Issued: July 25, 2007

Southwest Climate Outlook

THE UNIVERSITY OF ARIZONA.

Source: Gregg Garfin, Institute for the Study of Planet Earth

Photo Description: Convective thunderstorm in central Tucson, July 21, 2007. The storm dropped 1.32 inches at the official National Weather Service Tucson International Airport observation station (elevation 2,550 feet), 1.54 inches on Mt. Lemmon (8,210 feet), and 0.25 inches at The University of Arizona weather station (2,478 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

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Monsoon

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The 2007 monsoon season began on July 8, approximately five days later than average, according to the National Weather Service (NWS) Tucson Weather Forecast Office. There is a tendency for late monsoons to record lower precipitation totals than early monsoons...

Drought

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The NOAA-CPC U.S. Seasonal Drought Outlook projects decreased drought conditions in the eastern two-thirds of Arizona, and persistent or intensifying drought conditions along Arizona's western third, chiefly Yuma, La Paz, and Mohave counties. Warmer-than-average temperatures...

Fire Outlook

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The monthly fire potential outlook from the National Interagency Coordination Center shows above-average fire potential for western New Mexico and all of Arizona for July 2007. Fire potential is expected to decrease throughout the August–October period...

July Climate Summary

Drought – Drought conditions remain at moderate to severe levels across Arizona again this month while most of New Mexico remains drought free. Extreme drought conditions have grown to include the western third of Arizona with decreasing intensity eastward into New Mexico.

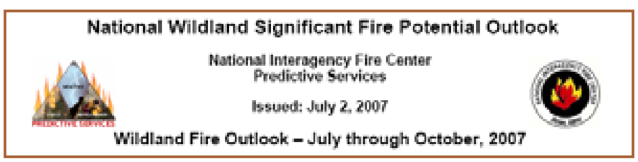
Temperature – Above-average temperatures dominated most of Arizona again this month with some locations reporting departures of 6–8 degrees F. New Mexico was generally near-average with far eastern sections slightly below-average.

Precipitation – Precipitation was spotty in New Mexico over the past thirty days with locations in northeastern and southeastern portions of the state reporting 150–400 percent of average. Many other locations saw only 25–50 percent of average precipitation. Arizona was below-average once again, with most locations reporting less than 75 percent of average.

Climate Forecasts – Temperature forecasts remain confident that much of Arizona and eastern New Mexico will see above-average temperatures throughout the summer. Seasonal precipitation forecasts reflect 'equal-chances' through October while the November–January period introduces a slight shift towards a higher chance of drier conditions for southern New Mexico and Arizona.

The Bottom Line – A slow start to the monsoon and above-average temperatures have done little to alleviate drought conditions across Arizona. New Mexico is hanging on to drought-free conditions across most of the state even with slightly below-average precipitation and above-average temperatures across western portions of the state. Monsoon thunderstorm precipitation has been growing in coverage and intensity over the past several weeks, which could bring drought relief to many parched areas through the next month.

New fire outlook summary



The National Interagency Coordination Center's (NICC) Predictive Services introduced a new National Wildland Significant Fire Potential Outlook summary. This monthly product forecasts seasonal fire potential for three-month periods using a classification scheme similar to that of the U.S. Seasonal Drought Outlook. The product includes input from predictive services units at 11 geographic areas around the United States and expert guidance from climate forecasters around the country. The outlook's multi-page discussions include summaries of past climate, forecasts, reports from geographic areas, historic wildland fire statistics, and predicted acres burned. The product is an extension of the National Seasonal Assessment Workshops developed by NICC, CLIMAS, and the Program for Climate, Ecosystem and Fire Applications (Desert Research Institute).

To view the outlook, visit http://www.nifc.gov/nicc/predictive/outlooks/montlhly_seasonal_outlook.pdf

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This work is published by the Climate Assessment for the Southwest (CLIMAS) project and the University of Arizona Cooperative Extension; and is funded by CLIMAS, Institute for the Study of Planet Earth, and the Technology and Research Initiative Fund of the University of Arizona Water Sustainability Program through the SAHRA NSF Science and Technology Center at the University of Arizona.

New divisions for monitoring and predicting climate

The following is an adaptation of an article by Klaus Wolter and Dave Allured, University of Colorado at Boulder, CIRES Climate Diagnostics Center, and NOAA-ESRL Physical Sciences Division. It appeared in the June 2007 issue of the Intermountain West Climate Summary .

Climatologists have long questioned the accuracy of the current climate divisions (CDs) in the United States in representing regional climate. To address their concerns, we embarked on a long-term effort in 2003 to create a more rational, statistically-based set of national CDs that would help improve drought monitoring and climate forecasting. The result, thus far, is an experimental map of new CDs that more accurately represents U.S. climate.

Near-real time climate monitoring, long-term climate change assessments, and statistical climate predictions are often based on data aggregated into CDs. CDs come from century-long efforts to organize climate observations across the country to match up with crop reporting districts, county lines, and/or drainage basins; the CD boundaries were finalized in the 1950s. Perhaps surprisingly, given their use, climate, based on objective groupings of long-term observations, was not the primary consideration in determining the CD boundaries (Guttman and Quayle, 1996).

The vast majority of data used in climate analyses comes from stations that are part of the voluntary Cooperative Observer Program (COOP) at NOAA. This network of stations has been collecting daily high and low temperatures, precipitation, and snowfall since 1890. CD data are computed by simply averaging all available, representative COOP station data within each division since 1931 into single monthly values. Data prior to 1931 were derived from statistical relationships between current division data and state-wide averages. CDs

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Climate division methodology

In order to ascertain which climate stations have the tendency to exhibit the same climate anomalies, we performed analyses on temperature (T), precipitation (P), and combined records. We found that the last approach, with combined time series, yielded the best-defined climate regions.

From currently available records for 17,575 COOP stations in the lower 48 states, we selected 4,324 stations with both sufficient P and T records to perform statistical analyses for water years 1979–2006. For much of the U.S., this translates into at least one station per 1,000 square miles. Some less populated regions, such as the deserts in the Interior West, have less dense spatial coverage. We used several thousand more P COOP stations of similar quality for supportive analyses. In addition, there are more than 500 SNOTEL sites in the higher elevations of the western U.S. that have sufficient P records since 1979 to be analyzed as well. However, their T records typically only start in the late 1980s and have been somewhat unreliable. To develop new experimental climate divisions (CDs) we used five steps:

Step1. For every climate station, we computed average T and P totals for every three-month season from October 1978–September 2006. These 'sliding' seasons include all three month periods (i.e., October–December, November–January) within the 28-year record. Individual seasonal anomalies were calculated by subtracting the 28-year average for that same season. For missing data, anomaly values were set equal to zero to keep all station anomaly time series to the same length.

Step 2. Multivariate cluster analyses, a statistical method for grouping data in a way that yields a strong degree of association between members of the same cluster and a weak degree of association between members of different clusters (http://www.statsoft.com/textbook/stcluan.html), were used to find out which stations tended to experience climate anomalies of the same sign (i.e., above average or below average), based on correlation matrices among all of them. The two cluster analysis techniques applied here were Average Linkage and Ward's method, both well-established and superior to other methods (Wilks, 1995, pp. 419-428).

Step 3. Results from both clustering methods were compared against each other and used to group stations with similar T and P anomalies into core regions. A large majority of these cores could be identified by simple overlapping station counts, but some less clear-cut groupings were settled by correlating the respective cluster time series against each other. After this initial classification, core time series were computed based on normalized T and P time series (produced by taking each data value, subtracting from it the long-term average, then dividing by the standard deviation) at the station level. These were used to calculate correlation coefficients between all stations and all cores.

Step 4. The assignment of stations to cores was refined iteratively, until no changes occurred. In particular, if a station was not classified as belonging to a core, but correlated highly with a nearby core, it was admitted to that core; or if a station had been classified as being inside a core, but did not correlate highly with the core time series, it was removed from that core. (This was a rare event in

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Climate divisions, continued

are used in many climate-related monitoring products, like the U.S. Drought Monitor (see page 8), because they allow for an easy calculation of regional averages and a comparison of recent climate anomalies against a century-long record. The NOAA Climate Prediction Center (CPC) has used so-called "mega-divisions," which are based on merging smaller CDs, as targets for climate predictions and for verifying forecasts.

The 344 U.S. CDs allow for up to ten divisions per state; however, they cover the conterminous United States rather unevenly (Figure 1a). Many states, such as Wyoming and Idaho, have ten divisions, but some rather large states do not. Arizona, a large state with complex topography, is represented by only seven CDs, some of which may not accurately represent regional climates. For example, the northeast third of the state, from the Mogollon Highlands and San Francisco Peaks, across the Painted Desert to the Four Corners is represented by a single division. Similarly, the southeastern Arizona CD stretches from the parched deserts of Organ Pipe National Monument, across the lofty Sky Island mountain ranges to the Gila River headwaters. Decisions about how to organize CDs were made on a state-by-state basis rather than from a national perspective (Guttman and Quayle, 1996).

Although the CD data provide a long, consistent, and gap-free record, climatologists have long questioned the assumption that the simple averaging of COOP stations into CDs is optimal for depicting regional climate, especially precipitation. To examine this issue, we correlated individual COOP station data with divisional averages (Figure 1b). Results show that much of the high elevation Interior West, especially along the Rocky Mountains down into New Mexico, is not well represented by divisional averages. During the winter

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Figure 1a. The 344 climate divisions currently in use for the conterminous United States. For more information visit http://www.cdc.noaa.gov/USclimate/USclimdivs.html.

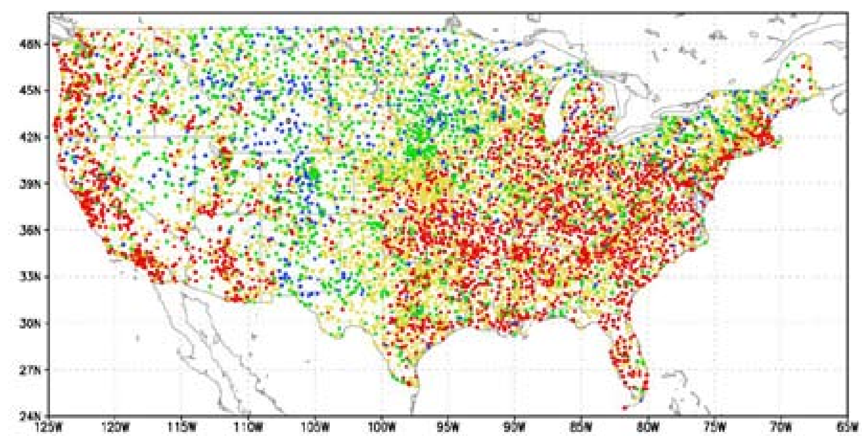


Figure 1b. Seasonal correlations between climate division time series and COOP station time series during January–March 1979–2002. Green and blue dots show that divisional indices account for less than 50 percent of the local seasonal precipitation variance (i.e., values less than 0.5).

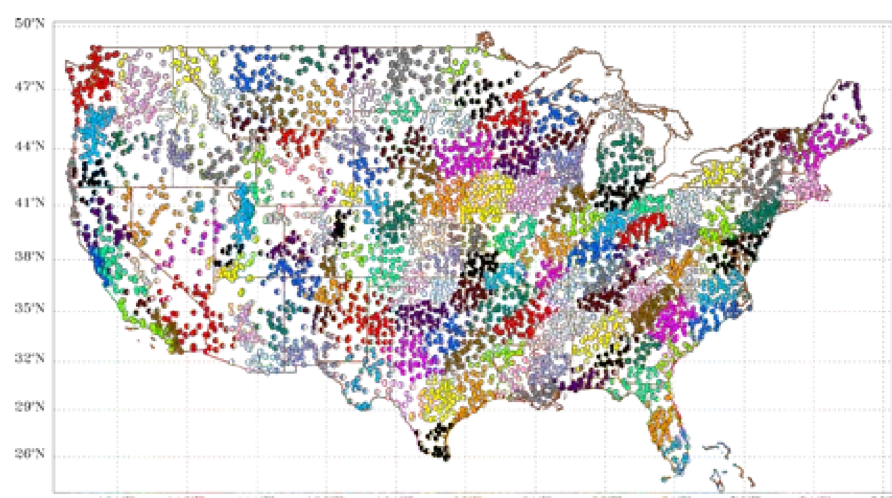


Figure 1c. Near-final map of new climate divisions, based on temperature and precipitation station data. Each dot is a COOP station, and a cluster of dots of the same color represents a new climate division. For more information visit: http://www.cdc.noaa.gov/people/klaus.wolter/ClimateDivisions/

Climate divisions, continued

snow accumulation season in parts of the Interior West, there are poor correlations between individual stations and the associated CD (Figure 1b), and the situation is even worse in the summer.

Low correlations between individual COOP stations and divisional averages translate into poor reliability when large-scale drought assessments or ENSO-related forecasts based on these divisions are scaled down to the station level. This is one reason why drought monitoring and seasonal climate forecasting are difficult in the Interior West. In addition, some of the higher elevation Snowpack telemetry (SNOTEL) sites, operated by the USDA Natural Resource Conservation Service, may correlate negatively with their CD time series. This is due to orographic effects in high mountain areas: during the winter season, strong westerly winds yield large snowfall amounts on the windward side of mountain ranges, while the valleys to the east may experience windstorms and dryness. Because most COOP stations are located in valleys, CD averages may end up with precipitation deficits when compared with long-term averages, whereas SNOTEL-based precipitation assessments may show precipitation surpluses. This type of precipitation pattern is not well captured by the current CDs.

Analogous maps for seasonal temperature correlations do not show the same disparity between station and CD data, most likely because temperature variations are similar over larger regions than precipitation variations. Nevertheless, wintertime regional temperature anomalies are also not well represented by climate divisions in the orographic regions of the Interior West.

In 2003, we launched a project to create a different set of national CDs that would help improve drought monitoring and climate forecasting in the U.S. (see sidebar for methodology). The result is a map of new CDs, based on temperature and precipitation station data, which are no longer bounded by state lines (Figure 1c). Note the divisions along the borders of California, Arizona, Utah, Nevada, New Mexico, and Texas. For example, the map shows divisions that encompass the climatic similarity of the southeast corner of Arizona and the southwest corner of New Mexico. Both have similar ecosystems and year-to-year precipitation variations.

In addition, there is no upper limit of ten divisions per state. One of the goals of this project was to integrate SNOTEL sites into the analysis. We found that SNOTEL data correlates well with the new CDs, and most of the SNOTEL sites match up nicely with the nearest COOP-based CD.

With the creation of the joint temperature and precipitation maps (Figure 1c), this project is almost complete. The remaining stage is to fine-tune the new division boundaries with precipitation data from SNOTEL and precipitation-only COOP stations. For more information on the new climate divisions, visit the NOAA Earth System Research Laboratory web site (Figure 1c). We are working on the additional products, including additional time series of temperature and precipitation averages in each new climate division, from 1978–2006, and from 1948–1978, based on new climate divisions for that period, and final new climate division maps, including boundaries, spatial coverages (in percent of area), and new state-wide averages.

References

Guttman, N.B., and R.G. Quayle, 1996. "A historical perspective of U.S. climate divisions." *Bulletin of the American Meteorological Society*, 77, 293–304.

Wilks, D.S., 1995. *Statistical Methods in the Atmospheric Sciences*. Academic Press, San Diego, 467pp.

Methodology, continued

the combined analysis suite, but more common in P analyses). A third scenario involved the transfer of a station from one core to another, if its correlation with the new core was substantially higher than with the old core.

Step 5. While there was some experimentation with correlation thresholds, the basic procedure always remained the same and yielded similar results. Transfers between core regions required at least a 1 percent increase in explained variance for that station, and the drop-correlation threshold had to be lower than the add correlation threshold. The final correlation thresholds were in the 0.55–0.60 range, to allow for virtually all stations to be classified. One final check consisted in correlating all new CD time series against each other to flag regions that were extremely well correlated (r>0.90) and thus prime candidates for mergers, as long as the resulting new division did not exceed certain size limitations.

The current version of the new 139 combined core regions (i.e., new CDs) for water years 1979–2006 is shown in Figure 1c. From the pool of 4,324 COOP stations with sufficient temperature and precipitation data, the initial core map classified 3,112 stations as being within 145 initial clusters (Step 3). Using the iterative methodology described above, the remaining stations were gathered into core regions, resulting in a stable classification of all but one station by the seventh iteration in 139 final core regions (Steps 4 and 5; Figure. 1c). While there was no requirement for stations within a core to be spatially adjacent to each other, it is reassuring to see that virtually all of them are indeed neighbors, even in the more diverse terrain of Wyoming, Colorado, Utah, and New Mexico.

Temperature (through 7/18/07)

Source: High Plains Regional Climate Center

Temperatures across much of New Mexico continue to be 0–5 degrees Fahrenheit below average for the water year that began October 1, 2006, due to frequent cloud cover and precipitation during the year (Figures 1a–b). That pattern has changed slightly, with the north-central mountains seeing above-average temperatures in the past month because of drier conditions. Arizona temperatures for the water year remain a mirror image of New Mexico, with virtually all locations logging temperatures of 1–4 F degrees above average. The precipitation patterns during the water year are still key to the temperatures, as dry conditions have persisted in Arizona while New Mexico has been extremely wet.

The 30-day temperature pattern is unchanged from last month for Arizona, with temperatures ranging from 0–8 degrees F above average (Figures 1c–d). Temperatures have been at or above 110 degrees F in Phoenix every day for the past 30 days. The extreme temperatures are due to the late arrival of monsoon moisture. Skies have remained clear across most areas of the state, with only isolated rainfall in the mountains.

In contrast, the relatively cool pattern in New Mexico has started to break, as western New Mexico had temperatures of 0–8 degrees F above average. The eastern counties continue to be 0–4 degrees below average. At various locations, 15 of the past 28 days have been above 100 degrees, and 26 days have been rainy and cloudy.

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 '06–'07 (through July 18, 2007) average temperature.

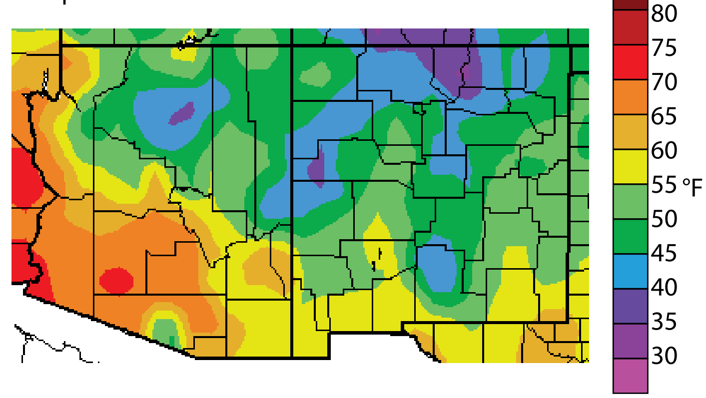


Figure 1b. Water year '06–'07 (through July 18, 2007) departure from average temperature.

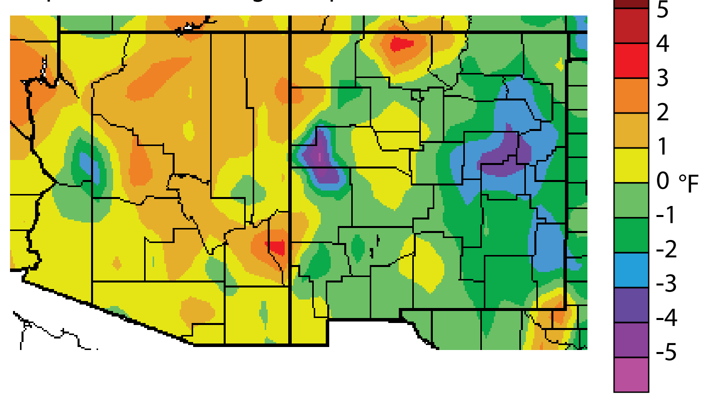


Figure 1c. Previous 30 days (June 19–July 18, 2007) departure from average temperature (interpolated).

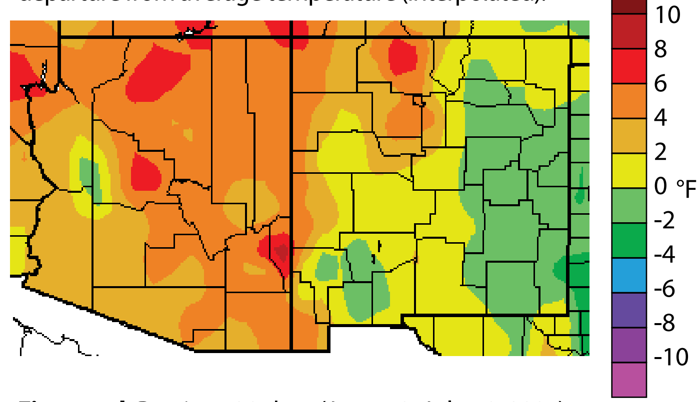
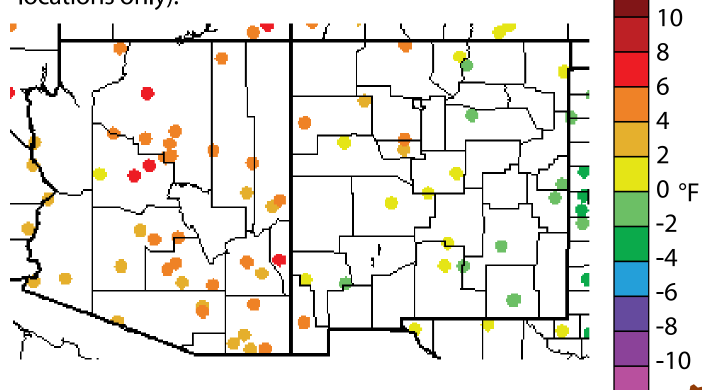


Figure 1d. Previous 30 days (June 19–July 18, 2007) departure from average temperature (data collection locations only).



Precipitation (through 7/18/07)

Source: High Plains Regional Climate Center

New Mexico has received 110–200 percent of average precipitation for the water year almost everywhere except the northeast quadrant (Figures 2a–b). In Arizona, precipitation has generally been 50–90 percent of average in the eastern half of the state, but only 5–50 percent of average across the western half of the state. These dry conditions are unchanged from last month's outlook because of the late and weak start to the monsoon in the state. Very little moisture has moved through Arizona this year, due to unusual upper air patterns; consequently, cold fronts have been unable to generate precipitation in the state. New Mexico, on the other hand, has had significant moisture inflow through Texas, with storms triggered by frontal activity or convection from surface heating, resulting in a wetter-than-average water year.

June and July have been extremely dry in Arizona (Figures 2c–d). Rainfall has totaled up to 50 percent of average everywhere except the southeast corner, which has benefited from the northeasterly flow of moisture from New Mexico and occasional southwesterly moisture flow from Mexico. Until a surge of moisture moves through Yuma, dry conditions will continue in southwest Arizona. In New Mexico, precipitation over the past 30 days has been highly variable, ranging generally from 25 to 800 percent of average. A few isolated pockets have seen less than 25 percent of average.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2006, we are in the 2007 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 '06–'07 (through July 18, 2007) percent of average precipitation (interpolated).

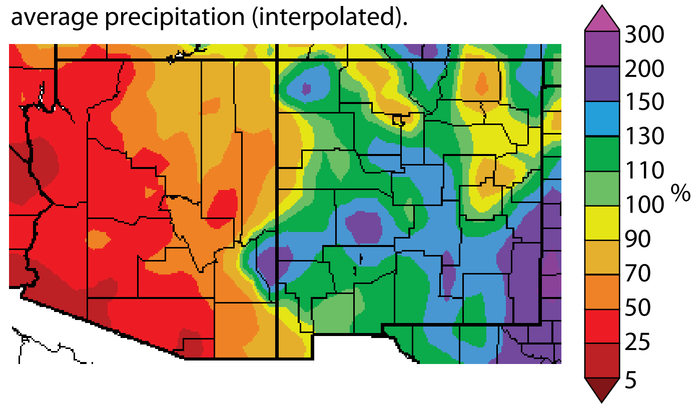


Figure 2b. Water year '06–'07 (through July 18, 2007) percent of average precipitation (data collection locations only).

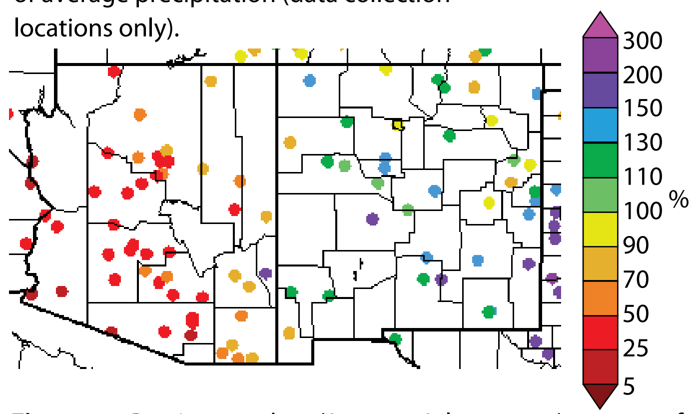


Figure 2c. Previous 30 days (June 19–July 18, 2007) percent of average precipitation (interpolated).

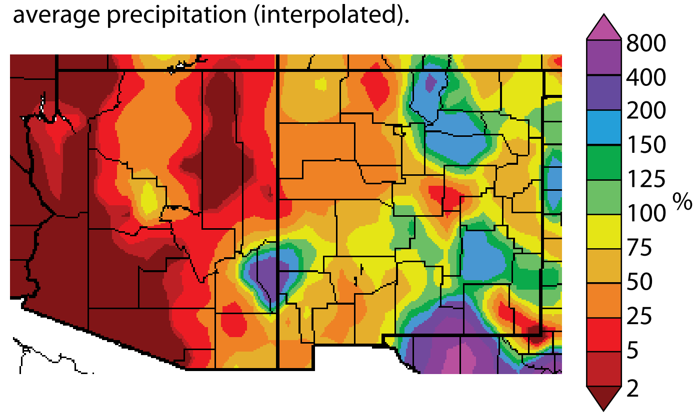
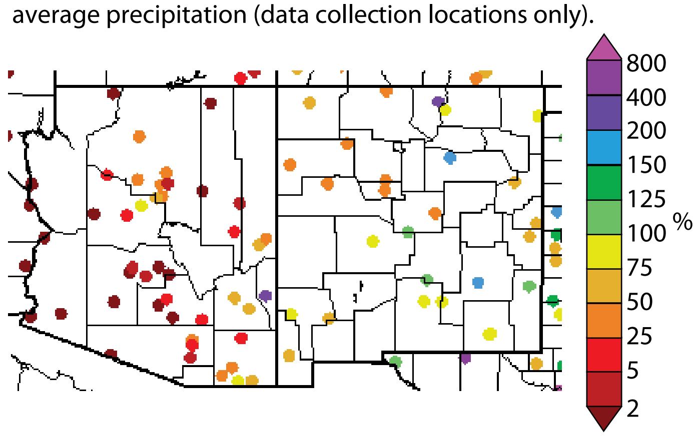


Figure 2d. Previous 30 days (June 19–July 18, 2007) percent of average precipitation (data collection locations only).



U.S. Drought Monitor
(released 7/19/07)

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

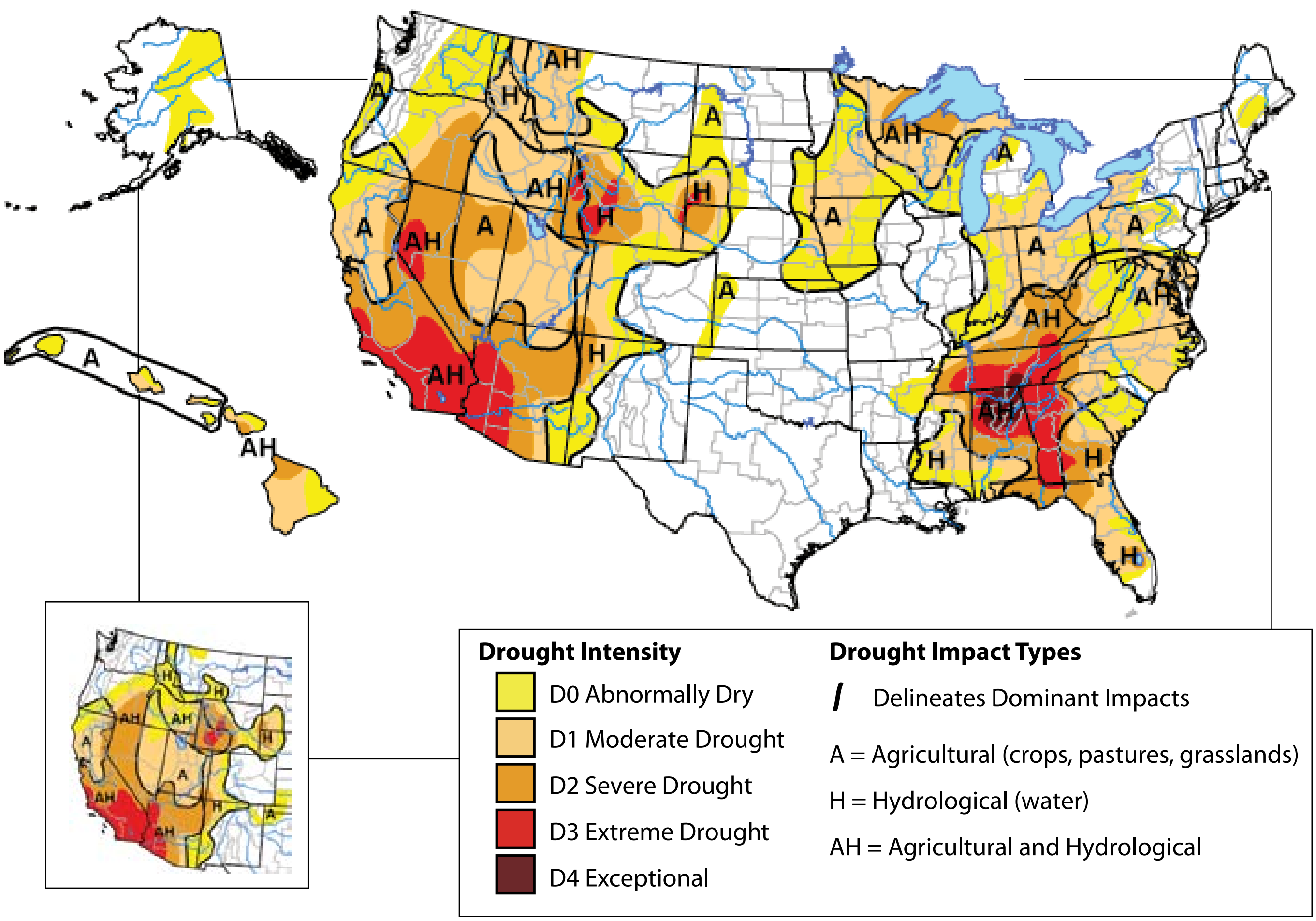
Drought conditions remain largely unchanged across Arizona and New Mexico since last month (Figure 3). All of Arizona is experiencing some level of drought with only extreme western portions of New Mexico observing abnormally dry to moderate drought conditions. Almost 90 percent of Arizona is classified as experiencing at least moderate drought conditions, with one-third of the state under extreme drought. The only changes from last month occurred in Yavapai County, Arizona, where conditions were upgraded from severe to extreme based on reports of local drought impacts and continued below-average precipitation amounts. Drought conditions across New Mexico remain confined to the far western portions of the state. Less than 10 percent of New Mexico is experiencing moderate or severe drought conditions, based on the latest National Drought Monitor analysis.

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 Brad Rippey, U. S. Department of Agriculture.

Figure 3. Drought Monitor released July 19, 2007 (full size) and June 21, 2007 (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 5/31/07)

Source: Arizona Department of Water Resources

Drought conditions continue to be moderate to severe over much of Arizona (Figure 4a). There were no changes between the May and June Arizona drought reports, indicating that conditions neither worsened nor improved into June. The most intense drought conditions across the state continue to be observed at longer timescales, as seen in the long-term drought map (Figure 4b). Rankings of average precipitation and streamflow levels in the 2- to 4- year (long-term drought) window continue to depict the Little Colorado, Verde, San Simon, Agua Fria, and Santa Cruz watersheds as experiencing severe drought conditions. Short-term conditions are slightly better with only the Bill William and Verde watersheds ranked as experiencing severe drought (Figure 4a). Every watershed in the state is classified with some form of short-term drought except the White Water Draw watershed in extreme southeast Arizona.

Reports of drought impacts continue to come in from Yavapai County. Both long and short-term drought status reflect severe conditions in Yavapai County's portions of the Verde and Bill Williams watersheds. Range conditions continued to deteriorate through June due to hot and dry conditions. The little rain that fell during the month quickly evaporated and did little to promote the growth of vegetation. Drought-related wildlife impacts are emerging in the area. Pronghorn antelope appear thin and are moving to residential landscapes to find food and water. The seasonal emergence of grasshoppers is also stressing forage supplies as these insects devour many hay fields and rangeland areas.

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/Content/Hot_Topics/Agency-Wide/Drought_Planning/

Figure 4a. Arizona short-term drought status for June 2007.

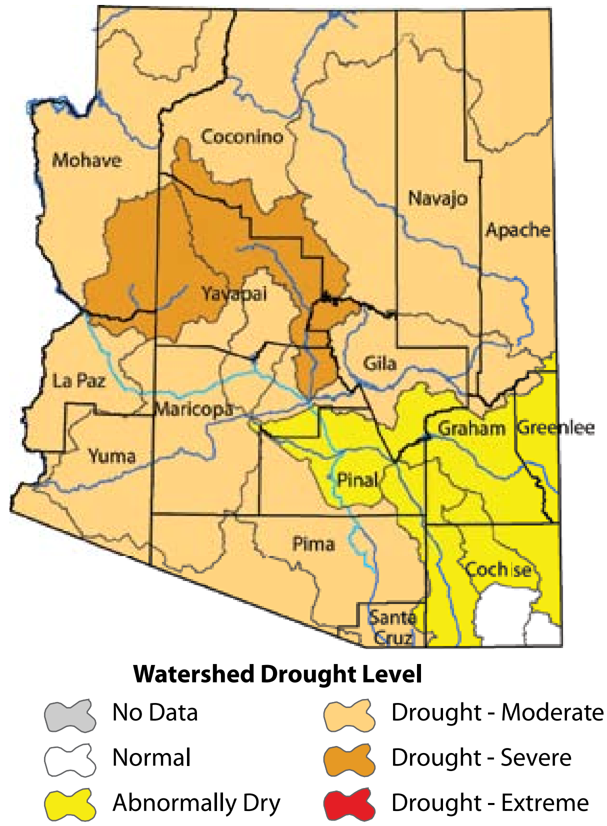
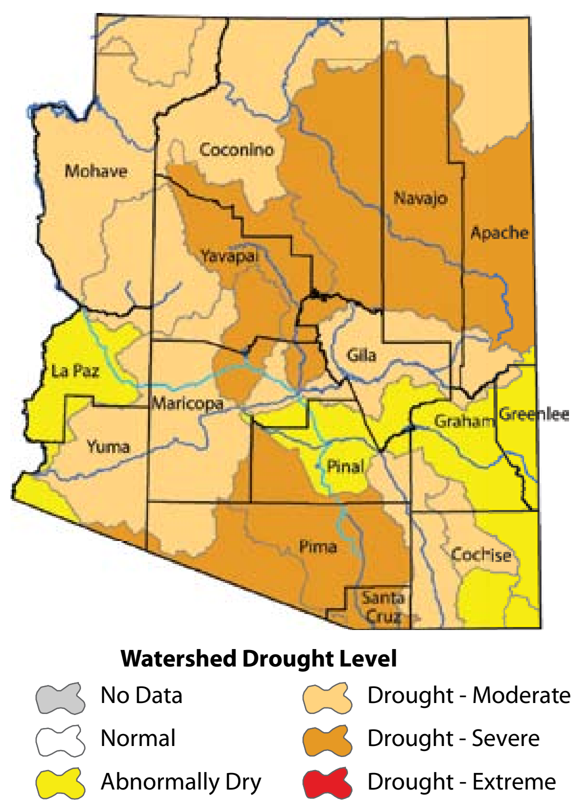


Figure 4b. Arizona long-term drought status for June 2007.



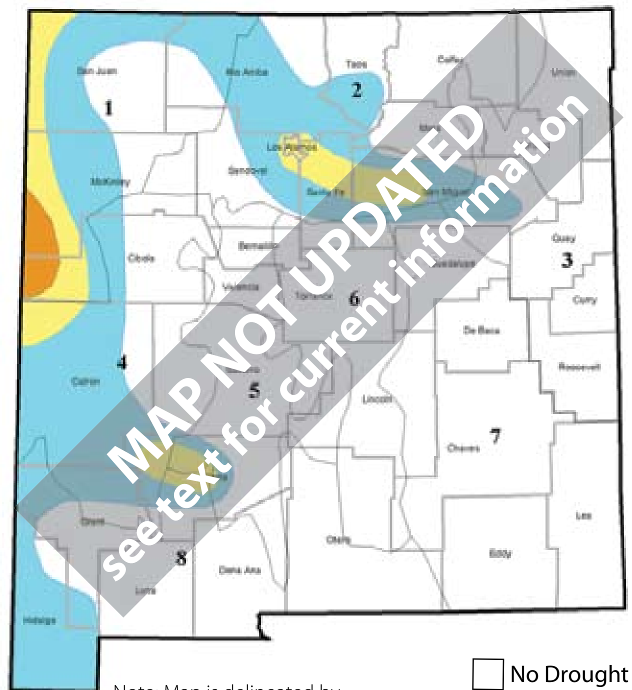
New Mexico Drought Status
(through 6/30/07)

Source: New Mexico Natural Resources Conservation Service

An updated July 2007 New Mexico drought status map was not available, but conditions appear to be the same as last month across the state, according to the National Drought Monitor. Most of the state remains drought free except for extreme western and northwestern portions of the state. Precipitation totals have been below-average for the western half of New Mexico over the past thirty days which may intensify the advisory and alert conditions reported on the June 2007 New Mexico Drought Status map. Precipitation has been above-average across central and southeastern New Mexico, which should help these areas remain drought free in the short-term.

A recent news report featured in *USA Today* (July 15) noted that xeriscaping—landscaping with plants that are appropriate for the arid climate of the Southwest—is catching on in New Mexico and Arizona. George Radnovich, president of the Xeriscape Council of New Mexico, noted that up to 50 percent of residential water use is tied to watering landscaping and lawns and that the move towards plants that need less water could provide up to a 50 percent water savings. Radnovich was quoted as saying that he used up to 30 gallons a minute to water his plants when he first moved to New Mexico. His move to xeriscaping has cut that rate to 30 gallons per week.

Figure 5. Short-term drought map based on meteorological conditions for June 2007.



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

No Drought
Advisory
Alert
Warning
Emergency

Notes:

The New Mexico drought status map is produced monthly by the New Mexico State Drought Monitoring Committee. When near-normal conditions exist, they are updated quarterly. The map is based on expert assessment of variables including, but not limited to, precipitation, drought indices, reservoir levels, and streamflow.

Figure 5 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).

On the Web:

For the most current meteorological drought status map, visit:
http://www.srh.noaa.gov/abq/feature/droughtinfo.htm

For the most current hydrological drought status map, visit:
http://www.nm.nrcs.usda.gov/snow/drought/drought.html

Arizona Reservoir Levels

(through 6/30/07)

Source: National Water and Climate Center

Reservoir conditions have changed very little since last month across Arizona. Signals are mixed with respect to changes in storage with large reservoirs on the Colorado River. Lake Mead is up to 53 percent from 52 percent from last month, while Lake Powell fell from 50 percent to 49 percent of total storage. Tom Ryan of the Bureau of Reclamation noted that inflow to Lake Powell was below-average over the past month but was slightly exceeding forecasted amounts.

Total water year projections through September indicate that inflows will be about 70 percent of average for October 2006 through September 2007. Heavy localized storms in October 2006 boosted overall water year inflows to Lake Powell by raising the reservoir level by 6.2 feet, according to Ryan. Smaller reservoirs across the rest of Arizona saw declines from May to June. Both the Salt River System and the San Carlos Reservoir saw significant drops of 4 to 5 percent of total storage.

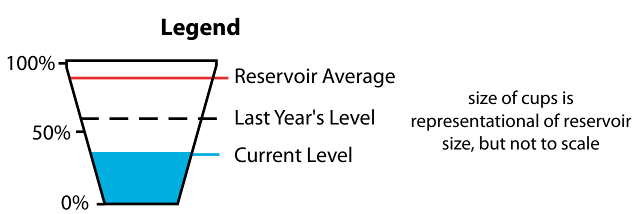
Notes:

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. The last column of the table list an increase or decrease in storage since last month. A line indicates no change.

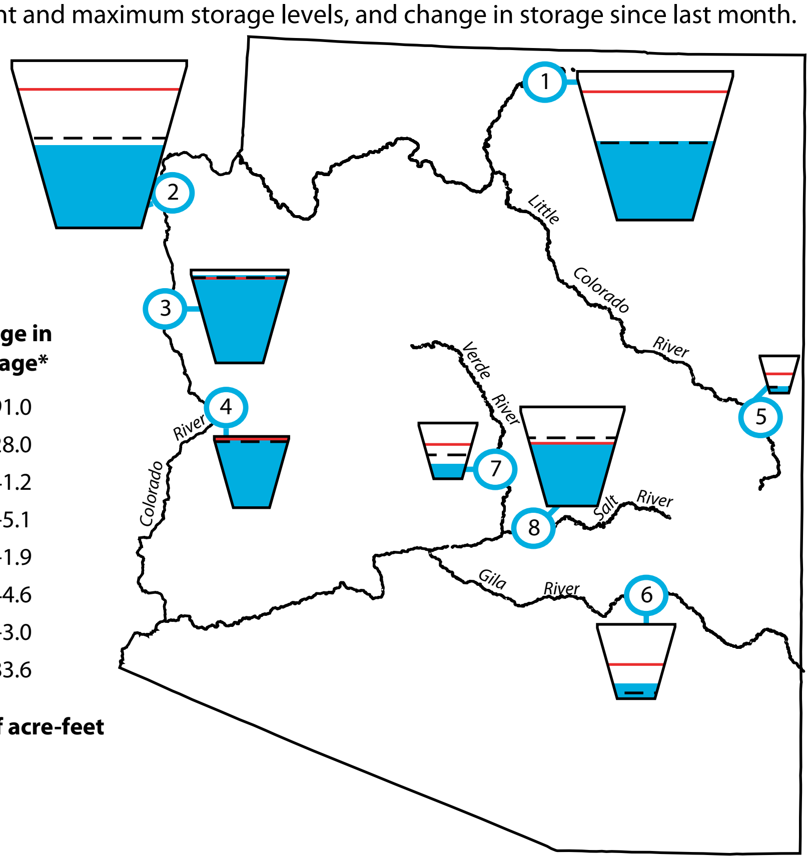
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tom.pagano@por.usda.gov; 503-414-3010) or Larry Martinez, Natural Resource Conservation Service, 3003 N. Central Ave, Suite 800, Phoenix, Arizona 85012-2945; 602-280-8841; Larry.Martinez@az.usda.gov).

Figure 6. Arizona reservoir levels for June 2007 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	53%	12,882.0	24,322.0	191.0
2. Lake Mead	49%	12,735.0	26,159.0	-228.0
3. Lake Mohave	94%	1,693.0	1,810.0	-41.2
4. Lake Havasu	95%	585.8	619.0	-5.1
5. Lyman Reservoir	19%	5.8	30.0	-1.9
6. San Carlos	21%	183.1	875.0	-44.6
7. Verde River System	26%	75.1	287.4	-3.0
8. Salt River System	62%	1,257.5	2,025.8	-83.6

*** 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

New Mexico Reservoir Levels

(through 6/30/07)

Source: National Water and Climate Center

Reservoir levels across New Mexico have generally leveled off this past month in comparison to reports from June. Many reservoirs experienced significant gains in storage this past spring due to above-average winter and spring precipitation. This appears to be coming to an end, according to observations from May to June. Only Heron, Lake Avalon, and Costilla reservoirs showed increasing levels from May to June; seven other reservoirs reported decreasing storage levels. The Caballo and Brantley reservoirs saw the largest declines, falling 11 percent and 6 percent respectively. Remaining reservoirs generally fell by less than 2 percent, with the Santa Rosa holding steady at 20 percent of total capacity.

Notes:

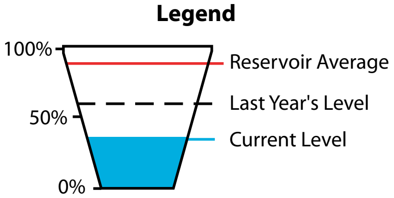
The map gives a representation of current storage levels for reservoirs in New Mexico. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total 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. 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. For additional information, contact Tom Pagano at the National Water Climate Center (tom.pagano@por.usda.gov; 503-414-3010) or Dan Murray, NRCS, USDA, 6200 Jefferson NE, Albuquerque, NM 87109; 505-761-4436; Dan.Murray@nm.usda.gov).

Figure 7. New Mexico reservoir levels for June 2007 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.

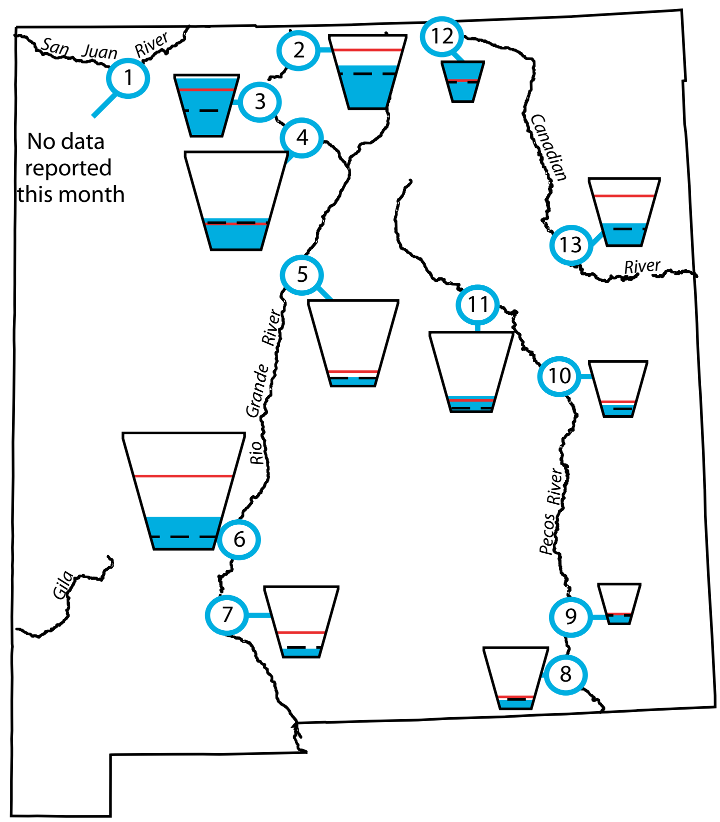
Legend



size of cups is representational of reservoir size, but not to scale

Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Navajo	No Navjo data reported this month			
2. Heron	59%	234.8	400.0	20.9
3. El Vado	94%	174.8	186.3	-4.8
4. Abiquiu	32%	179.7	554.5	-2.4
5. Cochiti	10%	51.4	502.3	-7.8
6. Elephant Butte	28%	579.2	2,065.0	-17.6
7. Caballo	12%	40.9	331.5	-35.0
8. Brantley	15%	22.2	147.5	-9.5
9. Lake Avalon	22%	1.3	6.0	0.3
10. Sumner	21%	21.9	102.0	-2.7
11. Santa Rosa	20%	90.1	447.0	-0.2
12. Costilla	99%	15.8	16.0	1.4
13. Conchas	33%	84.1	254.0	-3.4

*** thousands of acre-feet**



On the Web:

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

Southwest Fire Summary

(updated 7/18/07)

Source: Southwest Coordination Center

Despite several substantial fires since early July, Arizona and New Mexico continue to log fewer large fires and fewer acres burned than average (Figure 8a). Total acres burned are about as low as the totals for the 2001 fire season, which produced a remarkably low total acres burned in comparison to 2002–2006. The Alambre Fire, in the Quinlan Mountains of southern Arizona, drew attention due to its relatively large size for this season (7,267 acres), and its proximity to the Kitt Peak National Observatory. Fire managers have been able to take advantage of conditions in New Mexico to treat more than 60,000 acres through a combination of prescribed fire and wildland fire use—that is, not extinguishing a fire if it can be controlled and used to meet management objectives to improve forest health and fire safety.

Large fuel moisture (not shown) is below average for much of the region, especially across western Arizona into the western Great Basin. Recent National Fire Danger Ratings are mostly in the low-to-moderate categories for most of Arizona and New Mexico.

Buffelgrass remains a concern in southern Arizona. This fine herbaceous non-native plant can be found in high densities in desert foothills areas, and, if within 30 feet of structures, can elevate fire danger. Wildfires burning in buffelgrass can generate temperatures of 800–1,200 degrees Fahrenheit—twice as hot as the typical 400- to 700-degree wildfire—and flames up to 20 feet high (*Arizona Daily Star*, July 12). For more information, visit http://www.buffelgrass.org.

Figure 8a. Year-to-date fire information for Arizona and New Mexico as of July 16, 2007.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	972	21,504	365	34,269	1,337	55,773
NM	431	24,949	368	9,231	799	34,180
Total	1,403	46,453	733	43,500	2,136	89,953

Figure 8b. Arizona large fire incidents as of July 18, 2007.

Figure 8c. New Mexico large fire incidents as of July 18, 2007.

Notes:

The fires discussed here have been reported by federal, state, or tribal agencies during 2007. The figures include information both for current fires and for fires that have been suppressed. Figure 8a shows a table of year-to-date fire information for Arizona and New Mexico. Prescribed burns are not included in these numbers. Figures 8b and 8c 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.htm
http://gacc.nifc.gov/swcc/predictive/intelligence/daily/ytd_large.htm

Monsoon Summary
(through 7/17/2007)

Source: Western Regional Climate Center

The 2007 monsoon season began on July 8, approximately five days later than average, according to the National Weather Service (NWS) Tucson Weather Forecast Office. There is a tendency for late monsoons to record lower precipitation totals than early monsoons, with late monsoons usually peaking during August.

Through July 18, monsoon precipitation totals were below average at most long-term NWS Cooperative Observer sites in southeastern Arizona (Figure 9a–c). The exception is the Clifton station, which recorded 3.21 inches of rainfall since June 15, compared to an average of 1.28 inches for the same period (Figure 9a). Most locations in Arizona reported monsoon precipitation deficits of around -0.30 inches to over 1 inch. As of July 19, locations in south- and north-central New Mexico have received above-average monsoon season precipitation, whereas most of the rest of the state has recorded monsoon precipitation deficits of -0.25 to -0.75 inches (Figure 9b).

The U.S. House of Representatives approved $14 million for flood control in Tucson's Arroyo Chico (Fox-11 News, July 17). The flood control runs through 11 miles of Tucson's urban core. The project will help address flood hazards such as those experienced by Tucsonans during the 2005 and 2006 monsoon seasons.

High-intensity monsoon season thunderstorms account for approximately two-thirds of the all-time heavy rainfall events since 1881 at El Paso, according to the National Weather Service.

Figure 9a. Total precipitation in inches July 1–July 17, 2007.

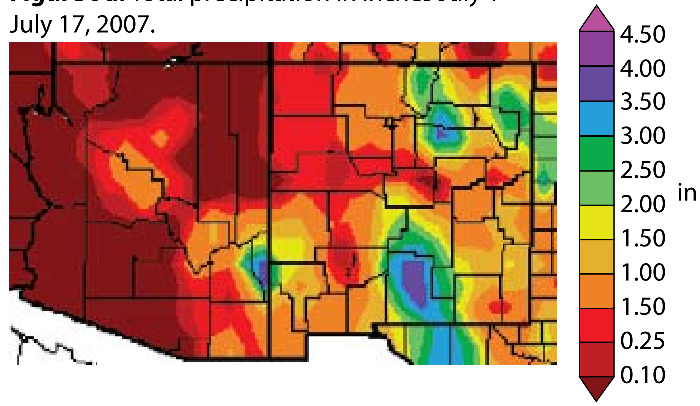


Figure 9b. Departure from average precipitation in inches July 1–July 17, 2007.

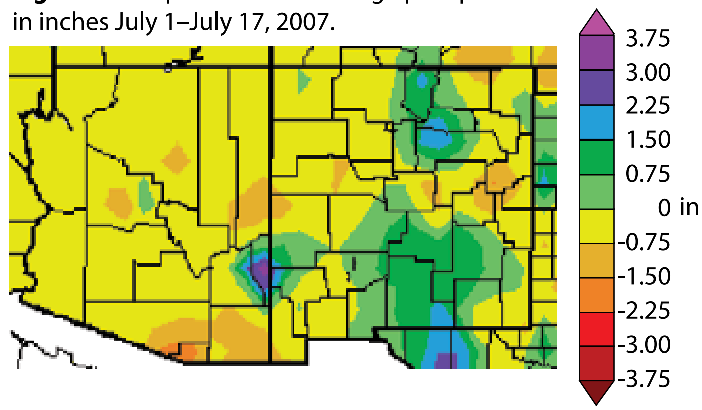
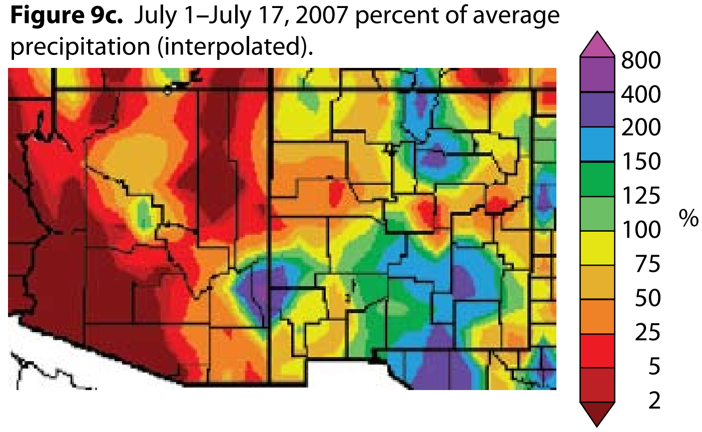


Figure 9c. July 1–July 17, 2007 percent of average precipitation (interpolated).



Notes:

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

The continuous color maps (Figures 9a–c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. Interpolation procedures can cause aberrant values in data-sparse regions. The data used to create these maps is provisional and have not yet been subjected to rigorous quality control.

On the Web:

These data are obtained from the Western Regional Climate Center: http://www.wrcc.dri.edu

Temperature Outlook

(August 2007–January 2008)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC long-lead forecasts predict an increased likelihood of above-average temperatures for much of the Southwest for the August–January period (Figures 10a–d). According to Klaus Wolter of the NOAA-CIRES Climate Diagnostics Center, this reflects both long-term trends and a lack of soil moisture that would otherwise moderate temperatures in the region. The greatest probability for above-average temperatures is in Arizona during most of this time period. New Mexico will also see an increased chance of above-average temperatures from September 2007 to January 2008, although the predicted likelihood of such conditions is somewhat lower for most of that period, especially in the northeastern corner of the state (Figures 10b–d). Overall, these forecasts suggest that the Southwest can expect an increased chance of above-normal temperatures for the foreseeable future.

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 August–October 2007.

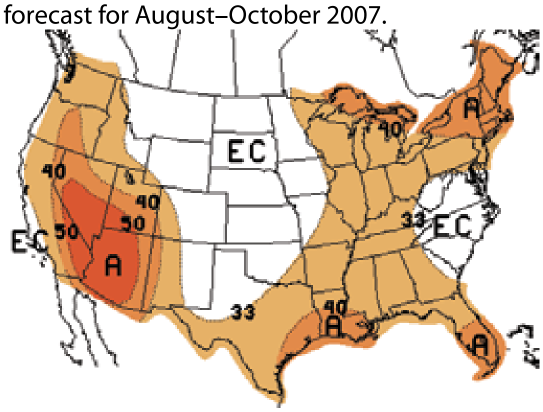


Figure 10b. Long-lead national temperature forecast for September–November 2007.

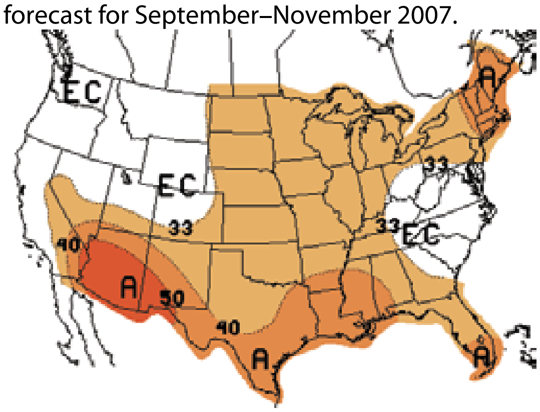


Figure 10c. Long-lead national temperature forecast for October–December 2007.

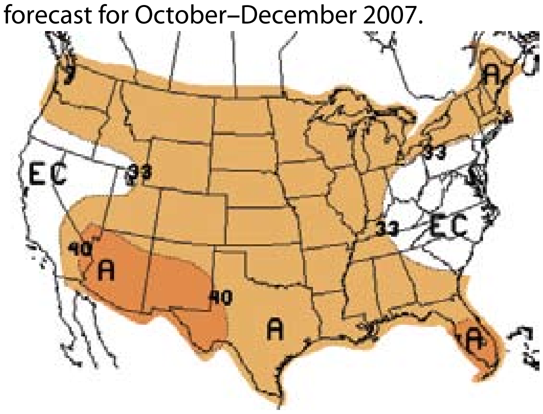
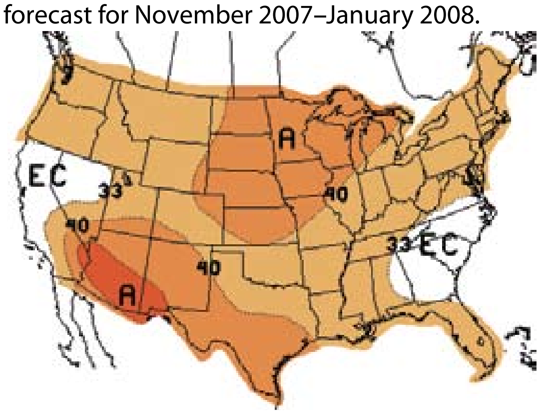


Figure 10d. Long-lead national temperature forecast for November 2007–January 2008.



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

EC= Equal chances. No forecasted anomalies.

On the Web:

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

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

Precipitation Outlook

(August 2007–January 2008)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC forecasts for August–January predict equal changes of below-average, average, and above-average precipitation across the most of the Southwest and, indeed, much of the nation (Figures 11a–d). However, the November–January forecast indicates an increased probability of below-average precipitation for southern Arizona and southern New Mexico over that time period (Figures 11d).

This forecast is consistent with an expected shift from ENSO neutral conditions to weak La Niña conditions in the late summer to early fall (see Figure 14b). NOAA-CPC also continues to predict an increased probability of below-average precipitation for the northwestern states through October, as well as an increased chance of above-average precipitation across the Gulf Coast and most of the eastern seaboard through November (Figures 11a–b).

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 August–October 2007.

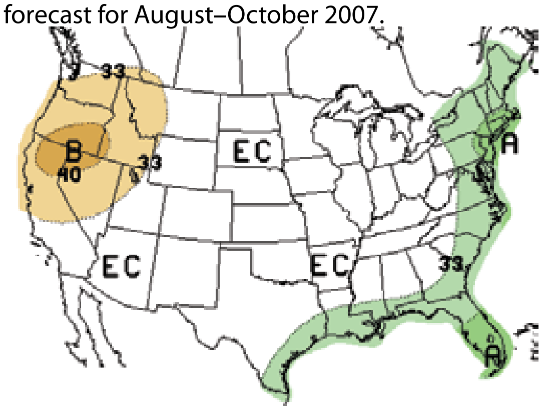


Figure 11b. Long-lead national precipitation forecast for September–November 2007.

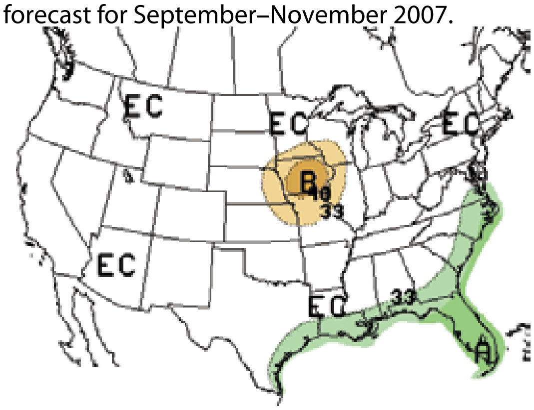


Figure 11c. Long-lead national precipitation forecast for October–December 2007.

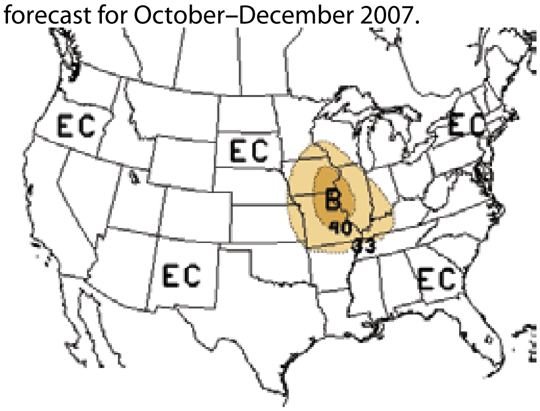
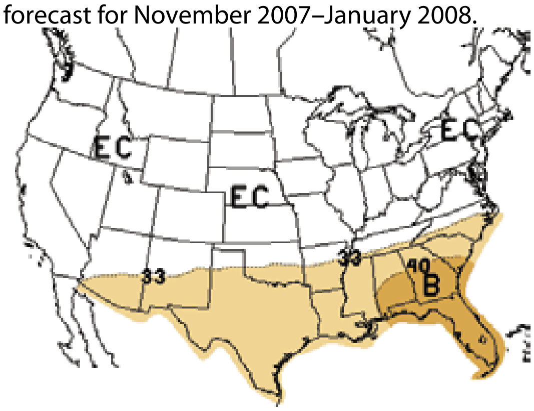


Figure 11d. Long-lead national precipitation forecast for November 2007–January 2008.



A= Above: 40.0–49.9% / 33.3–39.9%

B= Below: 33.3–39.9% / 40.0–49.9%

EC= Equal chances. No forecasted anomalies.

On the Web:

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

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

Seasonal Drought Outlook
(through October 2007)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC U.S. Seasonal Drought Outlook projects decreased drought conditions in the eastern two-thirds of Arizona, and persistent or intensifying drought conditions along Arizona's western third, chiefly Yuma, La Paz, and Mohave counties. Warmer-than-average temperatures and low winter and recent precipitation totals (see Figures 2a–d) have intensified drought conditions and increased the potential for wildland fires (see Figure 13a). Moreover, forecasts show increased chances of above-average temperatures in this region for the next several seasons (see Figures 10a–d).

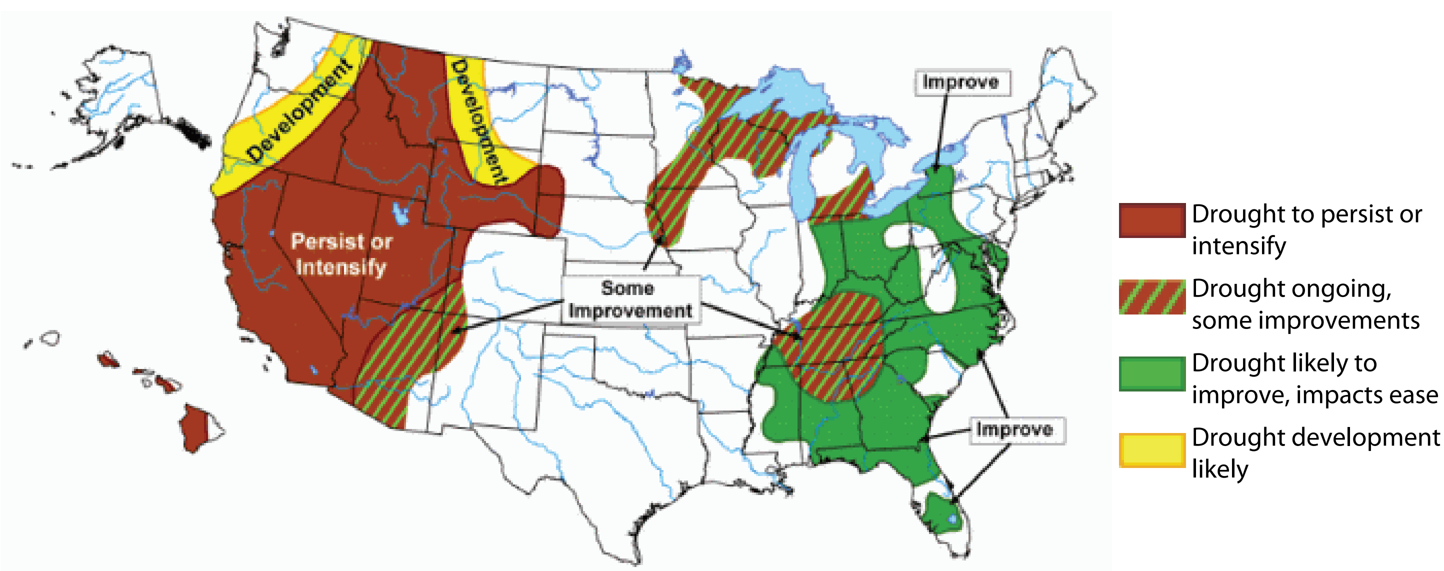
In July, drought conditions spurred a number of calls for water conservation. In mid-July, Arizona American Water requested customers in Bullhead City, Arizona's Desert Foothills Estates, and Laughlin Ranch to conserve water until further notice due to low well levels (*Tri-State Online*, July 13).

Pima County, Arizona, re-affirmed a Stage One Drought declaration for unincorporated areas (KOLD-TV News, July 9). Stage one drought asks residents to voluntarily cut water use; restaurants are asked to provide water only upon request, and hotels and motels are urged to conserve water. Water wasters can be fined $250.

New Mexico State University researchers have created a desalination system that could provide almost a million gallons of fresh water annually (enough to supply 25 homes with up to 100 gallons of water each per day), through a process that uses solar power, waste heat from appliances, and a vacuum system that allows water to boil at lower temperatures (*High Country News Online*, July 19). The method requires more energy than the more commonly used reverse-osmosis desalination, but energy use is offset by renewable energy power.

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 October 2007 (released July 19, 2007).



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

Wildland Fire Outlook

Sources: National Interagency Coordination Center, Southwest Coordination Center

The monthly fire potential outlook from the National Interagency Coordination Center shows above-average fire potential for western New Mexico and all of Arizona for July 2007. Fire potential is expected to decrease throughout the August–October period, with the exception of northwestern Arizona (Mohave County), where above-average fire potential is expected to persist. The main causes for concern include ongoing drought; low fuel moistures; high density of cured fine fuels, such as grasses; and lightning strikes and high winds associated with erratic monsoon outbreaks.

On July 18, the Southwest Coordination Center issued a Fuels and Fire Behavior Advisory for northern Arizona from Yavapai County west to the California border, and all across the Arizona-Utah border into northwestern New Mexico. The main concerns are low fuel moisture in this region, as well as a high loading of herbaceous and chaparral fuels, which include low, woody vegetation, such as manzanita and small evergreen oaks. Dry chaparral fuels can increase fire intensity and rate of spread.

Fire potential in our region is expected to diminish as monsoon humidity and precipitation increase during the summer. High fire potential is likely to persist or increase in major portions of the Great Basin, California, the Northern Rockies (Idaho, Montana), and the Pacific Northwest.

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

Figure 13a. National wildland fire potential for fires greater than 100 acres (valid July 1–31, 2007).

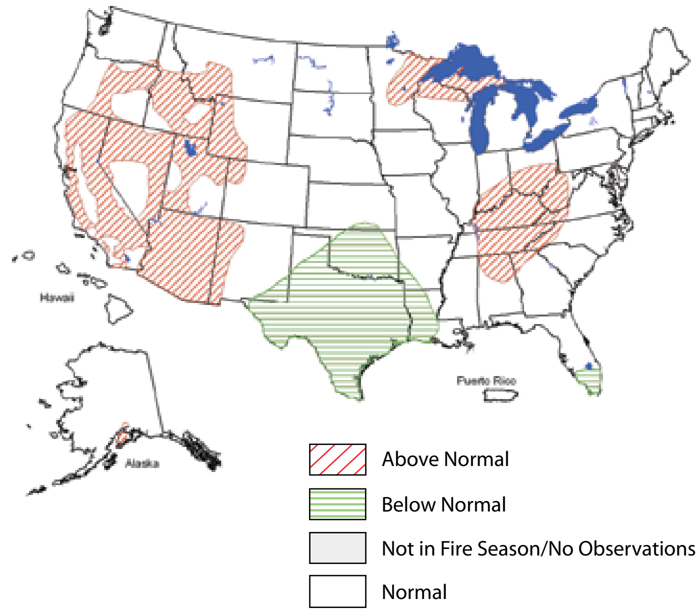


Figure 13b. Current fine fuel condition and live fuel moisture status in the Southwest.

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

Live Fuel Moisture	**Percent of Average**
Douglas Fir	104
Juniper	91
Piñon	96
Ponderosa Pine	92
Sagebrush	148
1000-hour dead fuel moisture — AZ	**5**
1000-hour dead fuel moisture — NM	**10**
Average 1000-hour fuel moisture for this time of year	**7–14**

El Niño Status and Forecast

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

Sea surface temperatures (SSTs) were near average again this month across the central equatorial Pacific Ocean region, reflecting the persistence of neutral ENSO conditions (Figure 14a). Cooler-than-average SSTs intensified slightly across the far eastern Pacific Ocean along the South American coast, hinting again at the possible development of La Niña conditions. Forecasts made this past spring speculated that there was a decent chance that La Niña conditions would develop this summer based on a quick transition from weak El Niño conditions to cooler-than-average SSTs. The Climate Prediction Center (CPC) notes that this potential event has not unfolded as directly as expected. Large variations in the strength of the easterlies across the Pacific from month to month have done little to carry potential La Niña conditions forward. The International Research Institute (IRI) notes that sufficient cooler-than-average water is just below the surface in the eastern Pacific to carry the development of a La Niña event if easterly winds cooperate and bring the water to the surface. Output from statistical and dynamical ENSO models assembled by IRI continue to show this chance of La Niña conditions developing through the fall with probabilities greater than 50 percent through the October–December period (Figure 14b). There is virtually no chance (less than 5 percent) of El Niño conditions developing this summer or fall, and an increasing chance of ENSO neutral conditions beyond next winter. The latter is the most probable, based on historical average conditions.

The persistent chance of La Niña conditions potentially developing this fall has crept into season precipitation forecasts for the Southwest. An increased chance of below-average precipitation is evident in winter season forecasts issued by the CPC this month. La Niña events are historically related to below-average winter precipitation totals for Arizona and New Mexico.

Notes:

Figure 14a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through June 2007. 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 Prediction (IRI) probabilistic El Niño-Southern Oscillation (ENSO) forecast for overlapping three month seasons. The forecast expresses the probabilities (chances) of the occurrence of three ocean conditions in the ENSO-sensitive Niño 3.4 region, as follows: El Niño, defined as the warmest 25 percent of Niño 3.4 sea-surface temperatures (SSTs) during the three month period in question; La Niña conditions, the coolest 25 percent of Niño 3.4 SSTs; and neutral conditions where SSTs fall within the remaining 50 percent of observations. The IRI probabilistic ENSO forecast is a subjective assessment of current model forecasts of Niño 3.4 SSTs that are made monthly. The forecast takes into account the indications of the individual forecast models (including expert knowledge of model skill), an average of the models, and other factors.

Figure 14a. The standardized values of the Southern Oscillation Index from January 1980–June 2007. 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).

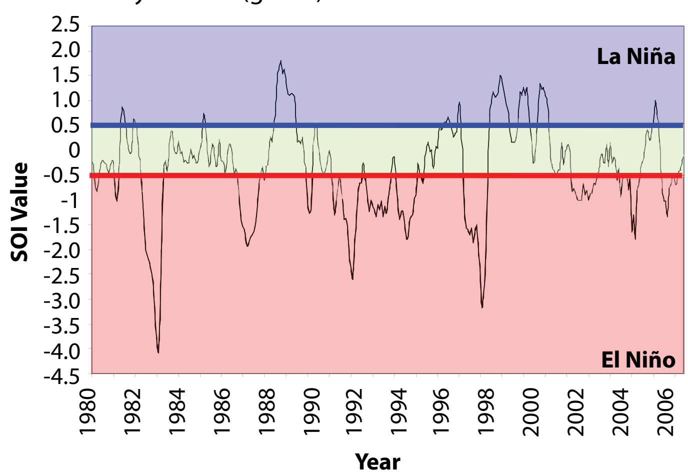
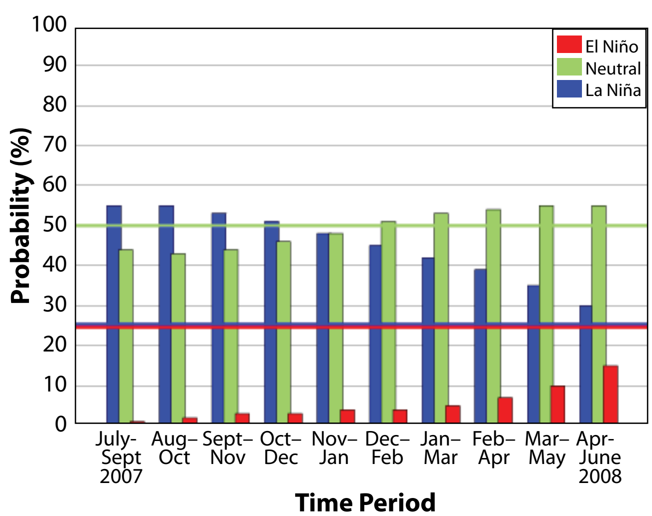


Figure 14b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released July 19, 2007). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



On the Web:

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

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

Temperature Verification
(April–June 2007)
Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC seasonal temperature outlook for April–June predicted an increased likelihood of above-average temperatures for most of the western two-thirds of the country (Figure 15a). This proved accurate across most of the Intermountain West, where temperatures ranged from 0–5 degrees F above normal, but an area centered over Texas and extreme western New Mexico experienced temperatures from 2 to more than 5 degrees F below normal (Figure 15b). As in preceding months, temperatures in the southwestern states were roughly split at the Arizona-New Mexico state line, with above-average temperatures in Arizona and states to the north and west, and average or below-average temperatures in New Mexico and states to the north and east. This trend coincided with a similar discrepancy in precipitation trends between the two states. Nonetheless, temperatures were within a few degrees of normal across most of Arizona and New Mexico.

Figure 15a. Long-lead U.S. temperature forecast for April–June 2007 (issued March 2007).

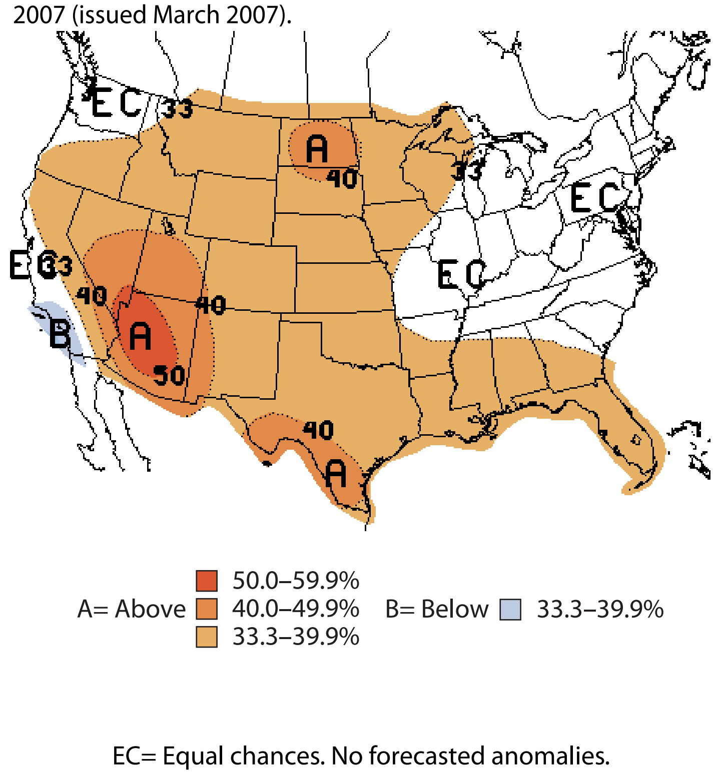
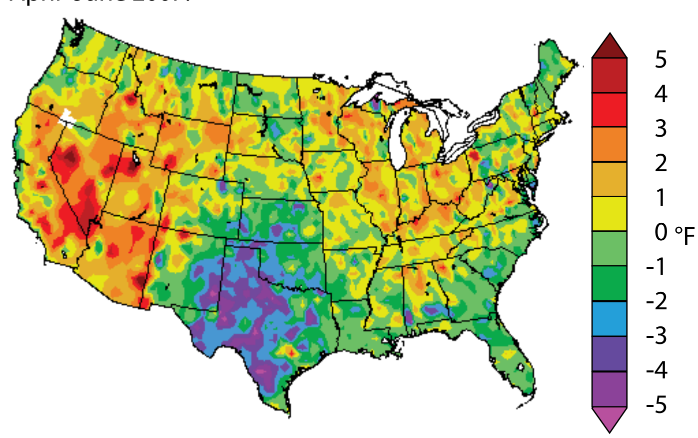


Figure 15b. Average temperature departure (in degrees F) for April–June 2007.



Notes:
Figure 15a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months April–June 2007. This forecast was made in March 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 April–June 2007 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

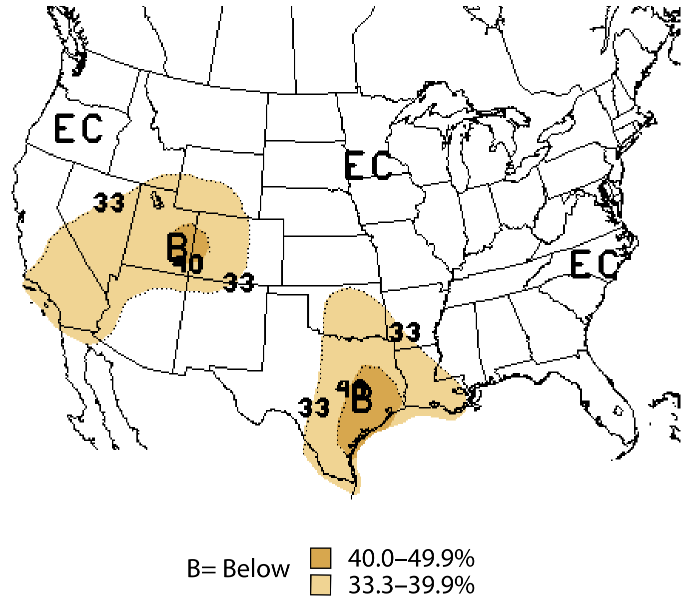
Precipitation Verification

(April–June 2007)

Source: NOAA Climate Prediction Center (CPC)

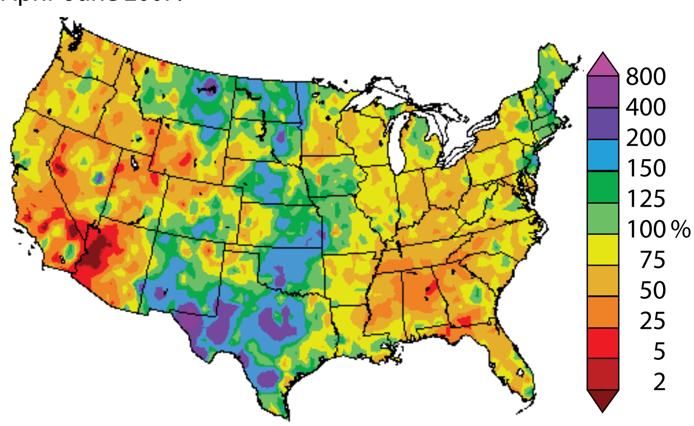
The NOAA-CPC seasonal precipitation outlook for April–June indicated an increased chance of below-average precipitation in areas centered over the Great Basin region and the western Gulf Coast (Figure 16a). Observed precipitation patterns were somewhat different, as unusually heavy precipitation occurred over much of Texas and Oklahoma (Figure 16b). Precipitation totals in the Great Basin were spotty and very local, with some locations far wetter and some far drier than average. Meanwhile, the Southwest saw a continuation of trends from earlier months. Most of Arizona saw below-average precipitation, with extremely dry conditions (less than 25 percent—and in some areas less than 2 percent—of average precipitation) in the western part of the state. New Mexico's wet winter turned into a wet spring, as all but the northeastern corner of the state received between 100 percent and 400 percent of normal precipitation. These trends were strong in the spring but appear to be weakening somewhat in the first months of summer.

Figure 16a. Long-lead U.S. precipitation forecast for April–June 2007 (issued March 2007).



EC= Equal chances. No forecasted anomalies.

Figure 16b. Percent of average precipitation observed from April–June 2007.



Notes:

Figure 16a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months April–June 2007. This forecast was made in March 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 April–June 2007. 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.

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