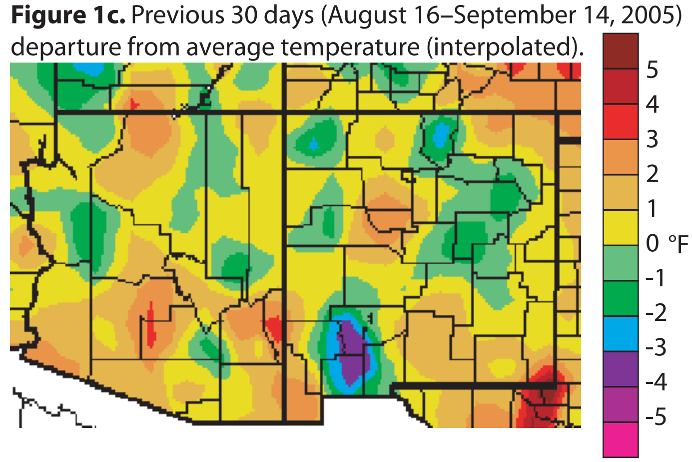
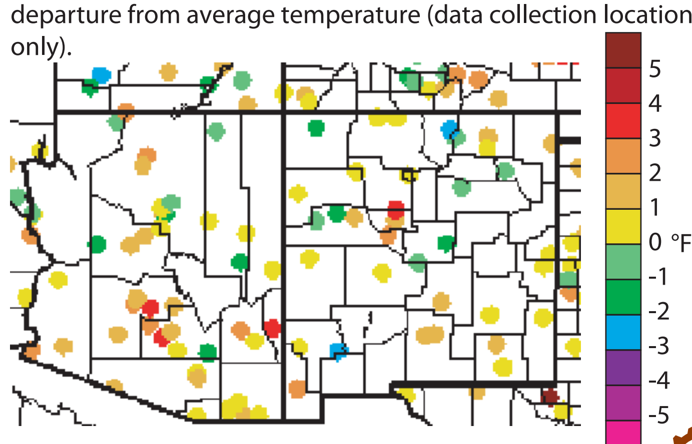


Figure 1d. Previous 30 days (August 16–September 14, 2005) departure from average temperature (data collection locations only).



Notes:

The water year begins on October 1 and ends on September 30 of the following year. Water year is more commonly used in association with precipitation; water year temperature can be used to measure the temperatures associated with the hydrological activity during the water year.

Average refers to the arithmetic mean of annual data from 1971–2000. Departure from average temperature is calculated by subtracting current data from the average. The result can be positive or negative.

The continuous color maps (Figures 1a, 1b, 1c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. The dots in Figure 1d show data values for individual stations. Interpolation procedures can cause aberrant values in data-sparse regions.

These are experimental products from the High Plains Regional Climate Center.

On the Web:

For these and other temperature maps, visit:
http://www.hprcc.unl.edu/products/current.html

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

Precipitation (through 9/14/05)

Source: High Plains Regional Climate Center

Precipitation for most of the Southwest remains above average during the water year (Figures 2a–b). Western, central, and northern Arizona and parts of New Mexico show departures of 130 percent above average or greater. Other portions of the region continue to show deficits with only 70–90 percent of average precipitation. The below-average precipitation in southeastern Arizona and from northeastern Arizona into northwestern New Mexico over the water year, along with low reservoir levels, has led to the moderate drought shown in the U.S. Drought Monitor (see Figure 3). Precipitation over the past 30 days was generally below average across the Southwest (Figures 2c–d). Much of the region was below 70 percent of average precipitation for this period. These deficits were due to an atmospheric circulation pattern that was not conducive to rainfall. Sections of northeastern and southeastern Arizona and from northeastern to south-central New Mexico recorded up to 300 percent of average precipitation.

The Albuquerque National Weather Service (NWS) reports that August precipitation was well above average in the eastern plains, but several storms in the first two weeks of September also contributed to the wetter-than-average conditions. For example, Clayton recorded 1.25 inches of rain on September 5 and 6, which played a role in pushing the monthly precipitation to 0.25 inches above average.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2004 we are in the 2005 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 '04–'05 through September 14, 2005 percent of average precipitation (interpolated).

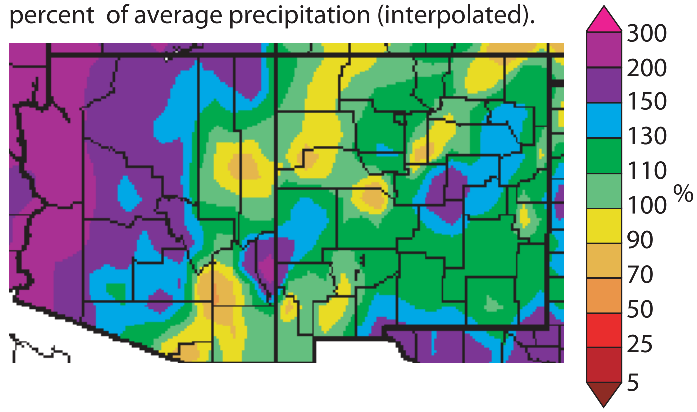


Figure 2b. Water year '04–'05 through September 14, 2005 percent of average precipitation (data collection locations only).

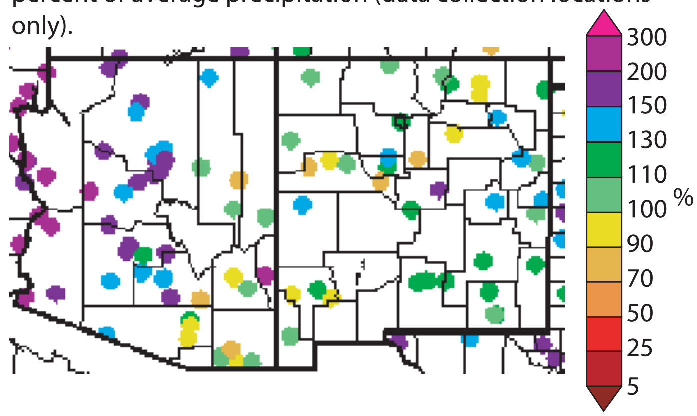


Figure 2c. Previous 30 days (August 16–September 14, 2005) percent of average precipitation (interpolated).

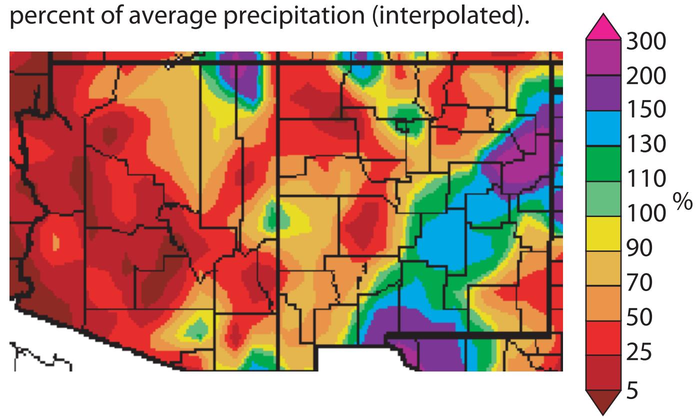
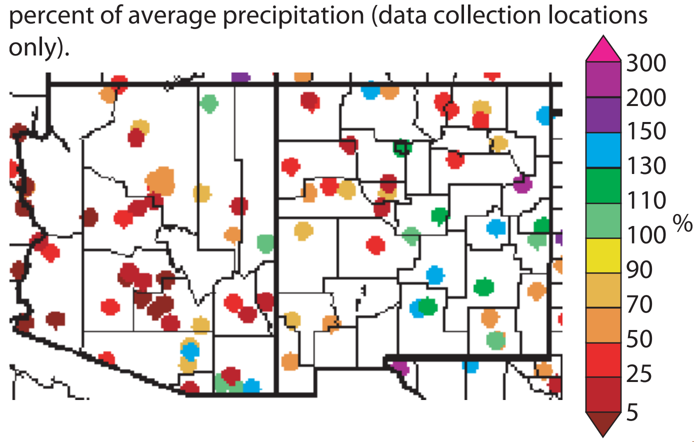


Figure 2d. Previous 30 days (August 16–September 14, 2005) percent of average precipitation (data collection locations only).



U.S. Drought Monitor
(released 9/15/05)

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

Drought conditions have improved in portions of eastern Arizona and central New Mexico since mid-July (Figure 3). The areas that still show drought suffer from long-term precipitation deficits over the current water year (see Figures 2a–b) or longer. Graphics produced by the National Drought Mitigation Center indicate that most of the region has shown marked improvement during 2005 and since last October. Officials rate 45 percent of the pasture and range land in Arizona as poor to very poor, and 21 percent as poor to very poor in New Mexico. These numbers represent a decrease from one year ago, but they are up by 32 percent and 10 percent in Arizona and New Mexico, respectively, since early May.

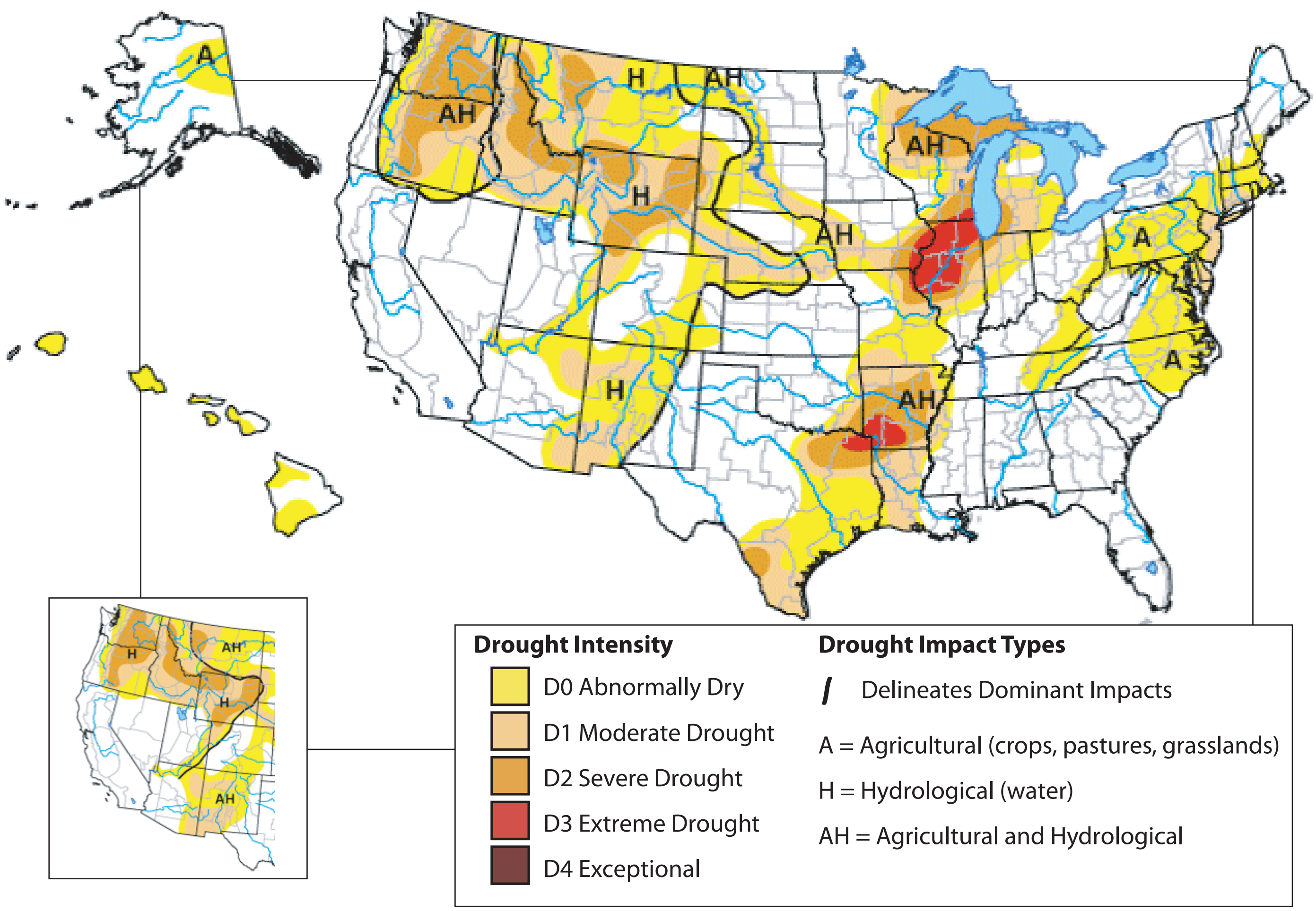
According to research at the University of Arizona Laboratory of Tree-Ring Research, the Upper Colorado River Basin, and the Salt, Verde, and Tonto river basins in Arizona are often concurrently in high or low flow (*Arizona Daily Wildcat*, August 30). The finding contrasts with previous notions that a flow deficit in one basin would be compensated in another basin. This result and others from the study will help with water management during the current and future droughts.

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 Michael Hayes, NDMC.

Figure 3. Drought Monitor released September 15, 2005 (full size) and August 18, 2005 (inset, lower left).



On the Web:

The best way to monitor drought trends is to pay a weekly visit to the U.S. Drought Monitor website: http://www.drought.unl.edu/dm/monitor.html

New Mexico Drought Status

(through 8/19/05)

Source: New Mexico Natural Resources Conservation Service

Meteorological and hydrological drought status in New Mexico is unchanged since July (Figures 4a–b). Despite an exceptionally dry June and July, August and early September precipitation improved meteorological conditions in some areas. Rangeland conditions have ameliorated considerably since the early summer. However, north-central, northwestern, and south-central New Mexico remain in mild to moderate drought. Summer precipitation was below average in the Capitan-Sacramento Mountains region despite a wet August (Albuquerque National Weather Service [NWS]). The Albuquerque NWS also reports that hydrological drought conditions are considerably better than at this time last year. The Zuni and Bluewater basins still exhibit moderate hydrologic drought status.

The Colorado River Basin states, including New Mexico, are still negotiating shortage sharing arrangements. One particularly thorny issue is whether tributary flows in the lower basin states (Arizona, Nevada, and California) should be counted against their shares of Colorado River water, as is the practice in the upper basin states. Some upper basin states have not yet appropriated their full share of the Colorado. Further upper basin appropriation, in conjunction with growth-related demands in the lower basin, will increase pressure on the Colorado River system. One water manager noted "the problem is not the drought, but overuse in the lower basin." (*U.S. Water News*, September 2005).

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 August 19, 2005.

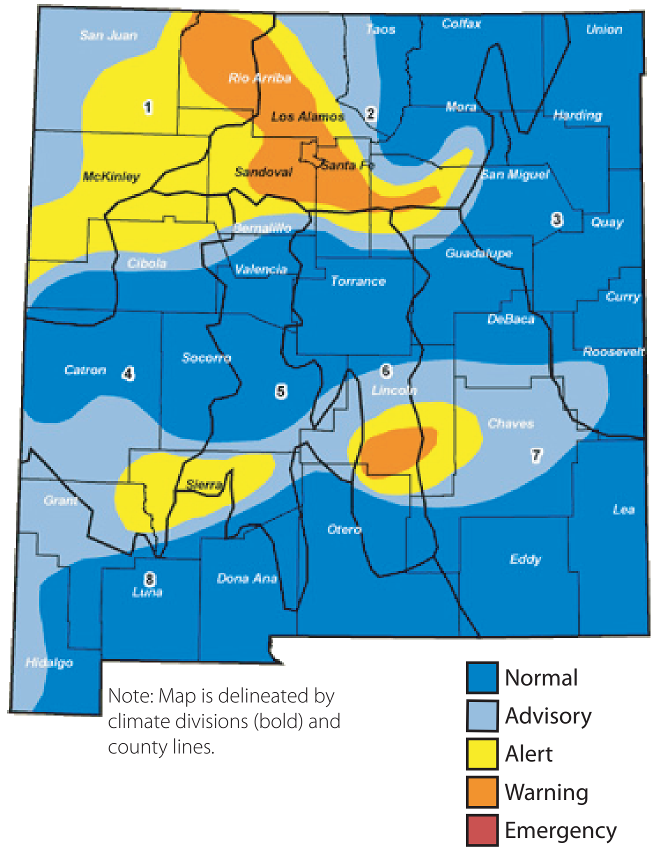
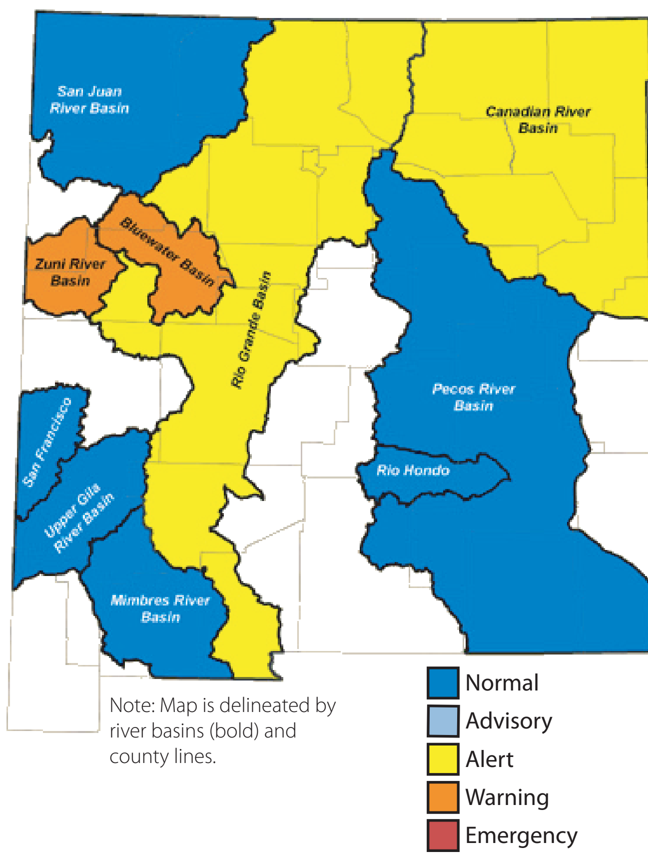


Figure 4b. Long-term drought map based on hydrological conditions as of August 19, 2005.



Arizona Reservoir Levels

(through 8/31/05)

Source: National Water and Climate Center

Reservoirs in Arizona showed little change from July to August, as some lakes increased by several percent of capacity and others decreased slightly. The largest decrease (4 percent of capacity) occurred at the San Carlos Reservoir. Most of the state's reservoirs remain well below capacity, except the Salt River System (88 percent), Show Low Lake (100 percent), Lake Havasu (92 percent), and Lake Mohave (96 percent) as shown in Figure 5. Show Low Lake has been at full storage since March due to the above-average winter and early spring precipitation. The abundant winter and spring precipitation also reveals itself when the current storage is compared to storage one year ago. All reservoirs are near to well above the storage at the end of August 2004. Lakes Mead and Powell, which in 2004 were at some of their lowest levels since their initial filling, remain above last year's storage. More years of above-average precipitation will be required to raise these reservoirs to their average storage.

In August, the seven Colorado River Basin states signed a pledge to cooperate on methods of managing the Colorado River (*Rocky Mountain News*, August 30). The states made this declaration based on negotiations following actions by U.S. Interior Secretary Gale Norton in April to develop a federal drought plan. Officials agree that the pledge is a good initial step, but more work is necessary. Arizona recently developed a legal defense fund to protect its allocation of the Colorado River. As of early September, the Arizona Department of Water Resources and the Central Arizona Project board contributed at least $200,000 each to the fund (Arizona Republic, September 2). The Salt River Project may also contribute a similar amount.

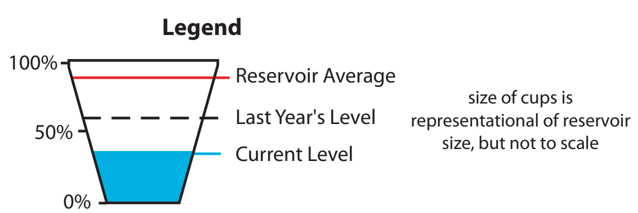
Notes:

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.

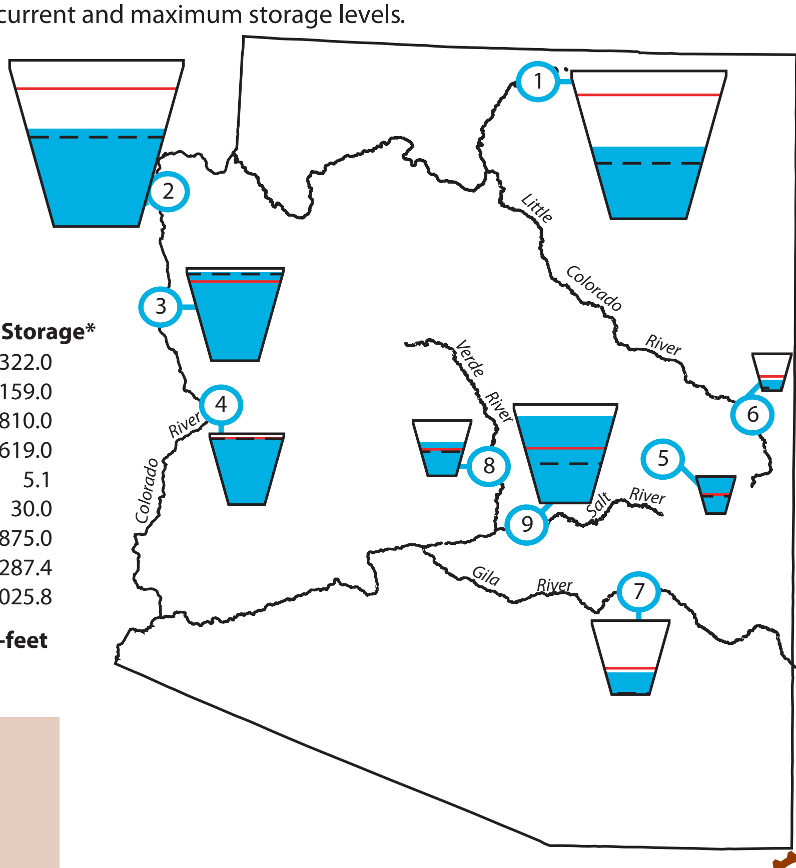
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) 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 August 2005 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Lake Powell	49%	12,022.0	24,322.0
2. Lake Mead	59%	15,351.0	26,159.0
3. Lake Mohave	96%	1,729.8	1,810.0
4. Lake Havasu	92%	569.4	619.0
5. Show Low Lake	100%	5.1	5.1
6. Lyman Reservoir	28%	8.3	30.0
7. San Carlos	30%	262.5	875.0
8. Verde River System	61%	175.4	287.4
9. Salt River System	88%	1,779.5	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 8/31/05)

Source: National Water and Climate Center

Most lakes remained well below capacity as of the end of August (Figure 6). Except for Navajo, El Vado, Costilla, and Heron reservoirs, each lake in New Mexico held less then 55 percent of its capacity. Caballo Reservoir was at only 7 percent of capacity after falling by 3 percent of capacity since the end of July. Other lakes in the central and western portions of the state also decreased or remained steady. The largest drop occurred at Costilla Reservoir, which fell from 80 to 61 percent of capacity. Lakes in the Canadian and Pecos River basins, which are in eastern New Mexico, remained steady or increased due to the above-average precipitation over much of the eastern and southeastern areas of New Mexico over the past 30 days (see Figures 2c–d). The Albuquerque National Weather Service reports that August precipitation was well above average, with some locations in the top 10 percent of wettest Augusts since records began. Lake Avalon rose by 10 percent of capacity, while Sumner and Brantley increased by 3 percent and 2 percent, respectively. As in Arizona, most reservoirs in New Mexico are near to above storage values in 2004. Lake Sumner, which held only 3 percent of its capacity last year at this time, was at nearly 40 percent at the end of August.

Santa Fe Community College will house the new Center for Community Sustainability, which will promote "clean, beneficial, self-sustaining water and energy projects" in Santa Fe (*Santa Fe New Mexican*, September 7). The city, the county, the college, the Santa Fe Business Incubator, and a local non-profit group will cooperate on the funding and operation of the center.

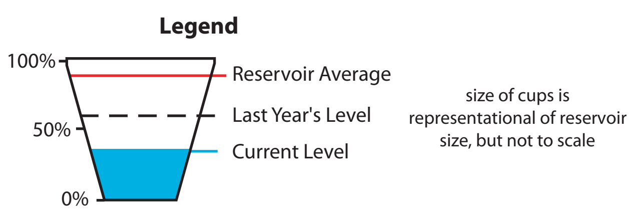
Notes:

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.

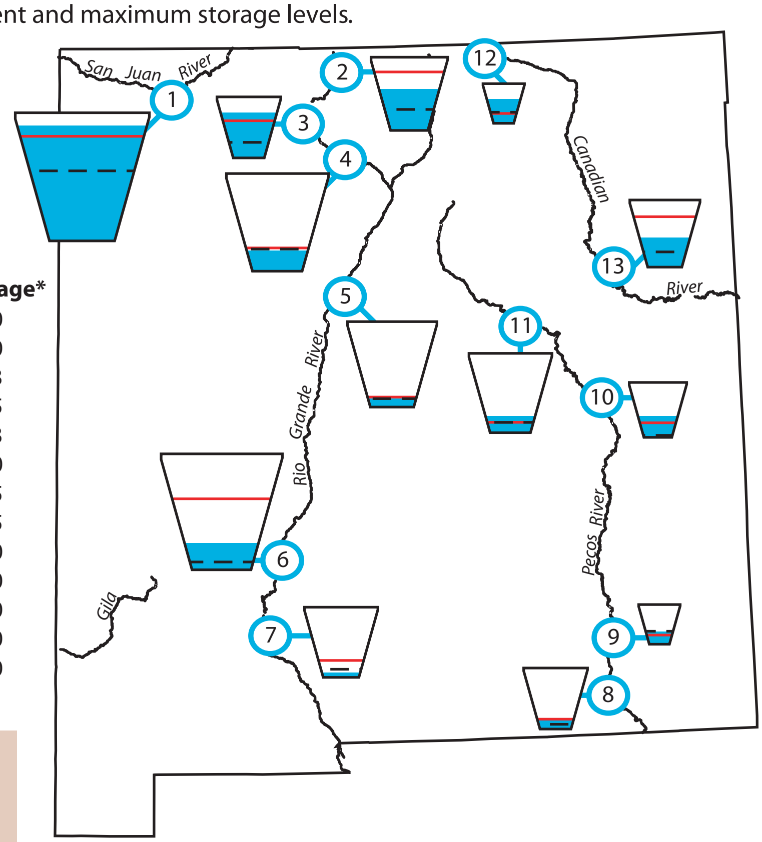
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) 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 August 2005 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Navajo	90%	1,534.2	1,696.0
2. Heron	57%	226.5	400.0
3. El Vado	74%	137.1	186.3
4. Abiquiu	21%	113.9	554.5
5. Cochiti	10%	48.5	502.3
6. Elephant Butte	23%	478.1	2,065.0
7. Caballo	7%	23.5	331.5
8. Brantley	14%	20.7	147.5
9. Lake Avalon	32%	1.9	6.0
10. Sumner	39%	39.9	102.0
11. Santa Rosa	21%	95.4	447.0
12. Costilla	61%	9.8	16.0
13. Conchas	44%	110.9	254.0

*** thousands of acre-feet**



On the Web:

Portions of the information provided in this figure can be accessed at the NRCS website:
http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html

Southwest Fire Summary

(updated 9/15/05)

Source: Southwest Coordination Center

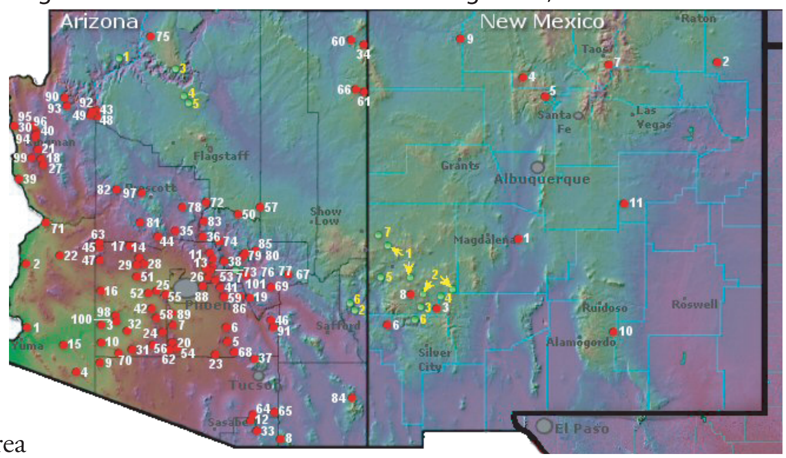
The 2005 fire season in the Southwest appears to be winding down, after a record total of 749,000 acres burned as of September 15 (Figure 7a). Most of the acreage was in Arizona, with only 23,097 acres in New Mexico. The Southwest Coordination Center (SWCC) reports that fuel moisture and fire weather conditions have improved considerably since a month ago, although with the end of the monsoon, there is still the possibility of wildfire activity this fall. In line with the generally improved conditions, the SWCC, on September 15, discontinued its daily morning briefing report until next spring. The latest morning briefing lists only one large fire in the Southwest, the Tank fire located north of Williams, Arizona. Fire managers are utilizing it as a wildland fire use blaze.

SWCC reports that a number of Southwest area resources have been mobilized to support Hurricane Katrina relief efforts in the South, including two Incident Management teams, 16 crews, and over 170 other personnel. Functions range from debris removal to logistics distribution and support. In addition, more Southwest area resources are helping to manage logistics and safety for the Hurricane Katrina Evacuation Center at Veterans Stadium on the Arizona State Fairgrounds in Phoenix. The Southwest Area remains in "Preparedness Level 2," which means that resources are sufficient to manage wildfires and prescribed blazes.

Figure 7a. Year-to-date fire information for Arizona and New Mexico as of September 15, 2005.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	2,420	169,216	1,167	556,687	3,587	725,903
NM	396	18,432	712	4,665	1,108	23,097
Total	2,816	187,648	1,879	561,352	4,695	749,000

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



Wildland Fires

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

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

Wildland Fire Use

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

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

Notes:

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

On the Web:

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

http://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

Monsoon Summary (through 9/13/05)

Source: Western Regional Climate Center

Precipitation over the past two and a half months ranges from less than 0.10 inches in southwestern Arizona to more than10 inches in portions of east-central Arizona and south-central and northeastern New Mexico (Figure 8a). Totals for much of the region are between 1 and 6 inches. The departure from average maps show that these totals are generally below average (Figures 8b–c). While most of the Southwest is only slightly below average in inches (0–2 inches), the percent of average values vary more because average monsoon precipitation can be vastly different across the area.

Due to the nature of rainfall during the monsoon, some locations may receive below-average precipitation, while others are wetter than average. It is also common for the precipitation at a location to change from below average to above average over a short period. This occurred at Tucson International Airport (TIA) in late August. The Tucson National Weather Service reports that a storm that dropped 2.29 inches of rain at TIA changed the monsoon ranking from the twenty-ninth driest monsoon to the twenty-ninth wettest on record. The event, which ranks as the tenth wettest day on record in Tucson, also pushed the monsoon rainfall total to 0.64 inches above average.

Figure 8a. Total precipitation in inches July 1–September 13, 2005.

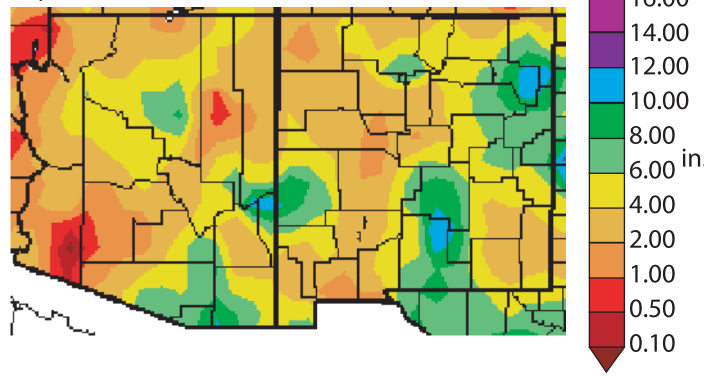


Figure 8b. Departure from average precipitation in inches July 1–September 13, 2005.

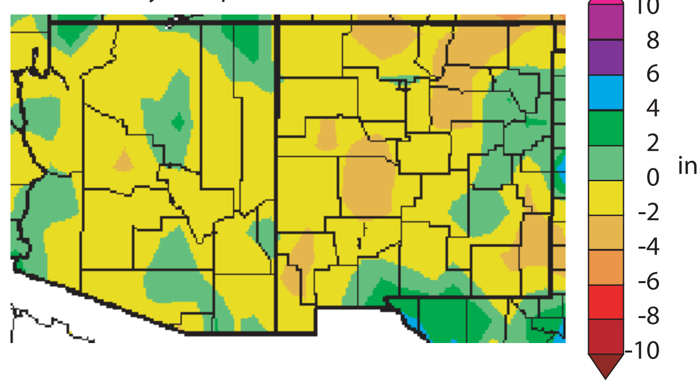
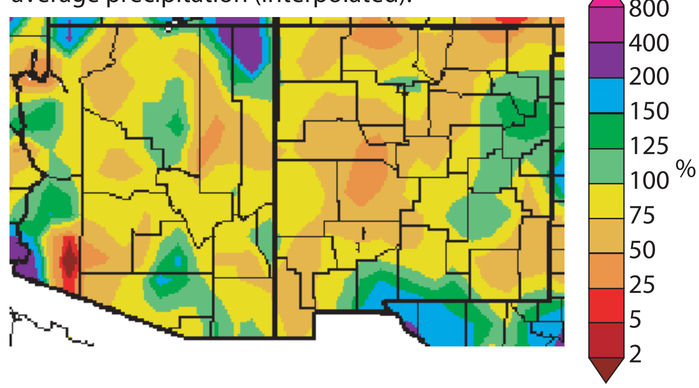


Figure 8c. July 1–September 13, 2005 percent of average precipitation (interpolated).



Notes:

Average refers to the arithmetic mean of annual data from 1971–2000. Percent of average precipitation is calculated by taking the ratio of current to average precipitation and multiplying by 100. Departure from average precipitation is calculated by subtracting the average from the current precipitation.

The continuous color maps (Figures 8a–c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. Interpolation procedures can cause aberrant values in data-sparse regions. The data used to create these maps is provisional and have not yet been subjected to rigorous quality control.

On the Web:

These data are obtained from the Western Regional Climate Center:

http://www.wrcc.dri.edu

Temperature Outlook
(October 2005–March 2006)
Source: NOAA Climate Prediction Center

The NOAA-CPC long-lead temperature outlooks show increased chances of above-average temperatures for most of the Southwest through March 2006 (Figures 9a–d.) The forecasts indicate the highest probabilities centered over the Four Corners area from January-March 2006 (Figure 9d). The area of increased chances of warmer-than-average conditions will expand from the Southwest and West Coast in the fall to include most of the western and central U.S. by mid-winter and early spring. The forecasts are based on a wide array of statistical and dynamic models, as well as recent trends. The CPC outlooks agree closely with the outlooks issued by the International Research Institute for Climate Prediction (not shown), although some minor differences exist in the placement of the forecasted anomalies.

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 9a. Long-lead national temperature forecast for October–December 2005.

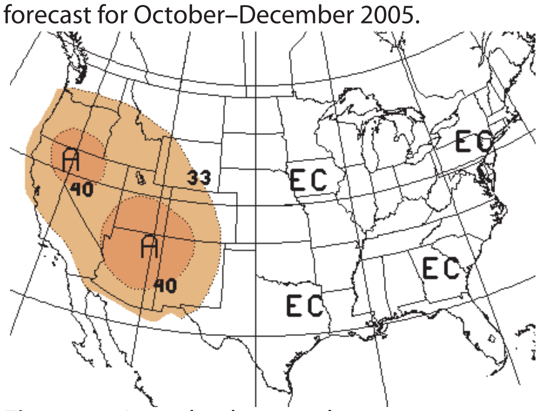


Figure 9b. Long-lead national temperature forecast for November 2005–January 2006.

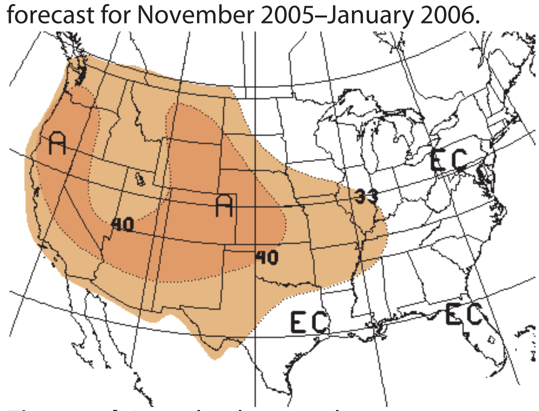


Figure 9c. Long-lead national temperature forecast for December 2005–February 2006.

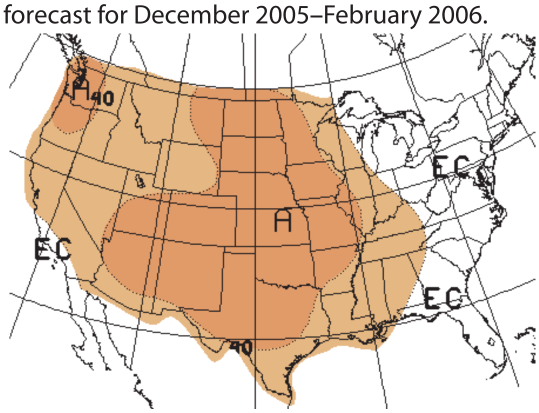
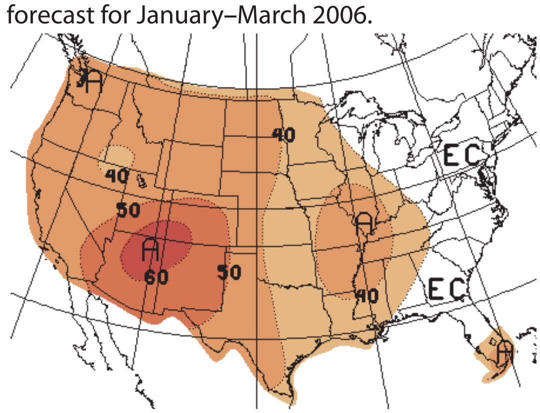


Figure 9d. Long-lead national temperature forecast for January–March 2006.



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

EC= Equal chances. No forecasted anomalies.

On the Web:

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

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

Precipitation Outlook

(October 2005–March 2006)

Source: NOAA Climate Prediction Center

The NOAA-CPC long-lead outlooks show increased chances of below-average precipitation for much of the southwestern United States through February 2006 (Figure 10a–c). The region of highest probability is centered over Arizona and adjacent parts of the surrounding states from October–December (Figure 10a). By December–February (Figure 10c), the forecasted anomaly shifts to the south and east and covers a smaller portion of Arizona and New Mexico. There are no forecast anomalies for the January–March period in the Southwest (Figure 10d). The forecasts are based on a wide array of statistical and dynamic models and recent trends. The outlooks issued by the International Research Institute for Climate Prediction (IRI, not shown) are similar to the CPC outlooks, although the IRI anomalies generally cover somewhat smaller areas.

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 10a. Long-lead national precipitation forecast for October–December 2005.

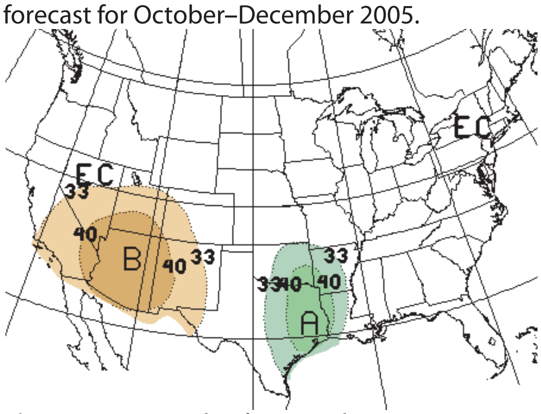


Figure 10b. Long-lead national precipitation forecast for November 2005–January 2006.

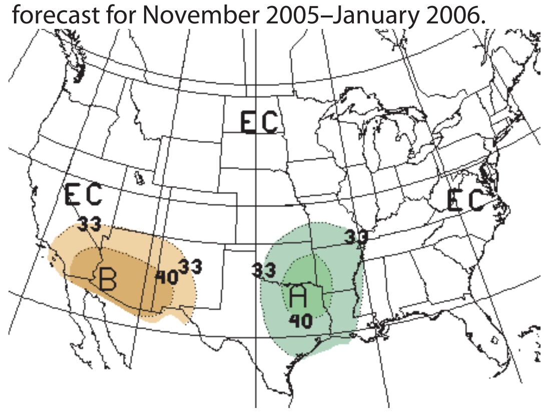


Figure 10c. Long-lead national precipitation forecast for December 2005–February 2006.

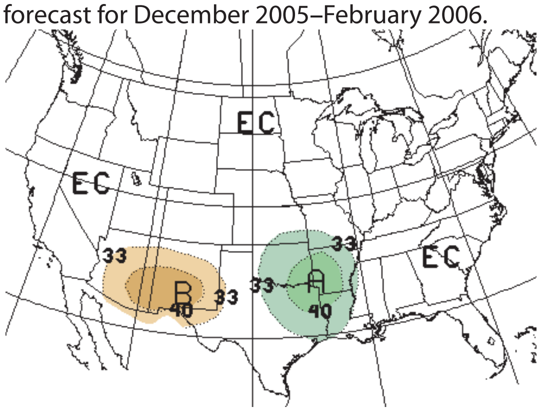
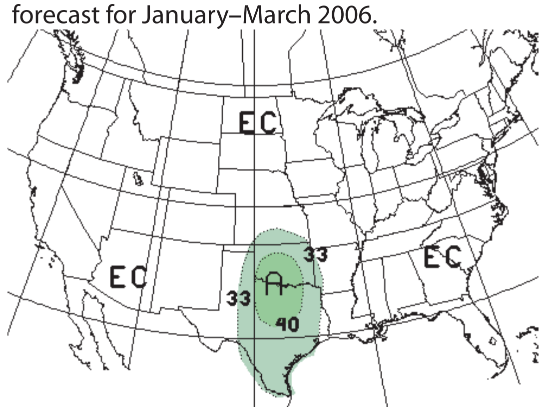


Figure 10d. Long-lead national precipitation forecast for January–March 2006.



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 December 2005)

Source: NOAA Climate Prediction Center

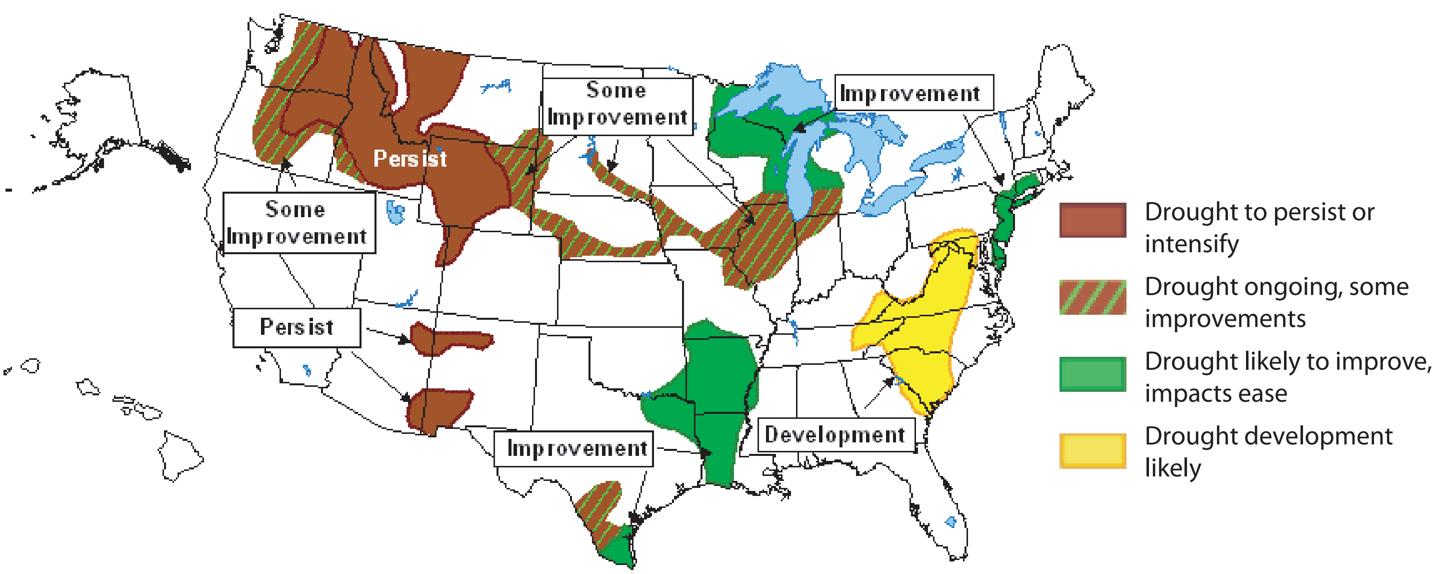
Experts expect drought to persist along the Arizona and New Mexico border (Figure 11). With the end of the monsoon and the region entering what is usually a dry time of year, these areas likely will not receive adequate rainfall to improve their current drought status (see Figures 3 and 10a–c). Monsoon rainfall was below-average in these areas, with some locations receiving less than 75 percent of average precipitation since early July. A late start to the monsoon contributed to these deficits. Near to above-average water year precipitation in both Arizona and New Mexico generally missed pockets of drought in Cochise, Graham, Navajo, and Apache Counties (see Figure 2a). In addition, the CPC outlook calls for increased chances of above-average temperatures (see Figure 9a) for most of the Southwest, which could intensify drought impacts.

The lack of relief after several years of drought has impacted rivers in and around southern Arizona. The San Pedro River gage at Charleston registered no flow on the evening of July 6 for the first time since records began (U.S. Geological Survey, as reported by officials and in the media). Likely factors contributing to record low flow include a late monsoon start, groundwater pumping, increased use by riparian vegetation, higher evaporation rates, and long-term drought. Also in southern Arizona, riparian trees died in numerous pockets along a 10-mile stretch of the Santa Cruz River near Nogales. Cottonwood, willows, mesquite, and even some salt cedars died, leading experts to believe that drought and low water tables are behind the deaths (*Arizona Daily Star*, September 15). Private wells in the area have dropped by 20–35 feet, at least partly because of drought, so it is possible that the trees cannot adequately tap into the water table.

Notes:

The delineated areas in the Seasonal Drought Outlook (Figure 11) are defined subjectively and are based on expert assessment of numerous indicators, including outputs of short- and long-term forecasting models.

Figure 11. Seasonal drought outlook through December 2005 (release date September 15, 2005).



On the Web:

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

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

According to the National Interagency Coordination Center (NICC), the fire danger rating in the Southwest is considerably lower than it was one month ago, but the possibility still exists for an above-average fall fire season. Wildland fire potential is above average for northeastern Arizona and northwestern New Mexico (Figure 12a). A significant number of fire management units in Arizona are still reporting high or very high fire danger ratings, including several units in southeastern Arizona. The fire danger rating is generally moderate in New Mexico, particularly in the southeastern portion of the state. The NICC also says that, even though significant fire activity during the fall months in the Southwest is rare, conditions this year are similar to years during which significant fall fire activity has occurred. Above-normal fire indices, warm and dry weather, and abundant fine fuels in a cured or curing condition all contribute to the possibility of a fall fire season. Elsewhere in the United States, above-normal fire potential extends from southern California to the Canadian border in Idaho and western Montana. The fire potential is at critical levels in sections of Nevada, Oregon, Washington, and parts of the Midwest.

Figure 12a. National wildland fire potential for fires greater than 100 acres (valid September 1–30, 2005).

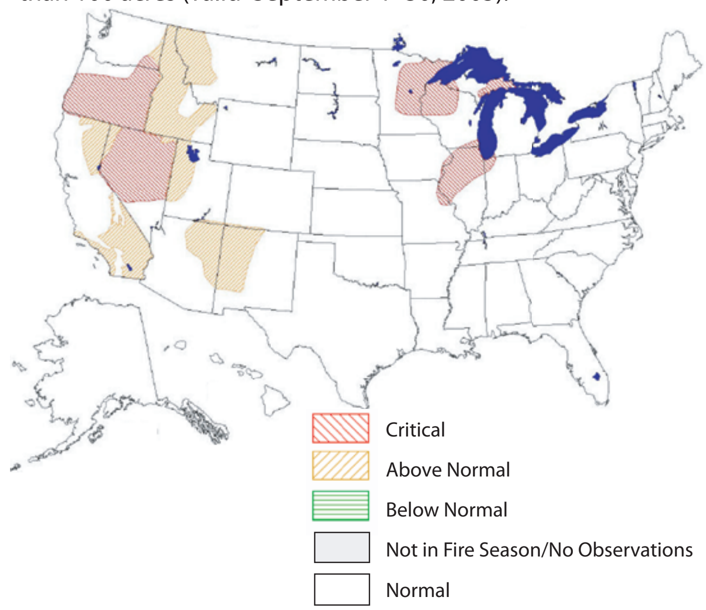


Figure 12b. Current fine fuel condition and live fuel moisture status in the Southwest.

TABLE NOT UPDATED
see text for current information

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

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

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces monthly wildland fire outlooks. The forecasts (Figure 12a) 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 12b 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, International Research Institute for Climate Prediction (IRI)

The tropical Pacific Ocean remains in a neutral El Niño Southern Oscillation (ENSO) pattern (Figure 13a). The likelihood that it will remain neutral has increased for the near-future (September–November), while the probability of a shift to a La Niña phase during the spring has also increased (Figure 13b) compared to last month's forecast. The neutral phase has an 80 percent or greater chance of prevailing through at least February. At that point, the odds of shifting into La Niña increase, reaching a 20 percent chance by March. The odds are roughly equal (25 percent) for either La Niña or El Niño to dominate the summer season, although neutral conditions remain the most likely scenario for the coming year.

Sea surface temperatures in the ENSO-sensitive central Pacific region were about average at of the end of August, with a swath of slightly cooler temperatures off the coast of Peru. Stronger-than-average easterly trade winds prevailed during most of the summer, although their strength decreased around early September. Strong easterly trade winds generally inhibit the warming of sea surface temperatures that contribute to El Niño. The IRI reports that most models forecast a continuation of neutral ENSO conditions, although the large variation in the model output leaves considerable uncertainty.

Notes:

Figure 13a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through August 2005. The SOI measures the atmospheric response to SST changes across the Pacific Ocean Basin. The SOI is strongly associated with climate effects in the Southwest. Values greater than 0.5 represent La Niña conditions, which are frequently associated with dry winters and sometimes with wet summers. Values less than -0.5 represent El Niño conditions, which are often associated with wet winters.

Figure 13b 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 13a. The standardized values of the Southern Oscillation Index from January 1980–August 2005. La Niña/El Niño occurs when values are greater than 0.5 (blue) or less than -0.5 (red) respectively. Values between these thresholds are relatively neutral (green).

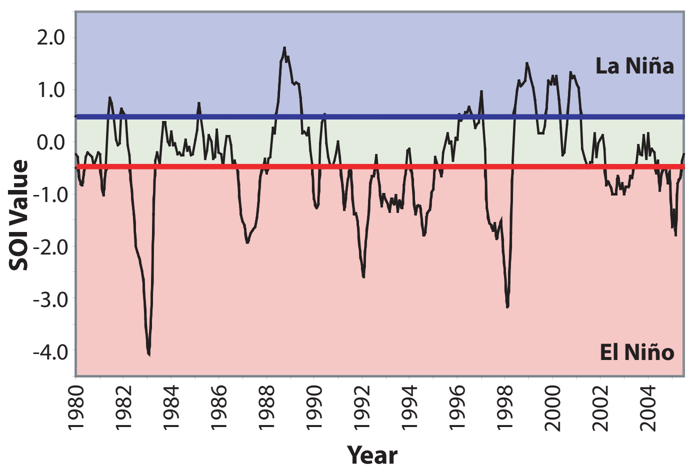
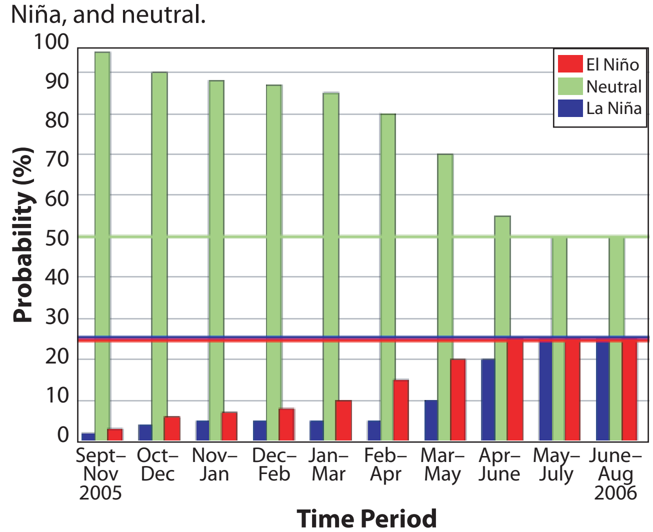


Figure 13b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released September 15, 2005). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Temperature Verification
(June–August 2005)

Source: NOAA Climate Prediction Center

The long-range forecast from the NOAA-Climate Prediction Center (CPC) for June–August 2005 showed greater chances of above-average temperatures for much of the Southwest, West Coast, southern Texas, and the Southeast (Figure 14a). Northwestern Arizona, southern Nevada, and southeastern California had the highest probabilities for warmer-than-average conditions. The forecast also showed increased likelihood of below-average temperatures for the upper Midwest and northern Great Plains. Most observed temperatures nationwide were within 5 degrees F above and below average (Figure 14b). The forecast performed best in predicting warmer-than-average conditions in southern Texas, California, and most of the Southeast and Southwest, except for patches in northwestern Arizona, Utah, and Colorado. Below-average temperatures in the northern Great Plains and upper Midwest were not as spatially extensive or consistent as predicted.

Figure 14a. Long-lead U.S. temperature forecast for June–August 2005 (issued May 2005).

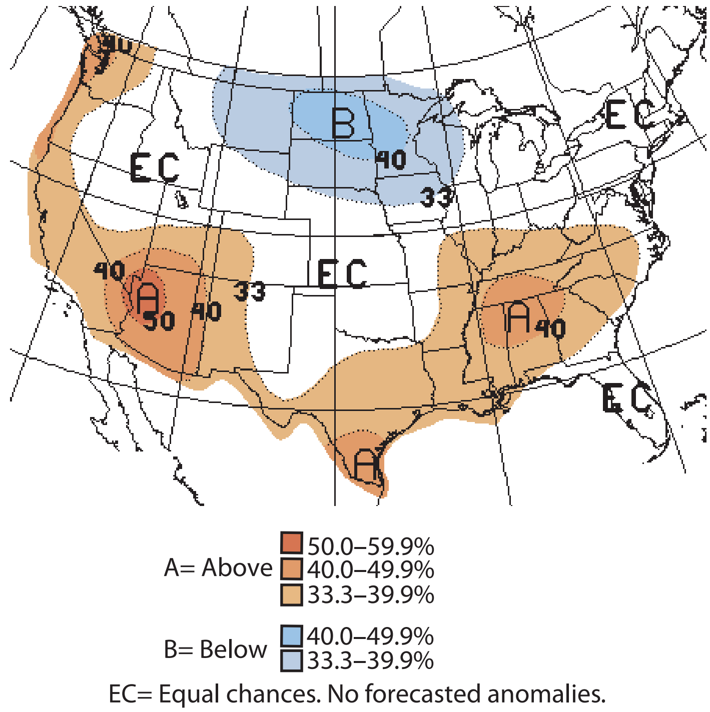
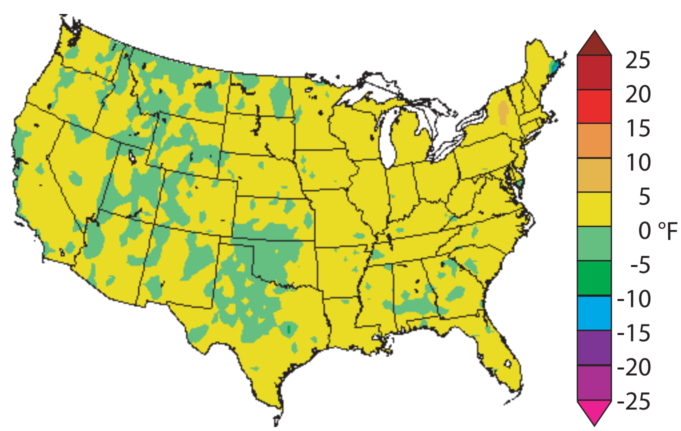


Figure 14b. Average temperature departure (in degrees F) for June–August 2005.



Notes:

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

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

Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average temperature. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation. Equal Chances (EC) indicates areas where reliability (i.e., the skill) of the forecast is poor and no prediction is offered.

Figure 14b shows the observed departure of temperature (°F) from the average for June–August 2005 period.

In all of the figures on this page, the term average refers to the 1971–2000 average. This practice is standard in the field of climatology.

On the Web:

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

Precipitation Verification
(June–August 2005)
Source: NOAA Climate Prediction Center

Outlooks from the NOAA-CPC for June–August 2005 showed increased chances for below-average precipitation for much of Arizona, New Mexico, and southeastern California, as well as in the Southeast and Gulf Coast regions (Figure 15a). The areas with greatest predicted likelihood of below-average precipitation were on the southern Arizona-New Mexico border and in northern Florida. Much of the Northwest and northern Great Plains states had increased chances for above-average precipitation. The forecast correctly predicted the drier-than-average conditions in most of the southwestern United States, except for observed above-average precipitation in south-central Arizona and parts of southeastern California (Figure 15b). The northern Great Plains and northern Rocky Mountains were wetter than average. However, above-average precipitation did not extend as far west as predicted. The above-average precipitation in the Southeast from Hurricane Katrina sharply contrasted with the forecast for increased chances of below-average precipitation in the region.

Figure 15a. Long-lead U.S. precipitation forecast for June–August 2005 (issued May 2005).

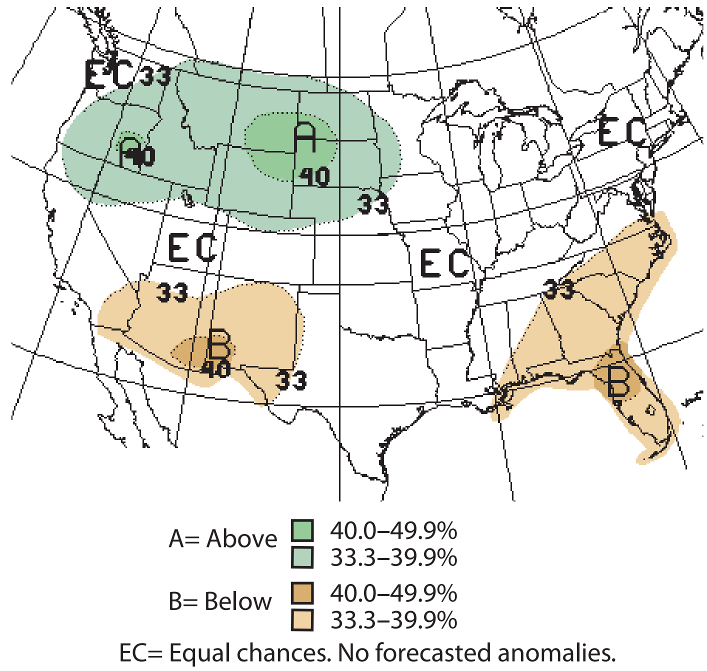
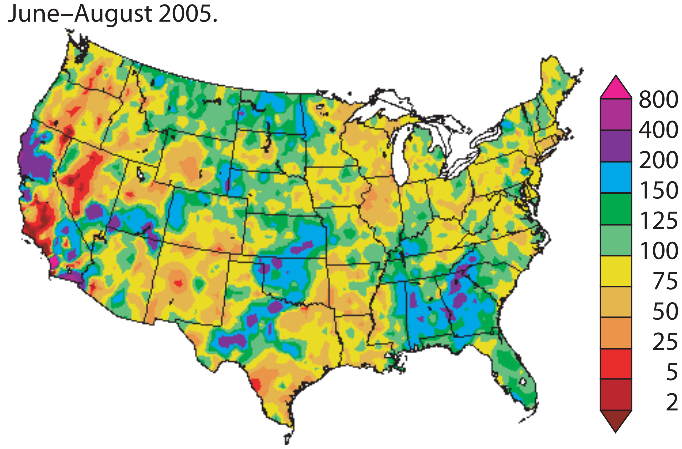


Figure 15b. Percent of average precipitation observed from June–August 2005.



Notes:

Figure 15a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months June–August 2005. This forecast was made in May 2005.

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

Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average precipitation. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation. Equal Chances (EC) indicates areas where reliability (i.e., the skill) of the forecast is poor and no prediction is offered.

Figure 15b shows the observed percent of average precipitation for June–August 2005.

In all of the figures on this page, the term average refers to the 1971–2000 average. This practice is standard in the field of climatology.

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