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Southwest Climate Outlook

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With winter in the rear view mirror, the Southwest will have to wait for monsoon storms—like the one taken near Flagstaff, Arizona, in this photo—for the next dollop of precipitation. Image courtesy of Uyen Nguyen.

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In this issue...

CLIMAS Climate Assessment for the Southwest
ARIZONA COOPERATIVE EXTENSION
THE UNIVERSITY OF ARIZONA • COLLEGE OF AGRICULTURE AND LIFE SCIENCES
ARIZONA
OFFICE OF THE STATE CLIMATOLOGIST
NM STATE UNIVERSITY

May Climate Summary

Drought: Most of Arizona and New Mexico continue to experience moderate drought or more severe drought conditions. The driest areas are in central and southern Arizona and eastern New Mexico.

Temperature: Warm temperatures have set in across the Southwest as a result of high pressure systems that have blocked incursions of colder and moister air.

Precipitation: Precipitation in parts of southwestern New Mexico was been 1–2 inches above average in the past 30 days, while western New Mexico and virtually all of Arizona were bone dry.

ENSO: ENSO-neutral conditions have officially returned and near-average sea surface temperatures characterize much of the equatorial Pacific Ocean. However, there is some early indication that an El Niño event is brewing.

Climate Forecasts: Warming trends in recent decades are driving forecasts for above-average temperatures in coming months. Precipitation forecasts for the monsoon, on the other hand, are not definitive, in part because the monsoon is difficult to forecast.

The Bottom Line: The historically driest time of the year for Arizona is in full swing. Precipitation in the last month totaled less than 0.5 inches for nearly the entire state, which is less than 50 percent of average. Extremely dry conditions have been a mainstay in Arizona since the end of December, and the January–~~April~~ March period ranks as the ~~11th~~ 13th driest on record in the state; New Mexico experienced the ~~12th~~ 10th driest on record (corrected June 7th). Despite the overall dry conditions in New Mexico, the last 14 days delivered much-needed rain to southern regions, which have been mired in extreme and exceptional drought for more than a year. Dry conditions usually favor warmer weather, and this held true in the last 30 days. In Arizona, temperatures were 4–6 degrees F above average in the past month, while New Mexico was slightly cooler. The warm and dry conditions helped expand and intensify drought. Extreme drought now occupies a large swath in the Four Corners region, and extreme drought remains entrenched in central Arizona. In Phoenix, for example, precipitation deficits in the last year amounted to 3.6 inches. La Niña, which helped cause the dry winter, waned to neutral conditions at the end of April. While it is currently difficult to project the evolution of the El Niño-Southern Oscillation (ENSO), there is some indication that an El Niño may emerge in coming months. This would increase chances for a wetter-than-average monsoon and winter. The fate of ENSO will become clearer in coming months and precipitation forecasts for the monsoon remain a coin flip.

Drought Declaration in New Mexico

New Mexico Gov. Susana Martinez has issued a formal drought declaration that encompasses all of New Mexico. Moderate or more severe drought covers about 96 percent of the state, according to the May 17 update of the U.S. Drought Monitor. Drought conditions have been a constant presence in the region for more than a year and a half, peaking in intensity last July when exceptional drought—defined as drought that occurs, on average, once in every 50 years—blanketed more than 49 percent of the state. As it turned out, the 2011 water year (October 2010 through September 2011) was the second driest on record, with only 1955–1956 being drier, according to the executive order issued by Martinez. This winter, precipitation was also below average for most of the state. The drought declaration will make it easier for farmers, ranchers, and communities to secure federal funding for expenses related to the drought (Associated Press, May 16). The declaration also convenes the New Mexico Drought Task Force, which will bring together drought managers to assess ways the state can prepare for and mitigate the impacts brought on by the dry conditions. Martinez also ordered the state's drought plan to be reviewed and urged municipalities to consider implementing fireworks bans and other fire restrictions.

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SWCO Staff:

Mike Crimmins
UA Extension Specialist

Stephanie Doster
Institute of the Environment Editor

Dan Ferguson
CLIMAS Program Director

Gregg Garfin
Founding Editor and Deputy Director of Outreach, Institute of the Environment

Zack Guido
CLIMAS Associate Staff Scientist

Gigi Owen
CLIMAS Assistant Staff Scientist

Nancy J. Selover
Arizona State Climatologist

Jessica Swetish
CLIMAS Publications Assistant

This work is published by the Climate Assessment for the Southwest (CLIMAS) project, the University of Arizona Cooperative Extension, and the Arizona State Climate Office.

Americans' Perspectives on the Link between Extreme Events and Climate Change

By Sarah White and Zack Guido

Extreme weather doled out damage with punishing efficiency in 2011. Torrential rains swelled the Mississippi and Ohio rivers in June, destroying roads and bridges; spring and summer drought in the southern tier of the U.S. desiccated thousands of acres of crops; and the remnant of Hurricane Irene pummeled the East Coast.

When all was said and done, 14 separate billion-dollar weather and climate disasters thrashed the United States, shattering the previous record of nine set in 2008. The hefty $53 billion disaster price tag exceeds the gross domestic product of about 60 percent of the world's countries. Outside the U.S., heat waves and drought affected millions of people living in Europe and China, fires torched Mexico, and Thailand and Australia suffered record floods.

The high number of extreme events last year reinvigorated conversation about the link between rapid and catastrophic events and the slow drift of human-caused climate change. While the causes of those disasters cannot be attributed unequivocally to human-caused climate change, the events were likely influenced by it. The public also has made this link, and their perceptions are in line with scientific evidence connecting human actions and extreme events.

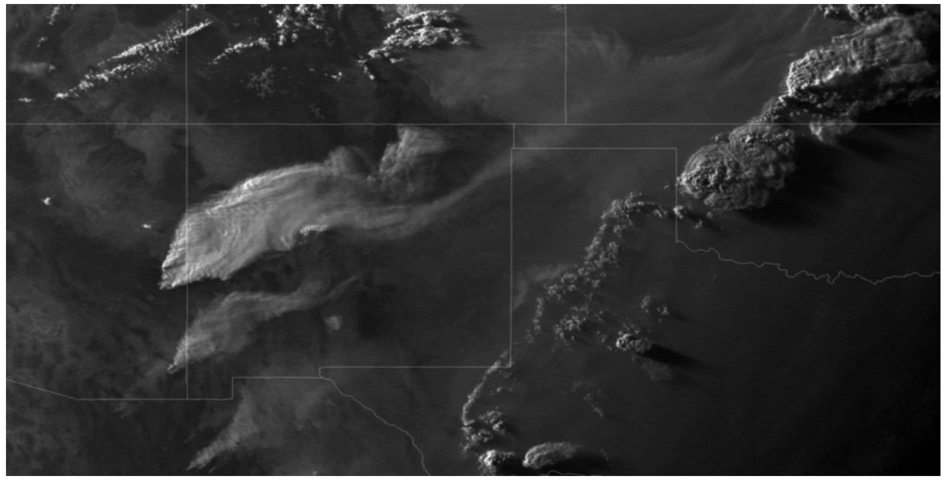


Figure 1. An extremely dry 2010-2011 winter teamed with windy spring weather to prime the landscape for an epic fire season. In recent polls, people in the U.S. are linking extreme weather and its impacts like fire with human-caused climate change. In this satellite image, smoke plumes waft into New Mexico from the Wallow (east-central Arizona) and Horseshoe Two (southeastern Arizona) fires that raged in June 2011. The Wallow Fire burned more than 500,000 acres and is Arizona's largest recorded wildland fire. Image source: National Oceanic and Atmospheric Administration

Scientific evidence mounting

Many studies on climate extremes have been published recently, including the report, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, by the Intergovernmental Panel on Climate Change (IPCC). In general, "single extreme events cannot be simply and directly attributed to anthropogenic [human-caused] climate change," according to the report, because natural climate variability also causes anomalous conditions. Only when extreme events repeatedly venture outside the range of natural patterns is a strong link with climate change implied. The report also states, however, that anthropogenic climate change likely has increased the probability of occurrence for some events, particularly those related to temperature and precipitation.

In "A Decade of Weather Extremes", a recent peer-review article in *Nature Climate Change*, scientists analyzed the occurrence of extreme events in the past decade. The authors state that in a stationary climate, one in which human actions do not increase temperatures, there should be an equal number of record highs and lows. In the past decade, the U.S. has experienced twice as many record highs as record lows. The ratio also has been higher in recent years. In the summer of 2011, for example, record highs were eight times more frequent than record lows. These statistical analyses, along with climate modeling exercises, led the authors to argue there is strong evidence linking at least some extreme events to human influence on climate.

Their argument also applies to extreme rainfall, which has increased by about 33 percent in the U.S. during the past 100 years, according to the paper. Models show that for more than approximately two-thirds of the Northern Hemisphere land area, greenhouse gases (GHG) have intensified the largest one-day annual precipitation event and five-day total during the second half of the 20th century. These results conform to well-established physical relationships. As the atmosphere warms—average U.S. temperatures have increased by about 2 degrees F in the last 50 years—the air can hold more water vapor, and the expectation is that the added moisture will cause the most intense events to strengthen and be more frequent.

The signals are not all clear. Tropical storms prove more difficult to analyze; their record keeping does not span long time periods and scientists do not yet

continued on page 4

Americans' Perspectives, continued

have a complete understanding of the driving forces. Even though the intensity of tropical storms has significantly increased since satellite records began in the 1970s, the authors note that scientists are still unsure if this increase is outside what occurs as a result of natural variability.

Public Perceptions

As observations increasingly suggest extreme events are influenced by climate change, the connection also appears to be strengthening in the perceptions of the public.

A nationally representative poll of 1,008 Americans conducted in March by researchers at Yale and George Mason universities reported that 82 percent of the respondents personally experienced at least one extreme weather event or natural disaster during the past year, and 35 percent stated experiencing at least a moderate amount of personal harm from one or more extreme events in that time. Americans also say the weather in the U.S. over the past several years has been getting worse, rather than better, by a margin of more than two to one (52 percent to 22 percent).

Many people believe that extreme events have become more common during the past two decades, according to the poll. This includes 53 percent of the respondents who believe that heat waves occur more often now than in the past, while 46 and 43 percent think drought and heavy rainstorms, respectively, are on the rise. Many Americans also say that extreme weather has increased the occurrence of other problems in their local areas, including harm to crops (46 percent), floods (39 percent), forest fires (34 percent), and water quality issues (31 percent).

The poll also suggests that a majority of people believe global warming helped fuel several high-profile extreme events last year. For example, 72 and 70 percent of the respondents stated that global warming added to the unusual warmth last winter and summer, respectively. Another 69 percent said global warming intensified the drought in the southern tier of the U.S., while 63 and 59 percent said global warming exacerbated the flooding on the Mississippi and strengthened Hurricane Irene, respectively.

Although these numbers suggest the public connects extreme weather with climate change, the poll did not address whether people believe human actions contribute to climate change.

Jon Krosnick, professor in the departments of communication, political science and psychology at Stanford University, addressed this question in a 2011 survey. Krosnick and his colleagues found that 72 percent of Americans polled believe that global warming is at least in part caused by humans.

Krosnick and his colleagues also sought the public's perceptions about decreasing GHG emissions—the principal driver of human-caused climate change. A 2010 survey reported that 76 percent of Americans think the government should limit GHGs emitted by businesses, and 84 percent think the government should give companies tax breaks to produce more electricity from water, wind, and solar power. Even more surprising, 65 percent of Americans support cap and trade, one of several market-based strategies to curtail GHG emissions; cap and trade sets a limit on the total GHG emissions and fosters the exchange of GHG permits.

Several years ago, an article in the journal *Eos, Transactions, American Geophysical Union* stated that while about 97 percent of climatologists actively publishing believed that humans influence the climate, only about 57 percent of the general public held this belief. The challenge, as the authors saw it, was finding ways to communicate the link between human actions and climate changes to policy makers and the public. It seems that nature's force in recent years has been a costly but effective communication tool.

Related Resources

1. IPCC report on extremes: http://ipcc-wg2.gov/SREX/

2. A Decade of Weather Extremes (Subscription Required): http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate1452.html

3. Yale and George Mason Poll: http://environment.yale.edu/climate/files/Extreme-Weather-Climate-Preparedness.pdf

4. 2011 survey by Krosnick and others: http://woods.stanford.edu/docs/surveys/Global-Warming-Survey-Stanford-Reuters-September-2011.pdf

5. 2010 survey by Krosnick and others: http://woods.stanford.edu/docs/surveys/Global-Warming-Survey-Selected-Results-June2010.pdf

Temperature (through 5/16/12)

Data Source: High Plains Regional Climate Center

Temperatures since the water year began on October 1 have generally followed the terrain, with the warmest conditions in the southwest deserts of Arizona, and the coldest conditions on the Colorado Plateau of northern Arizona and New Mexico (*Figure 1a*). The temperature pattern reflects the trajectory of cold winter storms that have passed through Nevada and Utah and dipped down into northern Arizona before wafting northeast through New Mexico. The southeastern half of New Mexico missed out on most of the cold fronts, but an occasional storm that tracked through northern Mexico kept southern New Mexico's temperatures cooler than the otherwise would have been. In general, temperatures are within 2 degrees F of average across most of both states, with most areas being warmer than average (*Figure 1b*). Only a few isolated spots had significantly colder-than-average temperatures.

In the past 30 days, high pressure has dominated the atmospheric circulation pattern, bringing warm, dry air up from Mexico and setting new records for both daytime highs and high nighttime low temperatures. As a result, all of Arizona and New Mexico experienced unseasonably warm conditions (*Figures 1c–d*). There was also a large west-east temperature gradient, with temperatures in Arizona warmer than in New Mexico. This gradient was caused by high pressure systems that were more persistently parked over Arizona. The excessive heat early in the season, combined with a very dry spring, dried out grasses and is contributing to high wildfire danger (see page 18).

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2011, we are in the 2012 Water year. Water year is more commonly used in association with precipitation; water year temperature can be used to measure the temperatures associated with the hydrological activity during the water year.

Average refers to the arithmetic mean of annual data from 1971–2000. Departure from average temperature is calculated by subtracting current data from the average. The result can be positive or negative.

The continuous color maps (Figures 1a, 1b, 1c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. The dots in Figure 1d show data values for individual stations. Interpolation procedures can cause aberrant values in data-sparse regions.

These are experimental products from the High Plains Regional Climate Center.

On the Web:

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

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

Figure 1a. Water year 2011 (October 1 through May 16) average temperature.

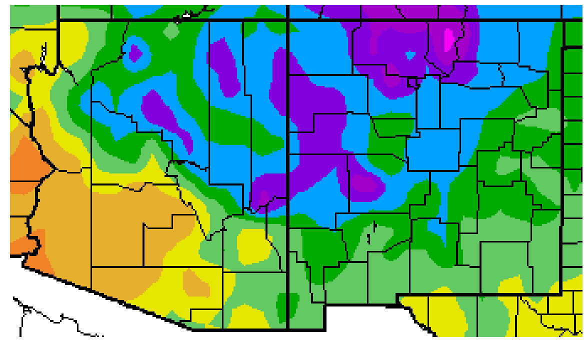
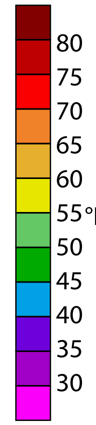



Figure 1b. Water year 2011 (October 1 through May 16) departure from average temperature.

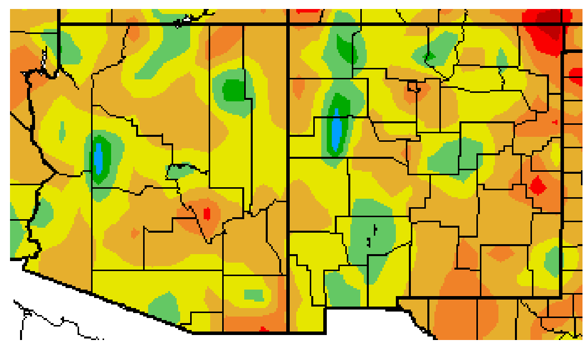
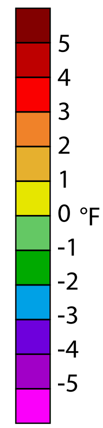



Figure 1c. Previous 30 days (April 17–May 16) departure from average temperature (interpolated).

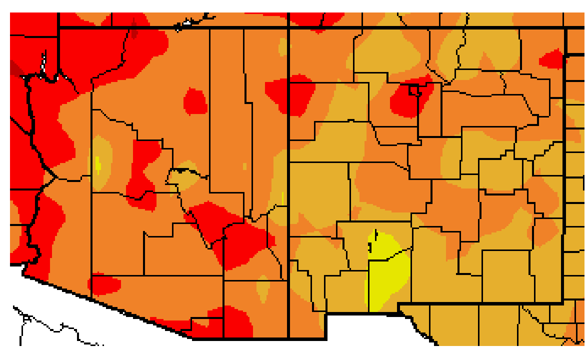
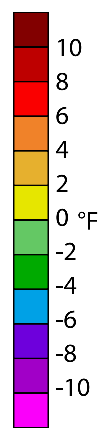
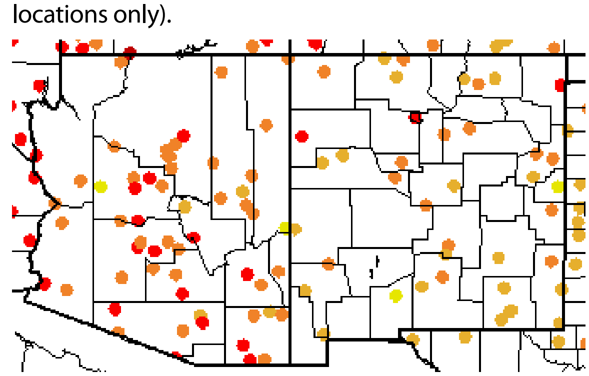
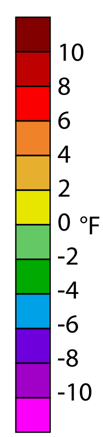



Figure 1d. Previous 30 days (April 17–May 16) departure from average temperature (data collection locations only).

Precipitation (through 5/16/12)

Data Source: High Plains Regional Climate Center

Precipitation since the water year began on October 1 has continued to be much drier than average across nearly all of Arizona. New Mexico, on the other hand, has experienced both wetter- and drier-than-average conditions (*Figures 2a–b*); eastern and southwestern parts of the state have been dry, while southeastern, central, and northwestern New Mexico have been wet. The extreme variability is due to the position of the storm tracks, availability of moisture, and topography. Areas with higher elevations can squeeze moisture out of the storms more effectively than lower elevations, but many storms have had scant moisture this past winter. A few storms that wafted across southern Arizona had surges of warm, moist air from the western equatorial Pacific Ocean. This led to a large rain event in southern Yuma and western Pima counties of about 1 inch on December 13, which produced more than half of the total average annual rainfall in parts of these regions. The moisture source for central and southern New Mexico was the Gulf of Mexico; high pressure set up over Texas, allowing southeasterly winds to carry moisture westward.

In the past 30 days, precipitation in parts of southeastern New Mexico was 1–2 inches above average, or more than 150 percent above average, while western New Mexico and virtually all of Arizona was bone dry (*Figures 2c–d*). Most of the dry areas received less than 0.5 inches of rain, with many places receiving less than 0.1 inches. Dry conditions, however, are expected during this time of year—most of Arizona and Southwest New Mexico receive less than 12 percent of their total annual precipitation in the April–June period. Much of the West also was generally dry as a result of a ridge of high pressure that forced most storm systems to track north of Utah and Colorado.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2011, we are in the 2012 water year. The water year is a more hydrologically sound measure of climate and hydrological activity than is the standard calendar year.

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

The continuous color maps (Figures 2a, 2c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. Interpolation procedures can cause aberrant values in data-sparse regions.

The dots in Figures 2b and 2d show data values for individual meteorological stations.

On the Web:

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

For National Climatic Data Center monthly state of the climate reports, visit http://www.ncdc.noaa.gov/sotc/

Figure 2a. Water year 2011 (October 1 through May 16) percent of average precipitation (interpolated).

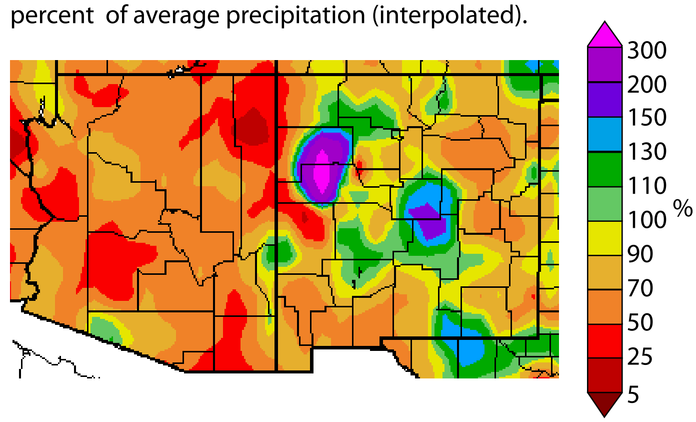


Figure 2b. Water year 2011 (October 1 through May 16) percent of average precipitation (data collection locations only).

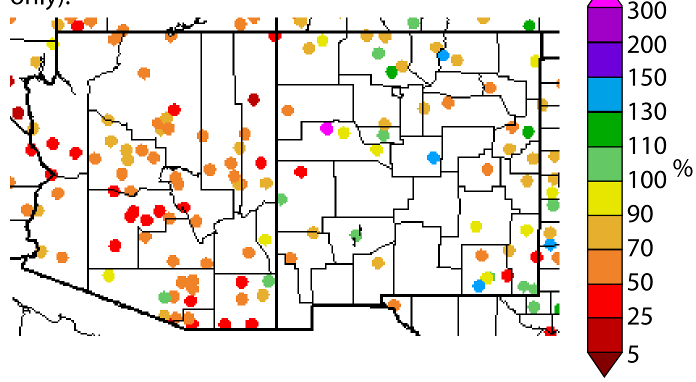


Figure 2c. Previous 30 days (April 17–May 16) percent of average precipitation (interpolated).

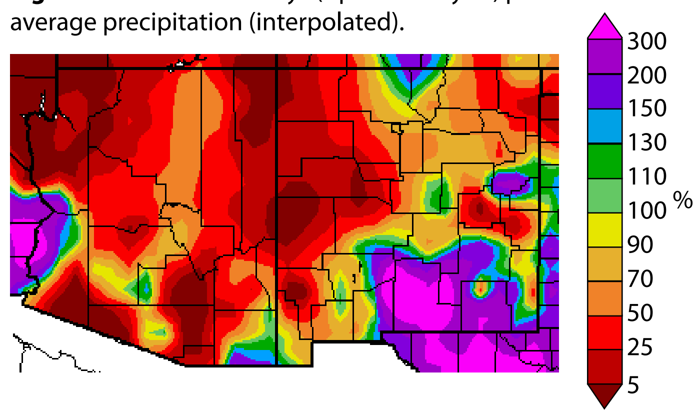
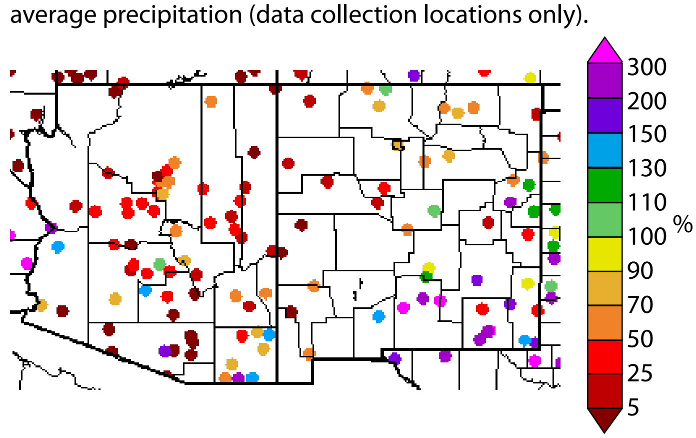


Figure 2d. Previous 30 days (April 17–May 16) percent of average precipitation (data collection locations only).



U.S. Drought Monitor (data through 5/15/12)

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

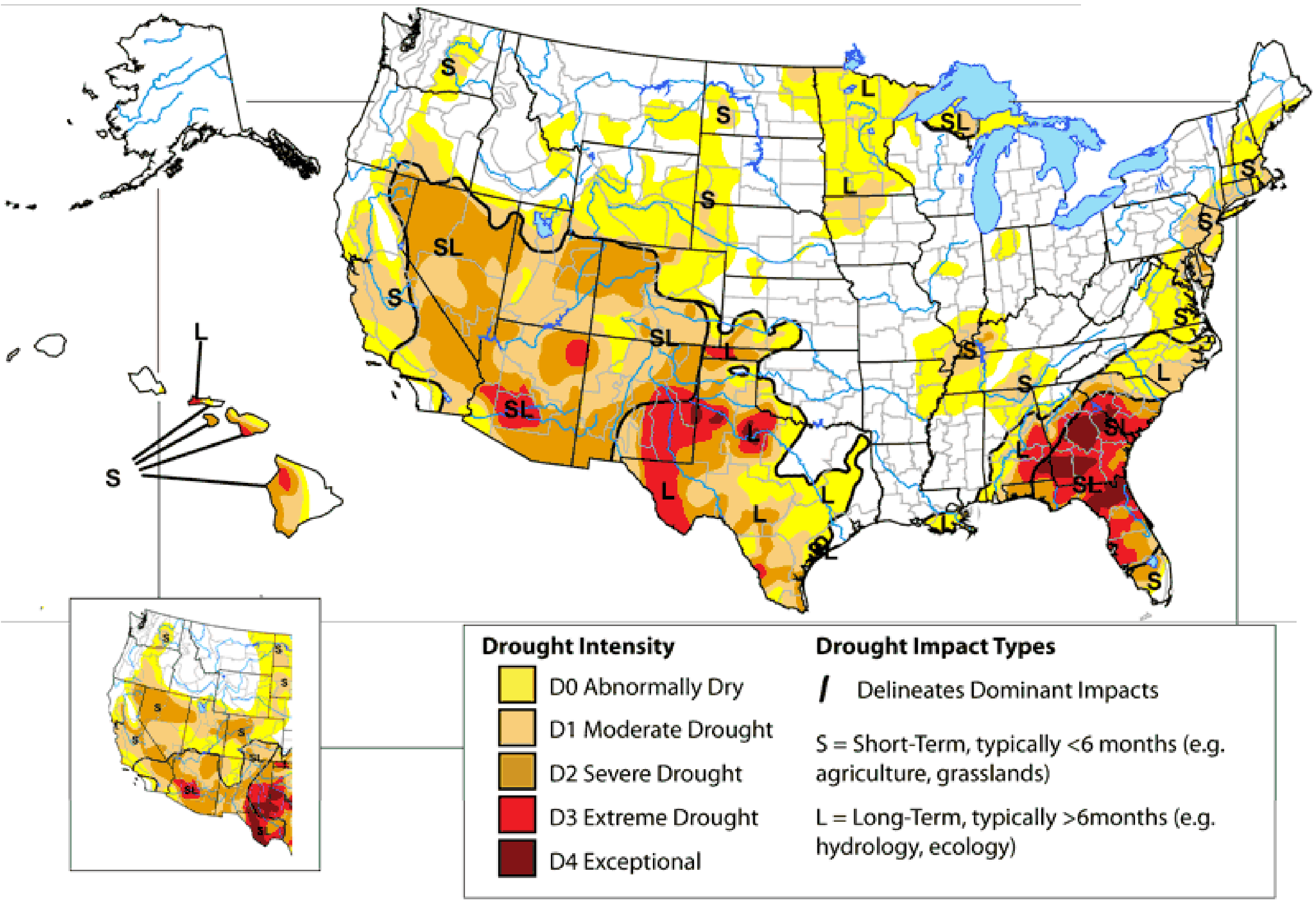
Precipitation events were few and far between across the Southwest U.S. during the past 30 days. Most of the wet weather was confined to the Pacific Northwest and the northern Rockies. Continued dry conditions across the Southwest, including California, Nevada, and Utah, led to a slight expansion and intensification of drought conditions. Severe drought expanded across most of Nevada and into northern Utah, while abnormally dry conditions slightly expanded north across most of Wyoming.

Slightly more than 50 percent of western U.S. states are observing moderate drought conditions or a more severe drought category (*Figure 3*). About 4 percent of western lands, all located in Arizona and New Mexico, are classified with extreme conditions, while about 23 percent of the West is classified with severe drought.

Notes:

The U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The inset (lower left) shows the western United States from the previous month's map. The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of several agencies.

Figure 3. Drought Monitor data through May 15, 2012 (full size), and April 17, 2012 (inset, lower left).



On the Web:

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

Arizona Drought Status

(data through 5/15/12)

Data Source: U.S. Drought Monitor

Below-average precipitation and above-average temperatures have intensified drought conditions and expanded extreme drought across Arizona during the past 30 days. About 96 percent of Arizona is classified with moderate drought or a more severe drought category, according to the May 15 update of the U.S. Drought Monitor (*Figures 4a–b*). Extreme drought expanded by 5 percent since April 17 and now covers a large swath of the Navajo Nation. Severe drought slightly expanded in Mohave County.

In drought-related news, the Interagency Coordinating Group of the Arizona Governor's Drought Task Force met earlier this month to review current drought conditions and impacts across the state. Based on drought impact reports and a review of recent hydroclimatic observations from multiple federal, state, and local agencies, the group recommended reaffirming and continuing the current state Drought Emergency Declaration that has been in place since 1999. Reaffirming this declaration allows the state to continue to provide emergency drought relief to impacted communities and to work with federal agencies like the Farm Services Agency to access their disaster relief assistance programs. More information is available at http://www.azwater.gov/azdwr/StatewidePlanning/Drought/DroughtStatus2.htm.

Figure 4a. Arizona drought map based on data through May 15.

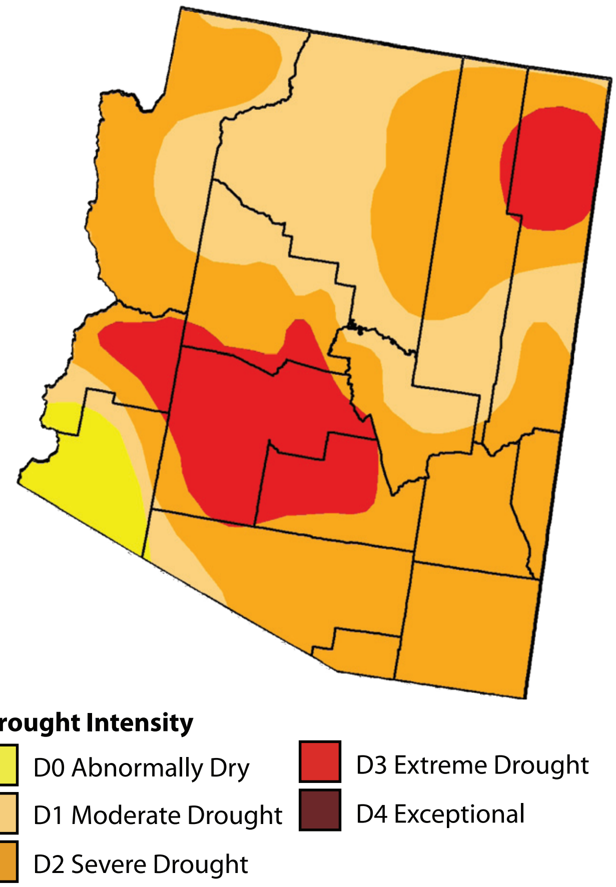


Figure 4b. Percent of Arizona designated with drought conditions based on data through May 15.

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	96.08	69.31	16.29	0.00
Last Week (05/08/2012 map)	0.00	100.00	96.08	67.19	16.29	0.00
3 Months Ago (02/14/2012 map)	1.98	98.02	80.56	33.32	0.00	0.00
Start of Calendar Year (12/27/2011 map)	16.70	83.30	60.34	36.56	2.78	0.00
Start of Water Year (09/27/2011 map)	0.02	99.98	69.76	42.81	15.34	1.67
One Year Ago (05/10/2011 map)	13.83	86.17	57.90	31.54	15.59	0.00

Notes:

The Arizona section of the U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of several agencies.

On the Web:

For the most current drought status map, visit http://droughtmonitor.unl.edu/DM_state.htm?AZ,W

For monthly short-term and quarterly long-term Arizona drought status maps, visit http://www.azwater.gov/azdwr/StatewidePlanning/Drought/default.htm

New Mexico Drought Status

(data through 5/15/12)

Data Source: New Mexico State Drought Monitoring Committee, U.S. Drought Monitor

Some much-needed rain fell across parts of eastern New Mexico during the past 30 days, helping improve drought conditions in some areas. Overall, however, drought is firmly entrenched across the entire state (*Figures 5a–b*). About 96 percent of New Mexico is classified with moderate drought or a more severe drought category, according to the May 15 update of the U.S. Drought Monitor. The largest changes in drought conditions occurred in the southeastern quarter of the state, where thunderstorm activity in the past several weeks dropped between 1 and 2 inches of rain in some areas. This helped improve conditions by one or two categories, from exceptional drought to severe or extreme levels. On the other hand, below-average precipitation worsened drought conditions in the opposite corner of the state, which is now classified with moderate and severe drought.

In drought-related news, New Mexico Gov. Susana Martinez issued an official drought declaration this past week for the first time since the 2009 summer. The New Mexico Drought Task Force is reviewing the state drought plan, looking for ways to mitigate current drought impacts and to further prepare for the possibility of continuing or worsening conditions (Associated Press, May 17).

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

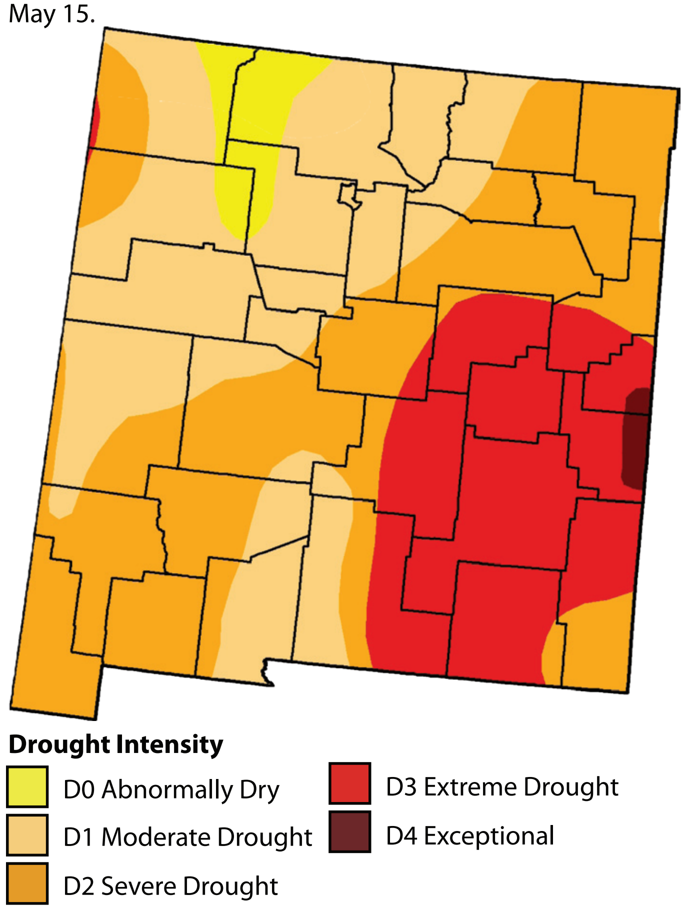


Figure 5b. Percent of New Mexico designated with drought conditions based on data through May 15.

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	96.20	62.63	23.99	0.67
Last Week (05/08/2012 map)	0.00	100.00	96.20	68.67	27.26	3.49
3 Months Ago (02/14/2012 map)	11.69	88.31	81.50	59.57	24.79	8.13
Start of Calendar Year (12/27/2011 map)	8.63	91.37	87.60	72.15	23.37	7.57
Start of Water Year (09/27/2011 map)	0.00	100.00	96.40	88.99	69.61	35.13
One Year Ago (05/10/2011 map)	0.00	100.00	96.59	87.36	61.02	30.14

Notes:

The New Mexico section of the U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of several agencies.

This summary contains substantial contributions from the New Mexico Drought Working Group.

On the Web:

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

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

Arizona Reservoir Levels
(through 4/30/12)
Data Source: National Water and Climate Center

Most of the reservoirs in Arizona are well below their historical average. Combined storage in Lakes Mead and Powell decreased by more than 500,000 acre-feet in April but is still about 10 percent greater than it was one year ago as a result of the copious winter snow in 2010–2011. The projected water year inflow to Lake Powell is 5.57 million acre-feet (MAF). If this holds true, inflow will rank as the fourth lowest on record since the closure of the Glen Canyon Dam in 1963. Precipitation in coming months could increase or decrease actual inflow, with the likely range falling between 4.9 MAF (45 percent of average) and 6.5 MAF (60 percent of average).

The Salt River Basin system, which supplies water to Phoenix, decreased by about 25,600 acre-feet in April and is about 4 percent above average for this time of year (*Figure 6*). Storage in the San Carlos Reservoir is at about 2 percent of capacity and is at its lowest level for this time of year since at least 1997, reflecting very low precipitation in southeastern Arizona during two consecutive La Niña winters.

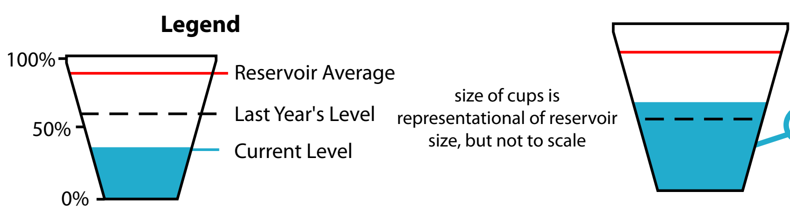
Notes:

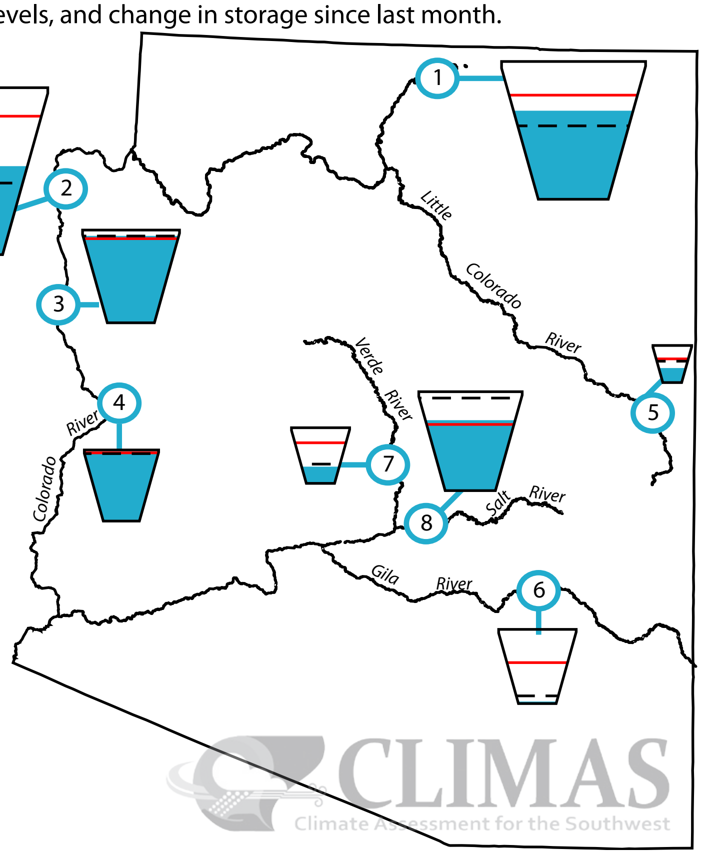
The map gives a representation of current storage levels for reservoirs in Arizona. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total capacity. Note that while the size of each cup varies with the size of the reservoir, these are representational and not to scale. Each cup also represents last year's storage level (dotted line) and the 1971–2000 reservoir average (red line).

The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). On average, 1 acre-foot of water is enough to meet the demands of 4 people for a year. The last column of the table list an increase or decrease in storage since last month. A line indicates no change.

These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

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





Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Lake Powell	64%	15,507.0	24,322.0	42.0
2. Lake Mead	53%	13,986.0	26,159.0	-553.0
3. Lake Mohave	94%	1,708.3	1,810.0	54.2
4. Lake Havasu	97%	602.0	619.0	36.4
5. Lyman Reservoir	39%	11.8	30.0	0.5
6. San Carlos	2%	16.5	875.0	-8.1
7. Verde River System	30%	84.8	287.4	3.7
8. Salt River System	71%	1,429.4	2,025.8	-25.6

*** thousands of acre-feet**

On the Web:

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

New Mexico Reservoir Levels

(through 4/30/12)

Data Source: National Water and Climate Center

New Mexico reservoirs gained 83,100 acre-feet in April due to early snowmelt runoff; New Mexico snowpack peaked almost four weeks earlier than average. Storage in New Mexico's largest reservoirs, Elephant Butte and Navajo, is about 372,200 and 1.3 million acre-feet, respectively (*Figure 7*). Elephant Butte, located on the Rio Grande in central New Mexico, is only 17 percent full. Storage in Navajo, located on the San Juan River in northwest New Mexico, is at 79 percent of capacity, much like it was at this time last year. Combined storage of reservoirs on the Pecos River is less than half of what it was during the extremely dry 2007–08 La Niña winter.

In water-related news, below-average winter snowpacks contributed to low groundwater levels near Santa Fe. In this area, community wells in the village of Chupadero recently dried and water rationing has been implemented (*The New Mexican*, May 7). Low snowpacks were a common occurrence in many basins in the southern Rocky Mountains this past spring and winter.

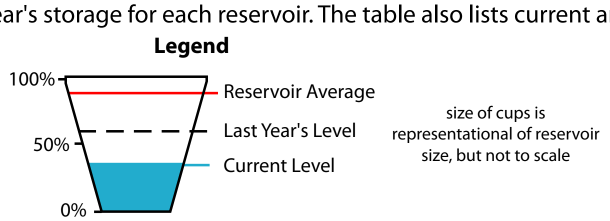
Notes:

The map gives a representation of current storage levels for reservoirs in New Mexico. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total capacity. Note that while the size of each cup varies with the size of the reservoir, these are representational and not to scale. Each cup also represents last year's storage level (dotted line) and the 1971–2000 reservoir average (red line).

The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels are given in thousands of acre-feet for each reservoir. One acre-foot is the volume of water sufficient to cover an acre of land to a depth of 1 foot (approximately 325,851 gallons). On average, 1 acre-foot of water is enough to meet the demands of 4 people for a year. The last column of the table list an increase or decrease in storage since last month. A line indicates no change.

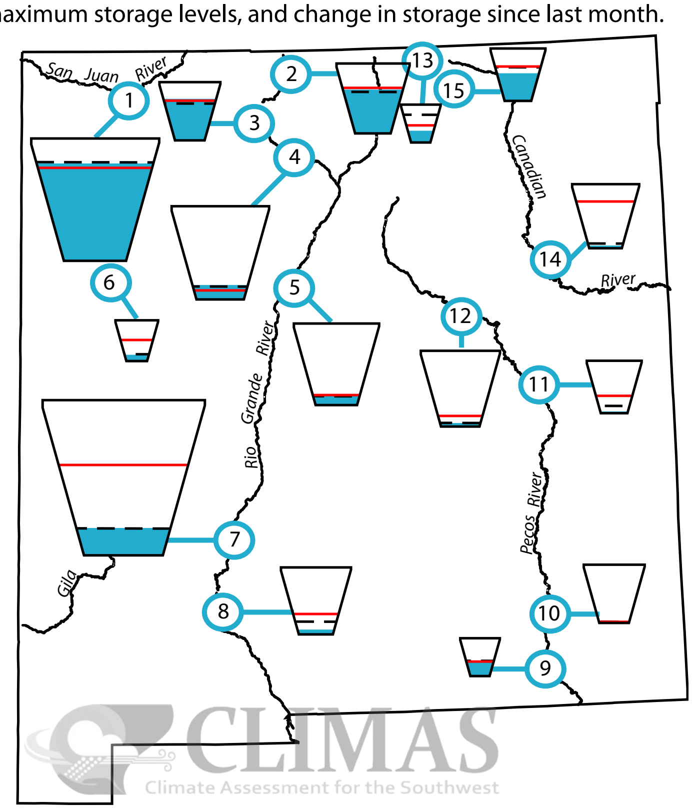
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS).

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



Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage*
1. Navajo	79%	1346.8	1,696.0	39.0
2. Heron	62%	249.3	400.0	15.3
3. El Vado	71%	134.7	190.3	41.8
4. Abiquiu	15%	175.6	1,192.8	0.8
5. Cochiti	11%	51.6	491.0	0.5
6. Bluewater	15%	5.8	38.5	-0.1
7. Elephant Butte	17%	372.2	2,195.0	-13.6
8. Caballo	7%	23.1	332.0	-3.0
9. Lake Avalon	38%	1.5	4.0	-1.4
10. Brantley	2%	17.8	1008.2	-3.8
11. Sumner	3%	2.6	102.0	-2.2
12. Santa Rosa	4%	15.5	438.3	9.3
13. Costilla	31%	4.9	16.0	1.1
14. Conchas	4%	10.9	254.2	-1.9
15. Eagle Nest	52%	41.2	79.0	1.3

*** thousands of acre-feet**



On the Web:

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

Southwest Snowpack
(updated 5/17/12)

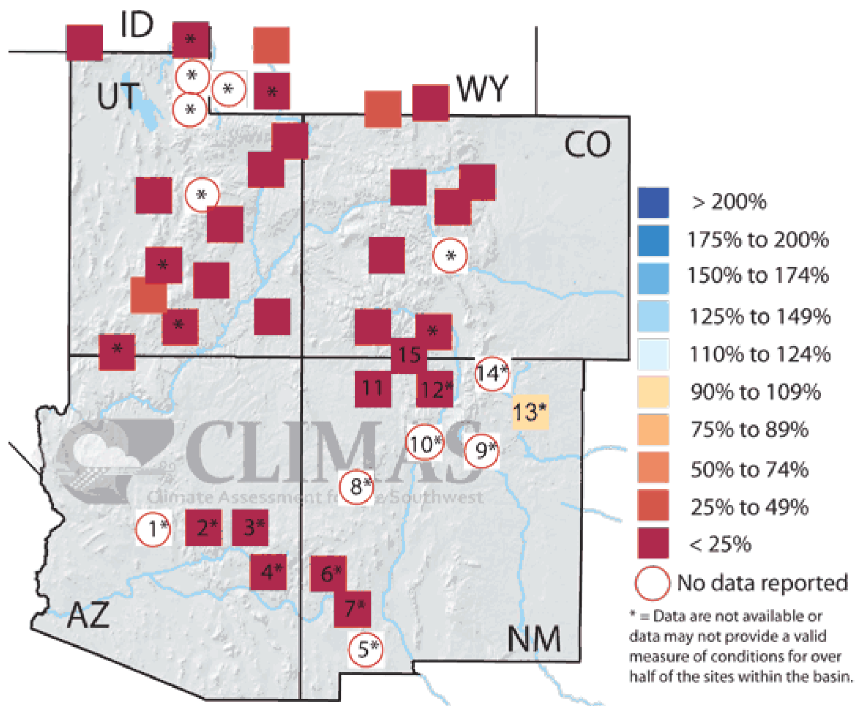
Data Sources: National Water and Climate Center, Western Regional Climate Center

Below-average precipitation and warmer-than-average temperatures across most of the Southwest after December caused the water contained in snowpacks, or snow water equivalent (SWE), to be persistently below average. Streamflow forecasts, which partly reflect the amount of past precipitation, were similarly below average for most of the winter.

Currently, snowpacks in Arizona have completely melted, while all but a few SNOTEL monitoring sites that measure SWE in New Mexico are reporting no snow (*Figure 8*). Some of the sites in both states completely melted about four weeks earlier than average. The only basin in Arizona, New Mexico, Colorado, Wyoming, and Utah with near-average snowpacks is the Cimarron watershed in New Mexico. However, the Natural Resources Conservation Service (NRCS), which administers the SNOTEL sites, cautions that the data in this basin may not be accurate. The Cimarron watershed was one of only two basins in both Arizona and New Mexico to receive more than 100 percent of average precipitation between October 1 and May 17.

In the Upper Colorado River and Rio Grande basins, no watersheds had more than 90 percent of average precipitation between October 1 and May 17; most basins received less than 80 percent. Consequently, all monitoring stations in Colorado, Utah, and Wyoming currently report well below-average SWE and streamflow forecasts for both the Colorado River and Rio Grande are well below average (see page 17).

Figure 8. Average snow water equivalent (SWE) in percent of average for available monitoring sites as of May 17, 2012.



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

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

Notes:

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

This figure shows the SWE for selected river basins, based on SNOTEL sites in or near the basins, compared to the 1971–2000 average values. The number of SNOTEL sites varies by basin. Basins with more than one site are represented as an average of the sites. Individual sites do not always report data due to lack of snow or instrument error. CLIMAS generates this figure using daily SWE measurements made by the Natural Resources Conservation Service.

On the Web:

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

For NRCS source data, visit:
http://www.wcc.nrcs.usda.gov/snow/

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

Southwest Fire Summary
(updated 5/17/12)

Source: Southwest Coordination Center

Above-average temperatures, combined with below-average precipitation during the winter and spring, have caused dry, fire-ready conditions across much of the Southwest. Grasses, shrubs, and trees have extremely low moisture levels, making them prone to ignite. Recent strong wind events also have heightened the threat for the spread of wildfires.

About 34,000 acres have burned in Arizona and New Mexico since January 1 (*Figure 9a*). This is the time of year when the fire season ramps up, and several wildfires greater than 100 acres are burning across central Arizona and western New Mexico (*Figures 9b–c*). While wildfires often occur throughout the year, there is generally an increase in the number of fires starting in April and May concomitant with the historical occurrence of rising temperatures and windy and dry weather. The two largest wildfires in the Southwest are located in the central part of Arizona. The Sunflower Fire began on May 12 from unknown causes about 30 miles north of Mesa. As of May 22, more than 16,000 acres had burned and the fire was only 43 percent contained. The Gladiator Fire ignited from human causes on May 13 on private property in Crown King. The fire had burned more than 15,000 acres as of May 22 and was spreading across Prescott National Forest.

Between January 1 and May 15, 440 fires burned nearly 25,000 acres in Arizona, according to Predictive Services at the Southwest Coordination Center. Most of these fires scorched fewer than 100 acres and are therefore not reflected in Figure 9. In New Mexico, 228 fires have burned this year, charring more than 9,000 acres. The number of acres burned in 2012 thus far is much lower than at this time last year. By mid-May 2011, almost 350,000 acres in New Mexico and nearly 77,000 acres in Arizona had burned. Last year was the worst fire season on record for Arizona and New Mexico, with more than 1 million acres burning in each state.

Notes:

The fires discussed here have been reported by federal, state, or tribal agencies during 2012. The figures include information both for current fires and for fires that have been suppressed. The top figure shows a table of year-to-date fire information for Arizona and New Mexico. Prescribed burns are not included in these numbers. The bottom two figures indicate the approximate locations of past and present "large" wildland fires in Arizona and in New Mexico. A "large" fire is defined as a blaze covering 100 acres or more in timber or 300 acres or more in grass or brush. The name of each fire is provided next to the symbol.

On the Web:

These data are obtained from the Southwest Coordination Center:

http://gacc.nifc.gov/swcc/predictive/intelligence/ytd_historical/ytd/wf/swa_fire_combined.htm

http://gacc.nifc.gov/swcc/predictive/intelligence/ytd_historical/ytd/large_fires/swa_ytd_combined.htm

http://gacc.nifc.gov/swcc/predictive/intelligence/daily/ytd_all_wf_by_state.pdf

Figure 9a. Year-to-date wildland fire information for Arizona and New Mexico as of May 15, 2012.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	413	22,727	27	2,146	440	24,728
NM	202	5,930	26	3,205	228	9,135
Total	615	28,657	53	5,351	668	33,863

Figure 9b. Arizona large fire incidents as of May 17, 2012.

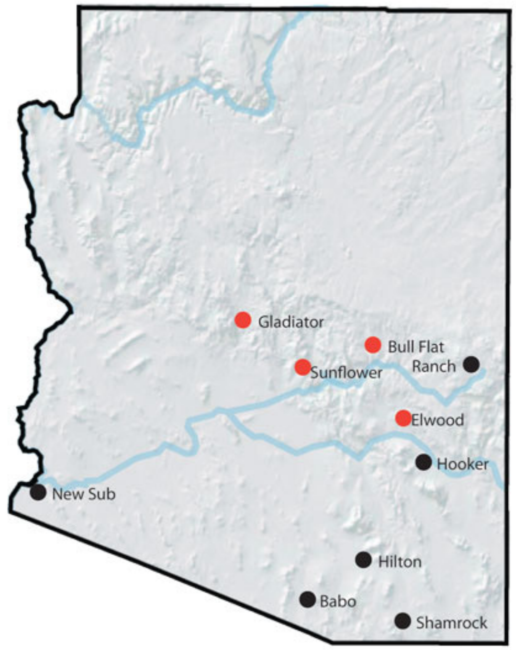
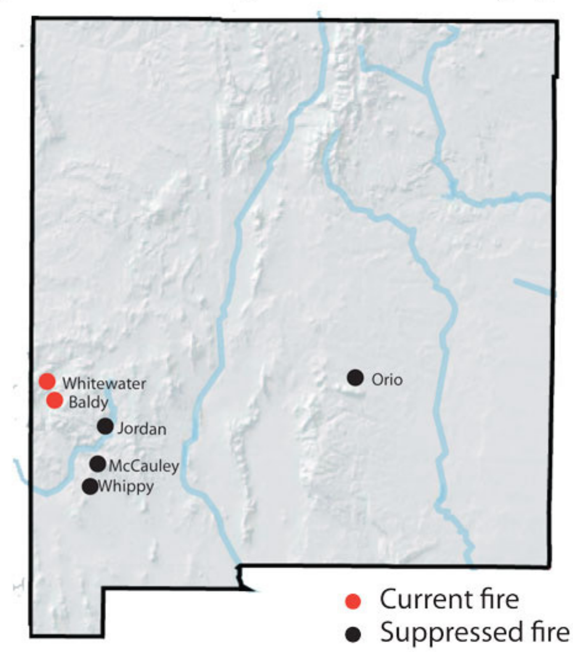


Figure 9c. New Mexico large fire incidents as of May 17, 2012.



Temperature Outlook

(June–November 2012)

Data Source: NOAA-Climate Prediction Center (CPC)

The seasonal temperature outlooks issued by the NOAA-Climate Prediction Center (CPC) in May call for increased odds that temperatures for the three-month seasons spanning June to Novmber will be similar to the warmest 10 years in the 1981–2010 period (*Figures 10a–d*). For the June–August period, there is a 50 percent chance that temperatures will be 0.6–1.5 degrees F above average in most of Arizona and western New Mexico. The highest temperature anomalies likely will be in northern Arizona. The above-average temperatures for this period strongly reflect recent warming trends. Low soil moisture inherited from the dry winter and spring also influences this outlook. In addition, there is more than a 50 percent chance of above-average temperatures in the summer months and into the early winter (*Figures 10b–d*), which also reflects recent warming trends. The uncertainty in the evolution of the El Niño–Southern Oscillation (ENSO), which may transition from currently neutral conditions to El Niño in the summer, is causing a slight shift toward cooler conditions in the Southwest at lead times starting in October. The impact of ENSO will become more certain in coming months.

Notes:

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

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1981–2010 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the "average" category is preserved at 33.3 likelihood, unless the forecast is very strong.

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

Equal Chances (EC) indicates areas where no forecast skill has been demonstrated or there is no clear climate signal; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a "default option" when forecast skill is poor.

Figure 10a. Long-lead national temperature forecast for June–August 2012.

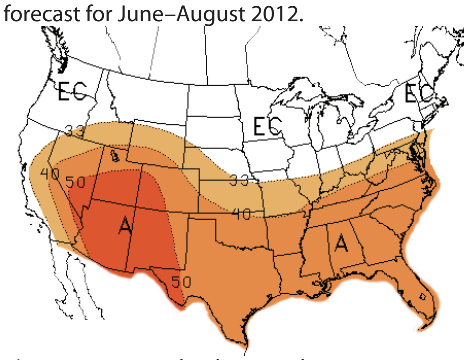
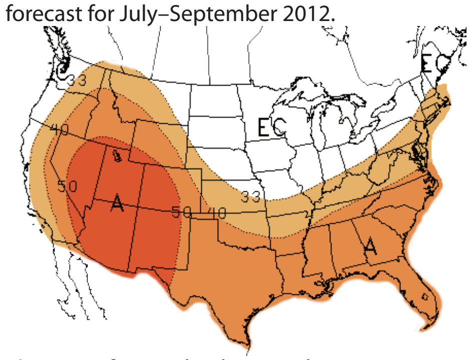


Figure 10b. Long-lead national temperature forecast for July–September 2012.



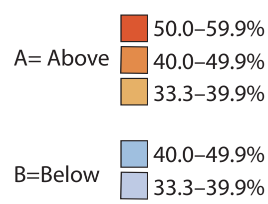


Figure 10c. Long-lead national temperature forecast for August–October 2012.

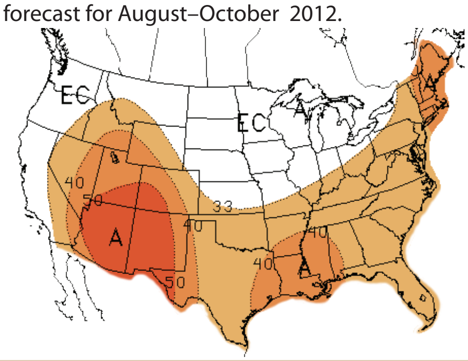
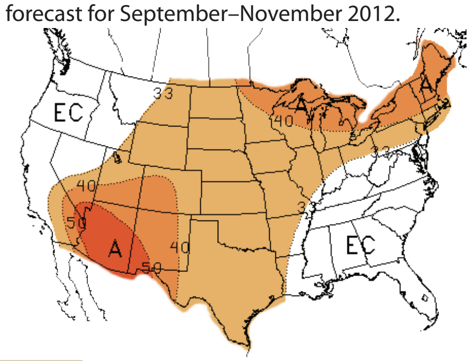


Figure 10d. Long-lead national temperature forecast for September–November 2012.



EC= Equal chances. No forecasted anomalies.

On the Web:

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

For seasonal temperature forecast downscaled to the local scale, visit http://www.weather.gov/climate/l3mto.php

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

Precipitation Outlook
(June–November 2012)
Data Source: NOAA-Climate Prediction Center (CPC)

The seasonal precipitation outlooks issued by the NOAA-Climate Prediction Center (CPC) in May call for equal chances that precipitation will be above, below, or near average in all of Arizona and New Mexico (*Figures 11a–d*). For the summer months, forecasts have been less accurate during the monsoon season. Consequently, the CPC has no basis to favor wetter- or drier-than-average conditions and gives an equal chances outlook for the June–August and July–September periods. Although not reflected in the official forecasts, studies have demonstrated that dry winters with low snowpack similar to this year often are followed by wet summers. Some studies suggest shorter-lived snow cover enables the land to warm sooner in the summer, which, in turn, instigates incursions of moisture from the Gulfs of California and Mexico that spark monsoon storms. According to an experimental forecast produced by the NOAA-Earth Systems Research Laboratory, current conditions slightly favor a wetter-than-average monsoon.

Notes:

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

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1981–2010 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the “average” category is preserved at 33.3 likelihood, unless the forecast is very strong.

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

Equal Chances (EC) indicates areas where no forecast skill has been demonstrated or there is no clear climate signal; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a “default option” when forecast skill is poor.

Figure 11a. Long-lead national precipitation forecast for June–August 2012.

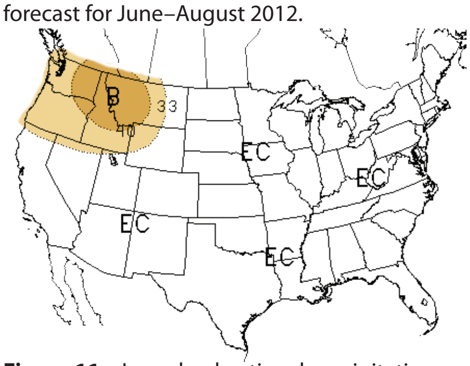
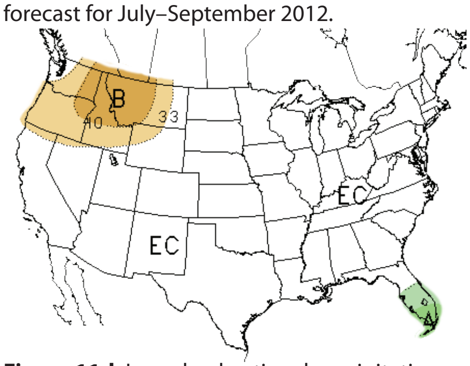


Figure 11b. Long-lead national precipitation forecast for July–September 2012.



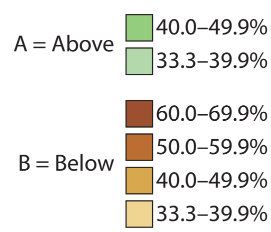


Figure 11c. Long-lead national precipitation forecast for August–October 2012.

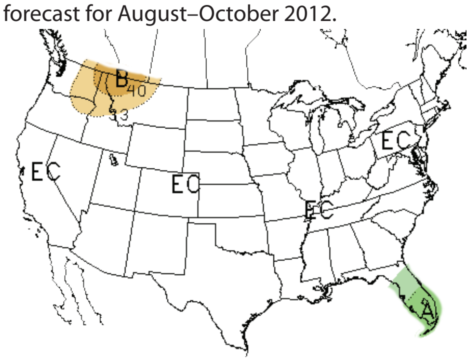
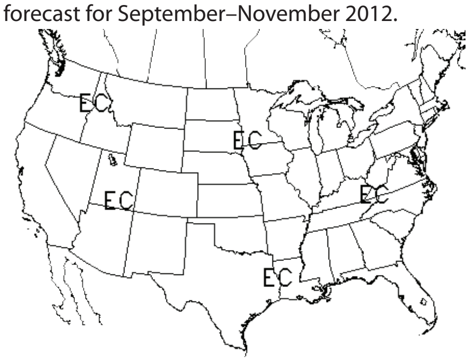


Figure 11d. Long-lead national precipitation forecast for September–November 2012.



EC = Equal chances. No forecasted anomalies.

On the Web:

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

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

Seasonal Drought Outlook
(through August)

Data Source: NOAA–Climate Prediction Center (CPC)

This summary is partially excerpted and edited from the May 17 Seasonal Drought Outlook technical discussion produced by the NOAA-Climate Prediction Center (CPC) and written by forecaster A. Allgood.

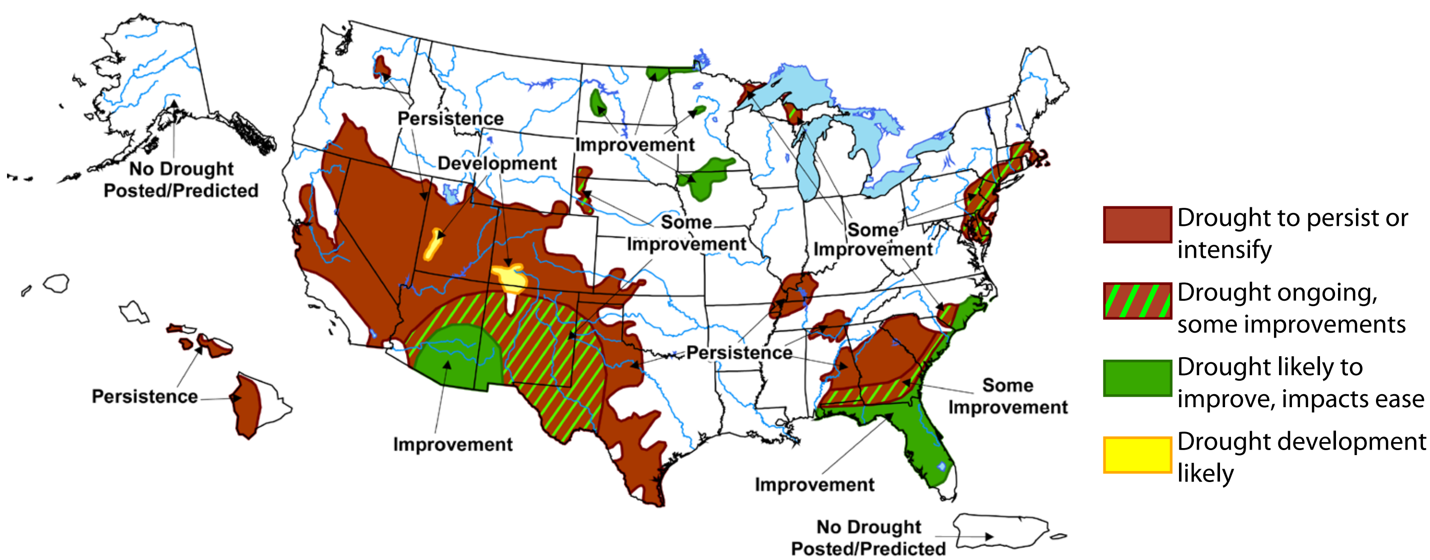
Severe to extreme drought continues across southern Arizona and New Mexico because rainfall deficits mounted during winter months in many locations. Improvement in these conditions likely will not occur until the monsoon begins, typically in early July. Monsoon thunderstorms have the potential to bring local drought relief, but there is high uncertainty in the monsoon's ultimate intensity and extent. A lack of snow cover in the southern Rocky Mountains may promote the early development of a high-pressure ridge, which could bring monsoon rains as early as June. Conversely, some forecast tools indicate a below-average monsoon, particularly in eastern locations. Despite uncertainty in the strength and onset date of the monsoon, moisture is expected, and therefore some improvement is likely across the Southwest (*Figure 12*). However, because there is high uncertainty in the monsoon, the NOAA-CPC assigns low confidence to this forecast.

Elsewhere in the West, moderate to severe drought covers most regions south of Oregon, Idaho, and Wyoming. While the southwestern monsoon can bring moisture throughout the Four Corners states, the summer is historically dry across the Great Basin, California, and the Northwest. The 6–10 and 8–14 day outlooks favor abnormal dry weather across the Southwest, while the monthly and seasonal outlooks indicate enhanced odds for below-median precipitation in the Northwest. Based on these forecasts, drought persistence is expected across the areas in the western U.S. currently with drought, while drought development is possible in southwestern Colorado and southwestern Utah. The CPC assigns a high confidence in this forecast.

Notes:

The delineated areas in the Seasonal Drought Outlook are defined subjectively and are based on expert assessment of numerous indicators, including the official precipitation outlooks, various medium- and short-range forecasts , models such as the 6-10 day and 8-14 day forecasts, soil moisture tools, and climatology.

Figure 12. Seasonal drought outlook through August (released May 17).



On the Web:

For more information, visit http://www.drought.gov/portal/server.pt

For medium- and short-range forecasts, visit http://www.cpc.ncep.noaa.gov/products/forecasts/

For soil moisture tools, visit http://www.cpc.ncep.noaa.gov/soilmst/forecasts.shtml

Streamflow Forecast
(for spring and summer)

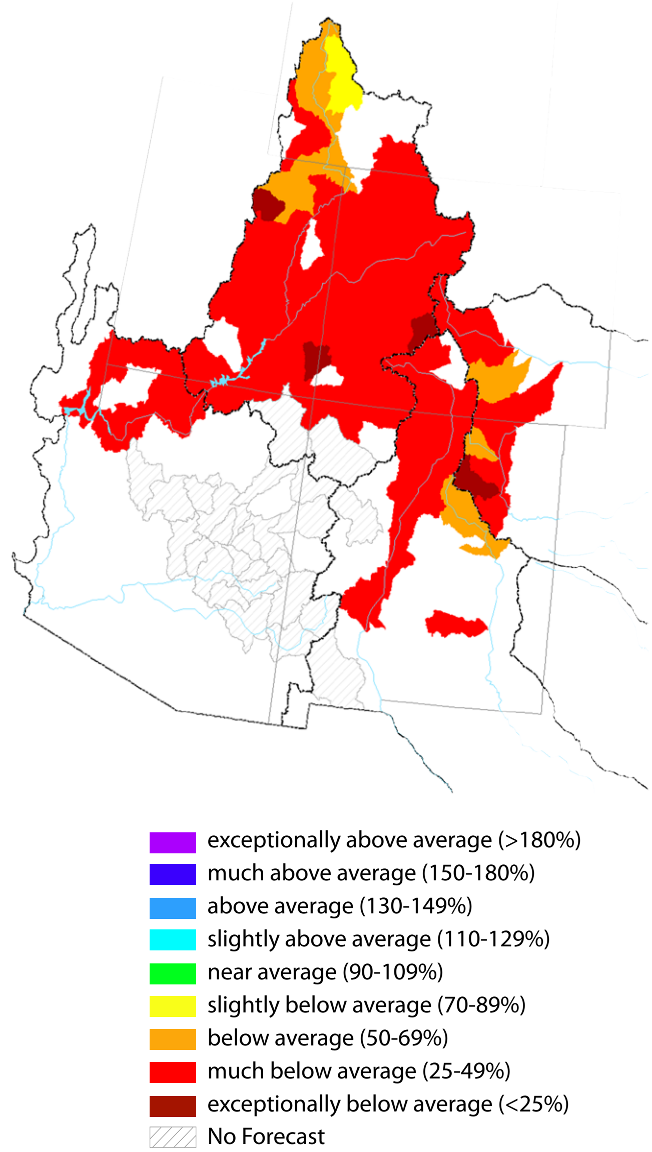
Source: National Water and Climate Center

The May 1 spring-summer streamflow forecast for the Southwest shows a 50 percent chance that all basins in the Colorado River, Rio Grande, and Arkansas watersheds will be below average (*Figure 13*).

In Arizona, the last streamflow forecast was made on April 1 because the vast majority of the rain and snow that contributes to spring streamflows has already fallen by this date. On April 1, there was a 50 percent chance that the Salt, Verde, and Gila rivers would have streamflows equal to or less than 28, 41, and 7 percent of the February–May average, respectively. In New Mexico, the last streamflow forecast, issued on May 1, suggests a 50 percent chance that streamflow in the Rio Grande, measured at Otowi Bridge, will be 45 percent of average and a 50 percent chance that inflow into Navajo Reservoir will be only 44 percent of average.

In the Upper Colorado River Basin, all snow-monitoring stations are reporting below-average snowpacks, with most measuring no snow. Many stations have been persistently below average all winter. As a result, the most recent forecast issued on April 1 projected that the April–July inflow into Lake Powell would be only about 3.5 million acre-feet (MAF), or 44 percent of the 1971–2000 April–July average. In snow-dominated basins like those in the upper Colorado River, April 1 forecasts are usually 80–90 percent accurate. Also, projections for the entire 2012 water year, which extends from October 1, 2011 through September 30, 2012, call for inflow into Lake Powell to be around 5.57 million acre-feet (MAF). If this holds true, inflow will rank as the fourth lowest on record since the closure of the Glen Canyon Dam in 1963. Precipitation in coming months could increase or decrease, with the likely inflow range falling between 4.9 MAF (45 percent of average) and 6.5 MAF (60 percent of average).

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



Notes:

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

The NRCS provides a range of forecasts expressed in terms of percent of average streamflow for various exceedance levels. The forecast presented here is for the 50 percent exceedance level, and is referred to as the most probable streamflow. This means there is at least a 50 percent chance that streamflow will occur at the percent of average shown in Figure 13. The CBRFC provides a range of streamflow forecasts in the Colorado Basin ranging from short fused flood forecasts to longer range water supply forecasts. The water supply forecasts are coordinated monthly with NWCC.

On the Web:

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

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

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

Wildland Fire Outlook

(June–August 2012)

Sources: National Interagency Coordination Center, Southwest Coordination Center

Above-normal significant fire potential is expected across most of Arizona and the very western portion of New Mexico for the June–August period (*Figure 14*). Significant fire potential is defined as those fires that require additional resources external to the region in which the fire originates in order to suppress the flames.

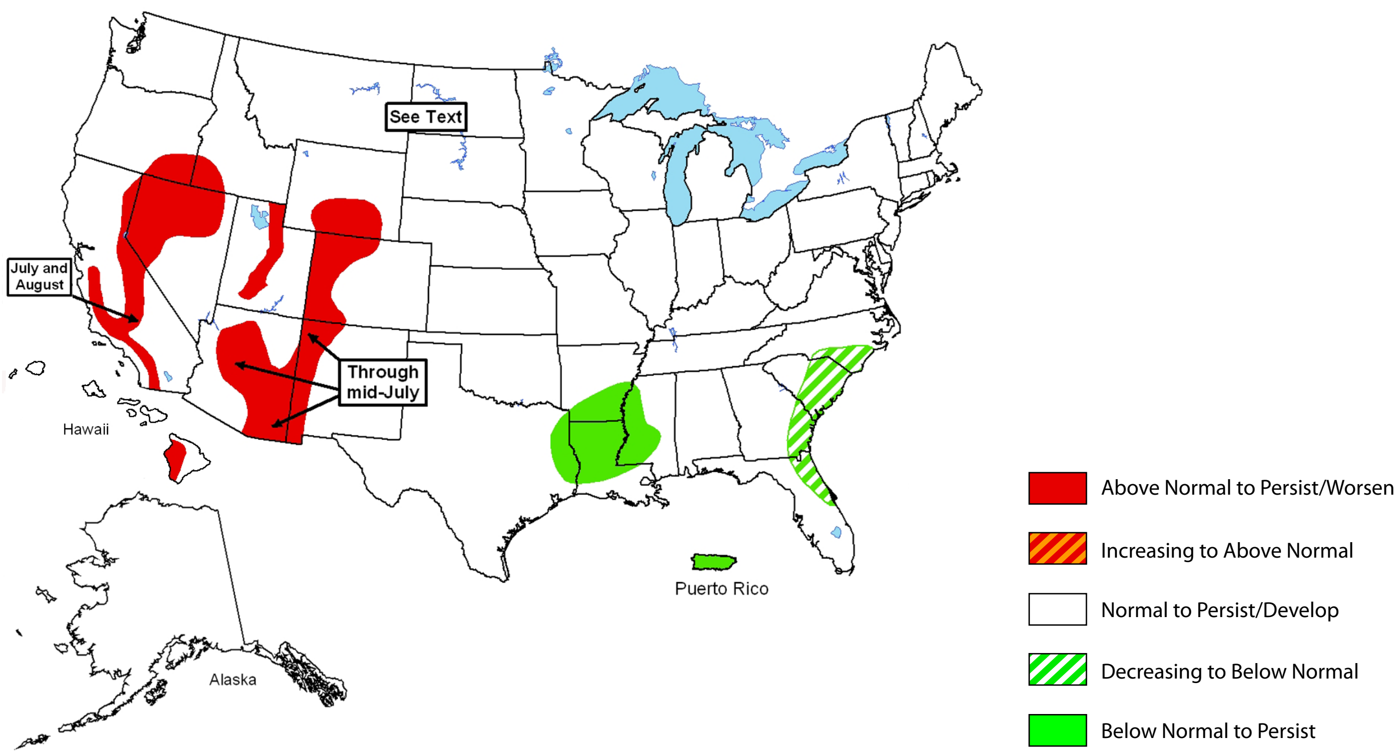
Currently, fuel and soil moisture conditions are extremely dry across most of the region due to above-average temperatures in recent months and below-average precipitation that accumulated during the winter and spring. However, even though grasses, shrubs, and trees are very dry, the profusion of these fine fuels is much lower than they were last year around this time. This lower amount may help reduce the number of acres burned this year in comparison to last, which was record setting for both Arizona and New Mexico.

The above-normal significant fire potential outlook is influenced by forecasts that call forabove-average temperatures, for the June–August period, according to the NOAA-Climate Prediction Center. Warmer-than-average temperatures will help further desiccate an already parched landscape. Also, fuel and soil moistures likely will remain extremely low until the monsoon begins around July 1 because the months preceding the summer rainy season are historically dry. In the weeks leading up to the monsoon, surges of moisture likely will move west across New Mexico into Arizona and will trigger more frequent dry lightning strikes, which elevate the risk for wildland fires. These lightning-caused fires usually peak in mid- to late June and wane as the monsoon ramps up and moisture dampens the landscape. Forecasts are still uncertain about when the monsoon will start and how vigorous it will be.

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces seasonal wildland fire outlooks each month. The forecast (Figure 14) consider observed climate conditions, climate and weather forecasts, vegetation health, and surface-fuels conditions in order to assess fire potential for fires greater than 100 acres. They are subjective assessments, that synthesize information provided by fire and climate experts throughout the United States.

Figure 14. National wildland fire potential for fires greater than 100 acres (valid June–August 2012).



On the Web:

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

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

El Niño Status and Forecast

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

Sea surface temperatures (SSTs) across the equatorial Pacific Ocean continued to warm during the past 30 days, helping to reinforce the ENSO-neutral conditions that began to take hold in mid-April. The NOAA-Climate Prediction Center (CPC) reports that SSTs are currently close to average across much of the east Pacific Ocean and that the lingering La Niña-like atmospheric circulation, including enhanced easterly trade winds along the equator and enhanced convection in the western Pacific Ocean, also have started to wane. The Southern Oscillation Index (SOI) in April fell to -0.3, and the most current three-month moving average of the SOI is now at ENSO-neutral levels for the first time since last summer (*Figure 15a*). All of these observations indicate ENSO-neutral conditions have returned, at least for the short term.

How long neutral conditions will last is the big question. A substantial pool of water with above-average temperatures has started to accumulate just below the sea surface across much of the equatorial Pacific Ocean, and some of this warmer-than-average water already has surfaced in the far eastern Pacific. This pool has increased the prospect of an El Niño event developing as early as mid-summer, according to the latest forecast model simulations.

Notes:

The first figure shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through April 2012. The SOI measures the atmospheric response to SST changes across the Pacific Ocean basin. The SOI is strongly associated with climate effects in the Southwest. Values greater than 0.5 represent La Niña conditions, which are frequently associated with dry winters and sometimes with wet summers. Values less than -0.5 represent El Niño conditions, which are often associated with wet winters.

The second figure shows the International Research Institute for Climate and Society (IRI) probabilistic El Niño-Southern Oscillation (ENSO) forecast for overlapping three month seasons. The forecast expresses the probabilities (chances) of the occurrence of three ocean conditions in the ENSO-sensitive Niño 3.4 region, as follows: El Niño, defined as the warmest 25 percent of Niño 3.4 sea-surface temperatures (SSTs) during the three month period in question; La Niña conditions, coolest 25 percent of Niño 3.4 SSTs; and neutral conditions where SSTs fall within the remaining 50 percent of observations. The IRI probabilistic ENSO forecast is a subjective assessment of current model forecasts of Niño 3.4 SSTs that are made monthly. The forecast takes into account the indications of the individual forecast models (including expert knowledge of model skill), an average of the models, and other factors.

On the Web:

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

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

The official ENSO forecast issued by NOAA-CPC and the International Research Institute for Climate and Society (IRI) indicates nearly a 50 percent chance of an El Niño event developing in the July–September season, matching the forecast chance of neutral conditions continuing (*Figure 15b*). IRI notes that several models that include information about the current state of the subsurface warm pool favor the development of El Niño conditions as early as July.

Overall, it looks like either ENSO-neutral or weak El Niño conditions will develop during the next six months. If El Niño is able to take hold and develop this fall, it could shift the upcoming fall and winter storm track to favor wetter conditions in the Southwest, providing some desperate drought relief in the region.

Figure 15a. The standardized values of the Southern Oscillation Index from January 1980–April 2012. La Niña/El Niño occurs when values are greater than 0.5 (blue) or less than -0.5 (red) respectively. Values between these thresholds are relatively neutral (green).

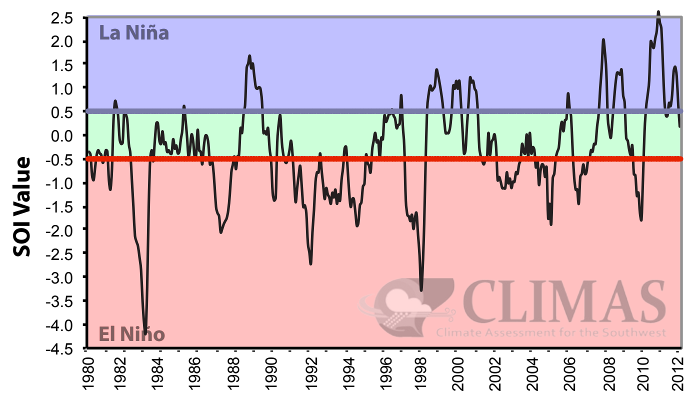


Figure 15b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released May 17). Colored lines represent average historical probability of El Niño, La Niña, and neutral conditions.