Issued: January 25, 2005

CLIMAS
Southwest Climate Outlook

January 2005 Climate Summary

Hydrological Drought – Hydrological drought continues in Arizona and much of New Mexico.

- Drought impacts have eased in northern and central Arizona and central New Mexico.
- Many reservoirs have held steady or increased slightly.

Precipitation – Wetter-than-average conditions dominated the Southwest over the past 30 days due to recent storm systems. Snowpack is also above average in many river basins in the region.

Temperature – Water year temperatures are near average in Arizona and New Mexico, while the past 30 days have generally been near- to above-average.

Climate Forecasts – Long-lead forecasts call for increased chances of warmer-than-average conditions in Arizona and western New Mexico through July. Increased chances of above-average precipitation are predicted through May.

El Niño – El Niño conditions in the tropical Pacific Ocean are forecasted to continue through May, although changes in its strength are difficult to forecast.

The Bottom Line – Limited improvement in drought conditions are expected in the coming months, although reservoir levels are forecasted to remain low.

The climate products in this packet are available on the web:
http://www.ispe.arizona.edu/climas/forecasts/swoutlook.html

Southwest Snowpack

The Southwest snowpack page has undergone several changes since the December packet. We have expanded the figure to include all of the river basins in Colorado and Utah, as well as, a few in southern Wyoming and Idaho. Snowfall in these states contributes to runoff and streamflow in the headwaters of the Colorado River. This in turn influences the water supply of Arizona and New Mexico, so we feel that it is important to show the conditions here.

The color scheme of the legend has been modified as well. The rainbow legend has been replaced with a blue and brown gradient to more clearly illustrate snowpack levels.

See page 11 for details...

In this issue:

The Southwest Climate Outlook is jointly published each month by the Climate Assessment for the Southwest project and the University of Arizona Cooperative Extension.

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THE UNIVERSITY OF ARIZONA®

Biologists bring water to species hurt by drought

Forage enhancement may aid endangered Sonoran Pronghorn

BY SUSAN SIMPSON

Sonoran pronghorn, had they been grazing as our caravan of pickup trucks raised a land-locked contrail of desert dust, would not have guessed that the disturbance was entirely for their benefit. We—a group of about 15 wildlife biologists and University of Arizona students—had packed ourselves and dozens of coils of plastic water tubing into truck beds and headed into the Cabeza Prieta Wildlife Refuge, about 30 miles north of the U.S.-Mexico border near Ajo, Arizona. By stretching this plastic tubing from an already-laid, mile-long PVC pipe connected to a well, we hoped to pump water far into the Wildlife Refuge along known pronghorn migration routes.

There was no trail to follow, but the pickup trucks in which we rode made their own, bouncing and lurching across dry washes and zigzagging to spare chain-fruit cholla in our path. At every joint in the main pipe, the drivers stopped to let the dust settle, and the students released white-knuckle grips on the truck and joined in a dash to unroll eight more lines of tubing. Like snakes crouching in the scant shade of creosote, the tubes stretched uncooperatively where we had pulled them from one plant to another. After securing the base of each water tube, the wildlife biologists drilled holes in the tubes to let water trickle toward the plants.

As we hopped back into the truck beds, the lines of tubing we left laying in the desert seemed almost too simple to help an endangered species flourish in a harsh desert environment. Yet the wildlife biologists hoped that the forage enhancement plots, established in small areas experimentally now for a couple of years, will provide adult pronghorn with the extra resources they need in severe droughts, and fawns with the critical nutrients they often lack in the long, dry, desert summers.

Declining Populations

Sonoran pronghorn (*Antilocapra americana sonoriensis*) have been on the Fish and Wildlife Service's list of species in danger of extinction since 1967, even before the federal Endangered Species Act was passed in 1973. A subspecies of the American pronghorn (*Antilocapra americana*) that lives throughout the Rocky Mountain region, the Sonoran pronghorn lived throughout southern Arizona and northern Mexico (Sonora) prior to extensive human development of the area. Since pronghorn will not cross most barriers, including roads, railroad tracks, or fences, many small populations have been isolated from one another. Isolation reduces the genetic diversity in each of these groups, prohibits movement into new habitat, eliminates forage and water supplies that pronghorn used to visit, and makes them more vulnerable to extinction during severe droughts.

"The basic cause of population loss is lack of rain," John Hervert, wildlife biologist for the Arizona Game and Fish Department explained in an early January interview. "Much of what we're trying to do [in conservation projects] is focused on climate, change in rainfall, seasonal rainfall, and availability of forage."

When monitoring of the Sonoran pronghorn began in the 1970s, Hervert said that it was easy to take what they found as the "normal" condition of the animals, and assume that this population and this habitat were representative of long-term conditions.

"Yet in the past," he explained, "the pronghorn had access to unaltered riparian zones, and they had a much larger habitat."

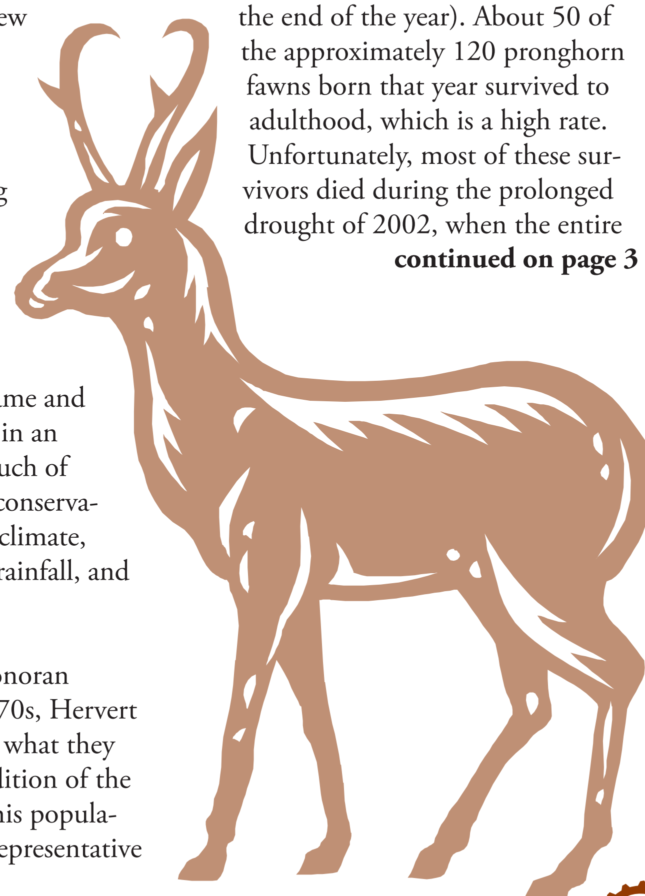
Even now, Hervert said, the 1.5 million acre wildlife refuge can create a false sense of security, because in reality the timing and availability of rain are so important.

"It's easy to become complacent, saying there always have been pronghorn here, and there always will be," Hervert said.

Sonoran Pronghorn and Drought

The vegetation enhancement project is part of the Arizona Game and Fish Department's efforts to ensure that, in fact, the pronghorn will be here for the foreseeable future. The population has fluctuated, often in relation to the amount and timing of seasonal precipitation. When winter precipitation rose in 2001, so did fawn recruitment (survival to the end of the year). About 50 of the approximately 120 pronghorn fawns born that year survived to adulthood, which is a high rate. Unfortunately, most of these survivors died during the prolonged drought of 2002, when the entire

continued on page 3



Pronghorn, continued

Arizona population plummeted from 99 to only 21 pronghorn.

Ongoing forage enhancement programs will mitigate for the drought, Hervert said, and alleviate some of the stresses the pronghorn undergo by having forage and water available during dry spells.

The prosperity of pronghorn, like many other desert animals, is closely tied to the condition of the habitat, and in turn, to adequate levels of precipitation. Although drought can be considered a normal part of Arizona's long-term climate, it also can have devastating effects on individuals, populations in a certain region, or an entire species.

Dry plants lack the nutrients and moisture that grazing animals such as the Sonoran pronghorn expect to find along regular migratory routes through the desert. During severe droughts, plants make more severe adaptations, shrinking the size of their leaves, refusing to flower, or sometimes disappearing altogether. For a grazing Sonoran pronghorn, this means that each surviving plant is smaller, offers fewer nutrients, and requires the pronghorn to find additional sources of water in order to digest the plant's desiccated cellulose.

Hervert reported that population studies support this conclusion. "All the signs pointed to the same thing: if you have good habitat conditions, pronghorn increase," he said. "If you have poor habitat conditions, they decrease in number. If you have really poor habitat conditions, you can lose them all."

While adult pronghorn can survive on vegetation that is lower in nutrients and moisture than normal, pronghorn fawns cannot. In average years adult pronghorn populations may decrease 10–20 percent and much more during of severe drought, Hervert noted. Without new fawn recruitment, herd population would go steadily downhill.

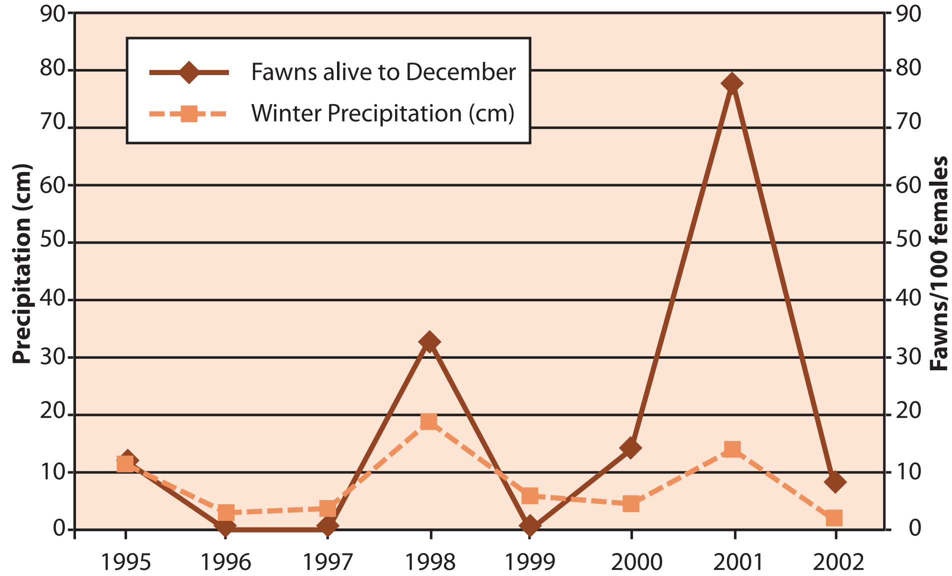


Figure 1. Endangered Sonoran pronghorn fawn survival (shown here as fawns alive at the end of December per 100 adult females in southwestern Arizona) is linked to winter precipitation. Many fawns, as seen in the graph, survived during years of higher winter precipitation (when there was sufficient forage to last until the next rains), while fawn mortality was greatest during very dry years. This demonstrates how crucial it is for fawns and lactating females to have nutritious, plentiful forage through the winter. Summer monsoon rains must follow good winter and spring conditions for fawns to survive until adulthood. Data from Bright and Hervert, in press.

The timing of the precipitation has to be right to meet various life stages for the pronghorn. The times of year when plants are dry are also the time when females are lactating, notes Ryan Wilson, a graduate student at the University of Arizona. Wilson is monitoring pronghorn as part of his master's work in the School of Natural Resources.

"If there is not adequate forage, [a mother] doesn't produce the adequate quantity or quality of milk," Wilson said. "The fawn has to start relying on forage earlier than usual."

But of course, Wilson notes, if there is not enough forage for the mother to produce milk, there will not be enough to sustain a growing fawn.

In a forthcoming article on pronghorn mortality in *Wildlife Society Bulletin*, Hervert and lead author Jill Bright illustrate the relationship between precipitation and fawn survival. The amount of winter precipitation appears to impact fawn recruitment (Figure 1), as does the dry spell that often comes in the spring.

"The timing between the last winter rain and the first summer rain is crucial," Hervert said.

Bright and Hervert found that the longer the gap between winter and summer rains the less fawns survived. Fawns at this time are no longer nursing, and must find nutrient-rich grasses and forbs to grow steadily.

"If there are abundant winter rains, fawns will be born and be healthy until they're at least three months old," Hervert explained. "Then they're susceptible to the spring drought."

In 1997, for example, the range had sufficient winter rains according to Hervert, but summer rains didn't arrive until September—after a gap of 108 dry days. The dry spell wasn't severe enough to deplete the adult pronghorns, but it devastated the fawn population.

"Basically all the fawns died because the summer rains just didn't come soon enough," Hervert said.

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Pronghorn, continued

In contrast the dry gap before summer rains was only 61 days in 2001. Fawn survival vastly improved that year (as shown in Figure 1).

Building a safety net

Hervert hopes to provide a safety net to keep pronghorn from declining as drastically as they did dry years such as 2002. Forage enhancement will help populations migrating through the irrigated areas find abundant, nutrient-rich forage when other areas are drying up, and will act as insurance against future threats of extinction.

The project, so far, seems to be working. While both Hervert and Wilson admitted that there is no objective way to measure the impacts forage enhancement projects have on pronghorn fawn survival, Wilson added that it makes sense to put the water out there just because it may be beneficial to them.

"You see green there where there's water, and you see brown where there's not," Wilson said.

The population is currently too small to do rigorous scientific monitoring of the effects of irrigation, which would require tracking a large, radio-collared sample of the population with access to vegetation plots and comparing their reproductive success to an equally-sized population of those without access. But, the proof of the irrigation seems to come through commonsense observation.

"If anyone had any doubt about whether watering forage to feed pronghorn is working, they only needed to come out and see the animals grazing there during the drought," Hervert stated. "I think the important question is not if they work, but how large they have to be, and how many we need to have."

Results of watering come almost immediately. "Once we put water on, the plants respond," Hervert explained. "They're lying dormant, waiting for rain. They start putting out leaves within a week of watering. The pronghorn find it by smell, and they will forage in these areas before moving on."

Although the forage enhancement plots are probably not numerous or extensive enough to have impacted the population size yet, the pronghorn are multiplying due to other factors. Wildlife biologists recently completed the 2004 population survey for both the Arizona and Mexican populations, and have optimistic results: 58 pronghorn in Arizona, and 624 in the core habitat, east of Rocky Point, in Mexico.

"That's more than double what we saw two years ago," Hervert said, referring to the Mexican population.

Pronghorn are capable of producing twin fawns each year, which means that if habitats are in good condition, they can increase steadily.

Other projects will augment the forage enhancement. Part of Wilson's research will be documenting pronghorn use of an existing enclosure, the success of a captive breeding program, and differences in seasonal and daily behavior according to sex of the animals. Some of the pronghorn are already radio-collared, and just last month four new females were captured and moved to the enclosure, where, following an exam, researchers discovered that all four were pregnant, hopefully with twins.

A current priority for wildlife managers is increasing genetic diversity. "We're moving forward with captive breeding," Hervert said. "The next phase in recovery is establishing herds in other locations."

Crucial to consider is the role of the unpredictable climate in the future of the pronghorn and their management. "It's not a stable habitat," Hervert said. "It's a big area, but it's totally at risk. That's the lesson that's hard to grasp."

Plastic tubing such as that pictured here serves as conduits for pronghorn habitat irrigation. Water will flow seasonally from a well to vegetation along known pronghorn migratory routes, in hopes that the enhanced forage will increase pronghorn fawn survival and mitigate population losses during extreme or prolonged drought.

He went on to add that it is the same lesson that people in Arizona will have to learn. "We're really at the whim of nature," Hervert said. "We'll suffer if there's a drought."

Risk did seem inherent in the desert, as the thin irrigation lines faded behind a billowing cloud of turmeric-colored dust, hiding any sign of human presence. Our work that warm fall day was only a small part of the Sonoran pronghorn conservation project, in a small part of the refuge. Many of the areas pronghorn visit—in the mountains rimming the horizon of our worksite—were too remote, or too dry, to be optimal locations for water lines. The future of the Sonoran pronghorn right now looks good, but even with irrigation, the population will follow the ebb and flow of the desert rains.

Susan Simpson is a master's student in Geography and Regional Development at the University of Arizona.

Temperature (through 1/19/05)

Sources: Western Regional Climate Center, High Plains Regional Climate Center

Water year temperatures have been near-average across much of the Southwest (Figure 1a-b). Areas with the highest departures are near Lake Mead, in east-central Arizona, and in north-central New Mexico, where temperatures are from 2–3 degrees Fahrenheit above average. In northwestern Arizona, water year temperatures have moderated since mid-December (not shown), when readings were 3–4 degrees cooler than average. The past 30 days have been near- to above-average in Arizona and New Mexico (Figures 1c–d). Areas from north-central Arizona to north-central New Mexico experienced the highest departures with readings from 4–8 degrees above average. Slightly cooler-than-average conditions were recorded in portions of western and central Arizona and northwestern New Mexico. This pattern is much different than the mid-November to mid-December period, when nearly the entire region was within 2 degrees of average.

Similar temperature trends are continuing in early 2005 with the Tucson, Phoenix, Flagstaff, and Albuquerque National Weather Service (NWS) offices all reporting above-average temperatures. Winslow, Arizona, and Albuquerque, New Mexico, were both nearly 7 degrees warmer than average through January 22 (Flagstaff and Albuquerque NWS). Also in New Mexico, Roswell was nearly 6 degrees above average for the same period.

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.

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

On the Web:

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

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

Figure 1a. Water year '04–'05 (through January 19, 2005) departure from average temperature.

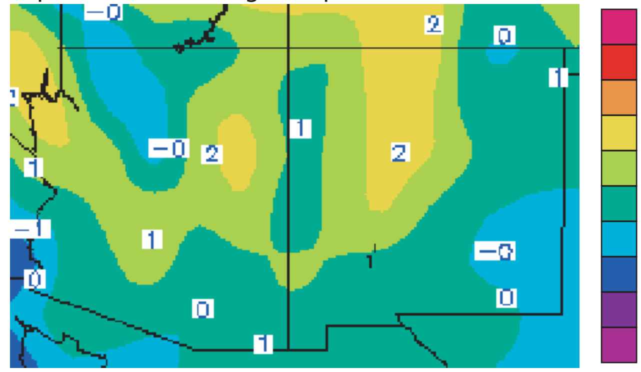


Figure 1b. Water year '04–'05 (through January 19, 2005) average temperature.

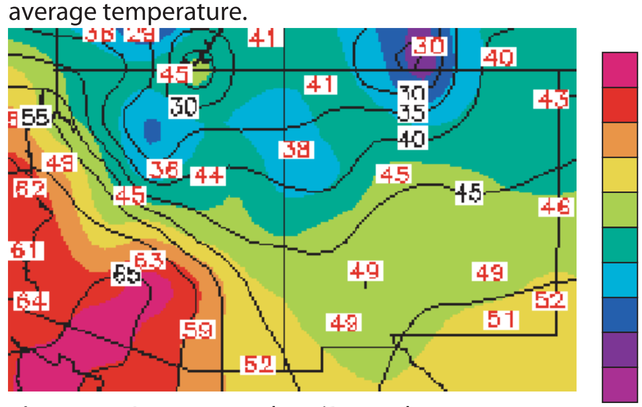


Figure 1c. Previous 30 days (December 21, 2004–January 19, 2005) departure from average temperature (interpolated).

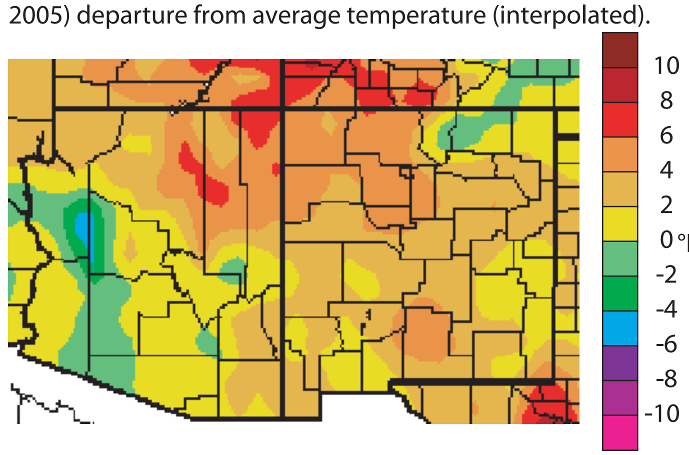
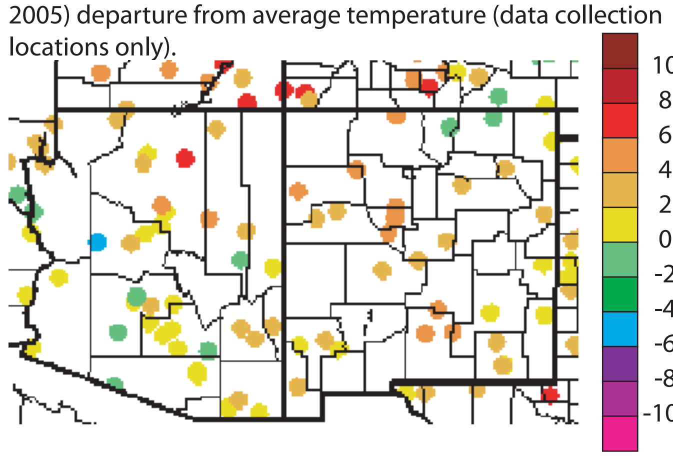


Figure 1d. Previous 30 days (December 21, 2004–January 19, 2005) departure from average temperature (data collection locations only).



Precipitation (through 1/19/05)

Source: High Plains Regional Climate Center

The water year continues to be wetter than average in eastern New Mexico and western Arizona with more than 150 percent of average precipitation recorded in many areas (Figures 2a–b). Portions of central New Mexico have soared to between 150 and 400 percent of average for the water year due to the series of storms that passed through the region beginning in late December. From December 21–January 19 nearly the entire Southwest experienced wetter-than-average conditions, except south-central Arizona and scattered sections of New Mexico (Figures 2c–d). In San Arriba County in north-central New Mexico, where water supply remains an issue, stations have only recorded 25–75 percent of average in the past 30 days.

According to AZCentral.com (January 13), the first two weeks of January marked the best beginning to a year in terms of precipitation in almost a decade. Unfortunately, these high precipitation amounts also have negative impacts. Heavy rain has led to mudslides in California and flooding in other western states. Early flood damage estimates from the Arizona Division of Emergency Management were approximately $3 million. In Sedona, Arizona, two people died while canoeing (*East Valley Tribune*, January 7).

Notes:

The water year begins on October 1 and ends on September 30 of the following year. As of October 1, 2004 we are in the 2005 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

Figure 2a. Water year '04–'05 through January 19, 2005 percent of average precipitation (interpolated).

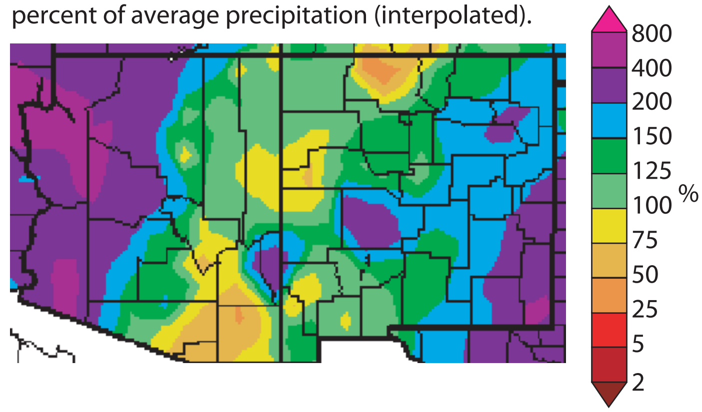


Figure 2b. Water year '04–'05 through January 19, 2005 percent of average precipitation (data collection locations only).

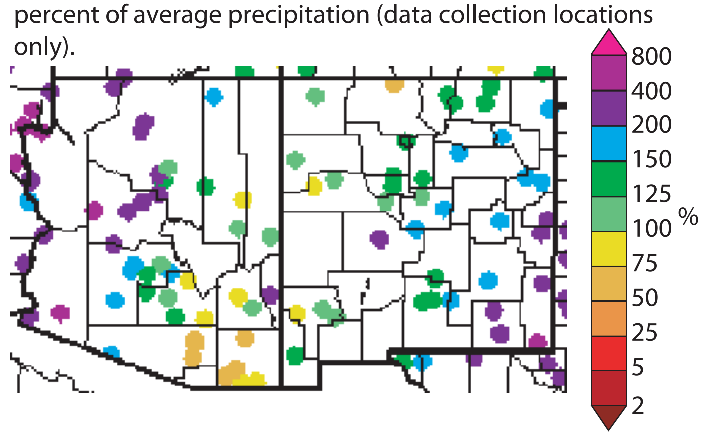


Figure 2c. Previous 30 days (December 21, 2004–January 19, 2005) percent of average precipitation (interpolated).

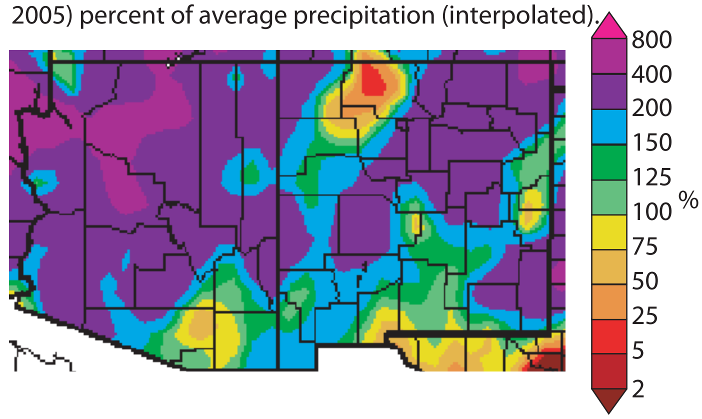
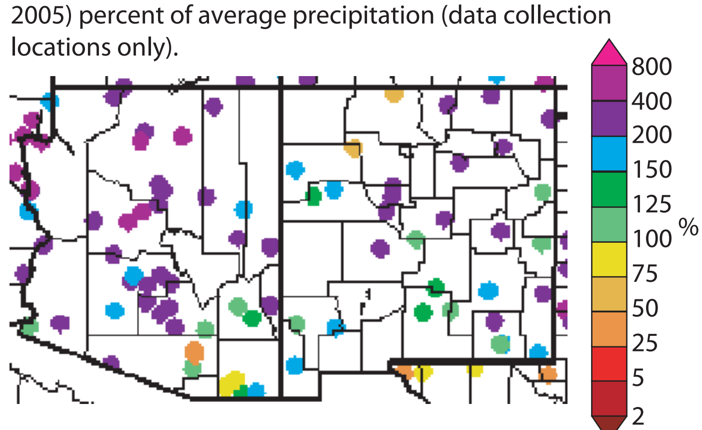


Figure 2d. Previous 30 days (December 21, 2004–January 19, 2005) percent of average precipitation (data collection locations only).



U.S. Drought Monitor

(released 1/20/05)

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

Drought impacts have diminished since mid-December due to a series of weather systems passing over the western United States (Figure 3). Northern and central Arizona and central New Mexico improved by 1 or 2 categories. Portions of southeastern and northeastern Arizona and northern New Mexico remain in extreme drought. Snow water content in those areas of New Mexico is near to slightly below average through mid-January, but wetter-than-average conditions this winter and in the coming years are needed for dramatic improvement. Elsewhere, most of California has been removed from the drought impacts, while impacts worsened in the Northwest and Minnesota.

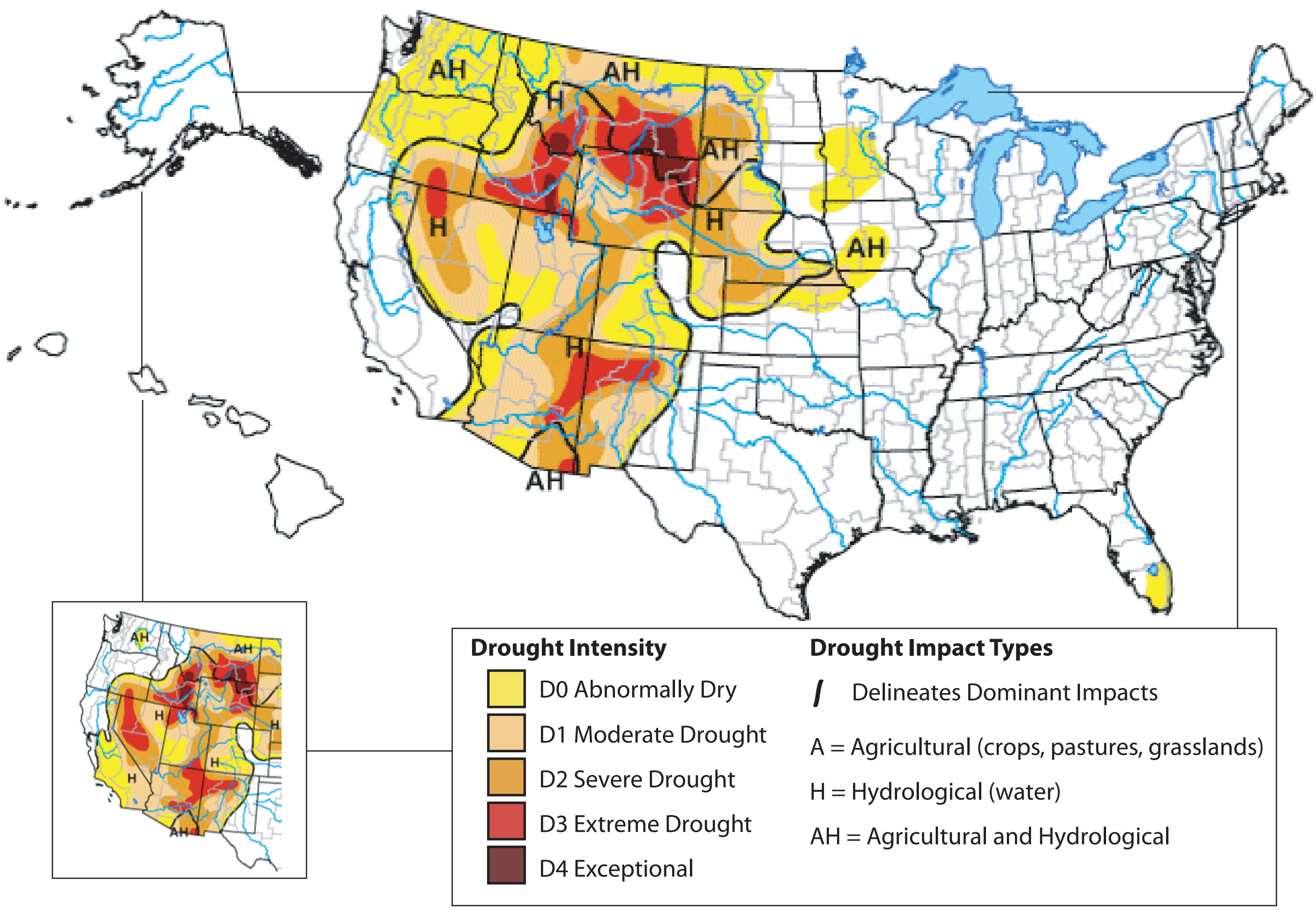
Officials continue to stress the importance of water conservation. Douglas LeComte, a drought specialist with NOAA, recalls last year when winter snowpack was reduced too quickly due to unusually warm and dry weather (*San Jose Mercury News*, January 11). Two Arizona cities—Tucson and Peoria—are discussing the importance of effluent water in the cities' futures (*Arizona Republic*, January 12 and 18).

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 Michael Hayes, NDMC.

Figure 3. Drought Monitor released January 20, 2005 (full size) and December 16, 2004 (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

New Mexico Drought Status
(through 1/14/05)

Source: New Mexico Natural Resources Conservation Service

Short-term drought status has improved considerably for much of New Mexico since early December. Normal conditions now cover much of the eastern third of the state, along the southern border, and in portions of the west (Figure 4a). The southeastern section of the northwestern plateau has jumped from emergency status to normal. The only areas where improvement did not occur are from western San Miguel County to southern Rio Arriba Country in north-central New Mexico and from northwestern Cibola County to southeastern McKinley County in northwestern New Mexico.

The water supply in Rio Arriba County has led residents to call for a moratorium on new development in the county (*Albuquerque Journal*, January 1). While county officials and the state engineer say that it is too early to call for a moratorium, they do agree that additional studies are necessary to determine water quality and quantity in northern New Mexico. Legislators are including water conservation in their list of priorities for the state in 2005 (*Albuquerque Journal*, January 8). According to the article, state representative Luciano Varela of Santa Fe has emphasized the need for good regional and statewide water plans. In water rights issues, several groups are challenging new state water allocation rules in court, claiming that they are unconstitutional (*El Defensor Chieftain*, January 12, and *U.S. Water News*, January).

Notes:

The New Mexico drought status maps are produced monthly by the New Mexico Drought Monitoring Workgroup. 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 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 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 New Mexico drought status map, visit:
http://www.nm.nrcs.usda.gov/snow/drought/drought.html

Information on Arizona drought can be found at:
http://www.water.az.gov/gdtf/

Figure 4a. Short-term drought map based on meteorological conditions as of January 14, 2005.

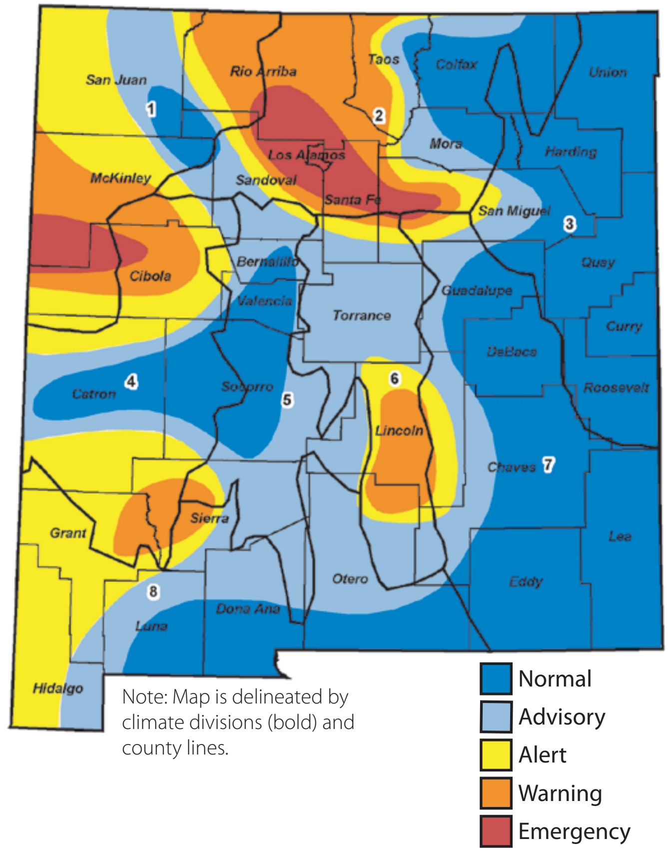
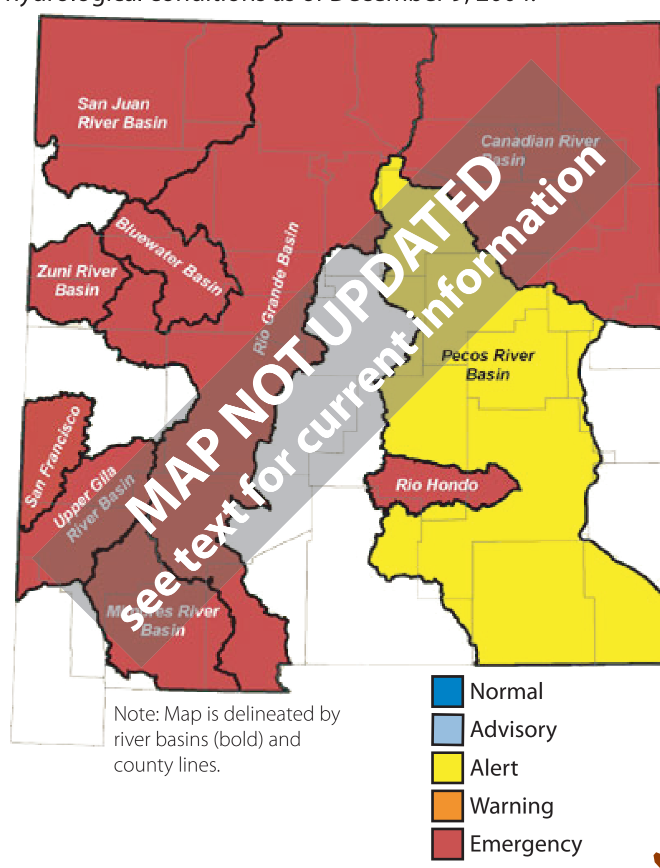


Figure 4b. Long-term drought map based on hydrological conditions as of December 9, 2004.



Arizona Reservoir Levels

(through 12/31/04)

Source: National Water and Climate Center

Levels in many Arizona reservoirs are gradually recovering from the downward trend that many of them experienced through much of last year (Figure 5). Several reservoirs increased in storage since December 2004. The greatest increases occurred in the Verde River System (15 percent), Show Low Lake (8 percent), and Lake Mohave (6 percent). These conditions resulted in part from the high precipitation amounts across much of Arizona recently. Lake Mead, Lake Powell, and Lake Havasu experienced drops, all of which were less than 2 percent of capacity. With forecasts for increased chances of wetter-than-average conditions in the Southwest through the March–May period, further improvements are possible through the spring.

The storms that moved through the Southwest in the past month created some rare events for portions of Arizona. The *Yuma Sun* (January 8) reports that enough water flowed into Painted Rock Dam north of Yuma in early January that water releases were necessary, which marks the first time since 1993 that releases occurred. Future releases will depend on the amount of rainfall in the coming weeks and months. Scott Harelson of the Salt River Project (SRP) told Bloomburg.com (January 7) that water was being released in the Salt River for the first time since 1998. Several reservoirs had reached capacity and overflowed into river beds that are normally dry. About a week earlier, the inflatable dam at Tempe Town Lake was deflated due to water released by the SRP, which marked the first time in six years that "significant" water was flowing through the Phoenix valley (*Arizona Republic*, December 31).

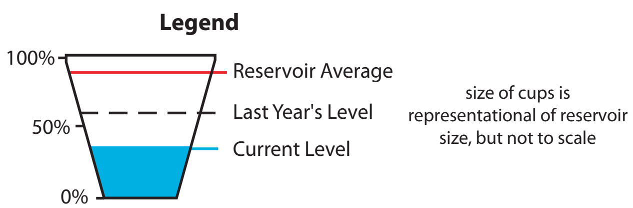
Notes:

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 (red line) and the 1971–2000 reservoir average (dotted 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.

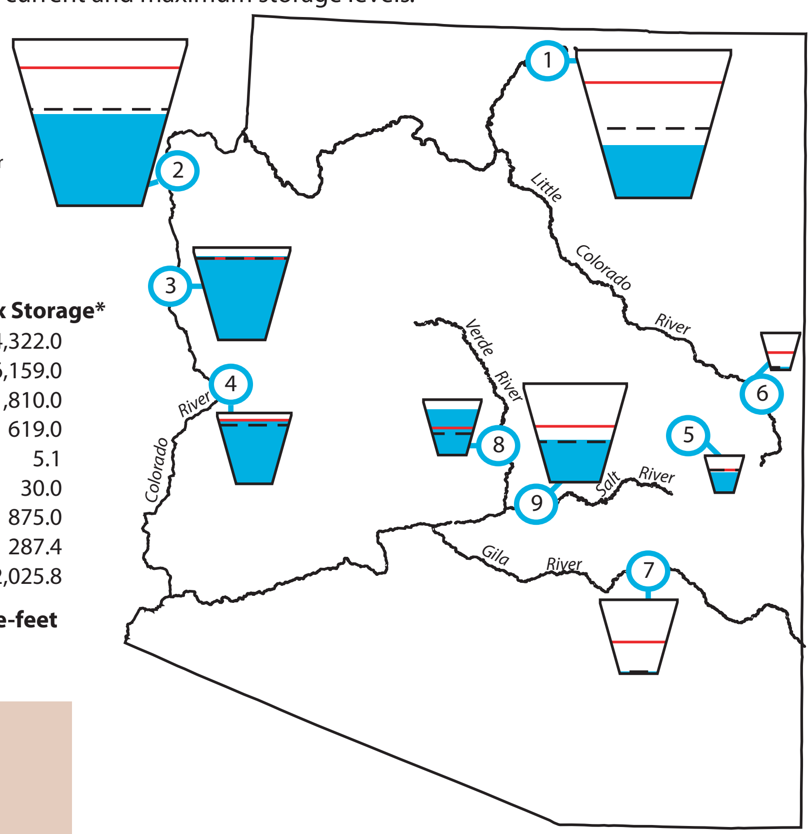
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010) 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 5. Arizona reservoir levels for December 2004 as a percent of capacity, the map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Lake Powell	36%	8,664.0	24,322.0
2. Lake Mead	55%	14,355.0	26,159.0
3. Lake Mohave	90%	1,632.6	1,810.0
4. Lake Havasu	91%	560.4	619.0
5. Show Low Lake	55%	2.8	5.1
6. Lyman Reservoir	9%	2.6	30.0
7. San Carlos	3%	24.1	875.0
8. Verde River System	83%	239.6	287.4
9. Salt River System	43%	880.4	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 12/31/04)

Source: National Water and Climate Center

Nearly one-third of New Mexico's reservoirs experienced capacity decreases in December, while other lakes were steady or increased slightly. The largest drop occurred at El Vado Reservoir (5 percent), while Lake Avalon had the greatest increase (12 percent). Only Navajo Reservoir in northwestern New Mexico is at greater than 50 percent capacity; other lakes are holding about 25 percent or less of their maximum storage. Forecasts for increased chances of above-average precipitation in New Mexico and near- to above-average snow water content in many of the state's river basins could improve reservoir conditions in the coming months. Richard Armijo of the Natural Resources Conservation Service told KOB-TV (January 3) that snowpack in New Mexico is the best it has been in 10 years, which should result in more runoff and streamflow into reservoirs.

Water projects throughout New Mexico made headlines in the past month. In late December, Santa Fe made public their $127 million plan to import 5.6 million gallons of brackish water from the Estancia Basin (KOB-TV, January 3). Supporters of the plan say that Santa Fe and surrounding areas will benefit (*Mountain View Telegraph*, January 6), while Basin residents and some Santa Fe city councilors oppose the plan (*Santa Fe New Mexican*, January 7, 12, 13, and 19). Residents of James Canyon in the Sacramento Mountains were recently told of a potential regional water system to deal with water supply issues (*Alamogordo News*, January 12). Elsewhere, Ute Water Project officials and the New Mexico Finance Authority settled on a $2 million grant for initial funding of the project (*Portales New-Tribune*, January 21).

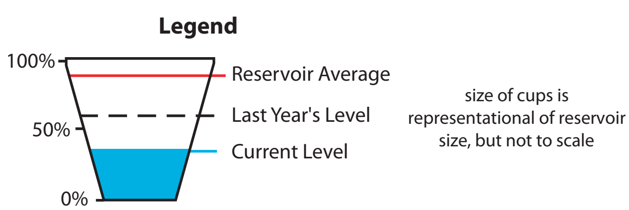
Notes:

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 (red line) and the 1971–2000 reservoir average (dotted 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.

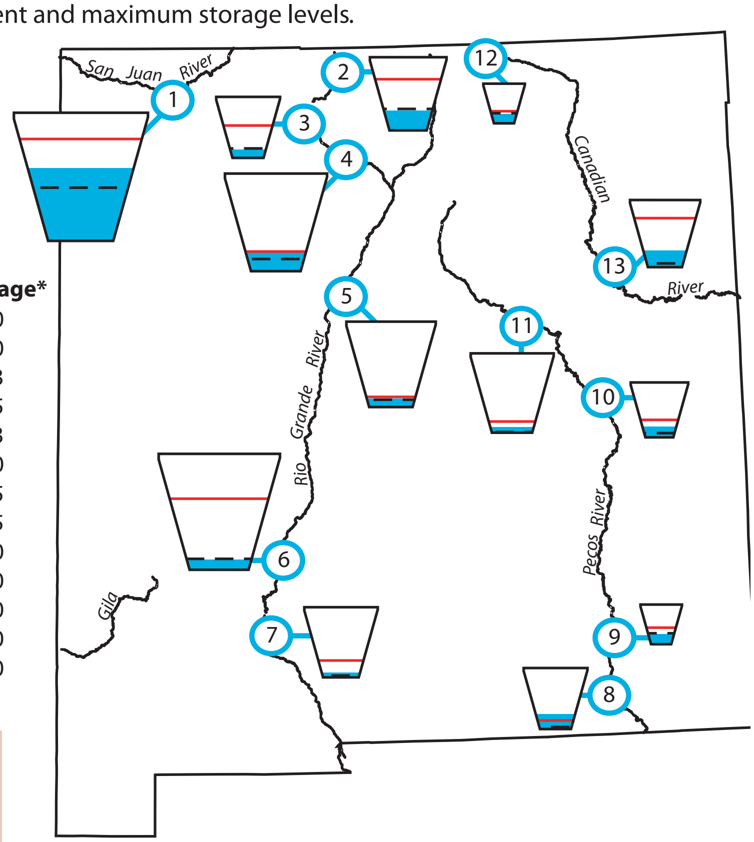
These data are based on reservoir reports updated monthly by the National Water and Climate Center of the U.S. Department of Agriculture's Natural Resource Conservation Service. For additional information, contact Tom Pagano at the National Water Climate Center (tpagano@wcc.nrcs.usda.gov; 503-414-3010)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

Figure 6. New Mexico reservoir levels for December 2004 as a percent of capacity, the map also depicts the average level and last year's storage for each reservoir, while the table also lists current and maximum storage levels.



Reservoir Name	Capacity Level	Current Storage*	Max Storage*
1. Navajo	57%	988.5	1,696.0
2. Heron	27%	109.5	400.0
3. El Vado	14%	25.4	186.3
4. Abiquiu	20%	111.7	554.5
5. Cochiti	10%	49.0	502.3
6. Elephant Butte	9%	191.9	2,065.0
7. Caballo	7%	23.3	331.5
8. Brantley	25%	36.5	147.5
9. Lake Avalon	25%	1.5	6.0
10. Sumner	19%	22.9	102.0
11. Santa Rosa	7%	30.2	447.0
12. Costilla	24%	3.8	16.0
13. Conchas	25%	63.5	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

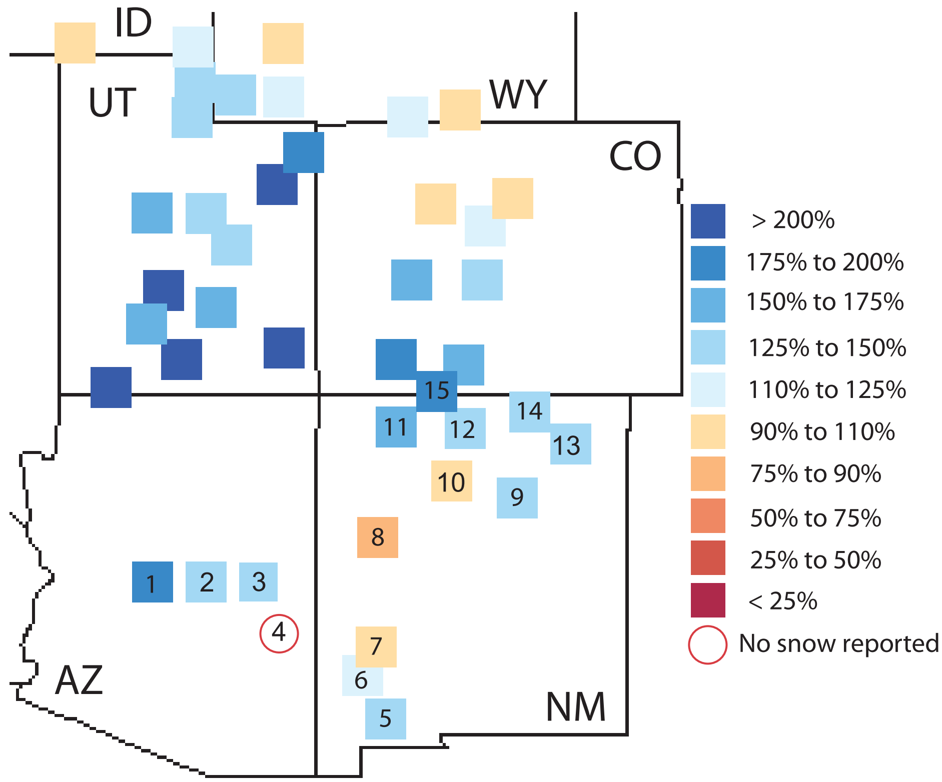
(updated 1/20/05)

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

Most river basins had increases in snowpack over the past four weeks, as a series of storm systems passed through the region. The snow water content (SWC) percent of average in Arizona and New Mexico is highest in central Arizona and in the Mimbres Basin and many northern basins in New Mexico (Figure 7). The Gila, Zuni/Bluewater, and Jemez river basins in New Mexico are reporting between 75–110 percent of average SWC. River basins in Colorado, Utah, Wyoming, and Idaho, which are important for Colorado River water supply as snow melts, range from near average to much above average. Some locations in Utah are in excess of 200 percent of average SWC. According to the Western Region Climate Center, nearly all stations are reporting in each basin.

Arizona state climatologist Drew Ellis said that it would be ideal if both rain and snowfall continue steadily throughout the winter, as opposed to only several short, intense storms (*East Valley Tribune*, January 12). Ellis added that if short, intense storms occur and are followed by warm, dry periods, snowmelt could occur too soon and too rapidly for reservoirs to hold the runoff. In addition to temperatures and the amount of snow, Chris Smith of the U.S. Geological Survey in Tucson stresses the importance to cities of where the snow falls (AZCentral.com, January 13). For example, much snow in the northwestern part of a state would not necessarily be beneficial throughout the entire state.

Figure 7. Average snow water content (SWC) in percent of average for available monitoring sites as of January 20, 2005.



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

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

Notes:

Snowpack telemetry (SNOTEL) sites are automated stations that measure snowpack depth, temperature, precipitation, soil moisture content, and soil saturation. A parameter called snow water content (SWC) 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 7 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.

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

Temperature Outlook
(February–July 2005)
Source: NOAA Climate Prediction Center

Long-lead temperature forecasts from the NOAA-Climate Prediction Center (CPC) generally show increased chances of warmer-than-average conditions across the western United States through July (Figures 8a–d). Arizona and extreme southern Nevada consistently have the highest probabilities of above-average temperatures (greater than 60 percent; Figures 8b–d). Elsewhere, the south-central United States is expected to have below-average temperatures during most of the period. In the West and south-central United States, the patterns are fairly similar to the forecasts from last month, while some differences occur in the Southeast. From March–May (Figure 8b) and later periods, the CPC reports that forecasts primarily represent trends towards warmer-than-average temperatures in the West. Forecasts from the International Research Institute for Climate Prediction (not shown) differ mainly in the likelihood of temperature anomalies.

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 8a. Long-lead national temperature forecast for February–April 2005.

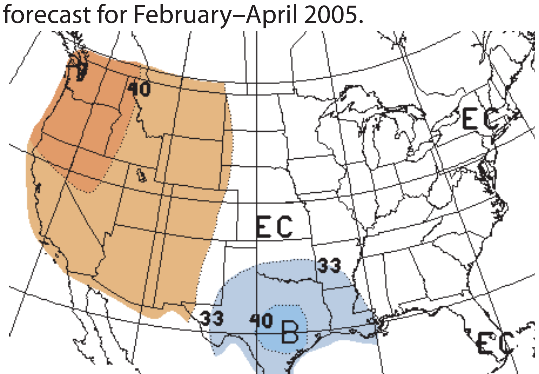


Figure 8b. Long-lead national temperature forecast for March–May 2005.

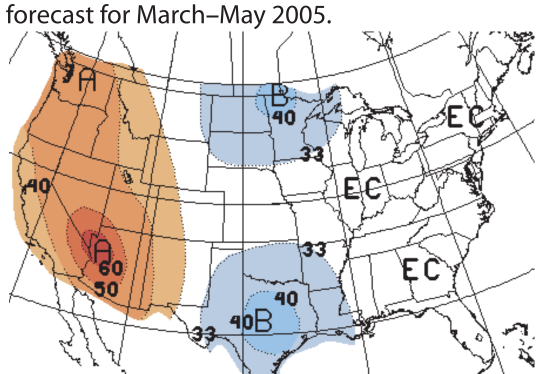


Figure 8c. Long-lead national temperature forecast for April–June 2005.

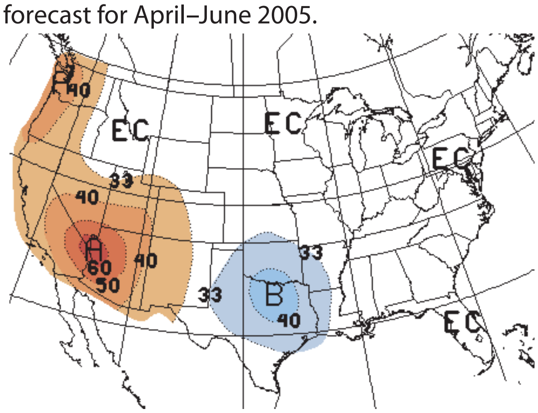
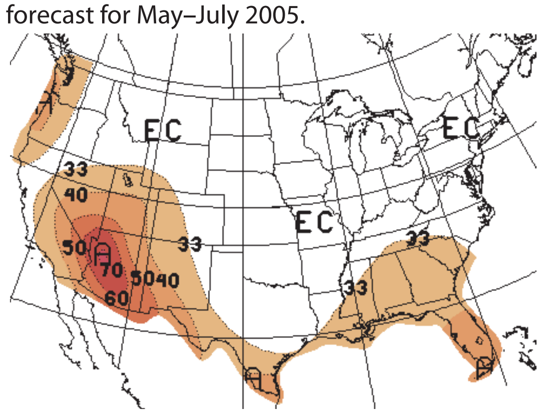


Figure 8d. Long-lead national temperature forecast for May–July 2005.



A= Above: 70.0–79.9%, 60.0–69.9%, 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.

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 2005)

Source: NOAA Climate Prediction Center

The NOAA-CPC long-lead precipitation forecasts indicate increased chances of above-average precipitation across the southwestern United States from February–May with the highest probabilities in Arizona and New Mexico (Figures 9a–b). No forecasted anomalies are shown for April–June or May–July (Figures 9c–d). The CPC reports that conditions in the north Pacific Ocean combined with the influence of tropical disturbances in the Indian and West Pacific Oceans caused the late 2004 and 2005 precipitation in our region. The tropical activity, known as the Madden-Julian Oscillation, moves eastward across the tropical oceans and can contribute signigicant amounts of moist air to our region. In contrast, El Niño may have much more of an effect on the February–April and March–May periods. Beyond these two time frames, the forecasts are based on long-term trends.

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 9a. Long-lead national precipitation forecast for February–April 2005.

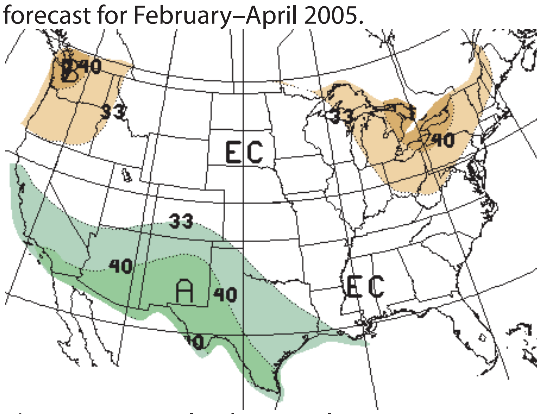


Figure 9b. Long-lead national precipitation forecast for March–May 2005.

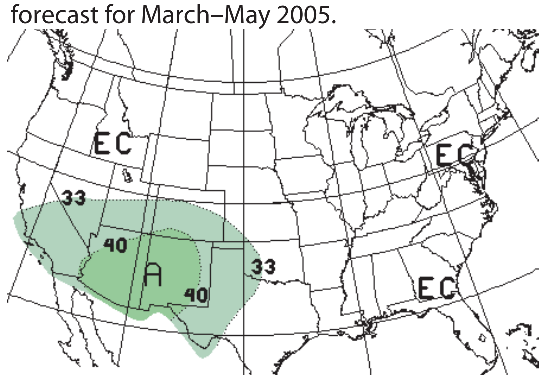


Figure 9c. Long-lead national precipitation forecast for April–June 2005.

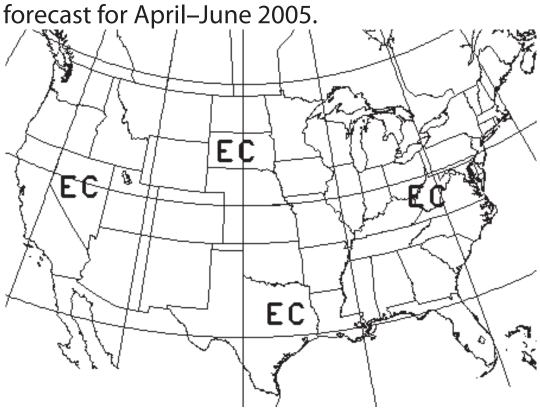
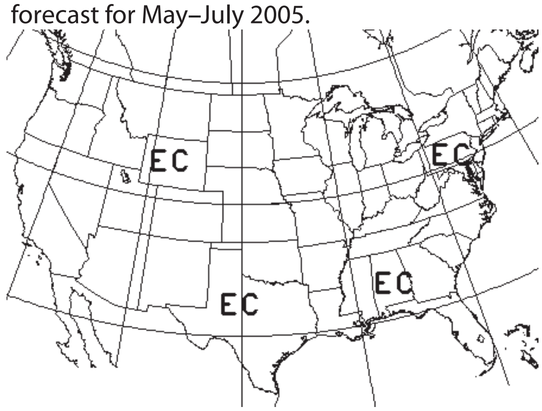


Figure 9d. Long-lead national precipitation forecast for May–July 2005.



A= Above: 40.0–49.9%; 33.3–39.9%

B= Below: 33.3–39.9%; 40.0–49.9%

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/

Seasonal Drought Outlook
(through April 2005)

Sources: NOAA Climate Prediction Center

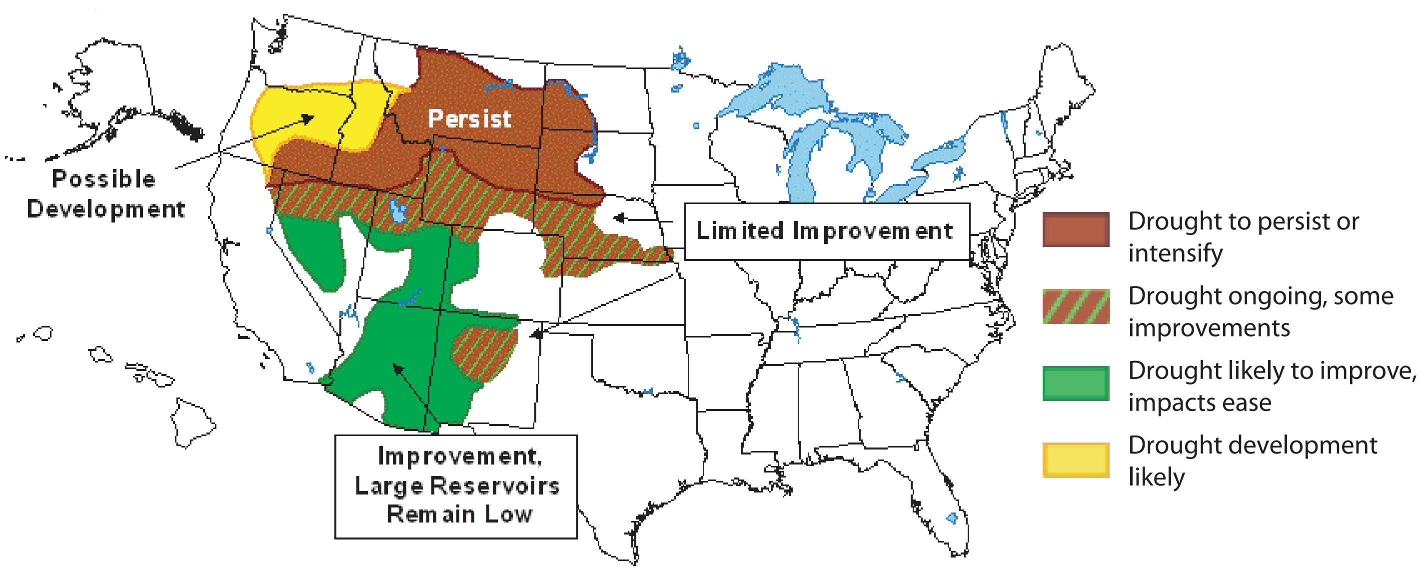
The NOAA-Climate Prediction Center (CPC) seasonal drought outlook shows that improvement is expected for much of the western United States through April (Figure 10). Drought impacts are forecasted to ease in Arizona and New Mexico, although large reservoirs will remain low. The continuing weak El Niño is important in the predicted reduction in the drought impacts in the Southwest. Drought conditions are expected to persist in the northern Rocky Mountains and the northwestern Great Plains, while portions of the Northwest may see the development of drought. The circulation patterns associated with El Niño typically result in below-average precipitation in the northwestern United States, as indicated in the long-lead precipitation forecasts (see Figure 9a–d). According to the latest U.S. Drought Monitor (see Figure 3) and the October–December percent of average precipitation (see Figure 14b), this area is already experiencing abnormally dry conditions. Continued drier-than-average conditions may therefore lead to drought development.

Despite the recent precipitation in the West, long-term drought continues to be entwined in western U. S. politics. The *Arizona Republic* (January 7) reports that water will be a priority issue for the Arizona state legislature. Proposals are anticipated from House of Representatives Natural Resources Committee chairman Tom O'Halleran and from the Governor's Drought Task Force. According to the article, opposition is expected from the Senate Natural Resource and Rural Affairs Committee. The seven Colorado River Basin states continue to work to develop plans to deal with potential water shortages (*Coloradoan*, January 14). Tom Long of the Colorado River Water Conservation District believes that the states will create a management plan by the April 1 deadline established by the U.S. Bureau of Reclamation (*Summit Daily News*, January 2). The *Summit* also reports that if no plan is developed and drought conditions do not improve, the federal government could force water delivery reductions as early as 2006.

Notes:

The delineated areas in the Seasonal Drought Outlook (Figure 10) are defined subjectively and are based on expert assessment of numerous indicators, including outputs of short- and long-term forecasting models.

Figure 10. Seasonal drought outlook through April 2005 (release date January 20, 2005).



On the Web:

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

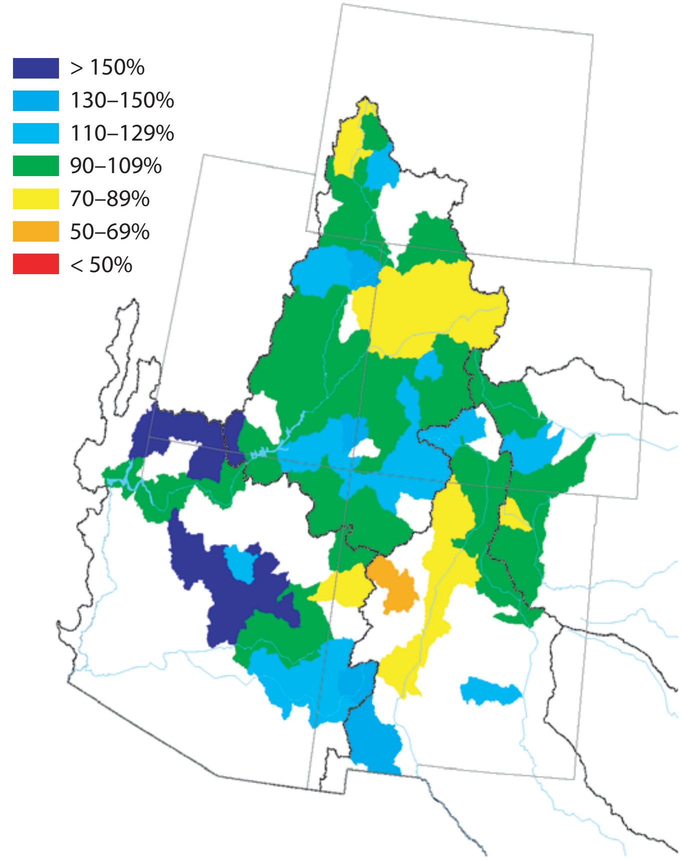
Streamflow Forecast
(for spring and summer)

Source: National Water and Climate Center

The forecast for the Colorado River Basin shows that many locations are expected to have near- to above-average streamflow during the spring and summer (Figure 11). The lowest values (50–69 percent of average) are in west-central New Mexico, where severe to extreme long-term drought persists (see Figure 3), and short-term conditions have improved slightly (see Figure 4a). In addition, snow water content in this portion of the state is below average (see Figure 7). Models also predict below-average streamflow in sections of central New Mexico. The forecast for Arizona is more positive with central and extreme northwestern areas expected to have greater than 150 percent of average streamflow. The majority of the Colorado River Basin is predicted to range from 90–150 percent of average.

Since much of the water in western rivers is from snowmelt, the amount of snowfall in the coming months will greatly influence the actual streamflow. Also tied to the streamflow forecast are precipitation forecasts and runoff. The long-lead precipitation outlook (Figure 9a–d) shows increased chances of above-average precipitation in the Southwest through May. More measurement of factors that influence runoff leads to improved streamflow forecasts later in the season. Therefore, the Natural Resources Conservation Service, who produces the streamflow forecasts, cautions that early forecasts generally undergo greater change than late-season forecasts.

Figure 11. Spring and summer streamflow forecast as of January 1, 2005 (percent of average).



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/water/quantity/westwide.html

Notes:
The forecast information provided in Figure 11 is updated monthly by the National Water and Climate Center, part of the U.S. Department of Agriculture's Natural Resources Conservation Service. Unless otherwise specified, all streamflow forecasts are for streamflow volumes that would occur naturally without any upstream influences, such as reservoirs and diversions. The USDA-NRCS only produces streamflow forecasts for Arizona between January and April, and for New Mexico between January and May.

The NWCC provides a range of forecasts expressed in terms of percent of average streamflow for various statistical exceedance levels. The streamflow forecast presented here is for the 50 percent exceedance level, and is referred to as the most probable streamflow.

There is at least a 50 percent chance that streamflow will occur at the percent of average shown in Figure 11 or lower.

El Niño Status and Forecast

Sources: NOAA Climate Prediction Center, International Research Institute for Climate Prediction

Observations in the tropical Pacific Ocean, including the Southern Oscillation Index (SOI), remain indicative of a weak El Niño (Figure 12b). The SOI decreased again over the past month, but its inconsistent pattern continues to hamper forecasts. According to the NOAA-CPC, sea surface temperature (SST) anomalies are high enough to officially classify the event as El Niño, although only a weak atmospheric response is present. The International Research Institute for Climate Prediction (IRI) probabilistic forecast for El Niño-Southern Oscillation indicates that continued weak El Nino conditions have the highest probability of occurrence through March (Figure 12a). Probabilities remain greater than 70 percent through the March–May period. By late spring, the likelihood for neutral conditions increases, although El Niño probabilities remain at 40 percent. According to the CPC, with the warmest SSTs confined to the central tropical Pacific, the United States should experience only limited impacts from El Niño. Despite this consideration, long-term precipitation forecasts indicate increased chances of above-average precipitation in the Southwest (see Figures 9a–d).

Experts have attributed the recent precipitation amounts in the western United States to unusual conditions in the western Pacific rather than to El Niño (*Reuters*, January 12, and *Arizona Republic*, January 15). The activity was related to an atmospheric phenomenon known as the Madden-Julian Oscillation, which typically begins in the Indian Ocean. The activity then moves eastward over the tropical Pacific and can result in very moist air flowing from near Hawaii to the southwestern United States, which is referred to as the Pineapple Express.

Notes:

Figure 12a 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.

Figure 12b shows the standardized three month running average values of the Southern Oscillation Index (SOI) from January 1980 through September 2004. 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 12a. IRI probabilistic ENSO forecast for El Niño 3.4 monitoring region (released January 20, 2005). Colored lines represent average historical probability of El Niño, La Niña, and neutral.

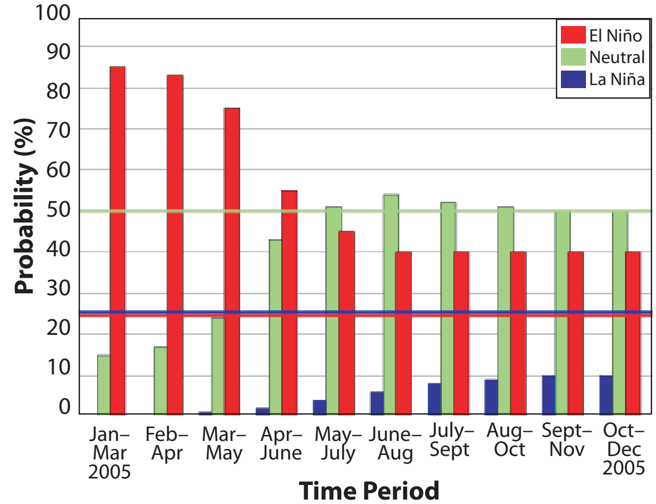
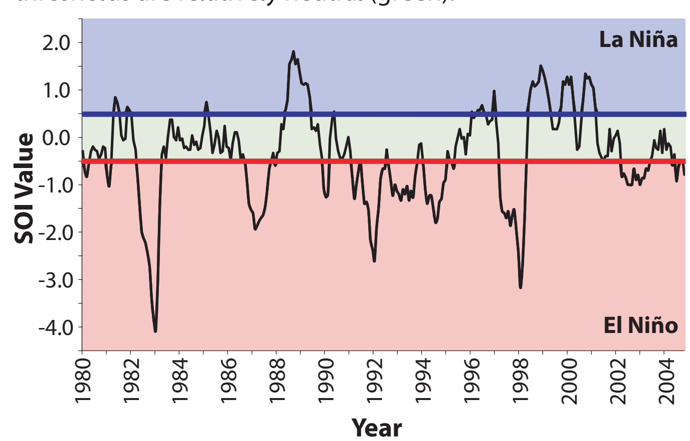


Figure 12b. The standardized values of the Southern Oscillation Index from January 1980–December 2004. La Niña/El Niño occurs when values are greater than 0.5 (blue) or less than -0.5 (red) respectively. Values between these thresholds are relatively neutral (green).



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/

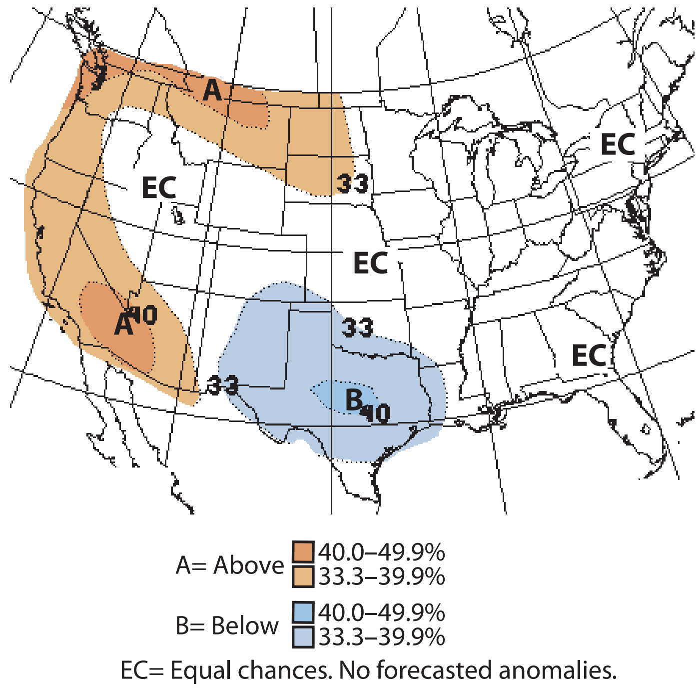
Temperature Verification
(October–December 2004)

Source: NOAA Climate Prediction Center

The NOAA-CPC long-lead temperature forecast for October–December 2004 predicted increased chances of warmer-than-average conditions from the southwest corner of New Mexico, along the West Coast, and along the northern tier of the United States into the Dakotas (Figure 13a). Increased chances of below-average temperatures were expected in the south-central United States. Observations show mainly warmer-than-average temperatures, except in southern Florida, western Texas, southern New Mexico and Arizona, and southern and central California (Figure 13b). Temperatures in the Southwest ranged from 2–4 degrees Fahrenheit below average to 2–4 degrees Fahrenheit above average.

The long-lead forecast performed well in the Northwest and the northern Great Plains, but it failed to predict the below-average temperatures in Arizona and California. The forecast for increased chances of below-average temperatures proved true for eastern and central New Mexico, but did not verify in the south-central United States.

Figure 13a. Long-lead U.S. temperature forecast for October–December 2004 (issued September 2004).



Notes:

Figure 13a shows the NOAA Climate Prediction Center (CPC) temperature outlook for the months October–December 2004. This forecast was made in September 2004.

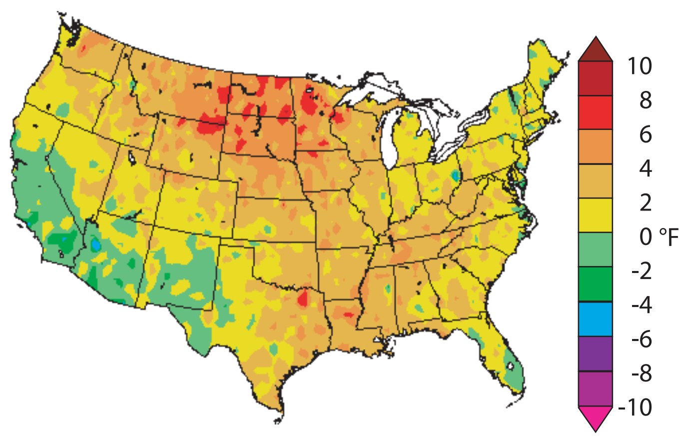
The October–December 2004 NOAA CPC outlook predicts the likelihood (chance) of above-average, average, and below-average temperature, but not the magnitude of such variation. The numbers on the maps do not refer to degrees of temperature. Care should be exercised when comparing the forecast (probability)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

Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average temperature. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 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 (°F) from the average for October–December 2004.

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

Figure 13b. Average temperature departure (in degrees F) for October–December 2004.



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 2004)

Source: NOAA Climate Prediction Center

The long-lead precipitation forecast for October–December 2004 from the NOAA-CPC showed no forecasted anomalies for much of the western United States (Figure 14a). Increased chances of wetter-than-average conditions were predicted in the south-central states and portions of the Southeast, while the lower Ohio and upper Mississippi river valleys had increased chances of drier-than-average conditions.

The forecasted wet anomalies verified in the south-central United States, but the Southeast forecast area was drier than average (Figure 14b). Above-average precipitation fell in the Ohio and Mississippi river valleys, also in contrast to the CPC forecast. In the West, much of New Mexico, western Arizona, and surrounding areas received much above-average precipitation (more than 800 percent in some instances). The high precipitation amounts were due in part to the conditions associated with conditions in the Indian Ocean (Madden-Julian Oscillation; see page 16), which current forecast models have difficulty in handling. Much of the northern United States recorded below-average precipitation.

Figure 14a. Long-lead U.S. precipitation forecast for October–December 2004 (issued September 2004).

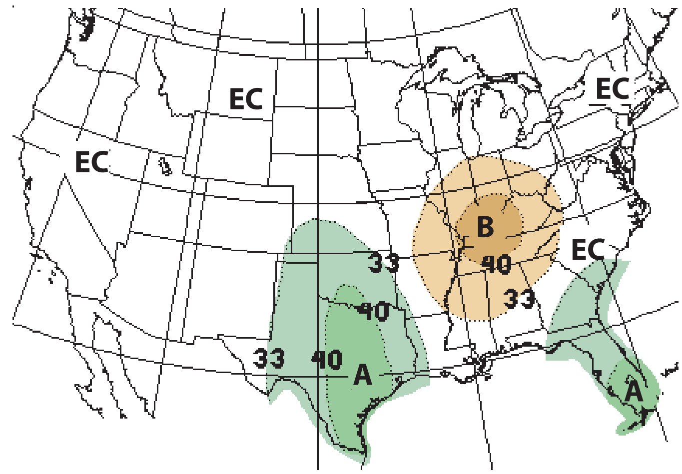
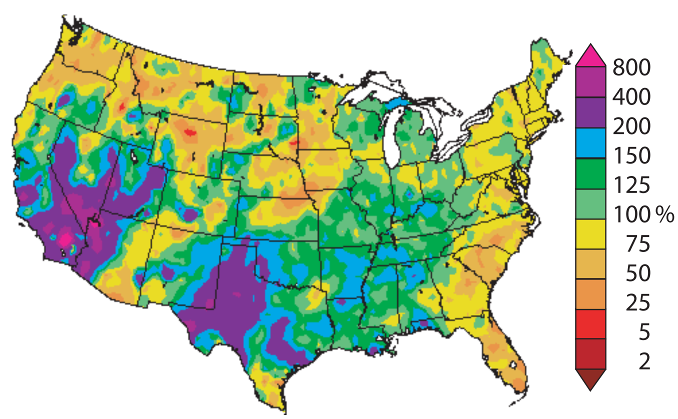


Figure 14b. Percent of average precipitation observed from October–December 2004.



Notes:

Figure 14a shows the NOAA Climate Prediction Center (CPC) precipitation outlook for the months October–December 2004. This forecast was made in September 2004.

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

Using past climate as a guide to average conditions and dividing the past record into 3 categories, there is a 33.3 percent chance of above-average, a 33.3 percent chance of average, and a 33.3 percent chance of below-average precipitation. Thus, using the NOAA CPC likelihood forecast, in areas with light brown shading there is a 33.3–39.9 percent chance of above-average, a 33.3 percent chance of average, and a 26.7–33.3 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 observed October–December 2004.

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

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