# Viewpoints: Is Arizona facing a megadrought?

***Climate scientist: Are we in a megadrought? The answer may not be what you think (or why you should worry).***

The current drought in California, now in its fourth year, is getting the nation's attention and costing the economy many jobs and billions of dollars. Meanwhile, the whole Southwest, from California to Texas — with Arizona right in the center — has been in a much longer drought stretching back to 1999. Both droughts are the worst in over 100 years of rainfall measurements.

The longer drought centered on Arizona has reduced flows of the Colorado River by nearly 20 percent, lowered the biggest reservoirs in the country from full to less than half-full, killed off a vast expanse of piñon pine in the Four Corners, and contributed to severe wildfire risk unprecedented since Europeans first came to our state.

Our summers have grown longer and hotter, and our dust storms have become a topic of national news. Last spring, we narrowly escaped an official declaration of shortage on the Colorado River, which would have cut deeply into Arizona's allocation of water for the Central Arizona Project that brings water to many of our farmers and the cities of Phoenix and Tucson.

**What's a megadrought?**

Are we in a megadrought? As a scientist who studies Southwest drought, I face this question more and more often. The answer might not be what you think, but first let's review what a megadrought is, and why we should worry.

Megadroughts are variously defined as drought lasting multiple decades, being unlike anything we've seen since Europeans came to the region, or an event with unprecedented consequences for society. The threat is real. The history of drought preserved in tree rings reveals several multi-decade megadroughts in the last 2000 years. The most famous ones occurred during medieval times, and were likely linked to Native American abandonment of settlements across the Southwest. The longest Southwest megadrought yet documented occurred nearly 2,000 years ago and lasted over 50 years.

So, are we in a megadrought now? The best answer is not yet, but we will be unless we act soon. Fortunately, we still have a choice.

Our 15-year drought is still five years short of being multi-decadal, and careful planning

on the part of excellent water managers has preempted severe impacts. But if the current drought survives our coming wet El Niño winter and lasts another five years, odds are that the impacts will start to be unprecedented — serious water shortages will be a good bet, along with bigger severe wildfires, dust storms, and loss of vegetation in forests and deserts.

Five more years of drought and we'll likely cross the megadrought threshold while pumping our limited fossil groundwater like never before. Agriculture will be fighting against dwindling water availability. Perhaps most troubling, Arizona will have a hard job fighting the impression that our time in the sun has passed.

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**How the future might look (it's not pretty)**

A megadrought future is a grim one. But we can still get ahead of the problem and send the message to the world that Arizona knows what it's doing and is still a state with a strong economic future.

Dealing with the megadrought threat, and convincing the rest of the nation that we have a credible plan, requires that we understand what is driving the megadrought threat and what we can do about it. To understand why megadrought could be the future of Arizona, we need to acknowledge the one overwhelming reason that our current 15-year drought is our worst ever: this drought is the hottest we've ever seen.

Parts of Arizona and the Southwest have warmed more than two degrees in recent decades. This may not seem like a substantial change, but the increase has been enough to literally bake away spring snowpack in our headwaters, drying rivers at their source. The record warmth has outright killed whole vistas of trees and sucked forests dry, setting the stage for a growing number of record large severe wildfires. In California, the story is similar — record heat is making its drought the worst ever recorded.

If we don't address the role of warming temperatures in defining 21st century Southwest drought, we are condemned to a future of crippling hot megadrought. If the current warming trend continues, the best science indicates the odds of a hot megadrought in this century rise from about 10 percent to over 80 percent. If the current rate of warming continues, Arizona and its headwaters could be over 10 degrees warmer by the century's end.

**How Arizona can buy time**

See where the climate science takes us? Imagine you've visited cardiologist after cardiologist with an odd ache in your chest, and every one of these experts says you are on the verge of a heart attack, you need bypass surgery, and you need it fast. What climate scientist after climate scientist is saying is that the planet is warming, impacts will become crippling, and the worst can be avoided if we quickly reduce greenhouse gas production. The main reason for rapidly rising temperatures is the burning of fossil fuels, so job number one is to replace that practice with low-carbon energy sources like solar.

Arizona can help solve the climate change problem and we have a strong vested interest in doing so. We have vast untapped energy in our solar resources. Our state can become a net energy exporter, fuelling economic growth and jobs. This same shift to low-carbon energy is also the best way to avoid a future in which hot megadrought plunders the economic and environmental future of our state.

The fact that scientists understand the hot megadrought problem is good news for Arizona: we know what the challenge is, and we have enough early warning to join forces with other states of the Southwest, the nation, and beyond to reduce greenhouse gas emissions. By acting soon and seriously, our state solves the hot megadrought challenge,

expands major new solar-powered economic growth, and sends a clear message that Arizona is on top of the problem and is continuing to move forward.

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