

# Wolfe: Overcommitted water supply in a warmer, drier climate

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Accelerated depletion of groundwater in the Prescott Active Management Area (PrAMA) — as well as above the headwaters of the upper Verde River — began in the mid-1990s. Climate analysis for Yavapai County and the Southwestern states gives evidence of a transition to a warmer and drier climate at the same time.

Citizens and government officials should be concerned that our warming and drying climate is now contributing to a diminished water supply.

Groundwater depletion, or overdraft, occurs when the quantity of water leaving an aquifer exceeds the amount of water delivered to the aquifer. Water exits an aquifer via either groundwater pumping or natural discharge to springs, streams, and evapotranspiration. Recharge of the aquifer occurs largely from downward seepage of water from rain or snowmelt through streambeds.

The Arizona Department of Water Resources (ADWR) began estimating the overdraft in the PrAMA in 1985. From 1985 through 1995 the average annual overdraft was 2,608 acre-feet. An acre-foot can provide a year's supply of water for three Prescott-area homes. The average annual overdraft from 1996 through 2012, the year of ADWR's most recent analysis, was 13,173 acre-feet, five times the rate of the pre-1996 average.

Total overdraft of the PrAMA aquifer, 1985 through 2012, is estimated at 252,625 acre-feet and may represent as much as 5 to 8 percent of the groundwater stored in the aquifer. This large overdraft reflects the ever-increasing pumping of groundwater to supply thousands of new homes, and, since the mid-1990s, reduced natural recharge.

The U.S. Geological Survey Paulden streamgage is on the upper Verde River about 10 miles east of Paulden. It has recorded a protracted decrease in seven-day lowest annual flow, which is a simple proxy for estimating base flow, the groundwater component of streamflow.

Over the past 24 years, in concert with the accelerated depletion of groundwater in the PrAMA, the estimated base flow on the upper Verde River has decreased 10 cubic feet per second (7,245 acre-feet per year), or 40 percent. This reflects depletion of groundwater within the Verde River watershed above the Paulden streamgage.

Average precipitation in Yavapai County from 1996 through 2018 was about 10 percent less than the long-term average of 17 inches. This dry period coincides approximately with the current episode of uniquely persistent elevated temperature, about 2 degrees F in Yavapai County, that began in 1995 and has continued through 2018. These changes also coincide closely in time with the substantially increased groundwater depletion recorded in the PrAMA and at the Paulden streamgage.

Higher temperature, decreased precipitation, and decreasing groundwater in storage in our area have persisted for nearly a quarter century. Whether or not we call this climate change, it is essential for us to plan for a drier future and a less abundant water supply than we commonly envision.

City of Prescott Water Resource Manager Leslie Graser presents “WaterSmart Strategies for Living in Arizona’s Central Highlands” on May 11. Details at [www.cwagaz.org](http://www.cwagaz.org).

*Edward W. Wolfe, Ph.D., is chair of the Citizens Water Advocacy Group Education Committee, former chair of the Verde River Basin Partnership, and a retired USGS geologist.*