Issued: January 23, 2007

Southwest Climate Outlook

THE UNIVERSITY OF ARIZONA.

Source: Steve Novy, Institute for the Study of Planet Earth

Photo Description: A rare snowstorm hit Tucson, Arizona on January 21. Notable accumulations of snow do not normally occur in downtown Tucson, which more often sees scattered flakes of snow if any. However, this storm brought enough for someone to build a snowman on The University of Arizona campus. Local news agencies reported up to three inches in some parts of the city.

Would you like to have your favorite photograph featured on the cover of the *Southwest Climate Outlook*? For consideration send a photo representing Southwest climate and a detailed caption to: knelson7@email.arizona.edu

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ARIZONA COOPERATIVE EXTENSION
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January Climate Summary

Drought – Conditions have improved somewhat in New Mexico due to winter precipitation but have deteriorated slightly in Arizona.

- In the short-term, much of New Mexico is drought-free while most of Arizona is abnormally dry or in moderate drought.
- Long-term conditions are forecast to improve somewhat with the expectation of above-average winter precipitation.

Temperature – Temperatures over the past thirty days have generally been cooler than average for most of the Southwest.

Precipitation – Over the past month, most of Arizona has had below-average precipitation while large regions in New Mexico have had above-average precipitation.

Climate Forecasts – Forecasters predict increased chances for above-average temperatures and above-average precipitation for most of the Southwest through May.

El Niño – Weak El Niño conditions are expected to persist through April, though the current event may have already reached peak strength.

The Bottom Line – Cooler-than-average temperatures combined with predicted above-average precipitation this winter could mean drought relief, increased water supplies, and fewer wildfires later in the year for the Southwest.

Global warming update

Cold snaps come and go, but the world as a whole is warming up and will continue to do so for many decades to come. For the latest findings on the extent of the warming, watch for some breaking news on February 2. On that day, the Intergovernmental Panel on Climate Change (IPCC) will share its Summary for Policymakers of the first volume of *Climate Change 2007*, their new assessment report.

Some of the report's contributing authors, including The University of Arizona's Institute for the Study of Planet Earth Director Jonathan Overpeck, will be gathered in Paris that Friday for a press conference. The summary will outline the evidence for climate change, and society's role in it. The full report will be released by mid-year. To watch a live webcast of the press conference and stay up to date on their findings, visit the IPCC website (link below).

For more information visit: http://www.ipcc.ch/...

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Global warming inspires a look at solar, wind energy

Southwest eyeing ways to cut emissions from fossil fuels such as oil and coal

By Melanie Lenart

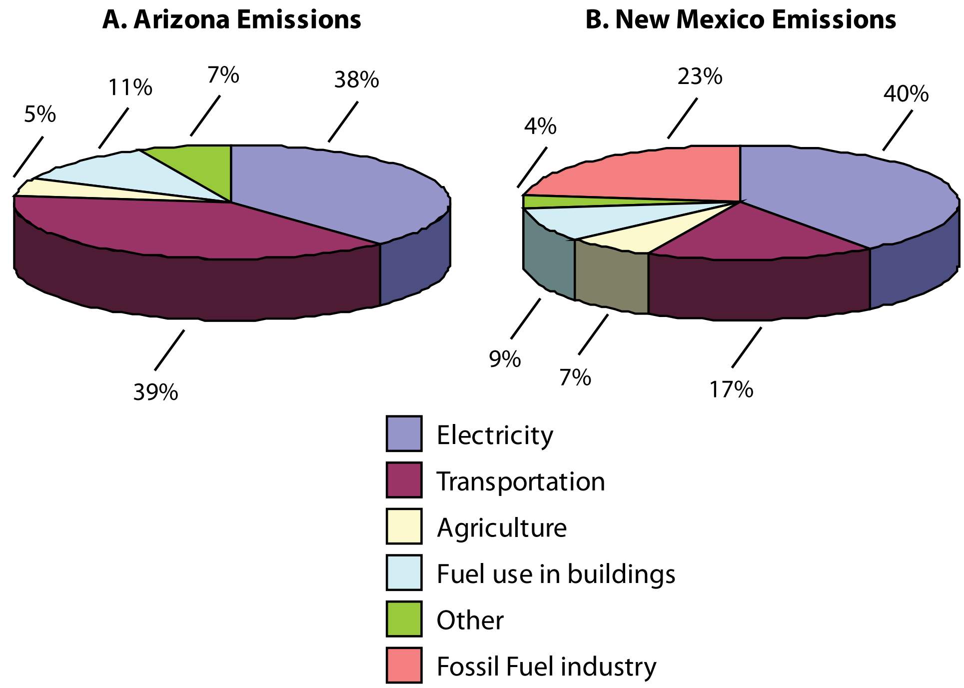

Figure 1. The pie charts show the source of greenhouse gas emissions in Arizona (a) and New Mexico (b) based on 2000 data. New Mexico has an additional category, Fossil Fuel Industry, which largely reflects its coal mining and processing operations.

Now that many Americans accept the reality of global warming, they want to do something about it. In the Southwest, that desire is being harnessed into initiatives to improve energy efficiency and boost alternative forms of power, such as solar and wind energy.

The rising temperatures of recent decades trace back largely to emissions of greenhouse gases, mainly from the burning of fossil fuels like coal, gas, and oil. So the first step toward reigning in global warming involves reducing fossil fuel emissions.

The United States releases more greenhouse gases from fossil fuels than any other nation. Per-person emissions tally about six times higher in the United States than in China, the runner-up for title of world's biggest producer of greenhouse gases. Yet the U.S. government has declined to join the international effort to reduce greenhouse gas emissions, known as the Kyoto Protocol.

Many states, cities, companies, and individuals are attempting to fill the void left by the federal government. New Mexico and Arizona are making efforts to reduce fossil fuel emissions by supporting alternative fuels and improving energy efficiency. The state efforts also affect cities, companies, and individuals, especially those interested in powering their homes and offices with solar energy.

Statewide initiatives

"The governors are moving on this primarily because the federal government is not," explained Sandra Ely, New Mexico's Energy and Environment Coordinator. Ely served as the point person for the state's Climate Change Advisory Group, which released an action report in December. Arizona released its action report in mid-2006. The groups identified major sources of greenhouse gases (Figure 1) and recommended ways to reduce them. (See links to these documents on page 6.)

In September, Arizona Governor Janet Napolitano responded to the report by issuing an executive order requiring the state to drop back to 2000 levels by 2020, and to 50 percent below 2000 levels by 2040. At the time, she noted that the proposed recommendations would actually save money, amounting to $5.5 billion through 2020 and more in subsequent years.

In New Mexico, Governor Bill Richardson had issued an executive order in 2005 setting up the advisory group and asking it to think of ways to reduce the state's total greenhouse gas emissions to 2000 levels by the year 2012, to 10 percent below those levels by 2020 and to 75 percent below by 2050. To address the quotas, the advisory group decided to focus on the electricity consumed within the state, which represents roughly a quarter of the all the greenhouse gas emissions produced. The governor followed up with an order last month prescribing some actions, including making new buildings and cars more energy-efficient.

Both states face the challenge of trying to stabilize greenhouse gas emissions even as their populations explode. The number of Arizona residents rose by 40 percent during the 1990s, while New Mexico's population increased by 20 percent. Population growth averaged 13 percent in the nation during this time frame.

Arizona's population growth is translating directly into the country's highest growth rates in greenhouse gas emissions, noted Kurt Maurer, an Arizona Department of Environmental Quality employee who helped organize Arizona's Climate Change Advisory Group.

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Sun and wind, continued

"Our growth rate is outpacing astronomically what other states are experiencing. We're the fastest growing state in the country," Maurer said.

In both states and the country as a whole, per-capita greenhouse gas emissions—measured in metric tons of carbon dioxide equivalent per person—remained roughly stable since 1990.

New Mexico's large coal industry coupled with its relatively small population help make the state's per-capita greenhouse gas emissions about double the national average. The New Mexico advisory group targeted changes in this sector as one of the most effective ways to reduce overall emissions.

Arizona falls below the national average for greenhouse gas emissions per person, in part because the region's mild winters demand less heating. Still, electricity demands for Arizona homes have quadrupled in recent years as developers build larger structures and air conditioners replace swamp coolers.

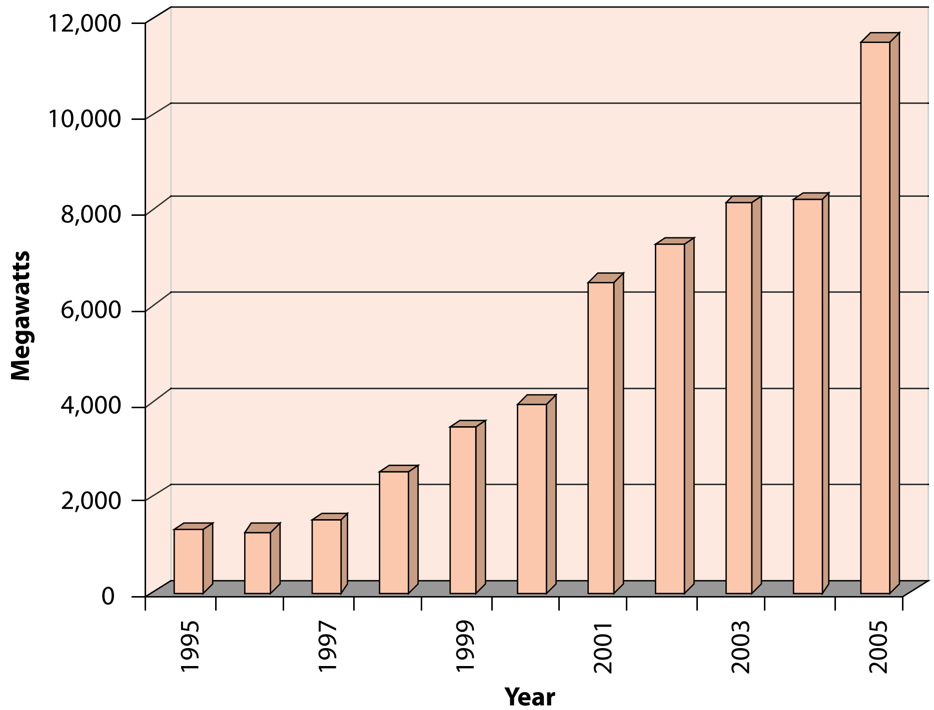

Figure 2. Wind power installments, measured by the capacity of windmills set up each year, rose by an average of 24 percent a year since 2000. Data from the Global Wind Energy Council.

Better buildings

Energy use in buildings accounts for about two-fifths of greenhouse gas emissions in the Southwest, counting the lighting and cooling provided by electricity. This has inspired leaders in both states to push for more energy-efficient structures.

Governor Richardson has promised to move forward on several regulatory fronts that don't need legislative approval. These include requiring contractors to follow the green building rating standards known as LEED, for Leadership in Energy and Environmental Design. This energy-efficient approach offers one of the best economic returns, Ely said.

"You may have some initial upfront costs of maybe 2 percent more, but you get so much back from that initial investment that you make the money back fairly quickly," she noted. Although homeowners will pay a bit extra for the home, the longer-term energy savings would amount to about $12 per ton of carbon dioxide equivalent by 2020, the report projects.

Even existing homes sometimes can benefit from improvements in energy efficiency, noted Tom Goldtooth, executive director of the Indigenous Environmental Network. Some reservation homes even have ice building up in corners, a sign that energy is leaking out of the cracks, he explained during a December Tribal Lands Climate Conference held in Yuma.

Federal tax credits for home improvements including insulation continue through this year. (See links on page 6.)

Fuel-efficient cars

Greenhouse gas emissions from vehicles rival the amount coming from energizing buildings in Arizona. Transportation accounts for about 39 percent of fossil fuel emissions in Arizona and 17 percent in New Mexico. Our nation's driving habits account for about half of the auto emissions around the planet, a 2006 Environmental Defense study showed, in part because Americans favor large vehicles with low gas mileage.

New Mexico plans to shift into more stringent vehicle emission standards by adopting California's Clean Car guidelines. California's interest in reducing its greenhouse gas emissions and related air pollution inspired Fran Pavley and other legislators to set a quota for electrical cars and restrict the sale of vehicles with low fuel efficiency. Auto makers and their organizations have sued to keep the state from implementing the law.

Arizona is holding off on adopting the California standards until the lawsuit is settled, Maurer said. In the meantime, the governor issued an executive order requiring that departments purchase

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Sun and wind, continued

fuel-efficient or hybrid vehicles so that the official fleet will meet these standards by 2010.

Plans are also moving forward for Arizona Grain, Inc., to open an ethanol production plant in Maricopa by mid-year. The company plans to convert corn into 50 million gallons a year of a fuel blend containing 85 percent ethanol. Ethanol is an alternative to oil that emits fewer pollutants than a conventional system, including perhaps 20 percent fewer greenhouse gases.

However, some policy experts worry that its widespread adoption could worsen conditions for the world's poor in the long run. Lester Brown, president of the Earth Policy Institute, has cautioned that a large-scale move to ethanol would force less developed countries to compete with wealthy countries for world grain supplies. Because of this risk, Brown instead promotes developing wind energy to power electric vehicles.

Wind power

Whether cars reap the bounty of wind energy in the Southwest or not, utilities in both states will be employing more windmills to meet requirements that renewable energy comprise a greater share of their generating capacity. Existing laws require Arizona to meet 15 percent of its electrical needs from renewable sources by 2025, while New Mexico must obtain 10 percent by 2011.

New Mexico already has a 204-megawatt wind farm in House, with windmills dotting the landscape on private ranches amid grazing cattle, Ely pointed out.

"The ranchers love it. It's a great utilization of their ranchland," she added. The leases for windmills provide an ongoing source of income to ranchers with a livelihood that is subject to change with climate fluctuations.

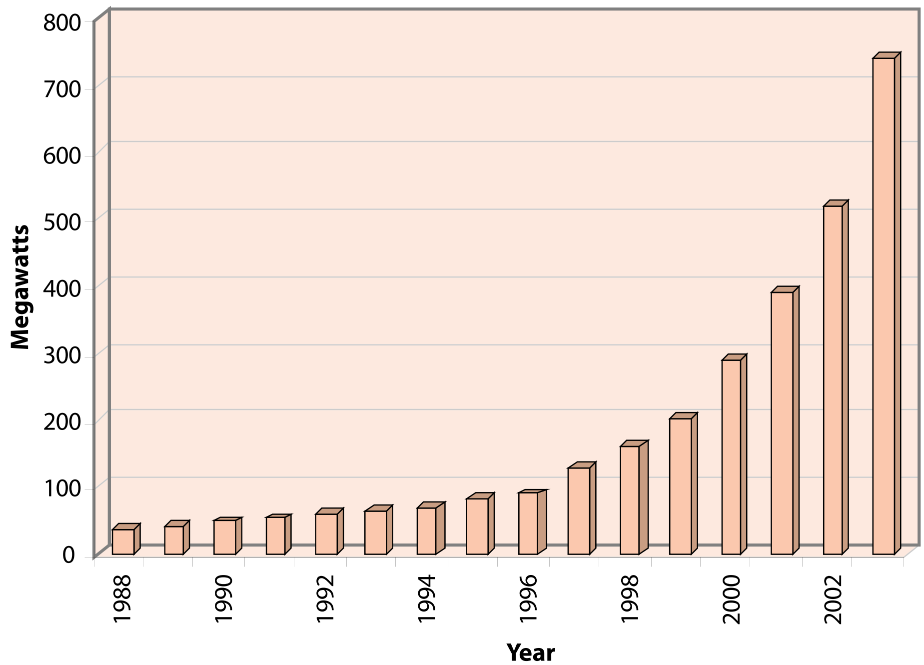


Figure 3. Electrical generation from solar cells lags behind wind globally, but the rate of increase surpasses 30 percent a year since 2000. Data here are estimates based on published graphs of information from PV Energy Systems, Inc.

According to Ben Luce, director of the New Mexico Coalition for Clean and Affordable Energy, New Mexico will need more electricity transmission lines to profit from wind potential. The coalition supports adding transmission lines throughout eastern New Mexico, a windy area that could eventually supply 4,000 to 8,000 megawatts of wind power—enough to power the whole state, he said

"A lot could change in this whole discussion in the next couple of years if we get this off the ground. Basically we could displace coal in the Southwest," Luce ventured. "The beauty is this is all local technology, so it won't hurt the economy. It could even help it."

New Mexico could develop a wind turbine manufacturing plant in an Albuquerque railyard under one proposal on the table, Luce said. Discussions call for the plant to produce windmills that can generate between 1.5 megawatts and 4 megawatts of electrical power each.

A shortage of windmills threatens to derail some U.S. projects in the short term. Many experts consider the shortage temporary, soon to be relieved with upcoming windmill production plans.

China currently overwhelms the windmill market with its demand, but lately the nation of 1.3 billion people has been stepping up its own production of windmills in hopes of meeting its needs independently. An upswing in windmill production in China and other countries is expected to ease the shortage within a few years.

At 10 cents a kilowatt-hour and falling, wind energy prices compete directly with electricity produced from fossil fuels. This helps explain their growing popularity around the world (Figure 2). Creating solar-powered electricity, meanwhile, remains relatively expensive, although passive solar heating of water pays off quickly. As a result, solar electrical systems haven't been keeping pace with wind except in rates of increase (Figure 3).

continued on page 6

Sun and wind, continued

Solar power

Both Arizona and New Mexico provide cash incentives to homeowners to supplement federal subsidies for renewable energy. As a result, the government covers about half the cost of rooftop panels using photovoltaic cells (PVCs). (See links to the right.)

A roof-mounted system from American Solar, which participated in Arizona's climate change advisory group, would cost about $14,000 after cashing in federal and state credits, explained spokesman Tom Alston. A system this size would supply half the electrical needs of a typical Arizona home, he said.

American Solar's systems run about $3 per watt of electrical energy installed, or $3,000 per kilowatt, Alston estimated. Electric bills come in kilowatt-hours, which measures the number of hours in which a system uses 1,000 watts of energy. Although solar energy is produced only while the sun is shining, Southwestern homeowners generally can sell their extra electricity to their utility companies at retail prices, then buy back what they need during the night.

The investment pays off before the 25-year warranty runs out, Alston said, noting it would yield a 6 and a half percent return over its lifetime assuming a modest increase of about 3 percent a year in electricity rates.

"But it's also like buying an energy future," Alston added, referring to the stock market tactic of banking on the likelihood of future price increases. "Every time the rates go up, the system becomes more valuable. I'm essentially ensuring my rates don't go up for the next 25 years."

Arizona Public Service has one of the world's largest electrical plants using solar power. Its Springerville, Arizona, plant hosts a 5-megawatt facility. American Solar also is finalizing plans for a 1-megawatt solar plant on the Gila River Indian Reservation south of Phoenix.

Luce hopes to lure PVC manufacturing plants into New Mexico, especially in places like Demming and Las Cruces where they could supply viable sunny sites nearby. An Albuquerque development known as Mesa del Sol might benefit from Sandia Laboratory efforts on a version of power known as concentrated solar power, he said.

With the concentrated approach, lens arrays follow the sun's daytime passage through the sky, focusing the captured light onto PVCs, explained Roger Angel, director of The University of Arizona's Mirror Lab.The Mirror Lab is researching concentrated solar power, applying its expertise in astronomy to the effort.

"It's like many little telescopes looking at the sun," said Angel. With the focused energy, fewer PVCs can yield more electricity compared to conventional solar. Angel has a team of investigators working to refine the materials and technique in the hope of bringing costs into the commercial range. "There's no difficulty in making energy from the sun," he said. "The key issue is can you do it for $1 a watt [installed], not $4 a watt."

Creating energy from PVCs remains relatively high for several reasons. Germany's appetite for solar panels is helping to keep demand greater than supply. Also, a shortage of refined silicon, an essential material for PVCs, limits production. Concentrating solar power could help get past this barrier because it provides more energy per unit-area of PVCs.

The Southwest is leading the way on concentrated solar, as befits the region with the lion's share of the nation's harvestable sunshine. An APS project in Red Rock, Arizona, is planning to use concentrated solar power to heat oil to generate power, Alston said.

By tapping into the power of the sun and wind and improving the energy efficiency of buildings and cars, officials hope to curb the growth of greenhouse gas emissions. This, in turn, could help stabilize climate and avoid some of the impacts of the ongoing global warming.

There's still a long way to go, but government mandates are fueling a revived interest in alternative power and conservation. Those who buy into these efforts enjoy the satisfaction of knowing they're doing their share to stabilize climate.

An upcoming article will address efforts to reduce greenhouse gas levels via forest management, carbon sequestration, and renewable energy credits.

Melanie Lenart is a postdoctoral research associate with the Climate Assessment for the Southwest (CLIMAS). The SWCO feature article archive can be accessed at the following link: http://www.ispe.arizona.edu/climas/forecasts/swarticles.html

Helpful Links

Arizona Climate Change Advisory Group
http://www.azclimatechange.us/

New Mexico Climate Change Advisory Group
http://www.nmclimatechange.us/

Database of State Incentives for Renewables & Efficiency
http://www.dsireusa.org/

Energy Star on federal incentives
http://www.energystar.gov/index.cfm?c=products.pr_tax_credits#1

New Mexico Coalition for Clean & Affordable Energy
www.nmccae.org

Calculating individual greenhouse gas emissions
http://www.cool-it.us/index.php?refer=&task=carbon

Temperature (through 1/17/07)

Source: High Plains Regional Climate Center

Since the beginning of the water year on October 1, 2006, average temperatures in the Southwest have ranged from 60 to 65 degrees Fahrenheit in southwestern Arizona to 25 to 30 degrees F in the higher elevations of northern New Mexico (Figure 1a). These temperatures were close to average for the period with locations generally reporting slightly above- or slightly below-average temperatures (Figure 1b). The past month however has been much cooler than average for most of the Southwest. Most of the region experienced temperatures 0–3 degrees F below average with 3–6 degrees F below- average temperatures recorded in areas in southern and western Arizona and northeastern New Mexico. Several stations in western and northern Arizona and in New Mexico recorded monthly temperatures that were 6–12 degrees F below average (Figures 1c–1d).

Cold air that settled into the region in the wake of several winter storm systems is responsible for the unusually cool temperatures over the past thirty days. Below-freezing temperatures in Arizona resulted in hundreds of reports of broken water pipes and extensive damage to citrus crops, according to the *Arizona Republic* (January 16).

Notes:

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

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

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

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

On the Web:

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

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

Figure 1a. Water year '06–'07 (through January 17, 2007) average temperature.

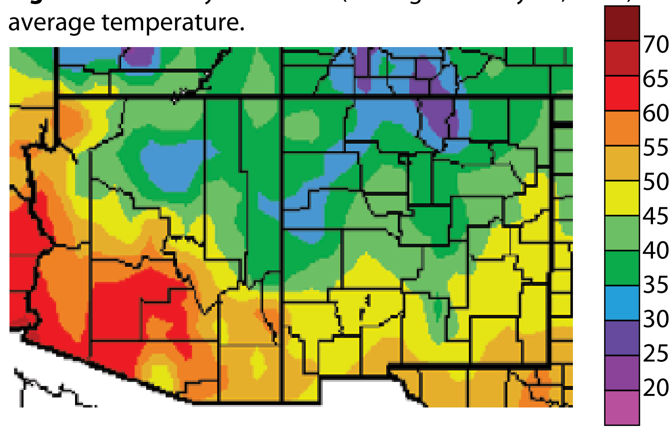


Figure 1b. Water year '06–'07 (through January 17, 2007) departure from average temperature.

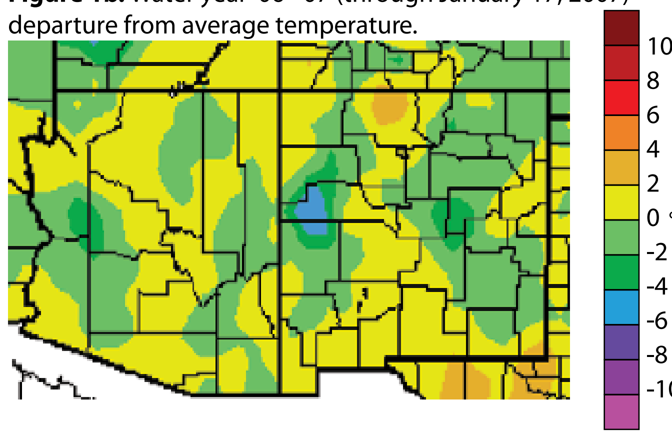


Figure 1c. Previous 30 days (December 19, 2006–January 17, 2007) departure from average temperature (interpolated).

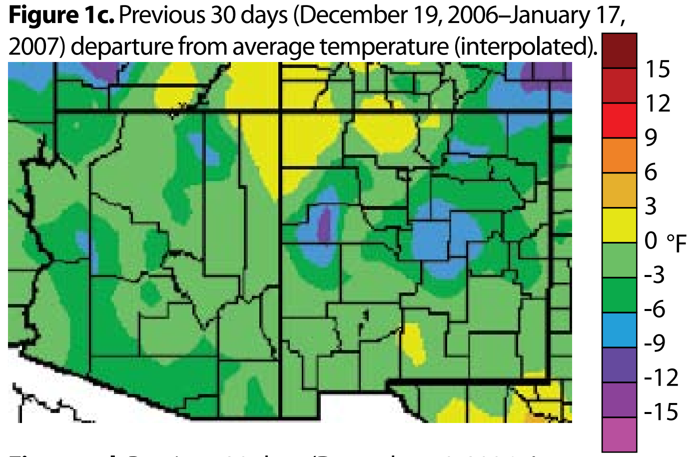
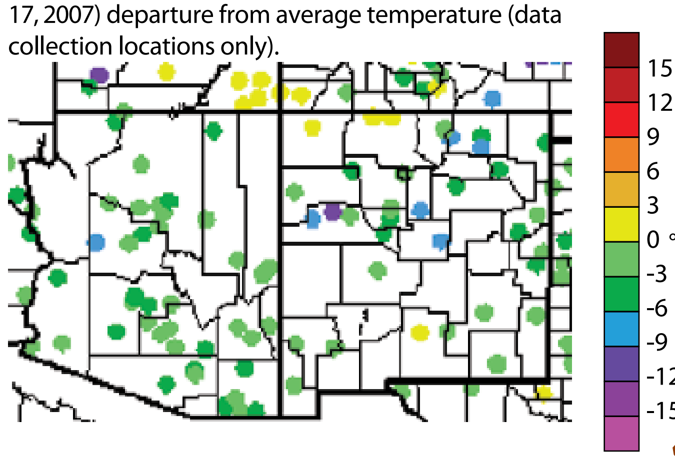


Figure 1d. Previous 30 days (December 19, 2006–January 17, 2007) departure from average temperature (data collection locations only).



Precipitation (through 1/17/07)

Source: High Plains Regional Climate Center

Precipitation throughout most of Arizona has been below average for the water year while areas of central New Mexico have been wetter than average (Figures 2a–2b). In the past thirty days, most of Arizona has been drier than average with some areas in the extreme southwestern portion of the state receiving less than 2 percent of average precipitation (Figure 2c–2d). The exception has been higher elevations in northern Arizona near Flagstaff where 150–200 percent of average precipitation has fallen. With the exception of southern New Mexico, most of the state has received above-average precipitation during the past month. Most of central and eastern New Mexico has received over 200 percent of average.

A series of slow moving winter storms moved through northeastern New Mexico near the end of December. Between 12 and 20 inches of snow were reported in Santa Fe and 8 to 10 inches were reported across Albuquerque on December 29. This precipitation will help enhance surface water supplies as it melts later in the spring, especially in contrast to last year's record dry winter precipitation.

Figure 2a. Water year '06–'07 (through January 17, 2007) percent of average precipitation (interpolated).

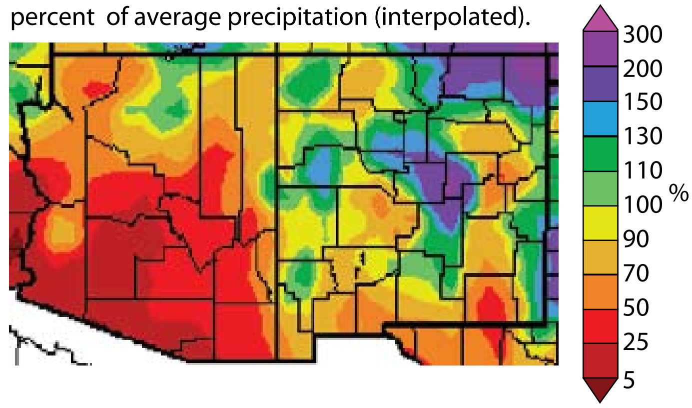


Figure 2b. Water year '06–'07 through (January 17, 2007) percent of average precipitation (data collection locations only).

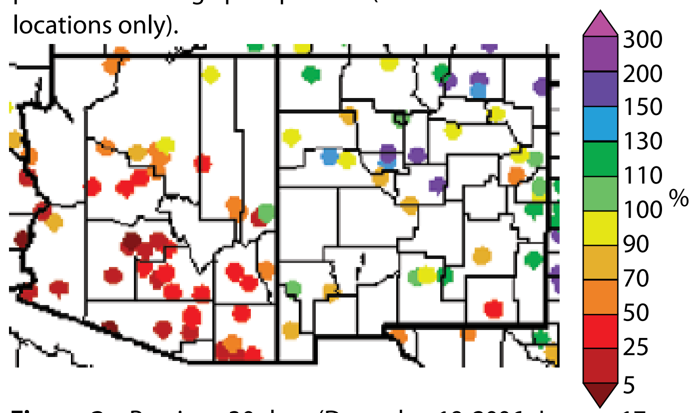


Figure 2c. Previous 30 days (December 19, 2006–January 17, 2007) percent of average precipitation (interpolated).

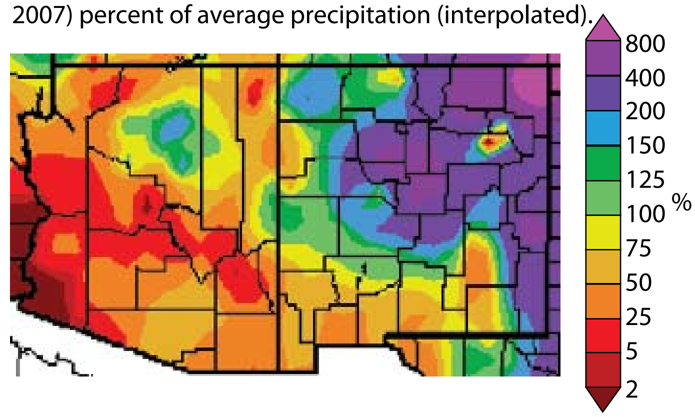
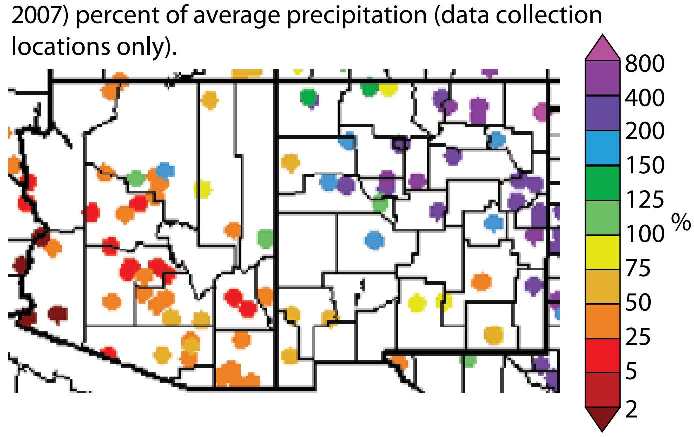


Figure 2d. Previous 30 days (December 19, 2006–January 17, 2007) percent of average precipitation (data collection locations only).



Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2006, we are in the 2007 water year. The water year is a more hydrologically sound measure of climate and hydrological activity than is the standard calendar year.

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

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

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

On the Web:

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

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

U.S. Drought Monitor

(released 1/18/07)

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

According to the U.S. Drought Monitor, nearly all of Arizona is classified as being in drought status (Figure 3). Extreme conditions persist in northwest Arizona due to long-term precipitation deficits. Drought conditions are severe in southwestern and western Arizona where precipitation has been virtually non-existent so far this winter. The rest of Arizona is classified as being in moderate drought. Southeastern Arizona and New Mexico and western New Mexico are classified as abnormally dry. These areas have so far missed out on the above-average precipitation that has fallen in central and northeastern New Mexico.

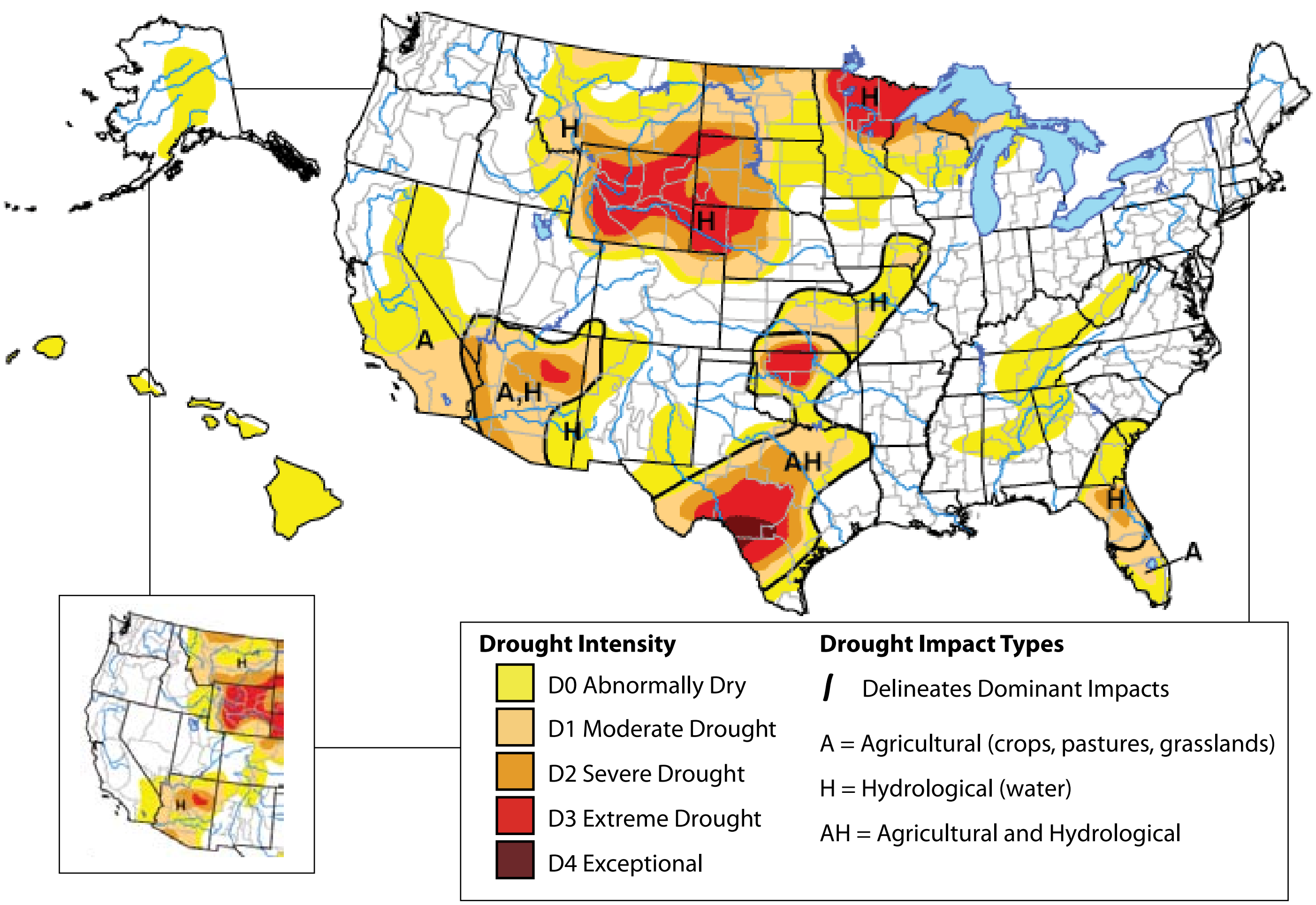
Relative to last month, conditions have deteriorated slightly in the Southwest due to below-average precipitation and snowpack in Arizona and western New Mexico. Increased chances of above-average precipitation are forecast through early spring and could bring some relief. Elsewhere, extreme and exceptional drought conditions exist in several areas, including southern Texas, parts of Oklahoma, much of Wyoming, and northern Minnesota.

Notes:

The U.S. Drought Monitor is released weekly (every Thursday) and represents data collected through the previous Tuesday. The inset (lower left) shows the western United States from the previous month's map.

The U.S. Drought Monitor maps are based on expert assessment of variables including (but not limited to) the Palmer Drought Severity Index, soil moisture, streamflow, precipitation, and measures of vegetation stress, as well as reports of drought impacts. It is a joint effort of the several agencies; the author of this monitor is David Miskus, JAWF/CPC/NOAA.

Figure 3. Drought Monitor released January 18, 2007 (full size) and November 16, 2006 (inset, lower left).



On the Web:

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

Arizona Drought Status
(through 12/31/06)

Source: Arizona Department of Water Resources

Nearly the entire state is classified as being in some short-term drought (Figure 4a). Dry conditions during November have resulted in moderate drought conditions in the southwest and central watersheds. The rest of the state is classified as abnormally dry, except for the San Pedro River watershed, which is classified as normal. Future short-term drought status is expected to improve when December and January precipitation is taken into account.

Long-term drought status shows improvement from severe to moderate drought in the Santa Cruz and San Simon watersheds (Figure 4b). The only watershed currently in severe drought is the Willcox Playa watershed. Western Arizona remains normal with no long-term drought conditions, while the remainder of the state is in moderate drought or classified as abnormally dry. Long-term conditions may improve with the forecast above-average winter and spring precipitation.

Figure 4a. Arizona short-term drought status for December 2006.

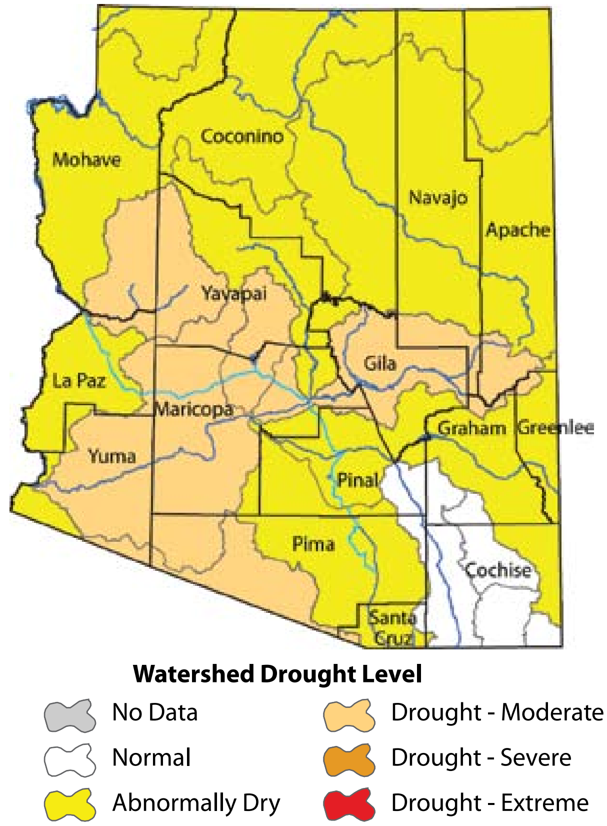
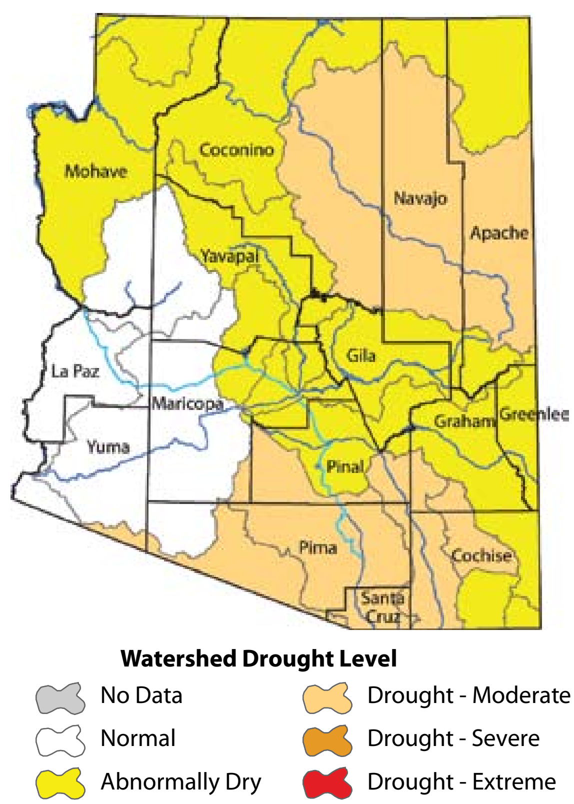


Figure 4b. Arizona long-term drought status for December 2006.



Notes:

The Arizona drought status maps are produced monthly by the Arizona Drought Preparedness Plan Monitoring Technical Committee. The maps are based on expert assessment of variables including, but not limited to, precipitation, drought indices, reservoir levels, and streamflow.

Figure 4a shows short-term or meteorological drought conditions. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) over a relatively short duration (e.g., months). Figure 4b refers to long-term drought, sometimes known as hydrological drought. Hydrological drought is associated with the effects of relatively long periods of precipitation shortfall (e.g., many months to years) on water supplies (i.e., streamflow, reservoir and lake levels, and groundwater). These maps are delineated by river basins (wavy gray lines) and counties (straight black lines).

On the Web:

For the most current Arizona drought status maps, visit:
http://www.azwater.gov/dwr/Content/Hot_Topics/Agency-Wide/Drought_Planning/

New Mexico Drought Status

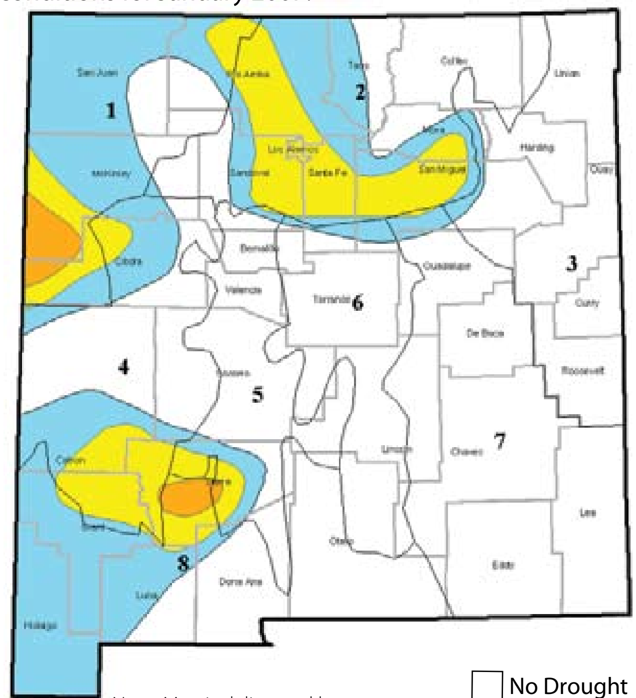
(through 1/31/07)

Source: New Mexico Natural Resources Conservation Service

In the short-term, most of eastern and southern New Mexico is drought-free due to recent winter precipitation and heavy summer thunderstorms (Figure 5a). The southwestern corner of the state is experiencing drought conditions with drought conditions as severe as warning status in Sierra County. Northwestern and north-central New Mexico are also experiencing some level of drought, with warning status in western McKinley and Cibola counties and alert status in portions of Rio Arriba, Sandoval, Los Alamos, Santa Fe, and San Miguel counties.

Long-term drought status is unchanged since last month, with most of the eastern and southern parts of the state in alert status. Northwestern and southwestern parts of the state remain in long-term advisory status (Figure 5b).

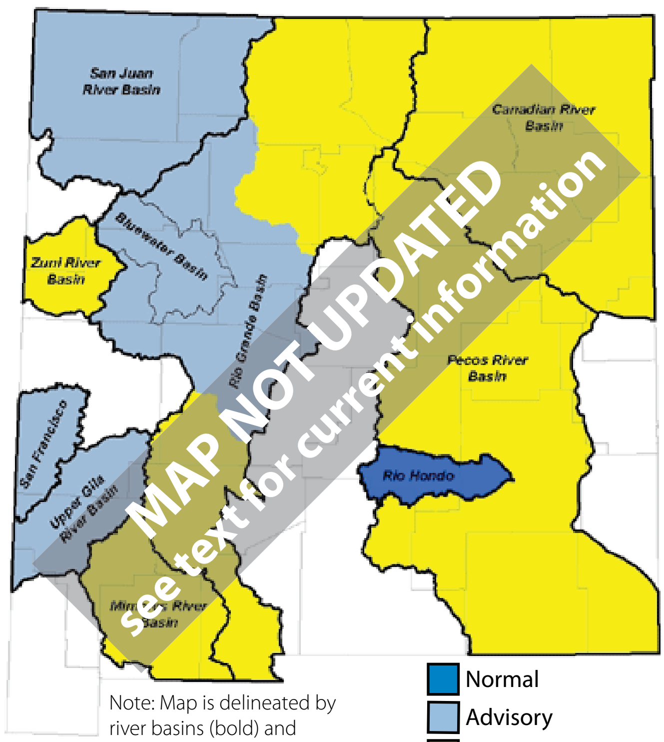
Figure 5a. Short-term drought map based on meteorological conditions for January 2007.



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

- No Drought
- Advisory
- Alert
- Warning
- Emergency

Figure 5b. Long-term drought map based on hydrological conditions for September 2006.



Note: Map is delineated by river basins (bold) and county lines.

- Normal
- Advisory
- Alert
- Warning
- Emergency

Notes:

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

Figure 5a shows short-term or *meteorological* drought conditions. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) over a relatively short duration (e.g., months). Figure 5b refers to long-term drought, sometimes known as *hydrological* drought. Hydrological drought is associated with the effects of relatively long periods of precipitation shortfalls (e.g., many months to years) on water supplies (i.e., streamflow, reservoir and lake levels, groundwater). This map is organized by river basins—the white regions are areas where no major river system is found.

On the Web:

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

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

Arizona Reservoir Levels

(through 12/31/06)

Source: National Water and Climate Center

Arizona reservoir levels changed somewhat relative to last month (Figure 6). Lake Powell, San Carlos, and the Verde River System all declined. The Verde River System experienced the largest relative decline at 7 percent. Lake Mead, Lake Mohave, Lake Havasu, and the Salt River System all increased storage relative to last month with Lake Havasu having the largest increase (3 percent).

Water Year 2007 in the Upper Colorado River Basin started off with an above-average October in terms of precipitation, but November and December precipitation above Lake Powell has been about 65 percent of average, according to the U.S. Bureau of Reclamation. Inflow to Lake Powell was 103 percent and 93 percent of average during November and December, respectively. Snowpack above Lake Powell is currently 84 percent of normal and inflow from April to July is forecast to be 91 percent of average.

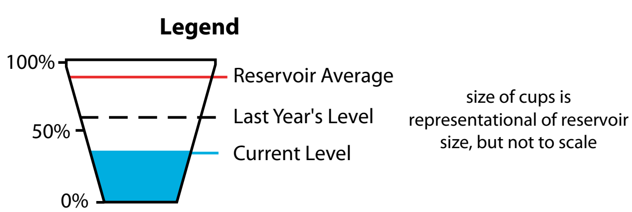
Notes:

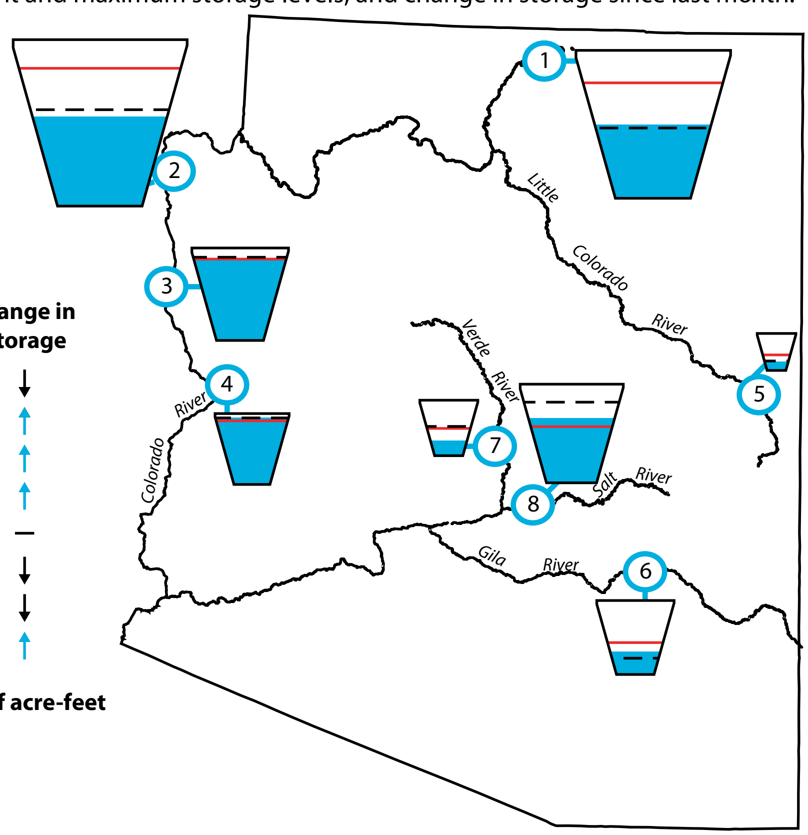
The map gives a representation of current storage levels for reservoirs in Arizona. Reservoir locations are numbered within the blue circles on the map, corresponding to the reservoirs listed in the table. The cup next to each reservoir shows the current storage level (blue fill) as a percent of total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

The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels are given in thousands of acre-feet for each reservoir. The arrows in the last column of the table indicate an increase or decrease in storage since last month. A line indicates no change.

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

Figure 6. Arizona reservoir levels for December 2006 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir. The table also lists current and maximum storage levels, and change in storage since last month.





Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage
1. Lake Powell	50%	12,076.0	24,322.0	↓
2. Lake Mead	54%	14,164.0	26,159.0	↑
3. Lake Mohave	87%	1,579.1	1,810.0	↑
4. Lake Havasu	94%	584.5	619.0	↑
5. Lyman Reservoir	24%	7.3	30.0	—
6. San Carlos	31%	270.3	875.0	↓
7. Verde River System	27%	77.8	287.4	↓
8. Salt River System	66%	1329.2	2,025.8	↑

*** 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 12/31/06)

Source: National Water and Climate Center

Storage in New Mexico's largest reservoir, Navajo, decreased slightly in storage relative to last month, though storage on Navajo Reservoir is still above average at 92 percent capacity (Figure 7). Other reservoirs at or above average storage are Abiquiu, Cochiti, Santa Rosa, and Brantley Reservoirs. Heron, Santa Rosa, and Conchas were the only other reservoirs whose storage declined while all others increased relative to last month.

Above-average snowpack at stations in north-central New Mexico and forecast increased chances of above-average winter and spring precipitation could mean reservoir storage increases later in the year. Also important to New Mexico reservoir storage is snowpack in the southern Colorado Rockies. Currently, stations in this area are reporting 90–110 percent of average snowpack with increased precipitation forecast through the spring.

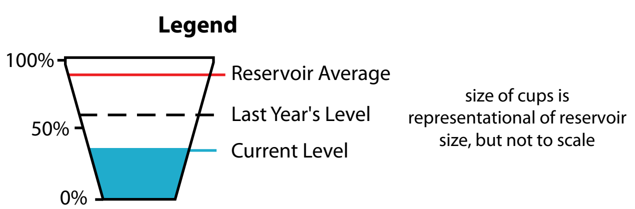
Notes:

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

The table details more exactly the current capacity level (listed as a percent of maximum storage). Current and maximum storage levels are given in thousands of acre-feet for each reservoir. The arrows in the last column of the table indicate an increase or decrease in storage since last month. A line indicates no change.

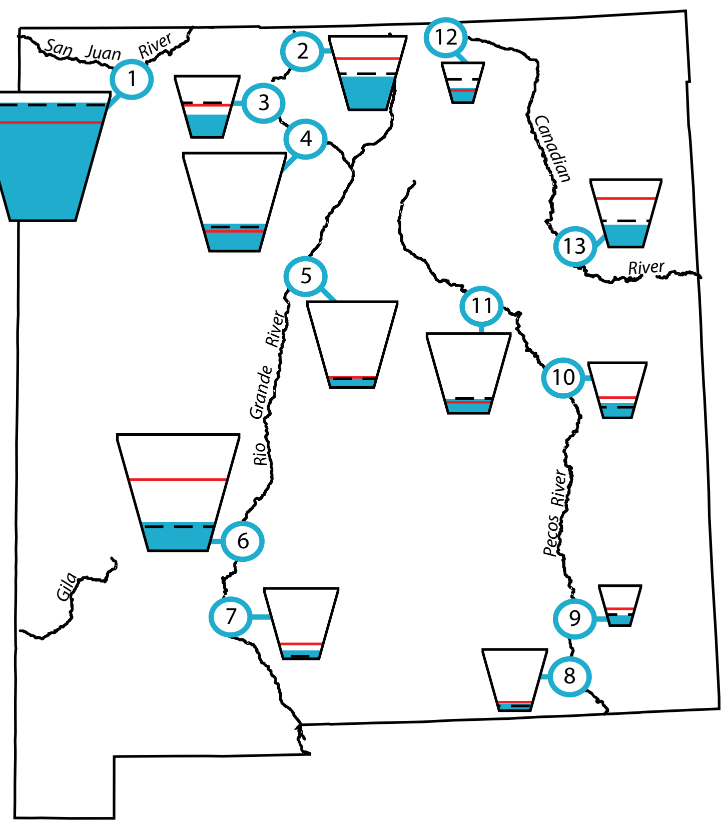
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tom.pagano@por.usda.gov; 503-414-3010) or Dan Murray, NRCS, USDA, 6200 Jefferson NE, Albuquerque, NM 87109; 505-761-4436; Dan.Murray@nm.usda.gov).

Figure 7. New Mexico reservoir levels for December 2006 as a percent of capacity. The map also depicts the average level and last year's storage for each reservoir. The table also lists current and maximum storage levels, and change in storage since last month.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*	Change in Storage
1. Navajo	92%	1,555.7	1,696.0	↓
2. Heron	45%	180.7	400.0	↓
3. El Vado	37%	69.8	186.3	↑
4. Abiquiu	28%	157.0	554.5	↑
5. Cochiti	10%	48.5	502.3	—
6. Elephant Butte	25%	514.0	2,065.0	↑
7. Caballo	13%	43.1	331.5	↑
8. Brantley	11%	16.2	147.5	↑
9. Lake Avalon	25%	1.5	6.0	↑
10. Sumner	27%	27.8	102.0	↑
11. Santa Rosa	18%	78.9	447.0	↓
12. Costilla	36%	5.7	16.0	↑
13. Conchas	33%	83.6	254.0	↓

*** 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

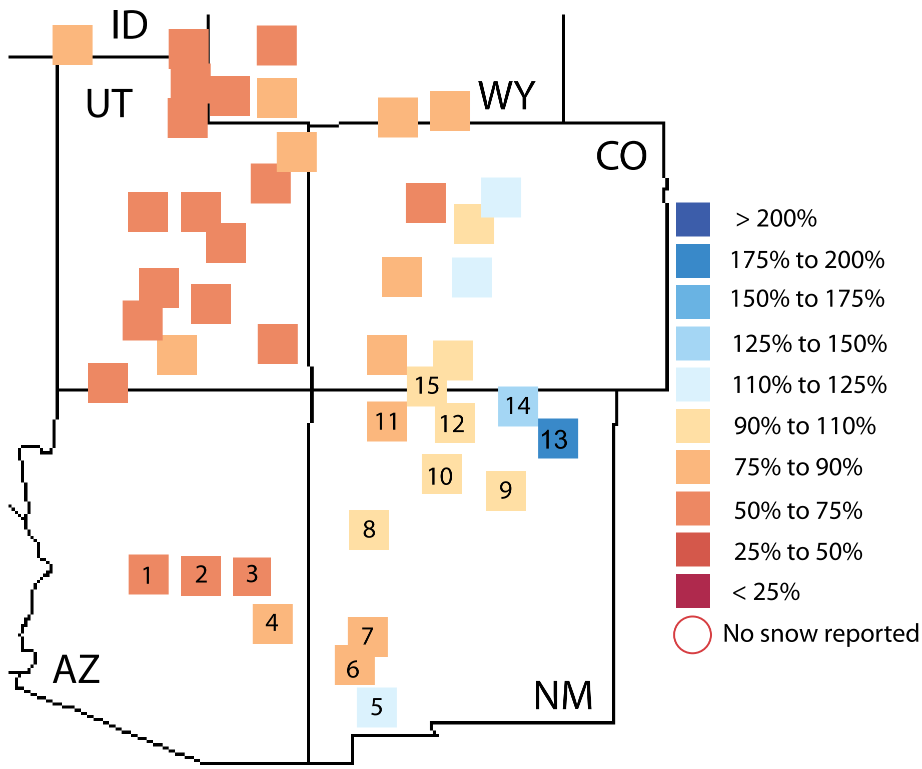
Southwest Snowpack

(updated 1/22/07)

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

Despite predicted above-average precipitation associated with El Niño conditions and cooler-than-average temperatures, snowpack in much of the Southwest remains below average since the water year began on October 1, 2006 (Figure 8). Stations in Arizona and in parts of New Mexico report less than 75 percent of average. In northern New Mexico, snowpack increased to over 90 percent at several stations and over 175 percent of average in the Cimarron River Basin. While below-average at a number of stations, snowpack this winter season is much greater than last year's record dry winter. This will improve surface water supply situations and help mitigate drought throughout the region, especially as snow begins to melt later in the spring. Snowpack conditions could also continue to improve, as precipitation is forecast to be above average over the next several months.

Figure 8. Average snow water content (SWC) in percent of average for available monitoring sites as of January 22, 2007.



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

On the Web:

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

For a numeric version of the map, visit:
http://www.wrcc.dri.edu/snotelanom/basinswen.html

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

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 content (SWC) or snow water equivalent (SWE) is calculated from this information. SWC 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 SWC than light, powdery snow.

Figure 8 shows the SWC 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.

Temperature Outlook

(February–July 2007)

Source: NOAA Climate Prediction Center (CPC)

Temperature forecasts for the Southwest for February–April 2007 are predicting equal chances of below-average, average, or above-average temperatures (Figure 9a). As the forecasts progress through spring, the region is predicted to have greater likelihoods of above-average temperatures (Figures 9b–9d). The forecast for March–May calls for a 33 percent chance of warmer-than-average temperatures in a large swath of Arizona and New Mexico while the April–June forecast has highest probabilities (greater than 50 percent) centered on northwestern Arizona. The May–July forecast calls for even greater chances (greater than 60 percent) of above-average temperatures in most of Arizona and in western New Mexico. These forecasts are based on large-scale atmospheric circulation patterns such as El Niño-Southern Oscillation and on observed recent warming trends.

Notes:

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

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1971–2000 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the "average" category is preserved at 33.3 likelihood, unless the forecast is very strong.

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

Equal Chances (EC) indicates areas where the reliability (i.e., 'skill') of the forecast is poor; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a "default option" when forecast skill is poor.

Figure 9a. Long-lead national temperature forecast for February–April 2007.

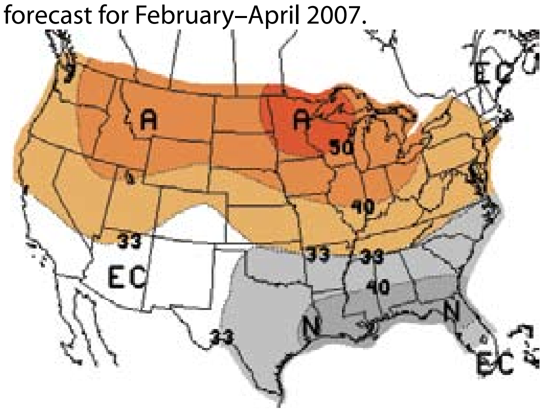


Figure 9b. Long-lead national temperature forecast for March–May 2007.

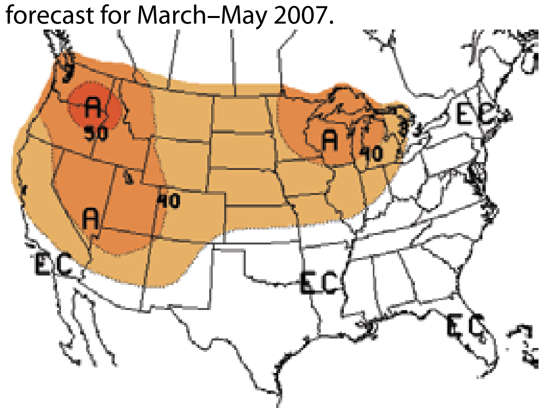


Figure 9c. Long-lead national temperature forecast for April–June 2007.

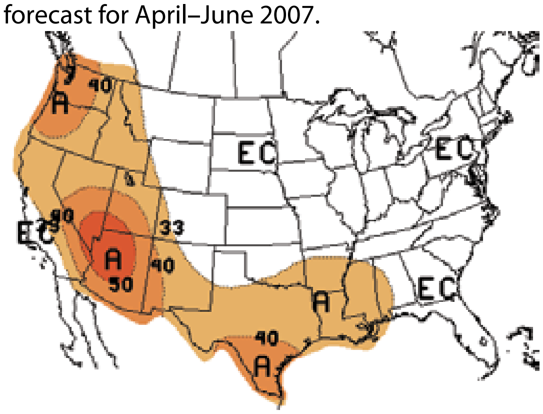
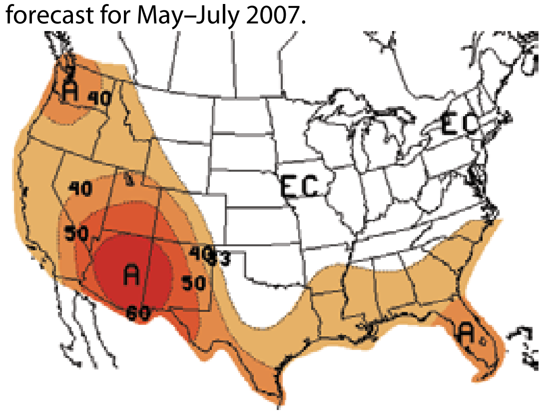


Figure 9d. Long-lead national temperature forecast for May–July 2007.



N= Near Normal: 33.3–39.9%; 40.0–49.9%

A= Above: 60.0–69.9%; 50.0–59.9%; 40.0–49.9%; 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

On the Web:

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

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

Precipitation Outlook
(February–July 2007)
Source: NOAA Climate Prediction Center (CPC)

Through early spring, forecasts predict increased chances of above-average precipitation in the Southwest (Figure 10a). The highest probabilities (greater than 50 percent) of above-average precipitation for February–April are across the Texas-Mexico border while most of Arizona and New Mexico have chances greater than 40 percent. Forecasts for March–May continue to predict increased chances of more moisture, though likelihoods are slightly less in Arizona (greater than 33 percent) than in most of New Mexico (greater than 40 percent) (Figure 10b). Forecasts through July 2007 predict equal chances of below-average, average, or above-average precipitation for most of the country (Figure 10c–10d). Precipitation patterns in these forecasts reflect conditions usually seen during El Niño events, with increased precipitation in the South and Southwest and drier conditions in the Midwest and Northwest.

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

The NOAA-CPC outlooks are a 3-category forecast. As a starting point, the 1971–2000 climate record is divided into 3 categories, each with a 33.3 percent chance of occurring (i.e., equal chances, EC). The forecast indicates the likelihood of one of the extremes—above-average (A) or below-average (B)—with a corresponding adjustment to the other extreme category; the "average" category is preserved at 33.3 likelihood, unless the forecast is very strong.

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

Equal Chances (EC) indicates areas where the reliability (i.e., 'skill') of the forecast is poor; areas labeled EC suggest an equal likelihood of above-average, average, and below-average conditions, as a "default option" when forecast skill is poor.

Figure 10a. Long-lead national precipitation forecast for February–April 2007.

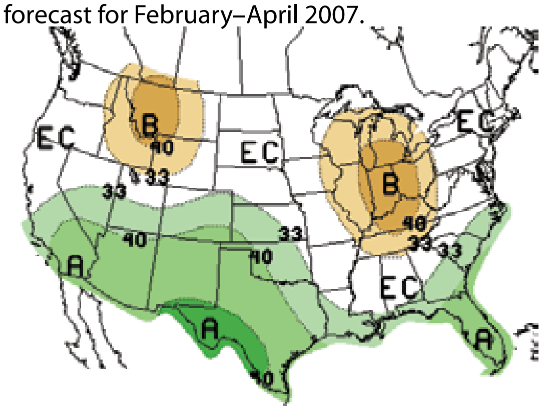
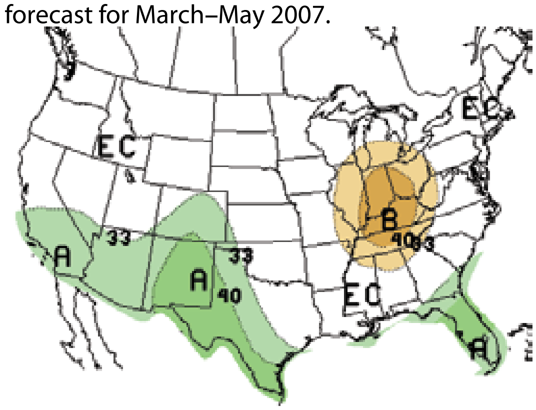


Figure 10b. Long-lead national precipitation forecast for March–May 2007.



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

B= Below
- 33.3–39.9%
- 40.0–49.9%

EC= Equal chances. No forecasted anomalies.

Figure 10c. Long-lead national precipitation forecast for April–June 2007.

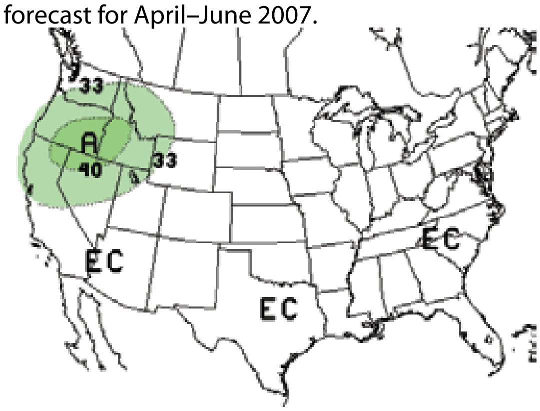
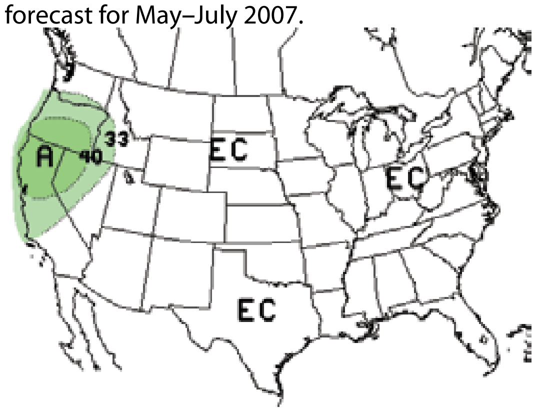


Figure 10d. Long-lead national precipitation forecast for May–July 2007.



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

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

Seasonal Drought Outlook
(through April 2007)

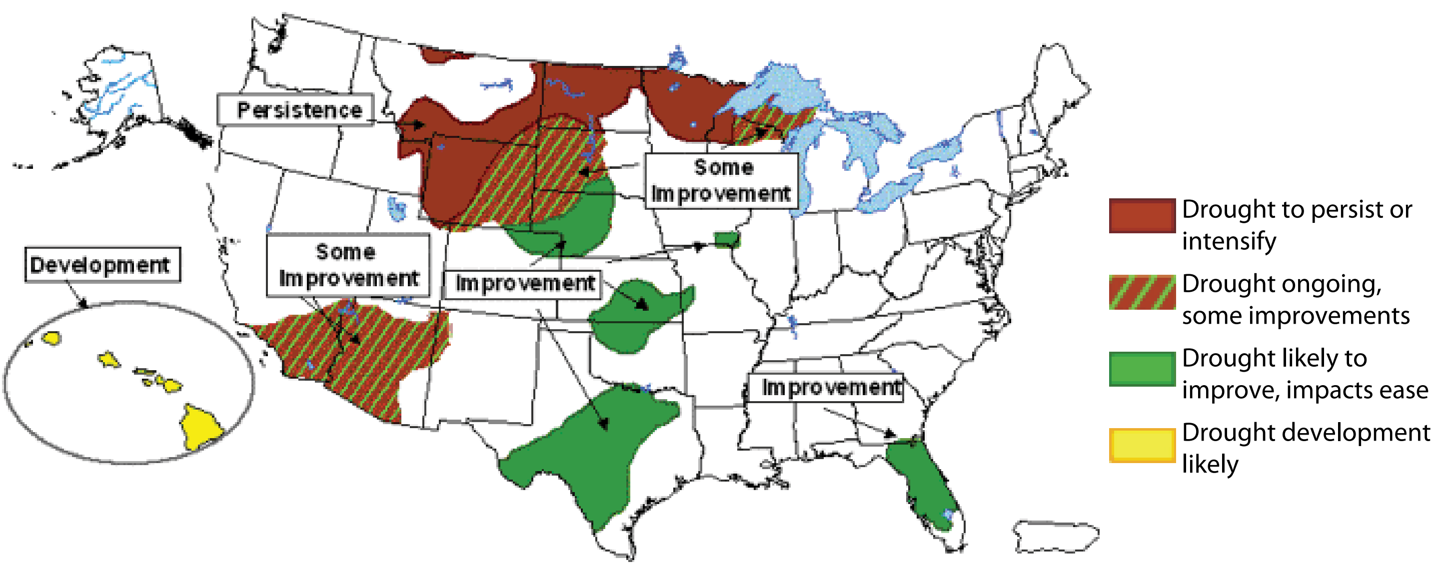
Source: NOAA Climate Prediction Center (CPC)

The U.S. Seasonal Drought Outlook continues to call for some relief in lingering drought conditions across Arizona with the expectation of above-average winter precipitation occurring across the region (Figure 11). Long-term hydrologic drought still plagues portions of Arizona even with the above-average summer 2006 monsoon rainfall. Several winter storms have brought some precipitation to the Southwest, but overall precipitation amounts are below average to date across most of Arizona and southern New Mexico. The present weak El Niño may not deliver the anticipated above-average winter precipitation, leaving drought conditions to intensify, especially across Arizona.

Improving conditions are expected across Texas and Florida with the enhancement of the southern subtropical jet stream and associated precipitation in response to El Niño conditions across the Pacific Ocean. This shift in activity towards the southern tier states is expected to leave the upper Midwest in a dry pattern for the upcoming months. Warmer and drier-than-average conditions across the upper Midwest will combine to exacerbate already intense drought conditions.

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

Figure 11. Seasonal drought outlook through April 2007 (release date January 18, 2007).



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

El Niño Status and Forecast

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

Weak El Niño conditions continue to persist across the equatorial Pacific Ocean with sea surface temperatures averaging just over 0.5 degrees Celsius above average across the basin. The warmest waters are confined to the far eastern Pacific where temperatures are close to 1.5 degrees C above average. The atmospheric response to this El Niño episode has been weak thus far with the equatorial Southern Oscillation Index (Figure 12a) fluctuating over the past several months, indicating weak coupling of ocean temperature and atmospheric circulation patterns.

ENSO forecasts indicate a high probability (greater than 70 percent) of the continuation of weak El Niño conditions through April (Figure 12b). Recent observations of wind patterns and sea surface temperatures across the central Pacific have suggested that the episode has reached its peak strength and will continue to weaken slowly into the spring.

Several factors, including a resurgence in Madden-Julian Oscillation (MJO) activity, may help sustain the strength of the current El Niño for the next several months, slowing the decay towards ENSO-neutral conditions expected this spring.

Weak El Niño episodes present a challenge for seasonal forecasters. Winter precipitation forecasts for Arizona and New Mexico rely heavily on precipitation patterns associated with past El Niño and La Niña episodes. Past weak El Niño events have not been consistently wet, but have brought both above- and below-average winter precipitation to the Southwest. This reduces the confidence in the above-average precipitation forecasts issued for this winter (see Figure10a). Further weakening of the current episode may lead to updates of the winter precipitation forecasts over the next several months.

Figure 12a. The standardized values of the Southern Oscillation Index from January 1980–December 2006. 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).

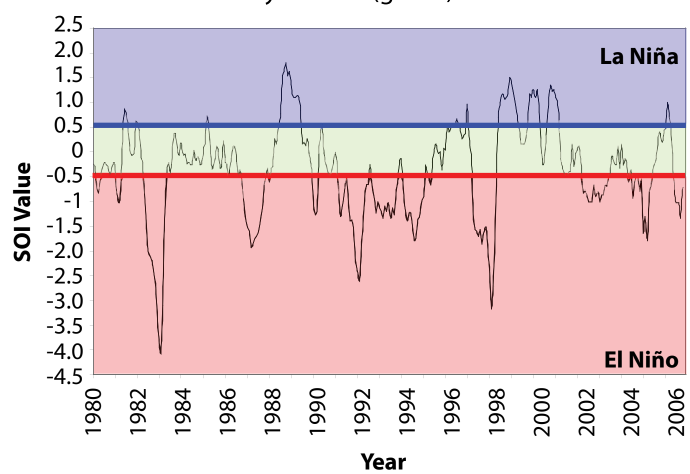
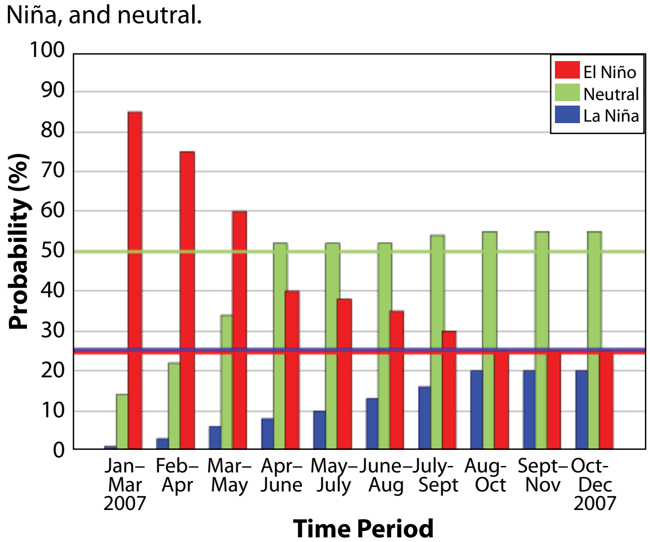


Figure 12b. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released January 19, 2007). Colored lines represent average historical probability of El Niño, La Niña, and neutral.



Notes:

Figure 12a shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through December 2006. The SOI measures the atmospheric response to SST changes across the Pacific Ocean Basin. The SOI is strongly associated with climate effects in the Southwest. Values greater than 0.5 represent La Niña conditions, which are frequently associated with dry winters and sometimes with wet summers. Values less than -0.5 represent El Niño conditions, which are often associated with wet winters.

Figure 12b shows the International Research Institute for Climate Prediction (IRI) probabilistic El Niño-Southern Oscillation (ENSO) forecast for overlapping three month seasons. The forecast expresses the probabilities (chances) of the occurrence of three ocean conditions in the ENSO-sensitive Niño 3.4 region, as follows: El Niño, defined as the warmest 25 percent of Niño 3.4 sea-surface temperatures (SSTs) during the three month period in question; La Niña conditions, the coolest 25 percent of Niño 3.4 SSTs; and neutral conditions where SSTs fall within the remaining 50 percent of observations. The IRI probabilistic ENSO forecast is a subjective assessment of current model forecasts of Niño 3.4 SSTs that are made monthly. The forecast takes into account the indications of the individual forecast models (including expert knowledge of model skill), an average of the models, and other factors.

On the Web:

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

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

Temperature Verification

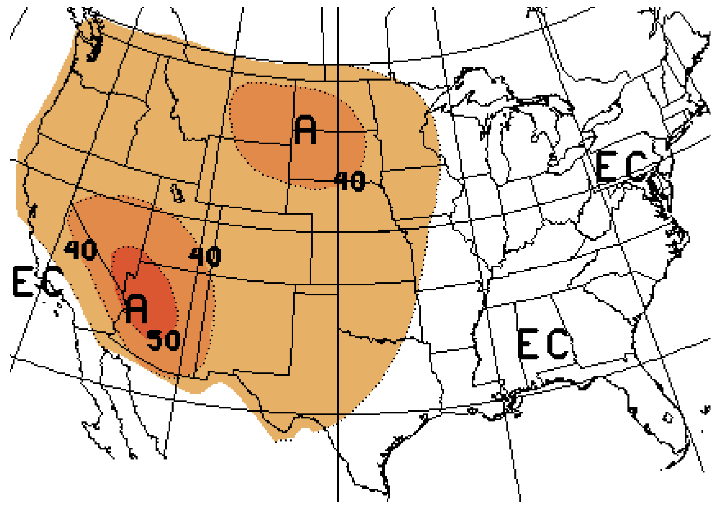
(October–December 2006)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC long-lead national temperature forecast for October–December 2006 predicted above-average temperatures for the entire western U.S. with the exception of southern coastal California. Regions with the highest likelihood predicted for above-average temperatures included the northern Great Plains and Arizona, Utah, and Nevada in the Southwest (Figure 13a). Most of the observed temperatures over the West were actually near-average within 2 degrees Fahrenheit (Figure 13b). Observed temperatures were average or 2–4 degrees F above average over the northern Great Plains and 4–6 degrees F above average over much of Minnesota. Observed temperatures in the New England states, where EC was predicted, were 4–6 degrees F above average, with November being the fourth warmest November on record and December being the warmest December on record.

Observed temperatures in the Southwest generally were near average and not above average as predicted. In October and December in particular, observed temperatures over the Southwest generally were 0–2 degrees F below average. Observed temperatures in November were 2–4 degrees F above average.

Figure 13a. Long-lead U.S. temperature forecast for October–December 2006 (issued September 2006).



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

EC= Equal chances. No forecasted anomalies.

Notes:

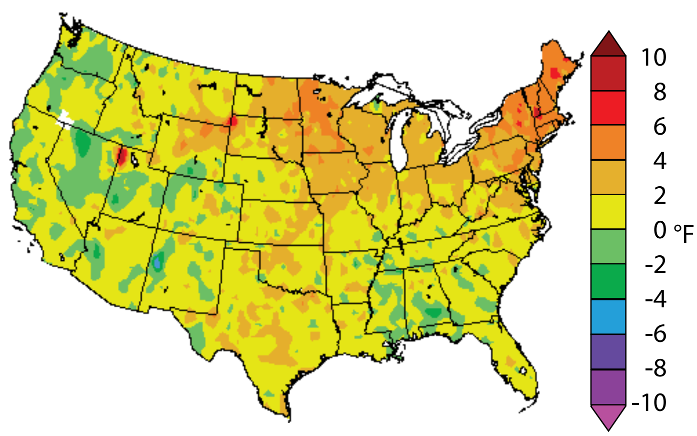
Figure 13a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months October–December 2006. This forecast was made in September 2006.

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

Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average temperature. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation. Equal Chances (EC) indicates areas where reliability (i.e., the skill) of the forecast is poor and no prediction is offered.

Figure 13b shows the observed departure of temperature (degrees F) from the average for the October–December 2006 period. Care should be exercised when comparing the forecast (probability) map with the observed temperature maps. The temperature departures do not represent probability classes as in the forecast maps, so they are not strictly comparable. They do provide us with some idea of how well the forecast performed. In all of the figures on this page, the term average refers to the 1971–2000 average. This practice is standard in the field of climatology.

Figure 13b. Average temperature departure (in degrees F) for October–December 2006.



On the Web:

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

Precipitation Verification

(October–December 2006)

Source: NOAA Climate Prediction Center (CPC)

The NOAA-CPC long-lead national precipitation forecast for October–December 2006 predicted increased probabilities for below-average precipitation in the Pacific Northwest and the central Mississippi Valley, and increased probabilities of above-average precipitation for southern Texas and southern New Mexico (Figure 14a). There was no prediction offered for the rest of the U.S. Observed precipitation over most of the nation differed widely from the forecasts (Figure 14b). October remained dry for the Pacific Northwest, but an active jet-stream over the region in November and December brought some record-breaking precipitation events that boosted precipitation totals to 110–200 percent of average. Over the central Mississippi Valley, observed precipitation was 70–130 percent of average, with below-average amounts in the West and above-average amounts in the South and East. In eastern Colorado, western Kansas, and northern Texas, record snowfall events in December helped push precipitation totals to 130 to more than 300 percent of average. In contrast to the forecast, southern Texas and southern New Mexico were generally drier than average, with observed precipitation totaling 25–90 percent of average. The remainder of the Southwest was significantly drier than average; observed precipitation in most locations in Arizona and southern California was only 5–50 percent of average. Much of the highlands of central and northern New Mexico, however, had observed precipitation that was 100–300 percent of average.

Notes:

Figure 14a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months October–December 2006. This forecast was made in September 2006.

The outlook predicts the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps do not refer to inches of precipitation. Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average precipitation. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 percent chance of below-average precipitation. Equal Chances (EC) indicates areas where reliability (i.e., the skill) of the forecast is poor and no prediction is offered.

Figure 14b shows the observed percent of average precipitation for October–December 2006. Care should be exercised when comparing the forecast (probability) map with the observed precipitation maps. The observed precipitation amounts do not represent probability classes as in the forecast maps, so they are not strictly comparable, but they do provide us with some idea of how well the forecast performed.

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

Figure 14a. Long-lead U.S. precipitation forecast for October–December 2006 (issued September 2006).

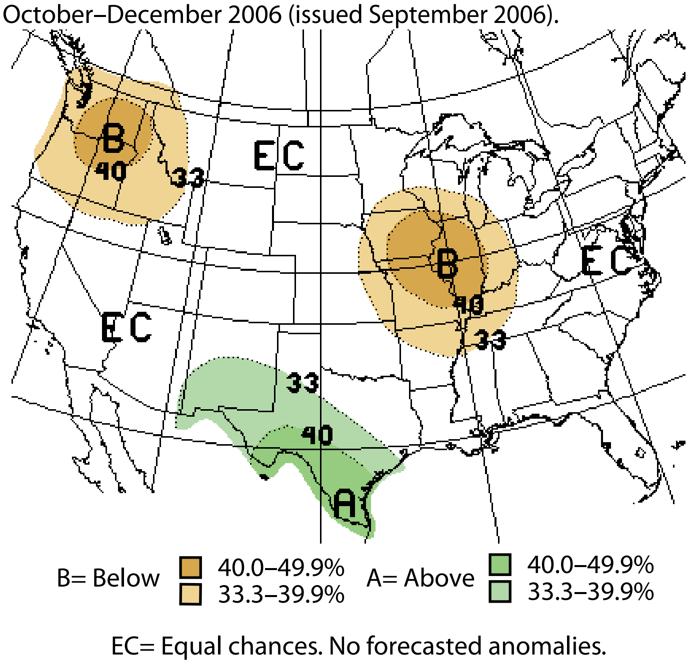
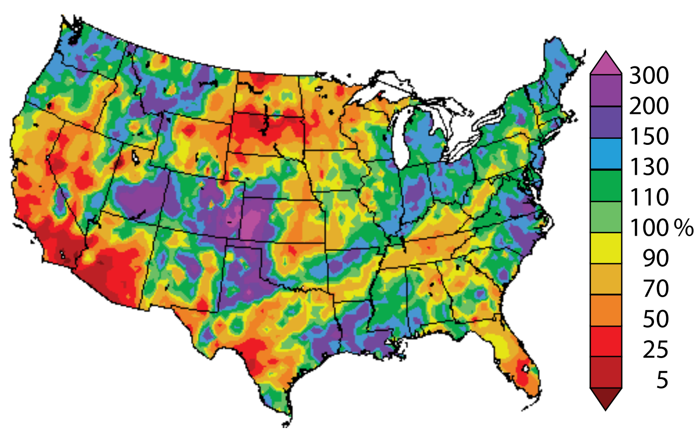


Figure 14b. Percent of average precipitation observed from October–December 2006.



On the Web:

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