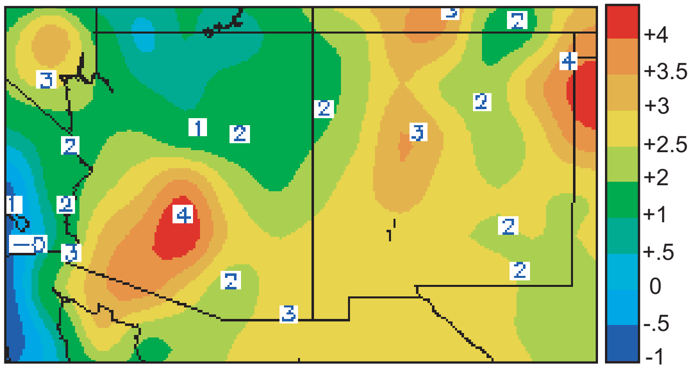
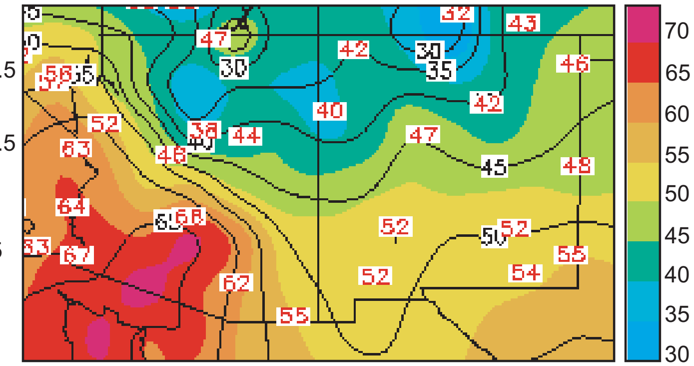
1. Recent Conditions: Temperature (up to 1/14/04) Sources: WRCC, HPRCC

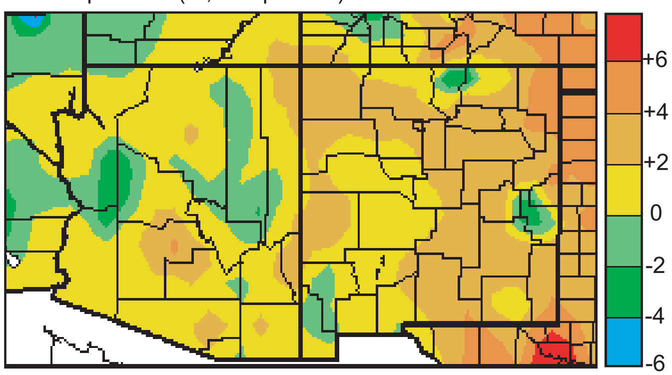
1a. Water year '03-'04 (through 1/14) departure from average temperature (°F).



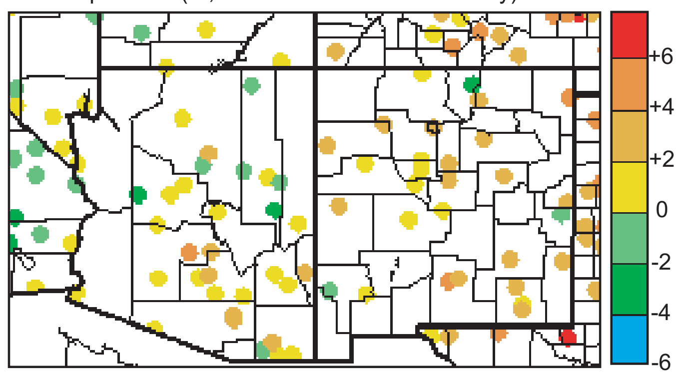
1b. Water year '03-'04 (through 1/14) average temperature (°F).



1c. Previous 30 days (12/16 - 1/14) departure from average temperature (°F, interpolated).



1d. Previous 30 days (12/16 - 1/14) departure from average temperature (°F, data collection locations only).



Highlights: Over the past 30 days, average daily temperatures in Arizona have varied both above- and below-average depending on the area of the state, whereas temperatures across virtually all of New Mexico were above-average and of greater magnitude than in Arizona (Figure 1c). Several winter weather systems moved across the region, most notably a cold (but mostly dry) air mass that resulted in record and near-record lows across both states in the last few days of 2003. As of January 20, according to records from airports across the Southwest, provided by the Western Regional Climate Center (WRCC), minimum temperatures have been notably above average during the past 28 days. The National Weather Service reported that 2003 was the third warmest year on record in Tucson. NWS Tucson also reported that nine daily record high temperatures were set or tied in 2003, as was one record low.

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.

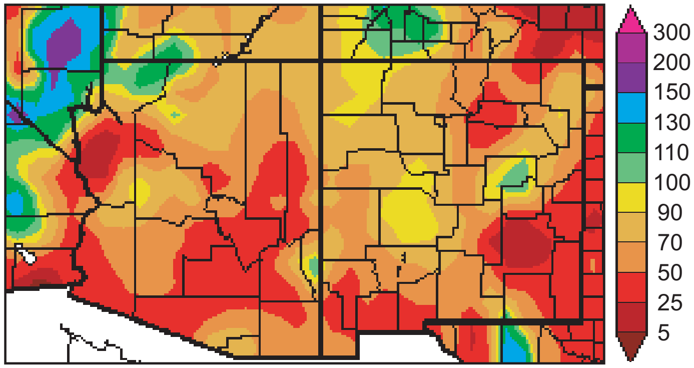
The continuous color maps (Figures 1a, 1b, 1c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. The blue numbers in Figure 1a, the red numbers in Figure 1b, and the dots in Figure 1d show data values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

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

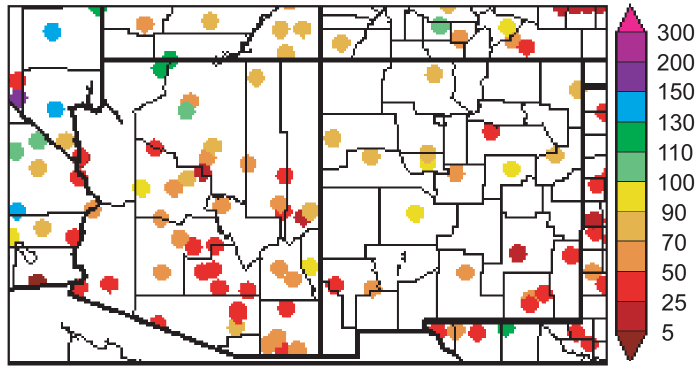
Figures 1c and 1d are experimental products from the High Plains Regional Climate Center (HPRCC).

2. Recent Conditions: Precipitation (up to 1/14/04) Source: High Plains Regional Climate Center

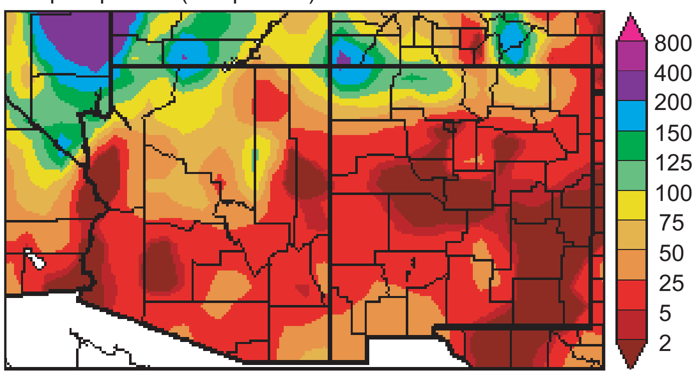
2a. Water year '03-'04 (through 1/14) percent of average precipitation (interpolated).



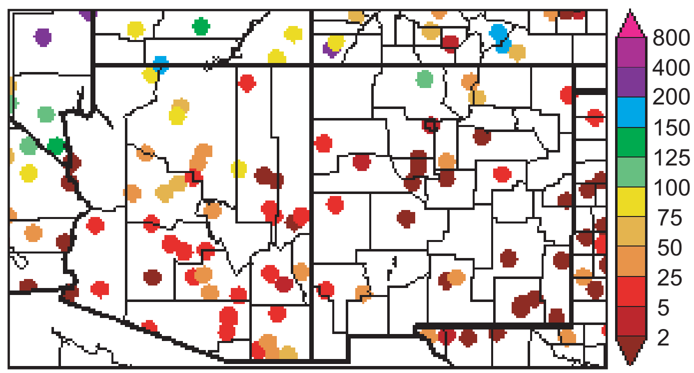
2b. Water year '03-'04 (through 1/14) percent of average precipitation (data collection locations only).



2c. Previous 30 days (12/16 - 1/14) percent of average precipitation (interpolated).



2d. Previous 30 days (12/16 - 1/14) percent of average precipitation (data collection locations only).



Highlights: Drier than average conditions persisted across virtually all of Arizona and New Mexico during the past 30 days. In some areas, most notably eastern New Mexico, precipitation did not exceed even 10 percent of average for the period. According to NWS Albuquerque, precipitation for the year in Albuquerque was 6.35 inches, 3.1 inches below average and the 13th driest calendar year since 1931. The ongoing drought continues in 2004, with virtually no precipitation measured through mid-January in northern and central Arizona and New Mexico. On January 14th precipitation fell in southeastern Arizona and southern New Mexico, bringing some relief to otherwise worsening drought conditions. Totals from this event were as little as 0.05 inches in Tucson, 0.9 inches in Bisbee, over 1.2 inches in the White Mountains at Hannagan Meadow, but just 0.1 inches in Deming, New Mexico. Precipitation falling at the time that this outlook went to press should provide at least short-term drought relief to our region.

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.

Note: 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.

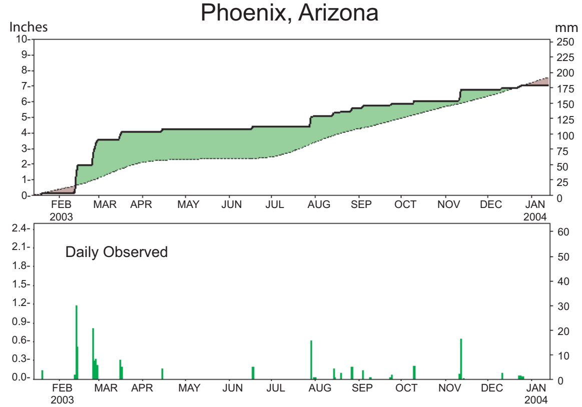
The top of each of the pairs of graphs shows average (dotted line) and actual (solid line) accumulated precipitation (i.e., each day's precipitation total is added to the previous day's total for a 365-day period). If accumulated precipitation is below the long-term average, the region between the long-term 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.

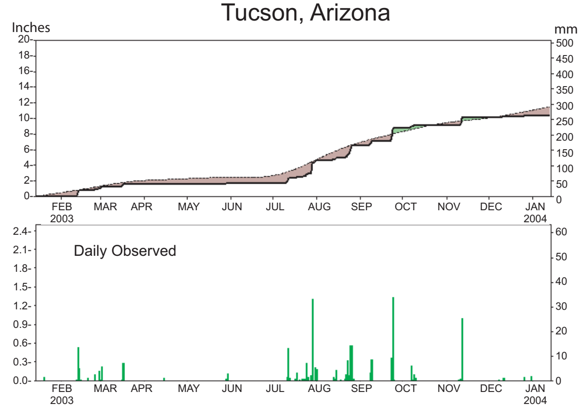
It is important to note that the scales for both the accumulated precipitation and the daily precipitation vary from station to station.

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.

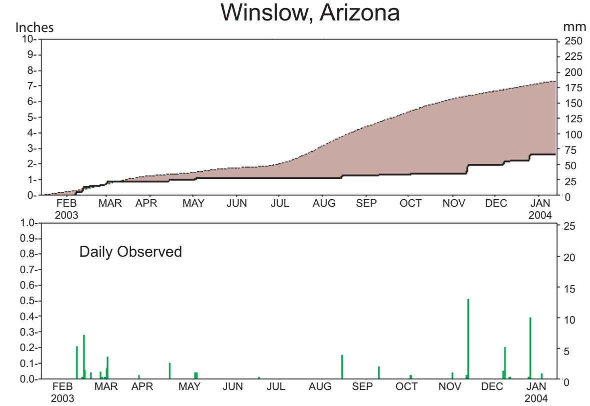
Phoenix, Arizona



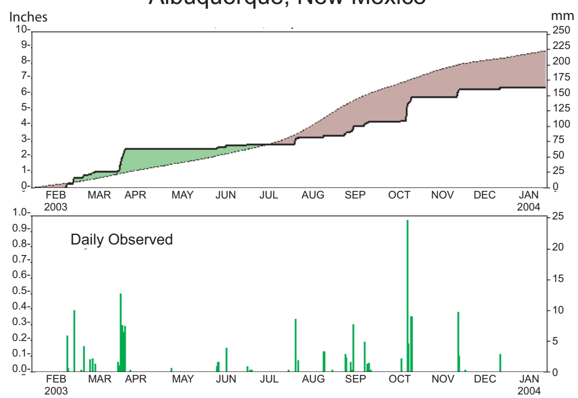
Tucson, Arizona



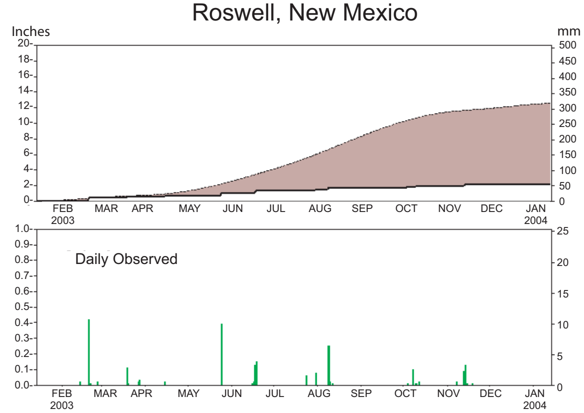
Winslow, Arizona



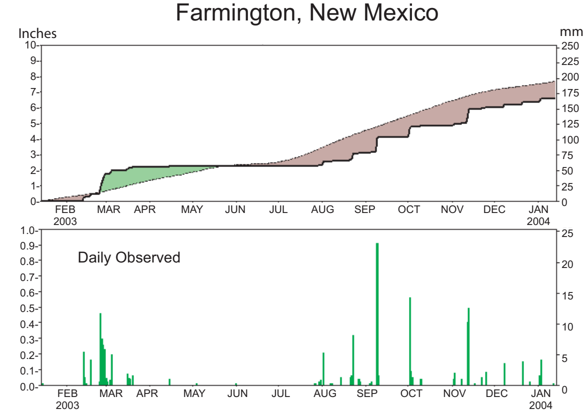
Albuquerque, New Mexico



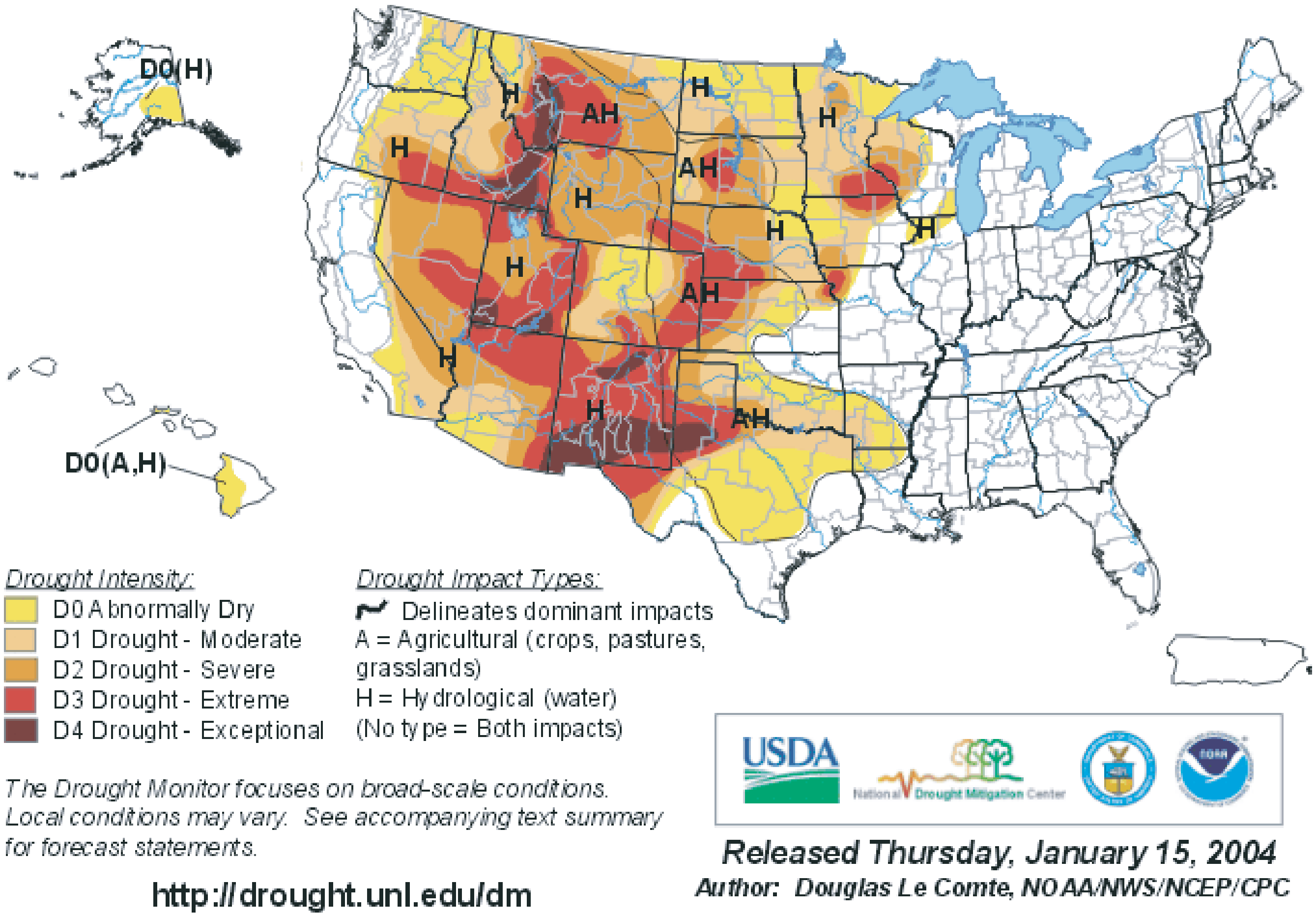
Roswell, New Mexico



Farmington, New Mexico



4. U.S. Drought Monitor (updated 1/15/03) ♦ Source: USDA, NDMC, NOAA



Notes:

The U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. This monitor was released on 1/15 and is based on data collected through 1/13.

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

The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) PDSI, soil moisture, stream flow, precipitation, and measures of vegetation stress, as well as reports of drought impacts.

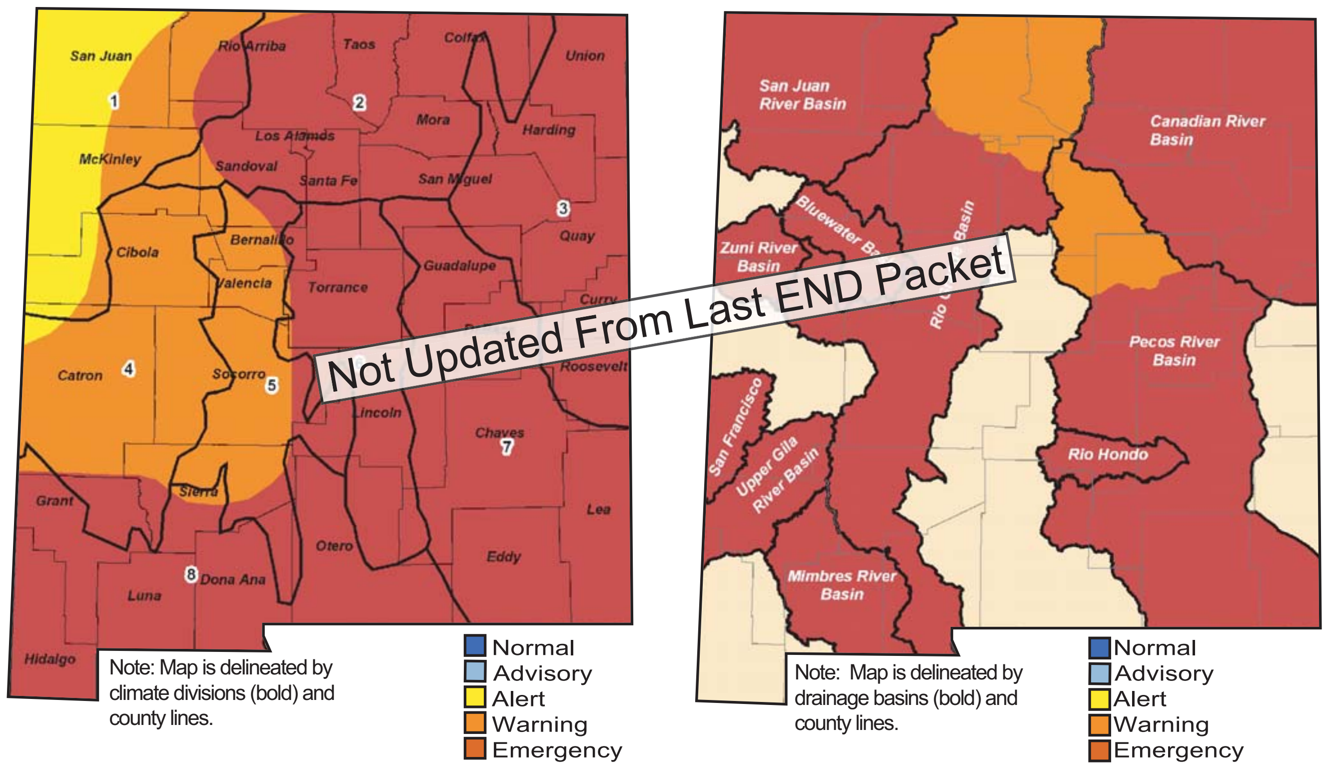
Highlights: Drought status conditions for the southwestern United States are identical to conditions last month, as reported by the U.S. Drought Monitor. Compared to this time last year, drought status in northern Arizona dropped from exceptional to extreme status. Southwestern Arizona drought status has also decreased, going from extreme drought status to abnormally dry or moderate. Drought index values and satellite vegetation health indices for locations in southeastern Arizona and southwestern New Mexico (not pictured), indicate continued extreme to exceptional drought conditions and vegetation stress. U.S. Drought Monitor status for New Mexico looks more severe than it did at this time last year. Whereas last year only the northwestern corner of the state was declared to be in severe to exceptional drought status, this year severe conditions represent the low end of the range throughout the state. Most of the areas deemed in extreme drought this year were in abnormally dry to moderate condition at this time last year. Especially dry conditions have been observed in southeastern New Mexico.

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 11/21/03) Source: New Mexico NRCS

Meteorological Drought Map
Drought Status as of November 21, 2003

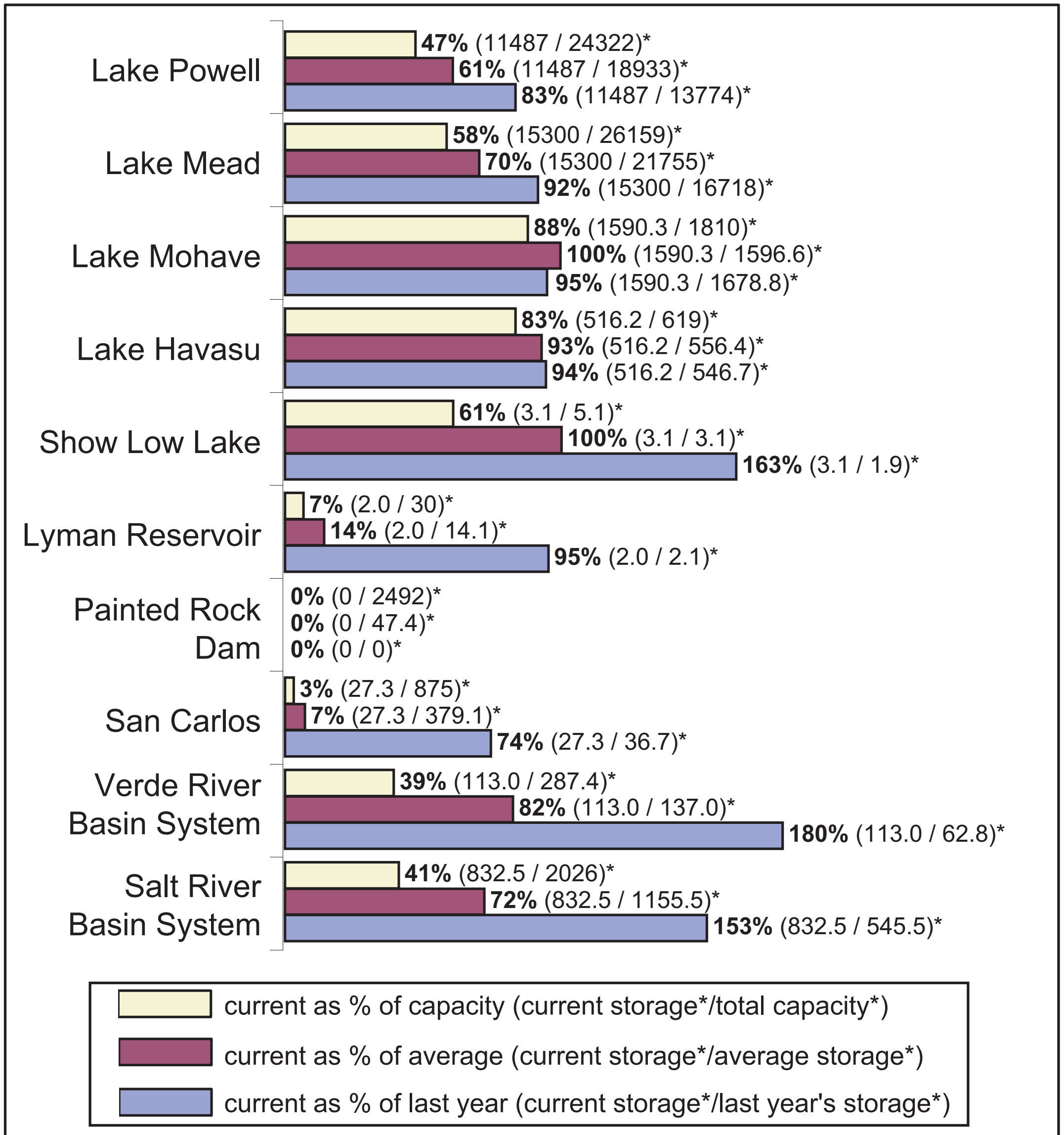
Hydrological Drought Map
Drought Status as of November 21, 2003



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: The New Mexico Drought Monitoring Workgroup will not update the New Mexico drought status maps until later in 2004; the following report is based on a variety of information, some of which is usually reviewed by the NMDMW. Reservoir levels throughout New Mexico (see page 7) are still well below average. Based on historical January 1 snowpack amounts in the Rio Grande Basin going back to 1995, the 2004 total ranks as the third lowest. Only January 1 of 1996 and 2000 showed lower snowpack than in 2004. Nevertheless, a storm system moving through the region at the time this outlook was going to press should bring snow to parts of New Mexico. North central New Mexico drought conditions should be improving due to above-average snow and precipitation in the San Juan River Basin. An early prediction of fire danger throughout New Mexico indicates that, due to extensive drought and insect-induced tree mortality, the fire season is expected to be severe. However, significant winter snow can help delay the onset of the fire season.

6. Arizona Reservoir Levels (through the end of December 2003) ♦ 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). 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 1/15/04, Arizona's report had been updated through the end of December.

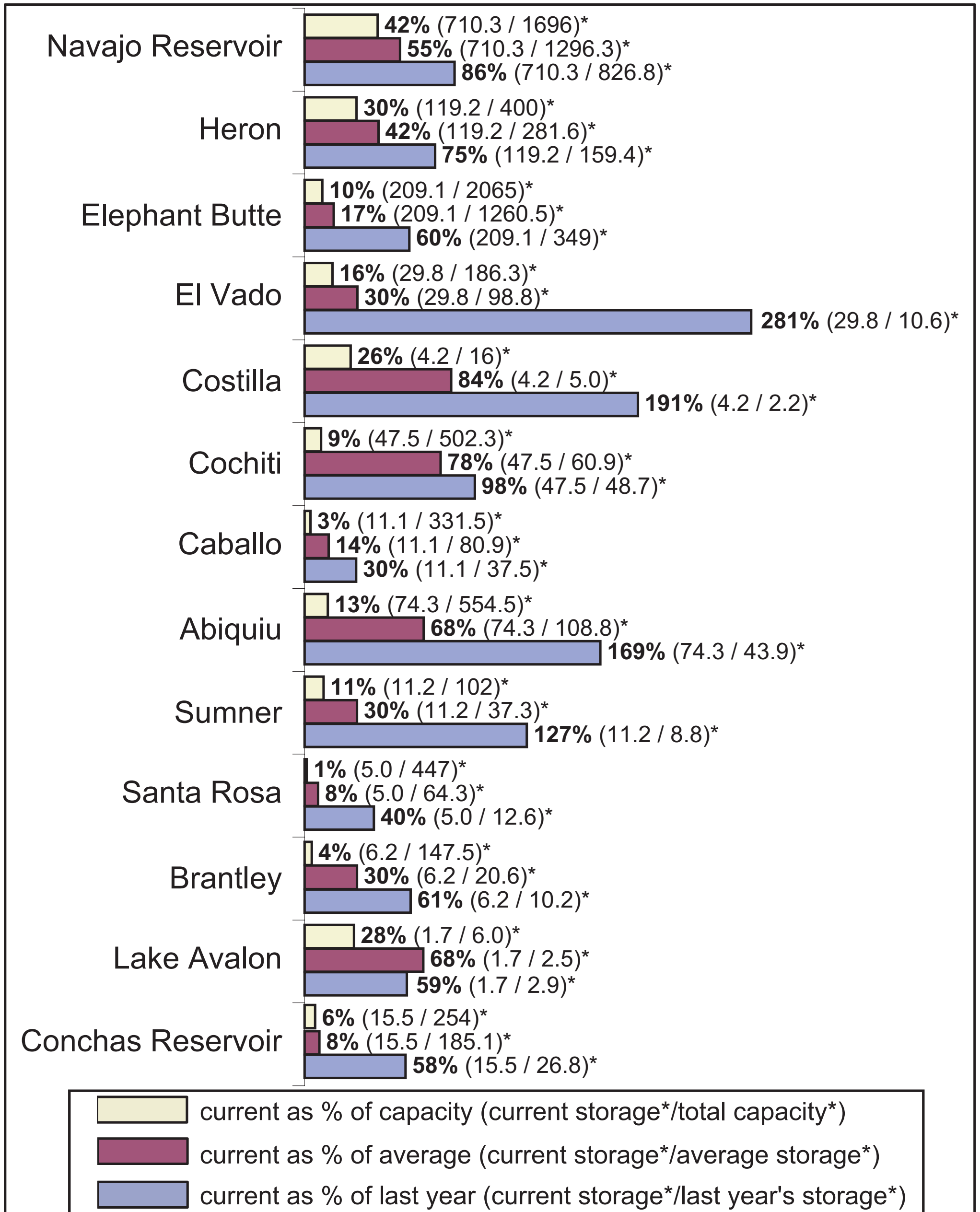
For additional information, contact Tom Pagano of the NWCC-NRCS-USDA (tpagano@wcc.nrcs.usda.gov; 503-414-3010) or Larry Martinez, NRCS, USDA, 3003 N. Central Ave, Suite 800, Phoenix, Arizona 85012-2945; 602-280-8841; Larry.Martinez@az.usda.gov)

Highlights: Higher than usual temperatures and lower than usual precipitation across most of the state since the water year began in September continued to deplete Arizona's water supplies. Lake Powell, Lake Mead, and Lake Havasu declined by 309, 37, and 44 acre-feet, respectively during December. The gain of 64 acre-feet in Lake Mohave and 8 acre-feet in the Salt River system did little to reverse the decline of the state's aboveground water reserves. An acre-foot is the amount of water that would cover an acre 1 foot in depth and is sufficient to sustain a family for 1 year.

Of particular concern are levels on the Salt and Verde River systems, as well as the San Carlos reservoir. The Salt River Project (SRP) will curtail water deliveries to customers by 33 percent for a second straight year.

The University of Arizona Laboratory of Tree-Ring Research will provide SRP with reconstructions of annual runoff and streamflows on the Salt, Verde, and upper Colorado rivers and some of their tributaries. According to a January 8 article in the *Arizona Republic*,early results from the study suggest that 2002 was the driest year in 1500 years in these watersheds.

7. New Mexico Reservoir Levels (through the end of December 2003) 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 1/15/04, New Mexico's report had been updated through the end of December.

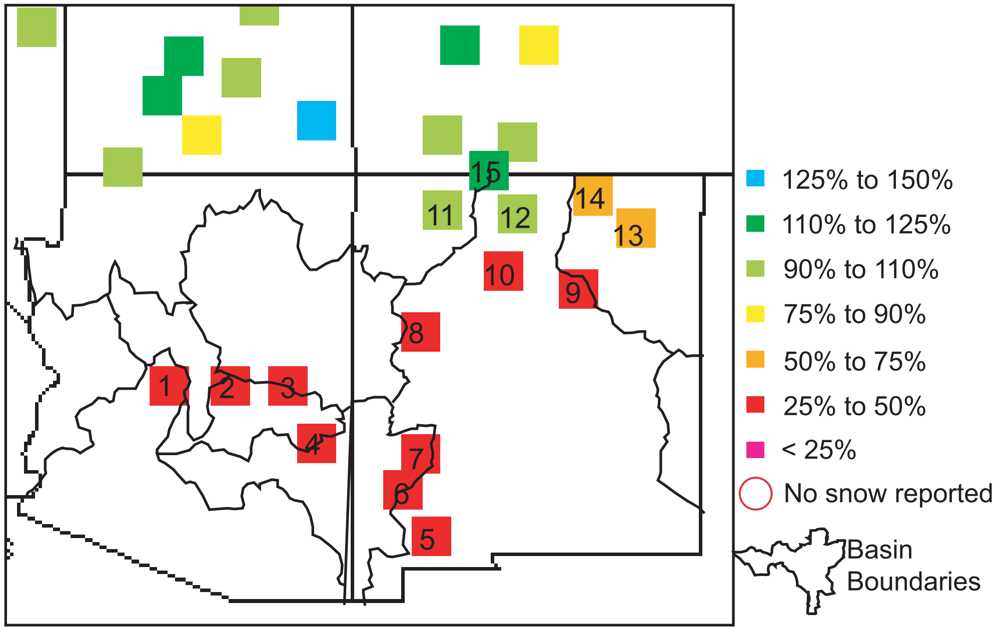
For additional information, contact Tom Pagano of the NWCC-NRCS-USDA (tpagano@wcc.nrcs.usda.gov; 503-414-3010) or Dan Murray, NRCS, USDA, 6200 Jefferson NE, Albuquerque, NM 87109; 505-761-4436; Dan.Murray@nm.usda.gov)

Highlights: Slight gains in reservoir water storage provided minimal relief for about half of the sites reported here compared to last month. The reservoir situation remains dire for much of New Mexico. Total reservoir storage at the start of January of 2004 was down to 1.25 million acre-feet. This is about a quarter of the 4.38 million acre-feet of reservoir storage in January of 2000, according to a Natural Resources Conservation Services report. The NRCS report, which provides a water supply outlook as of Jan. 1, forecasts below-average snowpack that will lead to below-average streamflow when it melts in the spring for most of the state, with the exception of the San Juan River Basin, which includes the Navajo Reservoir. An acre-foot is the amount of water that would cover an acre 1 foot in depth.

Public comments are being sought this month on a 389-page report that is expected to reach the New Mexico Interstate Stream Commission in February to become part of a statewide plan, the *Albuquerque Journal* reported in a January 13 story. The water plan makes 40 recommendations, including lining irrigation ditches with concrete, requiring low-flow toilets and xeriscapes in all new construction projects, and storing a smaller proportion of the state's water in Elephant Butte in favor of reservoirs with lower evaporation rates.

8. Snowpack in the Southwestern United States (updated 1/15/04) Source: USDA NRCS, WRCC

8. Basin average snow water content (SWC) for available monitoring sites as of 1/15/04 (% 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: Snowpack remains well below average throughout the southwestern United States as of January 15, 2004. Several winter storms have passed through the region in the past 30 days, but have left little snow in their wake. When compared with the December 2003 Climate Outlook, three SNOTEL sites in Northern New Mexico (numbers 11, 12, and 15 in Figure 8) show improvement in snow water content (SWC). With the exception of extreme northern New Mexico, all SNOTEL sites in Arizona and New Mexico report less than 50 percent of average for this time of year. However, at the time that this outlook went to press, our region was receiving substantial precipitation. As a result, it is expected that SNOTEL SWC percentages will increase, from the values presented in Figure 8, especially in central and southeastern Arizona.

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 1971-2000. 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.

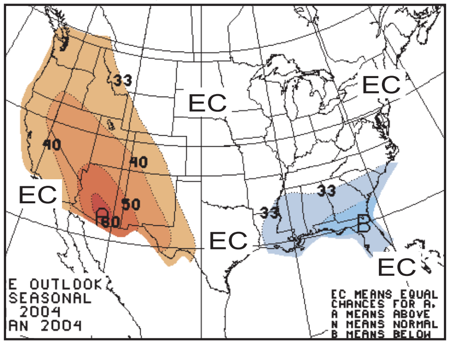
The dark lines within state boundaries delineate large river basins in the Southwest.

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.

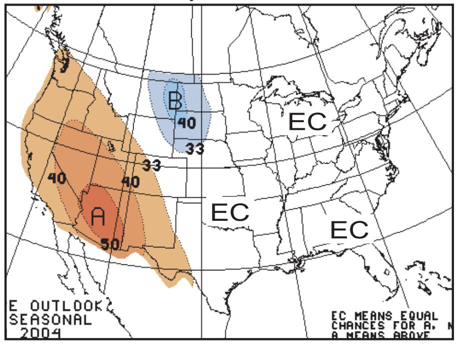
9. Temperature: Multi-season Outlooks ♦ Source: NOAA Climate Prediction Center

Overlapping 3-month long-lead temperature forecasts (released 1/15/04).

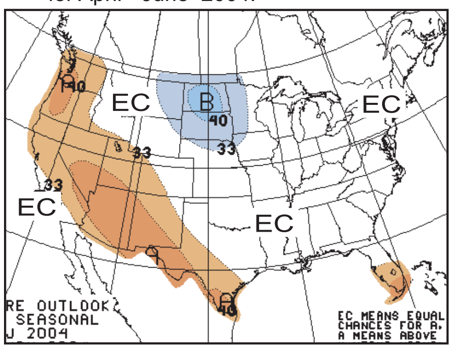
9a. Long-lead national temperature forecast for February - April 2004.



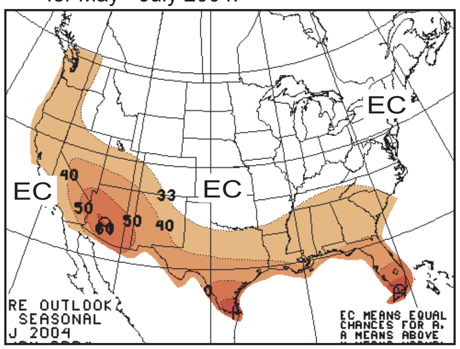
9b. Long-lead national temperature forecast for March - May 2004.



9c. Long-lead national temperature forecast for April - June 2004.



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



Percent Likelihood of Above and Below Average Temperatures*

A = Above
- > 60%
- 50% - 59.9%
- 40% - 49.9%
- 33% - 39.9%

B = Below
- 33% - 39.9%
- 40% - 49.9%

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

Highlights: The NOAA-CPC temperature outlooks for February through July 2004 forecast considerably increased probabilities of above-average temperatures for almost the entire Southwest (Figures 9a-d). The maximum likelihood of above-average temperatures (greater than 60 percent, which indicates only a 7 percent likelihood of below-average temperatures) is centered over western Arizona for the remainder of winter and into spring (Figures 9a and 9b). The CPC predictions are based primarily on agreement between long-term temperature trends for the region and statistical models. The predictions indicate very good agreement among dynamical models regarding an atmospheric circulation pattern that favors high temperatures over the western United States. The International Research Institute for Climate Prediction (IRI) temperature forecasts (not pictured) also indicate increased probabilities of above-average temperature for the southwestern United States. However, IRI maximum probabilities of above-average temperature are not as high.

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.

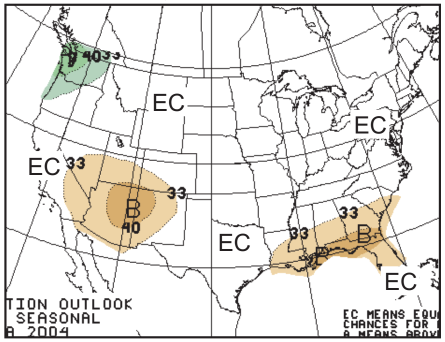
The term average refers to the 1971-2000 average. This practice is standard in the field of climatology.

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

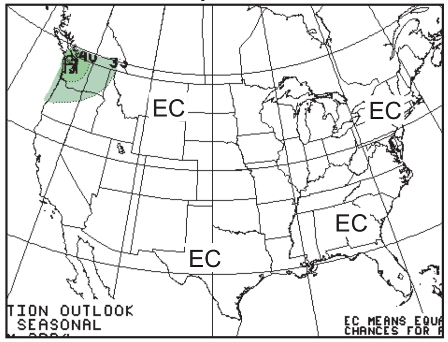
10. Precipitation: Multi-season Outlooks ♦ Source: NOAA Climate Prediction Center

Overlapping 3-month long-lead precipitation forcasts (released 1/15/04).

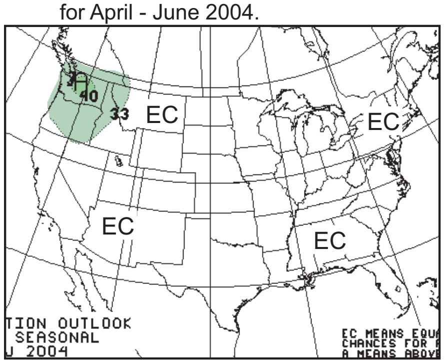
10a. Long-lead U.S. precipitation forecast for February - April 2004.



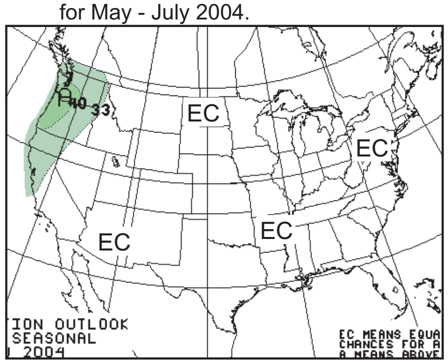
10b. Long-lead U.S. precipitation forecast for March - May 2004.



10c. Long-lead U.S. precipitation forecast for April - June 2004.



10d. Long-lead U.S. precipitation forecast for May - July 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 forecast for February-April 2004 indicates slightly increased probabilities of below-average precipitation for Arizona and much of New Mexico (Figure 10a). Confidence in this forecast is derived primarily from agreement among statistical models. CPC forecasters have reserved judgment regarding precipitation in the Southwest for the spring and early summer months (Figures 10b-d). The February-April 2004 IRI precipitation forecast (not pictured) indicates slightly increased probabilities (40-45 percent) of below-average precipitation covering much of Arizona and northwestern New Mexico for February-April 2004. NOAA CPC climate outlooks are released on Thursday, between the fifteenth and twenty-first of each month.

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.

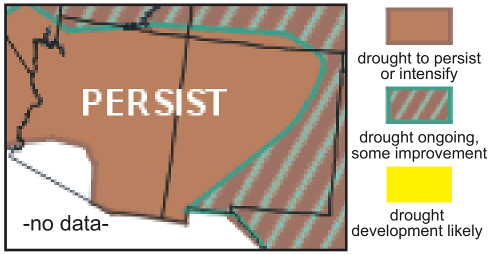
The term *average* refers to the 1971-2000 average. This practice is standard in the field of climatology.

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

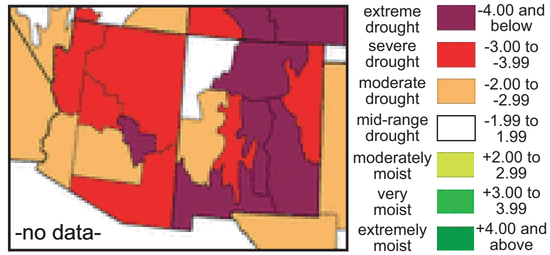
11. Drought: Seasonal Drought and PHDI Outlook Maps ♦ Sources: NOAA-CPC, NCDC

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.

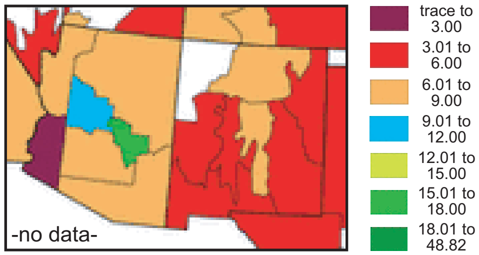
11a. Seasonal drought outlook through April 2004 (accessed 1/16).



11b. December 2003 PHDI conditions (accessed 1/16).



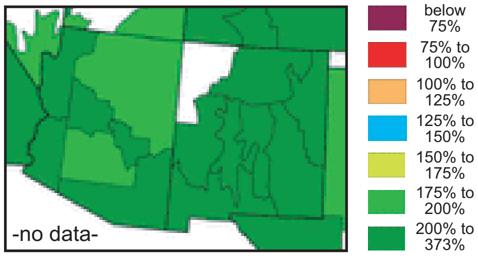
11c. Precipitation (in.) required to end current drought conditions in three months.



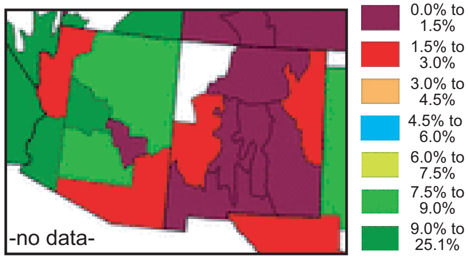
Figures 11b-e are based on the Palmer Hydrological Drought Index (PHDI), which reflects long-term precipitation deficits. PHDI is a measure of reservoir and groundwater level impacts, which take a relatively long time to develop and to recover from drought. Figure 11b shows the current PHDI status for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

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.



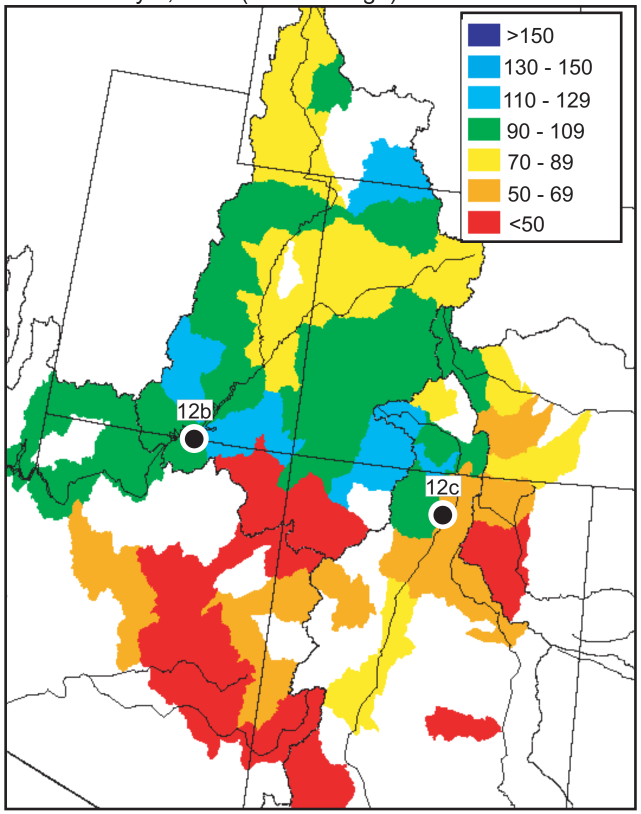
The season in which the precipitation falls greatly influences the amount of precipitation needed to end a drought. For example, during a typically wet season more precipitation may be required to end a drought than during a typically dry season. Also, because soil moisture conditions generally are lower 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 across most of the Southwest. The probability of ending drought within the next three months is still exceedingly low for most of New Mexico, as well as Gila County, Arizona. The probability of receiving drought-ending precipitation, though low, has increased for much of Arizona.

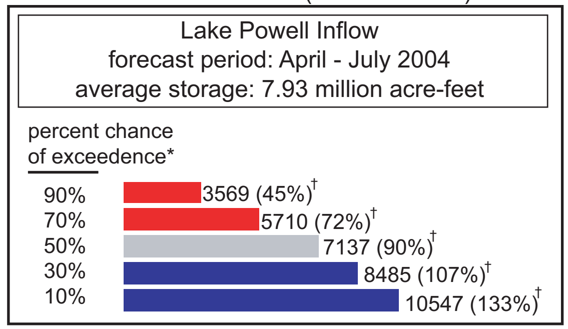
For more information, visit: http://www.drought.noaa.gov/ —and— http://www.ncdc.noaa.gov/oa/climate/research/drought/drought.html

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

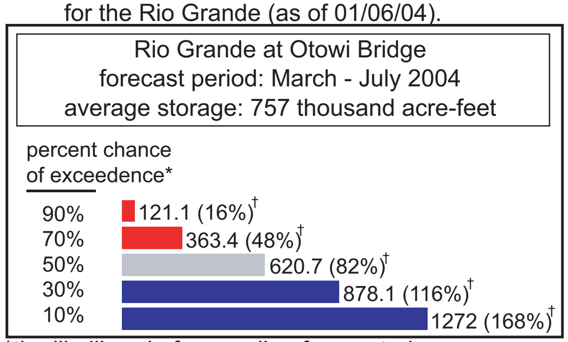
12a. NRCS spring and summer streamflow forecast as of January 1, 2004 (% of average).



12b. NRCS percent exceedence forecast chart for Lake Powell inflow (as of 01/06/04).



12c. NRCS percent exceedence forecast chart for the Rio Grande (as of 01/06/04).



*the likelihood of exceeding forecasted streamflow volume.

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

Highlights: Streamflow forecasts for Arizona and New Mexico river basins indicate that below-average streamflow is most likely this spring and summer for many gauged basins in both states. The good news, shown in Figure 12a, is that streamflow in some of the large basins in the Upper Colorado River Basin states (WY, UT, CO) is predicted to be average to above average. The best estimate of streamflow volume given current conditions and based on past outcomes of similar situations is that inflow to Lake Powell will be 90 percent of average (Fig. 12b). Inflow to the Rio Grande at Otowi Bridge in New Mexico is predicted to be 62 percent of average, with a 30 percent chance that inflow will be as high as 118 percent of the 1971-2000 average. Forecasts for both the Rio Grande and San Juan Basins are more optimistic than those issued during the previous two years. At the time that this information packet went to press, substantial precipitation was occurring in our region, and more was forecast. Based on northern New Mexico streamflow during 2003, however, our region will require much higher snowfall in order to generate even average streamflows in the major river basins.

For state river basin streamflow probability charts, visit: http://www.wcc.nrcs.usda.gov/water/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.

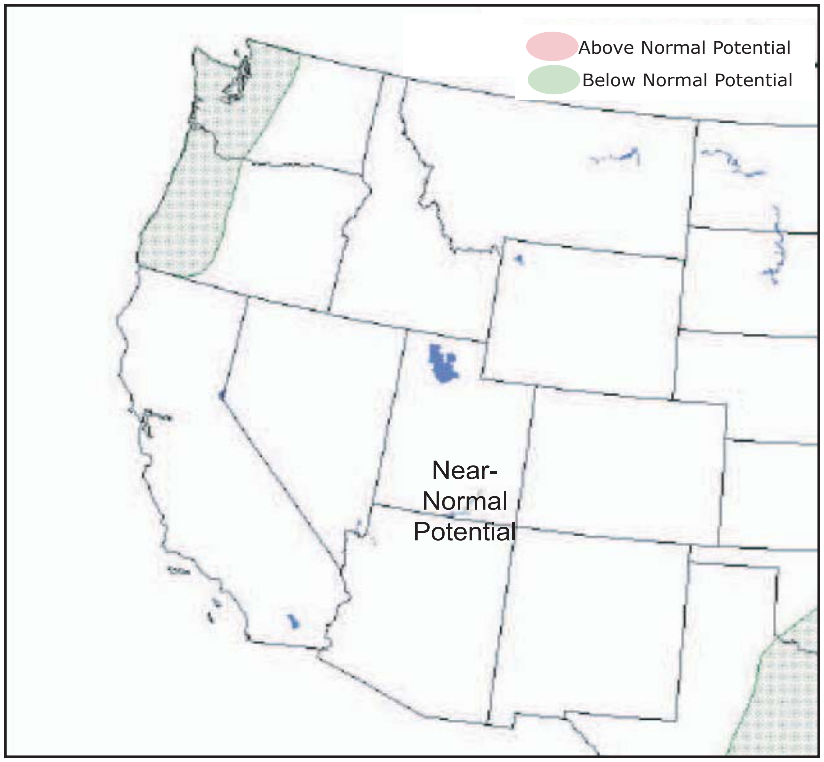
Each month, five streamflow volume forecasts are made by the NRCS for several river basins in the United States. These five forecasts correspond to standard *exceedence* percentages, which can be used as approximations for varying ‘risk’ thresholds when planning for short-term future water availability.

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 878.1 acre-feet of water (116 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.

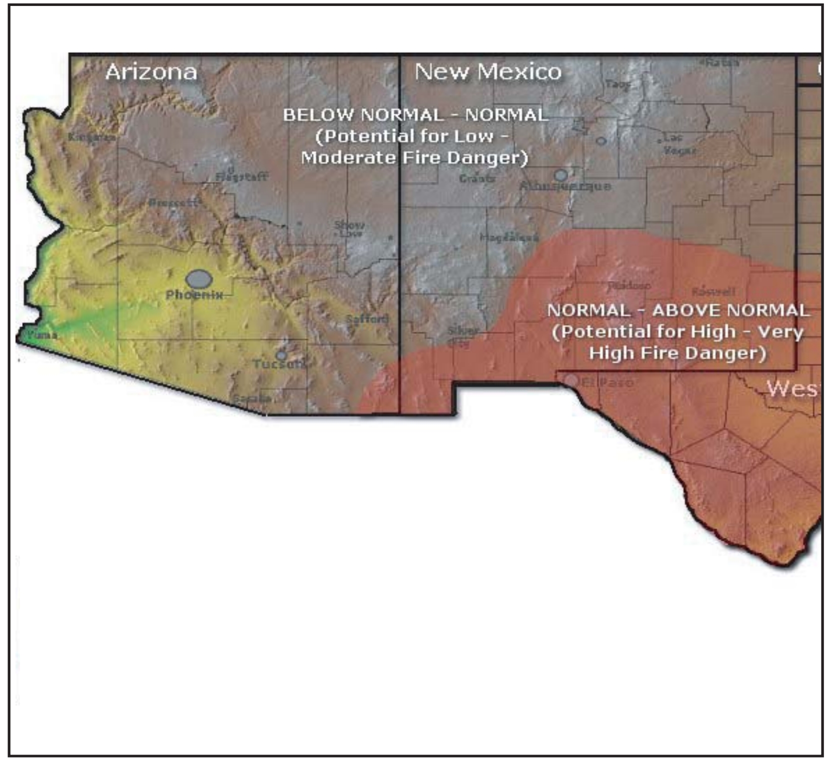
In addition to monthly graphical forecasts for individual points along rivers (Figures 12b and 12c), the NRCS provides a forecast map (Figure 12a) of basin-wide streamflow volume averages based on the forecasted 50 percent exceedence threshold.

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

13a. Monthly wildfire outlook (valid January 1 - 31).



13b. Monthly fire danger outlook (valid January 1 - 31).



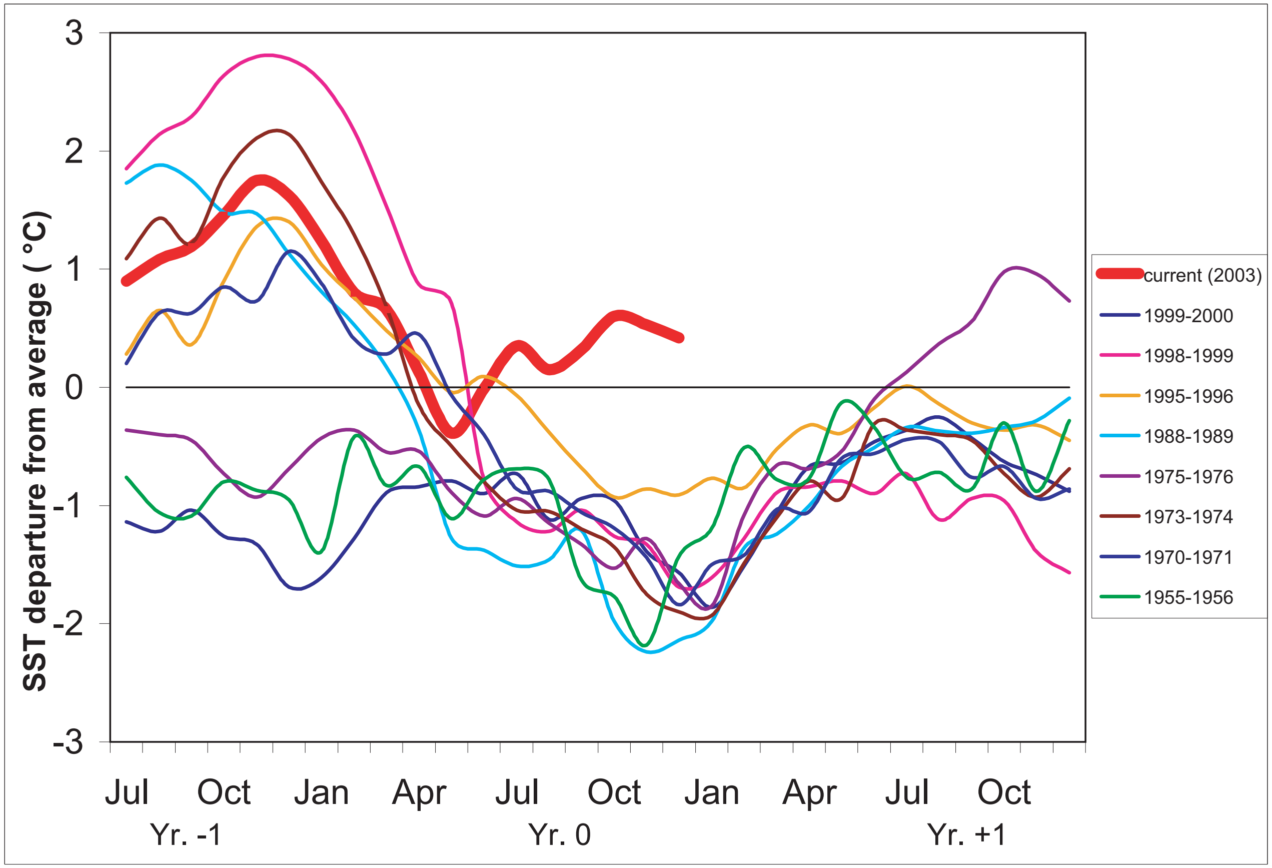
Notes: The National Interagency Coordination Center (NICC) at the National Interagency Fire Center (NIFC) produces monthly (Figure 13a) wildland fire outlooks. These forecasts consider climate forecasts and surface-fuels conditions in order to assess fire potential. They are subjective assessments, based 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: The January 1-31, 2004 NICC wildfire outlook is for near-normal fire potential for Arizona and New Mexico. The SWCC forecast (Figure 13b) indicates below normal-to-normal fire danger potential for much of our region; however, SWCC predicts normal-to-above normal fire danger across southern New Mexico and west Texas. As of January 21, 2004, (i.e., before recent rains visited our region) the observed fire danger class, used by the U.S. Wildland Fire Assessment System, denoted low fire danger across the Southwest. Other indicators, such as observations of large fuel moisture readings (1000-hour fuels), and experimental measures of vegetation health and greenness for the Southwest (not pictured) indicate relatively low potential for large fire across northern Arizona and northwestern New Mexico.

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

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



Notes: The graph (Figure 14) shows sea-surface temperature (SST) departures from the long-term average for the Niño 3.4 region in the central-eastern equatorial Pacific Ocean. SSTs in this region are a sensitive indicator of 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).

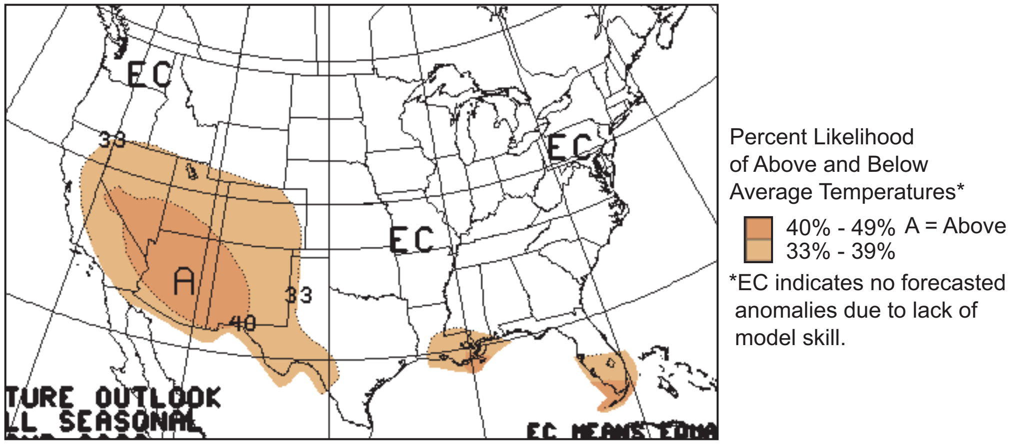
The most recent SST departures are plotted as a thick red line. The magnitude of the SST departure, its timing during the seasonal cycle, and its exact location in the equatorial Pacific Ocean are some of the factors that determine the degree of impacts experienced in the Southwest.

Highlights: Sea-surface temperatures (SSTs) remained above average for most of the equatorial Pacific Ocean; however, these conditions are not considered strong enough to declare an El Niño episode. The International Research Institute for Climate Prediction (IRI) states that the chance that an El Niño episode will develop between February and the summer is considered slightly greater than that of an average year, but still less than 50 percent. The chances of a La Niña episode developing are less than that of an average year. Both IRI and NOAA's Climate Prediction Center agree that atmospheric conditions in the Pacific do not show trends that would support the development of an El Niño episode.

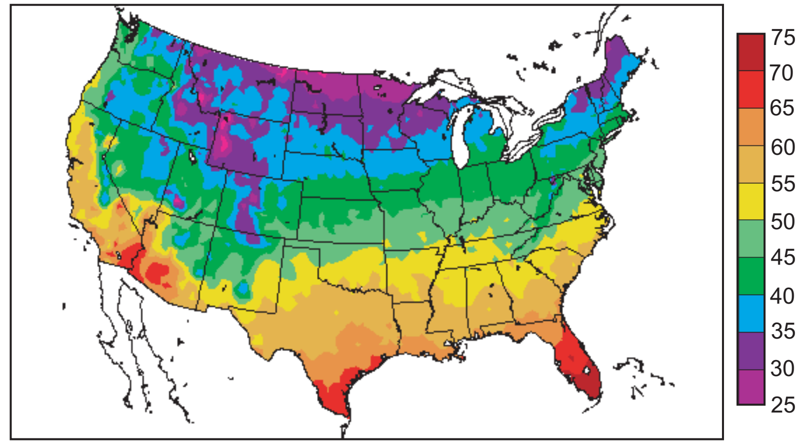
For a technical discussion of current El Niño conditions, visit: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/
For more information about El Niño and to access graphics similar to the figure above, visit: http://iri.columbia.edu/climate/ENSO/

15. Temperature Verification: October – December 2003 ♦ Source: NOAA Climate Prediction Center

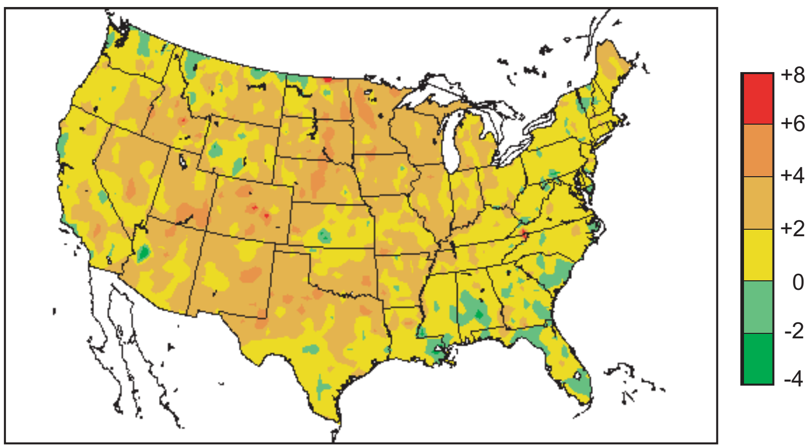
15a. Long-lead U.S. temperature forecast for October - December 2003.



15b. Average temperature (in °F) for October - December 2003.



15c. Average temperature departure (in °F) for October - December 2003.



Highlights: The NOAA-CPC October-December temperature outlook forecast increased probabilities for above-average temperatures for virtually all of the southwestern United States (Figure 15a). During the forecast period, above-average temperatures were observed in the region (Figure 15c). To put these above-average temperatures in perspective, note that average is based on 1971-2000, the warmest period in the last 100 years.

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

The October–December 2003 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.

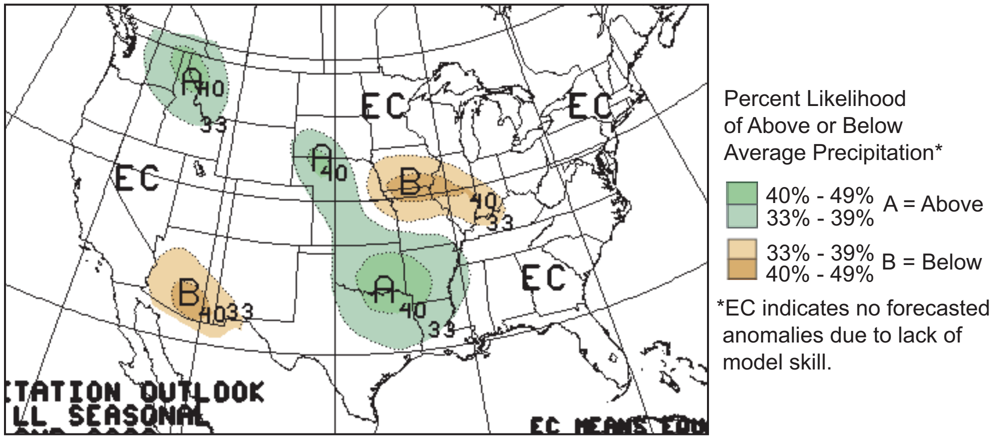
Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average temperature. Thus, using the NOAA CPC likelihood forecast, in areas with light 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 October–December 2003 (°F). Figure 15c shows the observed departure of temperature (°F) from the average for October–December 2003.

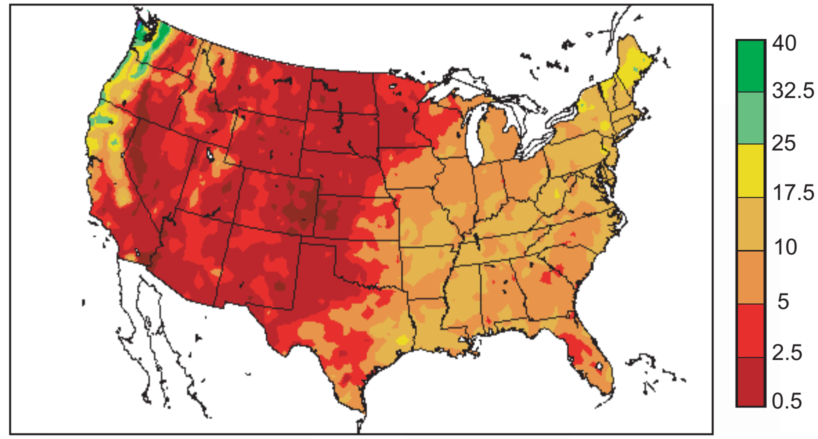
In all of the figures on this page, the term average refers to the 1971-2000 average. This practice is standard in the field of climatology.

16. Precipitation Verification: October – December 2003 ♦ Source: NOAA Climate Prediction Center

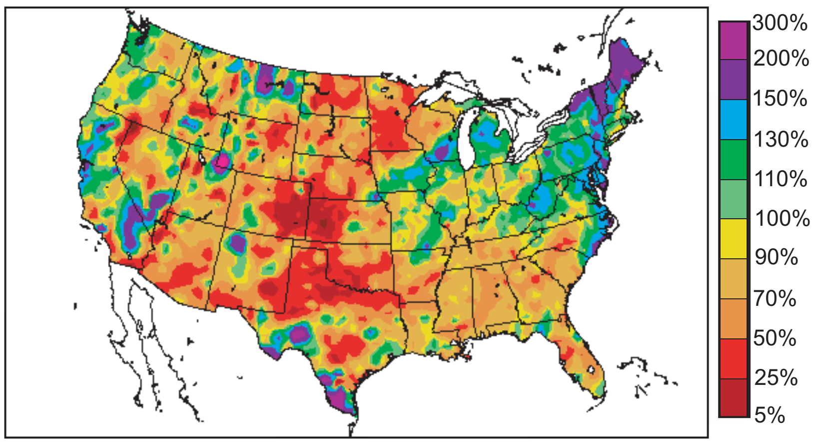
16a. Long-lead U.S. precipitation forecast for October - December 2003.



16b. Observed precipitation for October - December 2003 (inches).



16c. Percent of average precipitation observed between October - December 2003.



Highlights: The NOAA-CPC October-December 2003 precipitation outlook forecast increased probabilities of below-average precipitation for southern Arizona (Figure 16a). Well below-average precipitation was, in fact, the norm across much of the Southwest. However, the NOAA-CPC forecast was less successful in other parts of the U.S., such as northern Texas, the Midwest, and the northern Rockies. It is important to remember that slight shifts in forecast probability do not affect the probability of average precipitation and do not rule out precipitation in the opposite extreme (see CLIMAS Southwest Climate Outlook for September 2002).

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

The October–December 2003 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.

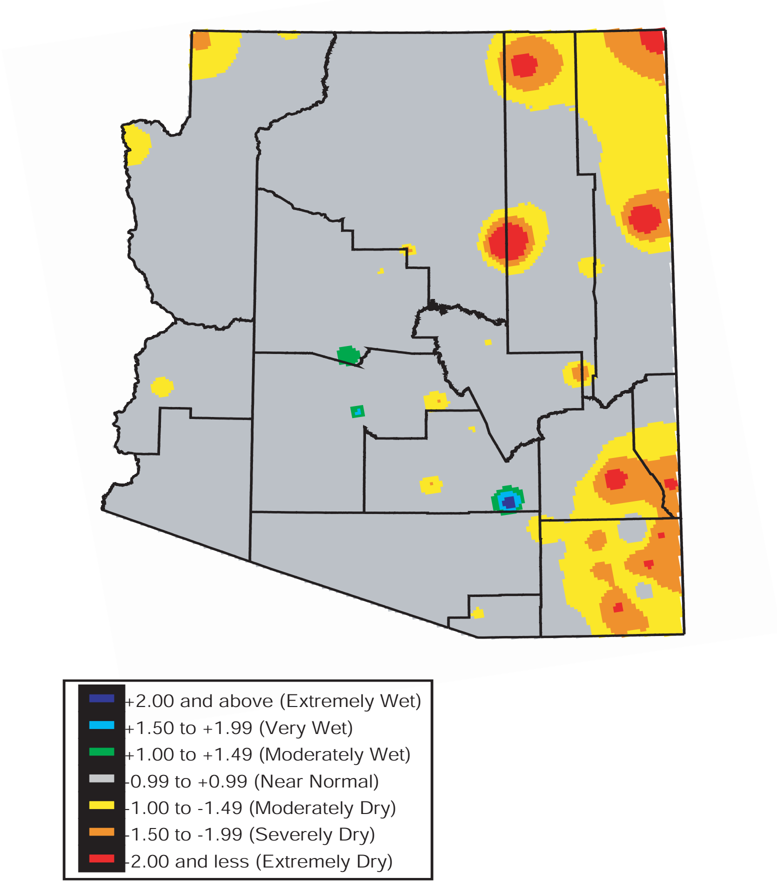
Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average precipitation. Thus, using the NOAA CPC likelihood forecast, in areas with 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 October–December 2003 in inches. Figure 16c shows the observed percent of average precipitation for October–December 2003.

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.

17. Focus on National Agricultural Decision Support System Monthly SPI Product

17. SPI Map for Arizona for June - August 2003.



Highlights:

For the three month period between June and August 2003, eastern Arizona experienced dry to extremely-dry conditions. This analysis was conducted using 139 stations; inverse distance weighting (IDW) interpolation was used. See the CLIMAS Glossary for a definition of IDW interpolations.

Notes:

The University of Nebraska, Lincoln provides a collection of decision support tools designed to help agricultural producers access a variety of risks. The National Agricultural Decision Support System includes drought indices such as the Standard Precipitation Index (SPI). This website is accessible at http://www.nadss.unl.edu/index.php. Additional information about the SPI can be found in the October, November, and December 2002 END Insight focus pages

To access the SPI "Quicklink" section, use the link on the left side of the page. To view monthly data, choose the state you wish to view and click the "monthly data" radio button in the box labeled "Generate an SPI Report".

Under "Parameters", there are a number of options to set to produce SPI maps for Arizona and New Mexico. For the end month, go at least one month back to get enough sample sites. Interpolation method refers to how isolines on the map are created, each method should produce similar results, however some methods require more stations. Under *analysis format*, if *table* is used, a table showing values at individual stations will be shown. The analysis format will effect how the interpolation occurs, for example, if the format of "County-level Map" is used, then the interpolation will use the average value for the county in the interpolation. Raster maps are recommended to show specific areas of abnormality.

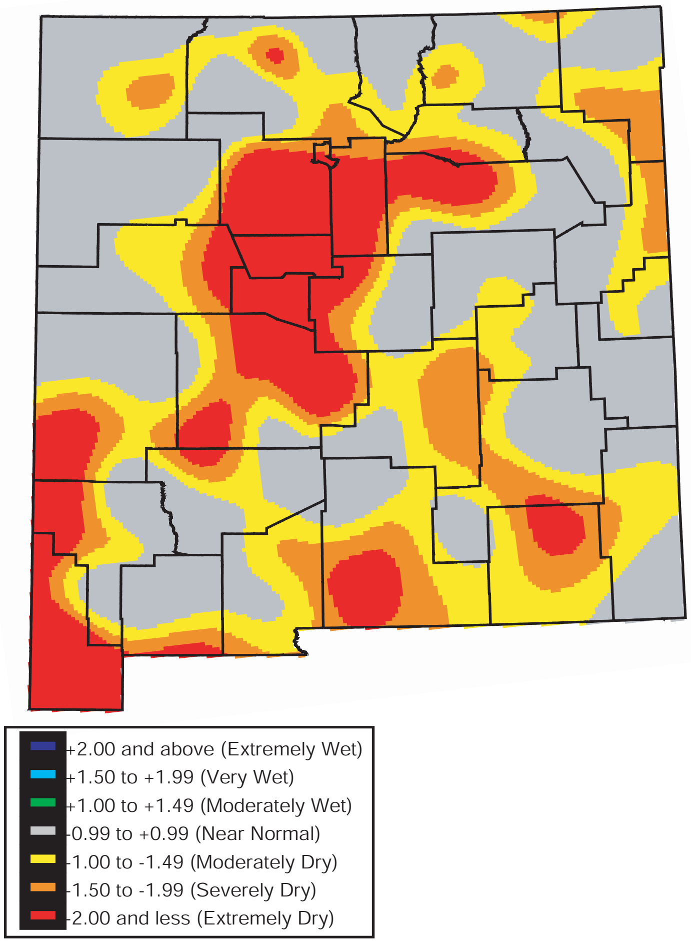
Overlay layer allows information to be overlaid on top of the map analysis. For example, you could overlay the congressional districts on top of your map to examine what districts might be affected by low precipitation. You can choose multiple overlay layers by holding the "Ctrl" key (Command Key on Macintosh) as you make selections.

You can choose to examine specific stations by clicking on their name from the list. Holding the "Ctrl" key will allow you to make multiple selections. In general it is best to use the "All Available Sites" selection.

Resolution alters the level of detail used in analysis. Using the "Low Resolution (3000 m)" provides a good level of detail for most analyses. As you increase the resolution, the download time will also take longer.

18. Focus on National Agricultural Decision Support System Weekly SPI Product

18. SPI Map for New Mexico for June 4 - August 26 2003.



Highlights:

For the period between June 4 and August 26, 2003, central and southern New Mexico experienced dry to extremely dry conditions. This analysis was conducted using 135 stations; a spline interpolation method was used. See the CLIMAS Glossary for a definition of spline interpolations.

Notes:

The University of Nebraska, Lincoln provides a collection of decision support tools designed to help agricultural producers access a variety of risks. The National Agricultural Decision Support System includes drought indices such as the Standard Precipitation Index (SPI). This website is accessible at http://www.nadss.unl.edu/index.php. Additional information about the SPI can be found in the October, November, and December 2002 END Insight focus pages

To access the SPI "Quicklink" section, use the link on the left side of the page. To view monthly data, choose the state you wish to view and click the "monthly data" radio button in the box labeled "Generate an SPI Report".

Under "Parameters", there are a number of options to set to produce SPI maps for Arizona and New Mexico. For the end month, go at least one month back to get enough sample sites. Interpolation method refers to how isolines on the map are created, each method should produce similar results, however some methods require more stations. Under *analysis format*, if *table* is used, a table showing values at individual stations will be shown. The analysis format will effect how the interpolation occurs, for example, if the format of "County-level Map" is used, then the interpolation will use the average value for the county in the interpolation. Raster maps are recommended to show specific areas of abnormality.

Overlay layer allows information to be overlaid on top of the map analysis. For example, you could overlay the congressional districts on top of your map to examine what districts might be affected by low precipitation. You can choose multiple overlay layers by holding the "Ctrl" button as you make selections.

You can choose to examine specific stations by clicking on their name from the list. Holding the "Ctrl" button will allow you to make multiple selections. In general it is best to use the "All Available Sites" selection.

Resolution alters the level of detail used in analysis. Using the "Low Resolution (3000 m)" provides a good level of detail for most analyses. As you increase the resolution, the download time will also take longer.