

Summer Blooms Wait on the Rain

By Zack Guido

Where have all the summer flower blooms gone?

To hear Dave Bertelsen tell it, this summer has been nearly petal-less along the eight-mile Finger Rock Canyon Trail in the Santa Catalina Mountains north of Tucson—a route the self-trained botanist has hiked, round-trip, 1,326 times, half of those during the summer.

“This is one of the worst beginnings of the summer blooming season I’ve ever seen,” Bertelsen said on July 15. He knows what he’s talking about. In the 26 years he’s hiked the trail, Bertelsen has logged more than 13,000 observations of flowering summer plants representing 240 species that span about 4,000 vertical feet.

Bertelsen and University of Arizona researchers Theresa and Michael Crimmins mined that information treasure trove, finding that summer blooms on the trail are tied tightly to early and continuous monsoon rains. Their research was published in *New Phytologist* in March.

The connection between monsoon rains and summer flowers is novel for most researchers studying the life cycle events of plants, a field known as phenology.

“[This research] is one of only a few studies to address the timing of flower blooms in arid regions,” said Michael Crimmins, UA climate extension specialist. “Most people don’t have data [on flower blooms] in dry places.”

Most phenological research occurs in temperate regions where plants bloom only once a year. In the Southwest, however, precipitation falls in two distinct periods, causing the landscapes to liven in March and April and in mid- to late summer. In the winter, flowering at lower elevations is prompted by precipitation, while plants at higher elevations are influenced more by temperature. In the summer, the cue is only rain.



Figure 1. The Schott's yucca recently started blooming on the Finger Rock Canyon Trail. However, Bertelsen has only seen two in bloom through July 14. It is one of many species off to a slow start this summer. Photo was taken in 2009 by Dave Bertelsen.

“It doesn’t matter what plant species you are or at what elevation you’re rooted, you’re waiting for the monsoon rains to begin,” said Theresa Crimmins, partnership coordinator for the USA National Phenology Network, headquartered at the UA.

There are, however, nuances to summer flowering. Plant species at lower

elevations on the trail fall within the Sonoran Desert ecosystem and begin sprouting rapidly after rain, while those at higher elevations are slower to respond. Also, the number of blooming species in the summer depends on the total July precipitation. For years in which July rains were high, the number of blooming species also was high, and vice versa.

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Because high July precipitation usually occurs when monsoon rains arrive early and are continuous, Bertelsen and the Crimmins' suggest the character of the monsoon also is important.

This is perhaps the reason why plants on the Finger Rock Canyon Trail are not yet verdant. While an inch of rain had fallen on the trail through mid-July—Bertelsen also monitors three rain gauges at different elevations on the trail—it all came in one splash around the July 4 weekend. A two-week break likely has stunted development.

"I typically see on average about 60 species in bloom in July. Yesterday [on July 14], I saw only 14, which is close to the lowest I have seen for this month," Bertelsen said.

The number of plant species in bloom likely will increase as the monsoon ramps up and summer advances—blooming typically peaks in August. However, repeated years of delayed blossoms can cause chain reactions in the ecosystem. In Europe, for example, the presence of caterpillars, which are a vital food source for the pied flycatcher, are occurring earlier in the year, in part because their food source, the leaves of oak trees, have started to bud earlier. By the time the birds start their northward migration, many of the caterpillars are gone, sending the pied flycatcher population plummeting by about 90 percent in recent decades.

"I don't know if people have pinned down the cascading effects of delayed flowering in the Southwest, but we can anticipate similar things will happen here, too [with a shift in the timing of summer blooms]," Theresa Crimmins said.

If the onset of the monsoon season influences when plants bloom, changes in future monsoon seasons could spark an ecological chain reaction. Unfortunately, basic science principles paint plausible yet contrasting pictures of a drier or wetter monsoon.

On one hand, warming air temperatures will require clouds to ascend to higher

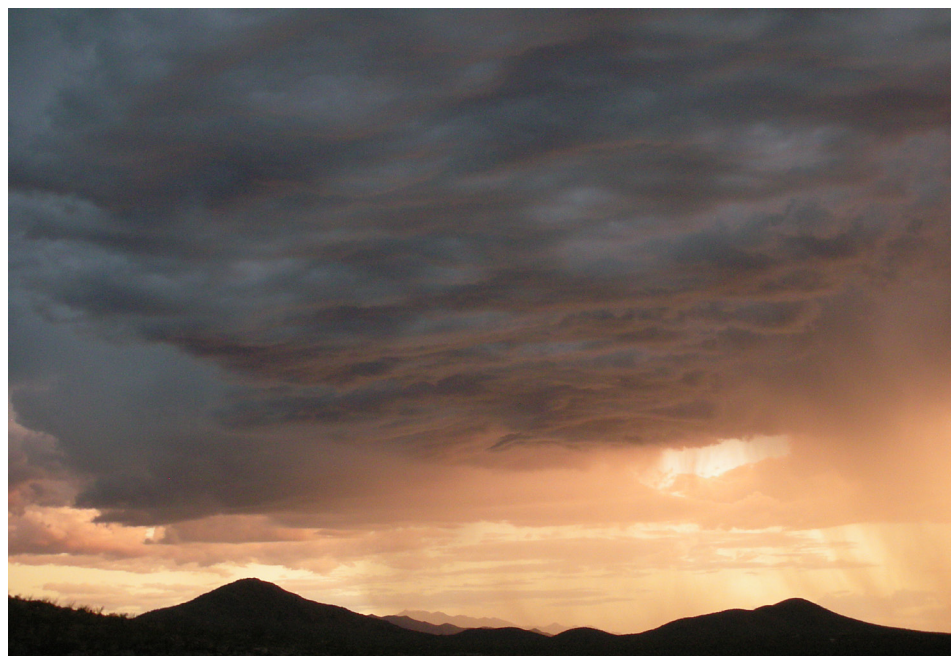


Figure 2. Evening storms drench Pistol Hill and Colossal Cave near Vail, AZ. Photo was taken by Holly Lawson.

altitudes before the vapor condenses into rain. If the atmosphere warms up enough, the mountains—which push air upwards and help develop thunderous storms—would not play as prominent a role in organizing rainfall, and total monsoon rainfall may be lower.

On the other hand, warmer air temperatures carry more moisture and may increase the temperature difference between the Southwest and the eastern Pacific Ocean. The monsoon winds would then intensify and deliver more moisture to the region, theoretically increasing rainfall.

Speculating about future temperature, however, is far less uncertain. The Southwest almost surely will continue to warm, and this likely will delay the onset of flowering and decrease the total number of species in bloom if increases in rain do not accompany warmer temperatures.

Warmer temperatures mean soils are drier and dry out faster after rain events. More rain therefore is needed to compensate for increases in temperature.

"Increasing temperatures will likely cause plant diversity to decrease, all else being equal," Bertelsen said. "The hotter it is

the more rain it takes for plants to produce seeds."

While the numbers have been low through the first half of July, it's too early to tell how many species ultimately will bloom this summer.

"So far, this year reminds me of 2006, which also had a dry spring and a slow start," Bertelsen said. "But when the monsoon rains finally came, the plants sprouted like gangbusters."