May 22, 2013

Southwest Climate Outlook

Vol. 12 Issue 5

Hot, dry, and windy conditions in May and June elevate fire risk. That risk plummets when monsoon storms, like this one, begin in earnest, usually in early July. Credit: David Elliot.

Editor's Note:

This and future publications will only periodically publish feature articles.

In this issue...

May Climate Summary

Drought: Severe drought has expanded across much of Arizona, while exceptional drought now covers about 44 percent of New Mexico.

Temperature: Warmer-than-average temperatures in Arizona and colder-than-average conditions in New Mexico dominated in the last month.

Precipitation: Although one storm wafted through the region in May, precipitation has been scant, which is typical for this time of year.

ENSO: ENSO-neutral conditions are expected to continue through the summer.

Climate Forecasts: The June–August forecast calls for increased chances for above-average temperatures in the Southwest, while precipitation may be below average in eastern New Mexico.

The Bottom Line: Drought conditions in New Mexico steadily worsened through the winter. Extreme and exceptional drought conditions cover about 82 percent of the state, an increase of approximately 70 percent since October 1. Drought conditions in Arizona are only slightly better, and both states experienced a third consecutive winter in which rain and snow was below average. Most of Colorado, from which much of the water in major southwestern rivers originates, also received below-average precipitation. Consequently, best estimates for spring streamflows in the Colorado River and Rio Grande, the Southwest's most important rivers, are projected to be only 42 and 24 percent of average, respectively. With May and June historically dry months for Arizona and New Mexico, improvements in drought and water supply likely will not arrive until the monsoon begins in earnest. Fire activity will also ramp up in coming months, which is the typical pattern for this time of year—fires peak in June and July. The parched landscape, however, has fire managers expecting above-normal fire risk. At this point, relief from drought and drought-related impacts hinges on the timing and vigor of the monsoon. With dry and warm conditions in the Great Plains, there is some indication that the monsoon may arrive earlier than average. However, monsoon forecasts are highly uncertain and there is no guarantee that an early arrival translates to above-average rain. While a vigorous monsoon could dampen temperatures by increasing cloud cover and evaporative cooling, forecasts call for above-average temperatures, in part because of warming trends experienced in recent decades.

Some Good and Bad in the Newest Climate Models

Have models become better at simulating the climate system since the most recent assessment report by the Intergovermental Panel on Climate Change (IPCC), published in 2007? That depends, said authors of research recently published in *Nature Climate Change*.

With the latest IPCC report (AR5) revving up, scientists have been analyzing the newest generation of models, which have nearly twice as more grid cells and incorporate more advanced understandings of the climate system compared to the previous generation of models used in the 2007 AR4 report. These improvements have helped substantiate some previous conclusions. For example, the general patterns of temperature and precipitation are similar, and the authors stated "this robustness across generations of models is positive… and provides strong support for the argument that climate change over the twenty-first century will probably exceed that observed over the past century." However, comparisons of the agreement in the simulations of average precipitation in AR4 and AR5 models is nearly identical, suggesting the latest models have made few advances in precipitation projections in many regions.

This paper is one of the first of what likely will be many studies that compare previous results to newly minted ones. Early indications confirm conventional wisdom—climate models perform well for some processes and in some places.

Read more at: www.nature.com/nclimate/journal/v3/n4/full/nclimate1716.html

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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.

Temperature (through 5/15/13)

Data Source: High Plains Regional Climate Center

Temperatures since the start of the 2013 water year on October 1 have been warmest in southwestern Arizona and coolest in the higher elevations of north-central New Mexico (*Figure 1a*). Many storm tracks this winter passed through Utah and Colorado, with only a few dipping down into Arizona and New Mexico. This led to warmer-than-average temperatures in southern portions of both states and below-average temperatures in many regions in northern areas (*Figure 1b*). This winter was also characterized by an ENSO-neutral event, which enabled a more north-to-south meandering jet stream typical of neutral events. Consequently, temperatures in the region swung from colder-than-average to warmer-than-average as storms passed through the region.

During the past 30 days, the temperature gradient radically shifted from temperature anomalies increasing in a north-south pattern to east-west (*Figures 1c–d*). The warmest temperatures were in central and western Arizona. Cold conditions in eastern New Mexico stemmed from late winter and early spring cold fronts moving through Colorado and wafting down through New Mexico into Texas. The storms were cold but did not bring moisture to the parched New Mexican landscape.

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2012, we are in the 2013 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 1981–2010. Departure from average temperature is calculated by subtracting current data from the average. The result can be positive or negative.

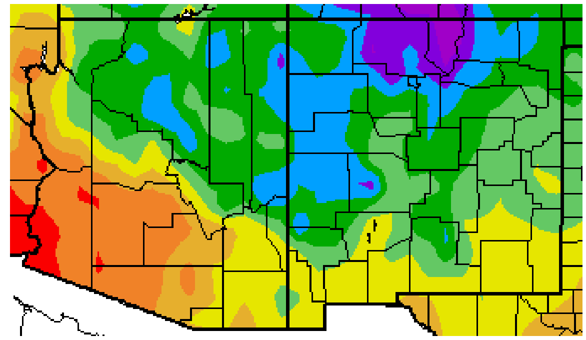
The continuous color maps (Figures 1a, 1b, 1c) are derived by taking measurements at individual meteorological stations and mathematically interpolating (estimating) values between known data points. The dots in Figure 1d show data values for individual stations. Interpolation procedures can cause aberrant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



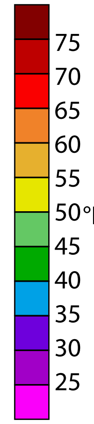
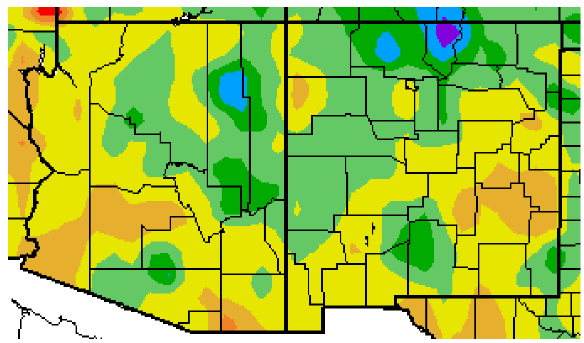


Figure 1a. Water year 2013 (October 1 through May 15) average temperature.



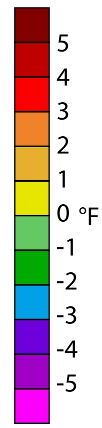
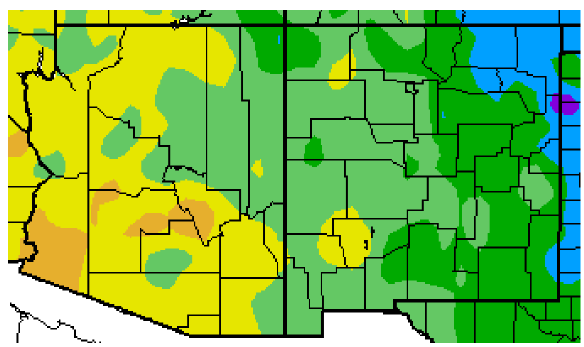


Figure 1b. Water year 2013 (October 1 through May 15) departure from average temperature.



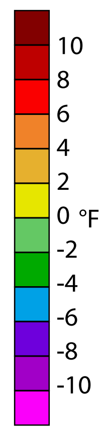
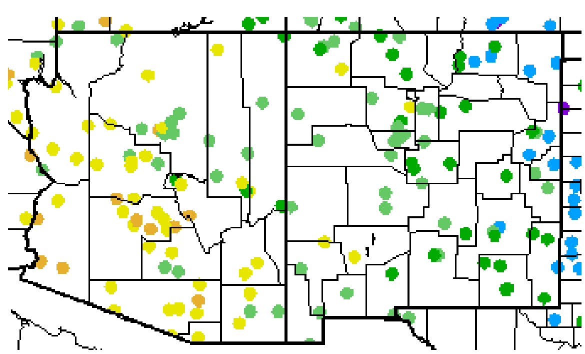


Figure 1c. Previous 30 days (April 16–May 15) departure from average temperature (interpolated).



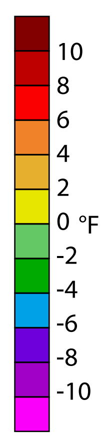


Figure 1d. Previous 30 days (April 16–May 15) departure from average temperature (data collection locations only).

Precipitation (through 5/15/13)

Data Source: High Plains Regional Climate Center

The 2013 water year, which began on October 1, continues to be extremely dry in the Southwest. The driest areas are in central and southern New Mexico, which have received less than 25 percent of average precipitation (*Figures 2a–b*). No weather stations in New Mexico have measured above-average precipitation. Most of Arizona also has received less than 70 percent of average, although near- or slightly above-average precipitation has fallen in two small regions. Two factors contributed to wetter-than-average conditions in central Arizona: the trajectory of several winter storms passing over this region and the Mogollon Rim, where the sharp rise in elevation forces air upward, forming clouds and ultimately resulting in precipitation.

Only one significant storm blew through the region in the past 30 days. The highest measured rainfall was 0.75 inches in the town of Alpine in the White Mountains of eastern Arizona. Far eastern New Mexico also had a single isolated storm. A station in southwest Utah near St. George also received substantial rain. The remainder of both states received less than 50 percent of average rainfall (*Figures 2c–d*). However, this time of year is historically dry, so large deviations in the percent of average do not account for large changes in total amounts.

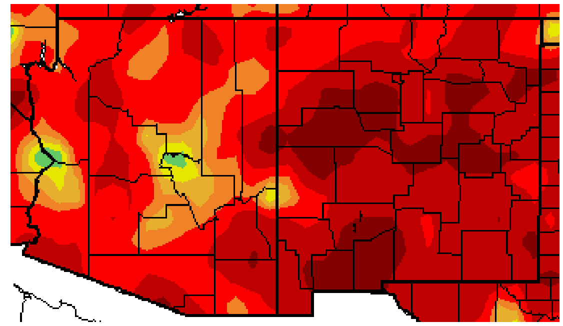


Figure 2a. Water year 2013 (October 1 through May 15) percent of average precipitation (interpolated).

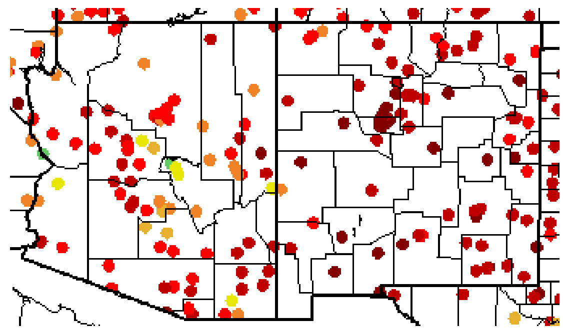


Figure 2b. Water year 2013 (October 1 through May 15) percent of average precipitation (data collection locations only).

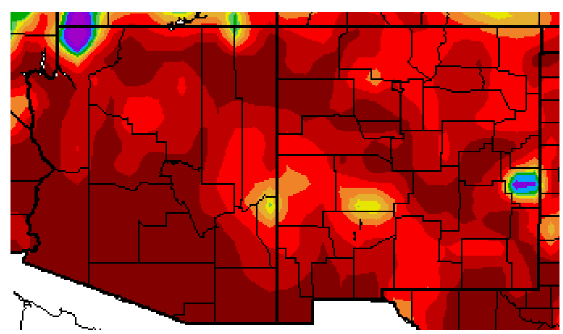


Figure 2c. Previous 30 days (April 16–May 15) percent of average precipitation (interpolated).

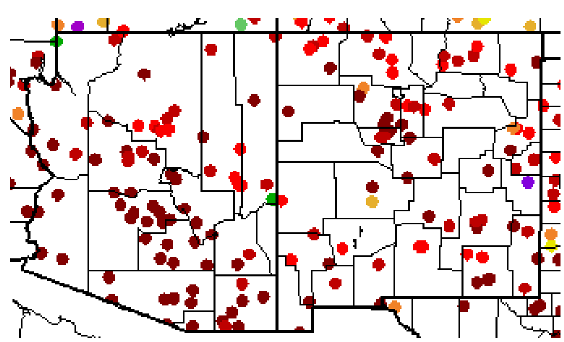


Figure 2d. Previous 30 days (April 16–May 15) percent of average precipitation (data collection locations only).

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2012, we are in the 2013 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 1981–2010. Percent of average precipitation is calculated by taking the ratio of current to average precipitation and multiplying by 100.

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

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

On the Web:

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

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

U.S. Drought Monitor (data through 5/14/13)

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

A relatively dry and warm weather pattern set up across much of the western U.S. in the last month, leading to an expansion of short-term drought conditions in some areas. At least abnormally dry conditions cover more than 85 percent of the West, an increase from 80 percent reported last month, according to the May 14 update of the U.S. Drought Monitor (*Figure 3*). California saw some of the largest changes in drought conditions in the past 30 days, with moderate and severe drought expanding to cover the entire state. The February–April period for California was the driest on record. Abnormally dry conditions also developed across Oregon and Idaho, replacing drought-free conditions reported there one month ago. The most extreme drought conditions continue to be in New Mexico, where exceptional drought expanded dramatically (see page 7). The winter storm season is winding down and will leave little chance for improvement in drought conditions across much of the West in coming months. However, the summer monsoon, which typically starts in early July and continues through September, may bring some welcome relief to parts of the Southwest.

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.

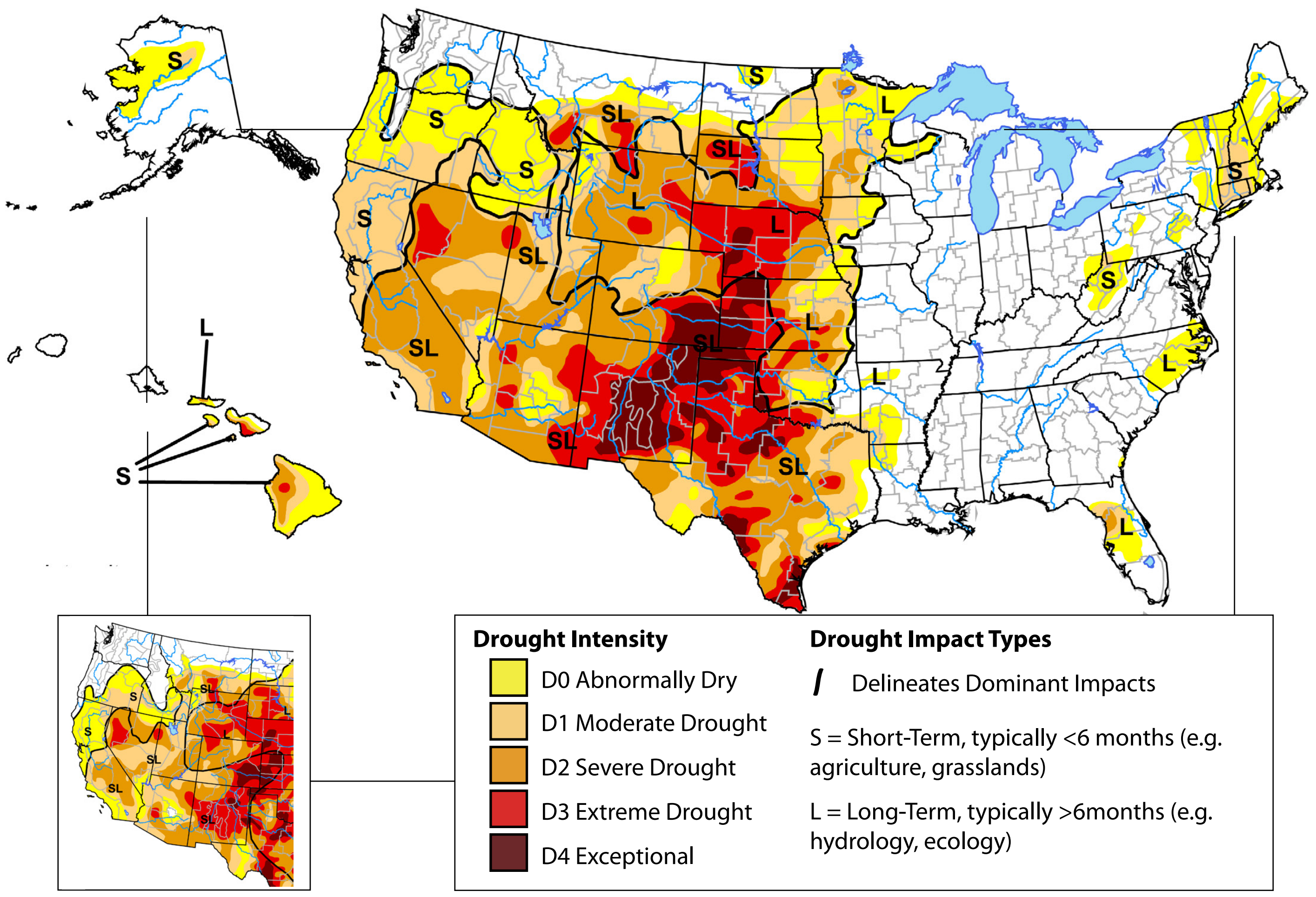


Figure 3. Drought Monitor data through May 14, 2013 (full size), and April 16, 2013 (inset, lower left).

On the Web:

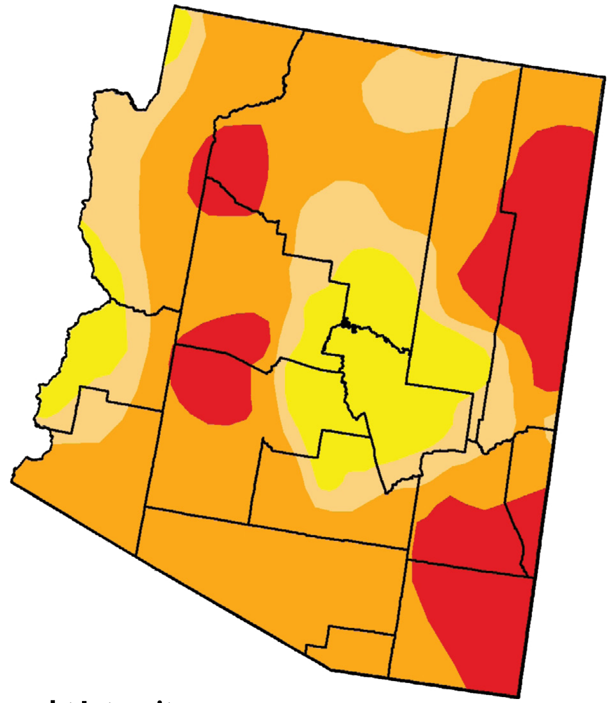
The best way to monitor drought trends is to pay a weekly visit to the U.S. Drought Monitor website: http://www.drought.gov/portal/server.pt/community/current_drought/208

Arizona Drought Status

(data through 5/14/13)

Data Source: U.S. Drought Monitor

Short- and long-term drought conditions worsened over the past 30 days, according to the May 14 update of the U.S. Drought Monitor. Above-average temperatures and dry conditions helped push the expansion and intensification of drought conditions across the region, and moderate or more severe drought covers about 87 percent of Arizona (*Figures 4a–b*). Severe drought conditions expanded across large parts of southern and western Arizona, replacing moderate drought conditions reported one month ago. In addition, extreme drought expanded across parts of the northeast and southeast corners of the state, where precipitation deficits continue to mount. These areas have received less than 50 percent of average precipitation over the past six months. The Vegetation Drought Response Index (VegDRI), a remotely sensed measure of vegetation drought stress, supports the depiction of drought conditions across the state, with most areas showing moderate to severe stress in vegetation conditions. In parts of northern Arizona, severe to extreme vegetation drought stress is present and is the most severe in the state. The widespread and intense drought, which has been a mainstay in the state since the beginning of 2011, has set the stage for another potentially active fire season.



Drought Intensity
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional

Figure 4a. Arizona drought map based on data through May 14.

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	86.66	69.64	18.95	0.00
Last Week (05/07/2013 map)	0.00	100.00	86.66	69.64	18.90	0.00
3 Months Ago (02/12/2013 map)	0.00	100.00	87.66	29.45	2.03	0.00
Start of Calendar Year (01/01/2013 map)	0.00	100.00	97.91	37.78	8.68	0.00
Start of Water Year (09/25/2012 map)	0.00	100.00	100.00	31.93	5.67	0.00
One Year Ago (05/08/2012 map)	0.00	100.00	96.08	67.19	16.29	0.00

Figure 4b. Percent of Arizona designated with drought conditions based on data through May 14.

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://www.drought.unl.edu/dm/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/DroughtStatus.htm

New Mexico Drought Status

(data through 5/14/13)

Data Sources: New Mexico State Drought Monitoring Committee; U.S. Drought Monitor

Warm and dry conditions over the past 30 days yielded little precipitation, leading to continued deterioration of both short- and long-term drought conditions. Exceptional drought, the most extreme drought category, covers about 44 percent of New Mexico (*Figures 5a–b*). Exceptional drought is defined as a drought that occurs, on average, once in every 50 years. About another 38 percent of the state is classified with extreme drought. Precipitation totals over the past six months have only been about 25 percent of average for most of the state.

Current drought conditions are impacting agricultural activities across the state. Water releases from the Elephant Butte Reservoir will likely be the lowest on record (*El Paso Times*, May 6). The water releases to farmers growing pecans and vegetables will be too small to meet irrigation needs and will require farmers to pump groundwater. Groundwater pumping is an expensive alternative to river water and may force some farms out of business, particularly the smaller ones.

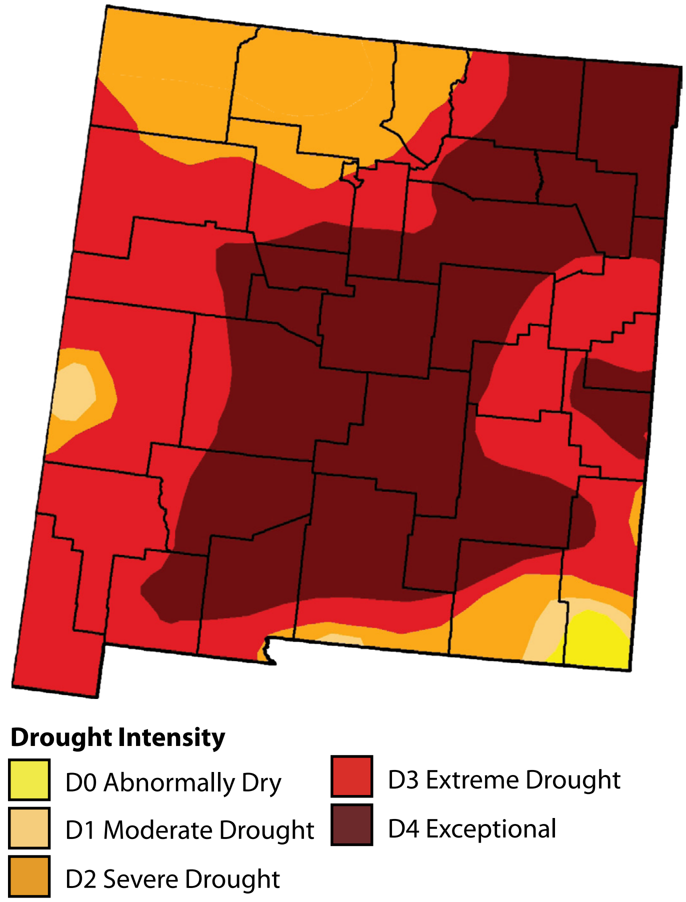


Figure 5a. New Mexico drought map based on data through May 14.

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	99.04	97.63	81.68	44.14
Last Week (05/07/2013 map)	0.00	100.00	99.04	97.75	81.82	39.89
3 Months Ago (02/12/2013 map)	0.20	99.80	98.45	89.85	25.36	0.97
Start of Calendar Year (01/01/2013 map)	0.00	100.00	98.83	94.05	31.88	0.97
Start of Water Year (09/25/2012 map)	0.00	100.00	100.00	62.56	12.25	0.66
One Year Ago (05/08/2012 map)	0.00	100.00	96.20	68.67	27.26	3.49

Figure 5b. Percent of New Mexico designated with drought conditions based on data through May 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://www.drought.unl.edu/dm/DM_state.htm?NM,W

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

Arizona Reservoir Volumes

(through 4/30/13)

Data Source: National Water and Climate Center

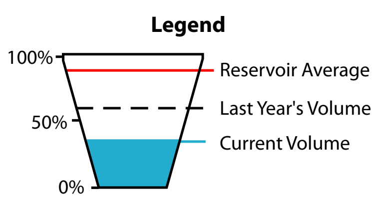
Combined storage in Lakes Mead and Powell stood at 48.2 percent of capacity as of April 30 (*Figure 6*), a decrease of 780,000 acre-feet from the previous month and roughly 10 percent lower than it was one year ago. Storage in the two reservoirs likely will begin to rise as snowmelt runoff increases in the higher elevations of the Upper Colorado River Basin. Despite storage increases, below-average inflows to the reservoirs are expected due to low winter precipitation. The most recent April–July streamflow forecast into Lake Powell is expected to be only about 34 percent of average, which would be the fourth lowest inflow since Lake Powell became operational in 1963 and slightly more than the inflow was last year. Elsewhere in Arizona, storage in San Carlos Reservoir decreased by about 9,000 acre-feet and only contains about 2,000 acre-feet. Storage in the Salt Basin increased by 2 percent, while storage in the Verde Basin declined by 9 percent.

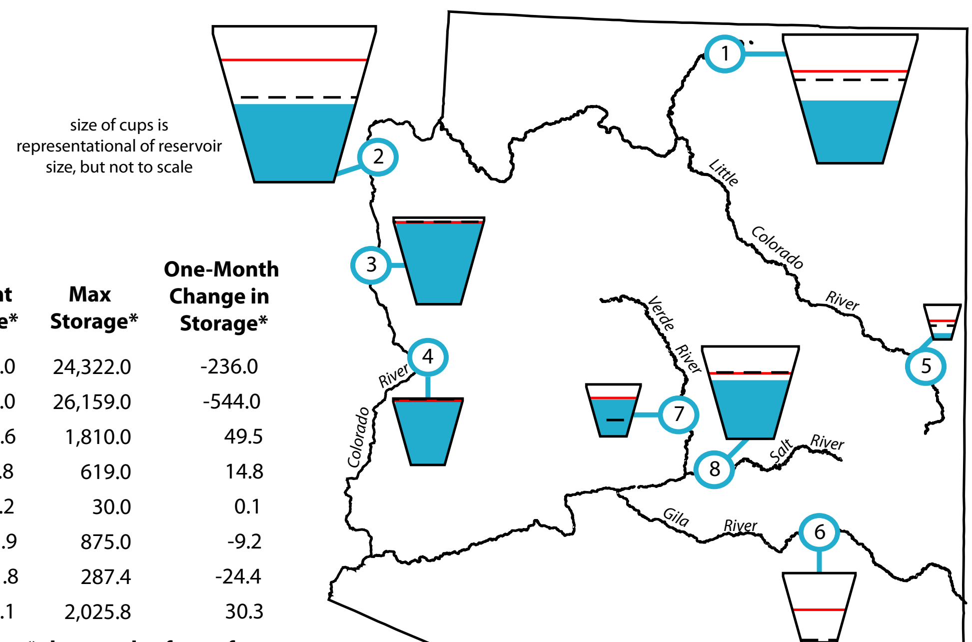
Notes:

The map gives a representation of current storage 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 (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 (dotted line) and the 1971–2000 reservoir average (red line).

The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage 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).





Reservoir Name	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	47%	11,422.0	24,322.0	-236.0
2. Lake Mead	49%	12,921.0	26,159.0	-544.0
3. Lake Mohave	95%	1,722.6	1,810.0	49.5
4. Lake Havasu	95%	586.8	619.0	14.8
5. Lyman	17%	5.2	30.0	0.1
6. San Carlos	0%	1.9	875.0	-9.2
7. Verde River System	70%	201.8	287.4	-24.4
8. Salt River System	62%	1,251.1	2,025.8	30.3

*** thousands of acre-feet**

CLIMAS
Climate Assessment for the Southwest

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

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 Volumes

(through 4/30/13)

Data Source: National Water and Climate Center

Combined water storage in New Mexico's reservoirs decreased by 16,000 acre-feet compared to one month ago, primarily due to a decrease Abiquiu (*Figure 7*). Reservoir levels throughout New Mexico are well below average as a result of low winter snowpacks in southern Colorado and northern New Mexico for the past three winters. As of April 30, combined storage on the four reservoirs on the Pecos River was about 18,900 acre-feet, which is about 17 percent of average and about 20,000 acre-feet less than it was one year ago. On the Rio Grande, only Abiquiu and Cochiti have near-average storage. All other reservoirs reported here have less than 50 percent of average storage. It will take several years of above-average rain and snow to improve the situation on both the Pecos River and the Rio Grande.

In water-related news, low water storage on the Rio Grande is being described as the most critical shortage of Rio Grande water for farmers in southern New Mexico and west Texas in nearly 100 years (*El Paso Times*, May 6). Elephant Butte Irrigation District officials warned farmers that allotments could be as low as 3.2 inches; in a good year, allotments are around 36 inches. The irrigation season may also last only one month, several months less than higher allotment seasons.

Notes:

The map gives a representation of current storage 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 (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 (dotted line) and the 1971–2000 reservoir average (red line).

The table details more exactly the current capacity (listed as a percent of maximum storage). Current and maximum storage 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.

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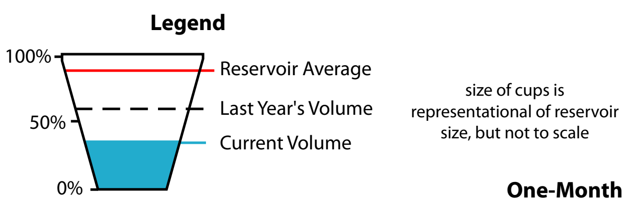


Reservoir Name	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	55%	928.4	1,696.0	-5.8
2. Heron	33%	133.9	400.0	-0.6
3. El Vado	17%	32.6	190.3	3.9
4. Abiquiu	13%	154.3	1,192.8	-14.9
5. Cochiti	10%	48.4	491.0	0.5
6. Bluewater	8%	3.0	38.5	-0.2
7. Elephant Butte	10%	223.1	2,195.0	2.9
8. Caballo	3%	10.2	332.0	-0.4
9. Lake Avalon	45%	1.8	4.0	-1.4
10. Brantley	1%	9.5	1,008.2	2.2
11. Sumner	5%	4.9	102.0	-0.8
12. Santa Rosa	1%	2.7	438.3	-0.1
13. Costilla	24%	3.9	16.0	3.9
14. Conchas	0%	0.0	254.2	0.0
15. Eagle Nest	37%	29.3	79.0	-0.7

* thousands of acre-feet

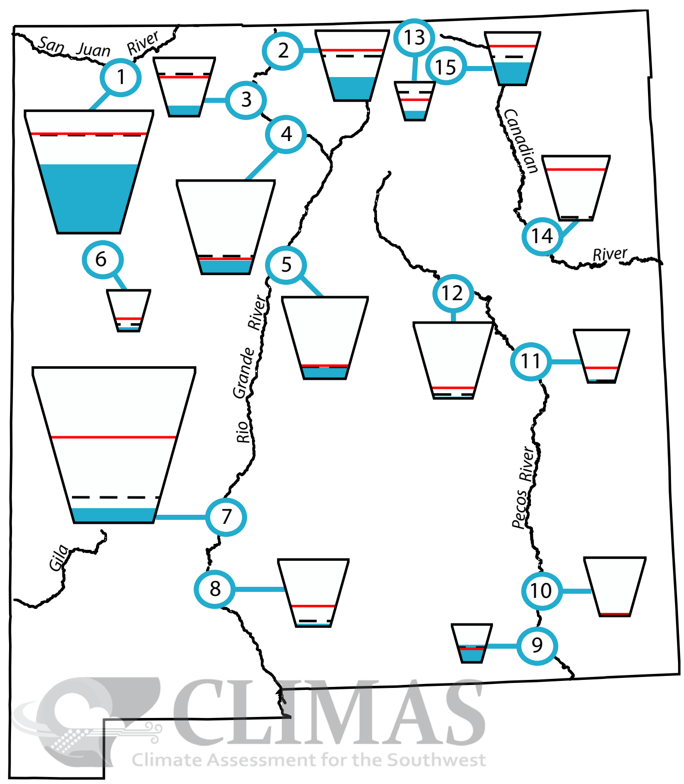


Figure 7. New Mexico reservoir volumes for April as a percent of capacity. The map depicts the average volume and last year's storage for each reservoir. The table also lists current and maximum storage, and change in storage since last month.

On the Web:

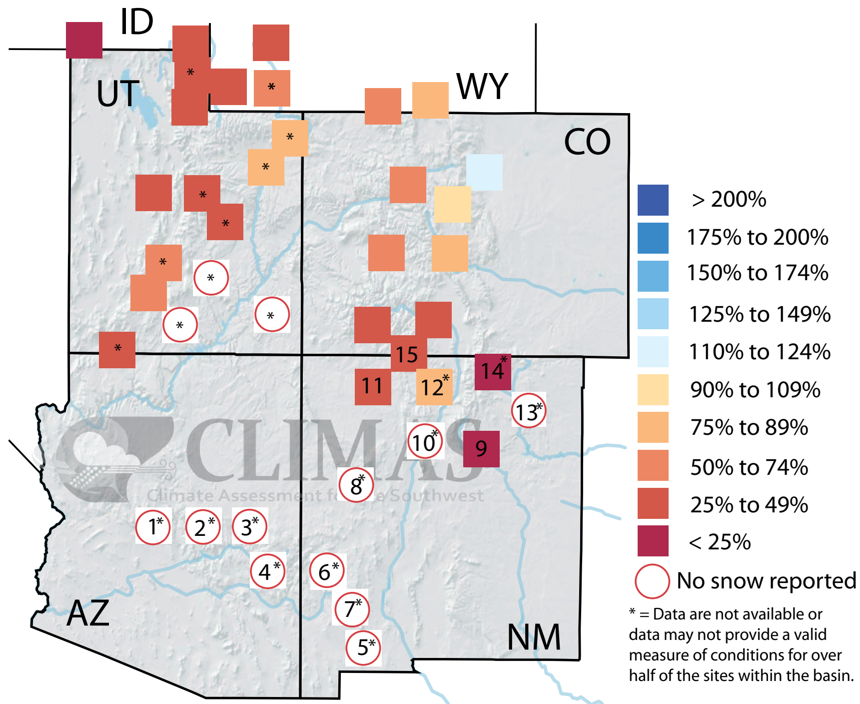
Portions of the information provided in this figure can be accessed at the NRCS website:
http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html

Southwest Snowpack
(updated 5/16/13)

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

Snowpacks in the Upper Colorado River Basin continue to decrease as spring temperatures warm. While several spring storms dropped snow in northern Colorado, which helped measuring stations record near-average snowpacks for this time of year, many other regions are recording well below-average totals (*Figure 8*). This includes the upper Rio Grande headwaters, where snowpacks are measuring, on average, about 24 percent of average.

Precipitation during the 2012–2013 winter was largely below average across the Southwest and Colorado. Since October 1, precipitation in all of New Mexico and most of southern Colorado has been less than 70 percent of average. Arizona has fared only slightly better. This is the third winter in a row in which the water contained in snowpacks, or SWE, averaged across SNOTEL monitoring stations in Arizona has been below average. The consequences of the dry winter are acute on the Rio Grande, where streamflow projections are low and many farmers likely will receive only a small fraction of the water needed to irrigate tree and vegetable crops. Other impacts relate to expanding drought conditions and elevated fire risk (see page 16).



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 Basin
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

Figure 8. Average snow water equivalent (SWE) in percent of average for available monitoring sites as of May 16, 2013.

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 from 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 1981–2010 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 5/16/13)

Source: Southwest Coordination Center

Dry conditions across Arizona and New Mexico since October 1 have set the stage for another potentially active fire season. In Arizona, many parts of the forested Mogollon Rim region have recorded precipitation deficits of up to 4 inches; a few isolated areas have received above-average rain and snow (see page 4). It has been even drier in New Mexico, where many areas have received between 3 and 6 inches below-average rainfall. With the fire season just underway, about 11,000 acres have burned in Arizona and New Mexico since January 1, mostly caused by human activity (*Figure 9a*). Between January 1 and May 16, 550 fires burned nearly 9,500 acres in Arizona, according to Predictive Services at the Southwest Coordination Center. In New Mexico, 321 fires have ignited this year, charring about 1,500 acres. Only four large wildfires greater than 100 acres are burning or have burned in Arizona, and only one large fires has burned in New Mexico (*Figures 9b–c*). The number of acres burned in 2013 thus far is lower than it was at this time last year. Two years ago, during the worst fire season on record for the Southwest, almost 350,000 acres in New Mexico and nearly 77,000 acres in Arizona had burned by mid-May.

While wildfires often occur throughout the year, more tend to start in April and May, concomitant with the historical occurrence of rising temperatures and windy and dry weather. The fire season in the Southwest usually peaks in June and July before the onset of the monsoon.

State	Human Caused Fires	Human caused acres	Lightning caused fires	Lightning caused acres	Total Fires	Total Acres
AZ	536	9,236	14	232	550	9,468
NM	289	1,240	32	284	321	1,524
Total	827	10,476	46	516	871	10,992

Figure 9a. Year-to-date wildland fire information for Arizona and New Mexico as of May 16, 2013.

Figure 9b. Arizona fire incidents greater than 100 acres as of May 16, 2013.

Figure 9c. New Mexico fire incidents greater than100 acres as of May 16, 2013.

- Current fire
- Suppressed fire

Notes:

The fires discussed here have been reported by federal, state, or tribal agencies during 2013. 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 current 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/daily/ytd_all_wf_by_state.pdf

Temperature Outlook

(June–November 2013)

Data Source: NOAA-Climate Prediction Center (CPC)

The seasonal temperature outlooks issued by the NOAA-Climate Prediction Center (CPC) in May call for increased chances that temperatures will be similar to the warmest 10 years in the 1981–2010 period for the three-month seasons spanning June through November (*Figures 10a–d*). The seasonal forecasts presented here are based primarily on dynamical models and are largely consistent with decadal warming trends. Confidence in the forecast is highest for portions of the southern Rocky Mountains and southern Great Plains, where dry initial soil moisture conditions favor above-average temperatures. Dry conditions and warm temperatures in the Great Plains can help jump-start the monsoon by facilitating the northern migration of the monsoon ridge earlier than when wet conditions are present. Experts have less confidence, however, in precipitation forecasts during the monsoon because the monsoon dynamics are less well known and are affected by many processes. The amount and frequency of rain, in turn, feeds back on temperature conditions. For example, evaporation and cloud cover, which help lower temperature, are greater when precipitation is consistent.

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 three-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.

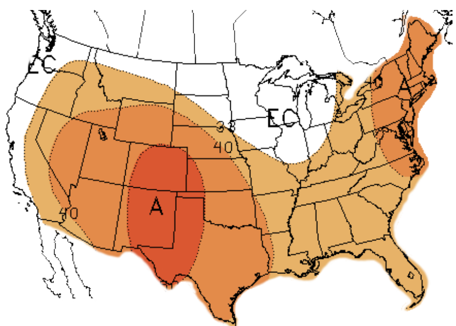


Figure 10a. Long-lead national temperature forecast for June–August 2013.

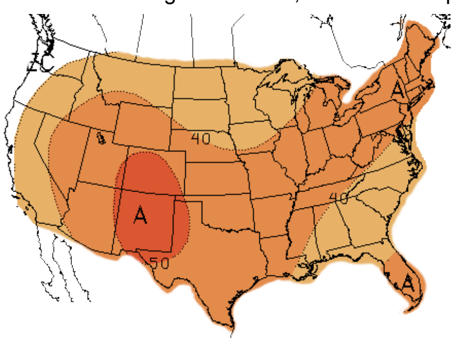
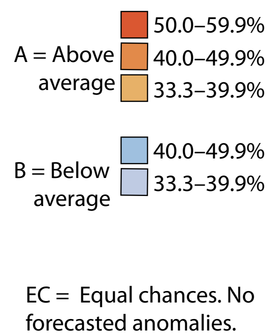


Figure 10b. Long-lead national temperature forecast for July–September 2013.



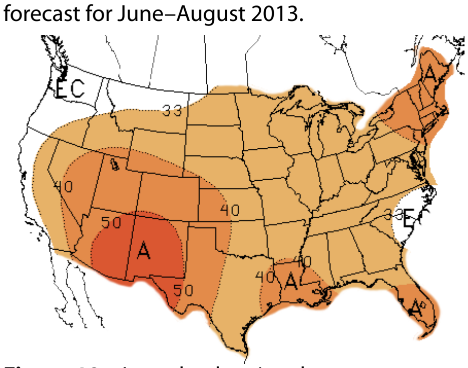


Figure 10c. Long-lead national temperature forecast for August–October 2013.

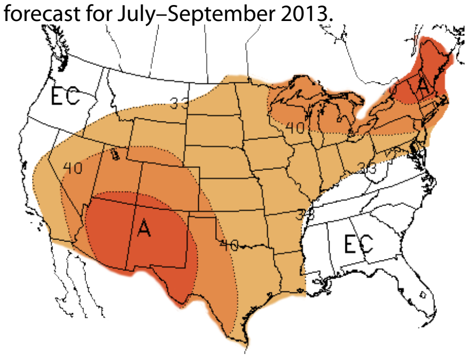


Figure 10d. Long-lead national temperature forecast for September–November 2013.

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 2013)

Data Source: NOAA-Climate Prediction Center (CPC)

The seasonal precipitation outlooks issued by the NOAA-Climate Prediction Center (CPC) in May call for increased chances that precipitation during the June–August period will be below average across the eastern half of New Mexico (*Figure 11a*). This forecast likely reflects a land-surface feedback spurred on by the dry landscape in eastern New Mexico. Seasonal forecasts that overlap the monsoon show increased chances of below-average precipitation for most of New Mexico (*Figures 10b–c*). The CPC states that there is little model consensus in the predicted strength of the monsoon. Consequently, the region of increased chances for below-average precipitation was adjusted eastward from its position in last month's outlook and now does not cover parts of southeast Arizona. While some models show chances for increased monsoon precipitation, models historically are not accurate at predicting the monsoon. The September–November season also calls for below-average precipitation in most of New Mexico and southeast Arizona. If rain is scant this summer in New Mexico, as projected, the severe drought conditions there likely will intensify.

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.

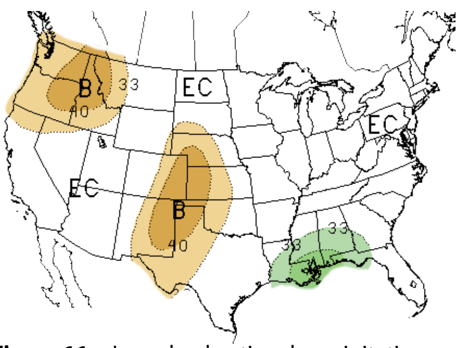


Figure 11a. Long-lead national precipitation forecast for June–August 2013.

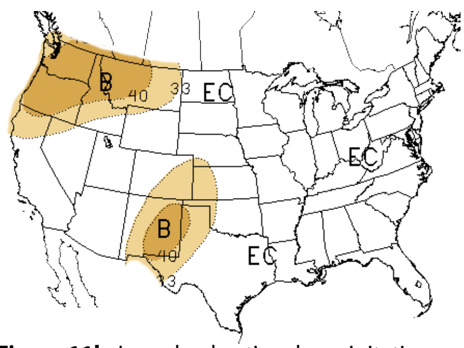
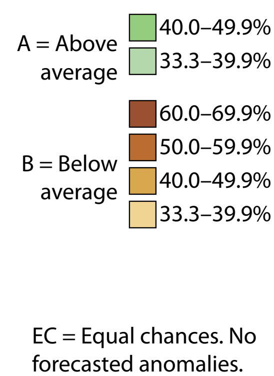


Figure 11b. Long-lead national precipitation forecast for July–September 2013.



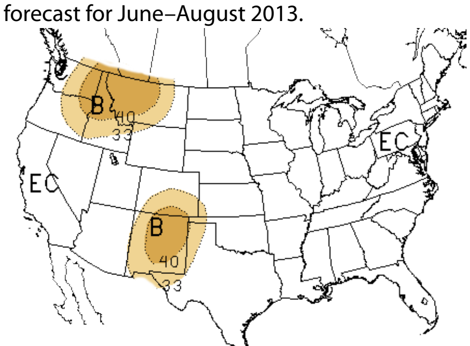


Figure 11c. Long-lead national precipitation forecast for August–October 2013.

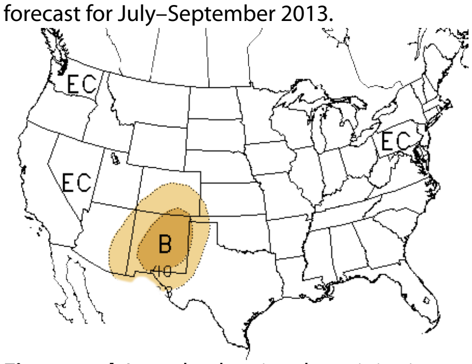


Figure 11d. Long-lead national precipitation forecast for September–November 2013.

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 may load slowly on your computer)

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

Seasonal Drought Outlook
(through August 2013)
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 D. Miskus.

After a wet November and December in the West, record dry conditions enveloped the region from January through April. Most of the West is now in the midst of the normally dry summer and fall months, making it unlikely that substantial precipitation will occur during the next several months. Moreover, 5-day, 6–10 day, and 8–14 day forecasts, as well as the June and June–August outlooks, do not call for wetter-than-average precipitation. Consequently, the drought forecast for most of the West calls for drought to persist or develop (*Figure 12*).

For the Southwest monsoon region, models do not agree on the strength of summer precipitation. As a result, the CPC forecasts equal chances that July–September rain will be below-, near-, or above-average. With drought conditions widespread (see pages 6 and 7), it is likely that the dry conditions will persist and may even develop in the White Mountains of Arizona. If a vigorous monsoon does occur, drought likely will improve but not disappear. The CPC states that it has moderate confidence in its drought forecast for the West.

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.

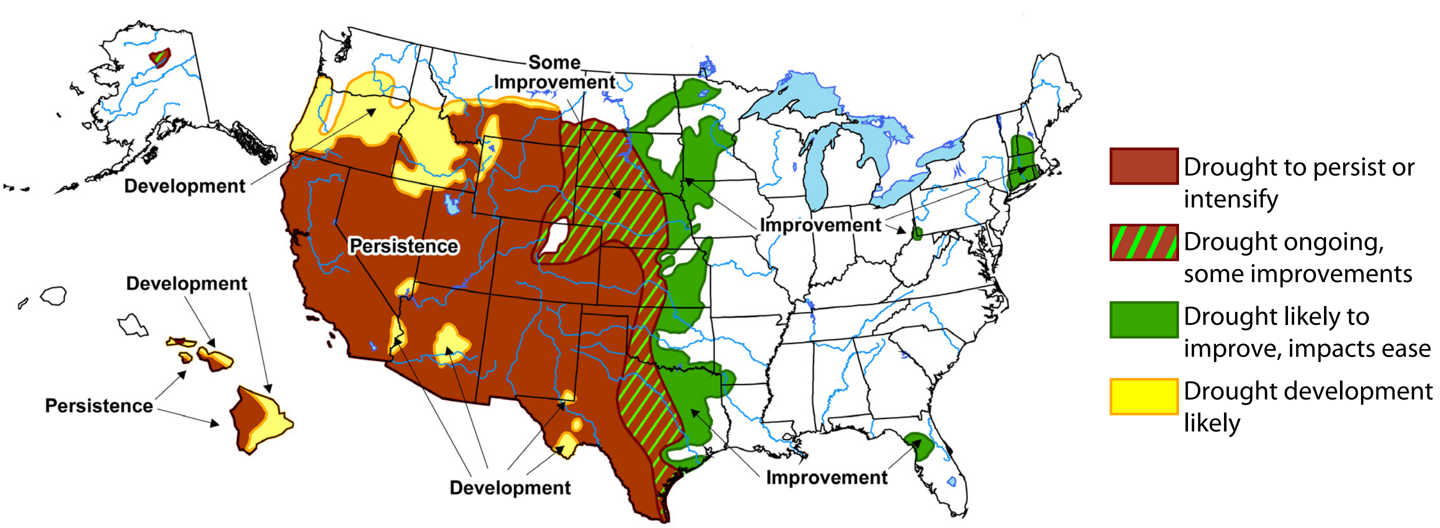


Figure 12. Seasonal drought outlook through August 2013 (released May 16).

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

Rain and snow this winter were well below average in many parts of New Mexico and southern Arizona. Consequently, the spring–summer streamflow forecast for New Mexico, issued on May 1 by the Natural Resources Conservation Service (NRCS), calls for below-average flows in all river basins (*Figure 13*). No streamflow forecasts are issued in May for Arizona; the last forecast is published in April.

The best estimate for total March–July streamflow calls for a 50 percent chance that flows in the Rio Grande, measured at Otowi Bridge north of Albuquerque, will measure less than 24 percent of average for the April–July period. This is a decrease from the estimate made one month ago. Now that most of the runoff season has passed, even optimistic estimates suggest streamflow on the Rio Grande will be less than 33 percent of average. Steamflow on the Pecos River is also projected to be very low, with best estimates calling for flows to be less than 30 percent of average.

For the Colorado River, unregulated inflow volume to Lake Powell in April was 34 percent of average. The forecast for the lake for the April–July period also projects below-average flow. The likely range is expected to be between 24 and 59 percent of average, with the most probable estimate calling for a total of 3.0 million acre-feet (maf), which is 42 percent of the 1981–2010 average. Due to late season snow storms in the Upper Colorado River Basin, the forecast increased by 0.3 maf from last month. Based on the current forecast, Lake Powell elevation likely will decline by approximately 10 feet during the spring and summer. The elevation at the end of the water year likely will be 3,588 feet, with storage around 10.6 maf, or 44 percent capacity.

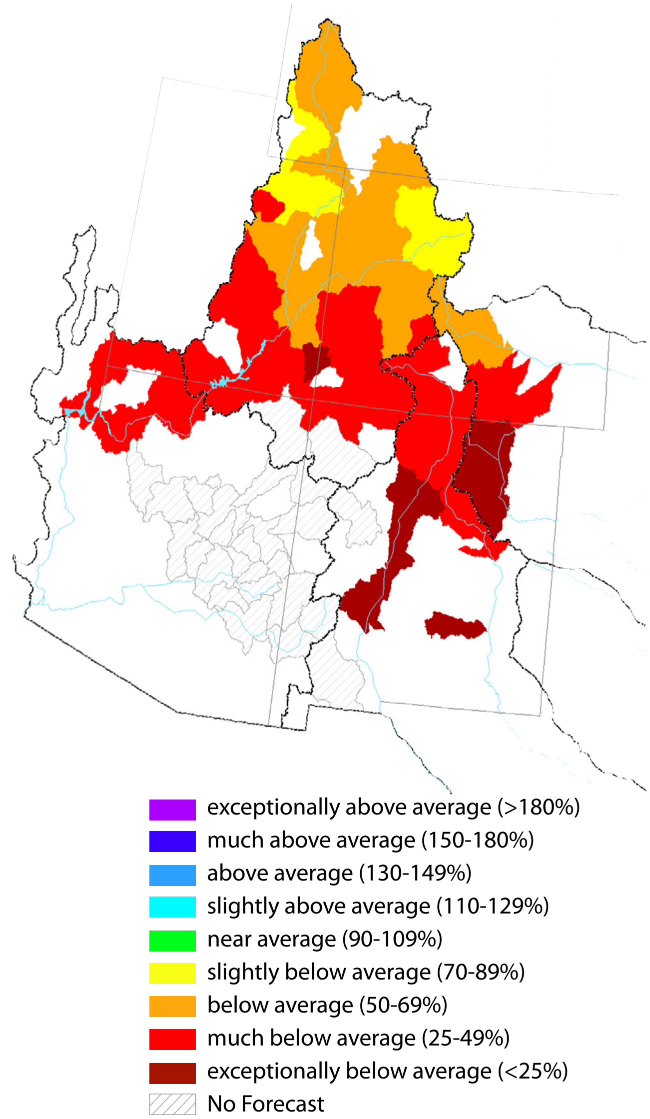


Figure 13. Spring and summer streamflow forecast as of May 1 (percent of average).

Notes:

Water supply forecasts for the Southwest are coordinated between the National Water and Climate Center (NWCC), 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 produced for Arizona and 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 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 2013)

Sources: National Interagency Coordination Center; Southwest Coordination Center

Above-normal significant fire potential developed across much of the southern halves of New Mexico and Arizona in May, a consequence of dry winter conditions combined with rising temperatures and winds typical of May. Significant wildfire potential is defined as the likelihood that a wildland fire will require additional fire-fighting resources from outside the area in which the fire originated. Drought has been widespread in the Southwest for several years, and moderate or more severe drought currently covers most of Arizona and New Mexico (see pages 6 and 7). Historically, the best predictor of the size of fires is drought conditions.

In June, areas of above-normal significant wildland fire potential are expected to spread up into northern areas of Arizona and New Mexico (*Figure 14*). Elevated fire risk will persist until monsoon rains substantially moisten the landscape. Currently, only two fires larger than 100 acres have burned in Arizona and New Mexico since January 1 (see page 11). Nonetheless, the potential exists for a significant fire season, but whether or not conditions will support sustained periods of activity is still uncertain, according to the National Interagency Fire Center Predictive Services.

Notes:

The National Interagency Coordination Center at the National Interagency Fire Center produces seasonal wildland fire outlooks each month. They are subjective assessments that synthesize information provided by fire and climate experts throughout the United States. The forecast (Figure 14) considers 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.

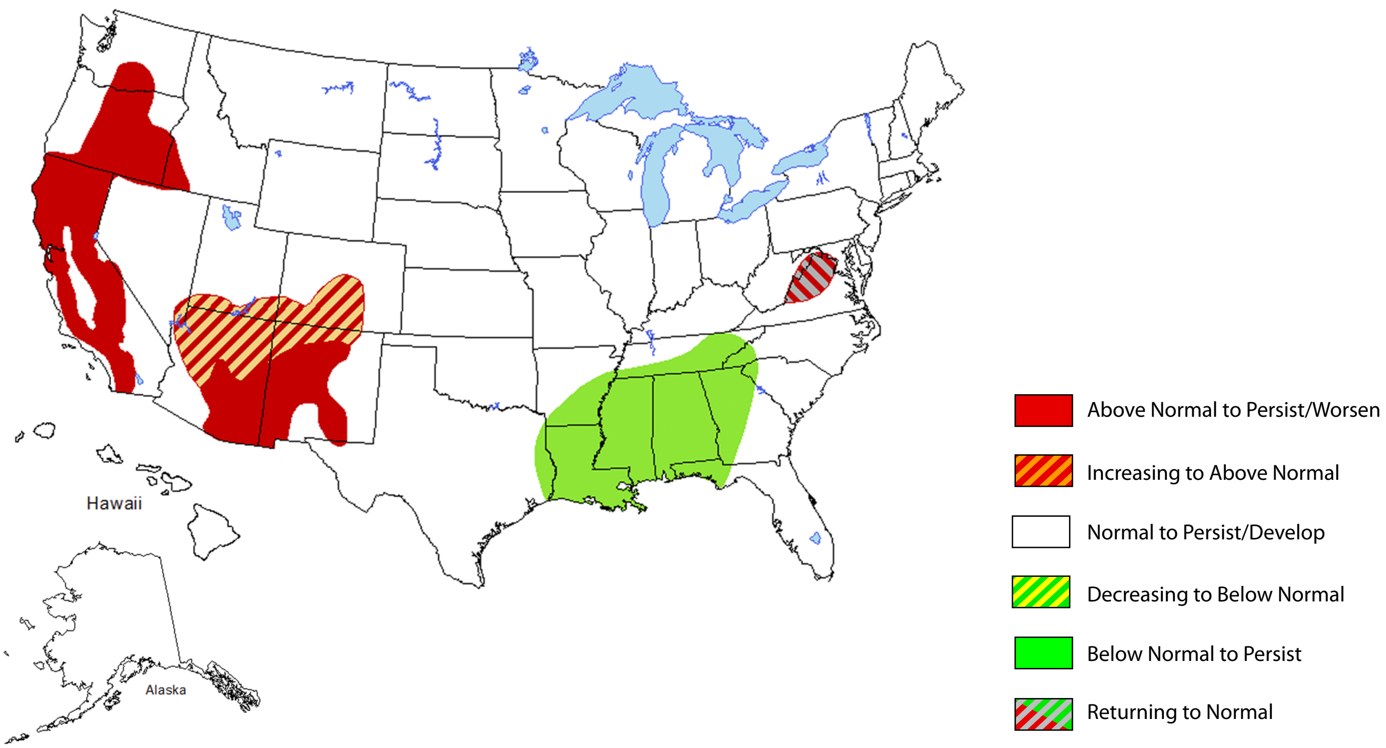


Figure 14. National wildland fire potential for fires greater than 100 acres for June 2013.

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) and wind patterns remained virtually unchanged from last month, indicating that ENSO-neutral conditions persisted across the equatorial Pacific. The Southern Oscillation Index (SOI), a measure of the atmospheric response to changing SST patterns, also remained near average over the past month, a further indication that neutral conditions remained firmly in place (*Figure 15a*).

Official SST outlooks issued by the NOAA-Climate Prediction Center (CPC) and International Research Institute for Climate and Society (IRI) continue to indicate that neutral conditions are likely to persist through the summer season. There is a 60 percent chance of neutral conditions extending through the July–September period, compared to a 27 percent chance that La Niña conditions will return. There is only a 13 percent chance that an El Niño event will develop (*Figure 15b*). The chance for a return of La Niña has risen slightly from last month's forecast, but neutral conditions are still the most likely outcome over the summer season. The chance of a neutral-event holding steady at longer time scales through next winter has jumped up considerably since one month ago. Because ENSO events often materialize in late fall, confidence in the evolution of SSTs, and consequently ENSO, will increase in coming months. Without the presence of a La Niña or El Niño, it will be difficult to project with any accuracy the onset and strength of the monsoon.

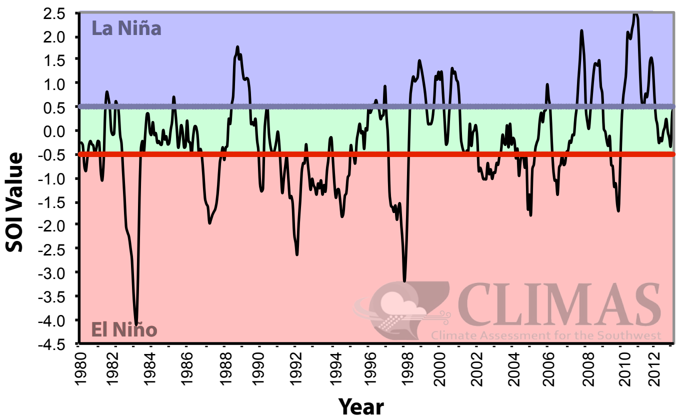


Figure 15a. The standardized values of the Southern Oscillation Index from January 1980–April 2013. La Niña/El Niño occurs when values are greater than 0.5 (blue) or less than -0.5 (red), respectively. Values between these thresholds are relatively neutral (green).

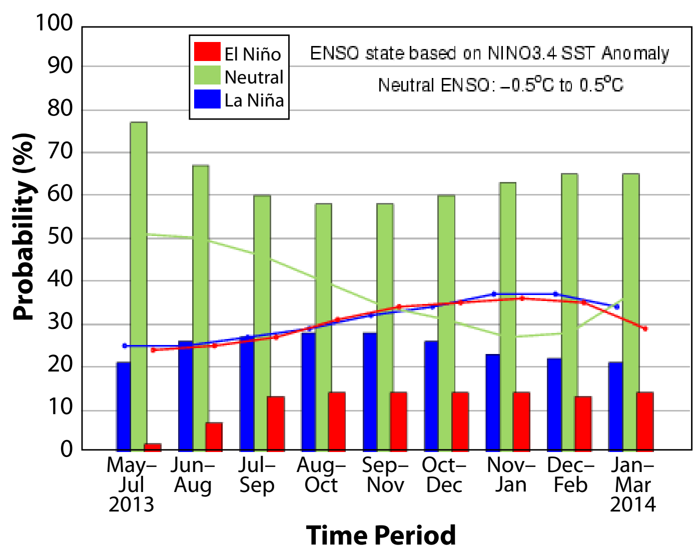


Figure 15b. IRI probabilistic ENSO forecast for the Niño 3.4 monitoring region (released May 17). Colored lines represent average historical probability of El Niño, La Niña, and neutral conditions.

Notes:

The first figure shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through April 2013. 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/