Issued: May 20, 2008

Southwest Climate Outlook

THE UNIVERSITY OF ARIZONA.

Source: *John J. Capuano III*

Photo Description: There was still snow visable in the mountains just south of Flagstaff, Arizona as of May 14 when this photo was taken near Mormon Lake at an elevation of 7500 feet.

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

In this issue...

Snowpack

page 13

Snow Water Content (SWC) observations relevant to Arizona and New Mexico water resources are now limited to northern New Mexico, Utah, Colorado, and Wyoming. All other stations in both states are no longer reporting measurable snowpack...

Fire Outlook

page 19

The southern half of Arizona and much of New Mexico are expected to see above-average significant fire potential over the next month due to a combination of high loads of fine fuels and a transition to drier spring conditions...

Verification

page 22

The NOAA-CPC seasonal precipitation outlook for February 2007–April 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...

CLIMAS

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

May Climate Summary

Drought – Short-term drought conditions remain normal for much of Arizona. However, in the southeast, conditions remain abnormally dry and conditions in the central section of Cochise County have degraded to moderate drought levels. Most of New Mexico continues to experience elevated drought conditions.

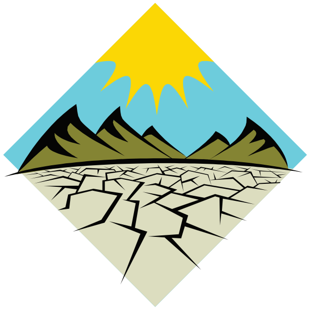
Temperature – this month Arizona and New Mexico temperatures generally hovered within 2 degree F of average. In Arizona, the southeast region has experienced temperatures slightly above average, while the northeastern section has seen below-average temperatures. In New Mexico, the higher elevations in the Northwest have experienced lower temperatures; the eastern half has seen slightly higher temperatures.

Precipitation – For the past thirty days, virtually all of Arizona and New Mexico have received below-average precipitation. Precipitation for large swaths of area in Arizona and western New Mexico has been less than 5 percent of average. The San Francisco Peaks area in Arizona is one of only a few locations that received more than the average precipitation. The low precipitation during the last thirty days does little to change the drought status due to abundant winter precipitation in parts of the state.

Climate forecasts – Seasonal climate forecasts suggest an enhanced probability that Arizona and New Mexico will experience above-average temperatures through the summer and fall. The forecast for precipitation is more ambiguous, with equal chances that the Southwest will experience above- or below-average precipitation.

The Bottom Line – Typical La Niña conditions were reflected in Arizona and New Mexico last month when the region saw far below-average precipitation. Although forecasts call for an equal chance of above-, near-, or below-average precipitation for the ensuing months in the Southwest, models suggest temperatures will be above average. With hotter temperatures and abundant dry fuels, expect a higher potential for fires.

Pacific Decadal Oscillation and La Niña



NASA's Jet Propulsion Laboratory (JPL) at the California Institute of Technology in Pasadena announced in late April that the La Niña that has persisted through most of the last year has begun to weaken, but that the longer-duration Pacific Decadal Oscillation (PDO) has shifted into its negative, or cooler, phase. The PDO is a long-term El Niño-like pattern of North Pacific climate variability. Unlike the El Niño Southern Oscillation pattern, the PDO phases tend to persist for twenty to thirty years. The negative (cool) phase tends to enhance La Niña and dampen El Niño conditions. For the Southwest, the cool phase of the PDO confirmed by JPL may mean drier-than-normal winters, on average, for the next decade or two. The last cool phase of the PDO persisted from 1947 to 1976, which coincides with the historic 1950s drought in the Southwest.

For more info visit:
http://www.jpl.nasa.gov/news/news.cfm?release=2008-066

Table of Contents:

SWCO Staff:

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Anticipating summer heat

A look at the impacts and extreme temperatures in the Southwest

By Zack Guido

Our bodies are like car engines. We produce heat as we move. As long as we dissipate that heat as fast at it accumulates, all runs well. But when the internal heat builds, our cars end up on medians with steaming radiators and our bodies and minds break down.

When the mercury shoots up during summers in the Southwest, prolonged exposure to the heat can be deadly. With temperatures already hitting 90-plus degrees Fahrenheit in some areas and warmer-than-average temperatures forecast for summer, officials from the National Weather Service (NWS) are reminding people to hydrate and heed heat safety guidelines and advisories.

"People in the Southwest know that summers will be hot, but some days are unusually hot. And while other forms of dangerous weather are visual, like thunderstorms and hurricanes, extreme heat is not," said Tony Haffer, a NWS meteorologist in Phoenix. "On these days, people should not maintain business-as-usual routines. They should take it easier."

An invisible threat

There is no simple formula to determine how long to remain in the heat because each person is different. An individual's susceptibility to heat is determined in part by activity, fitness, clothes, and awareness. Regardless of whether an individual is at football practice in August or walking in downtown Phoenix in June, the body tries to maintain an internal temperature near 98.6 degrees F by varying the rate and depth of blood circulation. During exercise and hot days, when the body temperature begins to rise, the heart pumps more blood and circulates it closer to the skin so that excess heat is lost to the cooler atmosphere. The body also sweats, inducing evaporative cooling. Heat exposure becomes serious when the body cannot regulate its internal temperature.

Medical Condition	Symptom	Responses
Heat Cramps	Painful muscle cramps and spasms, usually in muscles of legs and abdomen. Heavy sweating.	Apply firm pressure on cramping muscles or gently massage to relieve spasm. Give sips of water; if nausea occurs, discontinue water intake.
Heat Exhaustion	Heavy sweating, weakness, cool skin, pale, and clammy. Weak pulse. Normal temperature possible. Possible muscle cramps, dizziness, fainting, nausea, and vomiting.	Move individual out of sun, lay him or her down, and loosen clothing. Apply cool, wet cloths. Fan or move individual to air-conditioned room. Give sips of water; if nausea occurs, discontinue water intake. If vomiting continues, seek immediate medical attention
Heat Stroke (Sun Stroke)	Altered mental state. Possible throbbing headache, confusion, nausea, and dizziness. High body temperature (106°F or higher). Rapid and strong pulse. Possible unconsciousness. Skin may be hot and dry, or patient may be sweating. Sweating likely especially if patient was previously involved in vigorous activity.	Heat stroke is a severe medical emergency. Summon emergency medical assistance or get the individual to a hospital immediately. Delay can be fatal. Move individual to a cooler, preferably air-conditioned, environment. Reduce body temperature with a water mister and fan or sponging. Use air conditioners. Use fans if heat index temperatures are below the high 90s. Use extreme caution. Remove clothing. If temperature rises again, repeat process. Do not give fluids.

Table1. The three most severe stages of the body being subjected to extreme heat.
Sources: CDC, 2004a; Kunihiro and Foster, 2004; NWS, 2004

When subjected to extreme heat and unable to cool down, the body progresses through six stages of physical debilitation: heat stress, heat fatigue, heat syncope, heat cramps, heat exhaustion, and heat stroke. The symptoms range in severity (Table 1).

High heat is nothing new to Arizona. In 2007, Phoenix endured one hundred-thirteen days with temperatures exceeding 99 degrees F, while Tucson experienced 65. Fortunately, research shows that both cities and people adapt and acclimatize to high temperatures—100-degree temperatures in August feel less hot than they do in June. But each year, Arizona suffers high numbers of heat-related deaths and even greater numbers of illnesses. In 2005, for example, 51 U.S. residents died in Arizona from exposure to excessive heat, nearly a third of the total U.S. deaths reported from extreme heat. Last year, in Maricopa County alone, 50 people died.

Compared with more humid regions, the Southwest's dry climate may make heat-related illness more likely because people don't feel uncomfortable until problems such as dehydration have already started.

Erik Pytlak, science officer at the NWS in Tucson, doesn't mince words when describing the dangers of heat exposure: "Extreme heat is the number one weather-related killer in Arizona."

Who is at risk?

The trend in total number of deaths in Arizona is in lock-step with the trend in the number of migrants who die while crossing the Mexican-American border, Pytlak said. In 2005, roughly 80 migrants died in the Tucson sector alone from heat exposure, while more than 180 total deaths occurred from heat exposure along the border. Since 1994 the number of migrant deaths each year has generally increased, reflecting the switch in the point of entry from more urban areas to the sweltering Arizona desert.

continued on page 4

Summer heat, continued

Within U.S. citizen demographics, intuitively the most at-risk people are those who work outdoors. However, national studies break down illness and mortality more in terms of social class and physical location than occupation. The greatest risk of heat stress falls on people who live in cities, with a disproportionate number of deaths falling within marginalized groups such as the poor, minorities, and elderly.

In 2006, Sharon Harlan, associate professor in the School of Human Evolution and Social Change at Arizona State University, and others studied this by measuring temperatures in socially distinct neighborhoods in Phoenix. They found that during the summer of 2003, the mean temperature at 5:00 p.m. varied by as much as 7 degrees F across eight different neighborhoods and a heat wave exacerbated the measured temperature difference by as much as 14 degrees. The lowest temperatures occurred in a wealthy, city-central neighborhood that had low population density and more vegetation. The highest temperatures were recorded in the poorest neighborhood, which was partially characterized by having the highest population density and sparse vegetation. In the poor neighborhood, virtually every house was without air conditioning. Inside temperatures were routinely higher than outside temperatures, forcing many people to sleep outside.

The most plausible explanation for the statistically significant difference in neighborhood temperatures is the urban heat island effect (UHI). The UHI is caused primarily by dense concentrations of buildings and asphalt that absorb more heat during the day and release it more slowly at night compared with natural ground cover such as soil and vegetation. The most noticeable human-caused impact on excessive heat exposure may not be from the greenhouse gases injected in the air, but from the extra buildings and roads, Pytlak said.

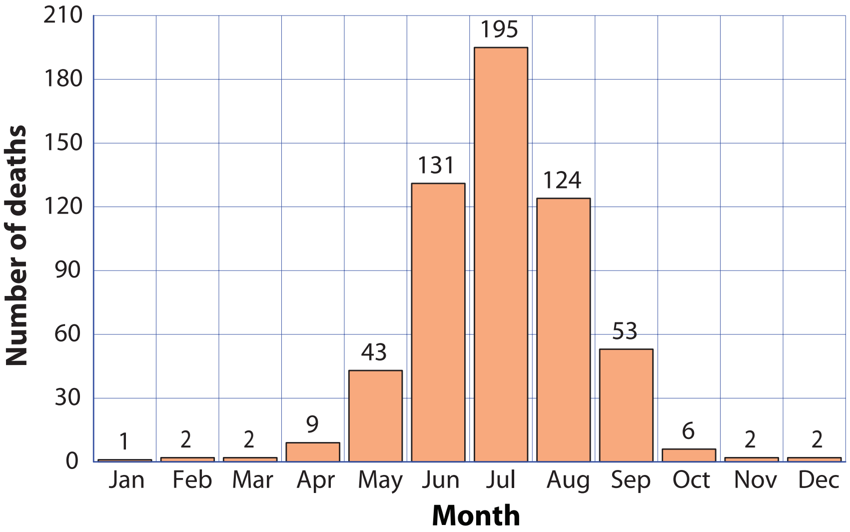


Figure 1. Deaths from exposue to excessive natural heat occurring in Arizona by month in 1992–2002. *Source: Arizona Department of Health Services*

As urban expansion gobbles-up farmland and desert, it amplifies temperature and places more people under the urban temperature magnifying glass.

The Heat Index

Providing expedient severe weather warnings to save lives and property is the most important mission provided by NWS offices in Arizona and New Mexico. In an effort to raise awareness and provide warnings during elevated-risk days, NWS forecasts and disseminates Heat Advisories and Excessive Heat Warnings at the local level. NWS offices in Arizona and New Mexico issue these alerts when certain weather thresholds are exceeded. These thresholds are based on a heat index in New Mexico; in Tucson and Phoenix, they are based more on locally calibrated temperatures.

The heat index is a common metric used to conceptualize the dangers of high heat. It is a measure of how hot it feels when relative humidity is added to the actual air temperature. At a higher humidity, the temperature feels hotter because sweat evaporates more slowly. Evaporative cooling works because heat from our skin is lost in the process of converting liquid sweat to vapor. It is an effective cooling mechanism, felt by those who have bounded out of a swimming pool on a hot, low humidity day and experienced a quick chilling. At high temperatures, the evaporation of sweat is the body's most effective mechanism for heat loss. It is the same physical process that makes swamp coolers effective in June when humidity is low. It is also the same process that renders evaporative cooling ineffective during the monsoon in July and August. During these months, higher humidity reduces evaporation and the body's ability to release heat. This may contribute to the higher incidence of heat-related illness and death during July and August than during June and September (Figure 1).

The monsoon both exacerbates and reduces risk to heat illness, Haffer said. On one hand, perspiration stays longer and provides a visual reminder that it is hot. On the other hand, temperatures are typically lower, giving people a false sense that the heat is not as dangerous.

Although the heat index neatly boils down the perception of heat to reflect a combination of temperature and humidity, it is a poor guide for people and decision makers in the Southwest.

continued on page 5

Summer heat, continued

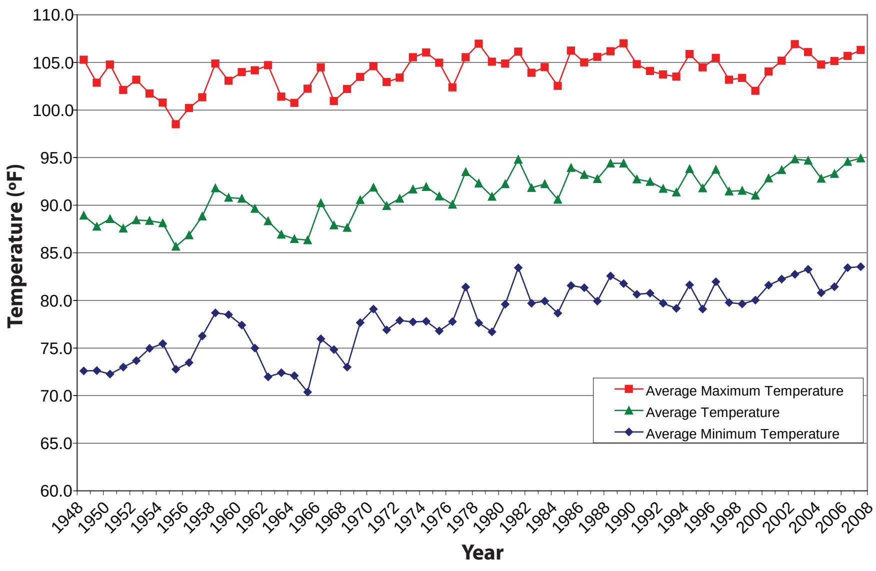


Figure 2. Average June, July, and August temperatures at Sky Harbor Airport in Phoenix, Arizona. *Sources: CDC, 2004a; Kunihiro and Foster, 2004; NWS, 2004*

"Even on the most humid monsoon days, afternoon humidity is usually 20 to 30 percent," Pytlak said. "[With lower humidity] the heat index is almost always lower than the temperature in Arizona, and also most of the western U.S. The heat index was designed to alert people of heat waves in humid climates, not the western U.S." As a result, NWS in both Phoenix and Tucson have designed warning systems that use better measures of dangerous heat conditions.

Heat advisories and warnings

NWS broadcasts digital and vocal alerts when certain weather conditions are met. In Tucson, a Heat Advisory is issued if either the temperature or the heat index rises to the point where people need to take extra precautions. The threshold is not, however, static throughout the year. It is based instead on a sliding scale that takes into account time of year and location, in part recognizing that people acclimatize to the heat as summer progresses. The extra precautions recommended may include drinking more water, shifting outdoor activities to cooler parts of the day, paying more attention to the higher risk populations like the elderly and young, and avoiding prolonged exposures to the heat.

While an advisory urges caution, an Excessive Heat Warning alerts people and decision makers that the heat will be life-threatening, even to those who are well-acclimated and healthy. In Tucson, warnings are issued when either the temperature or the heat index rises to a value of 110. Last year, NWS issued Heat Advisories seven times in Tucson and for 29 days in Phoenix. Phoenix also declared Excessive Heat Warnings for an additional eight days.

Phoenix does not use the same guidelines for their alerts. In 2001, Phoenix launched a customized method for assessing dangerous weather conditions. Researchers collaborated with NWS and numerous local agencies in Phoenix to establish threshold temperatures beyond which human mortality significantly increases. This statistical correlation implicitly incorporates human adaptation and acclimation. Phoenix's warning criteria also incorporates a maximum temperature threshold; a Heat Advisory is issued if the forecasted daily high is projected to be near the historical temperature record for that day.

Fortunately for residents of New Mexico, it is uncommon for temperatures to remain above critical levels for prolonged periods. As a result, the NWS office in Albuquerque has never issued an advisory or warning, and the Santa Teresa office has not issued them for at least the past eight years. That is not to say that residents can ignore precautions for heat-related illnesses. Under the right circumstances on a hot day, it doesn't take long to experience the first stages of excessive heat exposure, and the responsibility for staying heat-healthy ultimately falls on the individual. The most effective action is to limit exposure by periodically returning to air conditioned or cooled buildings. For construction workers, landscapers, police, and others who work outdoors, it's important to keep hydrated, wear comfortable clothes, pay attention to what the body says, and seek cooler conditions upon feeling ill.

Anticipating Summer

A cursory look at temperatures at Phoenix Sky Harbor International Airport suggests that average summer temperatures may slightly increase (Figure 2). Wiggles in the data render this type of simple forecast foolhardy. Nonetheless, since 1948, the average June, July, and August temperature as well as the average minimum and maximum temperatures have all increased. The three-month average minimum temperatures have increased at the fastest rate, rising roughly 0.15 degrees F per year. This has contributed to the increase in the number of days when the minimum temperature does not fall below 90 degrees F. A similar trend in the increase in minimum temperatures has been observed in Tucson. This is important because sustained elevated temperatures are taxing on the body. If temperatures continue to rise, future occurrences of heat illness may increase.

For more information on temperature forecasts see Figures 10a–d under Forecasts in this month's *Southwest Climate Outlook*.

Temperature (through 5/14/08)

Source: High Plains Regional Climate Center

Temperatures in Arizona and New Mexico since the start of the water year on October 1 continue to show a distinct north-south gradient (Figures 1a–b). The Colorado Plateau in Arizona and the Rockies and Sangre de Cristo Mountains in northern New Mexico have averaged between 35 and 45 degrees Fahrenheit, with temperatures in the upper 20 degrees F at the highest elevations. Southeastern Arizona and southern New Mexico have had temperatures in the 50s while southwestern Arizona and the lower Colorado River have had temperatures in the 60s. The colder temperatures in northern Arizona and New Mexico generally have been 1 to 2 degrees F below average, while the warm temperatures in southern Arizona and New Mexico are from 1 to 4 degrees F above average. In the past thirty days, temperatures continue to be 1 to 2 degrees F warmer than average in the southern deserts and lower elevations of both states and 1 to 2 degrees F cooler than average at the higher elevations (Figures 1c–d). Two cold storm systems that moved across the Southwest in the past week have lowered average temperatures even further. In general, the past thirty days have seen only a few weak storm systems move through the Southwest, and although they have not brought as much precipitation as the region normally receives, they have kept temperatures near the seasonal average this winter.

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 May 14, 2008) average temperature.

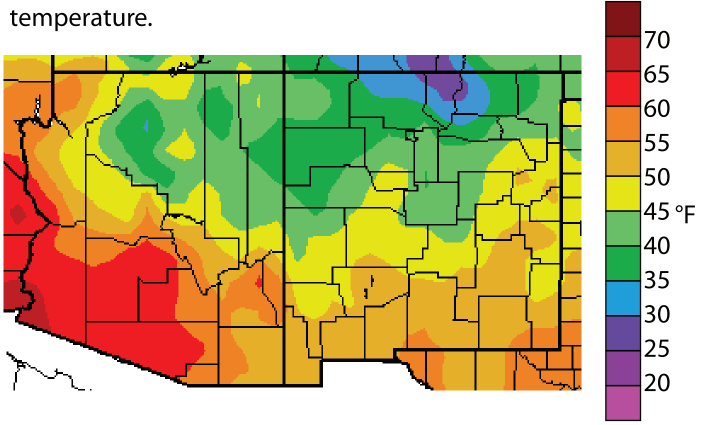


Figure 1b. Water year '07–'08 (through May 14, 2008) departure from average temperature.

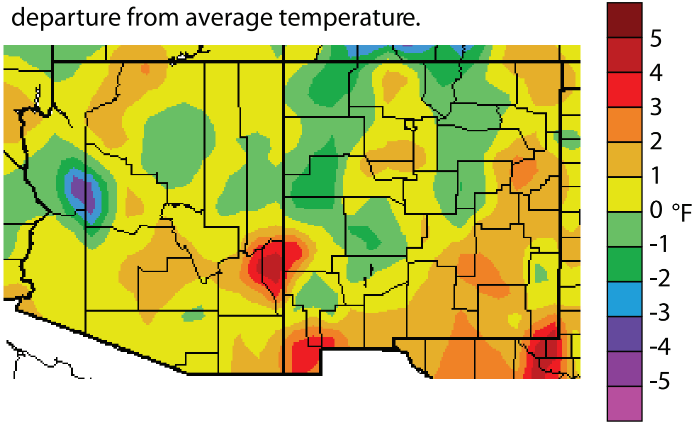


Figure 1c. Previous 30 days (April 15–May 14, 2008) departure from average temperature (interpolated).

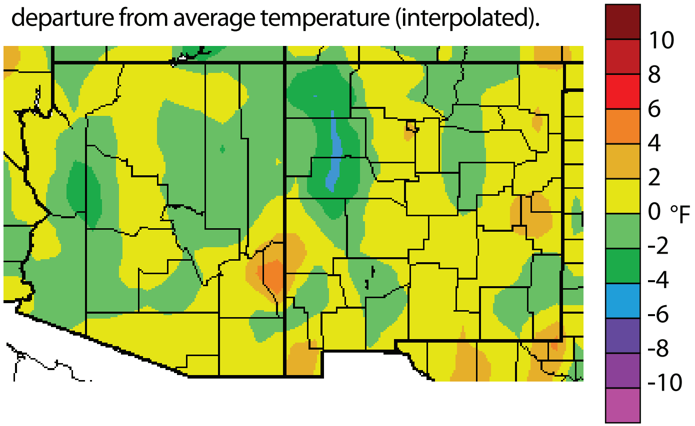
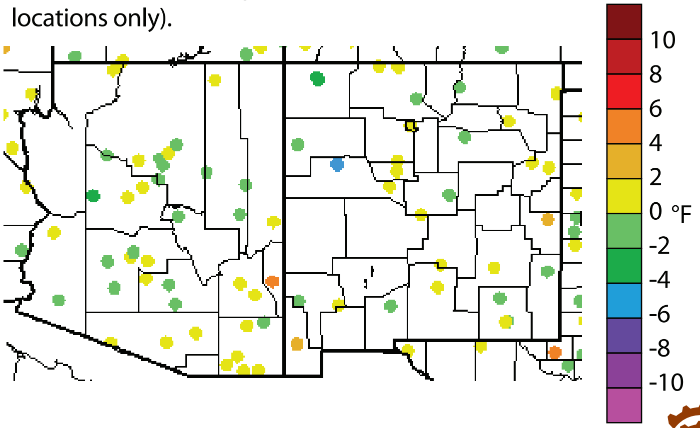


Figure 1d. Previous 30 days (April 15–May 14, 2008) departure from average temperature (data collection locations only).



Precipitation (through 5/14/08)

Source: High Plains Regional Climate Center

Precipitation for the water year remains at 50 percent or less of average across southeastern Arizona and the southeastern two-thirds of New Mexico (Figures 2a–b). Only a few high elevation locations, including the Sangre de Cristo Mountains of northern New Mexico and Arizona's Chuska Mountains in the northeast, San Francisco Peaks, and Kaibab Plateau in the north, have received 100 percent or more of average precipitation for the water year. What originally began as a very wet water year has dried out in the past two months, as the La Niña event finally kicked in, steering most storms north of the region. In the past thirty days, western New Mexico and southern Arizona have again received less than 5 percent of average precipitation (Figures 2c–d). Southeastern New Mexico has received 70 to 110 percent of average precipitation and parts of north central Arizona had up to 300 percent of average. Roswell, New Mexico, had 0.75 inches of precipitation from one storm on May 5, while Albuquerque has had 0.02 inches in the past month. Recent storms have brought very scattered, localized precipitation to both states, which is unusual, as winter storms typically bring widespread, uniform precipitation. The forecast by the Climate Prediction Center is for continued warm, dry conditions until the monsoon begins. The summer is not expected to be either drier or wetter than normal (see Figures 11a–d).

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 May 14, 2008) percent of average precipitation (interpolated).

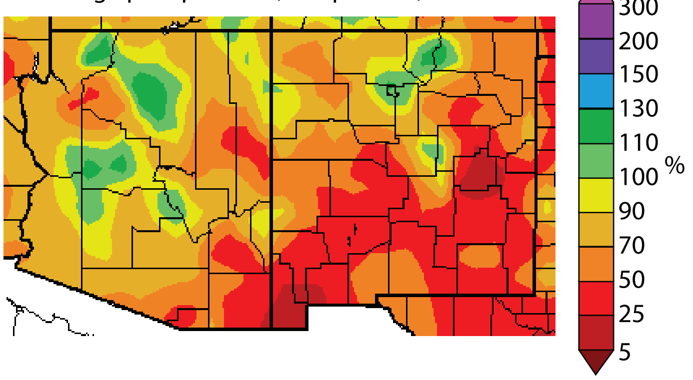


Figure 2b. Water year '07–'08 (through May 14, 2008) percent of average precipitation (data collection locations only).

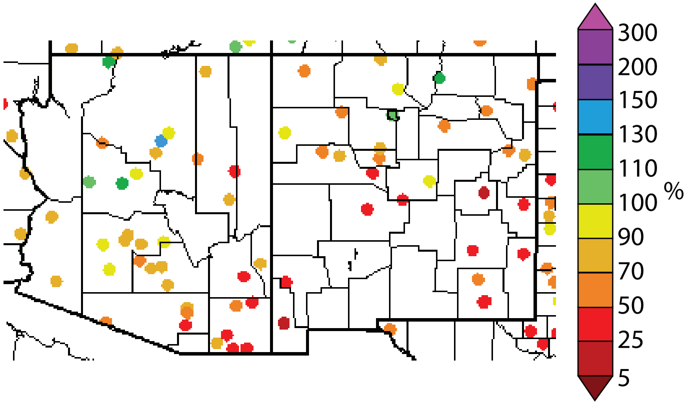


Figure 2c. Previous 30 days (April 15–May 14, 2008) percent of average precipitation (interpolated).

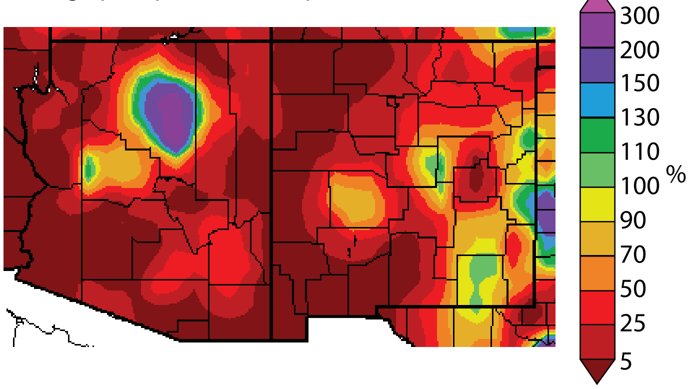
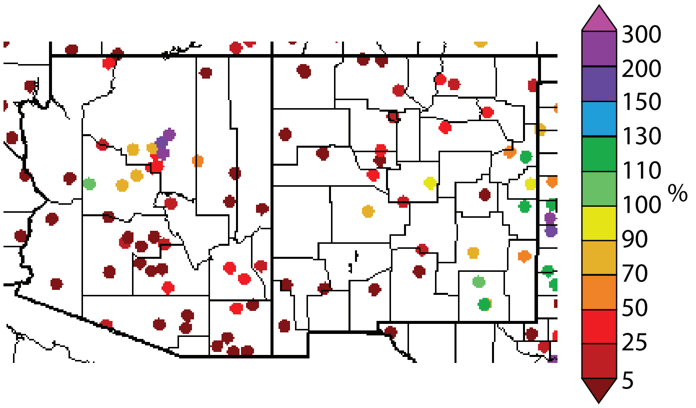


Figure 2d. Previous 30 days (April 15–May 14, 2008) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(released 5/15/08)

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

In contrast to last month, the U.S. Drought Monitor map depicts drought intensity increasing across Arizona, but decreasing slightly in New Mexico (Figure 3). Compared with one year ago, drought in Arizona is far less severe. In New Mexico, 73 percent of the state shows some degree of drought, whereas one year ago only 28 percent of the state showed drought. The shift in drought characteristics is primarily due to the irregularity of this winter's La Niña episode. It delivered uncharacteristically high moisture to central and northern Arizona and northwestern New Mexico, but characteristic dryness to southeastern Arizona, and southern and eastern New Mexico. Climatologists are attributing La Niña's erratic influence on North American storm tracks to the influence of ocean-atmosphere interactions outside of the areas of the tropical Pacific that historically have shown the strongest connections between La Niña and Southwest U.S. winter precipitation.

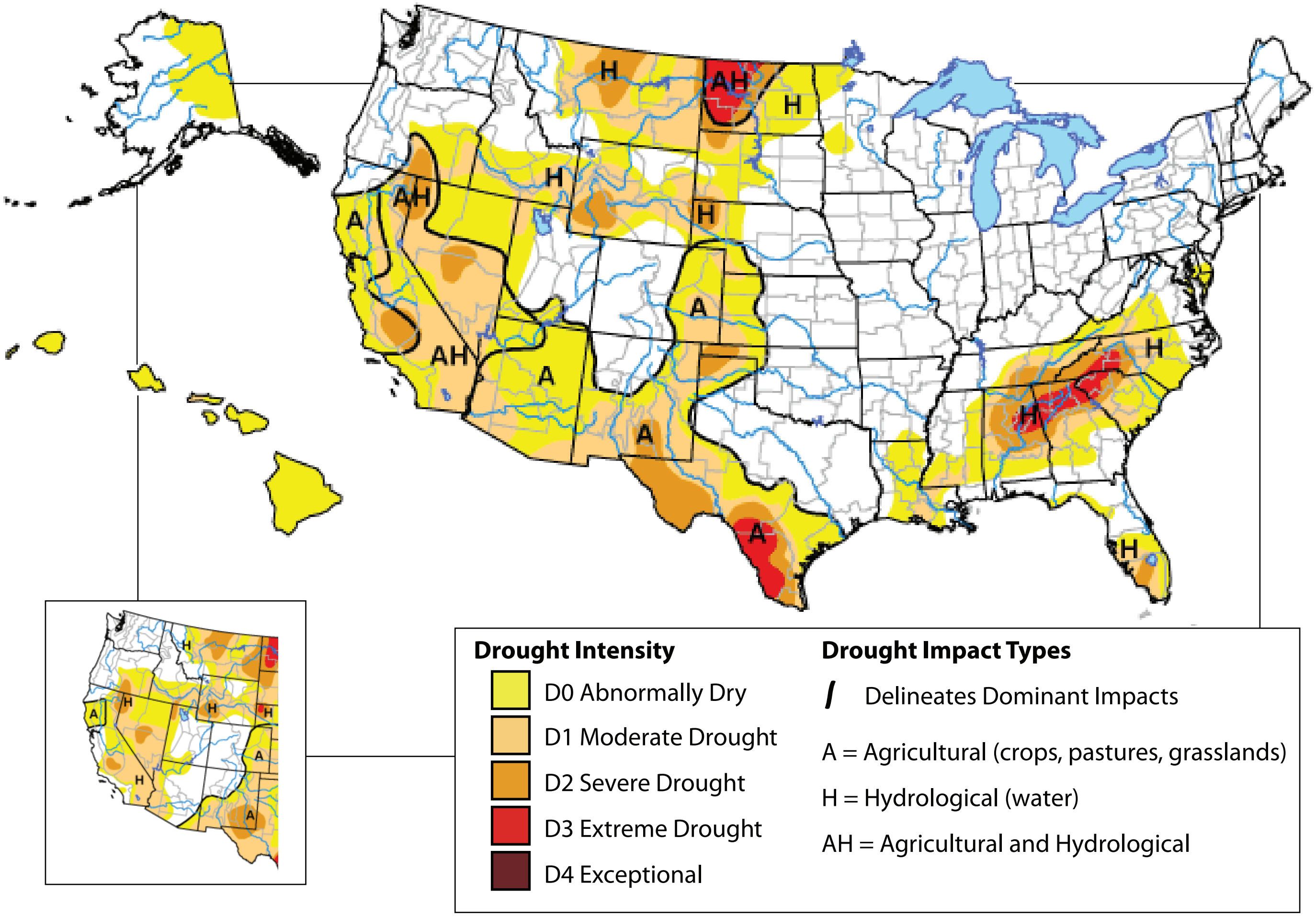
In drought-related news, geologists have completed a detailed mapping project for Chandler Heights and Apache Junction, Arizona, showing the locations of earth fissures (www.yourwestvalley.com, May 2).

Notes:

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

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

Figure 3. Drought Monitor released May 15, 2008 (full size), and April 17, 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 3/31/08)

Source: Arizona Department of Water Resources

While March was extremely dry across the entire state, southeastern Arizona was the only part of the state that received below-average precipitation for the previous three months. Many locations observed less than 50 percent of average precipitation between January and March. As a result, short-term drought status in the Willcox Playa and Whitewater Draw basins were elevated one category from last month, from abnormally dry to moderate drought (Figure 4a). This change in the short-term map is also supported by reports of reduced grassland productivity in those basins. Short-term drought status was not changed for other basins.

In the eastern half of the state, long-term drought status has improved one category in six basins: Agua Fria, Verde Little Colorado River, Salt, Upper Gila and San Pedro (Figure 4b). Precipitation this past winter (October-March) was average to above average across Arizona. Only southeast and extreme northwest Arizona experienced below-average levels. Late winter (January-March) precipitation across much of southeast Arizona was less than 25 percent of normal. As a result, long-term status for Whitewater Draw Basin was downgraded from abnormally dry to moderate drought. A single very wet year can improve long-term drought status but cannot completely offset multiple dry years, which is why all areas of the state remain in some level of long-term status.

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

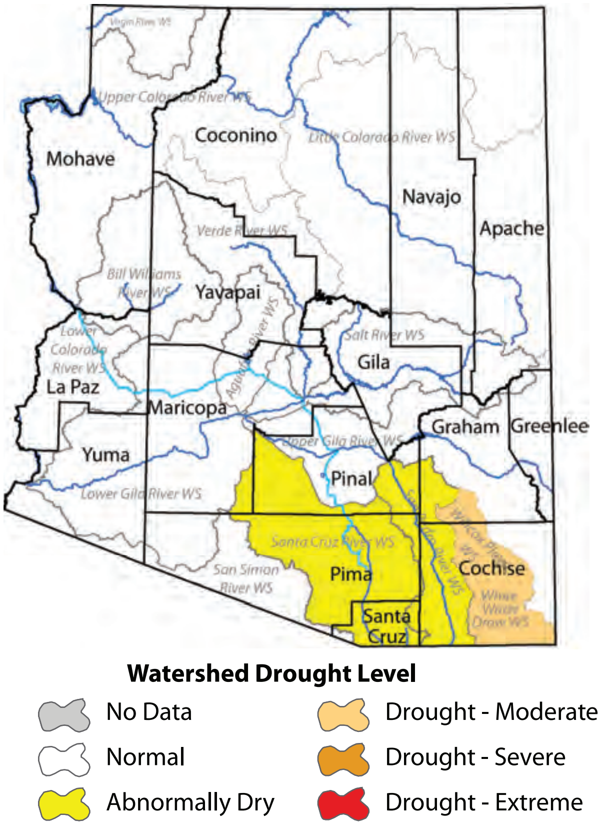
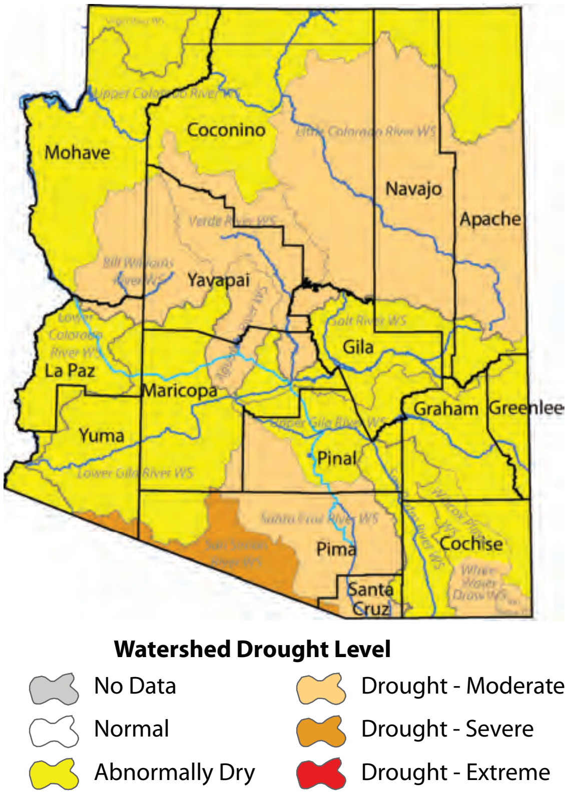


Figure 4b. Arizona long-term drought status for April 2008.



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 5/15/08)

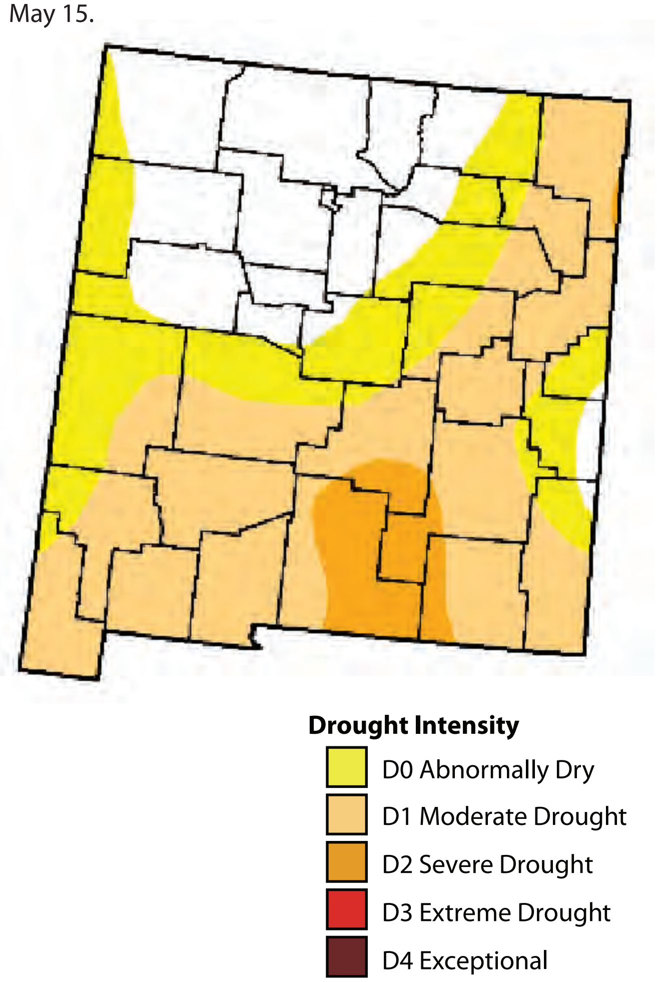
Source: New Mexico State Drought Monitoring Committee

The New Mexico section of the U.S. Drought Monitor reports that approximately 73 percent of the state is experiencing some level of drought compared to 28 percent a year ago (Figure 5). For the second consecutive month, much of Catron, Socorro, Lincoln, and Chaves counties received little or no rainfall during April 2008. Drier-than-normal conditions also persisted during April from west central and northwest New Mexico through the mid and upper Rio Grande Valley. However, a few high elevation sites in the Sangre de Cristo Mountains and along the east slopes received more than 70 percent of normal precipitation during April.

The spatial pattern of the drought intensities remains similar to that of last month. The northwest section of the state generally continues to be free from any drought designation, while the rest of New Mexico, aside from a small sliver in the east central region, is experiencing drought conditions of varying intensities. Although a severe drought designation continues in the south central region, the size of the impacted area has shrunk slightly and shifted to the west compared to last month.

For the water year, which began October 1, many counties in the south, southwestern, and northeastern parts of the state received precipitation amounts that were less than 25 percent of normal. However, in the northern mountains, water year precipitation continues to remain above normal. These wetter conditions will likely reduce drought impacts if summer precipitation in these areas is low.

Figure 5. New Mexico drought map based on data through May 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 4/30/08)

Source: National Water and Climate Center

Storage declined slightly in reservoirs within Arizona's borders over the past month (Figure 6). Storage in the Salt River reservoirs rose by more than 10,000 acre-feet; however, storage in the Verde River reservoirs decreased by almost 8,000 acre-feet. Storage in Lakes Mead and Powell decreased slightly during April, and combined storage in these large reservoirs is still less than 50 percent of capacity. In late July, Lake Powell elevation is projected to peak at approximately 64 feet below full pool elevation.

In water-related news, the San Xavier Coop Farm is using an underground irrigation system to grow alfalfa, hay, and beans, restoring an age-old crop growing tradition to Tohono O'odham Nation using a Central Arizona Project allotment (KOLD-TV, April 26). Also, Payson approved a contract with the Salt River Project to secure water rights to the Blue Ridge Reservoir (*The Payson Roundup*, May 8). The town expects to bring in 3,000 acre-feet of water annually.

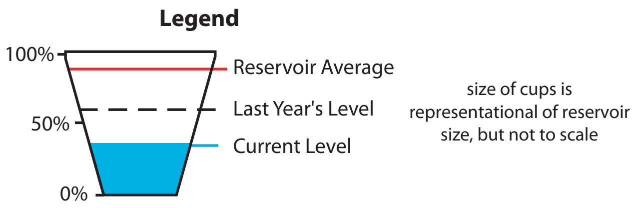
Notes:

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.

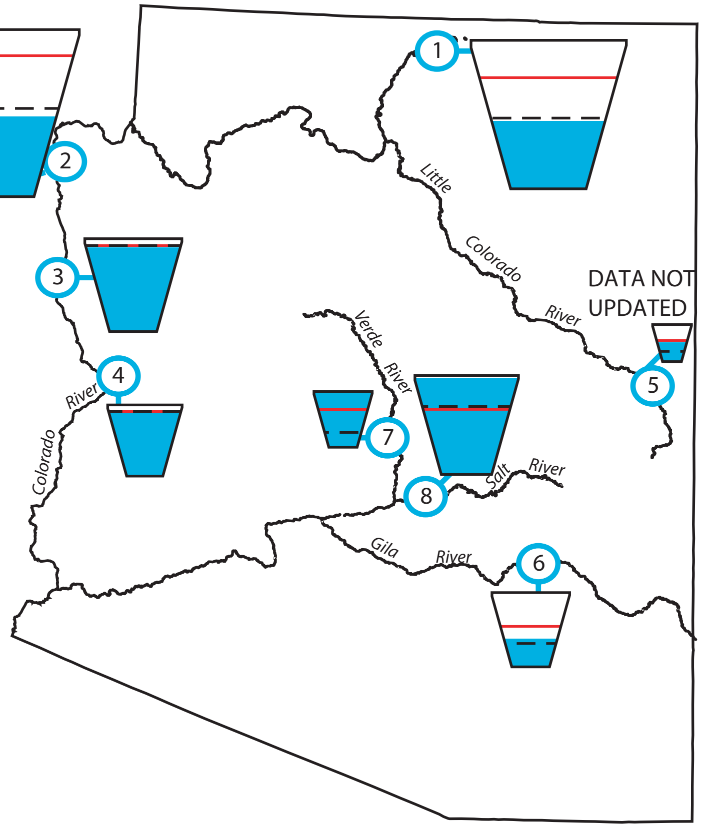
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Dino DeSimone, Dino.DeSimone@az.usda.gov.

Figure 6. Arizona reservoir levels for April 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	46%	11,195.0	24,322.0	411.0
2. Lake Mead	48%	12,463.0	26,159.0	-477.0
3. Lake Mohave	91%	1,649.8	1,810.0	32.0
4. Lake Havasu	91%	565.8	619.0	14.5
5. Lyman Reservoir		DATA NOT UPDATED		
6. San Carlos	38%	333.2	875.0	-28.7
7. Verde River System	97%	278.7	287.4	-7.9
8. Salt River System	98%	1,982.6	2,025.8	10.3

*** thousands of acre-feet**



On the Web:

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

New Mexico Reservoir Levels

(through 4/30/08)

Source: National Water and Climate Center

New Mexico statewide reservoir storage increased by more than 100,000 acre-feet since last month. Storage in the state's largest reservoirs, Navajo and Elephant Butte, increased by about 40,000 acre-feet each (Figure 7). Since last year, storage has decreased substantially for the reservoirs included in this report.

In water-related news, a measure to settle the Navajo Nation's water rights claims in the San Juan River Basin was approved by the U.S. Senate Energy and Natural Resources Committee (Associated Press, May 7). If approved by the full Senate, the nearly $900 million settlement would give about 600,000 acre-feet annually to Navajo Nation. The Albuquerque Bernalillo County Water Utility Authority reported that water usage was 620 million gallons over targeted values for the first four months of 2008 (*New Mexico Business Weekly*, May 2). Albuquerque must conserve water.

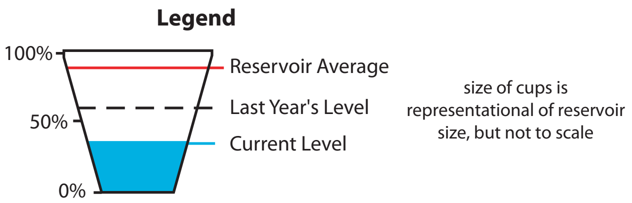
Notes:

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.

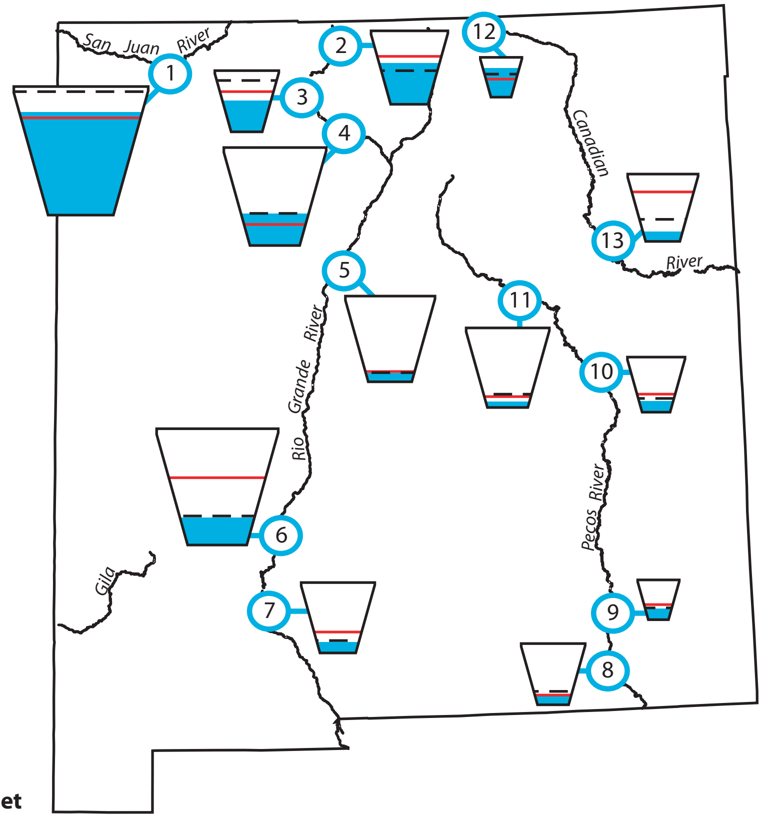
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). For additional information, contact Richard Armijo, Richard.Armijo@nm.usda.gov.

Figure 7. New Mexico reservoir levels for April 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	80%	1,360.2	1,696.0	39.5
2. Heron	56%	225.1	400.0	21.6
3. El Vado	51%	99.8	195.0	-4.4
4. Abiquiu	33%	180.4	554.5	-3.4
5. Cochiti	10%	50.7	491.0	-0.1
6. Elephant Butte	24%	535.9	2,195.0	40.9
7. Caballo	15%	50.9	332.0	13.5
8. Brantley	16%	23.4	147.5	-9.7
9. Lake Avalon	28%	1.1	4.0	-0.1
10. Sumner	20%	20.1	102.0	-2.5
11. Santa Rosa	8%	36.5	438.3	10.0
12. Costilla	73%	11.7	16.0	0.6
13. Conchas	15%	38.4	254.2	-2.3

*** thousands of acre-feet**



On the Web:

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

Southwest Snowpack

(updated 5/15/08)

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

Snow Water Content (SWC) observations relevant to Arizona and New Mexico water resources are now limited to northern New Mexico, Utah, Colorado, and Wyoming (Figure 8). All other stations in both states are no longer reporting measurable snowpack. Percent of average SWC for Utah and Colorado are similar to observations reported last month, with most stations in Utah reporting at or slightly below-average SWC and all stations in Colorado reporting above-average SWC.

The Southwest Climate Outlook will continue to include recent snow pack observations as long as sites are reporting SWC.

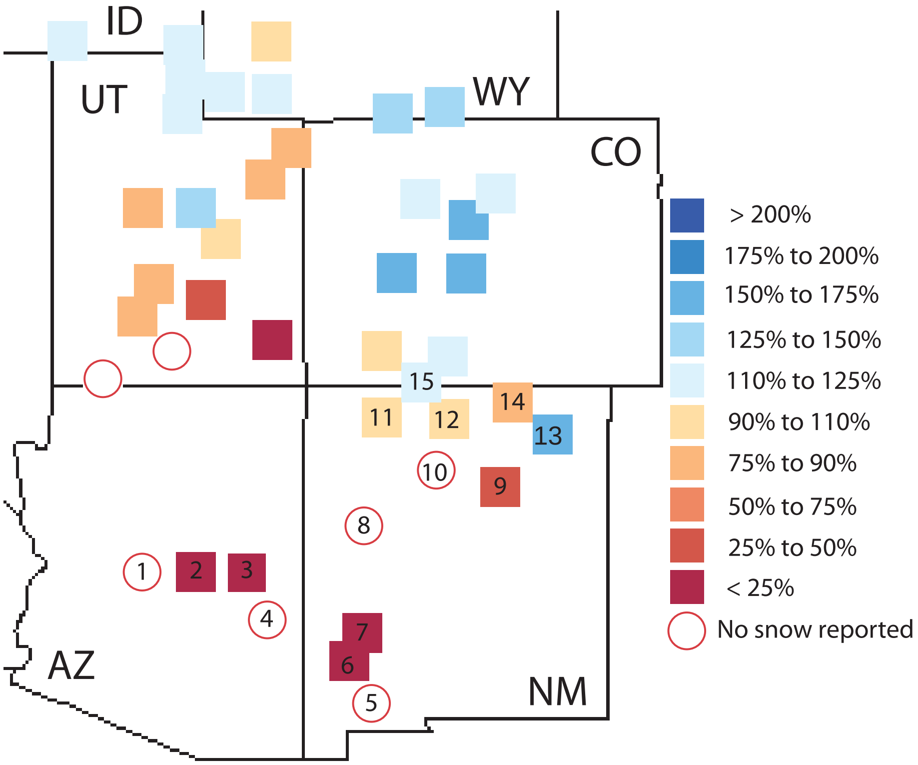
On the Web:

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

Figure 8. Average snow water content (SWC) in percent of average for available monitoring sites as of May 15, 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.

Southwest Fire Summary

(updated 5/15/08)

Source: Southwest Coordination Center

The latest observed Fire Danger Class map from the National Wildfire Assessment System (not shown) shows high to moderate fire danger for most of Arizona and New Mexico. Burning Index values remain very high for fine fuels, such as grasses, across the region due to recent windy conditions, low relative humidity values, and a typical springtime trend towards drier conditions. The Burning Index is an estimate of the expected fire line intensity based on fuel moisture and fire weather conditions.

As of May 13, Arizona has had 392 wildfires this year, and New Mexico has seen 444 (Figure 9a). Total acres burned have been quite different between the two states, with wildfires burning18,39919,750 acres in Arizona and 242,823 acres in New Mexico. Above-average significant fire potential is expected across much of southern Arizona and New Mexico through this spring into the summer due to abundant fine fuels and intensifying drought conditions across the region.

Recent extreme fire weather conditions helped spread a 2,100-acre wildfire on the Tohono O'odham Indian Reservation in southern Arizona in mid-May (Figure 9b). The human-caused fire started about seven miles south of the Kitt Peak National Observatory in the Baboquivari Mountains (*The Arizona Daily Star*, May 11). Red-flag fire weather warnings prompted by high winds, high temperatures, and low relative humidity values were issued as the Solano fire burned in rugged terrain that slowed fire fighting efforts. The fire was contained at 2,177 acres after fire fighters battled the blaze for more than a week.

Notes:

The fires discussed here have been reported by federal, state, or tribal agencies during 2008. The figures include information both for current fires and for fires that have been suppressed. Figure 9a shows a table of year-to-date fire information for Arizona and New Mexico. Prescribed burns are not included in these numbers. Figures 9b and 9c indicate the approximate locations of past and present "large" wildland fires and prescribed burns in Arizona and in New Mexico. A "large" fire is defined as a blaze covering 100 acres or more in timber or 300 acres or more in grass or brush. The name of each fire is provided next to the symbol.

On the Web:

These data are obtained from the Southwest Coordination Center website:
http://gacc.nifc.gov/swcc/predictive/intelligence/situation/swa_fire_combined.htm

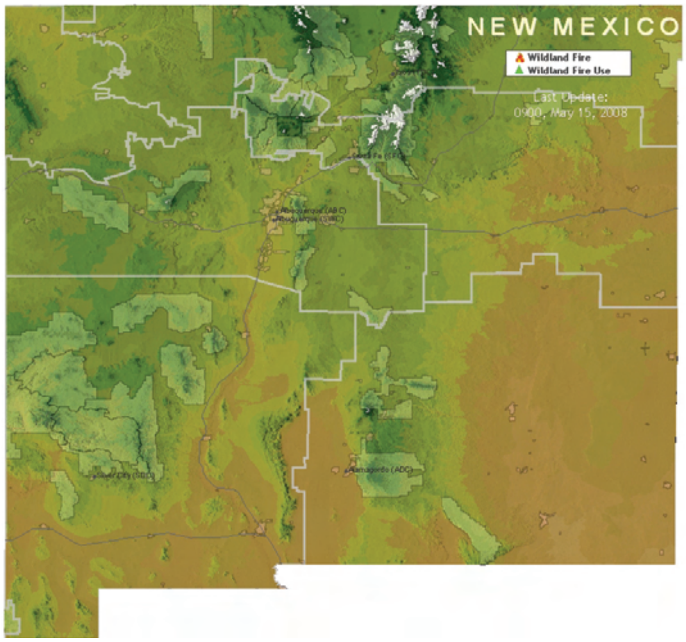
http://gacc.nifc.gov/swcc/predictive/intelligence/daily/ytd_large.htm

Figure 9a. Year-to-date fire information for Arizona and New Mexico as of May 13, 2008.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	382	18,396	10	3	392	18,399
NM	430	241,057	14	1,766	444	242,823
Total	812	259,453	24	1,769	836	261,222

Figure 9b. Arizona large fire incidents as of May 15, 2008.

Figure 9c. New Mexico large fire incidents as of May 15, 2008.



Temperature Outlook

(June–November 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 summer and into fall (Figures 10a–d). The chance of above-average temperatures through all of Arizona exceeds 50 percent relative to average or below-average temperatures through September. The temperature outlook for New Mexico suggests a moderate chance of above-average temperatures throughout the summer and into the fall. These forecasts are based primarily on the expectation that long-term trends in above-average temperatures in the region will persist through the summer of 2008.

Notes:

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

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

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

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

Figure 10a. Long-lead national temperature forecast for June–August 2008.

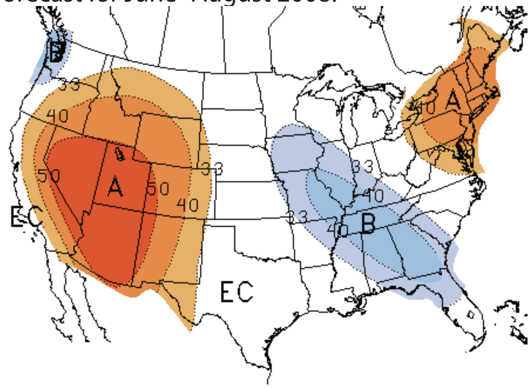


Figure 10b. Long-lead national temperature forecast for July–September 2008.

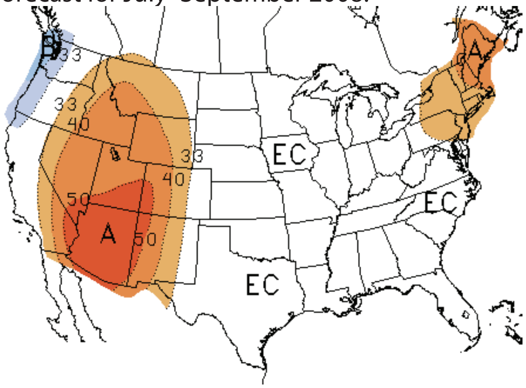


Figure 10c. Long-lead national temperature forecast for August–October 2008.

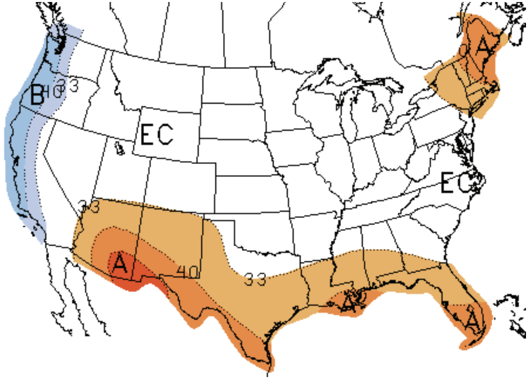
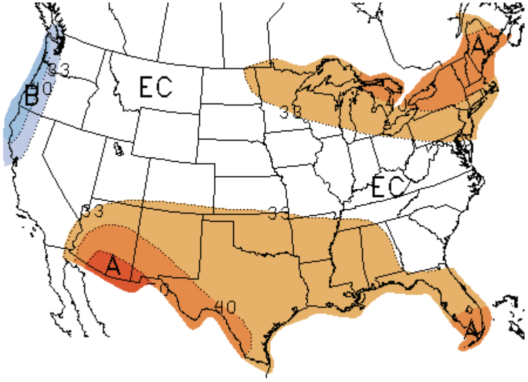


Figure 10d. Long-lead national temperature forecast for September–November 2008.



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

(June–November 2008)

Source: NOAA Climate Prediction Center (CPC)

The precipitation outlook through summer and into fall indicates an enhanced probability of below-average precipitation over the Pacific Northwest (Figures 11a–11c). Throughout Arizona and New Mexico, the forecast calls for equal chances (EC) of above-, near-, and below-average precipitation through November 2008. Klaus Wolter's (NOAA Earth System Research Lab) experimental forecast shows slightly increased chances of above-average precipitation along the Arizona-New Mexico border during July–September. Wolter notes that his forecast skill improves closer to the summer season; his next forecast release is May 24. The predictions for the Pacific Northwest and Northern Rockies reflect a historic tendency for below-average July–September precipitation in these regions during the waning stages of a La Niña event.

Notes:

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

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

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

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

Figure 11a. Long-lead national precipitation forecast for June–August 2008.

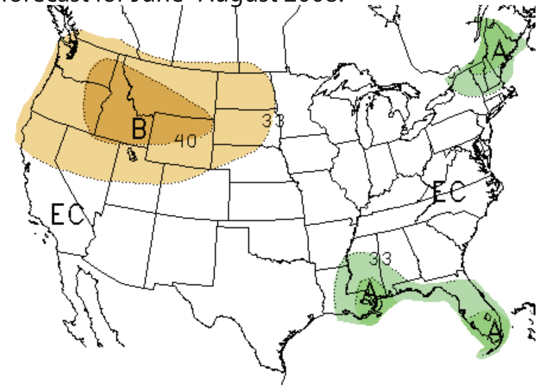


Figure 11b. Long-lead national precipitation forecast for July–September 2008.

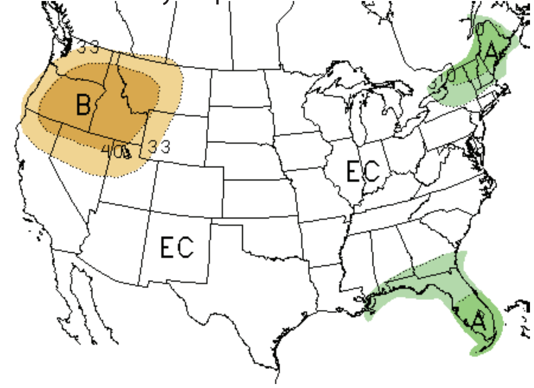


Figure 11c. Long-lead national precipitation forecast for August–October 2008.

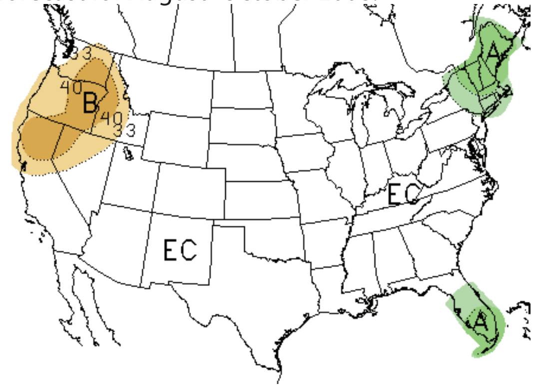
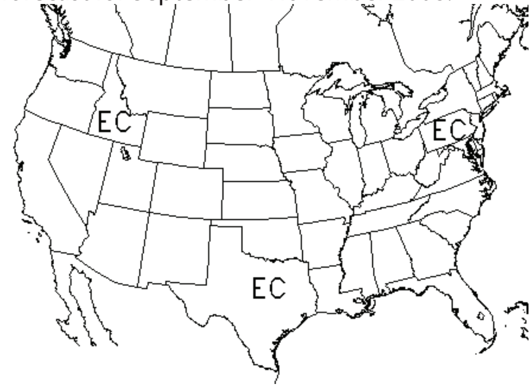


Figure 11d. Long-lead national precipitation forecast for September–November 2008.



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 August 2008)

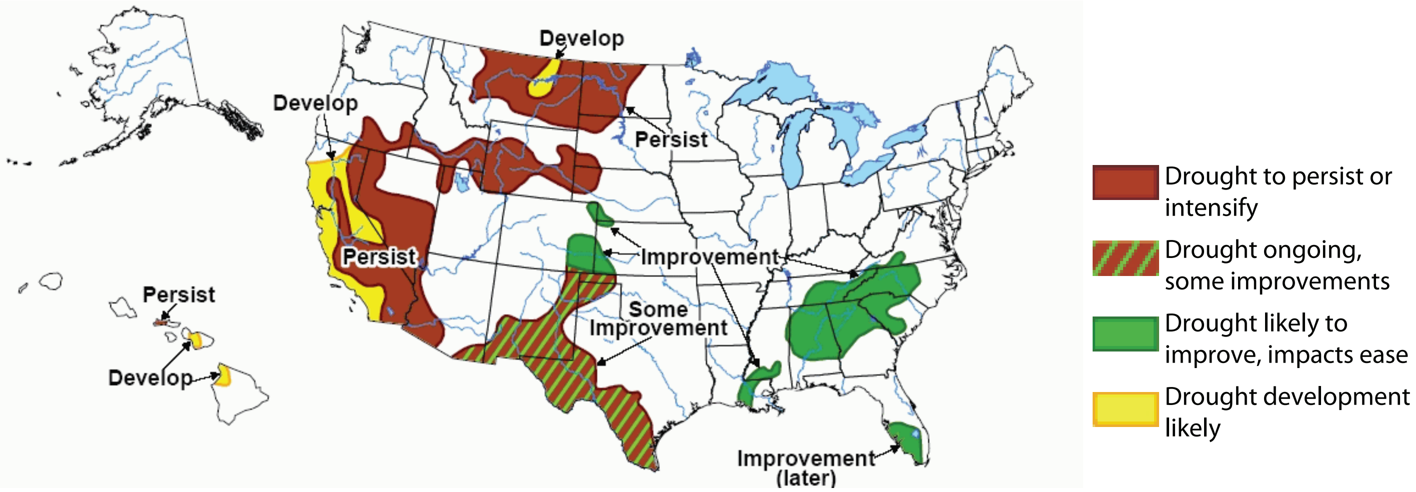
Source: NOAA Climate Prediction Center (CPC)

Some minor improvement in short-term drought conditions are expected across parts of New Mexico, western Texas, and extreme southeast Arizona, which have seen deteriorating conditions throughout this past winter due to below-average precipitation (Figure 12). Summer monsoon precipitation is expected to bring some relief to the region between June and August. Parts of the Southeast U.S., including northern Alabama, Georgia, and Florida, are expected to see more dramatic improvements, because above-average rainfall is forecast for the summer with expected increased chances of enhanced tropical storm activity. Areas across western Arizona and much of California are expected to see drought conditions remain or worsen over the next several months because the summer is a climatologically dry season. The Northern Rockies have a forecast for below-average precipitation, which is expected to continue drought conditions in that region and limit any opportunity for short-term improvements.

Notes:

The delineated areas in the Seasonal Drought Outlook (Figure 12) are defined subjectively and are based on expert assessment of numerous indicators, including outputs of short- and long-term forecasting models.

Figure 12. Seasonal drought outlook through August 2008 (released May 15, 2008).



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 are dependent in large part on mountain snowpack. Snowpack has diminished completely in most areas of Arizona and New Mexico, so forecasts are now limited to those basins of the Colorado and Rio Grande rivers that continue to retain snowpack. Forecasts for most basins continue to be above-average, but unlike last month, no basins in this forecast are expected to have more than 150 percent of average streamflow (Figure 13). Reservoir levels along the Colorado and Rio Grande are expected to rise in the coming months as the snowpack continues to melt.

The Southwest Climate Outlook will not provide streamflow forecasts again until January 2009. The National Resource Conservation Service typically provides forecasts from January to April of each year, after which the utility of spring and summer forecasts diminishes for water managers.

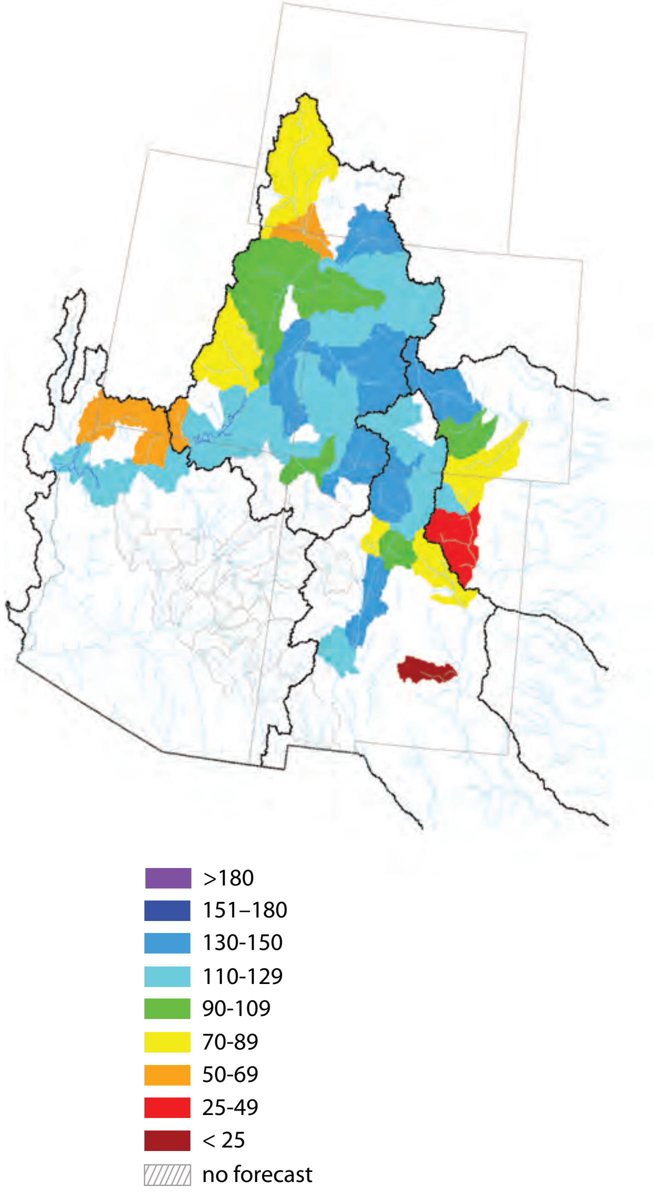
On the Web:

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

Figure 13. Spring and summer streamflow forecast as of May 1, 2008 (percent of average).



Notes:

The forecast information provided in Figure 13 is updated monthly by the National Water and Climate Center, part of the U.S. Department of Agriculture's Natural Resources Conservation Service. Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences, such as reservoirs and diversions. The USDA-NRCS only produces streamflow forecasts for Arizona between January and April, and for New Mexico between January and May.

The NWCC provides a range of forecasts expressed in terms of percent of average streamflow for various statistical exceedance levels. The streamflow forecast presented here is for the 50 percent exceedance level, and is referred to as the most probable streamflow. This means there is at least a 50 percent chance that streamflow will occur at the percent of average shown in Figure 13.

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

The southern half of Arizona and much of New Mexico are expected to see above-average significant fire potential over the next month due to a combination of high loads of fine fuels and a transition to drier spring conditions (Figure 14a). Significant fire potential refers to the projected need to bring in fire suppression resources from outside the Southwest.

A relatively wet winter across much of Arizona has prompted dramatic growth in fine fuels across the region at lower elevations. The Southwest Coordination Center notes that the greenup in these fine fuel fuels is less robust across New Mexico where below-average winter and spring precipitation have limited herbaceous growth. Above-average significant fire potential remains high across New Mexico because of existing drought conditions and limited fine fuel moisture. There is concern that the greenup across Arizona will quickly pass, leaving large amounts of cured fine fuels and conditions similar to those in New Mexico.

Wildfire experts note that invasive grass species have helped enhance fire danger across Arizona this season. Gregg Garfin, deputy director of outreach at the UA's Institute for the Study of Planet of Earth, points to the recent expansion of buffelgrass, a grass native to southern Africa, as a player in increasing fine fuel loads across Arizona at lower elevations.

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces monthly wildland fire outlooks. The forecasts (Figure 14a) consider climate forecasts and surface-fuels conditions in order to assess fire potential for fires greater than 100 acres. They are subjective assessments, based on synthesis of regional fire danger outlooks.

The Southwest Area Wildland Fire Operations produces monthly fuel conditions and outlooks. Fuels are any live or dead vegetation that are capable of burning during a fire. Fuels are assigned rates for the length of time necessary to dry. Small, thin vegetation, such as grasses and weeds, are 1-hour and 10-hour fuels , while 1000-hour fuels are large-diameter trees. The top portion of Figure 14b indicates the current condition and amount of growth of fine (small) fuels. The lower section of the figure shows the moisture level of various live fuels as percent of average conditions.

On the Web:

National Wildland Fire Outlook web page:
http://www.nifc.gov/news/nicc.html

Southwest Coordination Center web page:
http://gacc.nifc.gov/swcc/predictive/outlooks/monthly/swa_monthly.htm

Figure 14a. National wildland fire potential for fires greater than 100 acres (valid May 1–31, 2008).

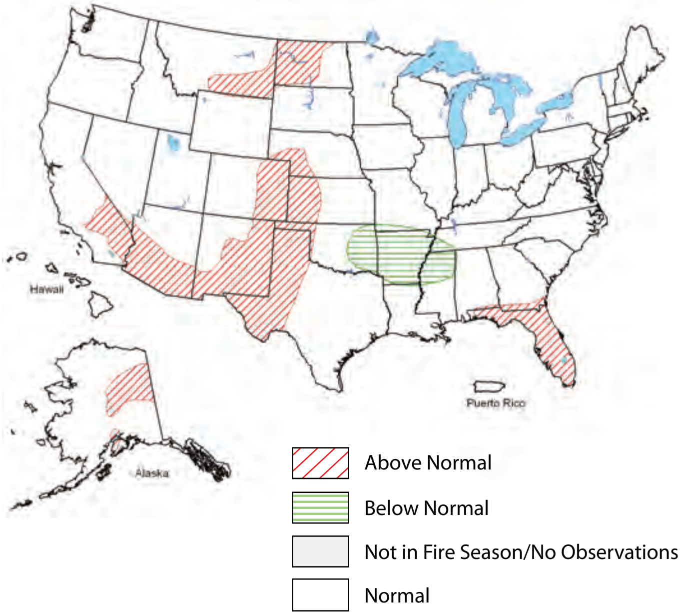


Figure 14b. Current fine fuel condition and live fuel moisture status in the Southwest.

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**

El Niño Status and Forecast

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

La Niña conditions continue to wind down across the equatorial Pacific Ocean with expectations of the 2007–2008 La Niña coming to a close over the next several months. The International Research Institute for Climate and Society (IRI) reports that several indicators continue to point towards a weakening La Niña event that will most likely give way to neutral-ENSO conditions by mid-summer. Observations along the equator continue to show below-average sea surface temperatures (SSTs) in the central Pacific, which is still indicative of a weak La Niña. SSTs have actually warmed slightly in the eastern Pacific, reinforcing the expectation that the La Niña event is losing its hold on the basin. Southern Oscillation Index (SOI) values also indicate that the atmospheric response to cool SSTs across the Pacific is also weakening. SOI values peaked in February at 2.7 and have continued to fall over the past several months (Figure 15a). April's SOI value fell to 0.6 from the March value of 1.1.

According to IRI, most ENSO forecast models indicate that La Niña conditions will continue to weaken over the next several months, giving way to ENSO-neutral conditions by the July–September period. The probability of the current La Niña event continuing through the summer has fallen to below 30 percent while the probability of neutral conditions returning has risen to more than 60 percent (Figure 15b). The IRI ENSO discussion notes that there is an outside chance that recently observed warming SSTs in the eastern Pacific could initiate a return to El Niño conditions by next fall. Forecast models downplay this scenario, with El Niño probabilities below 20 percent through the fall season, but conditions will need to be monitored closely throughout the summer.

Notes:

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

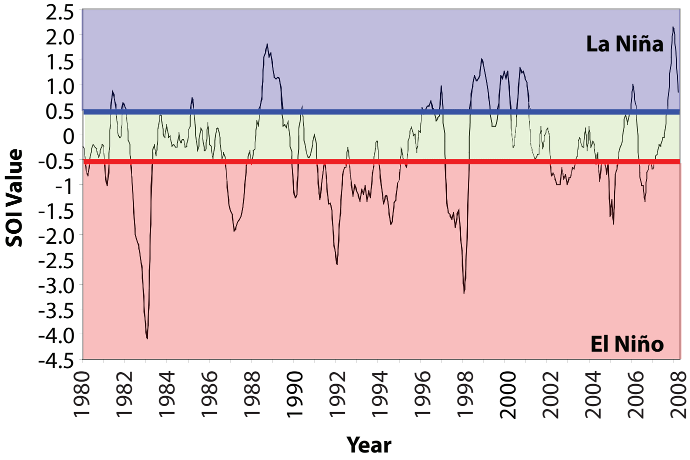
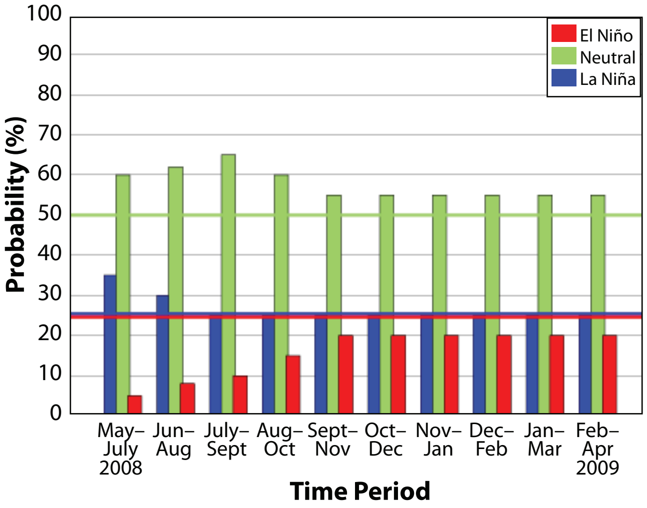


Figure 15b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released May 15, 2008). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Temperature Verification

(February–April 2008)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC seasonal temperature outlook for February 2008–April 2008 predicted increased chances of above-average temperatures for most of the United States, including probabilities of above-average temperatures throughout the Southwest (Figure 16a). These predictions were based on a combination of long-term temperature trends and expected effects associated with a moderate to strong La Niña episode in the Pacific Ocean. 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 Atlantic Coast (Figure 16b). Temperatures through Arizona and New Mexico were slightly warmer than average, the result of expected La Niña warmth and dryness kicking in at the end of February. This year tied with 1918 for having the twenty-fourth warmest March on record in Tucson, Arizona.

Notes:

Figure 16a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months February–April 2008. This forecast was made in January 2008.

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

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

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

Figure 16a. Long-lead U.S. temperature forecast for February–April 2008 (issued January 2008).

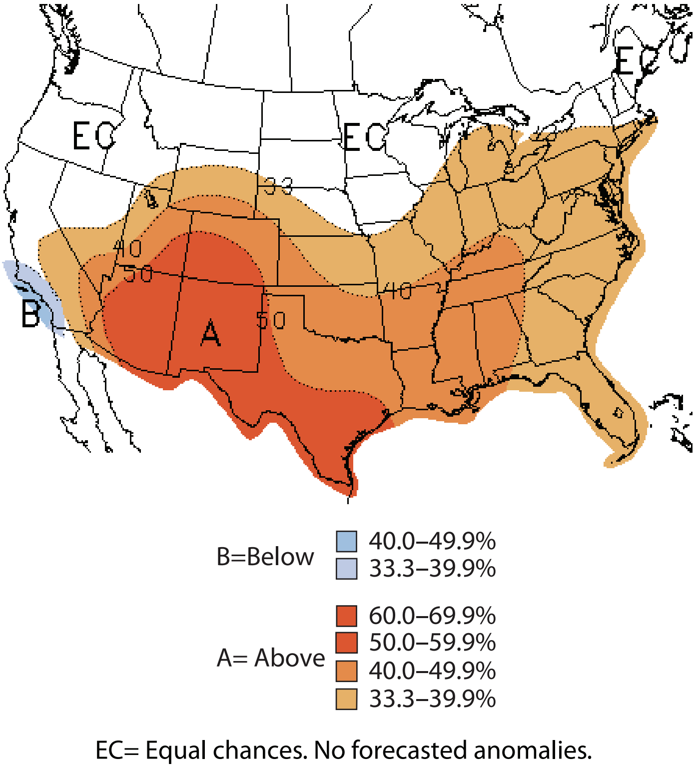
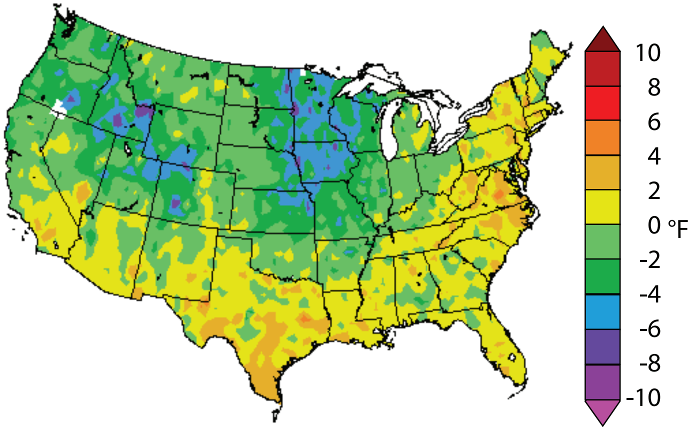


Figure 16b. Average temperature departure (in degrees F) for February–April 2008.



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

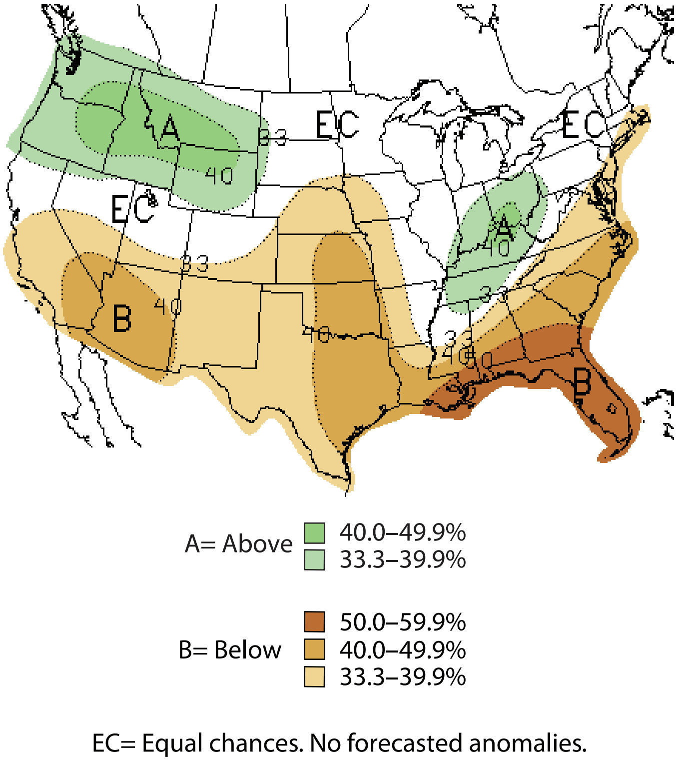
Precipitation Verification

(February–April 2008)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC seasonal precipitation outlook for February 2007–April 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 17a). The outlook also predicted increased probabilities of above-average precipitation for the Pacific Northwest. Observed precipitation revealed mostly below-average precipitation throughout most of the West, including the Pacific Northwest (Figure 17b). Much of Arizona and New Mexico received precipitation that was far below normal. Overall, the observed precipitation pattern in the Southwest and through the Midwest is close to what the CPC outlook predicted, with below-average precipitation in the Southwest typical of La Niña conditions and above-average precipitation through much of the Midwest and Northeast. The CPC forecast, however, called for increased probabilities of greater-than-average precipitation in the Pacific Northwest, when in fact the region mostly received from 25 to 90 percent of normal precipitation.

Figure 17a. Long-lead U.S. precipitation forecast for February–April 2008 (issued January 2008).



Notes:

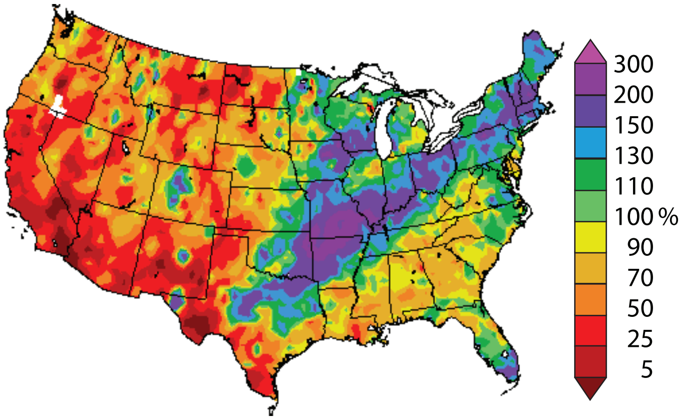
Figure 17a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months February–April 2008. This forecast was made in January 2008.

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

Figure 17b shows the observed percent of average precipitation for February–April 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 17b. Percent of average precipitation observed from February–April 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