Issued: August 23, 2005

CLIMAS
Southwest Climate Outlook

July Climate Summary

Drought – Abnormally dry conditions to moderate drought continue in eastern and northern Arizona and in much of New Mexico.

- Moderate drought was reintroduced to southern New Mexico.
- Most regional reservoirs decreased in storage since the end of June, but they remain above last year's levels.

Temperature – Average temperatures during the water year range from 3–4 degrees Fahrenheit below average to 3–4 degrees above average. The past 30 days were generally near to below average.

Precipitation – Much of the Southwest has received near to above-average precipitation during the water year. Precipitation departures in the past 30 days have ranged from 2 percent to over 400 percent of average.

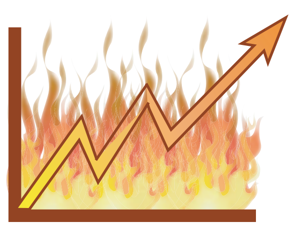
Climate Forecasts – The long-lead temperature outlooks indicate increased chances of warmer-than-average conditions in the Southwest. There are generally no forecasted precipitation anomalies through February 2006 in the region.

El Niño – Probabilistic forecasts call for the current neutral El Niño-Southern Oscillation conditions in the tropical Pacific Ocean to remain dominant through the middle of 2006.

The Bottom Line – Experts expect monsoonal precipitation to provide at least limited short-term improvement to drought conditions in Arizona and New Mexico.

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

Record-setting Fire Season



The 2005 wildland fire season was the worst in Arizona's history, judging by the number of acres burned. The abundant winter rainfall produced a bumper crop of grasses, which "cured out" during the prolonged dry season before the monsoon finally started. This created an almost explosive fire hazard, particularly in the deserts and grasslands. To date 723,918 acres have burned, topping even the 2002 season, when 629,876 acres went up in smoke, including the disastrous Rodeo-Chedisky fire of 468,638 acres. This year's largest fire was the Cave Creek Complex, which burned 248,310 acres north of Phoenix. Severely burned watersheds have caused greatly intensified flood runoff and sediment yield since 2002, contributing to the deaths of at least three people.

See Southwest Fire Summary (page 11) 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®

Water, energy, and climate linked in complex ways

Arizona water summit brings water and electrical connections to light

BY MELANIE LENART

Rain and snow yield water, flowing on the surface or replenishing groundwater aquifers. Water supports energy production—it's tapped for hydroelectric power or cycled to cool electrical plants. Most electrical plants, in turn, emit greenhouse gases, which warm the planet and disrupt water cycles.

These and other interconnections between water, energy, and climate fueled discussions at an Arizona Water Summit in Flagstaff earlier this month that attracted educators, tribal members, commercial interests, and policy makers, including the governor of Arizona.

Governor Janet Napolitano last year requested that the state's three universities address the links between water and electricity, summit organizer Gary Deason of Northern Arizona University (NAU) reminded as he introduced a session on the topic. Along with summit planning, researchers from NAU, the University of Arizona (UA) and Arizona State University (ASU) have been working together to launch a "virtual water university," also at the governor's behest. (See story to the right).

Concern about climate variability and global warming translates into worries about water and energy. The recent drought drained many reservoirs serving Arizona to half empty by mid-2004, including Lake Mead and Lake Powell, which store Colorado River water. Dams associated with these and other reservoirs together provide about 8 percent of Arizona's electrical power (Figure 1).

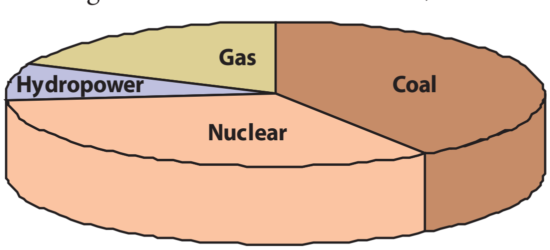

Figure 1. The share of electrical power generated by fuel types is shown above, based on 2002 data from the Energy Information Administration.

Although the smaller Arizona reservoirs are refilling at an encouraging rate, especially those serving Phoenix, it could take years to decades to refill the major reservoirs that store Colorado River water, noted Gregg Garfin, program manager for the UA Climate Assessment for the Southwest (CLIMAS).

Governor Napolitano said she suspects the drought will "reassert itself" despite the relatively wet water year that began last October, a position that many climatologists also hold. During a summit talk, Garfin illustrated the potential for more drought ahead by pointing out droughts of 10 to 20 years in long-term precipitation records for the Southwest derived from tree rings.

Tree rings and other climate proxies also have been used to reconstruct northern hemisphere temperature patterns for the past millennium. John Brock of ASU showed summit participants the famous "hockey stick" reconstruction of global temperatures (Figure 2). The record shows an ongoing trend toward increasing temperatures, which scientists agree relates mainly to the input of additional greenhouse gases from fossil fuel and forest burning.

Water vapor is the most prevalent of the atmospheric greenhouse gases that warm the planet to about 60 degrees Fahrenheit overall. Without the greenhouse effect provided by water vapor and other atmospheric gases, the Earth's average temperature would be a freezing 15 degrees Fahrenheit, analyses indicate.

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Virtual water university

BY MELANIE LENART

A "pet project" of Arizona Governor Janet Napolitano's—a virtual water university that pulls together on-line expertise from Arizona's three universities—took a step forward this month with a newly launched interactive website.

Gary Woodard of The University of Arizona (UA) unveiled a website called "Arizona Water," the first product of the virtual university's collaborative efforts. The website offers a searchable database on experts, projects, facilities, and publications by about 420 water researchers working at the UA, Northern Arizona University (NAU) and Arizona State University (ASU). It is posted at www.arizonawater.org.

The virtual university "breaks down walls" between the universities, providing a science-based pool of resources to assist state decision-makers at a variety of levels, Governor Napolitano told summit participants during the August 4 dinner. One of the tasks of the university will be to improve predictions of future climate conditions in order to reduce vulnerability of water supplies.

"My view is that we can't do good planning without good data. That has to be the foundation for the public policy choices that need to be made," Napolitano said.

During a breakfast meeting about the virtual university the next morning, the UA's Kathy Jacobs stressed that

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Complex links, continued

Given the additional input of greenhouse gases from human activities, scientists project the planet will warm by another 3 to 10 degrees Fahrenheit by the end of the century. The variable influence of water vapor helps confound precise projections (as does the possibility that society may change its patterns of energy use). Water vapor tends to moderate climate, working to dampen daytime temperatures through evaporative cooling while warming nighttime temperatures by trapping heat near the Earth's surface.

In the West, the warming is ramping up even faster than projected, although the heat island effect from growing cities also contributes to rising temperatures. Both greenhouse warming and urbanization have the greatest effect on nighttime temperatures.

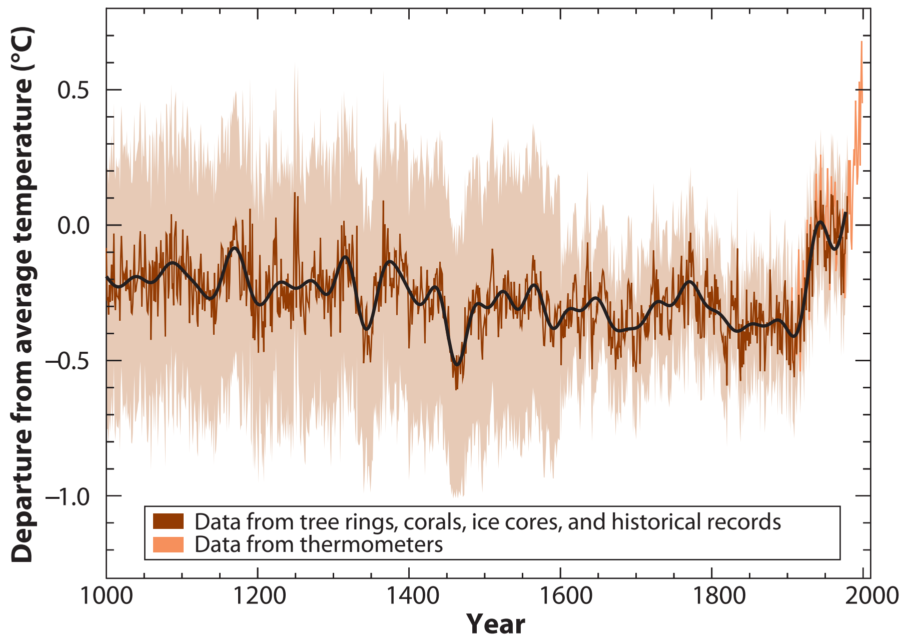

Figure 2. The instrumental record of northern hemisphere temperature (pink) is superimposed on a 1,000-year temperature record for northern hemisphere reconstructed from annual tree rings, coral growth, and ice core layers (brown, with range of potential error shown in tan and "smoothed" average shown in black). Its shape, with an abrupt rise in modern times, has led some to dub the record a "hockey stick." Source: Intergovernmental Panel on Climate Change Third Annual Assessment, 2001.

The ongoing warming threatens to wreak havoc on the delicate balance of southwestern water supplies, in part because of a trend toward earlier snowmelt that could strain Colorado River allocations. (see *Southwest Climate Outlook [SWCO]*, December 2004). To top it off, some fear that drought could become even more commonplace as evaporation rates climb with temperatures and precipitation becomes more variable. Many people advocate taking steps to reduce this risk (see *SWCO*, December 2003).

"We can mitigate climate change by decreasing our dependence on fossil fuels," Garfin suggested at the summit. This "no-regrets" strategy would address public health issues related to air quality. Society can also adapt to climate change, he added, by improving water conservation, water banking and irrigation practices.

A recent survey of Arizona irrigators suggests that nearly half a million acre-feet—roughly 160 billion gallons—of Colorado River allocations are likely to be freed up in the near future by farm sales, noted the UA's George Frisvold. However, expanding development in Arizona will continue to drink up any savings from the decline in agricultural use for irrigation, he warned.

"The plain fact of the matter is that with population growth in Arizona, Nevada and California, the Colorado River is being strained to the utmost," Governor Napolitano said at a summit dinner.

In addition, pending legal decisions are expected to require that Arizona's allocation of the Colorado be more fairly shared with the Native Americans living on tribal lands. "There are [water] rights that are going to be given to the Navajo and Hopi, appropriately, and people are going to have to live with that," as Arizona Legislature Representative Tom O'Halleran reminded the group.

Many Diné people living on the Navajo Reservation stretch a 55-gallon-drum's worth of water through an entire week, Justin Willie of the Navajo Waters Information Network told the group. The Hopi adopt a similar approach.

"Many of our people have to drive over 100 miles to haul water for their consumption, for their livestock, for their farms," said Wahleah Johns, a Hopi with the Black Mesa Water Coalition. "It's appalling."

Johns, Willie, and dozens of other Native Americans reminded summit participants that "water is life," and urged people to see water as sacred—not as something that can be bought and sold like any other commodity.

"One of the big themes was that we have a spiritual connection to water," Enei Begaye of the Indigenous Environmental Network said, reporting on a tribal water caucus held in Flagstaff the previous day. About 50 people from tribes throughout Arizona and New Mexico attended the caucus, and many stayed for the summit.

But prayer must be balanced with activism, Begaye counseled. "The issue of who controls the water is a huge issue," she said during a discussion session she

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Complex links, continued

moderated on the commodification of water. In Arizona and many parts of the country, groundwater pumping remains mostly unregulated, and it remains legal for companies to profit privately from water extracted from a shared aquifer.

Tribal members at the summit also expressed concern about the use of pristine groundwater below Navajo and Hopi lands to transport coal slurry from mining operations in northern Arizona's Black Mesa to an electrical plant in Nevada.

Mining operations account for about 2.6 percent of groundwater withdrawals for the state, but about 64 percent of groundwater withdrawals from the aquifer below Hopi and Navajo lands, based on U.S. Geological Survey documents for 2000 and 2003 respectively (available at http://water.usgs.gov/pubs/circ/2004/circ1268/index.html and http://water.usgs.gov/pubs/of/2005/1080/).

The cooling of coal, gas, and nuclear energy plants, accounts for about 2.2 percent of the state's groundwater withdrawals, or 10.9 percent of non-irrigation withdrawals. Counting surface water, it requires about 100 million gallons of water a day. Meanwhile, electricity consumption is growing at about 4 percent a year, Arizona Corporation Commission member Kristin Mayes told the group.

"It used to be that every megawatt powered 1,000 homes. Now it's powering 250 homes," Mayes explained. The average Arizona house is larger and less efficient, she said. Also, rising temperatures in recent decades, especially in paved cities like Phoenix, have boosted peak summer electrical demand for cooling.

The increased use of renewable energy was touted as a means of water conservation by Mayes and others during the summit and the sustainability exposition that followed on its heels. While nuclear energy uses the most water to produce electricity, wind and solar energy require virtually no water, except for the occasional cleaning of windmills and solar cells, speakers indicated.

Northern Arizona is well-suited for both wind and solar energy, Lane Garrett of ETA Engineering in Tempe explained during a workshop. The systems work well in tandem, in part because winds tend to blow the hardest on cloudy days and during the monsoon, Garrett indicated. (For a summary of Arizona's renewable energy potential and background on the Hopi solar enterprise NativeSUN, see: http://www.energyatlas.org/PDFs/LowRes/atlas_state_AZ.pdf).

Renewable energy fits well with tribal culture, and suits remote locations far from the grid, summit participants noted. The renewable model also interests Arizona residents concerned about sustainability. Napolitano appears to be among the latter: She chose "Creating Sustainability in the West" as this year's theme of the Western Governors Association, which she chairs.

Garrett's futuristic vision of sustainability features people using the wind and the sun—two elements as revered as rain by many cultures—to produce energy, along with hydrogen to store the energy generated by windmills and solar cells. Renewable energy sources have a neutral influence on global climate, he reminded, and lead to saving water instead of evaporating it in fossil fuel and nuclear power plants. In a desert region, where the sun is omnipresent and water is scarce, he has hope that this vision will continue to move beyond a mirage.

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.

University, continued

the virtual university's success will depend on it having a "cyber backbone" to make data available and accessible to a variety of users. She urged researchers in attendance to begin preparing datasets, along with the information required for their appropriate interpretation, for web distribution.

Plans for the web-based decision-support system include a variety of accessible databases, interactive maps, information on trend analyses, and easy-to-use models involving forecasts and scenarios.

During a question and answer session, the governor said she agreed with a summit participant's comment that the university should tap into tribal experts as well as university experts on water issues, particularly water conservation.

Input from the tribes will be solicited through the universities for at least the initial stages, the governor's chief of staff for operations, Alan Stephens, specified during the follow-up breakfast session. For instance, NAU's Institute for Tribal Environmental Professionals will be among the core groups involved, NAU's Rand Decker noted.

Though the Arizona Legislature has not provided any funding for the virtual university, the Board of Regents has pledged $150,000 to cover salary and expenses for an executive director of the virtual university. State officials indicated they envision the university becoming self-sustaining through federal and private foundation grants as well as contributions from industry.

The website, which was created by the University of Arizona's Water Sustainability Program, is housed at SAHRA, the NSF Center for Sustainability of Semi-Arid Hydrology and Riparian Areas.

Temperature (through 8/21/05)

Sources: High Plains Regional Climate Center

Average temperatures since the water year began October 1 ranged from the mid to upper 30 degrees Fahrenheit in extreme north-central New Mexico to the lower to mid-70s in portions of southwestern Arizona (Figure 1b). Water year departure from average temperatures range from 3–4 degrees F cooler than average in portions of west-central Arizona to 3–4 degrees F above average in far north-central New Mexico (Figure 1a). Over the past 30 days, temperatures were generally below average in much of the Southwest (Figures 1c–d). Some areas of central Arizona and southwestern New Mexico were up to 4–8 degrees F cooler than average. Elsewhere, a small portion of southeastern Arizona was 2–4 degrees F warmer than average.

Residents continued to flock to the higher, cooler elevations of Arizona and New Mexico to flee the heat in the valleys. Approximately 14,000 visitors went to the Arizona Snowbowl between Memorial Day weekend and the end of July, according to the *Arizona Republic* (July 27). This represents a 10 percent increase over the same period in 2004.

Figure 1a. Water year '04–'05 (through August 21, 2005) departure from average temperature.

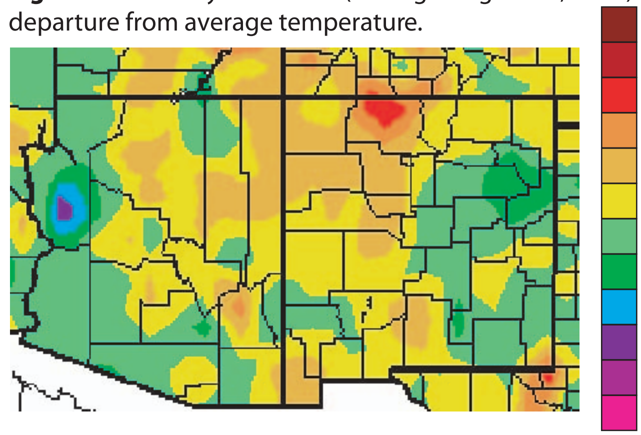


Figure 1b. Water year '04–'05 (through August 21, 2005) average temperature.

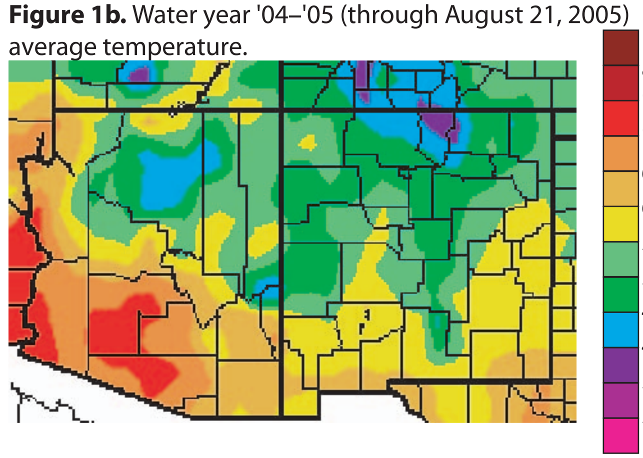


Figure 1c. Previous 30 days (July 23–August 21, 2005) departure from average temperature (interpolated).

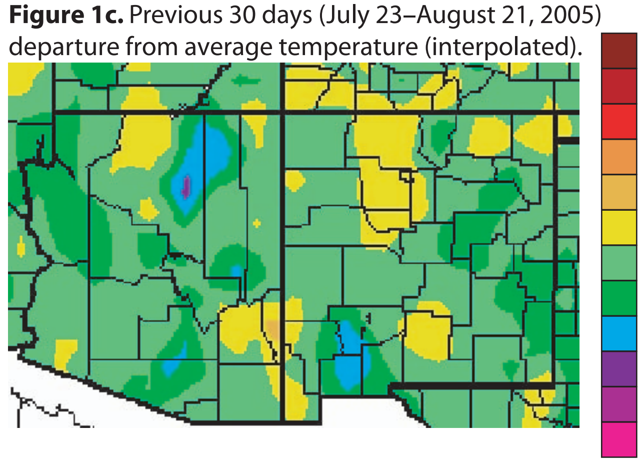
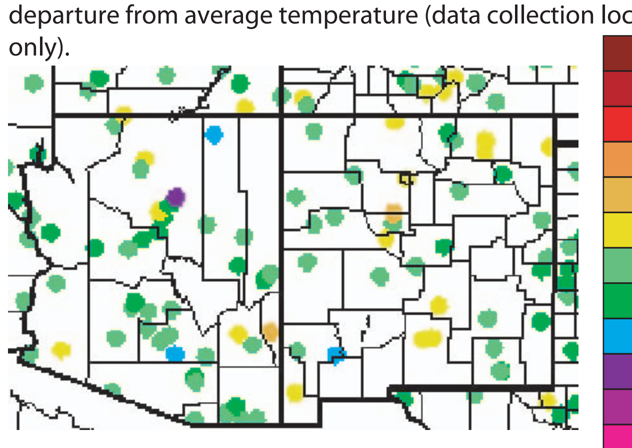


Figure 1d. Previous 30 days (July 23–August 21, 2005) departure from average temperature (data collection locations only).



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.htm

Precipitation (through 8/21/05)

Source: High Plains Regional Climate Center

Water year precipitation has been near to above average for nearly the entire Southwest (Figures 2a–b). Arizona has the highest departures, with values at or above 200 percent of average along the western quarter of the state. Many of the locations that were below average in mid-July remain so in mid-August, most notably portions of southeastern and east-central Arizona and southwestern and west-central New Mexico. These areas also remain, or were recently classified, in moderate drought (see Figure 3). Over the past 30 days, much of Arizona recorded above-average precipitation, while New Mexico was mostly drier than average, except in southern and northwestern portions of the state (Figures 2c–d). Departures range from less than 25 percent of average precipitation in north-central New Mexico to more than 400 percent of average in extreme northeastern and extreme southwestern Arizona. Since the monsoon began approximately 30 days ago, Figures 2c–d correspond well with Figure 8c which tracks the percent of average precipitation during monsoon season.

The Albuquerque National Weather Service reports that all climate divisions in New Mexico are above average for the water year, with the statewide value at 124 percent of average (Drought Status for August 2005). Furthermore, the climate divisions are showing near- to above-average precipitation for the calendar year.

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 August 21, 2005 percent of average precipitation (interpolated).

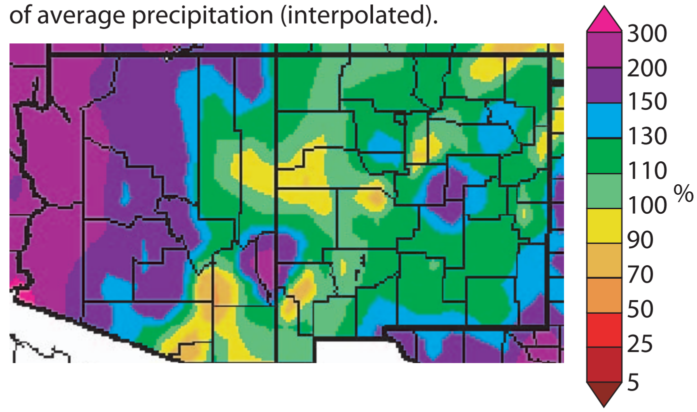


Figure 2b. Water year '04–'05 through August 21, 2005 percent of average precipitation (data collection locations only).

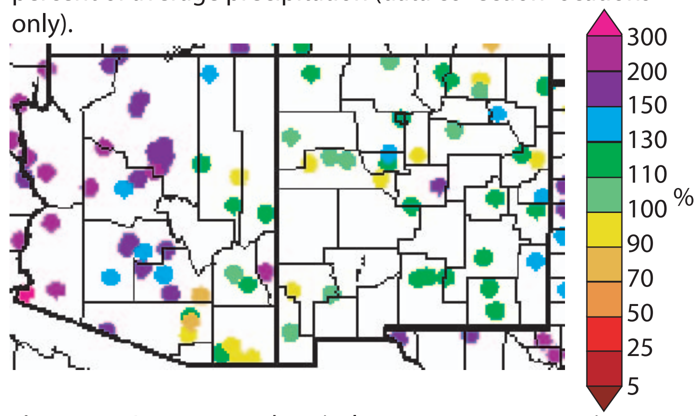


Figure 2c. Previous 30 days (July 23–August 21, 2005) percent of average precipitation (interpolated).

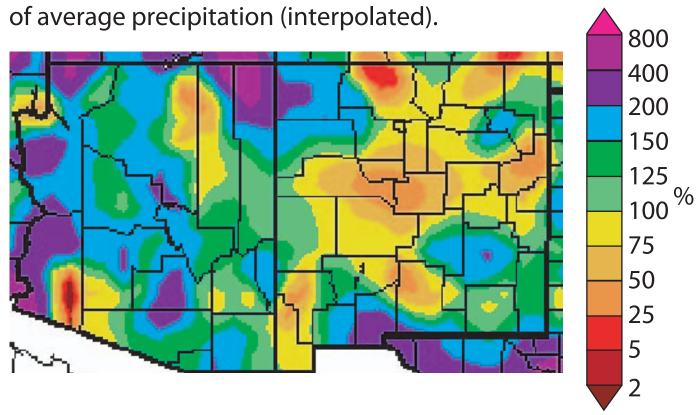
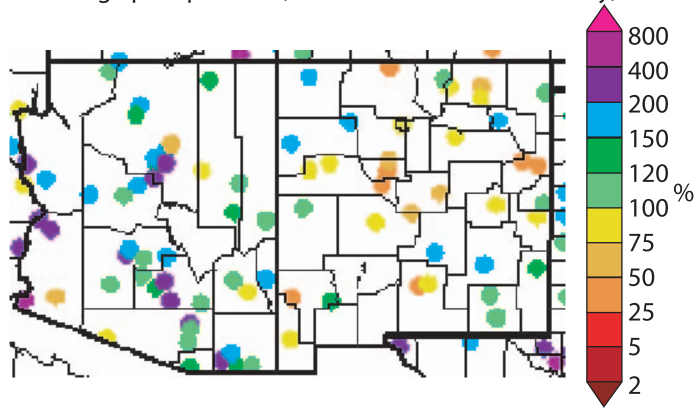


Figure 2d. Previous 30 days (July 21–August 23, 2005) percent of average precipitation (data collection locations only).



U.S. Drought Monitor
(released 8/18/05)

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

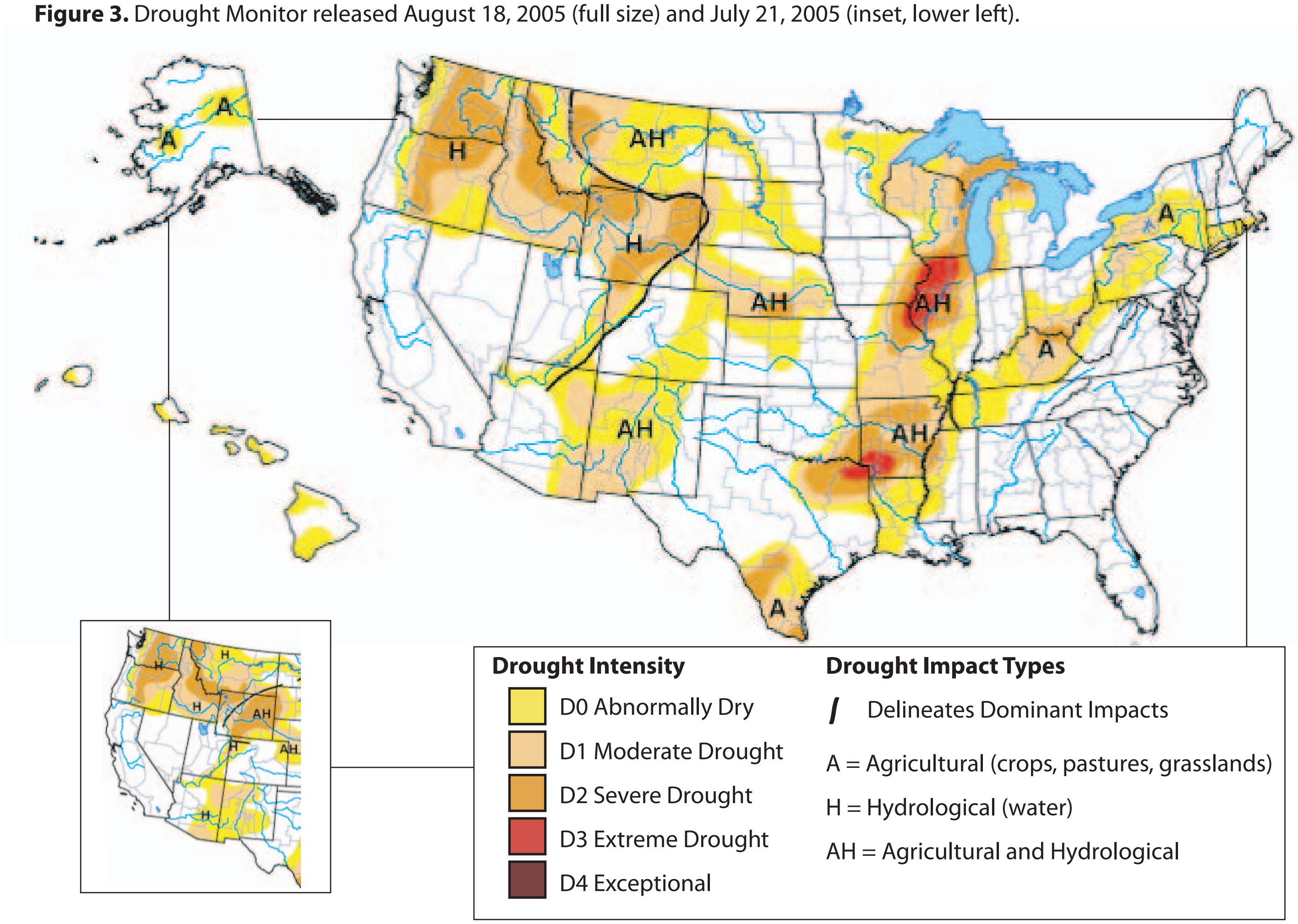
The Southwest has sections of both improvement and degradation in drought conditions over the past month (Figure 3). Improvement occurred in central and south-central Arizona and central and northeastern New Mexico, as recent above-average precipitation supplied some much-needed moisture to these regions. Most notable is the 125–400 percent of average 30-day rainfall anomaly in central Arizona (see Figure 2c). Although the monsoon onset was later than normal, it has provided higher precipitation departures than forecasts anticipated. The situation deteriorated from extreme southeastern Arizona to south-central New Mexico, where generally drier-than-average conditions led to the introduction of moderate drought. Parts of southwestern New Mexico received only 50–75 percent of average precipitation over the past 30 days (see Figure 2c). Low storage in Lakes Powell and Mead (see Figure 5) continue to warrant an abnormally dry classification for much of the Colorado River Valley upstream from Lake Mead into Utah and Colorado. The worst drought conditions in the U.S. continue in parts of southwestern Arkansas and northwestern Illinois. Except for the Pacific Northwest, the western U.S. has generally seen improvement in drought conditions during 2005 and the water year.

Notes:

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

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

Figure 3. Drought Monitor released August 18, 2005 (full size) and July 21, 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 7/15/05)

Source: New Mexico Natural Resources Conservation Service

A wet beginning to August, particularly over the past two weeks, contributed to the elimination of abnormally dry conditions in central and northeastern New Mexico. Elsewhere, below-average precipitation during the past 30–60 days led to the introduction of moderate drought from the Arizona/New Mexico border to central portions of the state. According to the Albuquerque National Weather Service (NWS), last month was one of the driest Julys on record (Drought Status for August 2005). Eastern portions of the state generally received 50–60 percent of average precipitation, while the rest of the state ranged from 30–40 percent of average. Most of New Mexico has improved significantly since the start of the current water year due to the above-average precipitation during the winter and early spring. Statewide precipitation has been above average during both the 2005 calendar and water years (Albuquerque NWS).

The NOAA-Climate Prediction Center reports that 29 percent of the pasture and range land in New Mexico is in good to excellent condition, while 31 percent is in poor to very poor condition. Officials in Portales are concerned that increasing costs of the Ute Water Project will result in the more communities leaving the project (*Portales News-Tribune*, August 16). The annual service contract has more than tripled in the past year, and it may continue to rise if the project is further postponed or delayed.

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.

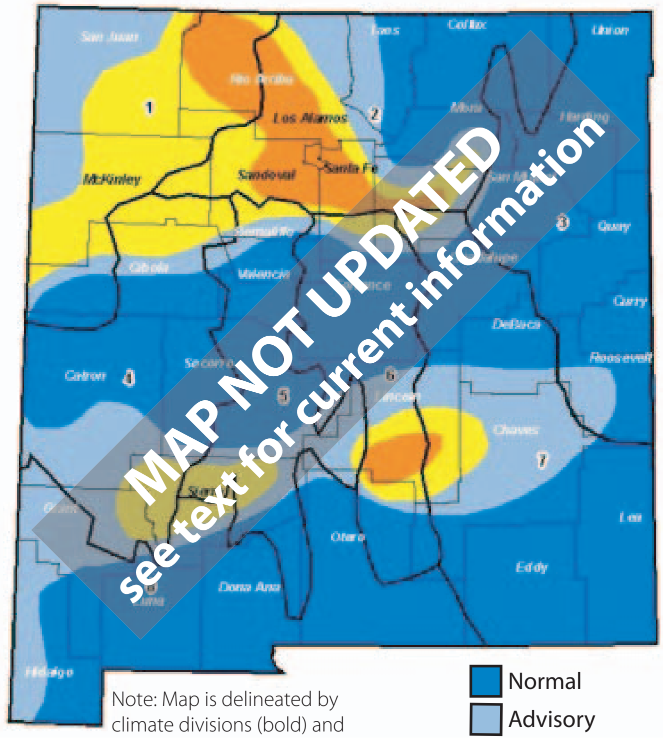
Figure 4a shows short-term or *meteorological* drought conditions. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) over a relatively short duration (e.g., months). Figure 4b refers to long-term drought, sometimes known 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/

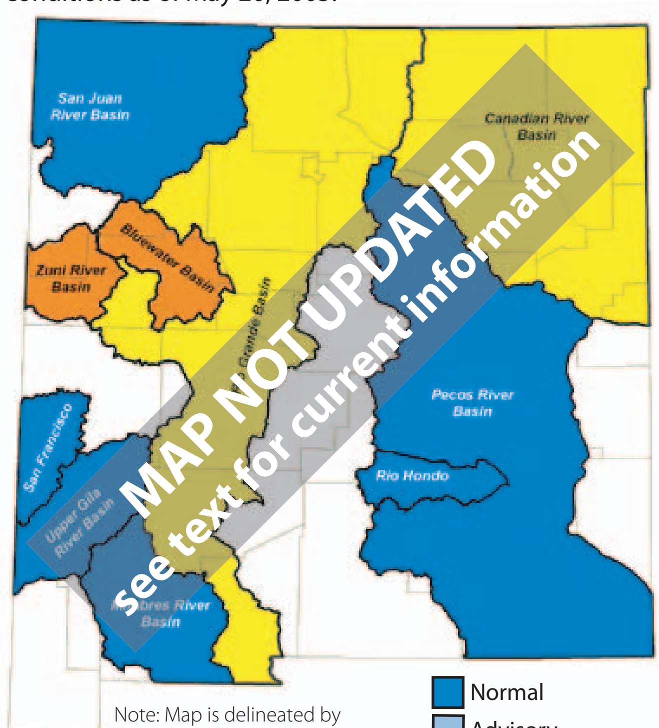
Figure 4a. Short-term drought map based on meteorological conditions as of July 15, 2005.



Note: Map is delineated by climate divisions (bold) and county lines.

- Normal
- Advisory
- Alert
- Warning
- Emergency

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



Note: Map is delineated by river basins (bold) and county lines.

- Normal
- Advisory
- Alert
- Warning
- Emergency

Arizona Reservoir Levels

(through 7/31/05)

Source: National Water and Climate Center

Storage in many Arizona reservoirs decreased for the second consecutive month with the exceptions of Show Low Lake and Lake Powell, which remained at 100 and 51 percent of capacity respectively (Figure 5). Reservoirs in the western part of the state—Havasu, Mohave, Mead, and Powell—each dropped by only about 1 percent of capacity. Elsewhere, lakes generally decreased by 5–12 percent of capacity. Despite the continuing losses, the reservoirs remain well above last year's values. In fact, levels at four are at least 1.5 times the levels from 2004. Statewide storage is also greater than in 2004, but it is only 70 percent of average storage and 57 percent of maximum capacity. The main reason for the low value when comparing current statewide storage with maximum capacity is that Lakes Mead and Powell can hold much more water than the other reservoirs. When their capacities are combined, they account for approximately 90 percent of Arizona's water storage.

The San Carlos Apache Tribe recently lost an appeal regarding the San Carlos Reservoir at the Ninth Circuit Court of Appeals in San Francisco (AZCentral.com, August 9). The court upheld a trial court ruling that the National Historic Preservation Act does not permit lawsuits against the federal government to protect fish and wildlife from damage related to low reservoir levels during drought. The U.S. Bureau of Reclamation has begun holding meetings to collect comments on the future of the Colorado River and its reservoirs (*Las Vegas Review-Journal*, July 27). In Utah the environmental group Living Rivers, presented its request that Glen Canyon Dam be torn down to allow Lake Powell to drain, which they believe would decrease evaporation, and increase water availability downstream (*Tucson Citizen*, July 29).

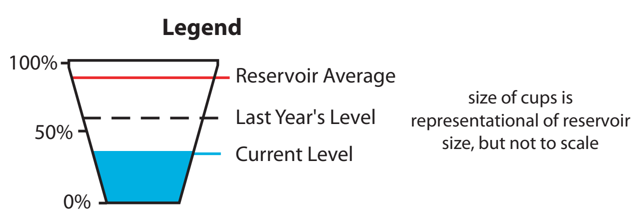
Notes:

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.

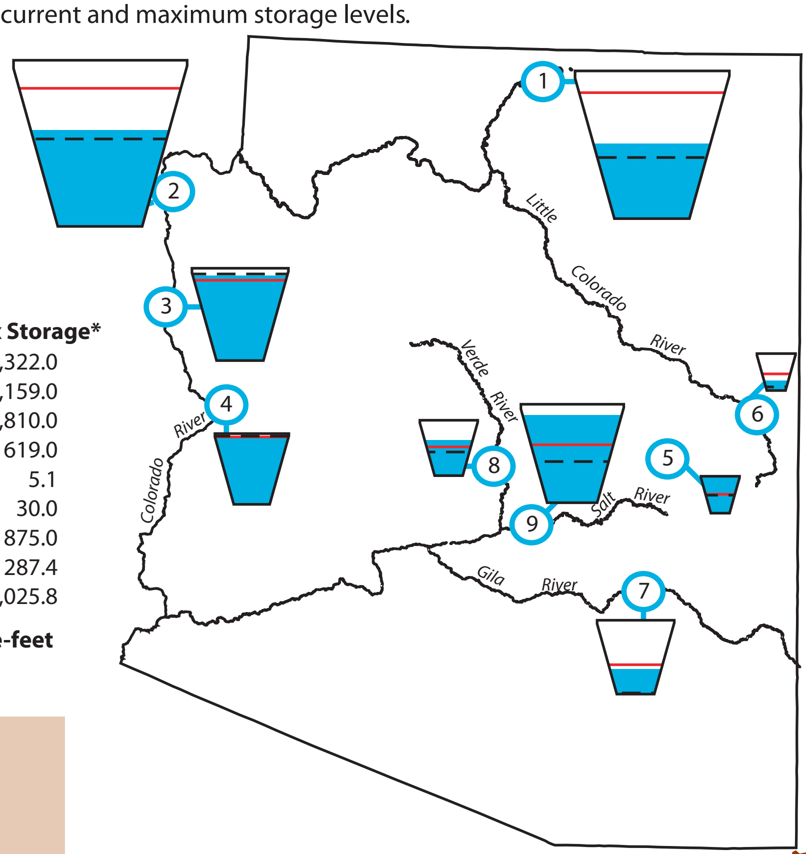
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) 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 July 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	51%	12,418.0	24,322.0
2. Lake Mead	58%	15,288.0	26,159.0
3. Lake Mohave	92%	1,671.9	1,810.0
4. Lake Havasu	93%	576.4	619.0
5. Show Low Lake	100%	5.1	5.1
6. Lyman Reservoir	27%	8.2	30.0
7. San Carlos	34%	297.4	875.0
8. Verde River System	64%	183.4	287.4
9. Salt River System	89%	1,810.7	2,025.8

*** thousands of acre-feet**



On the Web:

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

New Mexico Reservoir Levels

(through 7/31/05)

Source: National Water and Climate Center

The trend in New Mexico reservoir levels was similar to Arizona with nearly all locations undergoing a decrease in capacity or staying the same. The lone exception was Lake Heron, which had a 1 percent of capacity increase (Figure 6). While many lakes dropped by less than 5 percent of capacity, Costilla decreased by 28 percent. The state's second largest reservoir, Navajo, claimed the highest current capacity at 92 percent or nearly 1.6 million acre-feet. As a result of the abundant winter precipitation, most reservoirs were well above 2004 storage despite these decreases. Storage statewide is nearly 185 percent of last year's value, but it is only 42 percent of maximum capacity and 76 percent of average capacity. Low storage at Elephant Butte Reservoir, which accounts for nearly one-third of New Mexico's total capacity, factors significantly in the statewide deficit.

A spring 2005 report from New Mexico Tourism indicated a 1.4 percent increase in visitors over the same period last year, which the group attributes in part to the higher reservoir and river levels (*Deming Headlight*, August 4). According to the report, the greatest tourism occurred in Albuquerque, the I-40 corridor, Santa Fe, and northeastern and southwestern portions of the state. Tribal leaders, local officials, and areas residents recently gathered near Durango, Colorado, to mark the beginning of construction on the Ridges Basin Dam (*U.S. Water News*, August 2005). The resultant reservoir, Lake Nighthorse, will hold approximately 120,000 acre-feet of water. Plans call for the dam to be completed in 2008 and the reservoir filled in 2011.

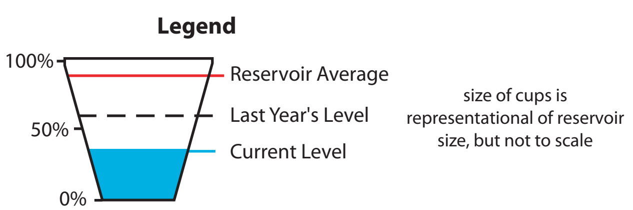
Notes:

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.

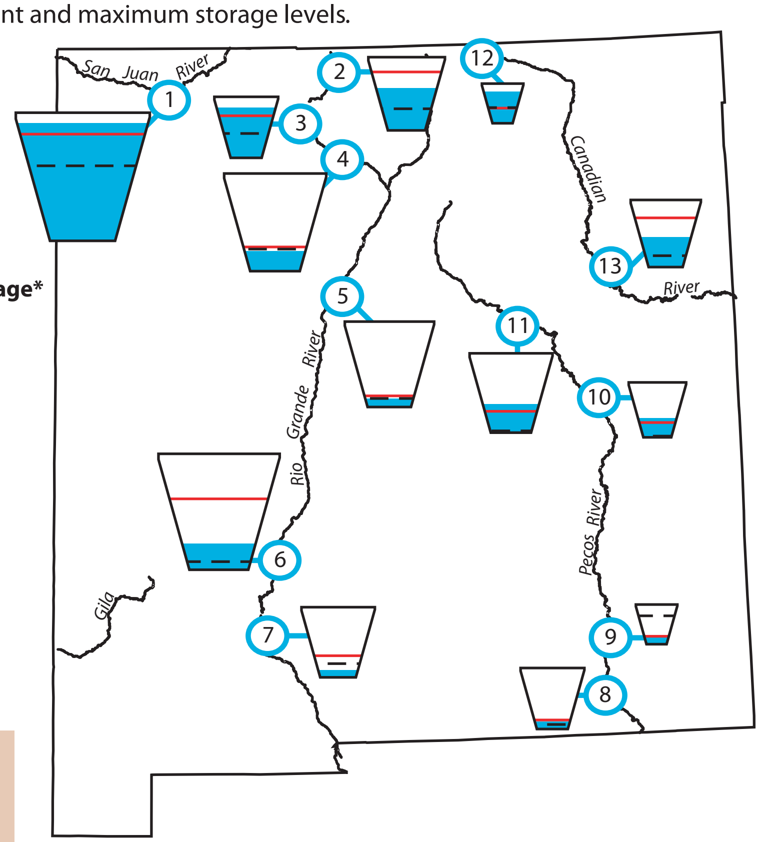
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) 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 July 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	92%	1,557.2	1,696.0
2. Heron	58%	231.3	400.0
3. El Vado	82%	152.2	186.3
4. Abiquiu	21%	115.3	554.5
5. Cochiti	10%	48.7	502.3
6. Elephant Butte	23%	478.1	2,065.0
7. Caballo	10%	34.2	331.5
8. Brantley	12%	17.5	147.5
9. Lake Avalon	22%	1.3	6.0
10. Sumner	36%	37.2	102.0
11. Santa Rosa	21%	94.3	447.0
12. Costilla	80%	12.8	16.0
13. Conchas	44%	111.4	254.0

*** thousands of acre-feet**



On the Web:

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

Southwest Fire Summary

(updated 8/22/05)

Source: Southwest Coordination Center

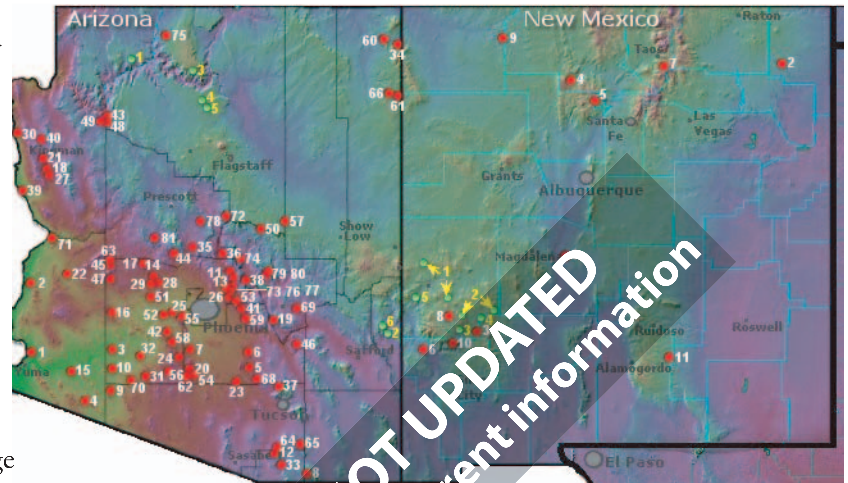
The Southwest Coordination Center (SWCC) reports that, through the end of July, the number of large fires, suppression fires, and acreage burned was above average across Arizona and New Mexico. Nearly 30 additional large fires and over 500 suppression fires charred 718,794 acres, or 425,500 acres above average. In July alone, the number of large fires was more than double the average count. In addition, the total acreage burned in July 2005 is only about 29,000 acres lower than the average year-to-date at the end of July. The number of wildfires and acreage burned has decreased significantly since mid-July. Only five large fires occurred in August, all in Arizona. The two largest were the Guacamole fire near Gila Bend (4,000 acres) and the Sycamore near Prescott (2,000 acres). According to the SWCC, 308 prescribed fires and 39 wildland fire use fires charred an additional 126,848 acres and 115,846 acres, respectively.

The Southwest Region is currently in "Preparedness Level 2," down from level 4 in mid-July. Level 2 means that resources are sufficient to manage wildfires and prescribed fires. Restrictions and closures are scattered throughout federal and tribal lands in portions of Arizona and New Mexico. The Mescalero Apache Indian Reservation near Ruidoso, New Mexico, is under "class III–high fire" restrictions. This restriction requires permits for burning slash, as well as safety devices to decrease the risk of fire ignition from sparks.

Figure 7a. Year-to-date fire information for Arizona and New Mexico as of August 22, 2005.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	2,356	168,459	1,093	555,459	3,449	723,918
NM	357	18,418	669	3,726	1,026	22,144
Total	2,713	186,877	1,762	559,185	4,475	746,062

Figure 7b. Year-to-date wildland fire location. Map depicts large fires of greater than 100 acres burned as of July 21, 2005.



Wildland Fires

Arizona
1. H[illegible]den
2. Bo[illegible]que
3. Oatman [illegible]t
4. Cami[illegible]o
5. Foster
6. [illegible]hapman
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.
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

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

New Mexico
1. North Fork
2. Black Range
3. Ring
4. Wahoo
5. Willow

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 8/20/05)

Source: Western Regional Climate Center

Total monsoon precipitation ranged from less than 0.1 inches in southwestern Arizona to more than 8 inches in southeastern Arizona (Figure 8a). Most of the Southwest has recorded from 1–5 inches of rain since the monsoon began in mid-July. The first 30 days of the monsoon brought a combination of below- and above-average precipitation to Arizona, while New Mexico was generally drier than average (Figures 8b–c). The largest positive departures are mainly in portions of Arizona. The wet anomalies in south-central Arizona resulted in the removal of abnormally dry conditions on the U.S. Drought Monitor (see Figure 3).

Precipitation during the monsoon is sometimes described as "popcorn" or "hit-and-miss" due to the variability in rainfall measurements at nearby locations. For example, an observation site on the University of Arizona (UA) campus recorded 2.28 inches of rain on August 8, while the Tucson International Airport, which is approximately 6 miles away, received 0.51 inches. Furthermore, the precipitation recorded during the week of August 8–14 totaled 3.82 inches at the UA campus and 1.62 at the airport.

Figure 8a. Total precipitation in inches July 1–August 20, 2005.

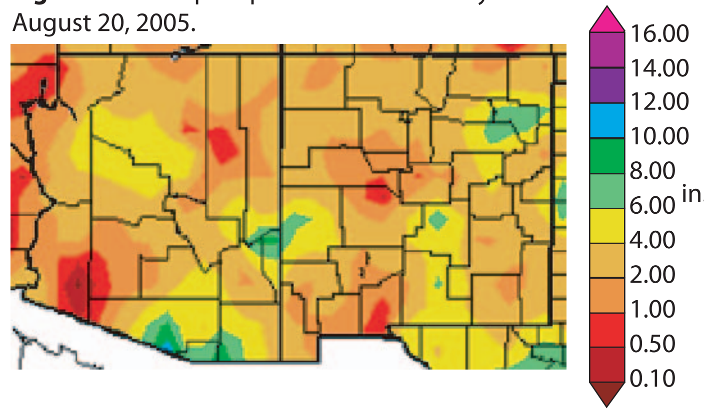


Figure 8b. Departure from average precipitation in inches July 1–August 20, 2005.

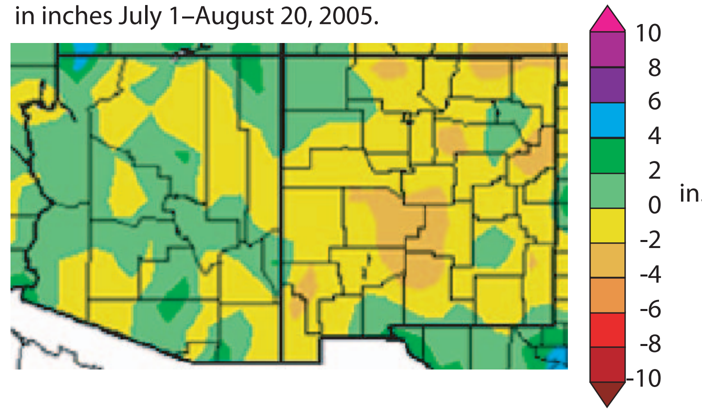
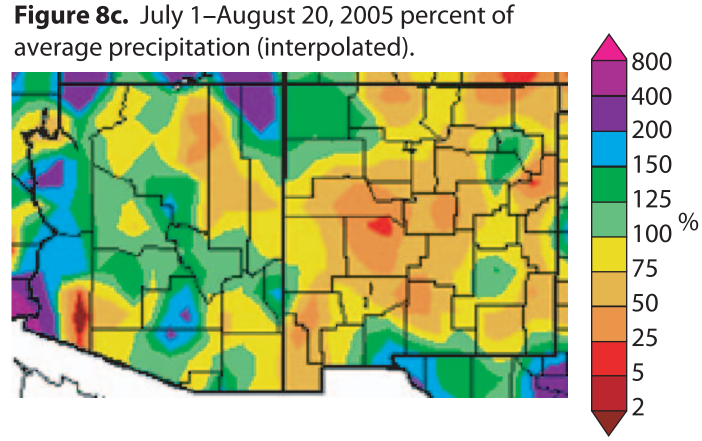


Figure 8c. July 1–August 20, 2005 percent of average precipitation (interpolated).



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

(September 2005–February 2006)

Source: NOAA Climate Prediction Center

The NOAA-CPC long-lead temperature outlooks show increased chances of above-average temperatures for much of the Southwest through February 2006 (Figures 9a–d). The models indicate the highest probabilities in both Arizona and portions of New Mexico in the fall from November 2005–January 2006 (Figures 9c). The area of increased chances of warmer-than-average conditions expands in the winter months into Texas and across the Great Plains and the Midwest to the Northeast (Figures 9c–d). The forecasts are based on the consensus of a wide array of dynamical and statistical models. The CPC outlooks generally agree with those 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 September–November 2005.

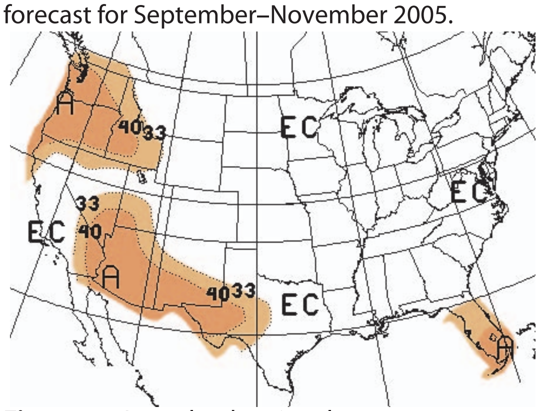


Figure 9b. Long-lead national temperature forecast for October–December 2005.

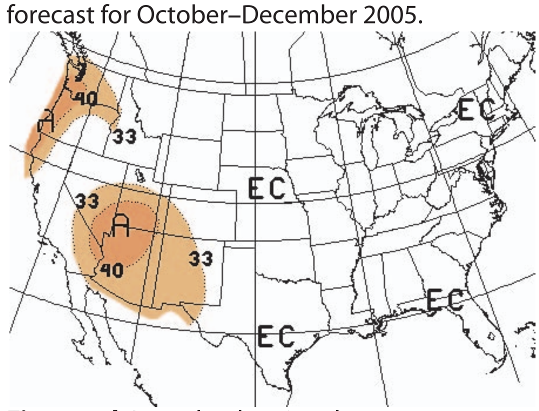


Figure 9c. Long-lead national temperature forecast for November 2005–January 2006.

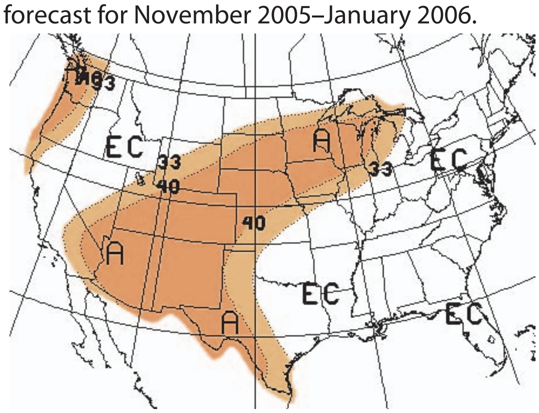
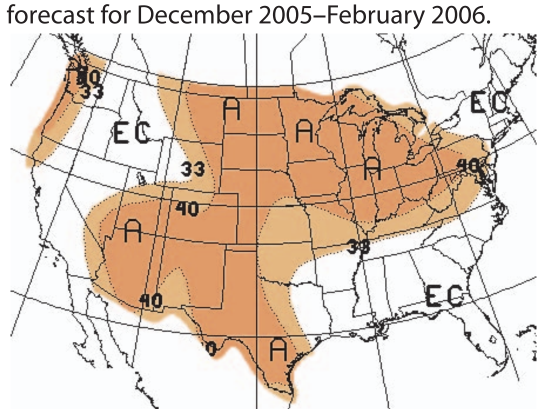


Figure 9d. Long-lead national temperature forecast for December 2005–February 2006.



A= Above
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
(September 2005–February 2006)
Source: NOAA Climate Prediction Center

The NOAA-CPC long-lead forecast shows slightly increased chances of below-average precipitation in northwestern Arizona with no forecasted anomalies elsewhere in the Southwest through November (Figure 10a). Except for increased chances of wetter-than-average conditions in extreme eastern New Mexico from November 2005–January 2006, the models indicate no other forecasted anomalies in the region (Figures 10b–c). The forecasts are based on the consensus of a wide array of dynamical and statistical tools. The outlooks issued by the International Research Institute for Climate Prediction (not shown) generally agree with the CPC. Only minor differences exist in the placement of the forecasted anomalies, such as slightly increased chances of below-average precipitation in the extreme southern portions of the Southwest through December.

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 September–November 2005.

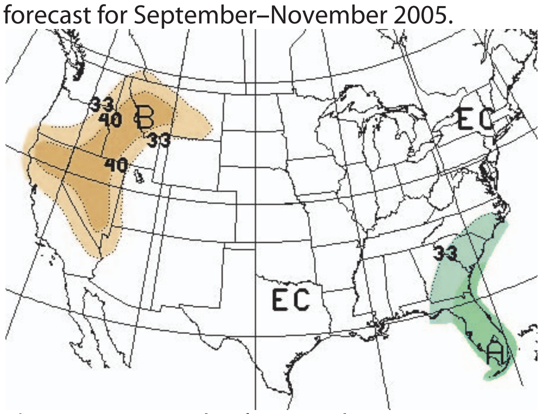


Figure 10b. Long-lead national precipitation forecast for October–December 2005.

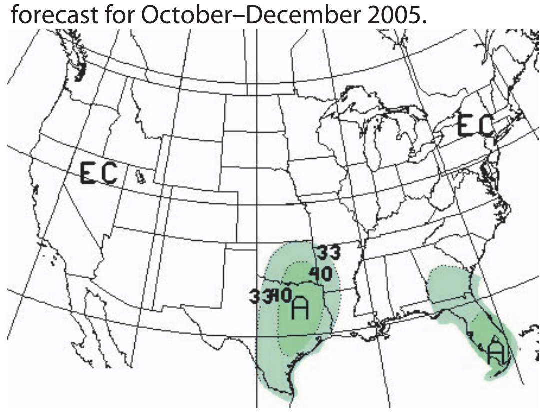


Figure 10c. Long-lead national precipitation forecast for November 2005–January 2006.

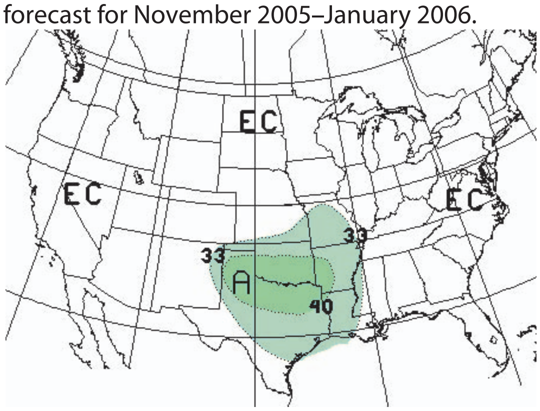
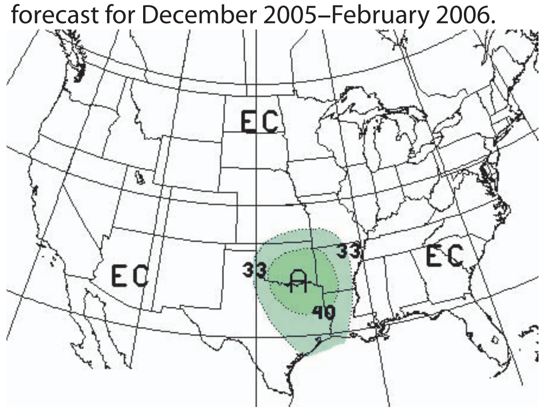


Figure 10d. Long-lead national precipitation forecast for December 2005–February 2006.



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 November 2005)

Sources: NOAA Climate Prediction Center

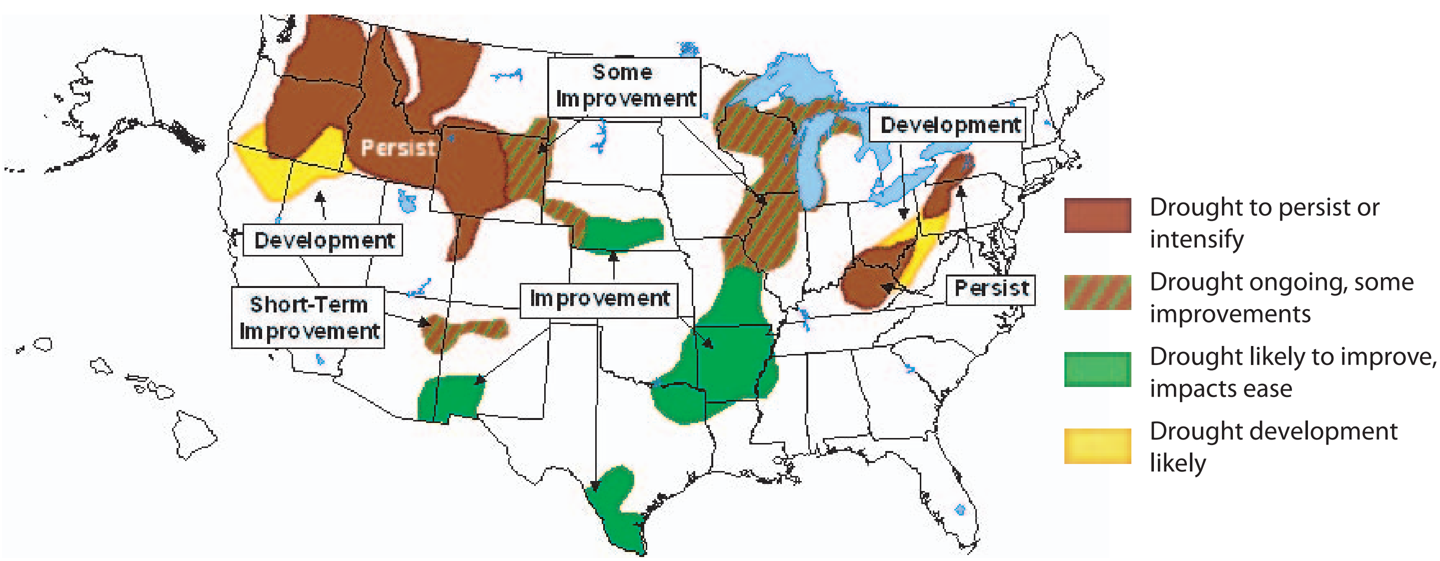
The drought outlook from the NOAA-Climate Prediction Center (CPC) indicates at least short-term improvement in the Southwest (Figure 11). Experts also expect conditions to improve in the Great Plains, southern Texas, and from northeastern Texas into the western Great Lakes. Elsewhere, portions of the northwestern and northeastern U.S. will likely experience drought persistence or development. The CPC believes that the monsoon, which has been wetter than forecasted in portions of the Southwest, will continue to provide some relief to Arizona and New Mexico. The highest probability for improvement in the region is in southeastern Arizona and southwestern New Mexico. While the long-lead precipitation forecast for September–November from CPC show no forecasted anomalies in this area of the Southwest (see Figure 10a), IRI predictions indicate increased chances of wetter-than-average conditions. Both groups feel that the atmospheric circulation pattern will be favorable for the movement of moisture from the south and southeast. The resultant precipitation should be sufficient to provide short-term improvement to areas with long-term rainfall deficits.

Researchers with the Laboratory of Tree-Ring Research at the University of Arizona (UA) determined that reduced flow on the Salt and Verde rivers tend to coincide with low streamflow on the upper Colorado River (*Arizona Republic*, August 19). They also found that extended droughts are fairly common in the region. Officials believe that this research will help Arizona as the seven Colorado River Basin states discuss water supply. Another UA study shows that underground drip irrigation could save water while increasing crop yield (*U.S. Water News*, August). Other federal and state groups also plan water-related studies, including engineering, financial issues, environmental impacts, and water rights (Associated Press, August 1). In addition, Arizona officials will resurrect a rural water study program using extra funding that legislators gave to the Department of Natural Resources (*Arizona Republic*, August 5).

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 November 2005 (release date August 18, 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, the onset of the monsoon has reduced fire potential to near average across most of the Southwest, except in the Four Corners area, where drier conditions are expected to continue through the month (Figure 12a). Critical fire potential exists in the Arizona Strip north of the Grand Canyon, and extends northward through portions of Nevada and Utah into the Pacific Northwest. Above-average potential extends northward through portions of Utah and Colorado to Montana and Idaho and includes portions of California as well. Elsewhere, critical potential exists in portions of the Midwest and the Great Lakes region. In the Southeast, below-average potential extends from Mississippi to Virginia. In the Southwest, live fuel moisture content remains near to above average and has generally improved with the monsoon. However, because of the abundance of fine fuels such as grasses in a cured condition, lower elevations of Arizona and New Mexico may see some short-term increases in fire activity during any periods of low relative humidity. The Southwest has been downgraded to "Preparedness Level 2," meaning that the potential for large fires exists, but resources within the zone are adequate.

Figure 12a. National wildland fire potential for fires greater than 100 acres (valid August 1–31, 2005).

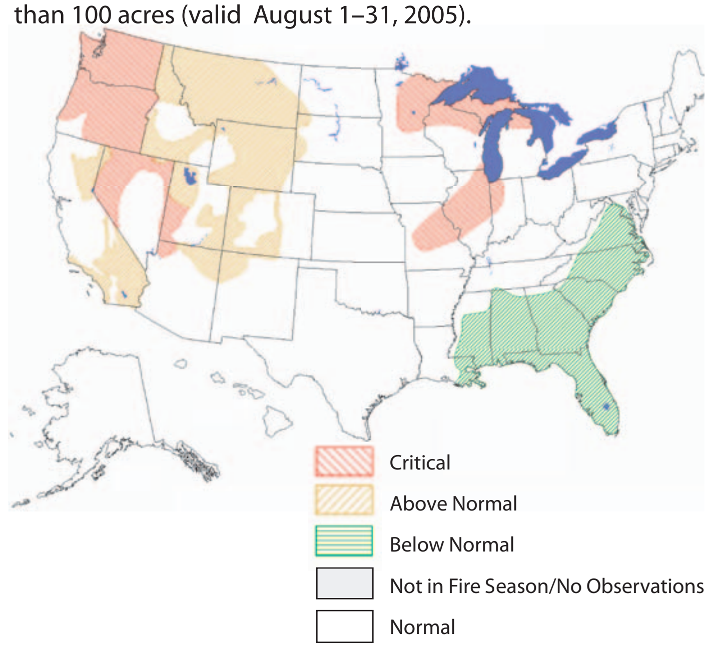


Figure 12b. Current fine fuel condition and live fuel moisture status in the Southwest.

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

The Southern Oscillation Index once again increased in July and continues to be representative of neutral El Niño-Southern Oscillation (ENSO) conditions in the tropical Pacific Ocean (Figure 13a). The NOAA-CPC and the International Research Institute for Climate Prediction (IRI) report that sea surface temperatures (SSTs) across nearly the entire tropical Pacific are close to average and are also indicative of neutral ENSO conditions. A small region of slightly cooler-than-average SSTs is located along the coast of South America near the equator, but this will have only regional impacts. Wind direction and speed, which can vary as SSTs change, are also near average.

In addition to the sea surface and atmospheric measurements, instruments measure the temperature of the ocean below the surface. These data show that the subsurface ocean temperatures are also close to average. These observations can provide a hint about the conditions that will exist in the next several months. The current near-average values signify that the neutral conditions are likely to persist. Probabilistic forecasts from IRI indicate that neutral conditions are most likely to persist over the next few months, as well as through the middle of 2006 (Figure 13b). The probabilities decrease from near 90 percent in the August-October period to 60 percent likely by mid-summer 2006, but they remain above the historical values during the entire period. Although the likelihood of both La Niña and El Niño increases slightly through July 2006, values are much lower than the probabilities for neutral conditions. The current and forecasted weak ENSO signal contributes to the fairly low confidence shown in the long-term temperature and precipitation forecasts.

Notes:

Figure 13a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through July 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.

Figure 13a. The standardized values of the Southern Oscillation Index from January 1980–July 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).

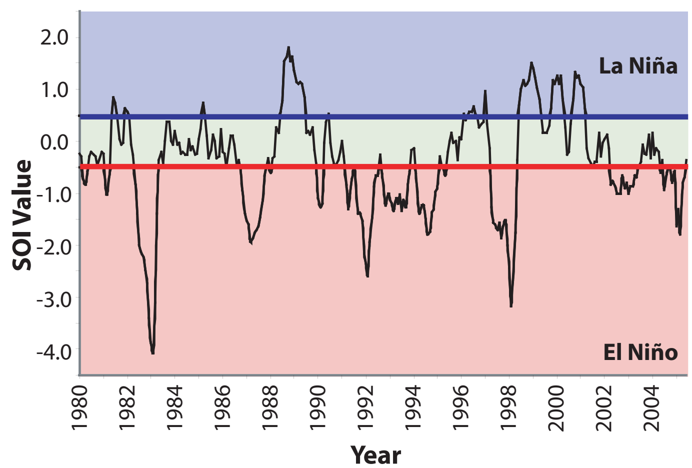
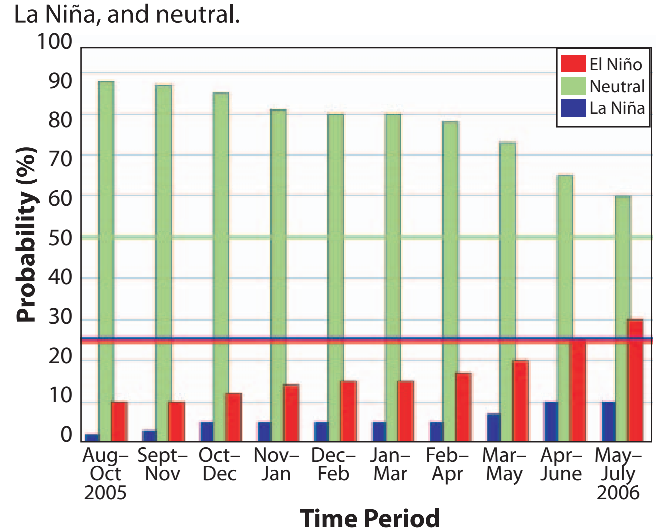


Figure 13b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released August 18, 2005). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



On the Web:

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

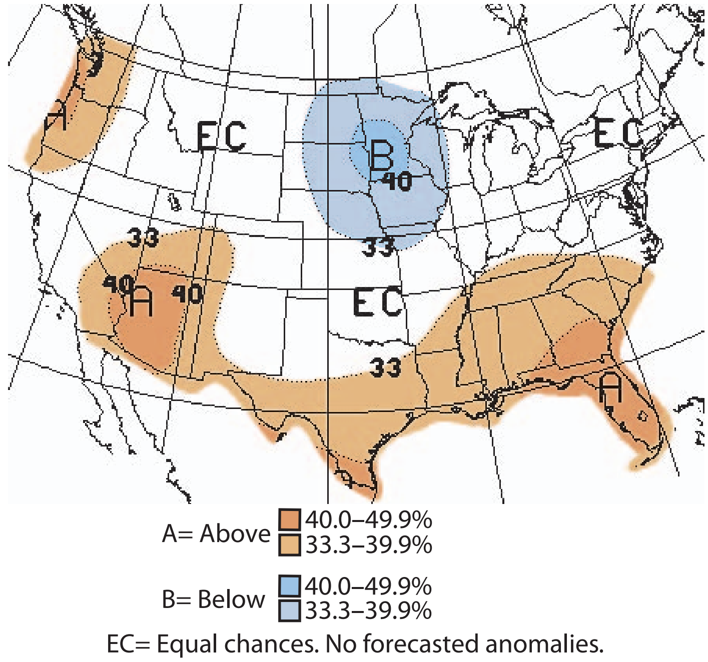
For more information about El Niño and to access graphics similar to the figures on this page, visit:
http://iri.columbia.edu/climate/ENSO/

Temperature Verification
(May–July 2005)

Source: NOAA Climate Prediction Center

The long-range forecast for May–July 2005 from the NOAA-Climate Prediction Center indicated increased chances of above-average temperatures across much of the southern tier of the United States and in the Pacific Northwest (Figure 14a). The highest probabilities were in Arizona, deep southern Texas, and portions of the Southeast. The outlook also showed increased chances of cooler-than-average temperatures in the upper Midwest and Great Plains. Observed temperatures during the period generally ranged from 5 degrees Fahrenheit above average to 5 degrees below average (Figure 14b). Most of the Southwest was slightly warmer than average. The forecast performed best from Arizona and southern New Mexico into southern Texas, as well as in portions of Florida and the Pacific Northwest. It was less successful in the Midwest, where only the northern areas experienced the forecasted below-average temperatures.

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



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

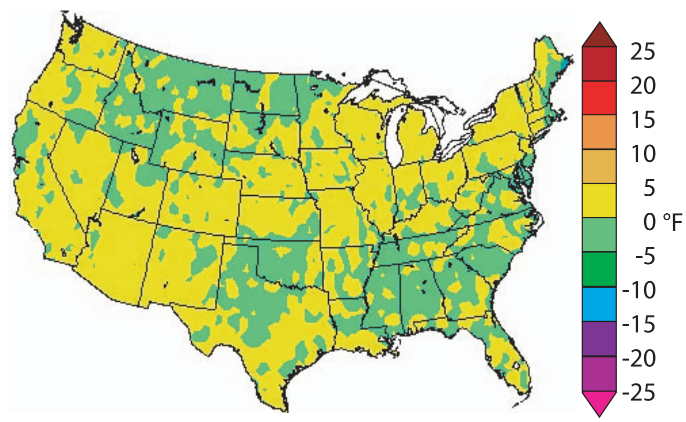
The May–July 2005 NOAA CPC outlook predicts the likelihood (chance) of above-average, average, and below-average temperature, but not the magnitude of such variation. The numbers on the maps do not refer to degrees of temperature. Care should be exercised when comparing the forecast (probability) map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

Figure 14b. Average temperature departure (in degrees F) for May–July 2005.



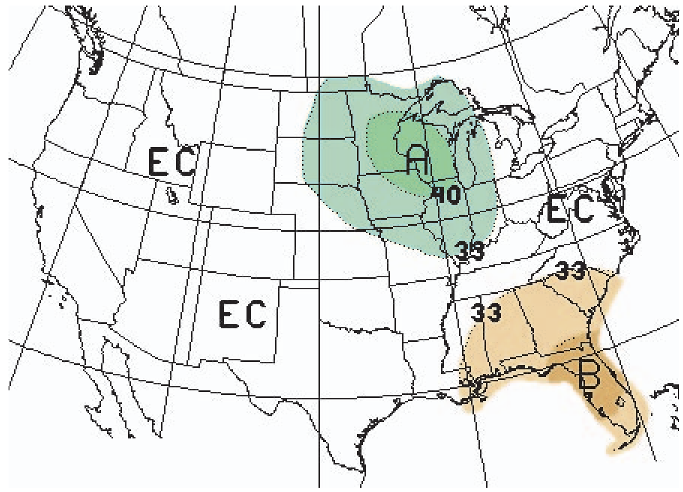
On the Web:
For more information on CPC forecasts, visit:
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html

Precipitation Verification
(May–July 2005)

Source: NOAA Climate Prediction Center

The long-range outlook from the NOAA-CPC for May–July 2005 indicated no forecasted anomalies for the entire western half of the country (Figure 15a). The forecast showed increased chances of below-average precipitation in the Southeast, with the highest probabilities in central and northern Florida. In the upper Midwest the forecast predicted increased chances of wetter-than-average conditions. Precipitation in Arizona and New Mexico was generally below average during the period, while California and areas from the Northwest to the northern Great Plains were generally wetter than average (Figure 15b). Some portions of the West received 200 percent of their average precipitation. The Southeast was wetter than average, particularly Georgia and central Alabama. The rest of the country was mostly drier than average. The outlook was on-target in the upper Midwest, but its performance was less desirable elsewhere. For example, observed conditions in the Southeast were essentially the opposite of the forecast.

Figure 15a. Long-lead U.S. precipitation forecast for May–July 2005 (issued April 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.

Notes:

Figure 15a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months May–July 2005. This forecast was made in April 2004.

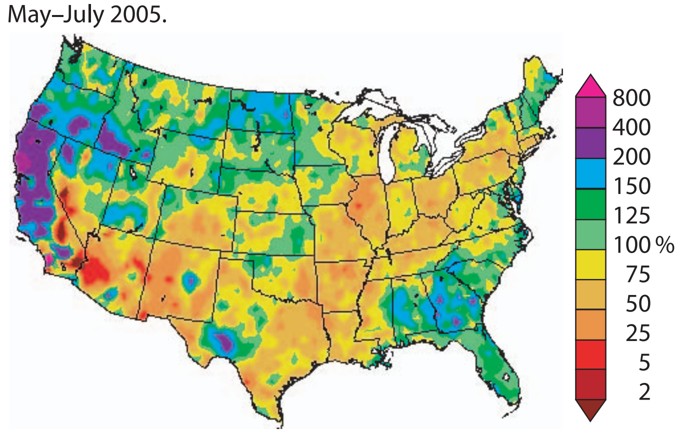
The May–July 2005 NOAA CPC outlook predicts the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps do not refer to inches of precipitation. Care should be exercised when comparing the forecast (probability)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

Figure 15b. Percent of average precipitation observed from May–July 2005.



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