Issued: April 23, 2008

Southwest Climate Outlook

THE UNIVERSITY OF ARIZONA.

Source: Steve Novy, ISPE

Photo Description: Theodore Roosevelt Lake, located near Phoenix in the Tonto National Forest, was formed by the construction of a masonry dam on the Salt River in 1911, making it the oldest artificial reservoir in Arizona. This photograph was taken on March 30th, on the southern edge of the lake near the Windy Hill Campground.

Would you like to have your favorite photograph featured on the cover of the *Southwest Climate Outlook*? For consideration send a photo representing Southwest climate and a detailed caption to: knelson7@email.arizona.edu

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NM Drought

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Little or nor precipitation was reported across the northern two-thirds of New Mexico during March as the storm track that had brought abundant mountain snow to the northwestern part of the state this past winter shifted further north. The southern and eastern portions...

Fire Outlook

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According to the Southwest Coordination Center, above-normal significant fire potential is expected across eastern and southern New Mexico and southeastern Arizona. Normal significant fire potential is expected elsewhere in our region. Above-normal potential is predicted...

El Niño

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The 2007–2008 La Niña event is starting to loosen its grip on the equatorial Pacific. The International Research Institute for Climate and Society reports that La Niña conditions (below-average sea surface temperatures across the equatorial Pacific Ocean) appeared to have peaked...

April Climate Summary

Drought – Wet winter conditions helped keep short-term drought at bay across most of Arizona even with very dry conditions over the past thirty days. New Mexico has not faired as well with deepening drought conditions due to many months of below-average precipitation.

Temperature – Temperatures were above-average across much of Arizona and New Mexico over the past thirty days. Many locations across the Southwest observed temperatures at least 1–2 degrees F above-average.

Precipitation – Much of Arizona and New Mexico observed below-average precipitation again this past thirty days. Almost no measurable precipitation fell across Arizona and southern New Mexico during this period.

ENSO – The current La Niña event weakened considerably this past month with warming sea surface temperatures in the eastern and central Pacific as well as a weakening influence on atmospheric circulations. Most forecast models indicate a steady slide towards ENSO-neutral conditions by mid-summer 2008.

Climate Forecasts – Seasonal climate forecasts project above-average temperatures and an equal chances precipitation forecast as La Niña impacts on precipitation patterns across the Southwest wane into the spring.

The Bottom Line – The transition from wet and cool winter conditions to more typical warm and dry springtime conditions appears to be complete with storm tracks retreating north. La Niña continues to become less of a player in Southwest weather. Long-term temperature trends dominate the expectation of above-average temperatures through the summer.

Fire: Back in the news

The Southwest Coordination Center reports that more than 150,000 acres already have burned in New Mexico in 2008, including several fires in excess of 5,000 acres each. In the Jemez Mountains of northern New Mexico, wildland firefighters have fought and controlled one blaze on national forest land near Gilman (*Santa Fe New Mexican*, April 4). Grasslands in southeastern New Mexico and southeastern Arizona, which have received scant precipitation since the start of the water year on October 1, are particularly at risk. Given recent dryness and high winds, several so-called red flag warnings have been issued for parts of Arizona and New Mexico, indicating that "critical fire weather conditions are either occurring or are imminent," according to the National Weather Service. The *Southwest Climate Outlook* will continue to cover fire conditions and forecasts through the fall.

For more info visit: http://gacc.nifc.gov/swcc/index.htm…

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Diagnosing 2007 U.S. precipitation extremes

By By the NOAA/ESRL Climate Attribution Team*: Contributors to this article include Taiyi Xu, Xiaowei Quan, Jon K Eisheid, Martin Hoerling, and Tao Zhang

Forget "CSI: Crime Scene Investigations," the television show that uses ubiquitous fingerprints, DNA, and gunshot residue to catch crooks. There's another CSI, and this one uses computer simulations, data, and atmospheric science for some sleuthing of its own: to uncover the reasons behind anomalous climatic behavior as it evolves.

Climate Scenes Investigators (CSI) recently focused on the causes of below-average precipitation in 2007 in the southwestern and southeastern United States to determine if those conditions can be attributed to sea surface temperature (SST) anomalies. After some climatic detective work, the team turned up some surprising findings.

Calendar Year 2007 Precipitation Departures

CSI is the nickname for the National Oceanic and Atmospheric Administration (NOAA) Climate Attribution Team. Led by Martin Hoerling, a NOAA meteorologist, the CSI team includes scientists from the NOAA Earth System Research Lab in Boulder, Colorado, other NOAA research labs across the U.S., and NOAA's Climate Prediction Center in Washington D.C. The scientists also assess seasonal climate predictors and evaluate the reasons for seasonal forecast success and failure.

A strong El Niño in the winter/spring of 2007 and a La Niña beginning in late summer 2007 gave the CSI team an opportunity to try to link below-average precipitation in the Southwest and Southeast to the SST anomalies in the Tropical Pacific Ocean, the region of the El Niño Southern Oscillation (ENSO). ENSO is the term currently used by scientists to describe periodic basin-wide changes in air-sea interaction in the equatorial Pacific Ocean; El Niño/La Niña is the oceanic component, and the Southern Oscillation is the atmospheric component. The term El Niño refers to a sustained warming of SSTs across a broad region of the eastern and central tropical Pacific Ocean and tends to be associated with drier winters in the Pacific Northwest and wetter winters in the southwestern United States. The opposite is generally associated with La Niña events.

The team analyzed SSTs in both the ENSO region and other regions, including the Indian, North Pacific, and North Atlantic oceans. While the team concluded that it is unlikely that ENSO played a role in the U.S. droughts of 2007, the scientists found the atmosphere to have been sensitive to SST anomalies in other parts of the world oceans that year, and that that was a factor in the U.S. dryness.

Investigating global ocean influences on 2007 U.S. precipitation

For the contiguous U.S., large deficits in annually averaged (January–December) precipitation occurred last year in the Southwest and the Southeast regions (Figure 1, top). In those regions, accumulated annual departures from average have exceeded -30 percent of the 1971–2000 average precipitation. Below-normal precipitation was a remarkably persistent feature of the 2007 climate conditions in these two regions; all seasons during 2007 yielded abnormally low precipitation.

To assess whether such dryness was related to global SST conditions (as opposed to SSTs in the ENSO region and the oceans mentioned above), the scientists ran three different atmospheric climate models with the monthly varying global 2007 SSTs. For these so-called GOGA (Global Ocean-Global Atmosphere) runs, fifty separate simulations were conducted for each model. Figure 1 (middle panel) shows the average precipitation anomaly (departure from average) for all model simulations compared to the long-term average global SSTs. A dry pattern emerges over much of the southern U.S.

Did ENSO cause the U.S. droughts of 2007?

Additional simulations indicate this dry pattern was very unlikely the result of ENSO variability. Lingering El Niño conditions during winter and early spring 2007 were replaced by a La Niña event in late summer 2007. In a further suite of runs, SSTs were specified over the region 20 degrees north to 20 degrees south, 160 degrees east to the South American coast only, while average SSTs were specified elsewhere over the world oceans. For these so-called EPOGA (East Pacific Ocean-Global

continued on page 4

Precipitation, continued

Atmosphere) runs, fifty separate simulations were again conducted for each model. Although drought conditions were observed in reality, the simulation results indicated a strong wet pattern over the Southwest (Figure 1, bottom left). This simulated wet pattern was especially strong during winter/spring 2007 when El Niño conditions prevailed, and is also consistent with historical observations that reveal ENSO impacts to be largest during that time of year. Clearly, the expected wet pattern failed to emerge during 2007, and it appears very unlikely that ENSO was a contributing factor to the droughts that year.

Did other ocean conditions contribute to U.S. droughts of 2007?

The principal anomalies in global SSTs during 2007, outside the ENSO region, were warmth in the tropical Indian and Atlantic oceans, and warmth across much of the extratropical North Pacific and North Atlantic oceans. The team estimated the effect of the non-ENSO region SST influence, or forcing, by constructing the GOGA-EPOGA, subsequently referred to as global/non-ENSO. This analysis provided one estimate for the SST-forced signal from the ocean conditions outside of the tropical eastern Pacific.

The global/non-ENSO results (Figure 1, bottom right) revealed a strong U.S. precipitation sensitivity to this non-ENSO region forcing. In particular, dry conditions occurred along the entire southern tier of states, having a maximum percentage reduction in precipitation over the Southwest akin to the observed anomalies. Over the U.S. as a whole, this dry signal overwhelmed the east Pacific-induced wet signal. Thus, the modest U.S. drying that emerged in response to the full global SST conditions of 2007 (Figure 1, middle) appears to reflect the cancellation between two different SST influences: a wet ENSO

continued on page 5

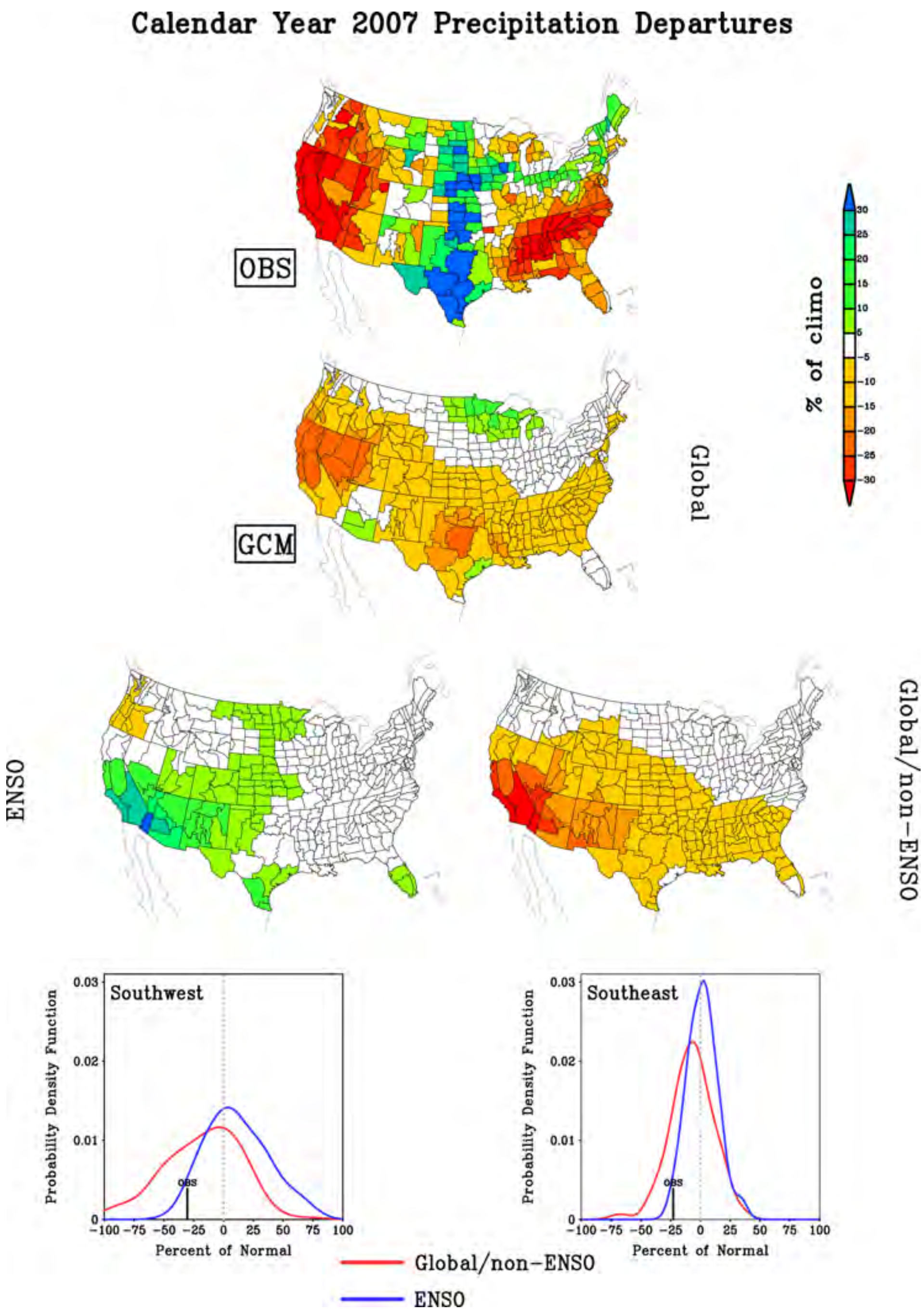


Figure 1. The U.S. 2007 annually averaged (January–December) precipitation departures expressed as a percent of the 1971-2000 climatologies for observations (top), for simulations based on global SST forcing (middle, contour interval half as for OBS), for simulations based on tropical east Pacific SST forcing (bottom left, same contour interval as for OBS), and for simulations based on global SST forcing excluding the tropical east Pacific (global/non-ENSO; bottom right, same contour interval as for OBS). The probability distribution functions of regional precipitation departures of the individual 150-member runs for the ENSO forced (blue curve) and global/non-ENSO forced regions (red curve) are shown for the Southwest U.S. (left) and the Southeast U.S. (right). Observed 2007 annual precipitation departures are shown by vertical gray bar.

Precipitation, continued

effect and a stronger drying effect due to non-ENSO SST conditions.

In other words, the models indicated that the conditions in the world oceans—but not in the central Pacific—swamped the ENSO signal in 2007. Those results are surprising because the scientific community generally has tended to associate El Niño events with a wet southwestern United States, but that is not what occurred.

What was the changed likelihood of U.S. dryness given ocean conditions of 2007?

To quantify the extent to which the observed U.S. precipitation extremes were statistically consistent with SST forcing during 2007, two probability density functions are compared (Figure 1, bottom), one drawn from the sampled population of runs forced by the ENSO-region 2007 SSTs only (blue curve), and the other drawn from the sample population of runs forced with global/non-ENSO region 2007 SSTs (red curve). Consistent with the spatial plots, a distinct shift toward increasingly dry probabilities under the influence of global/non-ENSO SSTs occurs over the southwestern and southeastern United States.

A simple ranking of all ENSO-forced runs reveals that only 3 percent and 2 percent of runs were as dry as observed over the Southwest and Southeast, respectively. By comparison, for the effect of global/non-ENSO SSTs, 22 percent and 15 percent of runs were as dry as observed over the Southwest and Southeast, respectively. There is thus an eight-fold increase in the probability that drying, with the severity observed over both the Southwest and Southeast during 2007, was due to the effect of global/non-ENSO region SSTs versus the effect of ENSO region forcing alone.

Summary

The diagnosis presented above provides some attribution of key features of the observed 2007 U.S. climate conditions. The text uses subjective language to interpret the likelihood that certain conditions were caused by certain forcings, but at this point that should be viewed as a qualitative, expert assessment.

Regarding the anomalously low precipitation within the U.S. Southwest and Southeast regions, this assessment suggests the following:

- The extreme low precipitation was inconsistent with east tropical Pacific SST variability during 2007, and thus was very unlikely caused by the ENSO cycle occurring during January–December 2007. The team estimated there is less than a 5 percent probability that the observed dryness was consistent with climate conditions driven from the tropical east Pacific in 2007.
- An SST-induced dry signal existed in 2007, spanning much of the southern U.S., and originated from SST conditions outside the tropical Pacific. This dry signal overwhelmed the ENSO wet signal; the team estimated a large increase in the probability of U.S. drying having intensities as large as observed in 2007 due to such a global SST influence.

**A full list of the Climate Attribution team members is available at http://www.cdc.noaa.gov/CSI/.*

This article originally appeared in the March issue of the Western Water Assessment's Intermountain West Climate Summary, and is reprinted here with permission. It is available online at: http://wwa.colorado.edu/products/forecasts_and_outlooks/intermountain_west_climate_summary/WWA_Mar_2008.pdf

Related Links

Visit the links listed below for more infomation on the CSI Team, their affiliates, and for information on climatological conditions discussed in the accompanying article.

NOAA Climate Attribution Team
http://www.cdc.noaa.gov/CSI/Team/

NOAA Earth System Research Lab
http://www.esrl.noaa.gov/

NOAA El Niño Page
http://www.elnino.noaa.gov/

NOAA La Niña Page
http://www.elnino.noaa.gov/lanina.html

NOAA Climate Prediction Center
http://www.cpc.ncep.noaa.gov/

NOAA El Niño Educational Sites
http://www.elnino.noaa.gov/edu.html

CLIMAS Glossary of Climate Terms
http://www.climas.arizona.edu/forecasts/glossary.html

The International Research Institute for Climate and Society (IRI) ENSO Forecast
http://iri.columbia.edu/climate/ENSO/currentinfo/figure3.html

USGS Information on El Niño
http://walrus.wr.usgs.gov/elnino/

Western Regional Climate Center
http://www.wrcc.dri.edu/

Temperature (through 4/17/08)

Source: High Plains Regional Climate Center

Temperatures in Arizona and New Mexico since the start of the water year on October 1 have had a distinct north-south gradient. The northern half of both states has averaged between 30 and 45 degrees Fahrenheit, with averages around 25 degrees F at the highest elevations in New Mexico (Figures 1a–b). The southern half of both states has been much warmer, between 45 and 55 degrees F in New Mexico and up to 65 in the southwest deserts of Arizona. These temperatures have continued to be within 2 degrees F of average across both states, just as they were last month. The few exceptions are in west-central Arizona, where temperatures have been 0–4 degrees F below average, and southeastern Arizona and southwestern New Mexico, at 3 to 5 degrees F above average. In the past thirty days, both states have seen warmer conditions; temperatures have been 0–2 degrees above average in most of New Mexico and 0–4 degrees above average in Arizona (Figures 1c–d). Some high elevation areas in New Mexico have had temperatures 0–2 degrees below average due to a few weak cold fronts passing through in the past several weeks. Most of these storm systems have remained north of Arizona. Earlier in the winter season the storms were moving across Arizona into Colorado, leaving eastern and southern New Mexico relatively warm and dry. More recently, the storms have swept southeast through Utah, missing Arizona and bringing cooler temperatures to northern and eastern New Mexico.

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/maps/current/

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

Figure 1a. Water year '07–'08 (through April 17, 2008) average temperature.

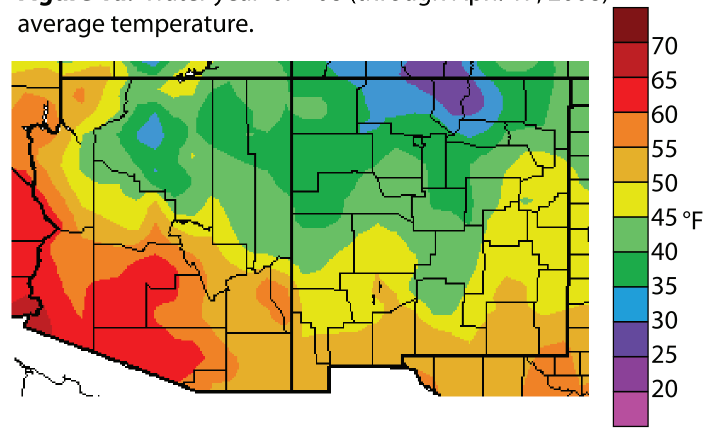


Figure 1b. Water year '07–'08 (through April 17, 2008) departure from average temperature.

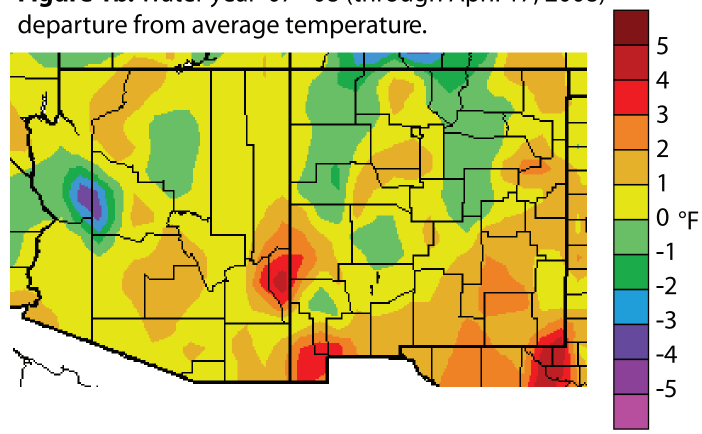


Figure 1c. Previous 30 days (March19–April 17, 2008) departure from average temperature (interpolated).

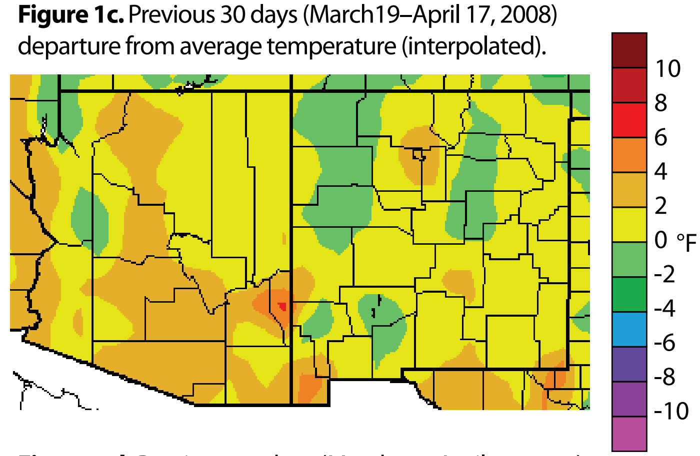
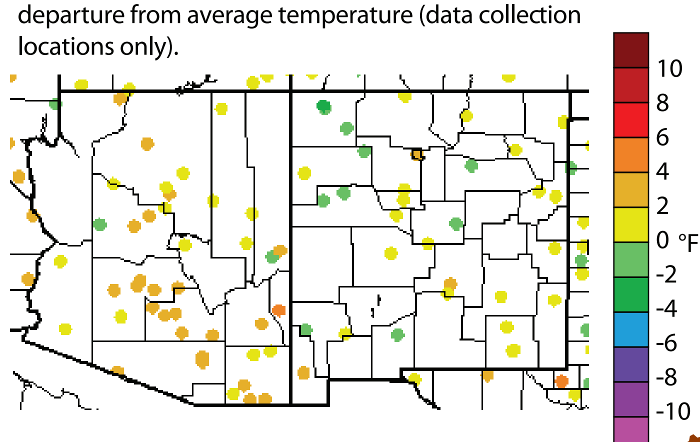


Figure 1d. Previous 30 days (March 19–April 17, 2008) departure from average temperature (data collection locations only).



Precipitation (through 4/17/08)

Source: High Plains Regional Climate Center

Precipitation for the water year has dropped significantly from last month, to 50 percent or less of average across the southeastern two-thirds of New Mexico and the southeastern corner of Arizona (Figures 2a–b). Few storms have moved through central, southern, or eastern New Mexico this winter, and only the highest elevations of northwestern New Mexico have received near- or above-average precipitation this year. Arizona has fared better, with most high elevation locations receiving near- or above-average precipitation. In both states, most of the precipitation fell before the middle of February. In the past thirty days, much of Arizona and the southwest half of New Mexico have received less than 5 percent of average precipitation (Figures 2c–d). Northeast New Mexico has been significantly wetter, and the highest elevations have received more than 200 percent of average precipitation from a couple of recent storm systems. March and early April have been among the driest periods on record for the southwestern United States. The wet conditions from October through February, followed by the exceptionally dry spring, are expected to enhance the fire season. Range conditions may deteriorate if the extreme dryness, coupled with above-average temperatures, continue until the start of the monsoon. This year the monsoon season in Arizona will officially begin June 15, although precipitation events may not begin that early.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2007, we are in the 2008 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/maps/current/

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 '07–'08 (through April 17, 2008) percent of average precipitation (interpolated).

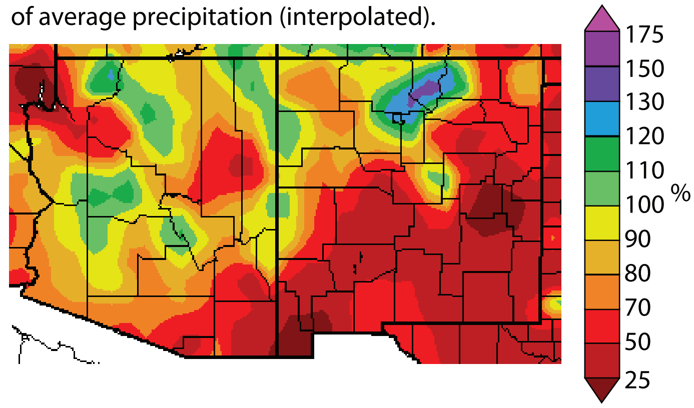


Figure 2b. Water year '07–'08 (through April 17, 2008) percent of average precipitation (data collection locations only).

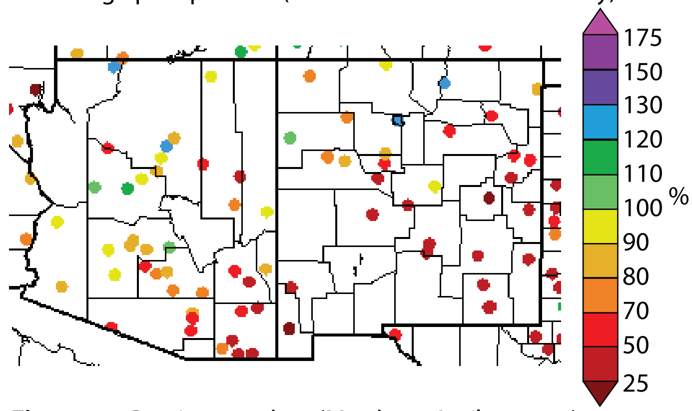


Figure 2c. Previous 30 days (March 19–April 17, 2008) percent of average precipitation (interpolated).

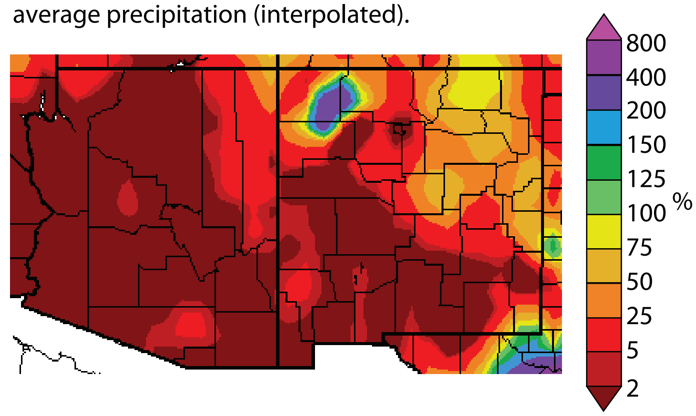
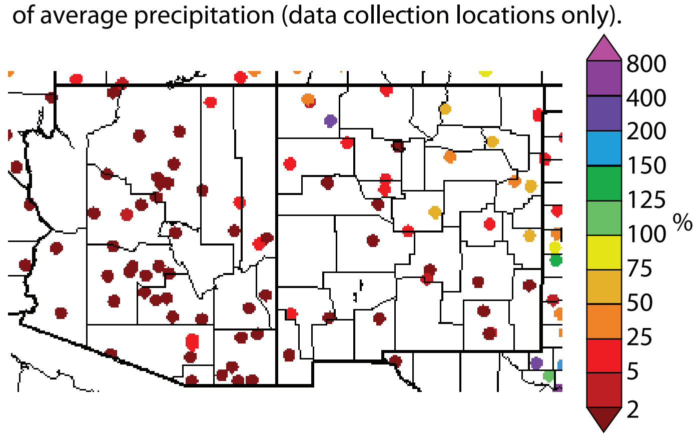


Figure 2d. Previous 30 days (March 19–April 17, 2008) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(released 4/17/08)

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

The weekly U.S. Drought Monitor map depicts increasing drought intensity across eastern and southern New Mexico, where typical dry La Niña conditions have occurred this winter (Figure 3). In particular, southeastern New Mexico entered severe drought status during the course of the last thirty days. Arizona drought status is largely unchanged since last month's report.

In water news, New Mexico's congressional delegation introduced the Eastern New Mexico Rural Water System Authorization Act, legislation authorizing the federal government to build a pipeline to carry water to communities in Curry and Roosevelt counties (cnjonline.com, April 3). The water would come from the Ute Reservoir, which was built on the Canadian River in 1959. The pipeline would serve a number of communities, including Grady, Clovis, Melrose, Texico, Portales, Elida, and Cannon Air Force Base.

The Albuquerque Bernalillo County Water Utility Authority has launched the voluntary Water by Numbers program to limit outdoor watering (*New Mexico Business Weekly*, March 28). The initiative's goal is to preserve groundwater aquifers.

Notes:

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

The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of the several agencies; the authors of this monitor are Jay Lawrimore and Liz Love-Brotak, NOAA/NESDIS/NCDC.

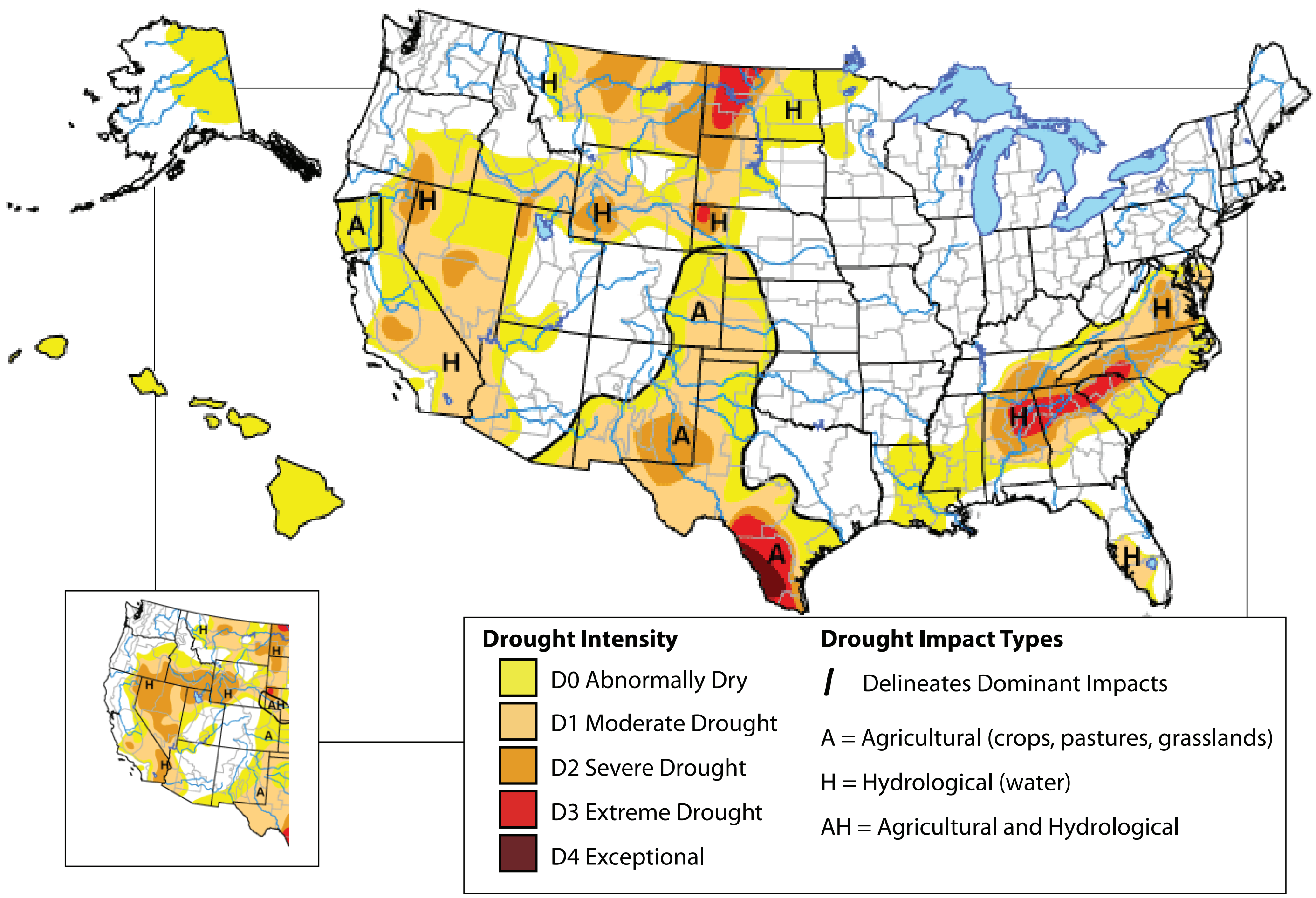


Figure 3. Drought Monitor released April 17, 2008 (full size), and March 20, 2008 (inset, lower left).

On the Web:

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

Arizona Drought Status

(through 2/29/08)

Source: Arizona Department of Water Resources

The recent trend of general improvement in short-term drought status continued through March (and is approaching near-statewide average conditions (Figure 4a). Twelve watersheds were designated as abnormally dry in the February 2008 drought status map, and only four of those watersheds continue to be designated as such in the March 2008 map. Storms in February diminished drought conditions in northern Arizona but had little to no impact in southeastern Arizona where the remaining watersheds designated as abnormally dry are clustered. According to the National Weather Service's climate report for Tucson, March 2008 was the forty-second driest and the twenty-forth warmest on record, with only 0.37 inches of precipitation (less than half of average); temperatures were 1.7 degrees above average.

Long-term drought status is assessed quarterly, and was last updated in January (Figure 4b). Long-term drought status remains unchanged from last month, and an updated long-term status will be provided in May.

Figure 4a. Arizona short-term drought status for March 2008.

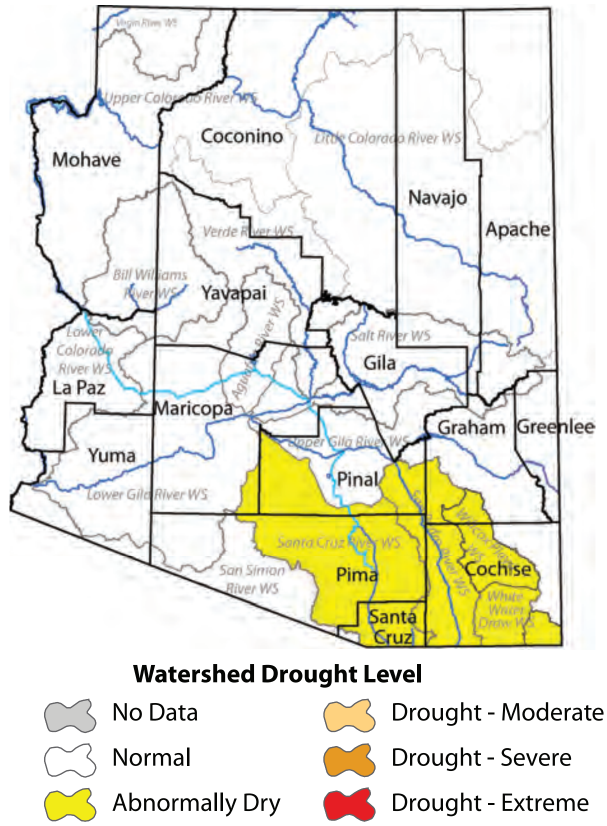
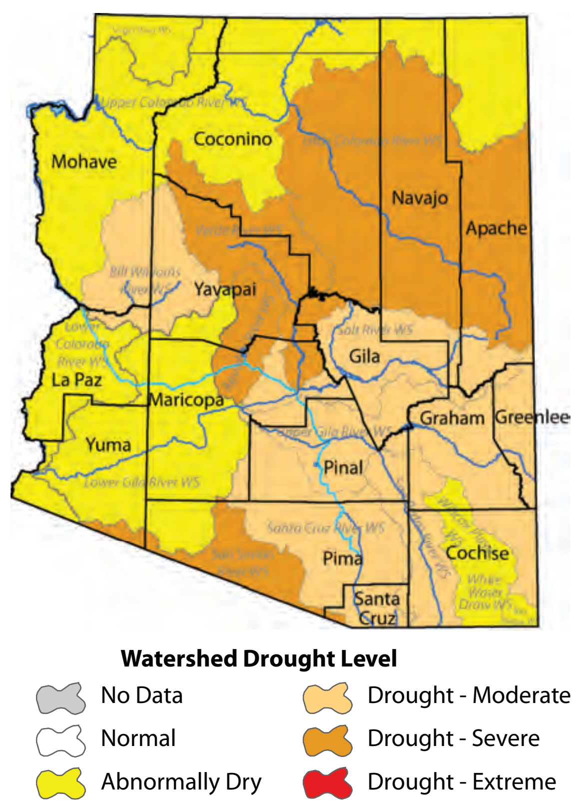


Figure 4b. Arizona long-term drought status for March 2008.



Notes:

The Arizona drought status maps are produced monthly by the Arizona Drought Preparedness Plan Monitoring Technical Committee. The maps are based on expert assessment of variables including, but not limited to, precipitation, drought indices, reservoir levels, and streamflow.

Figure 4a shows short-term or meteorological drought conditions. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) over a relatively short duration (e.g., months). Figure 4b refers to long-term drought, sometimes known as hydrological drought. Hydrological drought is associated with the effects of relatively long periods of precipitation shortfall (e.g., many months to years) on water supplies (i.e., streamflow, reservoir and lake levels, and groundwater). These maps are delineated by river basins (wavy gray lines) and counties (straight black lines).

On the Web:

For the most current Arizona drought status maps, visit:
http://www.azwater.gov/dwr/drought/DroughtStatus.html

New Mexico Drought Status
(released 4/17/08)

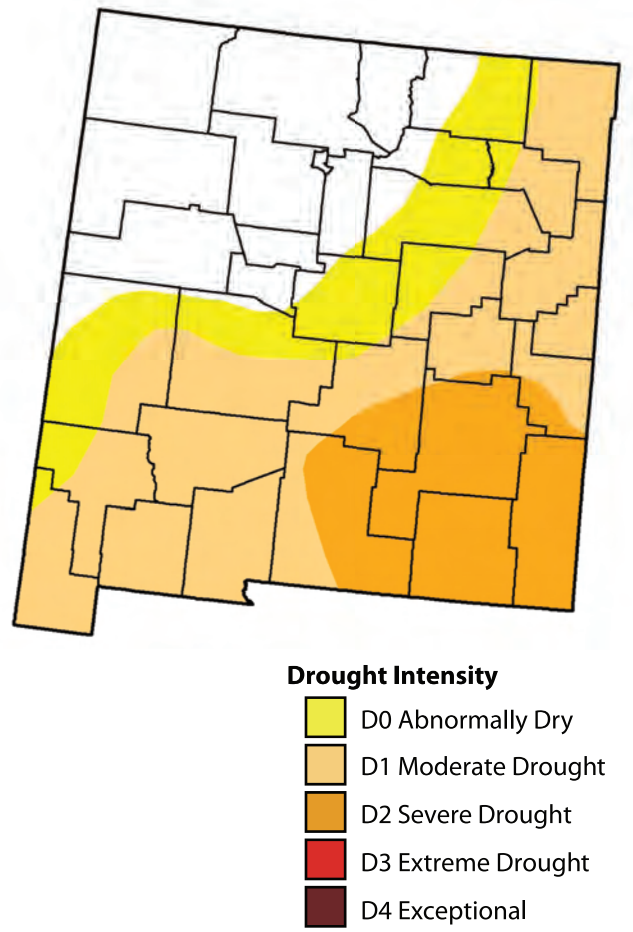
Source: New Mexico State Drought Monitoring Committee

Little or nor precipitation was reported across the northern two-thirds of New Mexico during March as the storm track that had brought abundant mountain snow to the northwestern part of the state this past winter shifted further north. The southern and eastern portions of the state have been unusually dry since mid-December. Likewise, during the first two weeks of April, many sites received no measurable amount or below-average precipitation.

The conditions are depicted in the most recent U.S. Drought Monitor, which shows drought conditions over the southeastern portion of the state from a line running roughly from Raton in the northeast to Reserve in the southwest (Figure 5). The severity of drought conditions increases to the south and east, with severe drought in the southeastern corner of the state.

Drought conditions appear to be impacting agriculture. The U.S. Department of Agriculture National Agricultural Statistic Service (*Weekly Ag Update*, Issue 58-15) reported that 86 percent of dry land winter wheat and 63 percent of rangeland was in very poor to poor condition. The report also notes that 86 percent of the state is in the short to very short soil moisture category. These levels indicate a significant lack of soil moisture necessary to support the normal development of agricultural crops. Other drought impacts include restrictions imposed by the state on fireworks, smoking, campfire, and open fires for the twenty-three counties east of Interstate 25; stage I fire restrictions in the Mountainair Ranger District; and stage II fire restrictions on Bureau of Land Management land near Fort Stanton and Lincoln in Lincoln County (*New Mexico Drought Status Report,* April 2008).

Figure 5. New Mexico drought map based on data through April 15.



Notes:
The New Mexico section of the U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The 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.

On the Web:
For the most current drought status map, visit:
http://www.drought.unl.edu/dm/DM_state.htm?NM,W

For the most current Drought Status Reports, visit:
http://www.nmdrought.state.nm.us/MonitoringWorkGroup/wk-monitoring.html

Arizona Reservoir Levels
(through 3/31/08)

Source: National Water and Climate Center

Storage continued to increase in reservoirs within Arizona's borders (Figure 6). Storage in the Salt River reservoirs increased by more than 139,000 acre-feet during the last month; current levels are more than 30 percent above average. Storage in Lakes Mead and Powell decreased during March; combined storage in these large reservoirs is still less than 50 percent of capacity. Lake Powell elevation is now at its seasonal low and is expected to increase during the spring snowmelt runoff season.

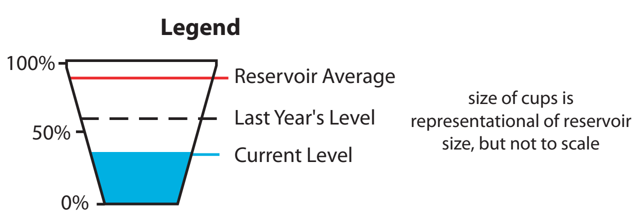
In water-related news, federal water managers will examine aging earthen embankments that carry water to farmers following the flooding failure of a century-old irrigation canal in northern Nevada, (Associated Press, April 7). The Bureau of Reclamation will focus initially on canals in urbanized areas, including a small section of the Salt River Project canal. Officials estimate that most of the earthen canals in Arizona are in good condition.

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. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). On average, 1 acre-foot of water is enough to meet the demands of 4 people for a year. The last column of the table list an increase or decrease in storage since last month. A line indicates no change.

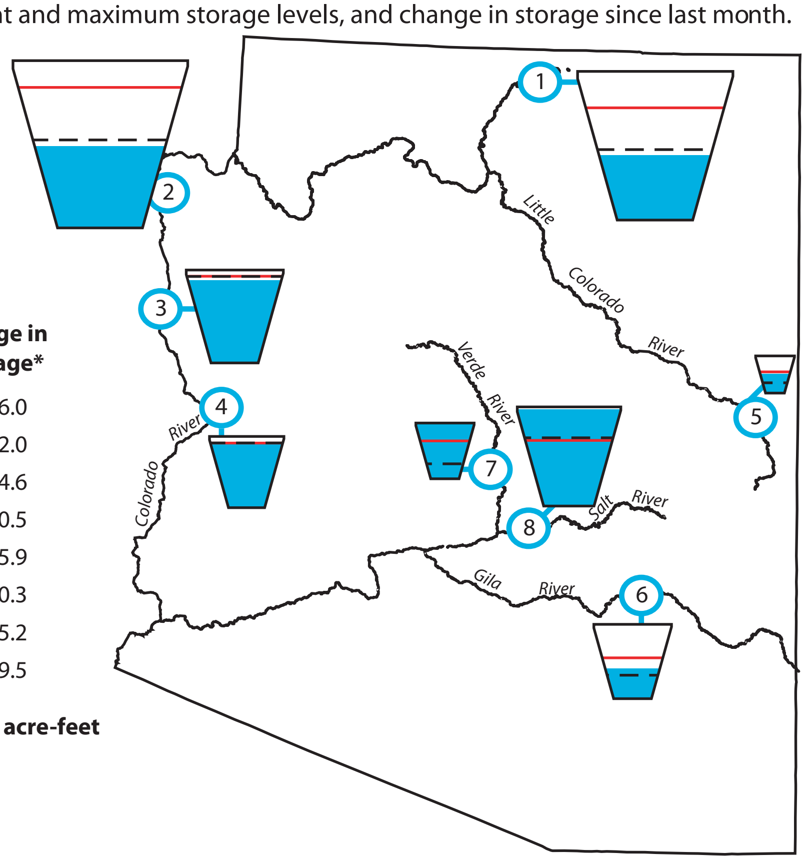
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Larry Martinez, NRCS, Larry.Martinez@az.usda.gov.

Figure 6. Arizona reservoir levels for March 2008 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir. The table also lists current and maximum storage levels, and change in storage since last month.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Lake Powell	44%	10,784.0	24,322.0	-96.0
2. Lake Mead	49%	12,940.0	26,159.0	-122.0
3. Lake Mohave	89%	1,617.8	1,810.0	24.6
4. Lake Havasu	89%	551.3	619.0	0.5
5. Lyman Reservoir	52%	15.6	30.0	5.9
6. San Carlos	41%	361.9	875.0	-0.3
7. Verde River System	100%	286.6	287.4	5.2
8. Salt River System	97%	1,972.3	2,025.8	139.5

*** 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 3/31/08)

Source: National Water and Climate Center

New Mexico statewide reservoir storage decreased since last month, with Navajo Reservoir recording the greatest total decrease (Figure 7). Since last year, storage has declined by more than 400,000 acre-feet for the reservoirs included in this report. Storage has increased since last month at Brantley, Heron, and Elephant Butte reservoirs.

In water-related news, projections for runoff in the Canadian River and tributary basins decreased due to dry March and April "snoweater" winds (*Quay County Sun*, April 9). The loss of snowpack and declines in Conchas Lake storage could mean decreased allocations to members of the Arch Hurley Conservancy District, compared with last year's 7.5-inch allocations.

Also, farmers in the Elephant Butte Irrigation District will be getting a 12 acre-inch allotment increase, bringing the total allotment for this year to 2.5 acre-feet (Associated Press, April 10).

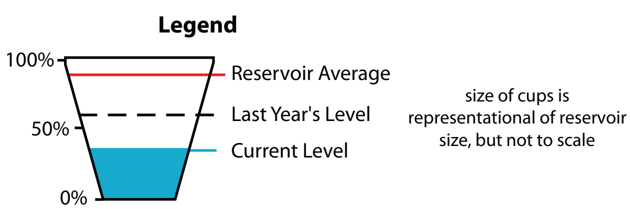
Notes:

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. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). On average, 1 acre-foot of water is enough to meet the demands of 4 people for a year. The last column of the table list an increase or decrease in storage since last month. A line indicates no change.

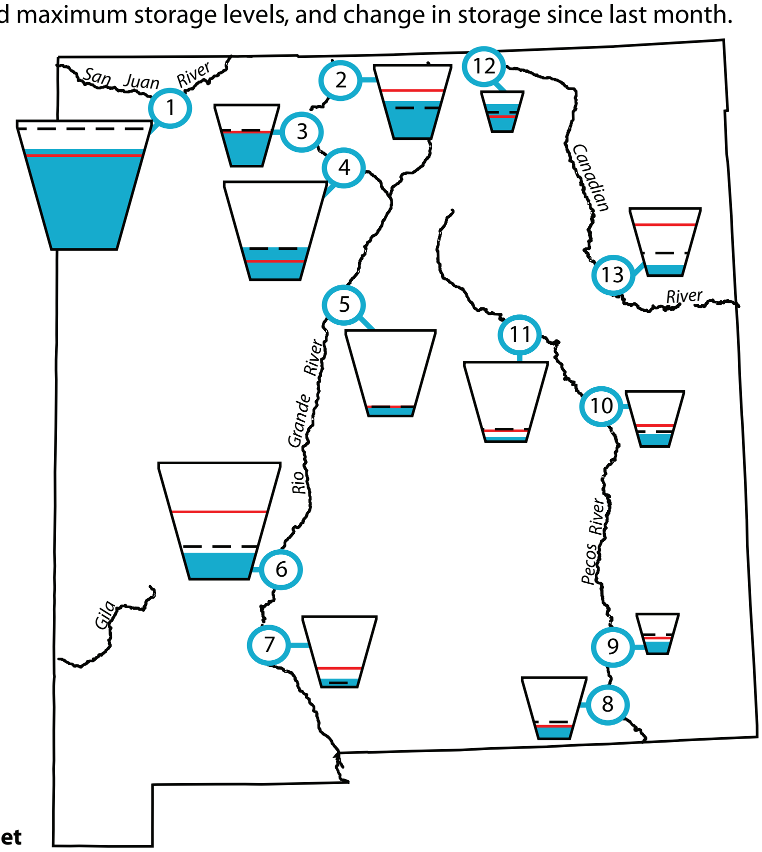
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Larry Martinez, NRCS, Larry.Martinez@az.usda.gov.

Figure 7. New Mexico reservoir levels for March 2008 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir. The table also lists current and maximum storage levels, and change in storage since last month.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Navajo	78%	1,320.7	1,696.0	-60.4
2. Heron	51%	203.5	400.0	7.4
3. El Vado	53%	104.2	195.0	-32.7
4. Abiquiu	33%	183.8	554.5	0
5. Cochiti	10%	50.8	491.0	0.2
6. Elephant Butte	23%	495.0	2,195.0	12.8
7. Caballo	11%	37.4	332.0	-2.0
8. Brantley	22%	33.1	147.5	16.6
9. Lake Avalon	30%	1.2	4.0	-1.6
10. Sumner	22%	22.6	102.0	-5.4
11. Santa Rosa	6%	26.5	438.3	-24.3
12. Costilla	69%	11.1	16.0	0.8
13. Conchas	16%	40.7	254.2	-0.6

*** thousands of acre-feet**



On the Web:

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

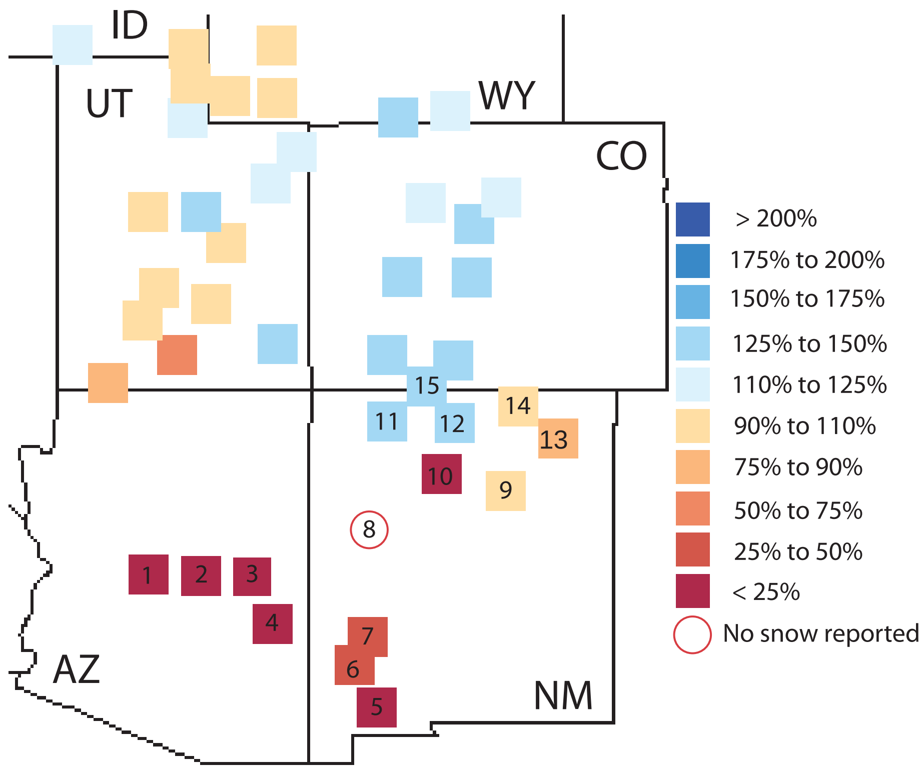
Southwest Snowpack

(updated 4/18/08)

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

Percent-of-average snowpack observations in Arizona and New Mexico are slightly to significantly lower than those reported last month. Snow Water Content (SWC) observations in northern New Mexico have persisted at near-average values except for a noticeable reduction at the site in the Jemez river basin (Figure 8). Cold temperatures in the San Juan and Sangre de Cristo mountain ranges have kept the snowpack in place longer than usual (*New Mexican*, April 4). At the Jemez river basin site, however, SWC has been reduced from near 100 percent of average on March 20 to less than 10 percent on April 18. SWC values in the Gila and Zuni/Bluewater river basins in southwest New Mexico have decreased from 60 percent of average last month to 20 percent this month. SWC in Arizona was less than 10 percent of average as of April 18; on March 20, SWC in the state was 80 to 140 percent of average. Most of the snow has melted on the Verde watershed (*Arizona Republic*, March 29).

Figure 8. Average snow water content (SWC) in percent of average for available monitoring sites as of April 18, 2008.



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

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

Notes:

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

Figure 8 shows the SWC for selected river basins, based on SNOTEL sites in or near the basins, compared to the 1971–2000 average values. The number of SNOTEL sites varies by basin. Basins with more than one site are represented as an average of the sites. Individual sites do not always report data due to lack of snow or instrument error.

On the Web:

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

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

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

Temperature Outlook

(May–October 2008)

Source: NOAA Climate Prediction Center (CPC)

Forecasts for the Southwest are predicting increased chances of above-average temperatures for most of the region through October 2008 (Figures 9a–d). The chance of above-average temperatures through all of Arizona and much of western New Mexico exceeds 50 percent relative to average or below-average temperatures through September. The outlook shows a reduced chance of above-average temperatures for eastern New Mexico through August, but a return to above-average temperatures in late summer (Figures 9b–d). These forecasts are based primarily on the expectation that long-term trends in above-average temperatures will persist through the late spring and through the summer.

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 May–July 2008.

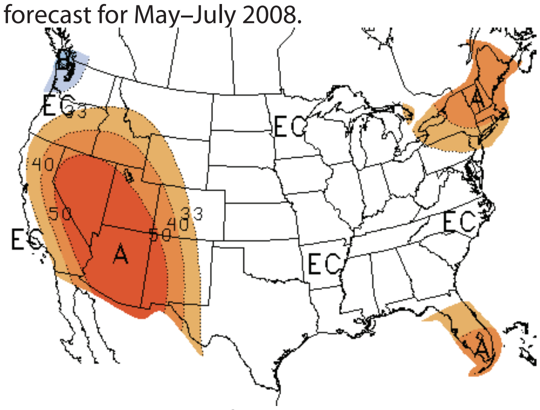


Figure 9b. Long-lead national temperature forecast for June–August 2008.

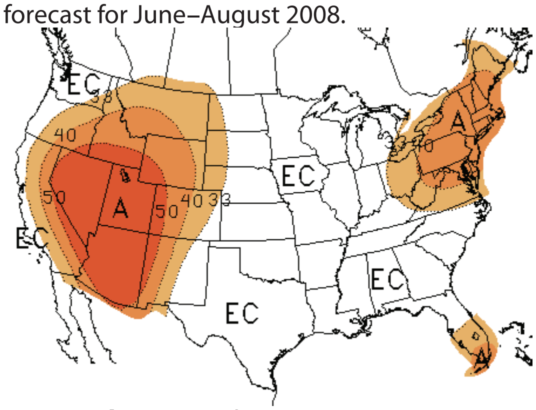


Figure 9c. Long-lead national temperature forecast for July–September 2008.

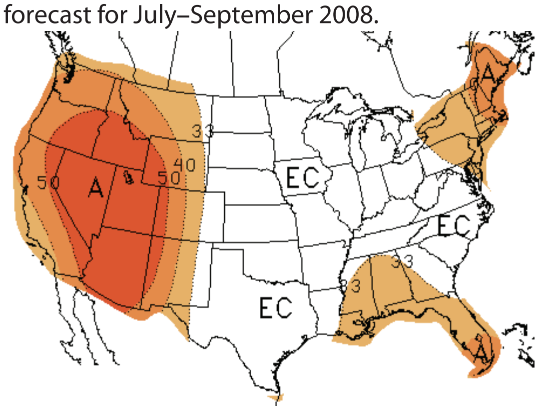
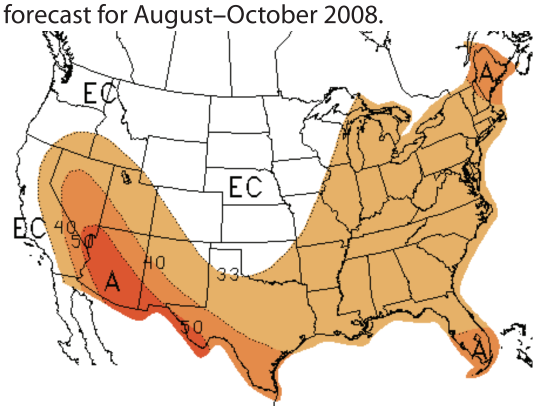


Figure 9d. Long-lead national temperature forecast for August–October 2008.



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

B= Below: 40.0–49.9%, 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

On the Web:

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

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

Precipitation Outlook
(May–October 2008)
Source: NOAA Climate Prediction Center (CPC)

The precipitation outlook through July 2008 indicates an enhanced probability of below-average precipitation over much of the western United States, and over the southern and central Rio Grande Valley (Figure 10a). These forecasts are based on historical connections between precipitation patterns across the West and weak to moderate La Niña events. The present strong La Niña event is expected to weaken through the spring, but it may continue to impact precipitation patterns, as reflected in the forecasts. The chances of below-average precipitation are increased for the Pacific Northwest through October 2008 (Figures 10b–d). Elsewhere, including most of Arizona and New Mexico, the forecast calls for equal chances (EC) of above-, near-, and below-average precipitation through October 2008.

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 May–July 2008.

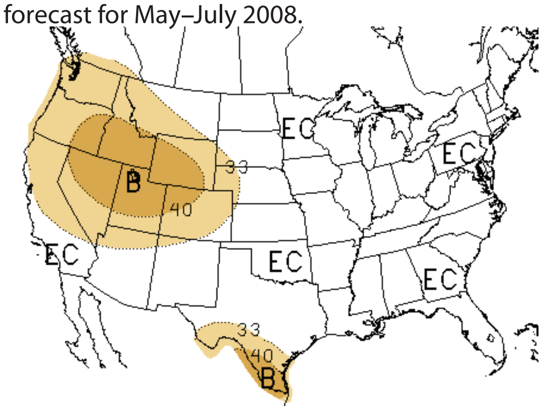


Figure 10b. Long-lead national precipitation forecast for June–August 2008.

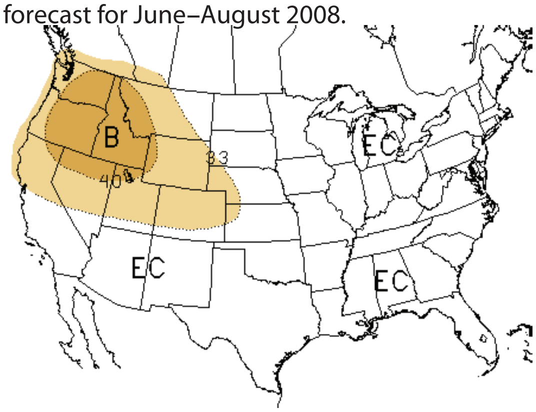


Figure 10c. Long-lead national precipitation forecast for July–September 2008.

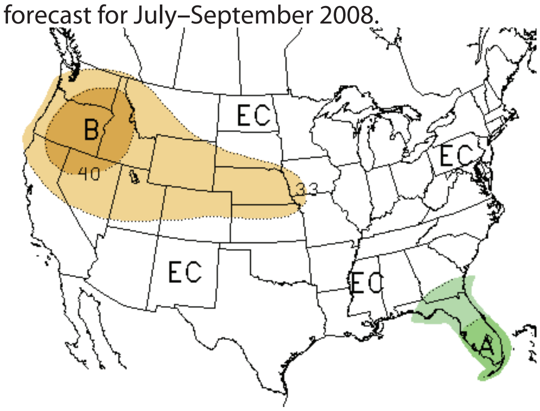
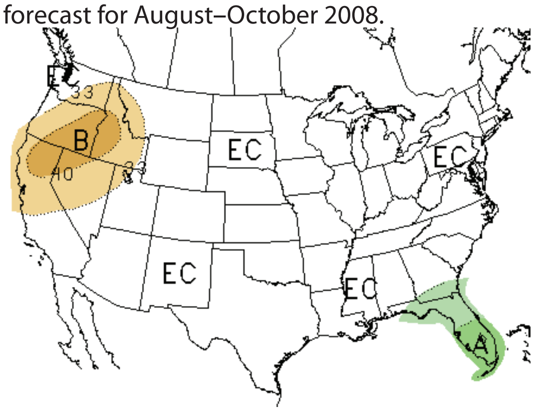


Figure 10d. Long-lead national precipitation forecast for August–October 2008.



B= Below: 33.3–39.9%; 40.0–49.9%

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/

Seasonal Drought Outlook
(through July 2008)

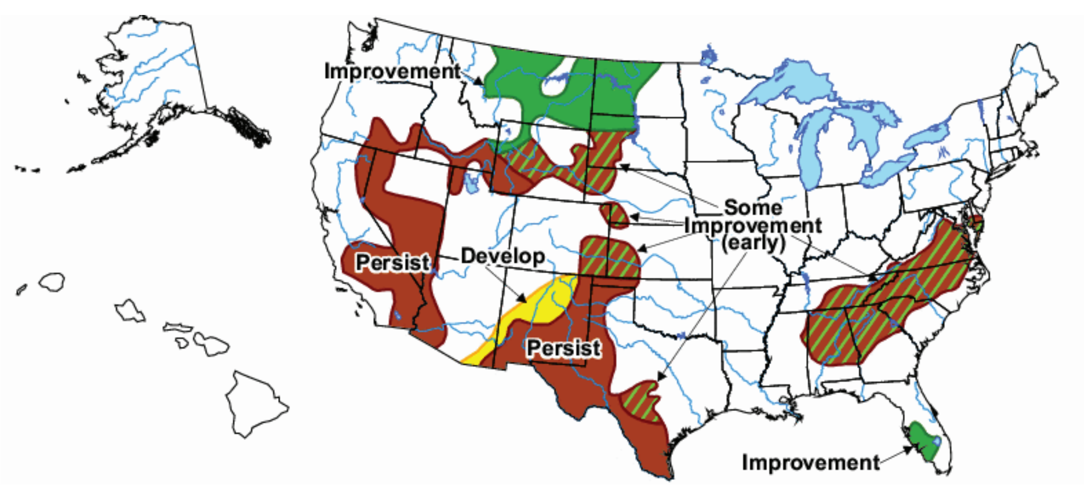
Source: NOAA Climate Prediction Center (CPC)

Drought conditions are expected to improve across much of the Southeast U.S., while much of the Southwest and southern California will see persistent and expanding drought, according to the latest NOAA Seasonal Drought Outlook (Figure 11). Lingering La Niña impacts (below-average springtime precipitation) are expected to cause drought to expand across northern New Mexico and parts of southeast Arizona. Drought conditions have deepened this past winter across much of New Mexico because of a persistent winter storm track that just missed the state over the past several months. This includes southeast Arizona, which has also experienced below-average winter precipitation. Significant improvements are expected across the northern Rockies due to recent above-average precipitation.

In drought-related news, a fireworks ban in El Paso County in Texas may go into effect in preparation for Cinco de Mayo celebrations early next month (*El Paso Times*, April 21). Deepening drought conditions have pushed the county's drought index to 521. The ban will go into effect when and if the index reaches 575 in coming weeks.

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 July 2008 (released April 17, 2008).



Drought to persist or intensify

Drought ongoing, some improvements

Drought likely to improve, impacts ease

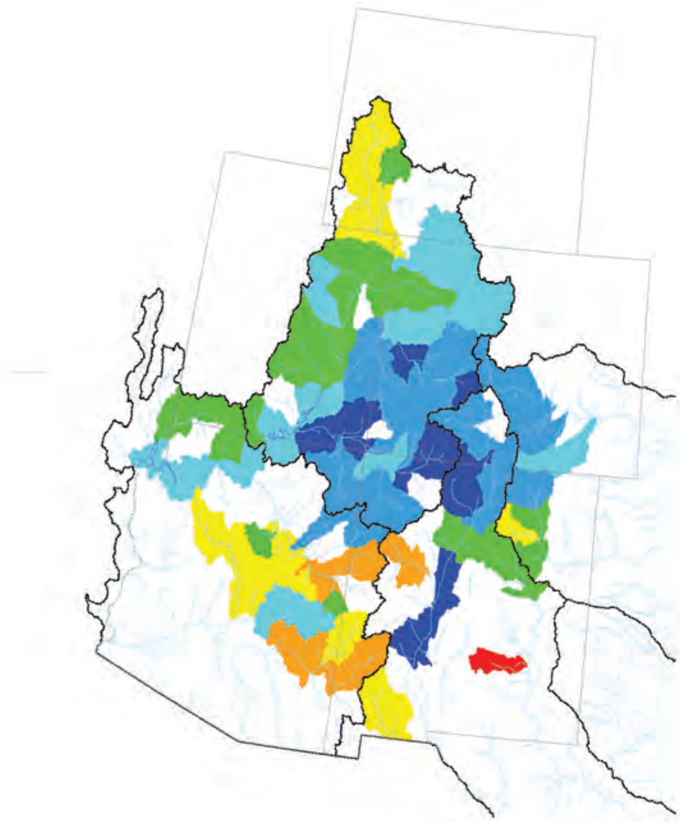
Drought development likely

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

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

Streamflow forecasts for most of Utah, western Colorado, and northern Arizona and New Mexico remain near-average to above-average for this time of year (Figure 12). Forecasted runoff this spring should raise Lake Powell by as much as fifty feet (*Arizona Republic*, March 29). Changes in streamflow forecasts for the Verde and Gila basins, however, were reduced significantly for this month compared to last. Most of the snow in the Verde watershed had melted by the end of March. Forecasts for the Salt River remain above-average. Roosevelt Lake had risen above 95 percent of capacity in late March, 6 inches above the peak set in 2005 and just 3 feet below the full mark.

Figure 12. Spring and summer streamflow forecast as of April 1, 2008 (percent of average).



- much above average (151–180)
- above average (130-150)
- slightly above average (110-129)
- near average (90-109)
- slightly below average (70-89)
- below average (50-69)
- much below average (<50)
- no forecast

Notes:
The forecast information provided in Figure 12 is updated monthly by the National Water and Climate Center, part of the U.S. Department of Agriculture's Natural Resources Conservation Service. Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences, such as reservoirs and diversions. The USDA-NRCS only produces streamflow forecasts for Arizona between January and April, and for New Mexico between January and May.

The NWCC provides a range of forecasts expressed in terms of percent of average streamflow for various statistical exceedance levels. The streamflow forecast presented here is for the 50 percent exceedance level, and is referred to as the most probable streamflow. This means there is at least a 50 percent chance that streamflow will occur at the percent of average shown in Figure 12.

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

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

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

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

According to the Southwest Coordination Center (SWCC), above-normal significant fire potential is expected across eastern and southern New Mexico and southeastern Arizona (Figure 13a). Normal significant fire potential is expected elsewhere in our region. Above-normal potential is predicted to gradually expand westward into most of central and western Arizona. This outlook is based primarily on typically declining precipitation and windy conditions during the spring, as well as climate outlooks calling for above-average temperatures. Experts expect these conditions to persist until the arrival of seasonal moisture that will begin in the southeast and expand west-northwest beginning in June.

National Fire Danger Rating status from the Wildland Fire Assessment System (not shown) depicts high to extreme fire danger across the southern fifth of Arizona and New Mexico. Large fuel moisture is less than 10 percent across the southern two-thirds of our region (Figure 13b). In contrast, dead large fuel moisture across northeastern Arizona and the northern third of New Mexico was greater than 30 percent. For trees, fuel moisture is like relative humidity.

In its April outlook, the SWCC cautions that "fire managers should continue to be on alert for more sustained drying and more frequent and significant wind events during the month."

Figure 13a. National wildland fire potential for fires greater than 100 acres (valid April 1–30, 2008).

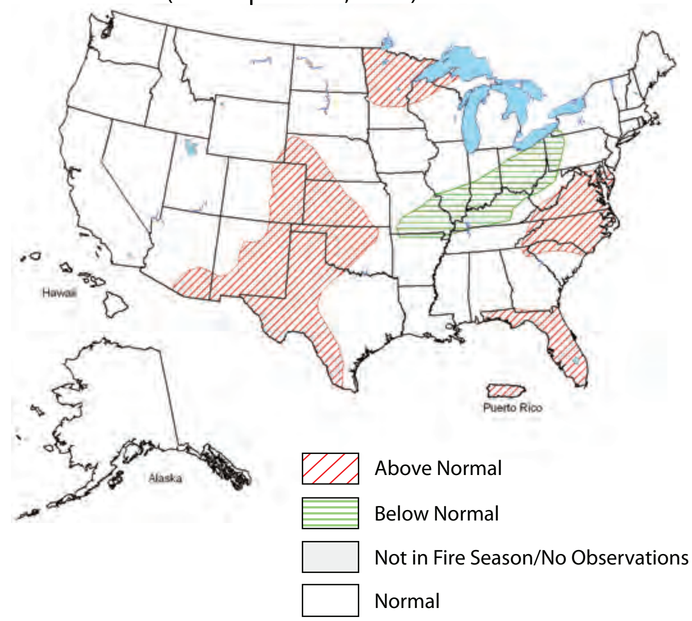


Figure 13b. Current fine fuel condition and live fuel moisture status in the Southwest.

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

Live Fuel Moisture	
	Percent of Average
Arizona	
Douglas Fir	101
Juniper	n/a
Piñon	n/a
Ponderosa Pine	101
Sagebrush	n/a
New Mexico	
Douglas Fir	n/a
Juniper	80
Piñon	93
Ponderosa Pine	94
Sagebrush	115
1,000-hour dead fuel moisture — AZ	**20**
1,000-hour dead fuel moisture — NM	**9**
Average 1,000-hour fuel moisture for this time of year	**13–18**

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces monthly wildland fire outlooks. The forecasts (Figure 13a) 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 13b 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 Coordination Center web page:
http://gacc.nifc.gov/swcc/predictive/outlooks/monthly/swa_monthly.htm

El Niño Status and Forecast

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

The 2007–2008 La Niña event is starting to loosen its grip on the equatorial Pacific. The International Research Institute for Climate and Society (IRI) reports that La Niña conditions (below-average sea surface temperatures across the equatorial Pacific Ocean) appeared to have peaked in February 2008 and have been declining over the past several weeks. Signs of the weakening include warming sea surface temperatures (SSTs) in the eastern and central Pacific Ocean and an increasing Southern Oscillation Index (SOI). The SOI peaked in February at 2.7 and fell to 1.9 in March, indicating a weakening connection between atmospheric circulation patterns and the current La Niña event (Figure 14a). The Climate Prediction Center (NOAA-CPC) notes that low-level easterly winds remain strong, which may help La Niña conditions hang on for the next several months.

IRI reports that most El Nino-Southern Oscillation (ENSO) forecast models predict a continued weakening of La Niña conditions through the spring into the summer season (Figure 14b). Most of the models predict a return to ENSO-neutral conditions by late summer 2008. The probability of La Niña conditions continuing through the present April–June season remain high, but fall quickly in subsequent seasons. The probability of ENSO-neutral conditions returning rises to 55 percent by July–September, while the chance of La Niña conditions continuing falls to less than 30 percent. ENSO-related impacts on precipitation and temperature are weak in the late spring and summer across the Southwest, leaving forecasters little to work with in preparing summer precipitation forecasts across the region (see Figures 10a–d).

Notes:

Figure 14a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through March 2008. 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 14b shows the International Research Institute for Climate and Society (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 14a. The standardized values of the Southern Oscillation Index from January 1980–March 2008. 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).

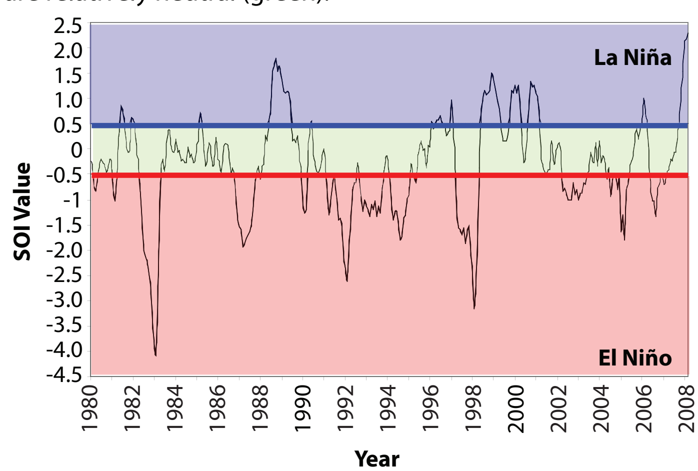
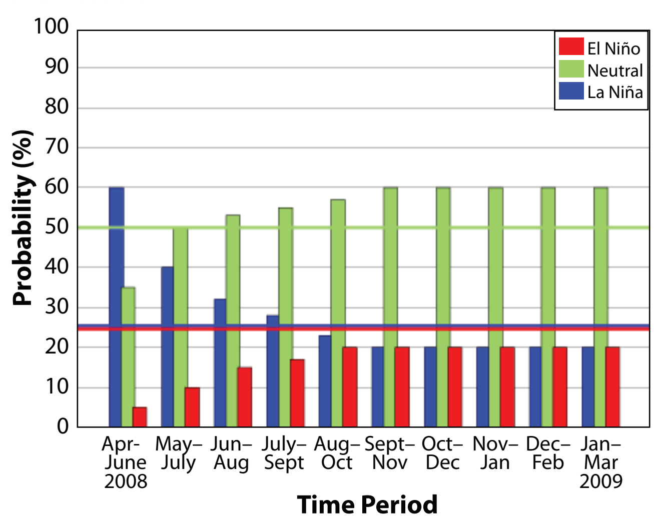


Figure 14b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released April 17, 2008). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



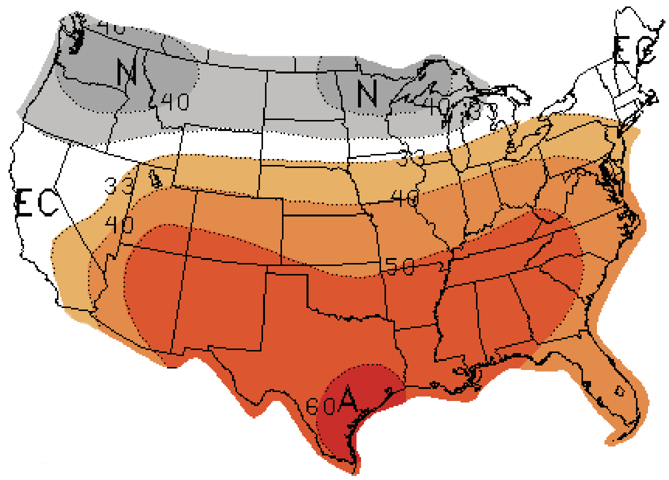
Temperature Verification

(January–March 2008)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC seasonal temperature outlook for January–March 2008 predicted increased chances of above-average temperatures for most of the United States, including probabilities of above-average temperature (greater than 50 percent) throughout the Southwest (Figure 15a). The overall pattern of temperatures from January through March showed slightly cooler to near-average temperatures through most of the Pacific Northwest and Rocky Mountain West and warmer-than-average temperatures from Texas across much of the South and up through the East Coast (Figure 15b). Temperatures generally were slightly cooler than average in Arizona and slightly cooler to slightly above average in New Mexico, in contrast to the temperature outlook. A persistent trough in the mid-latitude jet stream brought unsettled and cool weather to the Southwest through the winter. Seasonal forecasts had expected conditions more typical of La Nina events, such as a dominant ridge of high pressure across the Southwest and accompanying warm and dry conditions.

Figure 15a. Long-lead U.S. temperature forecast for January–March 2008 (issued December 2007).

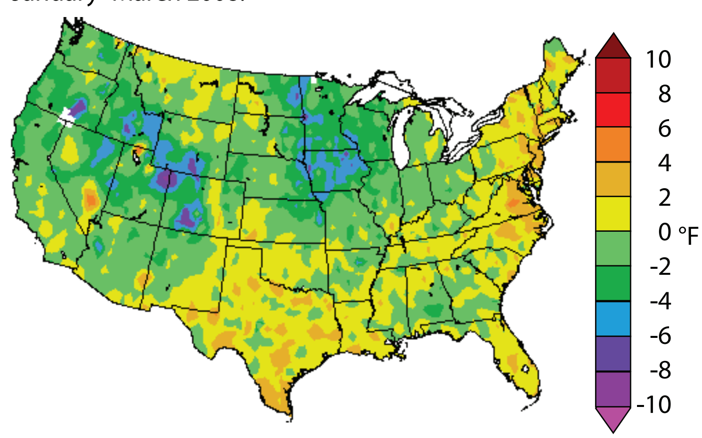


N= Near Normal
- 40.0–49.9%
- 33.3–39.9%

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

EC= Equal chances. No forecasted anomalies.

Figure 15b. Average temperature departure (in degrees F) for January–March 2008.



Notes:

Figure 15a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months January–March 2008. This forecast was made in December 2007.

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

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

Figure 15b shows the observed departure of temperature (degrees F) from the average for the January–March 2008. period. Care should be exercised when comparing the forecast (probability) map with the observed temperature maps. The temperature departures do not represent probability classes as in the forecast maps, so they are not strictly comparable. They do provide us with some idea of how well the forecast performed. In all of the figures on this page, the term average refers to the 1971–2000 average. This practice is standard in the field of climatology.

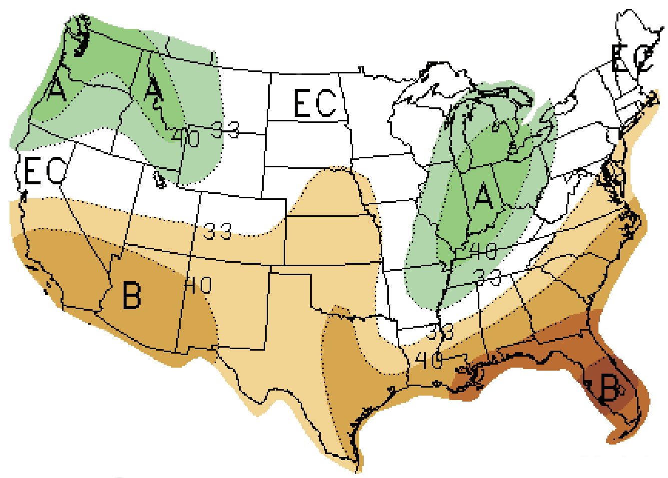
On the Web:

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

Precipitation Verification
(January–March 2008)
Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC seasonal precipitation outlook for January–March 2008 predicted increased probabilities of below-average precipitation in the Southwest, central and southern California, the central and southern Great Plains, and throughout most of the South (Figure 16a). The outlook also predicted increased probabilities of above-average precipitation for the Pacific Northwest. Observations revealed mostly below-average precipitation throughout most of the West, including the Pacific Northwest (Figure 16b). Much of Arizona and New Mexico received precipitation that was far below normal, with the exception for the Four Corners region, which received 100–150 percent of normal precipitation. Overall, the observed precipitation pattern in the Southwest was more typical of La Niña conditions. The high country around the Four Corners received significant precipitation from several storms that passed through in each of the three months represented. These storms came as the result of a persistent storm track that lasted through much of the winter. In contrast to the seasonal precipitation forecasts, this persistent jet stream pattern also left parts of the Northwest and northern Great Plains with below-average precipitation. Seasonal forecasts did capture the pattern of above-average precipitation observed across the Ohio Valley that is common during La Niña events.

Figure 16a. Long-lead U.S. precipitation forecast for January–March 2008 (issued December 2007).



A= Above
- 40.0–49.9%
- 33.3–39.9%

B= Below
- 60.0–69.9%
- 50.0–59.9%
- 40.0–49.9%
- 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

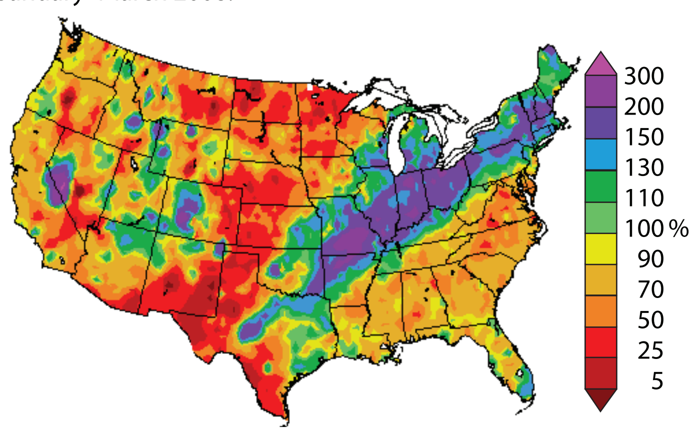
Notes:
Figure 16a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months January–March 2008.. This forecast was made in December 2007.

The outlook predicts the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps do not refer to inches of precipitation. Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average precipitation. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation. Equal Chances (EC) indicates areas where reliability (i.e., the skill) of the forecast is poor and no prediction is offered.

Figure 16b shows the observed percent of average precipitation for January–March 2008.. Care should be exercised when comparing the forecast (probability) map with the observed precipitation maps. The observed precipitation amounts do not represent probability classes as in the forecast maps, so they are not strictly comparable, but they do provide us with some idea of how well the forecast performed.

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

Figure 16b. Percent of average precipitation observed from January–March 2008.



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