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Talk of the Town

Column: Predictions of groundwater and river declines

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Future water shortages in the southwestern U.S. have been a recent topic for discussion in the national news. Locally, Prescott and Prescott Valley are planning for the importation of groundwater from an area 30 miles to the north known as the Big Chino sub-basin (BC). Currently Prescott gets almost all of its water from wells located in Chino Valley (Little Chino sub-basin), where we are pumping far more than is sustainable. As our region continues to grow, the availability of water from the Chino Valley well field will decrease and the overdraft will grow.

Importing groundwater from the BC via an expensive pipeline could provide a short-term solution to a future water shortage, but we should ask about the long-term consequences of taking groundwater from one basin and transporting it to another. These consequences would include lowering the groundwater level in the BC, and decreasing the baseflow of the upper Verde River (baseflow is the groundwater-supplied component of streamflow). Without baseflow, a river is a dry wash with flow only from runoff after storm events. The upper Verde River is a vibrant recreational and ecological resource and the last continuously flowing river in Arizona.

To gain an understanding of changes that may occur due to the usage and movement of groundwater, scientists use computer models. The U.S. Geological Survey (USGS), in conjunction with the Arizona Department of Water Resources (ADWR), recently constructed such a model, known as the Northern Arizona Groundwater Flow Model (NARGFM). The model has been used throughout Northern Arizona, most notably to evaluate potential changes in the middle Verde River baseflow. In this column I discuss model results for the Big and Little Chino sub-basins and the baseflow to the upper Verde River.

To run the model, future groundwater usage and recharge data are required. These data preferably depend on carefully developed population and per capita water-use projections, which are currently unavailable. Instead, the USGS, in conjunction with the Verde River Basin Partnership (VRBP), developed several hypothetical, but reasonable, scenarios for the years 2006-2110, which included changing rates of groundwater pumping over time. The purpose of these scenarios is to demonstrate potential effects on the Verde River and local wells.

The first scenario assumes that all groundwater pumping remains unchanged from the measured 2005 rates for the time period 2006-2110. This model run calculates that the baseflow in the upper Verde River would decrease by 4.1 cubic feet per second (cfs) by 2110, as measured at the USGS Paulden streamgauge.

The second scenario adds a 3 percent per decade increase in groundwater pumping. This would cause an additional decline in baseflow of 4.7 cfs.

A third scenario considers the effect of importing the anticipated 12,000 acre-feet per year of groundwater

from the BC via the proposed pipeline (assuming a starting date of 2020). A further decline in baseflow of 4.5 cfs is calculated to occur.

With continued population growth, it is highly likely that in the future we will see both increased groundwater pumping and the construction of the pipeline. For this situation, a total decrease in baseflow of 13.3 cfs would result. Since the measured baseflow in 2005 was approximately 19 cfs, this would leave a baseflow of only 5.7 cfs in the upper Verde River by 2110. Because the flow at Perkinsville is normally less than 13 cfs, in 2110 we could expect lengthy dry spots in the river and serious ecological impacts.

We also need to be concerned with the 12,000 private and municipal wells in our region. The model results from the above future scenarios predict an estimated lowering of the groundwater level in our wells of 50 to 200 ft. Lower groundwater levels have already caused many shallow wells and springs to go dry, and many others will dry up or yield less water in the future.

The 100-year time frame used for these scenarios may seem like a long time. However, these declines have already begun, and efforts to reduce their harmful effects will take even longer. Therefore, regional planning to develop a long-term water management strategy that protects both the Verde River and our local groundwater supplies must begin now.

I will discuss these topics when I speak to the Citizens Water Advocacy Group (CWAG) on Feb. 14, along with Steve Mauk, Yavapai County Development Services Director, who will describe other Big Chino issues. See details at www.cwagaz.org.

Please submit your questions and comments to info@cwagaz.org.

Dr. Peter Kroopnick, a retired professional hydrogeologist and CWAG board member, has been running the USGS model since its release. A scientific paper with additional details of his work is available for download at www.cwagaz.org.

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