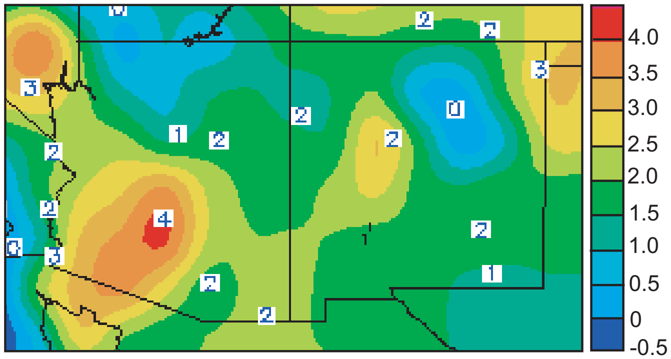
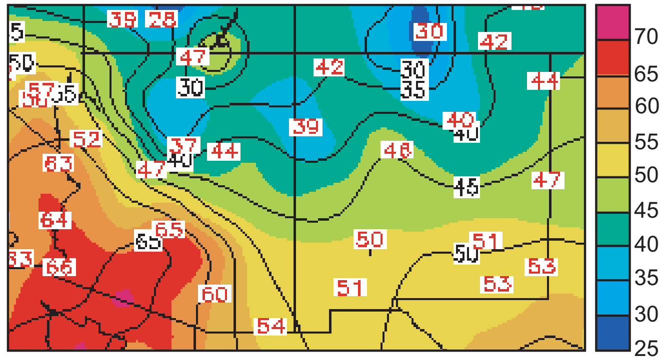
1. Recent Conditions: Temperature (up to 4/18/04) Sources: WRCC, HPRCC

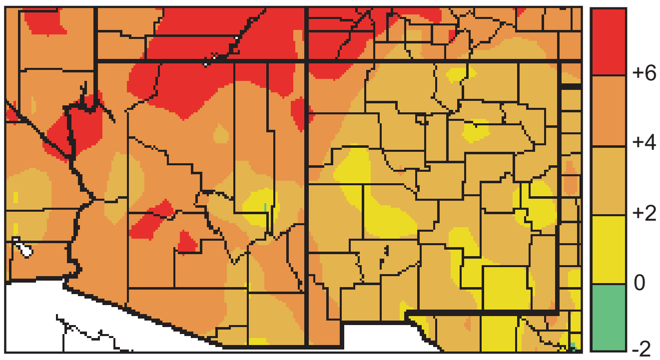
1a. Water year '03–'04 (through 4/18) departure from average temperature (°F).



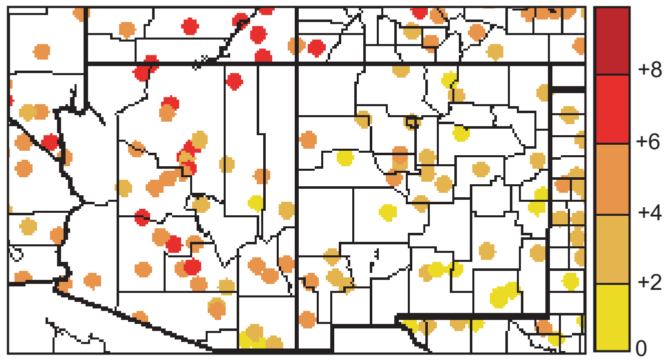
1b. Water year '03–'04 (through 4/18) average temperature (°F).



1c. Previous 30 days (3/20–4/18) departure from average temperature (°F, interpolated).



1d. Previous 30 days (3/20–4/18) departure from average temperature (°F, data collection locations only).



Highlights: The temperature story from mid-March to mid-April remains much the same as previous months with above-average temperatures driven by abnormally high nighttime minimum temperatures. According to the National Weather Service office in Albuquerque, 90 percent of the days in March had record high minimum temperatures. This continued a trend where four of the five warmest overnight March average temperatures in Albuquerque have occurred since 1995. In Arizona, Tucson set a record high monthly average low temperature of 53.5 degrees, shattering the old record of 49.8 degrees set in 1978. Because of this, Tucson and Douglas broke all-time record average maximum March temperatures by 8 degrees, breaking records that had stood since 1972 (National Weather Service Tucson office), The greatest warmth occurred in the western and northern parts of the Southwest (seeFigures 1c and 1d). In New Mexico, record daily highs were established at several stations every day from March 18th through the 25th and New Mexico had its 3rd warmest. March since records began in 1872.

For these and other temperature maps, visit: http://www.wrcc.dri.edu/recent_climate.html and http://www.hprcc.unl.edu/products/current.html

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

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. Data are in degrees Fahrenheit (°F).

Departure from average temperature is calculated by subtracting current data from the average. The result can be positive or negative.

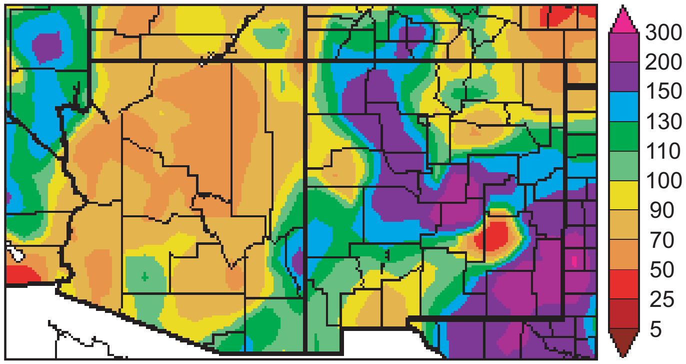
The continuous color maps (Figures 1a, 1b, 1c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. The blue numbers in Figure 1a, the red numbers in Figure 1b, and the dots in Figure 1d show data values for individual stations.

Interpolation procedures can cause aberrant values in data-sparse regions.

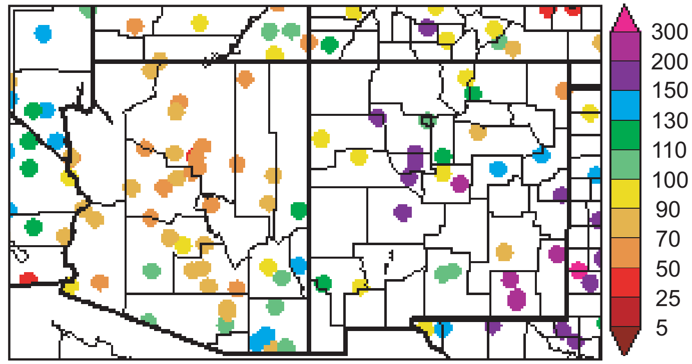
Figures 1c and 1d are experimental products from the High Plains Regional Climate Center (HPRCC).

2. Recent Conditions: Precipitation (up to 4/11/04) Source: High Plains Regional Climate Center

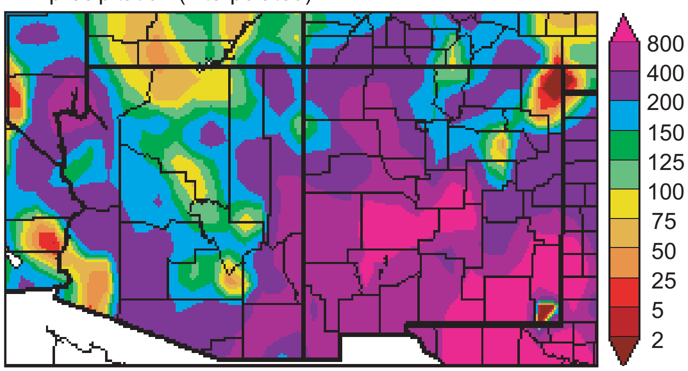
2a. Water year '03–'04 (through 4/18) percent of average precipitation (interpolated).



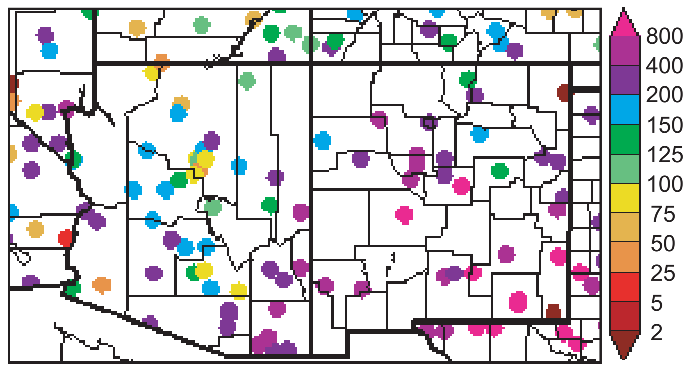
2b. Water year '03–'04 (through 4/18) percent of average precipitation (data collection locations only).



2c. Previous 30 days (3/20–4/18) percent of average precipitation (interpolated).



2d. Previous 30 days (3/20–4/18) percent of average precipitation (data collection locations only).



Highlights: In the past month, the Southwest has seen above-average precipitation in most areas (see Figures 2c and 2d). The precipitation fell in a series of storms associated with an upper level low pressure system that slowly traversed the region in late March and early April. Another storm the following week produced heavy rain and snow with greatest totals in the southeastern half of New Mexico and southern Arizona. The April 2–3 storm produced 2.29 inches of rain in Albuquerque, breaking a record on the books since 1893. Not surprisingly, the rains also caused problems with street flooding and road damage causing New Mexico Governor Bill Richardson to declare Bernalillo County a disaster area and releasing $750,000 to help with street and sewer repairs (*Albuquerque Journal*, April 10, 2004). The precipitation helped reduce the drought in many areas (see page 4) but the precipitation did not overcome the multi-year precipitation deficits we have experienced. Unfortunately, much of Arizona and many areas in New Mexico remain well below average for the current water year, creating concerns for future water needs.

For these and other precipitation maps, visit: http://www.hprcc.unl.edu/products/current.html

For National Climatic Data Center monthly precipitation and drought reports for Arizona, New Mexico, and the Southwest region, visit: http://lwf.ncdc.noaa.gov/oa/climate/research/2003/perspectives.html#monthly

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2003 we are in the 2004 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.

These figures are experimental products from the High Plains Regional Climate Center (HPRCC).

3. Annual Precipitation Anomalies and Daily Event Totals Source: NOAA Climate Prediction Center

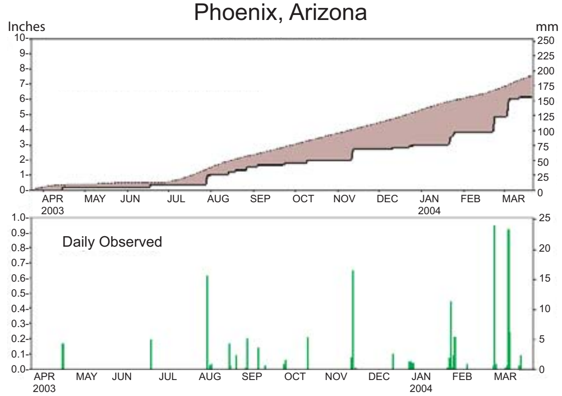
Notes: Based on a long-term average (1971–2000) of daily precipitation, these graphs contrast how much precipitation actually has accumulated at each station over the past year (beginning in mid-December 2002) with how much precipitation typically is received.

The top of each of the pairs of graphs shows average (dotted line) and actual (solid line) accumulated precipitation (i.e., each day's precipitation total is added to the previous day's total for a 365-day period). If accumulated precipitation is below the long-term average, the region between the long-term average and the actual precipitation is shaded brown, and if accumulated precipitation is above the long-term average, the region between the actual precipitation and the long-term average precipitation is shaded green.The green bars at the bottom of each of the pairs of graphs show the daily precipitation amounts (in both inches and millimeters) for the past year. Thus, one can get a sense of how frequent and intense individual precipitation events have been at the selected stations.

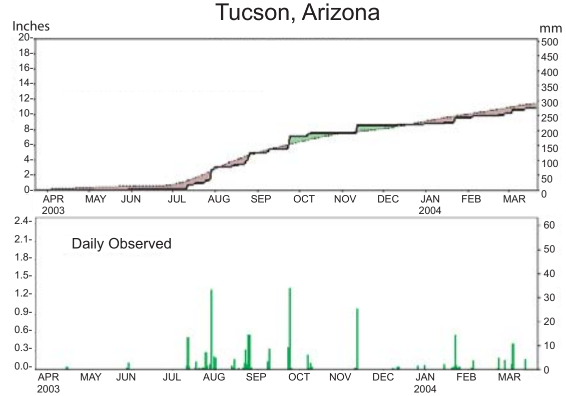
It is important to note that the scales for both the accumulated precipitation and the daily precipitation vary from station to station.

This type of graph is available for several other stations in Arizona and New Mexico as well as for many other places in the world. The graphs are updated daily by NOAA CPC at http://www.cpc.noaa.gov/products/global_monitoring/precipitation/global_precip_accum.html.

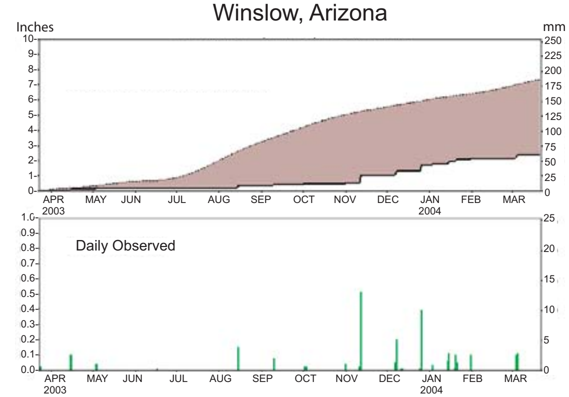
Phoenix, Arizona



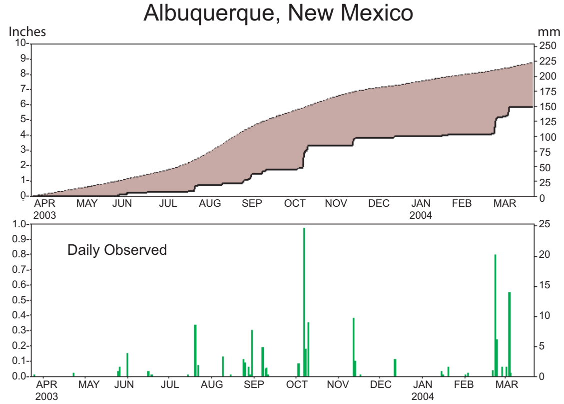
Tucson, Arizona



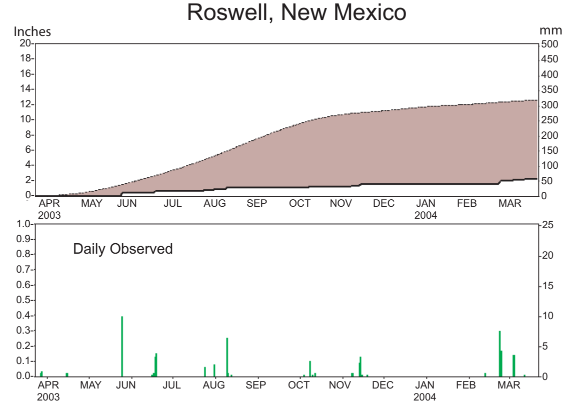
Winslow, Arizona



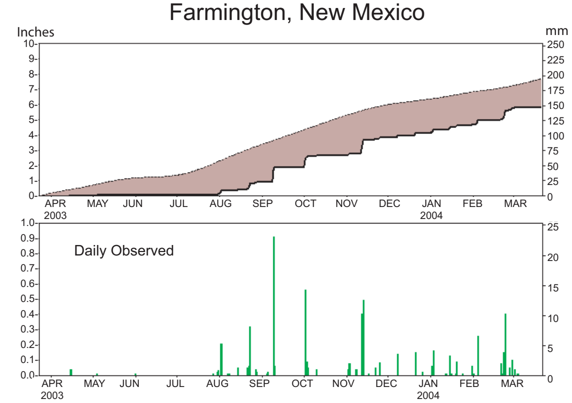
Albuquerque, New Mexico



Roswell, New Mexico

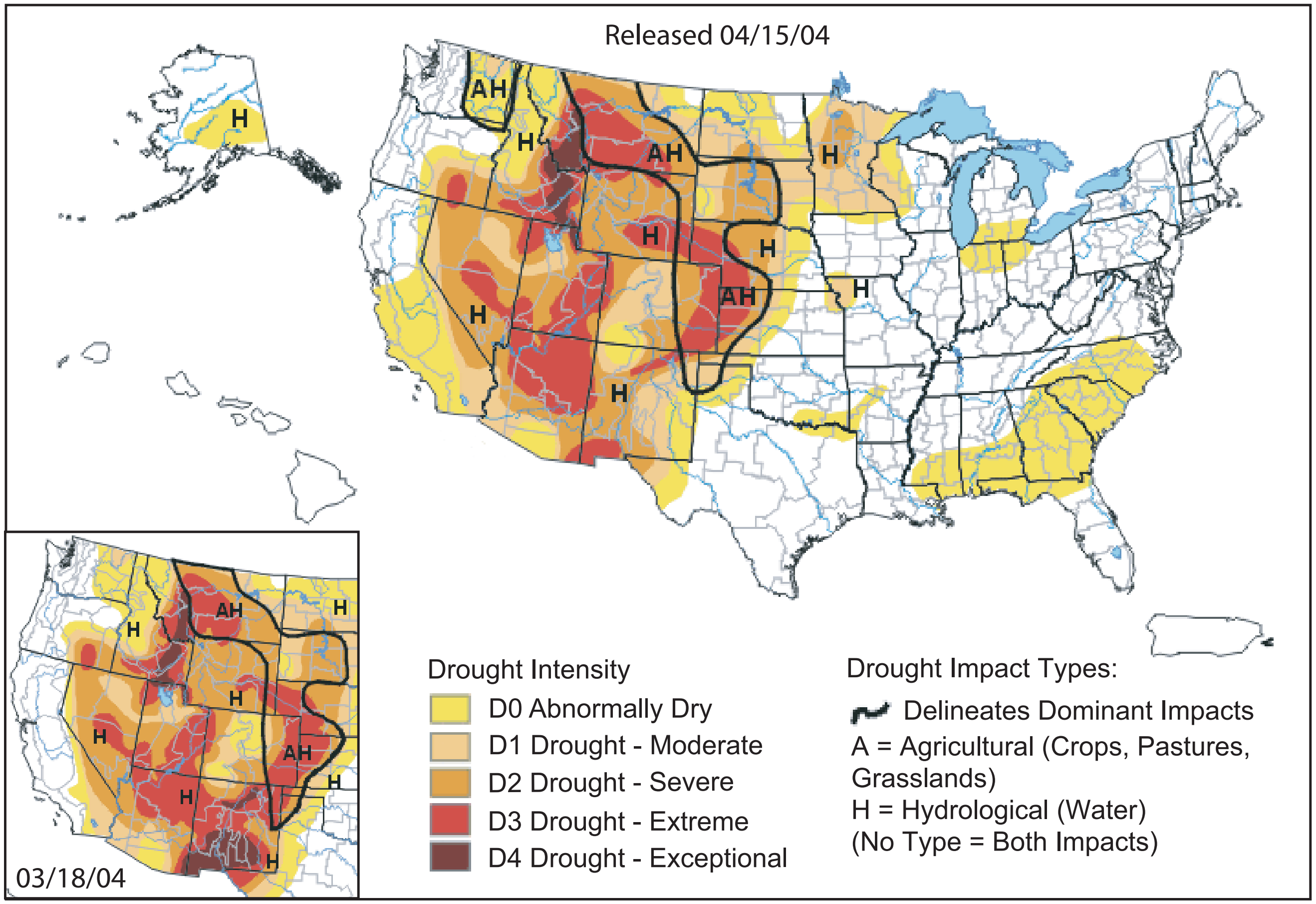


Farmington, New Mexico



4. U.S. Drought Monitor (released 4/15/04) ♦ Source: USDA, NDMC, NOAA

4. Drought Monitor for 04/15/04 (full size) and 03/18/04 (inset, lower left)



Notes: The U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The larger map was released on 4/15 and is based on data collected through 4/13. The inset (lower left) shows the previous month's map. It was released on 3/18 and is based on data collected through 3/16.

The best way to monitor drought trends is to pay a weekly visit to the U.S. Drought Monitor website (see below).

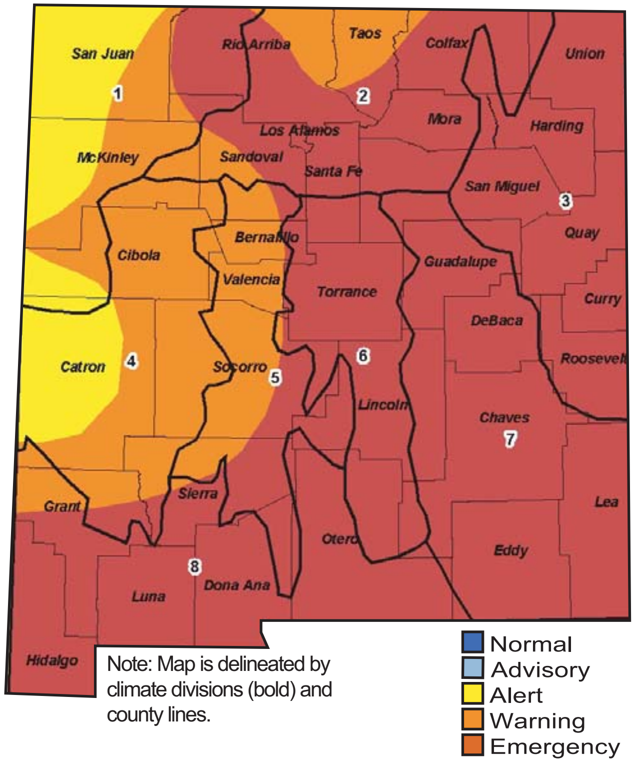
The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) PDSI, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of the United States Department of Agriculture (USDA), the National Drought Mitigation Center (NDMC) and the National Oceanic and Atmospheric Administration (NOAA) a division of the U.S. Department of Commerce. The author of this month's monitor is Mark Svoboda from NDMC.

Highlights: The rains of late March and early April (see page 2) brought welcome relief to drought conditions in southeastern New Mexico, changing many areas by as much as two drought classifications. However, while the agricultural drought status is lessening, the hydrologic facets of our long-term drought remain intact. As reported by the *Associated Press* (April 5, 2004), Charlie Liles, chief meteorologist at the Albuquerque National Weather Service office commenting on the early April storms said, "I think we'll see some short-term benefits, especially on the range and pasture land out in the eastern plains. As far as the long-term effect, it's kind of a drop in the bucket. You just can't take a five year drought and fix it with a wet weekend." Despite the rains, USDA officials placed Arizona range and pasture conditions in the "mostly fair" category—similar to last month. Poor range conditions are causing reduced grazing permits in many National Forests. In New Mexico, permit reductions range from one-third to one-half the cattle grazed a decade ago. Things are worse in Arizona with a 90 percent reduction in the Tonto National Forest and a grazing moratorium in parts of the Gila National Forest (*Albuquerque Journal*, March 28, 2004).

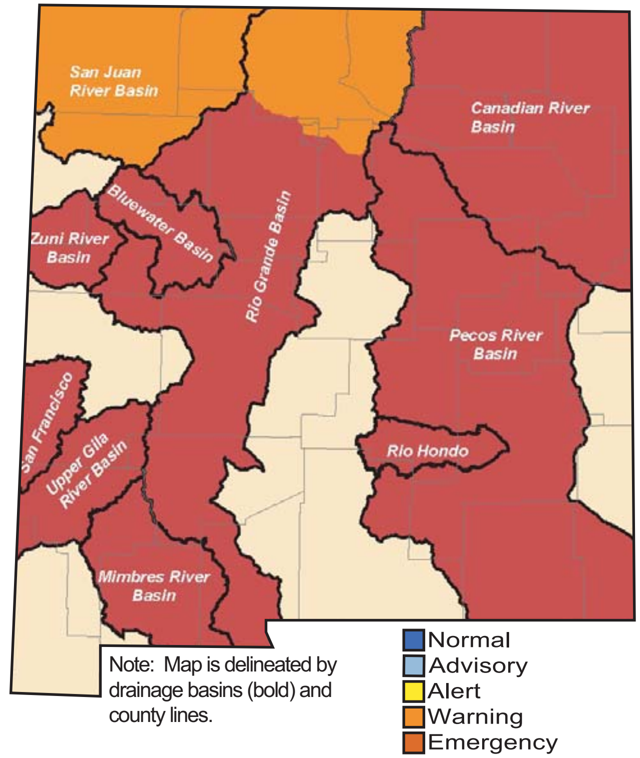
Animations of the current and past weekly drought monitor maps can be viewed at: http://www.drought.unl.edu/dm/monitor.html

5. Drought: Recent Drought Status for New Mexico (updated 03/17/04) ♦ Source: New Mexico NRCS

Meteorological Drought Map
Drought Status as of March 17, 2004



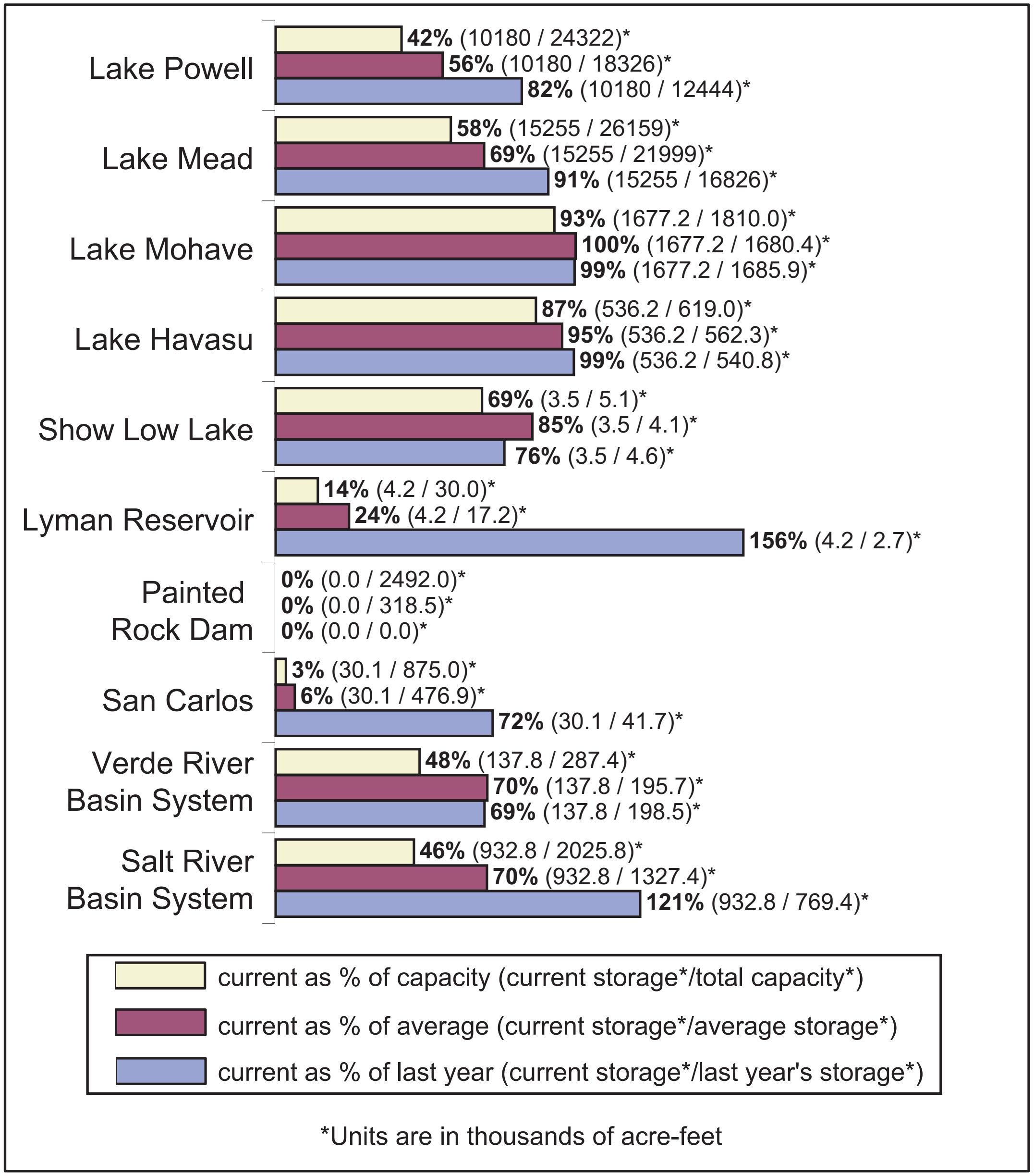
Hydrological Drought Map
Drought Status as of March 17, 2004



Notes: New Mexico drought status maps are produced by the New Mexico Drought Monitoring Workgroup (NMDMW). As with the U.S. Drought Monitor maps (see page 4), the New Mexico maps are based on expert assessment of variables including, but not limited to, precipitation, drought indices, reservoir levels, and streamflow. The New Mexico drought status maps (http://www.nm.nrcs.usda.gov/snow/drought/drought.html) are produced monthly. When near-normal conditions exist, they are updated quarterly. Information on Arizona drought can be found at: http://www.water.az.gov/gdtf/

Highlights: New Mexico meteorological drought status (left map) has remained the same since last month. Hydrological drought status (right map) has improved (from emergency to warning) in the San Juan River Basin, due chiefly to relatively consistent near to above-average snowpack in that basin, and early-April precipitation. According to the USDA, 42 percent of New Mexico range and pasture land is in poor to very poor condition, in contrast with 86 percent in poor to very poor condition before the early-April storms. According to the National Weather Service Albuquerque forecast office, the greatest benefit from the early-April precipitation was an improvement in soil moisture. The *Albuquerque Journal* (April 6, 2004), reported that Santa Fe, New Mexico is proposing a new pilot project aimed at encouraging less water consumption. The project would evaluate the concept of residential water budgets as a replacement for restrictions, such as limits on outdoor watering. Household water allocations would depend upon household size, time of year, and whether drought has caused a water emergency. Each household would be allotted a certain amount of water to use. If that amount is exceeded, the household would be required to pay surcharges. The water budget technique leaves the determination of specific water use in the hands of the water user, which eliminates the need for "water police."

6. Arizona Reservoir Levels (through the end of March 2004) Source: USDA NRCS



Notes: Reservoir reports are updated monthly and are provided by the National Water and Climate Center (NWCC) of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). 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

As of 4/08/04, Arizona's report had been updated through the end of March.

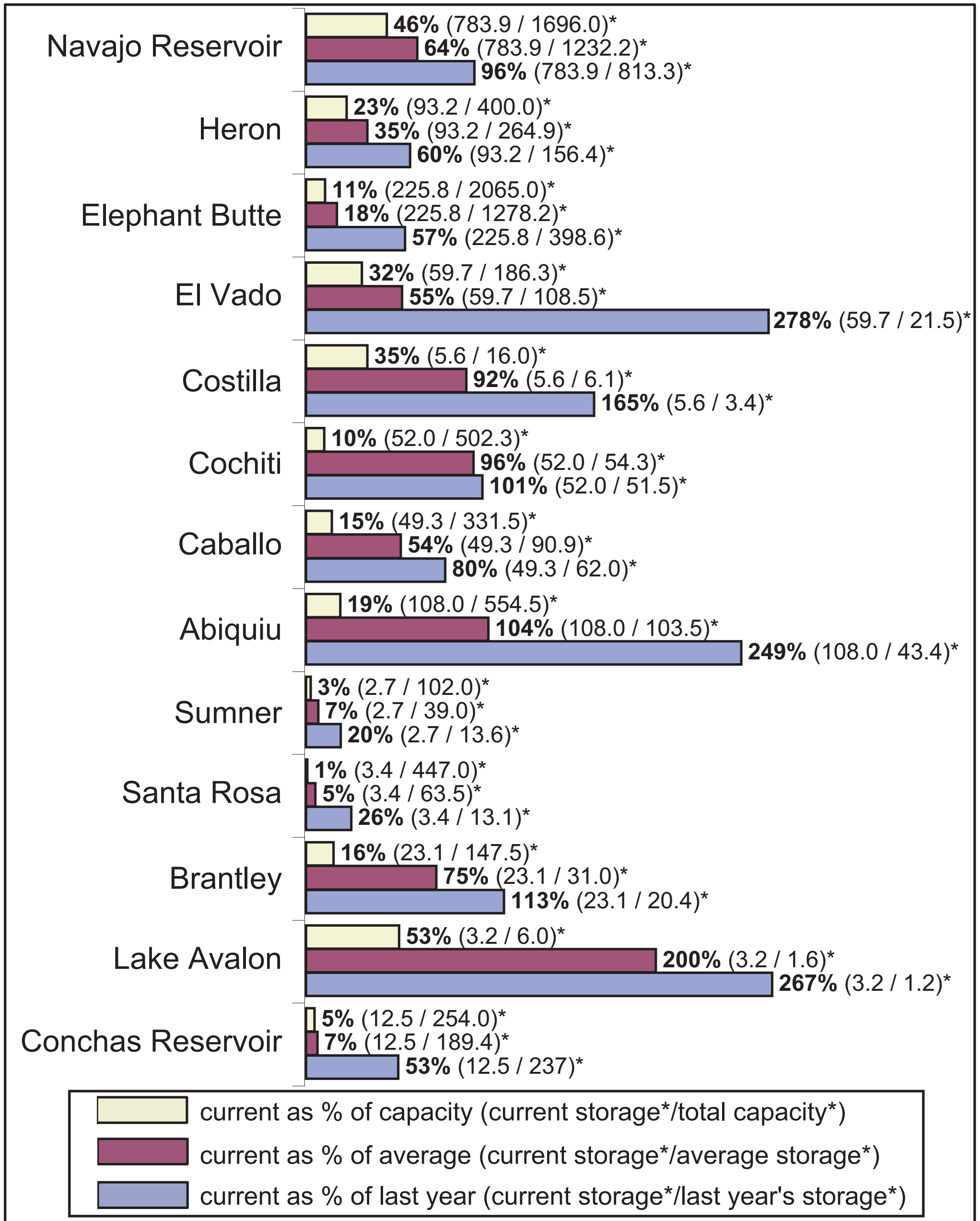
For additional information, contact Tom Pagano of the NWCC-NRCS-USDA (tpagano@wcc.nrcs.usda.gov; 503-414-3010) or Larry Martinez, NRCS, USDA, 3003 N. Central Ave, Suite 800, Phoenix, Arizona 85012-2945; 602-280-8841; Larry.Martinez@az.usda.gov)

Highlights: Since last month, the Salt and Verde River systems have registered moderate increases in reservoir storage, due in part to early snowmelt and in part to early April precipitation. However, Salt and Verde River reservoirs will probably not gain much more storage from the spring runoff season.

Colorado River reservoirs registered decreases during the past month, due to below-average snowpack in the upper Colorado River Basin and spectacularly rapid early snowmelt in March. According to NRCS water supply specialist Larry Martinez, "…once the snowpack melts, any additional snow which comes in April will be too late to do any good to build reservoir storage at Lake Powell. This is a major disappointment." Lake Powell is at its lowest level since 1970, when the reservoir was still filling.

American Rivers declared the Colorado River the nation's most endangered river for 2004. In particular, the *American Rivers* report brought attention to water quality problems stemming from abandoned uranium tailings in Utah, a defunct war-munitions complex in Nevada, and septic-tank systems in river communities.

7. New Mexico Reservoir Levels (through the end of March 2004) ♦ Source: USDA NRCS



*Units are in thousands of acre-feet

Notes: Reservoir reports are updated monthly and are provided by the National Water and Climate Center (NWCC) of the U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS). Reports can be accessed at their website: http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html.

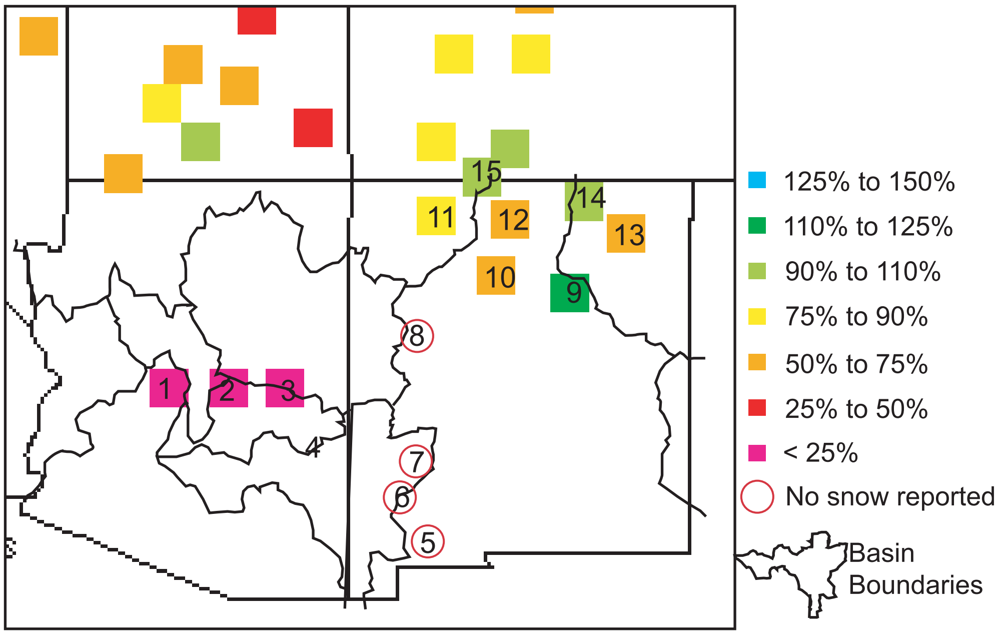
As of 4/08/04, New Mexico's report had been updated through the end of March.

For additional information, contact Tom Pagano of the NWCC-NRCS-USDA (tpagano@wcc.nrcs.usda.gov; 503-414-3010) or Dan Murray, NRCS, USDA, 6200 Jefferson NE, Albuquerque, NM 87109; 505-761-4436; Dan.Murray@nm.usda.gov)

Highlights: Many New Mexico reservoirs registered gains since last month. In fact, recent gains are probably larger than indicated by the graph at left, because the values in this graph do not take into account substantial early April precipitation. According to the National Weather Service Albuquerque forecast office, early April precipitation had major impacts only in the Pecos River Basin. Water supply experts are concerned about New Mexico water supply for irrigation; they point out that while mid-March snowmelt created slight increases in short-term total reservoir storage, the early snowmelt means that less snow water is available for late-spring runoff. Moreover, the storm system did little for the Upper Rio Grande Basin. Consequently, "this could well be one of the more limited irrigation seasons in recent memory," according to NRCS water supply specialists.

Ironically, Mexico announced on April 13 that it will release large amounts of water from the El Cuchillo and Cerro Prieto dams (*Arizona Daily Star*, April 14, 2004). These northeastern Mexico dams will release water too far south to be used by most Texas farmers. Also, the water will not help pay Mexico's outstanding water debt to the United States, according to the report.

8. Basin average snow water content (SWC) for available monitoring sites as of 4/13/04 (percent of average).



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

Highlights: The cold cut-off low pressure system in early April increased snow water content (SWC) in many southwestern areas, except for Arizona. As of April 1, the Natural Resources Conservation Service (NRCS) shows little hope that the early-April storms will help the long-term water resource picture. During this time of year, it is most important to look at higher-elevation snowpack as a measure of future water resources. The Upper Rio Grande, the San Juan River headwaters, and the Animas River basin currently stand at 89, 88 and 88 percent respectively. In Arizona, most lower-elevation basins have already melted out, so SWC does not provide a good water resource measure right now. David Brandon, the National Weather Service hydrology forecaster for the Colorado River basin, called the snow melt situation "dismal" according to the *Las Vegas Review Journal*. He also suggested that it will take 16 straight years of average runoff (mainly from snow) to refill the current water deficit in Lake Powell.

For color maps of SNOTEL basin SWC, visit: http://www.wrcc.dri.edu/snotelanom/basinswe.html
For a numeric version of the SWC map, visit: http://www.wrcc.dri.edu/snotelanom/basinswen.html
For a list of river basin SWC and precipitation, visit: http://www.wrcc.dri.edu/snotelanom/snotelbasin

Notes:

The data shown on this page are from snowpack telemetry (SNOTEL) stations grouped according to river basin. These remote stations sample snow, temperature, precipitation, and other parameters at individual sites.

Snow water content (SWC) and snow water equivalent (SWE) are different terms for the *same* parameter.

The SWC in Figure 8 refers to the snow water content found at selected SNOTEL sites in or near each basin compared to the *average* value for those sites on this day. *Average* refers to the arithmetic mean of annual data from 197—2000. SWC is the amount of water currently in snow. It depends on the density and consistency of the snow. Wet, heavy snow will produce greater SWC than light, powdery snow.

Each box on the map represents a river basin for which SWC data from individual SNOTEL sites have been averaged. Arizona and New Mexico river basins for which SNOTEL SWC estimates are available are numbered in Figure 8. The colors of the boxes correspond to the percent of average SWC in the river basins.

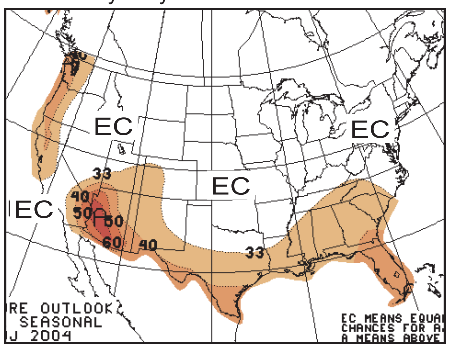
The dark lines within state boundaries delineate large river basins in the Southwest.

These data are provisional and subject to revision. They have not been processed for quality assurance. However, they provide the best available land-based estimates during the snow measurement season.

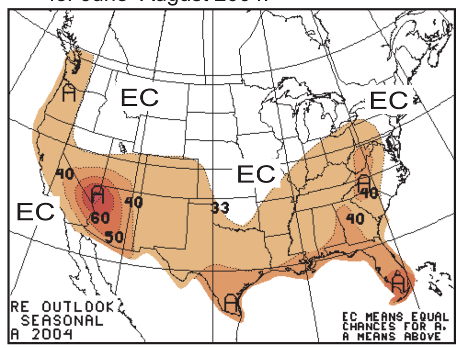
9. Temperature: Multi-season Outlooks ♦ Source: NOAA Climate Prediction Center

Overlapping 3-month long-lead temperature forecasts (released 4/15/04).

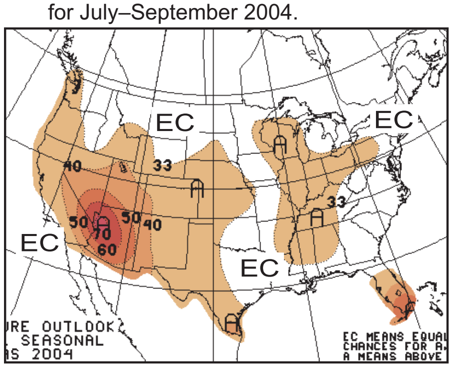
9a. Long-lead national temperature forecast for May–July 2004.



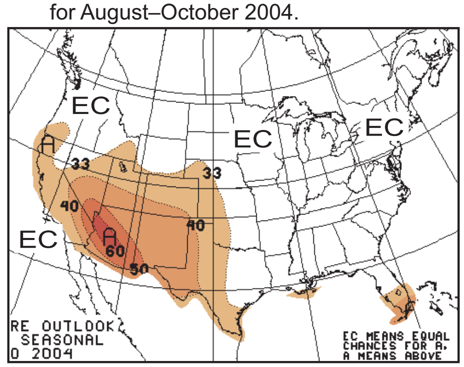
9b. Long-lead national temperature forecast for June–August 2004.



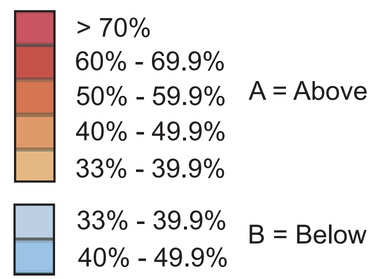
9c. Long-lead national temperature forecast for July–September 2004.



9d. Long-lead national temperature forecast for August–October 2004.



Percent Likelihood of Above and Below Average Temperatures*



*EC indicates no forecasted anomalies due to lack of model skill.

Highlights: The NOAA-CPC temperature outlooks for May–October 2004 (Figures 9a-9d) continue to show increased probabilities of above-average temperatures for the Southwest. The forecasts for each overlapping season show maximum probabilities of above-average temperatures in western Arizona in excess of a 60 percent, including an extraordinary greater than 70 percent probability of above-average temperatures in northwestern Arizona during the July–September forecast period (Figure 9c); this means that there is very little chance of below-average seasonal temperatures during July-September. As 1971–2000 was one of the warmest periods on record, this implies a good chance of record warm seasonal temperatures in western Arizona during summer 2004. The International Research Institute for Climate Prediction (IRI) temperature forecasts (not pictured) show a similar pattern of increased probabilities of above-average temperatures for the Southwest, although IRI maximum probabilities (50–60 percent) are somewhat lower than those indicated by the CPC forecasts. The CPC predictions are based primarily on long-term temperature trends for the region and the likely continuation of neutral ENSO conditions (see page 14).

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

Notes:

The NOAA CPC (National Oceanic and Atmospheric Administration Climate Prediction Center) 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.

In a situation where there is no forecast skill, one might look at average conditions in order to get an idea of what might happen. 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.

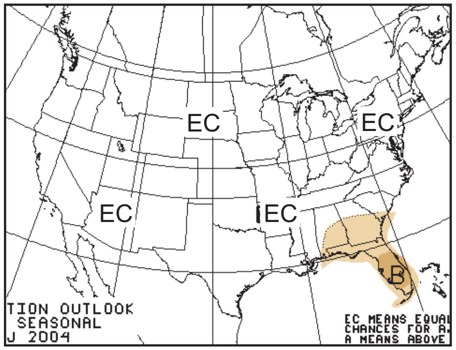
Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–40.0 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average temperature.

The term *average* refers to the 1971–2000 average. This practice is standard in the field of climatology.

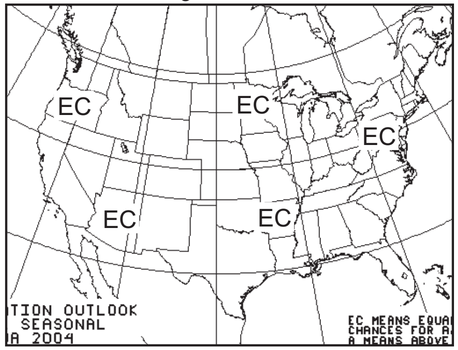
Equal Chances (EC) indicates areas where reliability (i.e., the 'skill') of the forecast is poor and no anomaly prediction is offered.

Overlapping 3-month long-lead precipitation forcasts (released 4/15/04).

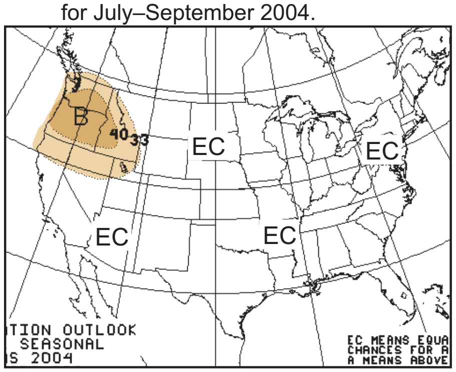
10a. Long-lead U.S. precipitation forecast for May–July 2004.



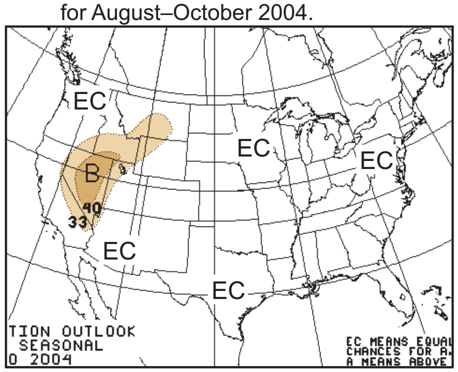
10b. Long-lead U.S. precipitation forecast for June–August 2004.



10c. Long-lead U.S. precipitation forecast for July–September 2004.



10d. Long-lead U.S. precipitation forecast for August–October 2004.



Percent Likelihood of Above or Below Average Precipitation*

> 40% / 33% - 40% A = Above

33% - 40% / > 40% B = Below

*EC indicates no forecasted anomalies due to lack of model skill.

Highlights: The NOAA-CPC precipitation outlooks withhold judgment (EC) for the Southwest for May–October 2004 (Figures 10a-d). The only exception is a small region of slightly enhanced probabilities for below-average precipitation in northwestern Arizona during August–October (Figure 10d). The latter is based on the results of statistical models. The International Research Institute for Climate Prediction (IRI) precipitation forecast for this time period (not pictured) also withholds judgment for the May–October forecast period. There is historically low dynamical model forecast skill for forecasts made during the spring, especially during neutral ENSO conditions (see page 14). Moreover, summer precipitation in the Southwest is characterized by great spatial variability and little seasonal forecast skill. This summer, NOAA and the National Center for Atmospheric Research are leading an intensive effort to learn more about the behavior of the summer monsoon in the Southwest, and how to better predict monsoon precipitation. CLIMAS will keep you informed about the progress of the 2004 North American Monsoon Experiment (NAME).

For more information, visit:
http://www.cpc.ncep.noaa.gov/products/predictions/multi_season/13_seasonal_outlooks/color/churchill.html
Please note that this website has many graphics and may load slowly on your computer.
For more information about IRI experimental forecasts, visit: http://iri.columbia.edu/climate/forecast/net_asmt/

Notes:

The NOAA CPC (National Oceanic and Atmospheric Administration Climate Prediction Center) 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.

In a situation where there is no forecast skill, one might look at *average* conditions in order to get an idea of what might happen. 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 green shading there is a 33.3–40.0 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation.

The term *average* refers to the 1971–2000 average. This practice is standard in the field of climatology.

Equal Chances (EC) indicates areas where reliability (i.e., the 'skill') of the forecast is poor and no anomaly prediction is offered.

11. Drought: Seasonal Drought and PHDI Outlook Maps ♦ Sources: NOAA-CPC, NCDC

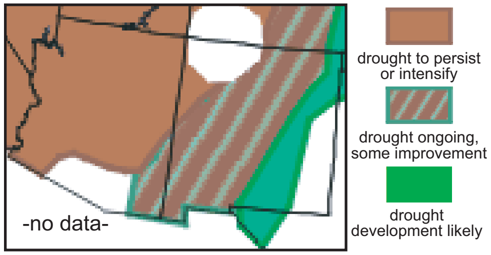
Notes:

The delineated areas in the Seasonal Drought Outlook (Fig. 11a) are defined subjectively and are based on expert assessment of numerous indicators, including outputs of short- and long-term forecasting models.

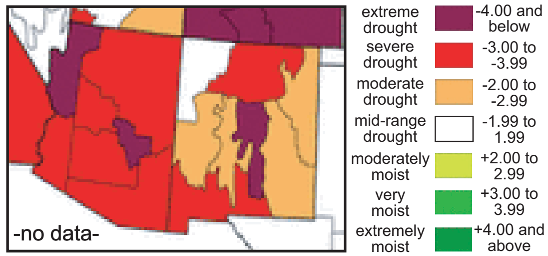
Figures 11b-e are based on the Palmer Hydrological Drought Index (PHDI), which reflects long-term precipitation deficits. PHDI is a measure of reservoir and groundwater level impacts, which take a relatively long time to develop and to recover from drought. Figure 11b shows the current PHDI status for Arizona and New Mexico.

Figure 11c shows the amount of precipitation, in inches, needed over the next three months to change a region's PHDI status to –0.5 or greater—in other words, to end the drought. Regions shown in white have a current PHDI value greater than –2.0 (e.g., in Figure 11b–e, these regions are not in hydrological drought).

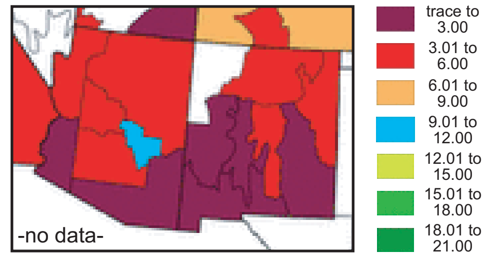
11a. Seasonal drought outlook through July 2004 (accessed 4/15).



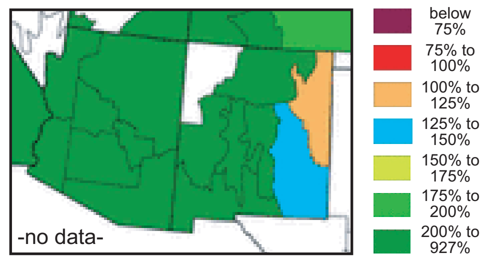
11b. March 2004 PHDI conditions (accessed 4/15).



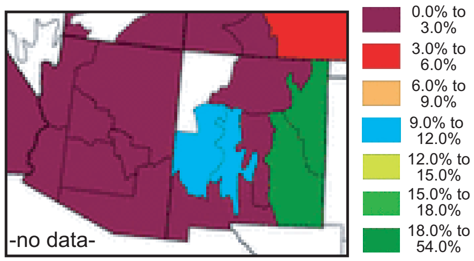
11c. Precipitation (in.) required to end current drought conditions in three months.



11d. Percent of average precipitation required to end current drought conditions in three months.



11e. Probability of receiving precipitation required to end current drought conditions in three months.



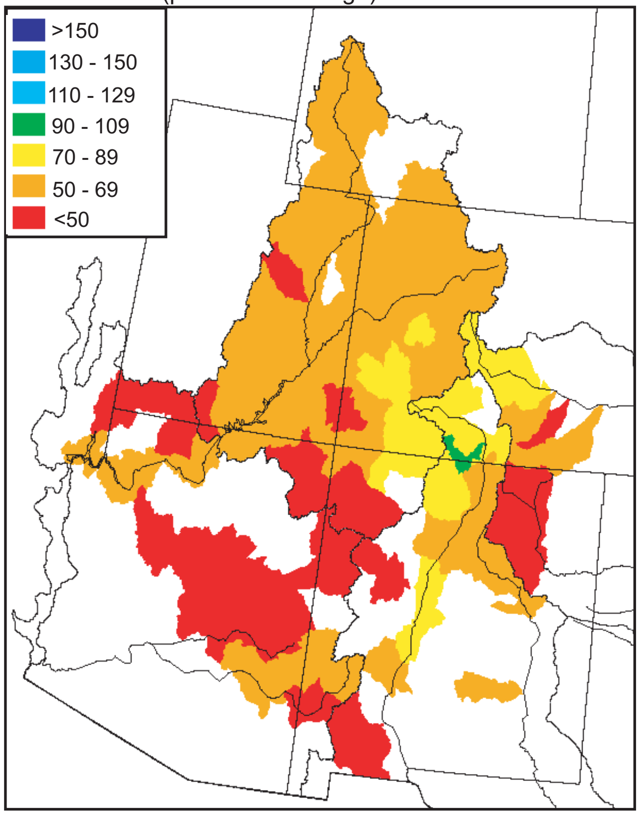
The season in which the precipitation falls greatly influences the amount of precipitation needed to end a drought. For example, during a typically wet season more precipitation may be required to end a drought than during a typically dry season. Also, because soil moisture conditions generally are lower in the dry seasons, the precipitation needed to bring soil conditions back to normal may be less than that required to return soil moisture conditions to normal during a generally wetter season. Figure 11d shows the percent of average precipitation needed to end drought conditions in three months, based on regional precipitation records from 1961–1990. A region that typically experiences extreme precipitation events during the summer, for example, may be more likely to receive enough rain to end a drought than a region that typically is dry during the same season. The seasons with the greatest probability of receiving substantially more precipitation than average are those subject to more extreme precipitation events (such as hurricane-related rainfall), not necessarily those seasons that normally receive the greatest average amounts of precipitation. Figure 11e shows the probability, based on historical precipitation patterns, of regions in Arizona and New Mexico receiving enough precipitation in the next three months to end the drought. Note that these probabilities do not take into account atmospheric and climatic variability (such as El Niño-Southern Oscillation), which also influence seasonal precipitation probabilities.

Highlights: The U.S. Seasonal Drought Outlook (Figure 11a) indicates that drought is likely to persist throughout most of Arizona through July 2004. Improvement in conditions is expected for much of New Mexico and part of southeastern Arizona, as a result of copious early April precipitation in central and eastern New Mexico. There is a very low probability of completely ending drought as we enter the dry pre-monsoon season (Figure 11e); analyses for the April–September period (not shown) indicate increased probabilities (25–40 percent) of receiving precipitation required to end current drought conditions, especially for New Mexico, which receives more than half of its annual precipitation during the summer months.

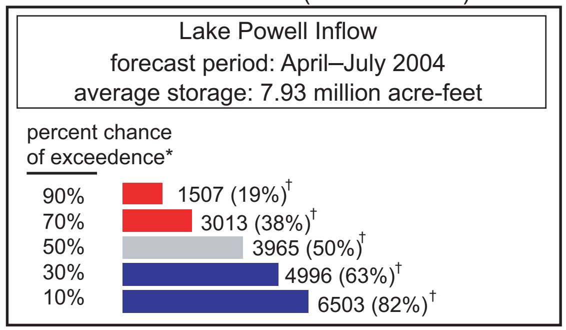
For more information, visit: http://www.drought.noaa.gov/ and http://www.ncdc.noaa.gov/oa/climate/research/drought/drought.html

12. Streamflow Forecast for Spring and Summer ♦ Source: USDA NRCS National Water and Climate Center

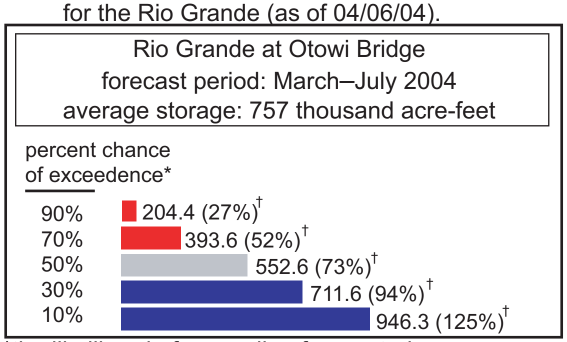
12a. NRCS spring and summer streamflow forecast as of 04/01/04 (percent of average).



12b. NRCS percent exceedence forecast chart for Lake Powell inflow (as of 04/05/04).



12c. NRCS percent exceedence forecast chart for the Rio Grande (as of 04/06/04).



*the likelihood of exceeding forecasted streamflow volume.

†associated forecasted streamflow volume (thousands of acre-feet) and percent of average volume.

Highlights: Below-average streamflow is predicted for virtually all Arizona and New Mexico river basins. Below-average snowpack and unseasonably warm temperatures have combined to create early snow meltout, which will increase short-term flows in some basins (notably in New Mexico); long-term flows for spring and summer are expected to be below average and Arizonans can expect reduced surface water supplies through the spring and summer water-use season. Inflow into Lake Powell is most likely to be around 50 percent of average; in an average year, Lake Powell receives around 8 million acre-feet of runoff between April and July, whereas the current forecast projects only around 4 million acre-feet between April and July. Las Vegas, Nevada, currently in a drought alert, is probably only one year away from a drought emergency, which would trigger more severe water-use restriction, according to the *Las Vegas Review-Journal* (April 9, 2004). Las Cruces, New Mexico has already put water restrictions into effect, in order to conserve water during the summer (*Associated Press*, April 1, 2004).

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

Notes: The forecast information provided in Figures 12a-c is updated monthly and is provided by the National Resources Conservation Service (NRCS). Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences, such as reservoirs and diversions.

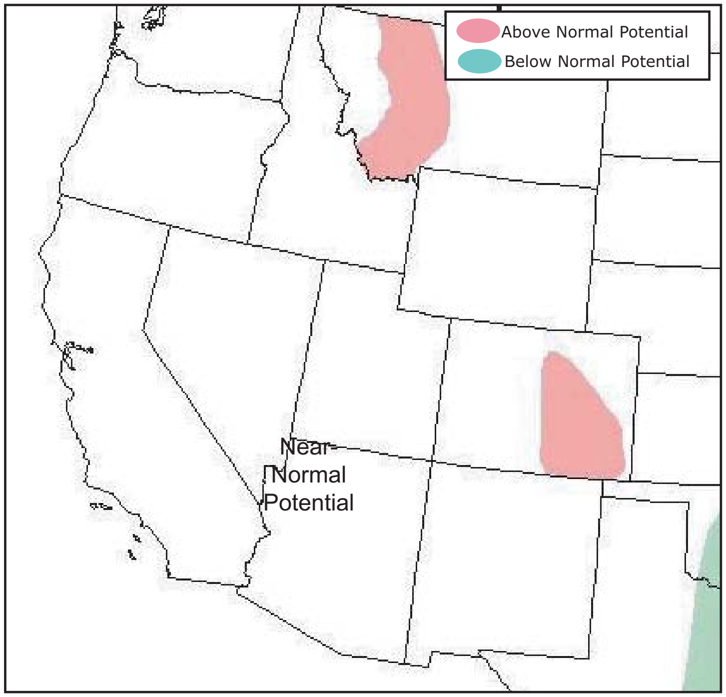
Each month, five streamflow volume forecasts are made by the NRCS for several river basins in the United States. These five forecasts correspond to standard *exceedence* percentages, which can be used as approximations for varying ‘risk’ thresholds when planning for short-term future water availability.

NRCS provides the 90, 70, 50, 30, and 10 percent exceedence streamflow volumes. Each exceedence percentage level corresponds to the following statement: “There is an (X) percent chance that the streamflow volume will exceed the forecast volume value for that exceedence percentage.” Conversely, the forecast also implies that there is a (100-X) percent chance the volume will be less than this forecasted volume. In Figure 12c for example, there is a 30 percent chance that Rio Grande at Otowi Bridge will exceed 711.6 acre-feet of water (94 percent of average) between March and July and a 70 percent chance that it will not exceed that volume. Note that for an individual location, as the exceedence percentage declines, forecasted streamflow volume increases.

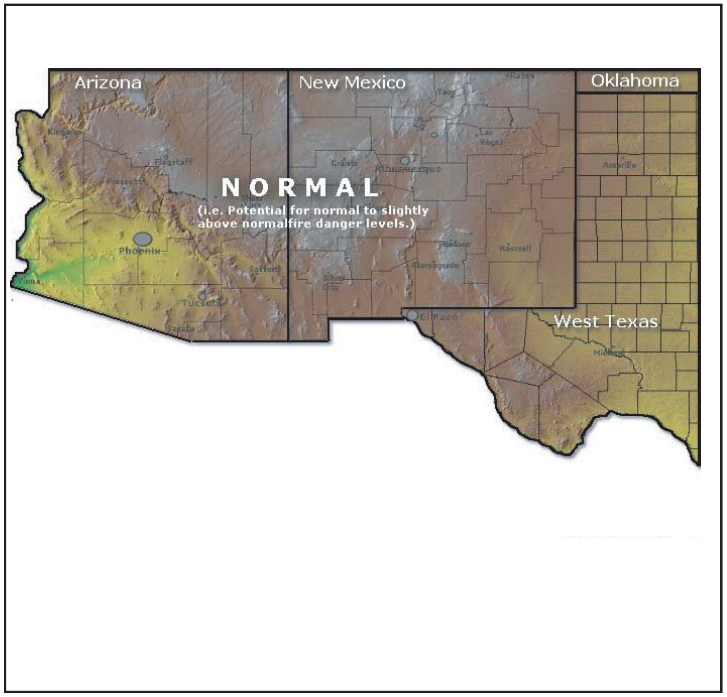
In addition to monthly graphical forecasts for individual points along rivers (Figures 12b and 12c), the NRCS provides a forecast map (Figure 12a) of basin-wide streamflow volume averages based on the forecasted 50 percent exceedence threshold.

13. National Wildland Fire Outlook ♦ Source: National Interagency Coordination Center

13a. Monthly wildfire outlook (valid April 1–30).



13b. Monthly fire danger outlook (valid April 1–30).



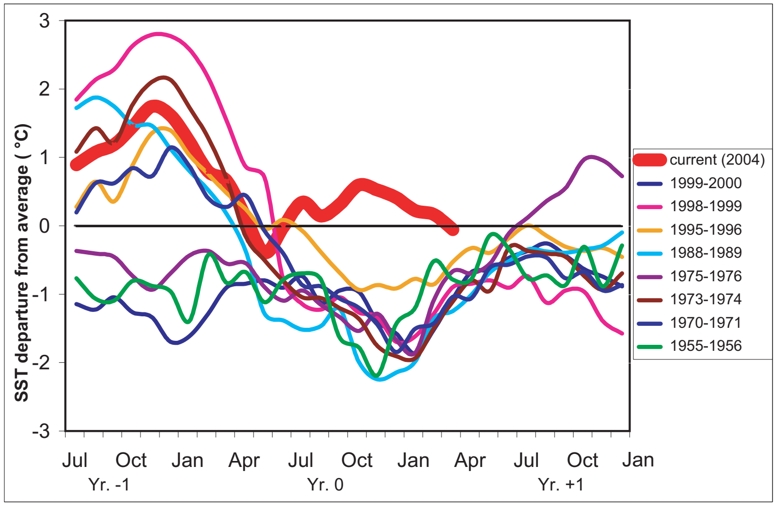
Notes: The National Interagency Coordination Center (NICC) at the National Interagency Fire Center (NIFC) produces monthly (Figure 13a) wildland fire outlooks. These forecasts consider climate forecasts and surface-fuels conditions in order to assess fire potential. They are subjective assessments, based on synthesis of regional fire danger outlooks. The Southwest Coordination Center (SWCC) produces more detailed monthly subjective assessments for Arizona, New Mexico, and west Texas (Figure 13b).

Highlights: Although short-term fire potential for April, 2004 is expected to be near-normal for the Southwest (Figures 13a and 13b), large fire potential is above-normal for northern Arizona and northwestern New Mexico (not shown), according to the SWCC. Fire season (roughly May–early July) fire potential is expected to be above-normal for most of Arizona and the western third of New Mexico. The expectation of above-normal fire potential is based on the following factors: underlying drought conditions, a below-average snowpack and early snowmelt, below-average winter and spring precipitation across most of Northern Arizona, enhanced fine fuel (e.g., grass) growth in the southern half of our region, and forecasts for increased probabilities of above-average temperatures during the late spring and summer months (see page 9). According to the SWCC, large fire (100 acres or more) potential will be near normal through much of April, then increase to above normal by mid-May and to significantly above normal during the latter half of May and June. The percentage of large fires requiring aggressive management will increase steadily throughout the season. SWCC fire specialists emphasize that due to underlying drought conditions, fire danger can increase rapidly during normal warm and dry periods of one week and less.

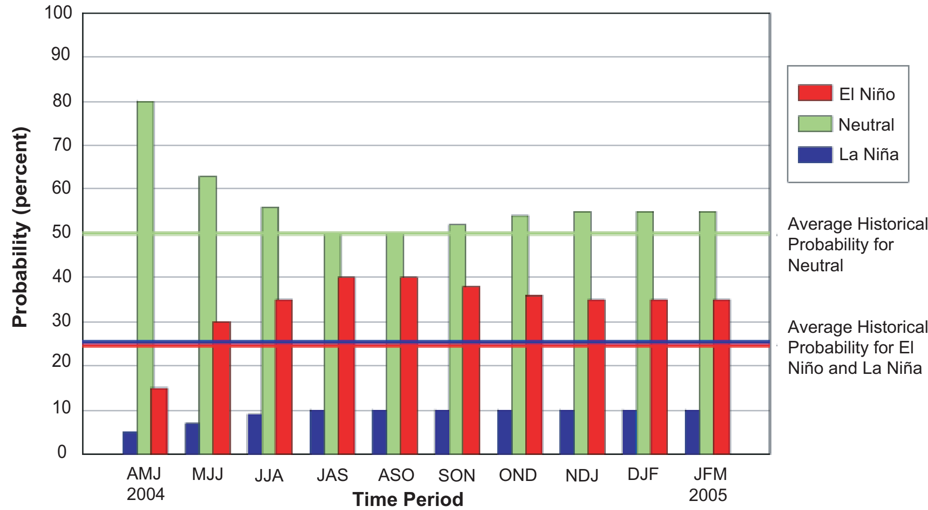
For more detailed discussions, visit the National Wildland Fire Outlook web page: http://www.nifc.gov/news/nicc.html and the Southwest Area Wildland Fire Operations (SWCC) web page: http://www.fs.fed.us/r3/fire/ For an array of climate and fire assessment tools, visit the Desert Research Institute program for Climate, Ecosystem, and Fire Applications (CEFA) web page: http://cefa.dri.edu/Assessment_Products/assess_index.htm

14. Tropical Pacific Sea Surface Temperature Forecast Sources: NOAA-CPC, IRI

14a. Current (red) and past La Niña event sea surface temperature anomalies (°C) for the El Niño 3.4 monitoring region of the equatorial Pacific Ocean.



14b. IRI Probabilistic ENSO Forecast for El Niño 3.4 Monitoring Region



Notes: Figure 14a shows sea-surface temperature (SST) departures from the long-term average for the Niño 3.4 region in the central-eastern equatorial Pacific Ocean (120°-170°W, 5°S-5°N). SSTs in this region are a sensitive indicator of El Niño-Southern Oscillation (ENSO) conditions. Each line on the graph represents SST departures for previous La Niña events, beginning with the year before the event began (Yr. –1), continuing through the event year (Yr. 0), and into the decay of the event during the subsequent year (Yr. +1). The most recent SST departures are plotted as a thick red line. The magnitude of the SST departure, its timing during the seasonal cycle, and its exact location in the equatorial Pacific Ocean are some of the factors that determine the degree of impacts experienced in the Southwest.

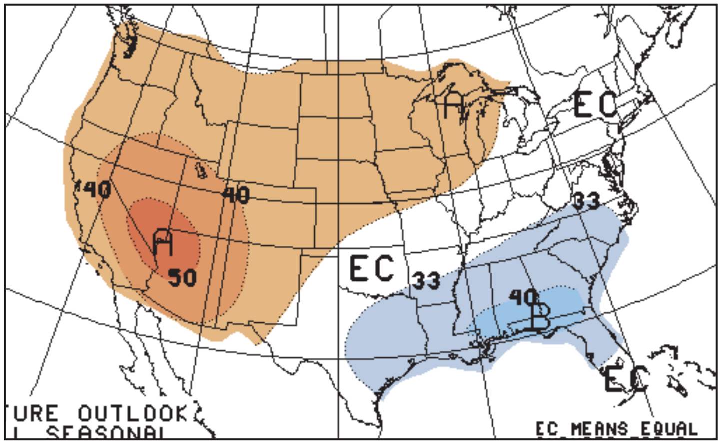
Figure 14b shows the International Research Institute for Climate Prediction (IRI) probabilistic ENSO forecast for overlapping three month seasons. The forecast expresses the probabilities (chances) of the occurrence of three ocean conditions in the ENSO-sensitive Niño 3.4 region, as follows: El Niño, neutral, La Niña. The forecast is a subjective assessment of current forecasts of ENSO prediction models. Only models that produce a new ENSO forecast every month are included in the assessment. The forecast takes into account the indications of the individual forecast models (including expert knowledge of model skill and how that skill varies seasonally), an average of the models, and additional factors such as the very latest observations. The forecast considers El Niño conditions as occurring during the warmest 25 percent of Niño 3.4 SSTs during the three month period in question; La Niña conditions are the coolest 25 percent of Niño 3.4 SSTs, and neutral conditions define the remaining 50 percent of observations.

Highlights: Both the IRI and NOAA Climate Prediction Center (CPC) suggest that near-neutral ENSO conditions will continue over the coming 3 to 6 months. Sea-surface temperatures in the ENSO-sensitive Niño 3.4 region are currently near average (Figure 14a), and atmospheric conditions do not support the development of either El Niño or La Niña episodes during 2004. According to the IRI, there is an approximately 40 percent probability of El Niño developing during the summer (Figure 14b), which is somewhat greater than the historical average probability (25 percent). The state of ENSO in June has some tendency to persist during the rest of the year, thus there is a *slightly* enhanced probability of El Niño developing during the remainder of 2004. The probability of La Niña, which brings dry winter conditions to the Southwest, developing is exceedingly low (Figure 14b).

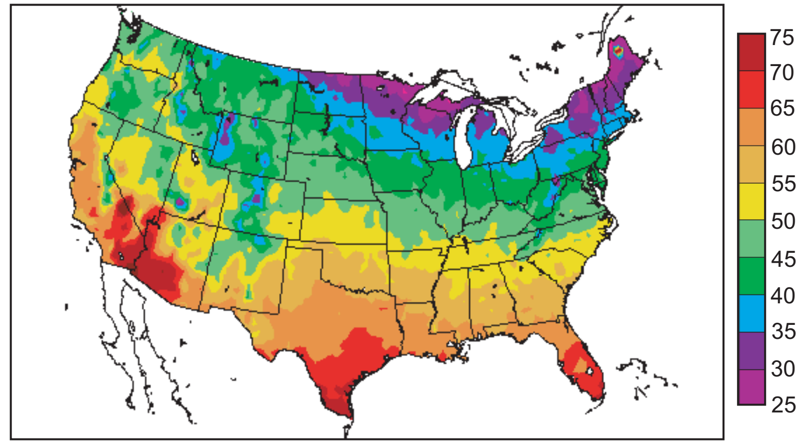
For a technical discussion of current El Niño conditions, visit: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/
For more information about El Niño and to access graphics similar to the figure above, visit: http://iri.columbia.edu/climate/ENSO/

15. Temperature Verification: January–March 2004 ♦ Source: NOAA Climate Prediction Center

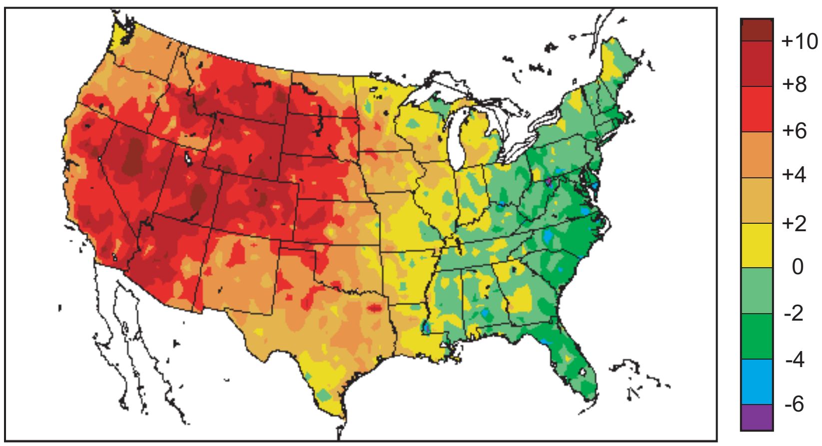
15a. Long-lead U.S. temperature forecast for January–March 2004.



15b. Average temperature (in °F) for January–March 2004.



15c. Average temperature departure (in °F) for January–March 2004.



Highlights: The NOAA-CPC January–March 2004 forecast for increased probabilities of above-average temperatures was on the mark for most of the western United States. A swath from east Texas to Mississippi exhibited above-average temperatures, when the forecast was for increased probabilities of below-average temperature. Overall, the forecast skill was quite good for this outlook period.

Notes: Figure 15a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months January–March 2004. This forecast was made in December 2003.

The January–March 2004 NOAA CPC outlook predicts the likelihood (chance) of above-average, average, and below-average temperature, but not the magnitude of such variation. The numbers on the maps do not refer to degrees of temperature. Care should be exercised when comparing the forecast (probability) map with the observed temperature maps described below.

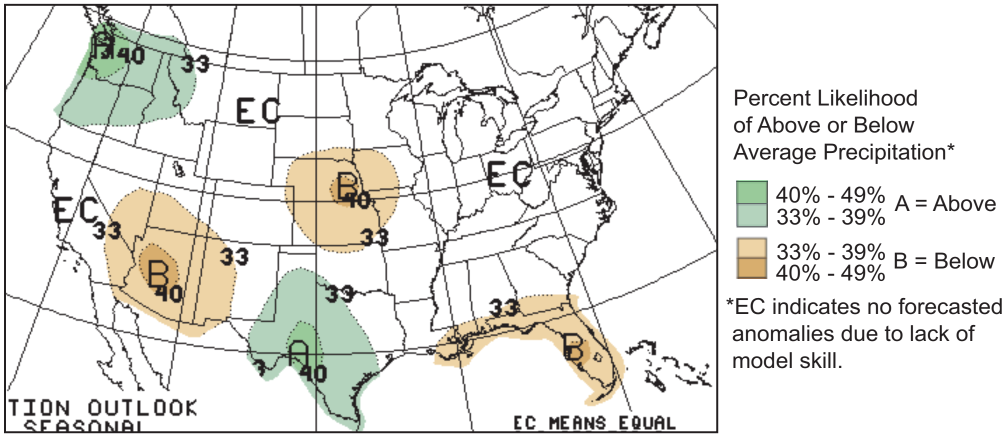
Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average temperature. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.8–33.3 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 average temperature between January–March 2004 (°F). Figure 15c shows the observed departure of temperature (°F) from the average for January–March 2004.

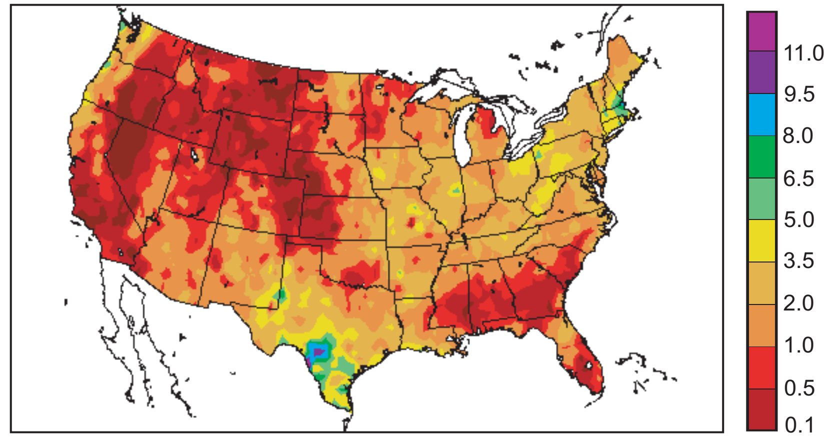
In all of the figures on this page, the term *average* refers to the 1971–2000 average. This practice is standard in the field of climatology.

16. Precipitation Verification: January–March 2004 ♦ Source: NOAA Climate Prediction Center

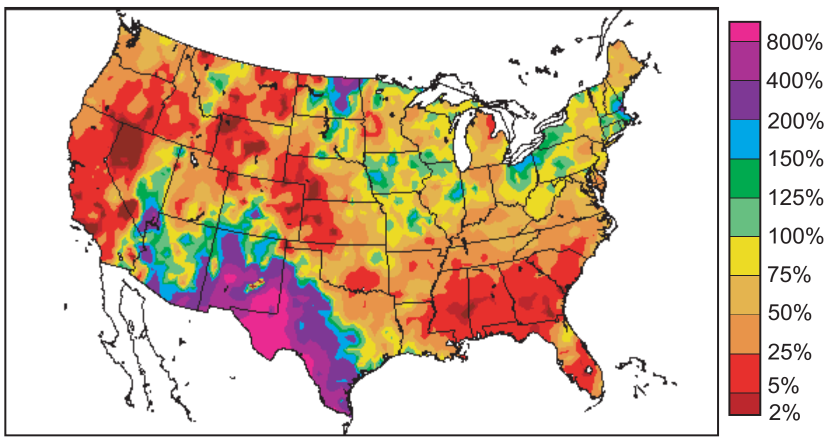
16a. Long-lead U.S. precipitation forecast for January–March 2004.



16b. Observed precipitation for January–March 2004 (inches).



16c. Percent of average precipitation observed between January–March 2004.



Highlights: The NOAA-CPC January–March 2004 forecast presented a complicated pattern of increased probabilities for above- and below-average precipitation. The region of predicted above-average precipitation in Texas (well predicted) actually extended into New Mexico and Arizona (where below-average precipitation was expected). The increased probabilities for below-average precipitation in the Midwest and Florida showed skill, but the predictions failed in the Pacific Northwest. Overall, a complicated pattern of precipitation departures was observed.

Notes: Figure 16a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months January–March 2004. This forecast was made in December 2003.

The January–March 2004 NOAA CPC outlook predicts the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the forecast map (Figure 16a) do not refer to inches of precipitation. Care should be exercised when comparing the forecast (probability) map with the observed precipitation maps described below.

Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average precipitation. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.8–33.3 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 total precipitation observed between January–March 2004 in inches. Figure 16c shows the observed percent of average precipitation for January–March 2004.

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.