

Monsoon impact on society: the good and the bad

BY MELANIE LENART

In a land marked by dry heat, people welcome the summer rains with songs, sales, and special events celebrating the monsoon season.

For better or worse, the monsoon brings changes to the Southwest and provides a break in soaring summer temperatures.

This year's monsoon officially reached Tucson on June 28, five days earlier than average, based on records back to 1949 compiled by Arizona's state climatologist, Andrew Ellis. His research has shown that stronger-than-average monsoons tend to arrive early and stay late (Figure 1). The longest seasons tend to bring the most rainfall (Figure 2).

Many hope the rains in the Southwest between the start of the monsoon and July 8 will be a sign of more relief to come. Few climatologists expect any long-term relief from the drought that has settled into the region for nearly a decade, but the region's drought status shows that this year's monsoon is putting a dent in the moisture deficit.

Wildfire

The monsoon heralds the beginning of the end of the burning season, a dangerous time for homes and businesses and the firefighters who protect them.

Southwestern wildfires came to a standstill in early July, their power dampened by a couple of weeks of rainfall that doubled, and even quadrupled, the average weekly tally for late June and early July. By July 4 in Arizona and July 6 in New Mexico, firefighters and rainfall had suppressed existing wildfires in the region. A few more Arizona fires have started since mid-July, when record-high temperatures drove humidities down in some lower-elevation areas below the Mogollon Rim.

"We're done in terms of widespread large fire potential," said Charles Maxwell, fire weather program manager for the Southwest Coordination Center (SWCC). "The season wound down between one and two weeks after the monsoon was declared in Tucson on June 28."

Although fires in the middle of the monsoon season can start between local

rains, they have little chance of developing into raging conflagrations.

"As dry or hot as it might be in one day, it will only be three or four days before another rain," Maxwell said. It takes about 40 days to really dry out some of the larger fuels.

The number of acres burned totaled about 515,000 in New Mexico and roughly 137,000 in Arizona, according to the SWCC's website on July 25. This compares to the average of roughly 400,000 acres for the Southwest region. Most of the tally resulted from grasslands, with some exceptions that included the Oak Creek area near Sedona, Arizona, and several fires in the Gila National Forest in New Mexico.

In many years, the monsoon can actually herald an increase in the number of wildfires in the first week or two of its arrival. The number of fire-causing lightning strikes usually rises well before monsoonal rains and general humidity levels dampen the branches and vegetation known as "fuels" to firefighters.

Usually, rain falls spottily around the Southwest from the storms carried in with the wind shift that defines the monsoon. This year, though, weak upper-level winds allowed clouds to linger across the region for days on end. Maxwell compared the resulting thunderclouds to "bumper cars" jostling each other into releasing their moisture across much of New Mexico and Arizona.

Ranching and Agriculture

The monsoon also ushers in summer grasses, which can make or break southwestern ranchers struggling to eke out a living in harsh desert lands.

July 4 and subsequent storms have already greened up some parts of the Southwest. Grasses had reached about

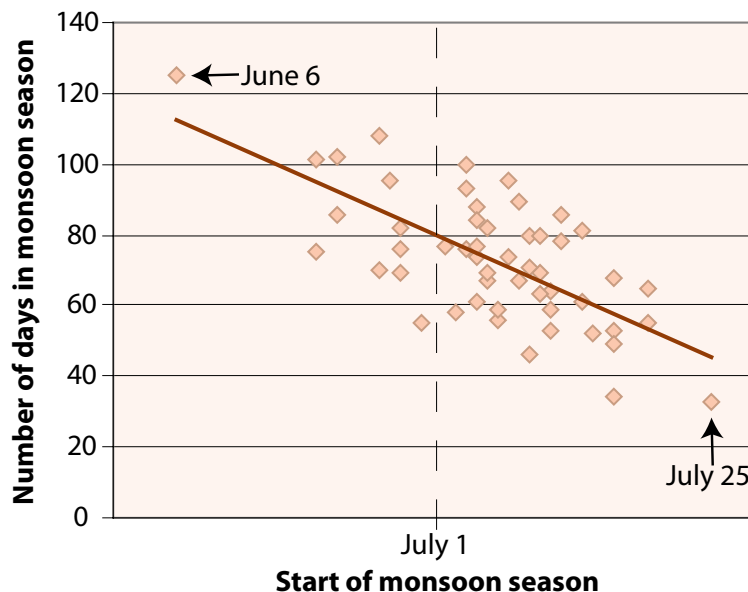


Figure 1. In general, the earlier the monsoon season starts in the Southwest, the longer it lasts. Each point above represents a monsoon season between 1949 and 2001. Data from state climatologist Andrew Ellis.

continued on page 4



Monsoon, continued

four inches high on a part of Dennis Moroney's ranch, the CrossU Cattle Company, in southeastern Arizona just north of Bisbee, he reported by telephone in mid-July.

When asked if he had time to talk about the monsoon, he responded, "There's nothing more important in the whole wide world. When the monsoons begin to bring moisture, it's fabulous."

Moroney said he was still waiting for "the big Chubasco" to signal the start of the monsoon on most of his ranch. But he and many of his neighbors were excited about the early monsoon start.

An earlier climate forecast issued by the National Oceanic and Atmospheric Administration's Climate Prediction Center had him and some of his neighbors anticipating the relief of summer rains, he said. Given the lack of prediction for below-average summer rainfall, Moroney arranged to graze his cattle on some pastures near his ranch.

The ongoing drought had shriveled up most of his range, and he had been hauling gasoline out to the field every day to fuel the water pumps filling the otherwise-empty stock tanks.

"If we had had an outlook for a poor prospect for a monsoon, we probably would have started liquidating cows," he noted.

While ranchers depend on rainfall for their livelihoods, many commercial farmers in the Southwest irrigate their crops with groundwater. However, monsoon rains remain important to farmers who depend on natural rainfall, such as many Navajo, Hopi, and Tohono O'odham farmers on tribal lands.

Even some of the southwestern farmers with access to irrigation depend on reservoirs, such as New Mexico's Elephant Butte, which benefits from the monsoon.

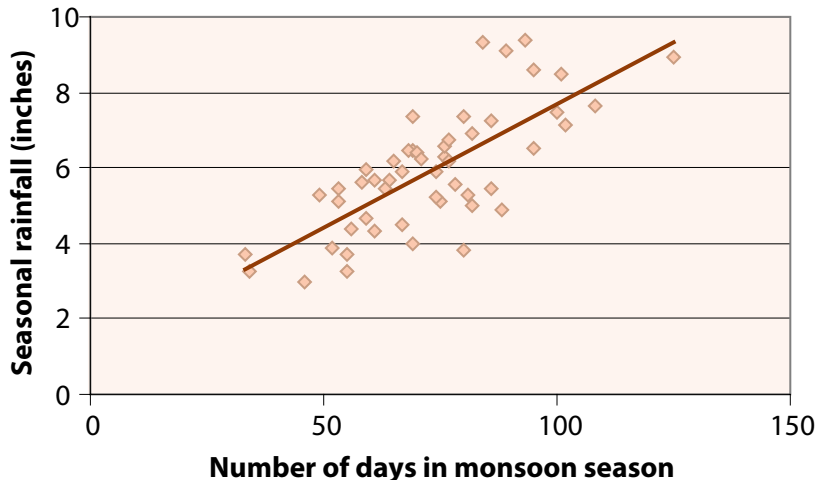


Figure 2. The number of days during the Southwest's monsoon season largely influences seasonal rainfall tallies. Each point represents a season between 1949 and 2001. Data from Andrew Ellis.

Water reservoirs

The monsoon brings rains that can help reverse the downward draw from reservoirs. Although, high summertime evaporation rates make the influence of the monsoon on water supplies smaller than one might expect. About one-third to nearly two-thirds of annual rainfall in many southwestern towns comes during the summer monsoon season.

Given those tallies, one might expect reservoirs to reach their highest points following summer rainfall events. Instead, monsoon storms do relatively little to balance out summertime withdrawals by farmers irrigating crops, people watering lawns and gardens, and hydroelectric dams powering air-conditioners.

Data provided by Tom Pagano, water supply forecaster at the National Water and Climate Center in Oregon, showed Arizona and New Mexico reservoirs typically receive slightly less than their average monthly inflow during July and August.

A few notable exceptions—gauges that usually register 30 percent or more of their annual flow during July and August—feed into a small reservoirs in New Mexico, the Little Colorado in Arizona, near Woodruff, Arizona, and the San Pedro near Charleston, Arizona.

The Charleston records indicated that at least this stretch of the protected San Pedro River typically receives about half of its annual inflow during July and August. This presumably reflects the stronger influence of the monsoon across the border, as the San Pedro flows north from its headwaters in Cananea, Mexico.

Additionally, unlike those along the Mogollon Rim and the Sangre de Cristo Mountains, the San Pedro lacks the pulse of winter and spring streamflow that comes from melting snow. But the river represents an important rest stop for hundreds of species of migratory birds flying both north and south, who thus depend in large part on monsoon rains for their sanctuary.

This year, the Gila River gauge at Clifton on the border of Arizona and New Mexico registered a dramatic response to the monsoon, Pagano said. After the river flow bottomed out at about 25 cubic feet per second (cfs) on July 6, it peaked at about 5,000 cfs for a few days following the rush of monsoonal rains.

"It was a huge flash of runoff. But it's unsustainable," he added, noting the rivers levels had plummeted again.

continued on page 5



Monsoon, continued

All of that drama added only a couple of inches to the San Carlos Reservoir downstream, which powers Coolidge Dam in Arizona. Also, the Elephant Butte Reservoir on the Rio Grande in New Mexico gained only nine inches from the July storms after having dropped about 37 feet since March.

These flashy summer rains also bring floods, however, which can damage property and even cause deaths. Water in normally dry riverbeds can rise quickly, taking people by surprise (see the September 2002 *Southwest Climate Outlook*). Lightning, too, can be dangerous for those caught unawares.

Health concerns

Monsoon rains and the grass growth that follows help keep down dust particles, which otherwise pollute the air and potentially transport the spores that cause valley fever, as research by Andrew Comrie, a climatology professor and dean at The University of Arizona, and his colleagues has shown.

The monsoon brings standing water that spawns mosquitoes, which can lead to the spread of West Nile disease and perhaps the eventual appearance of dengue.

So far, Arizona has only documented cases of dengue in people returning from travels to the tropics. But the warm, humid conditions marking the monsoon create conditions suitable for the arrival of dengue, a viral disease that potentially lasts for weeks and involves serious headaches and joint pain.

“All we need is one sick traveler to come back in an area at a time when we have active *Aedes aegypti* mosquitoes,” said said Craig Levy, program manager for the Arizona Department of Health Services’ vector-borne disease program.

The *Culex* mosquitoes that are behind the spread of West Nile virus, which has similar symptoms as dengue, have

Figuring out monsoon season

BY BEN CRAWFORD

102.4 degrees Fahrenheit (F): Average Tucson, Arizona daily high temperature for June 2006, **2.2** degrees F above normal. **91.3** degrees F: Average Albuquerque, New Mexico daily high temperature for June 2006, **1.1** degrees F above normal. **88.4** degrees F: Average Tucson June temperature, **4.3** degrees F above average and the **3RD** warmest on record. **78.1** degrees F: Average Albuquerque June temperature, **3.3** degrees F above normal. **74.3** degrees F: Average Tucson daily low temperature for June 2006, **6.3** degrees F above normal and the warmest on record. **65.0** degrees F: Average Albuquerque daily low temperature for June 2006, **5.6** degrees F above normal. **55** degrees F: Monsoon dewpoint temperature threshold for Phoenix, Arizona. **54** degrees F: Monsoon dewpoint temperature threshold for Tucson. **28TH** of June: official start date of the 2006 monsoon season in Tucson, the first June start since 2000. **26**: Number of June days with highs over **100** degrees F in Tucson. **3RD** of July: Average start of monsoon season in Tucson. **7TH** of July: Average start of monsoon season in Phoenix. **5.9** inches: Average July–September rainfall in Tucson. **2.8** inches: Average July–September rainfall in Phoenix. **3.8** inches: Average July–September rainfall in Albuquerque.

already killed 20 people and caused serious illness in more than 500 residents since it first appeared in the state in 2003. The department registered 113 cases in 2005, mostly during monsoon season, and 391 cases in 2004. The first sign of West Nile virus this year turned up in mosquito samples collected in Arizona’s La Paz County on June 27, just as the monsoon was about to become official in Tucson.

“When the monsoon kicks in, you’ll see those increasing as well,” Levy said of the *Culex* mosquitoes. “Flowing water is not going to breed mosquitoes. But when that water settles in and stops flowing, then you’ve got pockets of water that might allow breeding.”

The monsoon influences disease rates and dust pollution, river flow and lake levels. It generally dictates when the southwestern wildfire season ends, whether farmers outside of the irrigation belt will celebrate summer crops, and if on-the-edge ranchers will decide to hang in for another year.

Given the monsoon’s impact on life in the Southwest, it’s no surprise the rains are the subject of songs, celebrations, and millions of conversations.

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>

