

# Will the drought continue?

## Rains bring relief to Southwest, but experts caution the wet spell may be short-lived

BY MELANIE LENART

A series of fortunate events has pulled drought-busting precipitation into the Southwest since about fall. Still, climatologists warned this doesn't mean the region has moved out of the danger zone for long-term drought.

Tropical rainfall, short-term pressure systems that favored the Southwest, and El Niño conditions conspired to make the six-month September through February period the second wettest in Arizona and third-wettest in New Mexico in the 111-year instrumental record, as indicated by a National Climatic Data Center (NCDC) online comparison.

Meanwhile, New Mexico set a record high for November through February precipitation, while the same period was the third wettest for Arizona, NCDC records show (Figure 1).

The September through February period was also record-breaking when considering the Four Corner states together, NCDC reports show. This bodes well for spring snowmelt into rivers that supply residents and farmers in the Southwest, including the Colorado River.

"We're definitely in recovery mode. We had to kick over that first domino," said Mark Svoboda, a climatologist with the National Drought Mitigation Center. "Mother Nature has a way of giving things back a lot quicker than she takes it away."

A really wet October saturated western soils roughly everywhere south of Oregon, Idaho, and Wyoming, Svoboda said. With soils sated, additional moisture could flow into streams and reservoirs.

### Short-term surplus

The boon of precipitation is greening the Southwest and bringing forth a colorful cast of wildflowers. Waterways are also responding to the bounty, with many reservoirs filling surprisingly fast from streams sometimes bursting at their banks. Floods included a late December overflow of Oak Creek in Sedona, Arizona.

"It's really wet out there, that's for sure," agreed Tom Pagano, water supply forecaster at the National Water and Climate Center in Oregon. As of mid-March, all three main reservoirs in Phoenix were rebounding dramatically from years of overdrafts.

"The Verde system, for all intents and purposes, is completely full right now. Lake Pleasant on the Agua Fria is 99 percent full. And the Salt system has gone where the Salt has never gone before," Pagano said, alluding to a recent expansion that allows the Salt system to trap more water than it could previously.

Even the San Carlos Reservoir in Gila County is nearly half full, after hovering at about 4 percent capacity for much of the past year.

"We've been in disbelief," Pagano said. But he and others cautioned against hailing the end of the drought. "It sounds really paradoxical, but I think a lot of people are concerned that this is really just a blip in a long-term drought situation."

"Yes, we see the drought improving," agreed Charlie Liles, the meteorologist in charge of the National Weather Service's Albuquerque office. "The surface looks great because of the recent wet weather and the snowpack. But I have



to believe that the groundwater has been short-changed over the past 48 months. We can't say that the drought is gone."

Unfortunately, it seems unlikely that many of the conditions that led to the recent stellar improvement will re-align next year.

### A spell of relief

The improvement arguably began when a tropical storm—the remnants of Hurricane Javier—drizzled days of rain on the Southwest as it cut a north-easterly diagonal across Arizona. Most of the Southwest received at least some moisture during the storm's three-day sojourn that started September 19, with a regional high of 5.2 inches of precipitation falling on Promontory, Arizona.

The drizzle served as a gentle way to soak parched soils without pummeling them into an erosive state. But rainfall events linked to hurricanes only affect Arizona every 4.5 years on average, according to calculations by Erik Pytlak of the National Weather Service's Tucson office.

On the heels of the tropical storm came a series of frontal events. Since about October, the Southwest has been receiving a good share of the storms that normally would keep clouds over the Pacific Northwest, especially Oregon and Washington.

continued on page 3



## Drought, continued

“It’s going to look like an El Niño year when you look at the overall pattern of dryness in the Northwest and wetness in the Southwest,” Svoboda said. “But looks can be deceiving.”

In fact, the “smoking gun” from late December through January can be traced to short-term atmospheric pressure systems, mainly a Madden Julian Oscillation (MJO), said Ed O’Lenic, chief of the operations branch for NOAA’s Climate Prediction Center.

“The MJO lives and dies on the time scale of about a month. And an El Niño lasts a year or more. They are two very different kinds of things,” O’Lenic explained. “Both of them can have impacts on the weather where we live.”

The MJO is a relatively new discovery, and references to it are easier to find on the internet than in climatology textbooks. “Pineapple express” events that carry moisture over from Hawaii often are succumbing to MJO pressure.

This particular Madden-Julian Oscillation dissipated by the end of January. MJO activity tends to be stronger during neutral or weak El Niño years, as a Climate Prediction Center website reports. The ongoing El Niño is considered weak.

Still, it apparently had enough punch to make February the wettest for New Mexico and the second-wettest for Arizona in the instrumental record, according to the NCDC online comparison.

“The February rains appear to have been related to kind of a late bloom of El Niño,” O’Lenic said. “We pretty much waited all winter for this to happen.”

And now the bad news. The El Niño bloom may already be fading. Forecasts predict a 65 percent chance of neutral conditions prevailing over El Niño for the March to May period. At any rate,

El Niño impacts in the Southwest tend to center around winter precipitation.

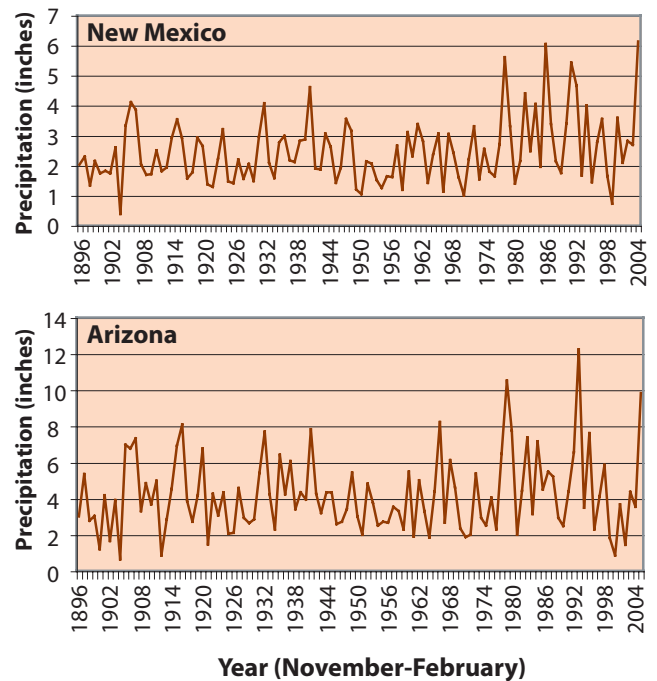
### The long and short of it

Regardless of which way the winds blow, the drought that established over more than a decade won’t disappear overnight. Nor will its impacts.

“It takes a while to dig yourself into a hole. And it takes a while to get yourself out of it,” as Pagano put it. At the moment, Arizona’s Lake Powell is still “bottoming out,” filled to only about 35 percent of capacity with roughly one year’s supply stored. Pagano anticipated that it, too, still would be half empty by the end of July. Or half full—this would be a gain of about 4 million acre-feet after distributing its portion of the Lower Basin’s annual share of the Colorado River flow. Still it could take decades to fill entirely.

Liles used a budget analogy to make a similar point, noting New Mexico had a 25-inch precipitation deficit accrued over five years when the current water year began on October 1. The state has garnered about 5 inches of precipitation toward that negative balance.

“Now we’re trying to put some money back in the bank, but the account’s pretty low,” he added. For instance, Elephant Butte Reservoir had dropped to only 9 percent of its average storage by the end of last summer. Now it’s approaching 30 percent of average, but it’s a long way from its 2 million acre-feet capacity. Groundwater, too, continues to be “short-changed,” he noted.



**Figure 1.** Precipitation from November 2004 through February 2005 was the highest on record for New Mexico (top figure) and the third-wettest on record for Arizona (bottom figure) compared to previous November-February periods. The data also seem to show a visual increase in variability, or extreme events, since about the mid-1970s. Source: Western Regional Climate Center.

Liles and others worry that reservoirs and aquifers could falter for decades, if long-term ocean patterns are aligning to maintain a multidecadal western drought. While the MJO might affect regional climate for a month and El Niño fluctuations might hold sway for a year or so, other patterns appear to keep the Southwest in overall drought mode for decades despite these short-term swings.

In particular, the Pacific Decadal Oscillation (PDO) and the Atlantic Multidecadal Oscillation (AMO) are suspected of having holding patterns that can last some 20 years or so based on observations in the instrumental record and inferences in the longer-term record reconstructed from natural archives such as tree rings. These oscillations appear to be associated with western drought.

Julio Betancourt of the U.S. Geological Survey in Tucson is among the research-

**continued on page 4**



## Drought, continued

ers arguing that these decades-long fluctuations contributed to the southwestern drought that spanned from about the 1940s through the 1970s (Figure 2). Betancourt indicated he fears drought could continue to haunt the Southwest for decades to come.

“I haven’t seen any evidence indicating that what we’ve seen lately will persist,” he said of the recent wet spell.

Liles agreed, noting that an El Niño-inspired wet period spanning about 1956 through early 1958 helped alleviate the drought impacts, but didn’t really end the drought.

“People thought drought was over. Looking back, you could see that drought actually lasted until about the 1980s,” Liles said (see Figure 2). “I think that Julio and I are pretty similar on our concerns that we were headed into a long-term drought. I think right now it’s going to take a couple of years to really know.”

### Another wild card

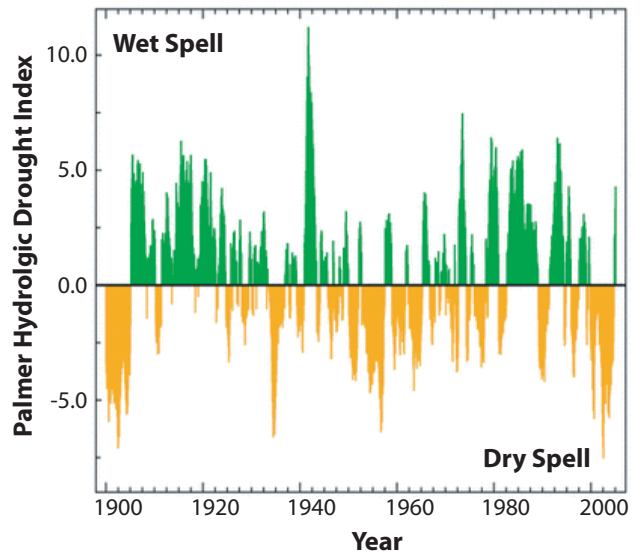
There’s an even longer term potential influence on modern drought regimes in the Southwest: global warming. The input of additional greenhouse gases into the atmosphere is expected to yield a temperature increase on the scale of about 1 degree Fahrenheit per decade in the Southwest through this century and beyond, as last month’s *Southwest Climate Outlook* article explained.

That warming trend appears to have started in earnest in the mid-1970s, in

the U.S. Southwest as well as the rest of the world. Although it remains unclear exactly how the warming will affect southwestern hydrologic regimes, consensus is emerging on several fronts. Climbing temperatures will certainly increase evaporation rates and will likely continue to shorten winters, resulting in an earlier seasonal snowmelt.

Warmer temperatures may also yield more extreme precipitation events, such as droughts and floods. Interestingly, the instrumental records for November-February precipitation in Arizona and New Mexico (Figure 1) seem to show an increase in extreme events—i.e., greater variability around the norm—since about the mid-1970s. This is a moment in time that many climatologists identify as launching a critical jump in global temperatures.

Since then, temperatures have continued an upward trend in the Southwest. Some of the concern over water supplies stems from these rising temperatures. For instance, warm temperatures during March of last year—which soared to record highs for Arizona and placed second for New Mexico in the instrumental record—consumed much of the existing southwestern snowpack without leaving moisture behind.



**Figure 2.** The Palmer Hydrological Drought Index above indicates that drought is a common occurrence in the Southwest, which for this analysis includes the Four Corner states of Arizona, New Mexico, Utah, and Colorado. Hydrologic drought tends to be more entrenched than other types of droughts, as it takes reservoirs and aquifers longer to rebound. Source: National Climatic Data Center.

Beyond global warming and the other short and long-term influences on climate, extreme precipitation events are part and parcel of life in the semi-arid desert.

If drought is seen as including any year when precipitation falls below 75 percent of the average, the Southwest is in drought about 43 percent of the time, as New Mexico State University Professor Jerry Holechek and colleagues note in their 1998 textbook “Range Management.” By comparison, the Pacific Northwest is in drought only 13 percent of the time, given this approach.

So odds are that relatively wet periods like the current one won’t last long in the Southwest.

“You’re still living in the desert. Average annual precipitation is a foot a year,” Pagano reminded, referring to Tucson. “That hasn’t changed.”

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### Resources on the Web

- To compare moisture status for different states using the NCDC online tool, visit: <http://lwf.ncdc.noaa.gov/oa/climate/research/prelim/drought/state-reg-moisture-status.html>
- To compare moisture status for different time frames using the Western Regional Climate Center online tool: [http://www.wrcc.dri.edu/cgi-bin/divplot1\\_form.pl?0204](http://www.wrcc.dri.edu/cgi-bin/divplot1_form.pl?0204)
- For more details on the Madden-Julian Oscillation: [http://www.cpc.ncep.noaa.gov/products/intraseasonal/intraseasonal\\_faq.html](http://www.cpc.ncep.noaa.gov/products/intraseasonal/intraseasonal_faq.html)
- For more on how the PDO influences Southwest climate, see: <http://www.ispe.arizona.edu/climas/learn/pdo/index.html>  
<http://www.srh.noaa.gov/abq/research/feature.htm>

