Issued: June 21, 2005

CLIMAS
Southwest Climate Outlook

June Climate Summary

Hydrological Drought – Despite unusual spring rainfall in parts of the Southwest, abnormally dry conditions to moderate drought persist.

- Lake Powell topped 10 million acre-feet for the first time since July 27, 2004.
- Storage in most New Mexico reservoirs increased, but statewide storage was still below average at the end of May.

Temperature – The water year has been near average in the Southwest, while the past 30 days were mainly above average.

Precipitation – Most locations, except portions of southeastern Arizona, are much wetter than average for the water year.

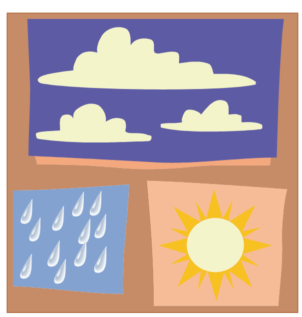
Climate Forecasts – NOAA-CPC long-lead outlooks show increased chances of above-average temperatures for much of the Southwest through December. Increased chances of drier-than-average conditions are expected through September.

El Niño – Probabilistic forecasts indicate that the current neutral ENSO conditions in the tropical Pacific Ocean are likely to continue through early 2006.

The Bottom Line – Abnormally dry conditions to moderate drought will persist through September in portions of the Southwest. Wildfire potential will remain above average as grasses continue to cure.

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

Monsoon



Experts predict a late monsoon onset and below-average monsoon precipitation this year. Outlooks from the NOAA Climate Prediction Center and the NOAA Climate Diagnostics Center show increased chances of drier-than-average conditions through September. Some studies have shown that above-average snowpack in the southern Rocky Mountains and spring rainfall in the Southwest, similar to this year, can negatively affect monsoon precipitation. Arizona ranchers and farmers agree with the latter. They have an adage that a wet spring, or any late spring precipitation, results in a dry monsoon. Regarding monsoon onset, an ancient Indian proverb states, "Rain will occur about a week after locusts begin to sing at night." The next few weeks and months will tell what Mother Nature's monsoon plans are for the Southwest in 2005.

See Precipitation Outlook (page 13) 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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THE UNIVERSITY OF ARIZONA

Monsoon could strengthen as climate warms

Broad-scale influences imply more summer rain, but many caveats apply

by Melanie Lenart

Editor's Note:
This is the first in a two-part series about how the monsoon might change with global warming. This article focuses on some of the broad-scale factors that could influence monsoonal strength while next month's article will consider atmospheric influences on the North American monsoon.

The mystery continues about how global warming might impact the North American monsoon, which lofts summer thunderstorms into the Southwest. Some circumstantial evidence suggests future monsoons could strengthen as temperatures rise, but the investigation has barely begun.

It's an important case considering that collectively New Mexico and Arizona receive about a third of their annual precipitation during the peak months of the monsoon, July and August (Figure 1). A major challenge is picking out the most influential suspects in the line-up, especially since they differ somewhat for the two states. Sea surface temperature (SST) definitely has some role in starting things off, while atmospheric response appears to determine where monsoonal rains will strike next.

Considering how climate change might affect the monsoon requires thinking out of the box. The Intergovernmental Panel on Climate Change projects that the world's average annual temperature will rise at an average rate of about 0.2 to 1 degree Fahrenheit per decade this century. But computer programs designed to consider the impacts of this warming model precipitation at grid scales that don't match regional monsoons.

Also, such models typically have 18 or more atmospheric layers, but they have only one land elevation for each grid cell measuring hundreds of square kilometers. This flattens the mountains that are so important to monsoon dynamics, with their slopes angling to take the full force of the summer sun's rays.

Besides North America, monsoons contribute summer precipitation in South America, Africa, Australia, and, of course, Asia. The North American Monsoon actually centers on Mexico, with Central America as well as Arizona and New Mexico receiving only fringe benefits from the main event. The southwestern U.S. region typically affected by the monsoon can expand or contract somewhat depending on seasonal monsoon strength and pattern.

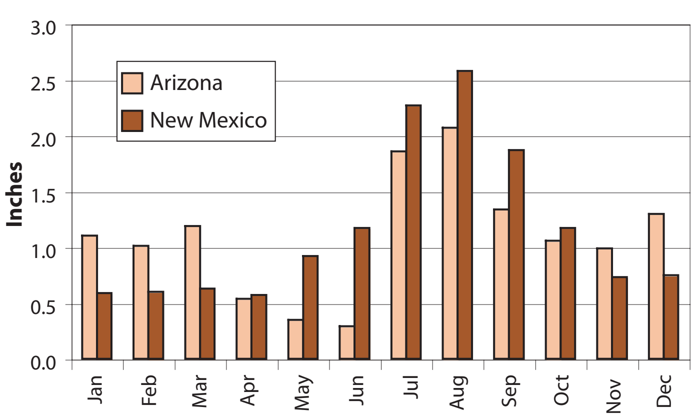

Figure 1. Average monthly values for July, August and September rainfall illustrate the monsoon's substantial contribution to Arizona and New Mexico precipitation. Data is provided by the Western Regional Climate Center, http://www.wrcc.dri.edu/htmlfiles/avgstate.ppt.html.

No smoking gun
There is no clear verdict on how the North American monsoon will fare in a warming world. However, circumstantial evidence suggests monsoons in general will strengthen as global warming heats up ocean and land surfaces and increases air moisture.

The first fact in the case is that rising sea surface temperatures tend to promote precipitation. At least that's what witnesses have observed, although the physical reasoning for this remains unclear. Global warming will continue to raise sea surface as well as air temperatures. In fact, data provided by the National Climatic Data Center (NCDC) shows that surface temperatures of the world's oceans already rose on average during the second half of the 20th century (Figure 2).

Another line of evidence involves the role of land heating in luring summer wind and rain to parched lands. Land temperatures fluctuate faster than ocean temperatures with a given heat input (Figure 2), and this operates at the scale of decades, as well as seasonally and even daily.

As for exhibit number three: As air temperatures go up, so does the atmosphere's ability to pick up and hold moisture. This well-documented factor leads climate change specialists to predict with confidence that precipitation rates as well as evaporation rates will increase with a warming climate—at the global scale. Regionally, it will vary, and there's little confidence regarding specifics.

All three factors suggest stronger monsoons with a warmer climate—but they also come with complexities. As might be expected, generalities drawn at such a broad scale have limitations for local or regional applications. Still, they're worth considering, with caveats in mind.

Sea surface temperatures
One of the more compelling reasons to suspect an increase in monsoonal strength with time involves the role played by sea surface temperatures in spawning thunderstorms and other convective systems.

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Monsoon, continued

Convection relates to surface heating. A pot of boiling water on a stove demonstrates a form of convection, with the heat from the stovetop being lifted up as bubbles float to the top. This is somewhat analogous to how the atmosphere works when it comes to convective processes.

Rising sea surface temperatures in the Gulf of California contribute to the convective processes that hail Arizona's monsoonal rains, according to research by atmospheric scientist David Mitchell and some colleagues (*Journal of Climate,* September 1, 2002).

Based on their temperature estimates from satellite observations, the sea surface in the gulf must warm up to 26 degrees Celsius (about 79 degrees Fahrenheit) to launch thunderstorms along the Sierra Madre mountains of northwestern Mexico into Arizona. This is also the minimum sea surface temperature required to spawn hurricanes, and for tropical convection in general.

"It's a very interesting number. That's when we get convection started along the coast of Mexico, and all over the world really," Mitchell noted. He cited an October 1993 *Journal of Climate* paper by Chidong Zhang for support.

An even more interesting number, at least for monsoon prediction purposes, is 29 degrees Celsius (about 84 degrees Fahrenheit). Relatively heavy rainfall from the monsoon in Arizona typically begins within days of the northern Gulf's sea surface reaching this temperature, the researchers found.

"We have been monitoring the monsoon since we wrote that paper, and so far the monsoon seems to be consistent with what we'd expect," Mitchell reported by phone. Although he has developed a model to use May conditions to predict this monsoon onset, he was unable to test it this year because he's working off-

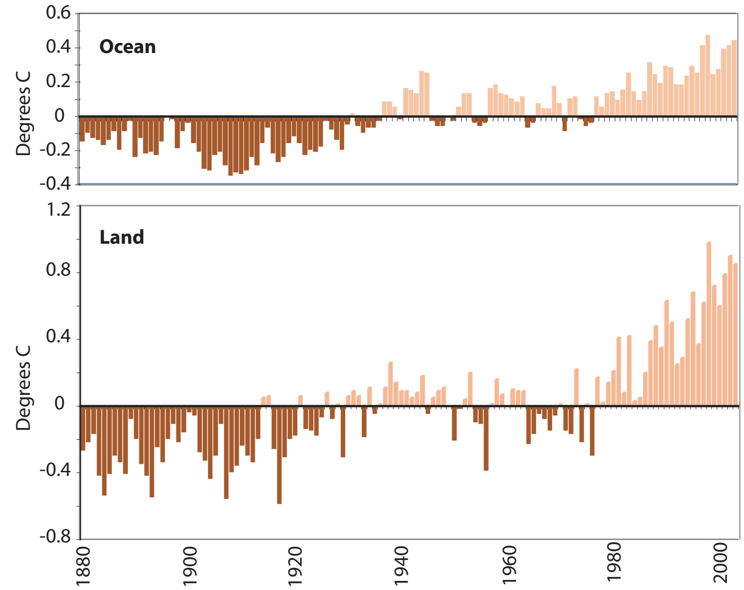

Figure 2. Global mean temperatures compiled by the National Climatic Data Center show an ongoing warming of the planet, with land temperatures heating up faster than ocean temperatures. The annual differences are shown in comparison to the average temperature for 1961–1990. Details about how the data were calculated as well as the data are available at http://lwf.ncdc.noaa.gov/oa/climate/research/anomalies/anomalies.html.

site on a project to improve the treatment of clouds in climate models.

Mitchell's finding that Gulf of California temperatures trigger Arizona's monsoonal rains is supported by another independent study. University of Arizona researchers led by William Wright used oxygen isotopes in tree rings to pinpoint Arizona's monsoonal moisture as coming from the Gulf of California and the eastern Pacific Ocean (*Geophysical Research Letters,* March 1, 2001).

Although Mitchell said he prefers relating northern Gulf sea surface temperatures to monsoon onset rather than strength, he has also found that a late arrival of warm water in the northern Gulf typically means a weaker monsoon for Arizona. If these sea surface temperatures don't reach about 84 degrees Fahrenheit by mid-July, the state's summer rainfall tends to fall below average, he indicated.

A connection between monsoon onset and strength was identified as well by Arizona state climatologist Andrew Ellis and colleagues (*International Journal of Climatology,* February 2004). Their analysis of monsoon seasons from 1950–2001 indicated that early onsets tend to mean longer—and thus wetter—seasons.

The relationships between Gulf of California sea temperatures and monsoon onset do not appear to translate to New Mexico, noted University of New Mexico researcher David Gutzler.

"It's less obvious that that sort of influence maintains its strength, as you move east toward and over the Continental Divide," Gutzler said.

Monsoon strength in Arizona and New Mexico often differ within the same year, leading him (and others) to suspect different influences for the two states. New Mexico's moisture source for monsoonal rains appears to be largely the Gulf of Mexico, although the tropical eastern Pacific also contributes.

Gulf of Mexico sea surface temperatures seem to vary less than those in the Gulf of California, Gutzler said. Meanwhile, eastern Pacific trends vary with El Niño fluctuations, which influence Arizona less consistently than Mexico, explained Wayne Higgins, a Climate Prediction Center researcher and leader of the

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Monsoon, continued

North American Monsoon Experiment. In general, El Niño tends to suppress monsoon activity, especially in Mexico, Higgins noted.

Now for the caveats: Some speculate El Niño events could increase as climate warms (although others suspect the opposite). Sea surface temperatures at a specific location also depend on ocean currents, which may change as climate changes. Along coastlines, upwelling of cooler water from below the surface potentially could temper some sea surface warming.

Even the relationship between tropical convection and sea surface temperatures of 26 degrees could change as the atmosphere warms. (For more on the latter, see the July 1, 2004, *Journal of Climate* paper by Chia Chou and J. David Neelin.) Gutzler noted that scientists still are working to unravel the physical reasons for the 26-degree-Celsius threshold for tropical convection.

"The fact that we see this threshold doesn't mean we understand it," he pointed out.

Land heating

Back in 1884, H.F. Blanford observed that the monsoon in India seemed to be weaker during years when there was abundant snow on the Tibetan Plateau (*Proceedings of the Royal Society of London*). His proposed mechanism—that heating the mountainous land pulls winds and rains landward—is still considered relevant.

Basically, the summer sun heats the land, causing air to rise. This creates a slight vacuum, compelling offshore air to rush in and fill it. The result is a landward shift in prevailing wind direction. As is often the case, with wind comes rain—especially when the wind is seaborne.

The connection between snow cover, and the cooling moisture it imparts, is not the only factor influencing monsoon dynamics, to be sure. But it's potentially important to pin down because most climatologists expect global warming to exacerbate the ongoing trend toward earlier western U.S. snowmelt documented by researcher Daniel Cayan and others (*Bulletin of the American Meteorological Society,* March 2001).

Arizona State University researcher Timothy Hawkins and colleagues found relatively low summer snow cover in the northwestern United States linked at the broad scale to higher summer rainfall in the Southwest. Similarly, University of New Mexico's Gutzler has found relatively low April snowpack in the Rocky Mountains tended to correlate with strong monsoon seasons in New Mexico, but less so for Arizona (*Journal of Climate,* November 15, 2000).

Even in New Mexico, the year-to-year variability was more predictable in some decades than others. Gutzler suspects the drought that began in the mid-1990s suppressed the relationship that held for the previous three decades, he explained in a follow-up telephone conversation earlier this month.

The potential for large-scale drought patterns to blur the relationship also adds uncertainty to predictions about what will happen to the monsoon with global warming. Some climatologists suspect western drought will become more frequent with global warming.

The investigation continues into how snowcover and drought factors relate to Southwest monsoon seasons, and whether the link involves land heating itself or the atmospheric processes that influence snow cover and drought variability.

Atmospheric moisture

A warmer atmosphere can hold more moisture, based on a physical relationship known as the Clausius-Clapeyron equation. This relationship is among the reasons given in an article by Kevin Trenberth and colleagues on how precipitation could be expected to increase and occur in more extreme events as climate warms (*Bulletin of the American Meteorological Society,* September 2003).

However, a projected increase in global precipitation does not necessarily translate into an increase in regional or local precipitation—especially effective precipitation, which is the moisture that remains to nourish plants and fill streams after evaporation has taken its toll.

First of all, the warming atmosphere's increasing ability to hold moisture means evaporation rates will climb. Rates could increase by about 5 percent for a rise of about 4 degrees Fahrenheit, based on calculations by Paul Brown of the Arizona Meteorological Network. So even with an increase in rainfall, there can be a drop in effective precipitation.

On top of that, atmospheric conditions vary daily, with dozens of interacting varieties possessing different modus operandi. Given the myriad of atmospheric combinations that contribute to climate variability, some areas and regions are sure to see a drop in effective precipitation, while other areas will get more than they can handle, at least at some scales.

So, will global warming strengthen the North American monsoon? It's not an open-and-shut case. But it doesn't take Sherlock Holmes to conclude that climate variability will continue to be an accomplice in any long-term changes in monsoon behavior related to global warming.

Next month's article will delve into some of the atmospheric processes affecting North American monsoon strength.

Melanie Lenart is a postdoctoral research associate with the Climate Assessment for the Southwest.

Temperature (through 6/15/05)

Sources: High Plains Regional Climate Center

Water year temperatures have ranged from the 30s (degrees Fahrenheit) in north-central Arizona and New Mexico to the mid- to upper 60s in southwestern Arizona (Figure 1b). These values are within 2 degrees of average across much of the Southwest (Figure 1a). Northwestern New Mexico has some of the highest departures (3–4 degrees F) since October 1, 2004. The above-average temperatures in this region generally correspond to lower water year precipitation (see Figures 2a–b) and abnormally dry to moderate drought (see Figure 3). With less soil moisture, more daytime heating of the ground and atmosphere can occur. The previous 30 days were warmer than average, although several areas were slightly cooler than average (Figures 1c–d). The largest anomalies were in southeastern Arizona and north-central and extreme southeastern New Mexico.

Tucson International Airport had the 11th warmest May on record, which included the 3rd and 5th hottest May temperatures on record [Tucson National Weather Service (NWS)]. Strong high pressure built over the region in late May and led to three straight days of record high temperatures. Many locations in New Mexico also reported record highs from May 20–25 in New Mexico (Albuquerque NWS).

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.htm

Figure 1a. Water year '04–'05 (through June 15, 2005) departure from average temperature.

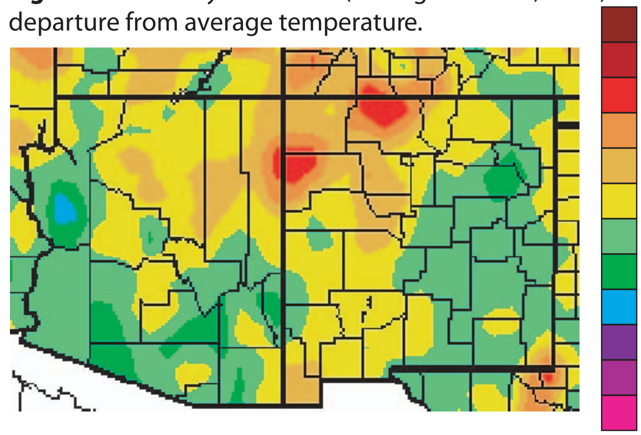


Figure 1b. Water year '04–'05 (through June 15, 2005) average temperature.

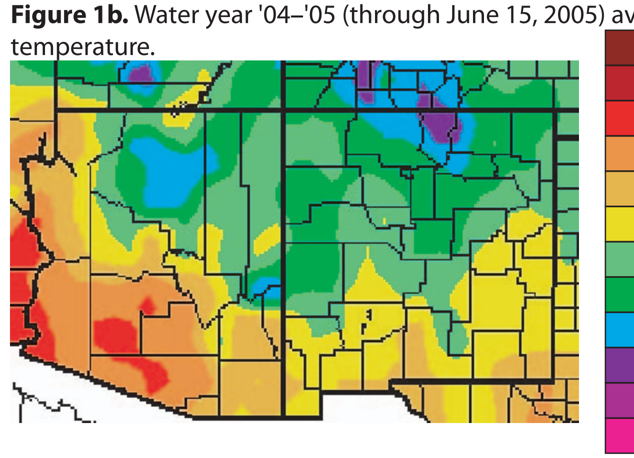


Figure 1c. Previous 30 days (May 17–June 15, 2005) departure from average temperature (interpolated).

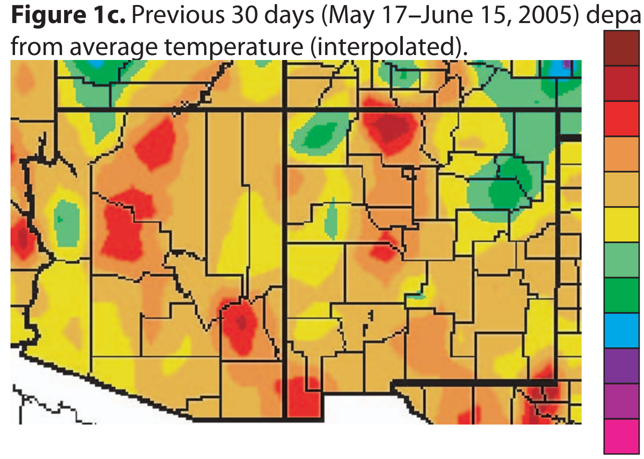
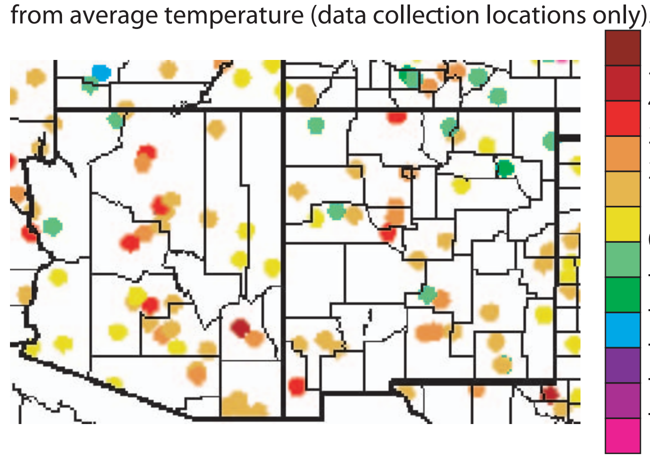


Figure 1d. Previous 30 days (May 17–June 15, 2005) departure from average temperature (data collection locations only).



Precipitation (through 6/15/05)

Source: High Plains Regional Climate Center

Water year precipitation is near to much above average across much of the Southwest (Figures 2a–b). Some locations have received more than 200 percent of their average precipitation since October 1, 2004. The main exception to the wet water year conditions is in southeastern Arizona, where sites have recorded only 70 percent of average rainfall. Storm systems missed this area consistently for much of the winter. The lack of rainfall and little groundwater recharge led to a reintroduction of moderate drought (see Figure 3). The past 30 days are have show nearly an opposite situation (Figures 2c–d). Southeastern Arizona was soaked with unusual rainfall in late May, as low pressure developed in northern Sonora, Mexico. The result for much of the area was from 200 to more than 800 percent of average precipitation for the 30-day period. Most other locations did not fare as well, generally receiving less than 75 percent of average precipitation.

The Tucson National Weather Service (NWS) reports that the city experienced the tenth wettest May. Record rainfall on May 27 accounted for over three-quarters of the monthly total. Eastern New Mexico generally received from 2.5–4.5 inches of rain in May, according to the Albuquerque NWS. The first half of June has been dry for much of the Southwest.

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 June 15, 2005 percent of average precipitation (interpolated).

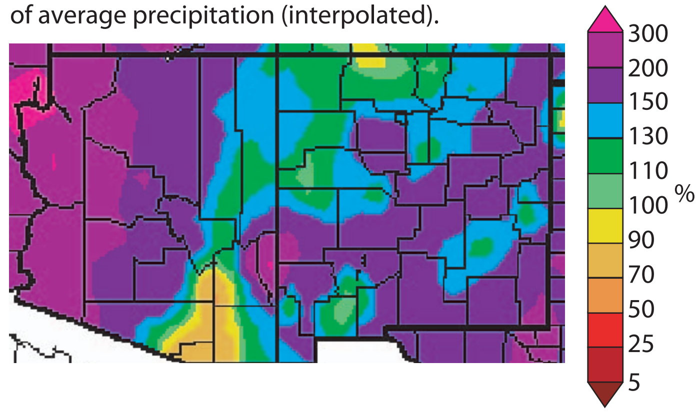


Figure 2b. Water year '04–'05 through June 15, 2005 percent of average precipitation (data collection locations only).

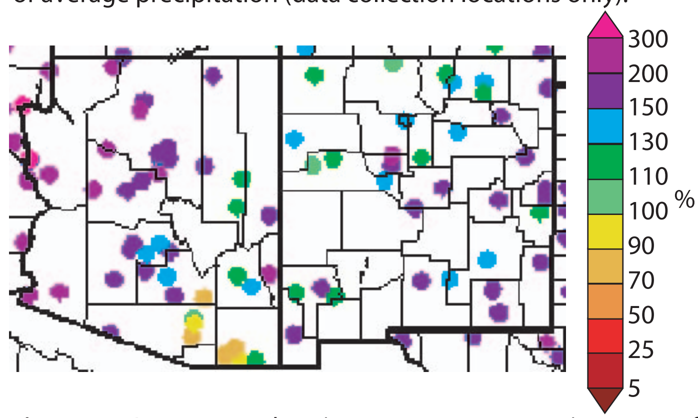


Figure 2c. Previous 30 days (May 17–June 15, 2005) percent of average precipitation (interpolated).

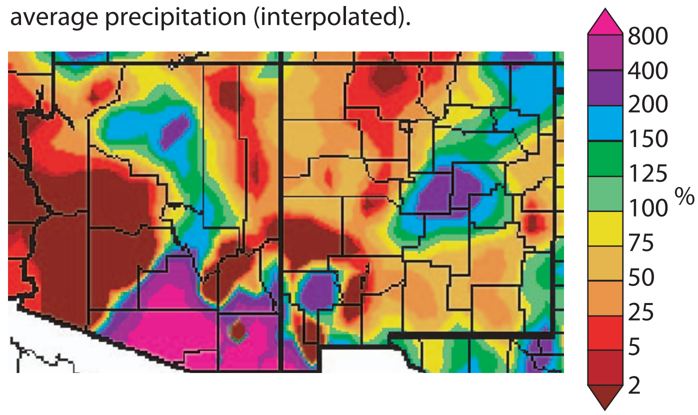
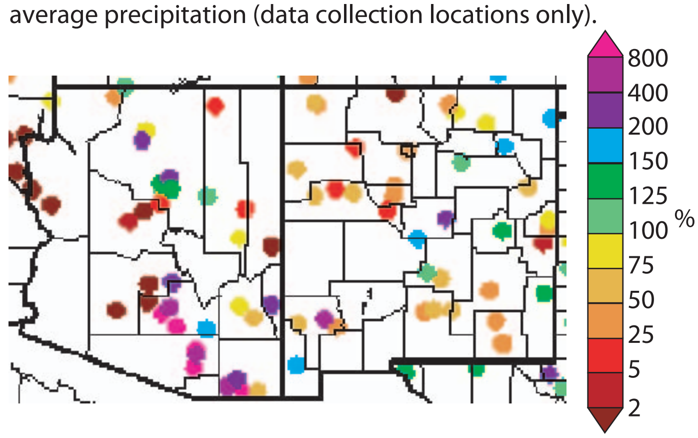


Figure 2d. Previous 30 days (May 17–June 15, 2005) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(released 6/16/05)

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

Unusual spring rainfall was not sufficient to improve abnormally dry conditions to moderate drought in Arizona and New Mexico (Figure 3). In fact, officials returned moderate drought to part of southern Arizona after additional studies showed lower-than-expected groundwater supply. Long-term precipitation remains well below average in eastern Arizona and northwestern New Mexico. Despite recent increases, many reservoirs in the Southwest are below full capacity. The section of the Colorado River from Lake Mead and northward remains in the abnormally dry category due to the low levels in Lakes Mead and Powell.

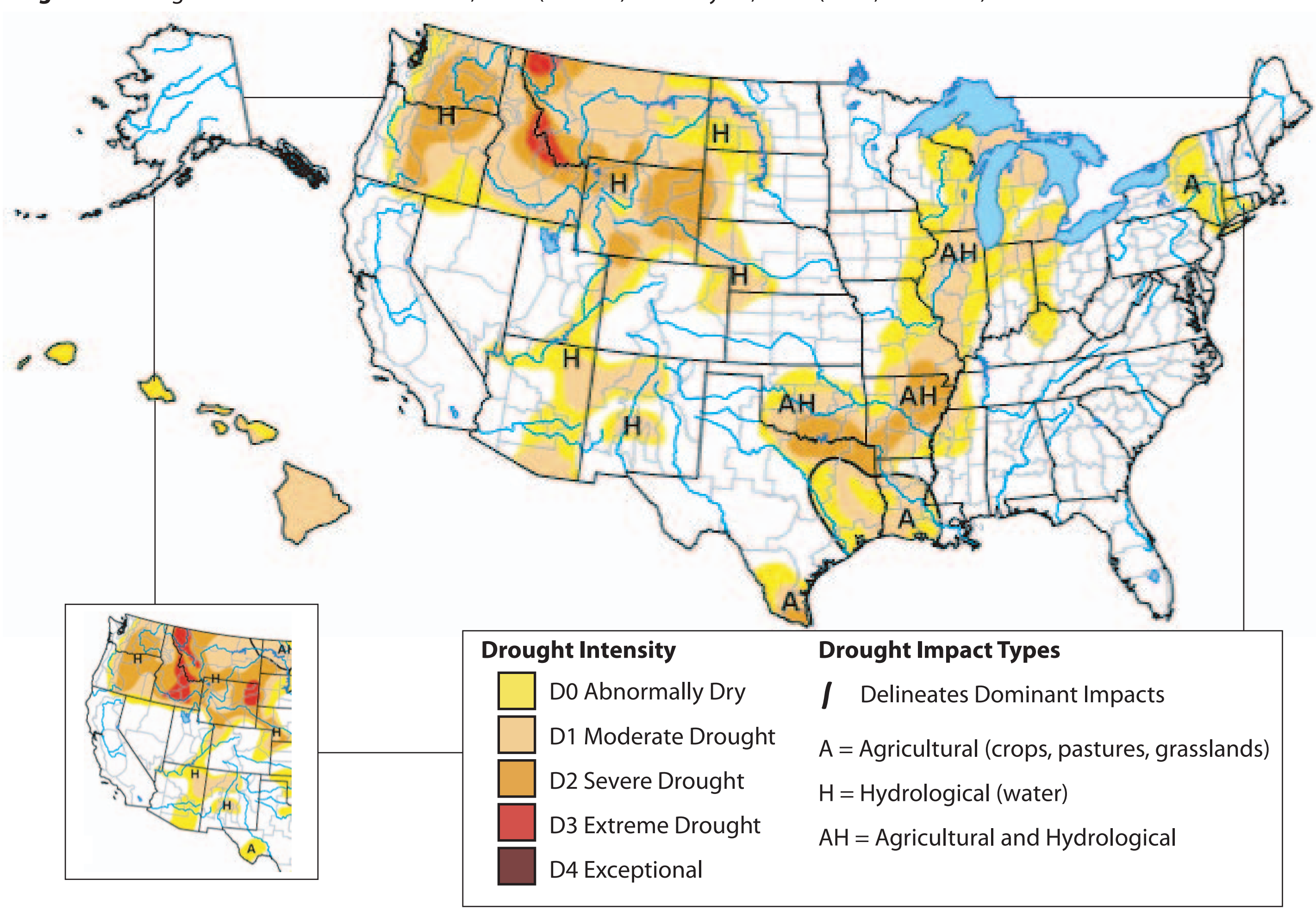
Representatives from the seven Colorado River Basin states met in Henderson, Nevada, in late May to discuss water resource issues. Although opinions differ about the details of sharing the water, the delegations agreed to meet again in August and September before the new water year begins (*Las Vegas Sun*, May 27). The ongoing dry conditions in the Southwest are affecting many vulnerable species, including the Chiricahua leopard frog in Arizona and the Pecos bluntnose shiner in New Mexico (MSNBC, June 6). Museums, zoos, private citizens, and the federal government are all stepping in to help these threatened and endangered species.

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 Micheal Hayes, NDMC.

Figure 3. Drought Monitor released June 16, 2005 (full size) and May 19, 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 5/20/05)

Source: New Mexico Natural Resources Conservation Service

The short-term drought map as of May 20 shows that most of New Mexico is free of drought, although some areas remain under alert or warning status (Figure 4a). More recently, the Albuquerque National Weather Service (NWS) reports that short-term drought is virtually nonexistent, except for some dryness in sections of western New Mexico (Drought Status Report, June 2005). Statewide precipitation is 175 percent of average from January–May and 165 percent of average for the water year. More than 200 percent of average precipitation has fallen at some locations. The worst long-term conditions as of mid-May are in the Zuni River and Bluewater basin in northwestern New Mexico (Figure 4b). Some areas of the northern mountains have 4-year precipitation deficits of 10–15 inches (Drought Status Report, June 2005). The greatest deficit through the end of May is 22 inches at Jemez Springs.

Governor Bill Richardson called upon innovators to develop technology to produce, conserve, recycle, deliver, or reuse water in New Mexico (*Ruidoso News*, June 14). Approximately $5 million in funding is available in a continuation of the Governor's Water Innovation Fund from 2004. Elsewhere, state officials and pueblo and non-Indian water users recently agreed on a framework to settle a 40-year old lawsuit (*Albuquerque Tribune* and *Santa Fe New Mexican*, June 2). The final settlement aims to resolve long-standing water rights issues in the Pojoaque, Nambé, and Tesuque areas.

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.water.az.gov/gdtf/

Figure 4a. Short-term drought map based on meteorological conditions as of May 20, 2005.

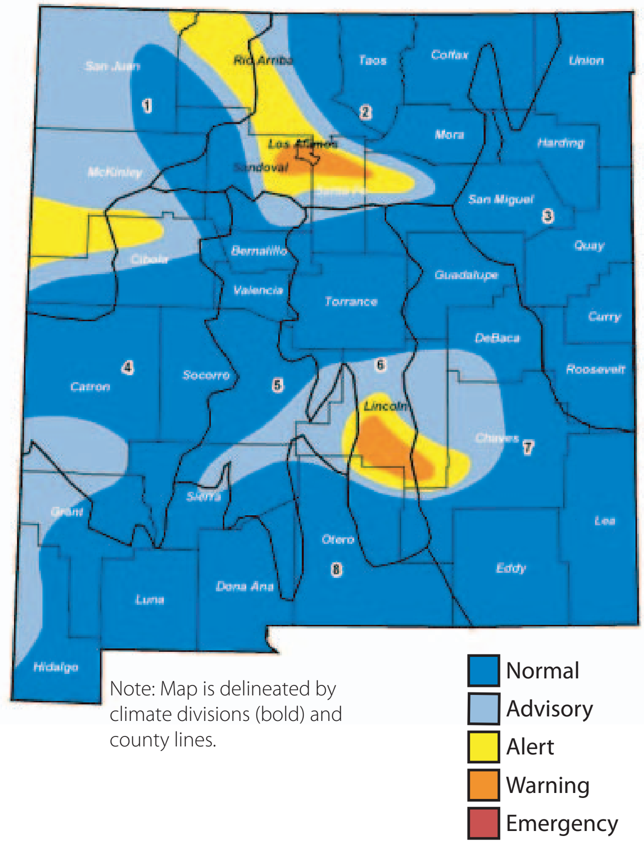
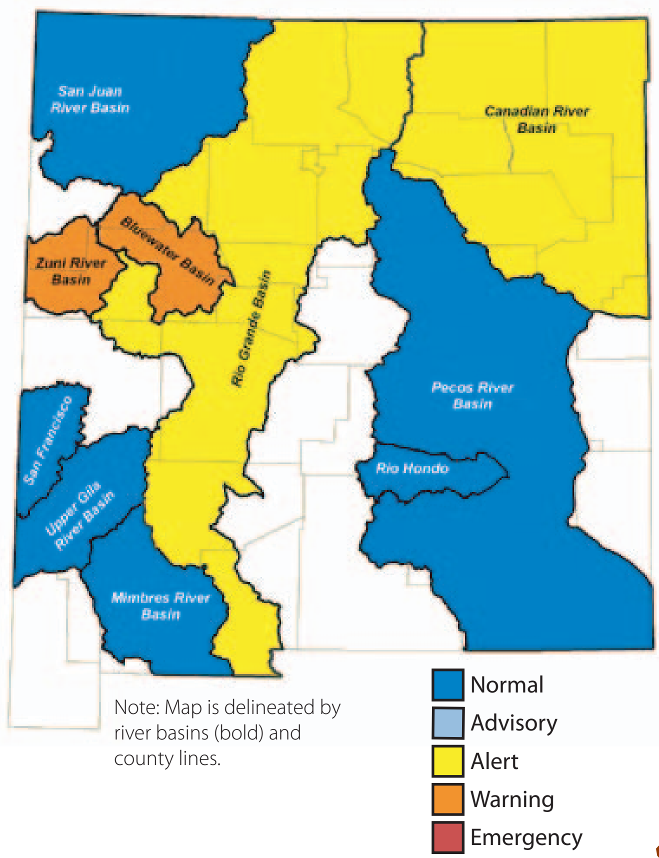


Figure 4b. Long-term drought map based on hydrological conditions as of May 20, 2005.



Arizona Reservoir Levels

(through 5/31/05)

Source: National Water and Climate Center

Although storage decreased in five Arizona reservoirs, all of them remain at or above 40 percent of capacity (Figure 5). Lyman Reservoir had the lowest storage (40 percent) after dropping 1 percent. The largest decrease occurred in the Verde River System (9 percent). Lake Powell had the greatest storage increase, 8 percent or approximately 1,971,000 acre-feet. Its storage topped 10,000,000 acre-feet for the first time since July 27, 2004 after reaching a 36-year low of 7,956,023 acre-feet in early April. Flow into the reservoir reached nearly 77,000 cubic feet per second in late May, its highest value in nearly eight years. The high inflow resulted from melting of above-average snowpack in the Upper Colorado River Basin. Snow water content remains above average, so further increases in Lake Powell can be expected through at least June. Bob Walsh of the U.S. Bureau of Reclamation told the *Yuma Sun* that the lake will be higher this year than it has been in the past five years (May 24). The combination of low or no snowpack in other Arizona basins, usage, and water release in May resulted in steady levels or decreases in storage.

Colorado River Basin states continue to feud over water supply, but officials from Arizona and Colorado are planning a series of meetings to reach "a higher comfort level" (*Rocky Mountain News*, June 10). Herb Guenther, director of the Arizona Department of Water Resources, believes that an agreement will help initiate a drought plan consensus between all seven Basin states. Elsewhere, the Salt River Project donated $1 million to Arizona State University and the University of Arizona for water resource studies in the state (*Phoenix Business Journal*, June 6).

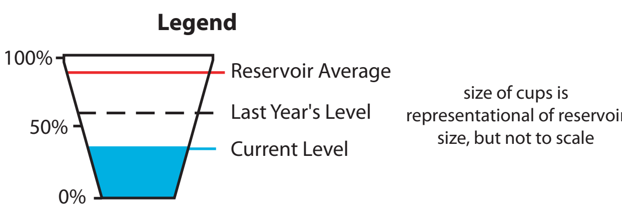
Notes:

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.

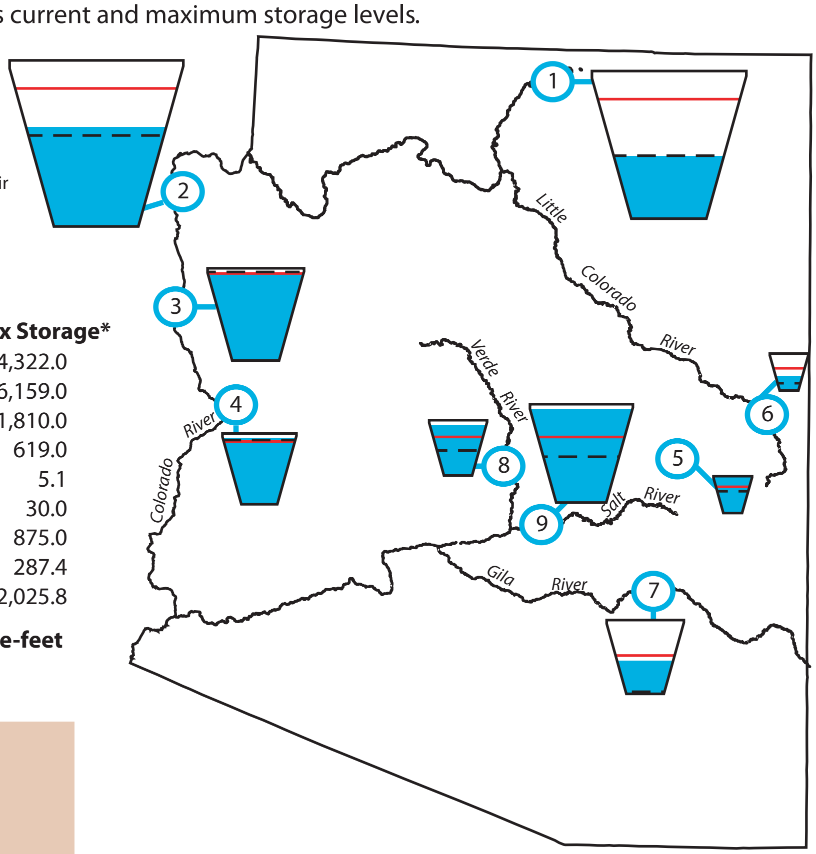
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) 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 May 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	43%	10,509.0	24,322.0
2. Lake Mead	60%	15,593.0	26,159.0
3. Lake Mohave	95%	1,722.3	1,810.0
4. Lake Havasu	95%	586.0	619.0
5. Show Low Lake	100%	5.1	5.1
6. Lyman Reservoir	40%	12.0	30.0
7. San Carlos	45%	398.0	875.0
8. Verde River System	90%	258.1	287.4
9. Salt River System	95%	1,928.2	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 5/31/05)

Source: National Water and Climate Center

New Mexico lakes continue to benefit from above-average snowpack and some recent storm systems in the Southwest. Every reservoir rose since the end of April, except Brantley, which remained steady. The largest increases (45 percent of capacity) occurred at both Costilla and El Vado reservoirs. Other lakes throughout the state rose from 1–12 percent of capacity, but 9 out of 13 remain below 50 percent of capacity. Statewide storage is 44 percent, which is below the average for the end of May but over 1.5 times more than last year.

In the Carlsbad Irrigation District (CID) in southeastern New Mexico, water orders were down in April and early June, the two highest water delivery months in the district (*Carlsbad Current-Argus*, June 3). Tom Davis, the CID manager, said that high reservoir levels may lead to water release from the Pecos River into Texas, which will build the state's water credit. New Mexico must meet certain water delivery requirements to Texas as part of the Pecos River Compact of 1947. Due to high streamflow in the Santa Fe River, the city began releasing water earlier this year than in several decades (*Santa Fe New Mexican*, June 2). As snowpack is reduced, officials plan to decrease or even end releases into the river to keep the city's two reservoirs near 100 percent of capacity (*Santa Fe New Mexican*, June 16). Officials report that the reduced snowmelt has led to some lake level decreases recently. Craig M. Lykins, senior manager at Cochiti Lake, said that levels are dropping by 1 foot per day (*Santa Fe New Mexican*, June 16).

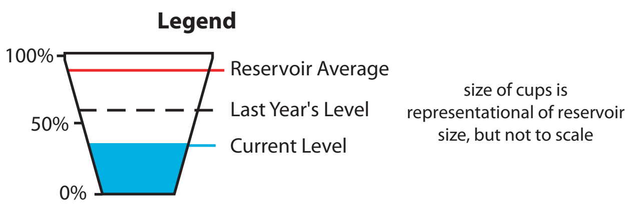
Notes:

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.

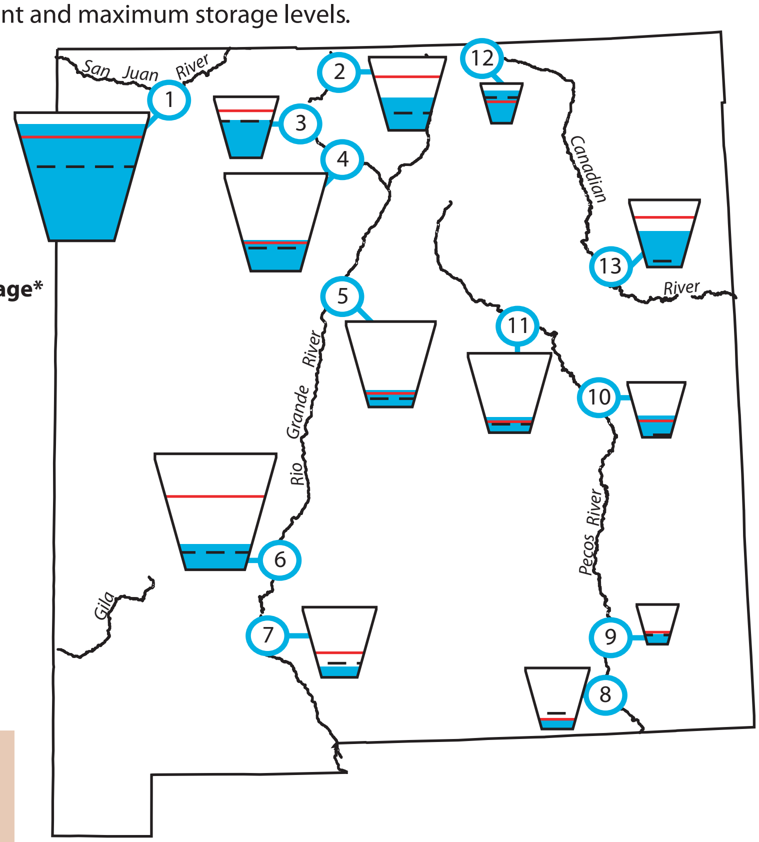
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) 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 May 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	91%	1,551.1	1,696.0
2. Heron	45%	178.3	400.0
3. El Vado	62%	114.8	186.3
4. Abiquiu	32%	175.0	554.5
5. Cochiti	20%	100.0	502.3
6. Elephant Butte	22%	447.8	2,065.0
7. Caballo	15%	48.8	331.5
8. Brantley	18%	25.9	147.5
9. Lake Avalon	25%	1.5	6.0
10. Sumner	40%	41.3	102.0
11. Santa Rosa	20%	90.0	447.0
12. Costilla	83%	13.2	16.0
13. Conchas	53%	133.5	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 Fire Summary

(updated 6/16/05)

Source: Southwest Coordination Center

Nearly 1,570 wildfires have burned 84,592 acres in the Southwest through June 16 (Figure 7a). These numbers do not include wildland fire use and prescribed fires, which adds another 278 fires and 121,106 acres (National Interagency Coordination Center's Incident Management Situation Report, June 16). Nearly 90 percent of these fires were human-caused, which accounted for 99 percent of the total acreage. Most of the human-caused wildfires were in Arizona, while New Mexico had slightly more lightning-caused fires. Arizona also has more total fires due in part to the earlier curing of fine fuels, such as grasses.

More than 40 large wildland fires, including wildland fire use have charred 87,866 acres in Arizona and New Mexico (Figure 7b). Once again, Arizona has the higher numbers, 31 large fires and 62,535 acres compared to New Mexico's 11 large fires and 25,331 acres. Most of the fires in Arizona have occurred in the southern and western portions of the state, where grasses and other fine fuels cured more quickly. All but three of the large fires in New Mexico burned in the southwestern corner of the state. These patterns are in line with the predictions made by the National Interagency Coordination Center earlier this year. The largest blazes in each state were the Bart fire in Arizona, which burned 14,534 acres in mid-May, and the Gladstone fire in New Mexico, which burned 12,350 acres in mid-April.

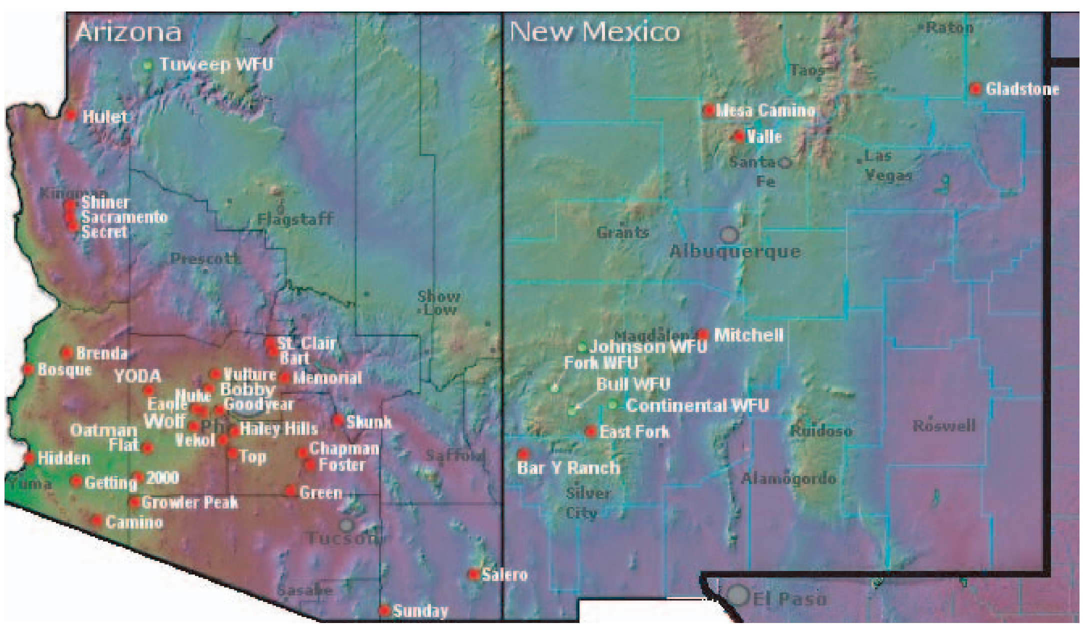
Notes:

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.

Figure7a. Year-to-date fire information for Arizona and New Mexico as of June 16, 2005.

Location	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
Arizona	1,245	66,447	70	595	1,315	67,042
New Mexico	164	16,895	89	655	253	17,550
Total	1,409	83,342	159	1,250	1,568	84,592

Figure 7b. Year-to-date wildland fire location. Map depicts large fires of greater than 100 acres burned as of June 14, 2005.



Wildland Fire
Wildland Fire Use

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

Temperature Outlook
(July–December 2005)
Source: NOAA Climate Prediction Center

The NOAA-CPC long-lead temperature outlooks call for increased chances of above-temperatures along the southern tier of the country for much of the West through October (Figures 8a–b). In later periods, this area shrinks to the southwestern United States (Figures 8c–d). The highest probabilities are concentrated around Arizona and the lower Colorado River region through December. Models indicate no forecasted anomalies for the remainder of the country throughout the entire period. The outlooks are based mainly on agreement between various statistical tools and dynamical forecast models through the first three periods (Figures 8a–c) with a slight shift to trends in the last period (Figure 8d). Continued above-average temperatures will lead to further curing of fuels throughout the Southwest, which, in turn, will increase wildfire potential.

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

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

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

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

Figure 8a. Long-lead national temperature forecast for July–September 2005.

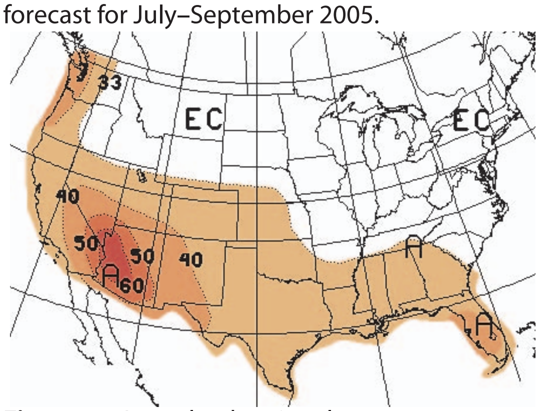


Figure 8b. Long-lead national temperature forecast for August–October 2005.

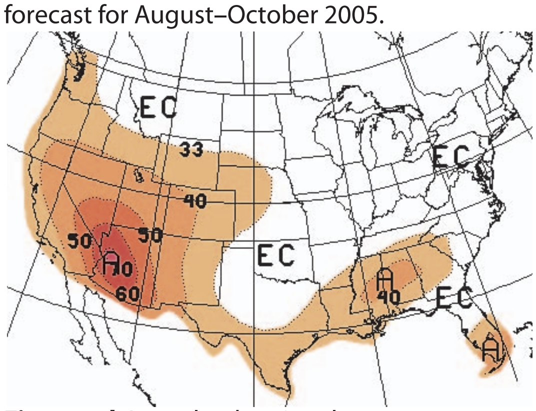


Figure 8c. Long-lead national temperature forecast for September–November 2005.

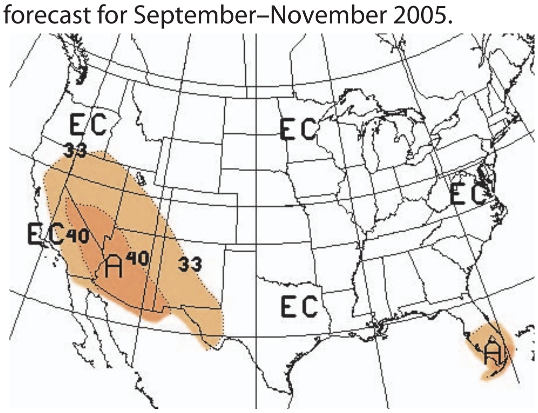
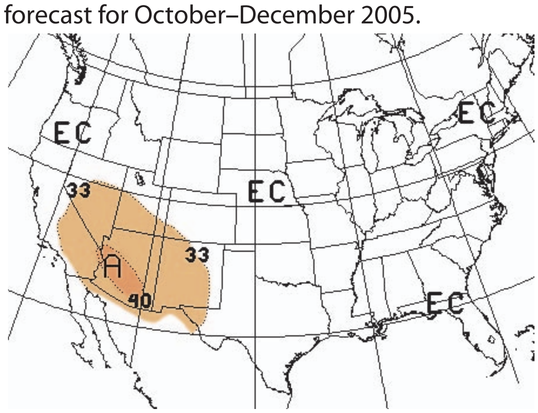


Figure 8d. Long-lead national temperature forecast for October–December 2005.



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

(July–December 2005)

Source: NOAA Climate Prediction Center

Long-lead outlooks from the NOAA-CPC indicate increased chances of below-average precipitation for much of the Southwest through September (Figure 9a). Since this period encompasses the late summer, forecasters expect a drier-than-average monsoon in Arizona and New Mexico. This is based on agreement between large-scale dynamical models and a trend in a weak monsoon following a winter with heavy snowpack in the southern Rocky Mountains. It is also in line with other outlooks, including IRI and experimental forecasts from the NOAA-Climate Diagnostics Center. Later periods show the area of increased chances of below-average precipitation centered over Nevada (Figure 9b) and eventually no forecasted anomalies in the West (Figures 9c–d). The increased chances of wetter-than-average conditions in the southeastern United States are based primarily on what is expected to be an active hurricane season.

Notes:

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

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

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

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

Figure 9a. Long-lead national precipitation forecast for July–September 2005.

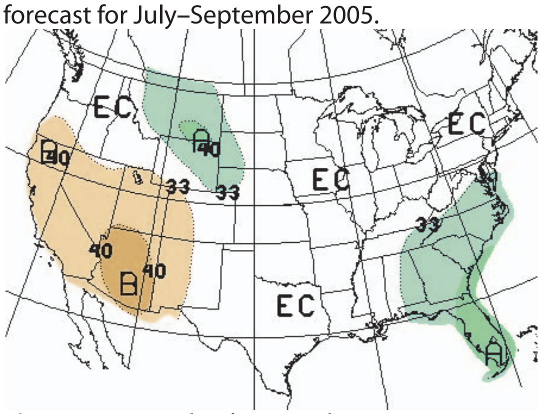


Figure 9b. Long-lead national precipitation forecast for August–October 2005.

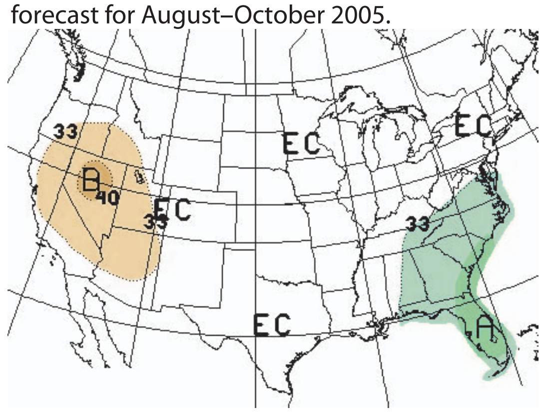


Figure 9c. Long-lead national precipitation forecast for September–November 2005.

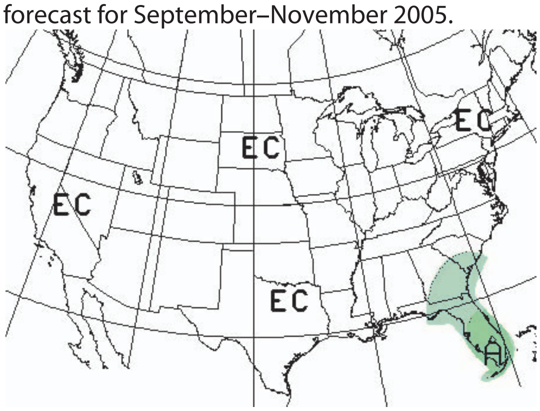
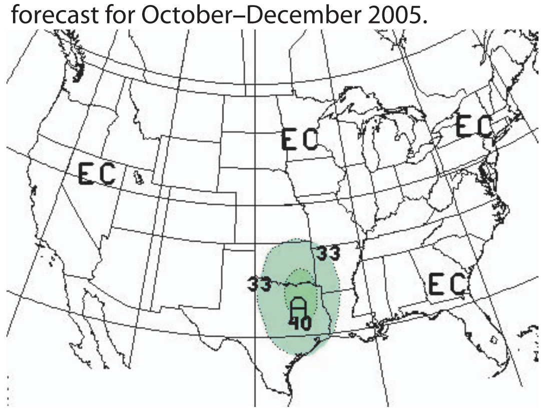


Figure 9d. Long-lead national precipitation forecast for October–December 2005.



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 September 2005)

Sources: NOAA Climate Prediction Center

The seasonal outlook from the NOAA-Climate Prediction Center shows that drought is expected to persist through September in southeastern and northeastern Arizona and northwestern New Mexico (Figure 10). This is based on long-lead forecasts for the Southwest that indicate increased chances of below-average precipitation through September (see Figure 8a) and increased chances of warmer-than-average conditions through the end of the year (Figures 9a–d). Additionally, forecasts from several research groups lean toward a dry monsoon. Increased chances of above-average temperatures mean greater likelihood for evaporation from both the lakes and the ground, which would support continued abnormally dry or drought conditions.

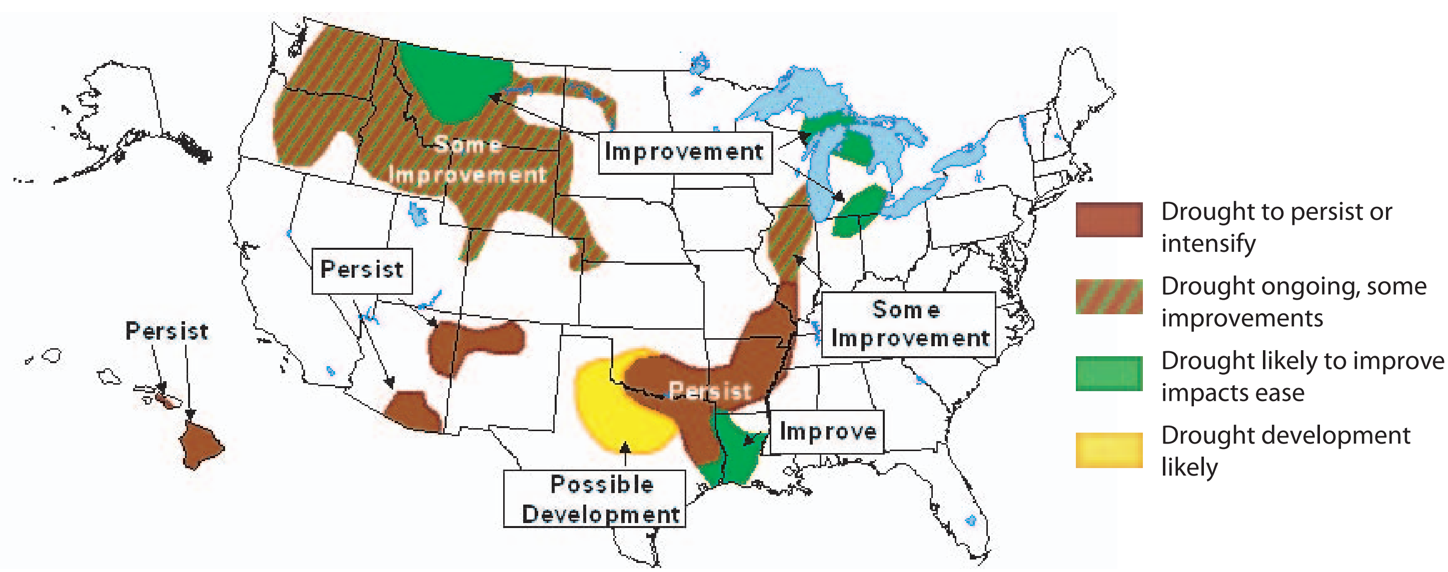
Regional plans to deal with drought continue to make headlines. In Arizona, officials have discussed cloud seeding, which involves adding silver iodide to clouds to promote rain development (*Tucson Citizen*, June 8). Other options that are being studied include leases from American Indian nations, adding new reservoirs along the Mexico-United States border and elsewhere in the state, reactivating the Yuma desalting plant, removing trees from mountainsides and replacing them with grass, and use of effluent water.

The City of Peoria, Arizona, lifted its stage one drought alert due to recent precipitation and runoff, but officials will continue to monitor municipal water use and encourage conservation (*Arizona Republic*, May 31). Wildlife in the West is already struggling, and continued drought could be more detrimental. The federal government has already donated more than $8 million to protect several species of fish in the Northwest and New Mexico (AZCentral.com, May 31). Officials have proposed another $2 million in California and Oregon.

Notes:

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

Figure 10. Seasonal drought outlook through September 2005 (release date June 16, 2005).



On the Web:

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

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

The wildland fire outlook from the National Interagency Coordination Center (NICC) indicates average potential across much of the United States in June (Figure 11a). Arizona and extreme western New Mexico have above-average chances of wildfire. Conditions are critical in southern Nevada. Near-average to above-average temperatures over the past 30 days (Figure 1c-d) have led to continued drying of the abundant fine fuels at low elevations, especially in southern and western Arizona (Figure 11b). In New Mexico, fine fuels have cured or are still curing, so fire potential will likely increase in the near future. The NICC reports that ignition potential will increase area-wide in grass and brush fuel types. Prescribed burns and wildland fire use will occur in areas where large fuels remain moist due to the above average winter and spring precipitation. Figure 11b also shows that fuel moisture in both live and dead large-diameter vegetation is near- to much above-average. The Southwest is in fire preparedness level three, which means that there is a potential for multiple areas to require major resource commitment to control and extinguish blazes.

Figure 11a. National wildland fire potential for fires greater than 100 acres (valid June 1–30, 2005).

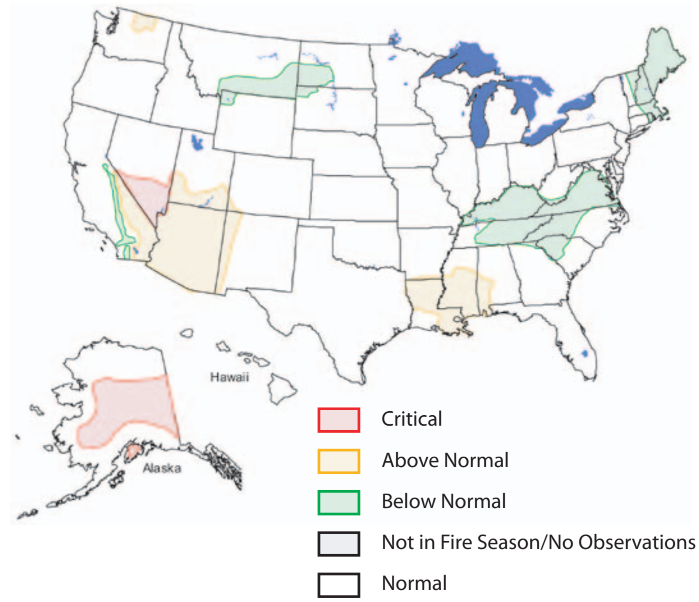


Figure 11b. Current fine fuel condition and live fuel moisture status in the Southwest.

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 11a) 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 11b 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

The Southern Oscillation Index (SOI) remained negative through May, which represents the fourth straight month with a negative value (Figure 12a). The negative three-month mean has persisted since early in 2004. Values have been only weakly indicative of El Niño and more characteristic of neutral conditions in the tropical Pacific Ocean. Other indictors, such as sea surface temperatures (SSTs) and trade wind direction and speed also remained near average and therefore typical of neutral conditions, according to the International Research Institute for Climate Prediction (IRI). In addition, observations have shown no anomalous large-scale combination of oceanic and atmospheric components of the El Niño-Southern Oscillation (IRI Technical ENSO Update, June 15).

Probabilistic forecasts from IRI continue to indicate that neutral conditions will be most likely through May 2006 (Figure 12b). Percentages are highest through August (70 percent) before declining slightly. The probability of El Niño remains relatively low (30 percent), but above historical values, over the same period. The likelihood for La Niña development stays consistently low (5 percent). Forecasters use a variety of models in the ENSO outlooks; some incorporate the temperature structure of the ocean, while others do not. In all cases, the majority of the models favor neutral or near-neutral conditions in the tropical Pacific. Neutral conditions tend to lower the confidence in long-range temperature and precipitation outlooks. Any anomalous weather or climate events will result from other influences.

Notes:

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

On the Web:

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

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

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

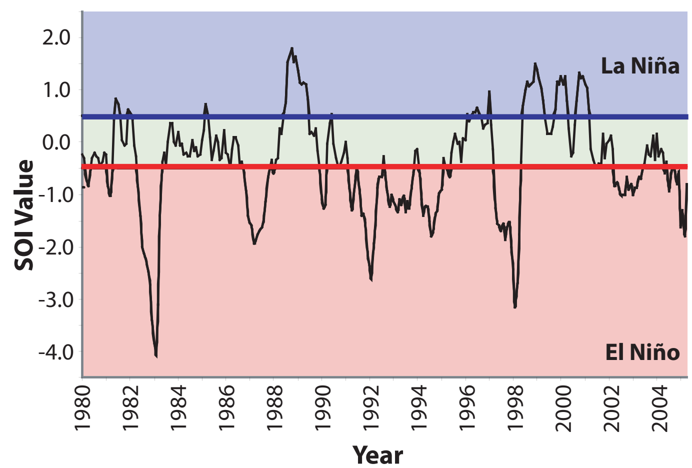
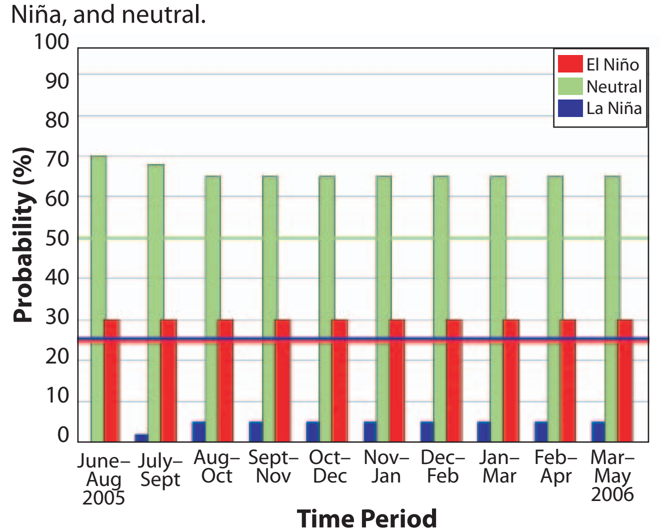


Figure 12b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released June 16, 2005). Colored lines represent average historical probability of El Niño, La Niña, and neutral.

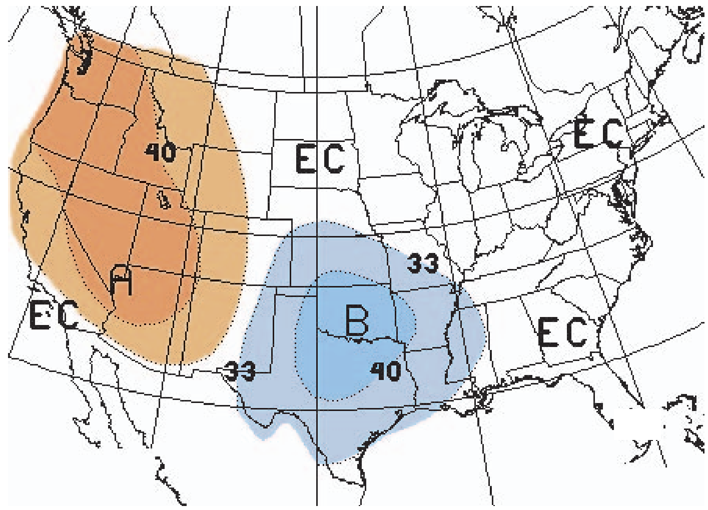


Temperature Verification
(March–May 2005)

Source: NOAA Climate Prediction Center

The NOAA-Climate Prediction Center long-range forecast for March–May 2005 indicated increased chances of above-average temperatures in Arizona, and western New Mexico, as well as across much of the West (Figure 13a). Models predicted increased chances of cooler-than-average conditions in the eastern third of New Mexico and the south-central United States. Temperatures were generally near average during the period (Figure 13b). The West and northern Great Plains were slightly warmer than average, although Washington state had a small region of temperatures that was 6–9 degrees Fahrenheit above average. The southern Plains and much of the eastern United States ranged from 0–6 degrees Fahrenheit cooler than average. The NOAA-CPC forecast performed well in both regions where they predicted anomalies. Other areas of the country were near average from March–May, so the models' output of no predicted anomalies was generally correct.

Figure 13a. Long-lead U.S. temperature forecast for March–May 2005 (issued February 2005).

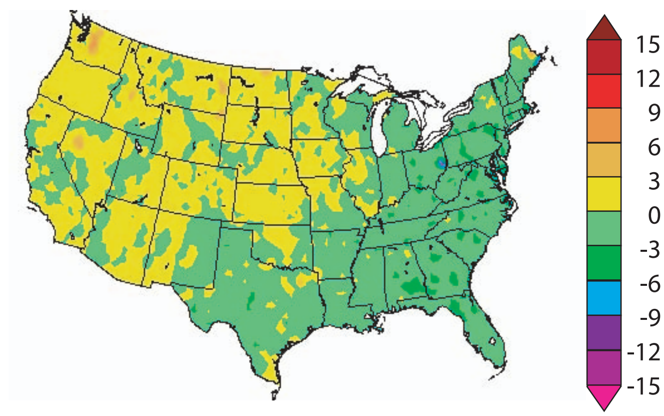


A= Above: 40.0–49.9%; 33.3–39.9%

B= Below: 40.0–49.9%; 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

Figure 13b. Average temperature departure (in degrees F) for March–May 2005.



Notes:

Figure 13a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months March–May 2005. This forecast was made in February 2005.

The March–May 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 13b shows the observed departure of temperature (°F) from the average for March–May 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
(March–May 2005)

Source: NOAA Climate Prediction Center

Forecasts from the NOAA-CPC showed increased chances of above-average precipitation from southern California to the Great Lakes and increased chances of drier-than-average conditions in the northwestern United States from March–May 2005 (Figure 14a). The highest probabilities for wetter-than-average conditions were in Arizona and New Mexico. The models forecasted no anomalies elsewhere. Northern and northeastern Arizona and much of New Mexico were near to much above average during the period (Figure 14b). Portions of New Mexico received more than 150 percent of their average precipitation. Southern, central, and western Arizona did not fare as well with precipitation—generally less than 90 percent of average. The models performed well in northeastern Arizona, New Mexico, and portions of Texas, but they did not predict the much drier-than-average conditions along the Lower Colorado River, southern and central Arizona, and from central Texas to the Great Lakes. Models were also incorrect in the Northwest, which ranged from near-average to more than 200 percent of average precipitation.

Figure 14a. Long-lead U.S. precipitation forecast for March–May 2005 (issued February 2005).

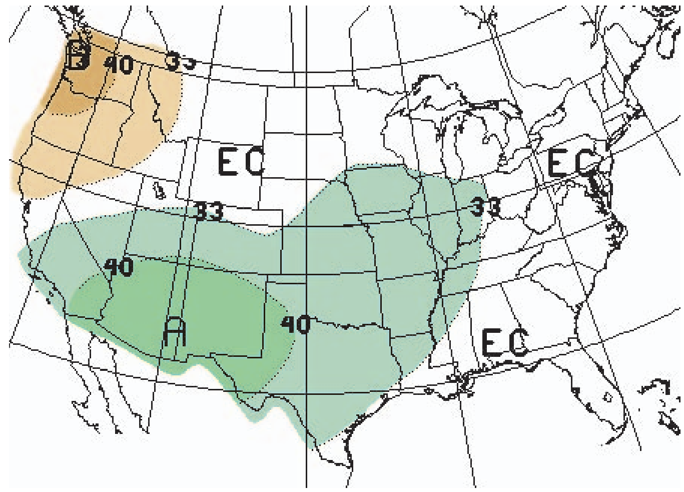
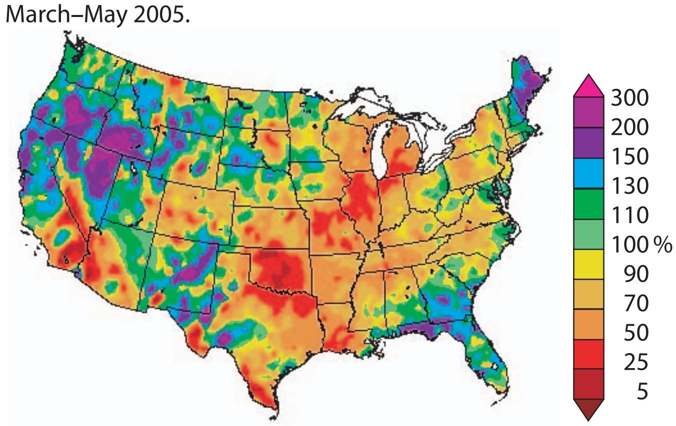


Figure 14b. Percent of average precipitation observed from March–May 2005.



Notes:

Figure 14a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months March–May 2005. This forecast was made in February 2004.

The March–May 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 14b shows the observed percent of average precipitation for March–May 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.

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