

A Plan to Mitigate the Effect of Prescott's Proposed Pumpage from Big Chino Valley on the Flow of the Upper Verde River—What Needs to Be Considered

By

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There has been legitimate public concern that the City of Prescott's (COP) proposed withdrawal of at least 8,717 acre-feet per year (af/y) of ground water from the Big Chino Valley will reduce ground-water flow into the upper Verde River (referred to as base flow) by an amount equal or nearly equal to the withdrawal. Since 1963, when measurement of the Verde River's flow began at a site near Paulden, base flow in the Verde River has averaged about 17,700 af/y. The loss of 8,717 af/y or some amount nearly equal to that would reduce this flow by approximately 49 percent. The issue is slightly more complicated than that, but even so, Prescott's proposed withdrawal would significantly reduce base flow in the upper Verde River. In response to this concern, the COP created a committee in 2004 to address possible mitigation of this reduction should the need arise. So far, however, a mitigation plan has not been developed.

In order for pumpage from the Big Chino Valley to reduce ground-water inflow to the upper Verde River, ground water from the valley must discharge to the river. Two reports (SGWC, 2004, 2005) prepared for the city of Prescott suggest that ground-water discharge from the Big Chino Valley to the upper Verde River is minimal. Another consultant report to the COP (Dishlip, 2004) states that "*most experts familiar with Big Chino Sub-basin do not believe that ground water withdrawals from the Project (the COP's proposed ground-water withdrawal) will have a direct and immediate effect on base flow discharges.*" The report goes on to say, however, that "*due to the complex geohydrology of this sub-basin (the Big Chino Valley) and the distance of the proposed well fields from the Verde River headwater springs, it is more likely that only after many years of pumping would any flow reductions actually be observed.*" These conclusions are, of course, contradictory; with one suggesting no impact from Prescott's proposed pumpage on the base flow of the upper Verde River, and the other indicating that the impact would only occur after many years following the initiation of ground water withdrawal.

In contrast to the above conclusions, three recent reports by the United States Geological Survey (USGS) state that ground water from the Big Chino Valley flows to the upper Verde River. According to these reports, this water constitutes the majority of the base flow of the upper 24-mile perennial reach of the river from the confluence of the Verde River and Granite Creek to Perkinsville. Wirt and Hjalmarson (2000) conclude that at least 80 percent of the upper Verde River base flow is derived from Big Chino Valley. Blasch and others (2006) report

that most of the base flow in the uppermost 0.2 mile perennial reach of the river below the confluence of Granite Creek with the Verde River is from Little Chino Valley; for the next 2 miles ground-water inflow to the river is from Little and Big Chino Valleys and from the western part of the Coconino Plateau; and, for the next 22 miles, ground-water discharge to the river is mainly from Big Chino Valley. Wirt (2005) concludes that the contribution of the Big Chino Valley to the base flow of the upper Verde River is between 80 to 86 percent whereas the contribution of Little Chino Valley is about 14 percent.

Given the conclusions of the USGS concerning the source of ground-water inflow to the upper Verde River, there can be no question that withdrawal of ground water from the Big Chino Valley will result in a loss of ground-water inflow from the valley to the upper Verde River by an amount that ultimately equals or nearly equals the water withdrawn by wells. The question isn't, if this loss will occur; the only question is the timing of the loss. In general a reduction in base flow will begin to occur sometime after pumping begins and increase over time until it equals or nearly equals pumpage.

An appropriate mitigation plan that would address the impact of Prescott's proposed withdrawal on the upper Verde River would begin with the concept that mitigation is required; it would then be followed by identification of the source of water for mitigation. The plan would also have to consider that, ultimately, the amount of water necessary for complete mitigation of the impact of Prescott's proposed withdrawal would have to equal the rate of withdrawal.

The initial impact of the proposed pumping will be to lower ground-water levels in Big Chino Valley, after which a reduction in base flow would begin. The second part of a mitigation plan would, as a result, require a prediction of the change in ground-water levels and the decline in base flow followed by establishment of a plan to monitor actual field conditions relative to the predictions.

The final part of the plan would be to initiate mitigation triggered by observed water-level declines and reduction in base flow.

Although the mitigation committee has been in place for about one and one-half years, the first and most basic component of mitigation, i.e., the identification of the source of water for mitigation has not been addressed. Dishlip (2004) suggested that because Prescott's proposed withdrawal would not immediately reduce the inflow of ground water to the upper Verde River, time exists in which Prescott can store effluent recharge in the Prescott Active Management Area, thereby building pumping credits that can be called upon later when they are needed for mitigation. This, of course, ignores the fact that the amount of effluent credits would ultimately have to equal the rate of pumpage from Big Chino Valley and, as a result, the COP would eventually run out of pumping credits.

Despite the existing failure to develop an adequate mitigation plan including identification of a source of water for mitigation, the COP and their partner, Prescott Valley, continue to state that their activities will not be allowed to impact the flow of the upper Verde River. As recently as April 21, 2006 Larry Tarkowski, city manager for Prescott Valley, stated: "*the Tri-City partners will mitigate any impact to the river. We are committed to that*" (Prescott Daily Courier, April 21, 2006). Tarkowski was unable to speculate on how mitigation would be accomplished, however, except to state that the well field could be moved further up valley. This, of course, does not solve the problem.

The second Southwest Groundwater report (SGWC, 2005) presents the results of an evaluation of the physical availability of Prescott's proposed pumpage from the Big Chino Ranch, located in the upper Big Chino Valley, and the effects of this pumpage on other users in the upper valley in terms of water level declines. These predicted declines have been accepted by the mitigation committee as the standard against which actual measurements of water-level changes will be evaluated.

Because the model is limited in extent to the upper Big Chino Valley, ground-water level declines in the middle and lower part of the Big Chino Valley and declines in the base flow of the upper Verde River are not predicted (Meyer and Wolfe, 2006). Thus, use of the model as a predictive tool is severely restricted by its limited areal extent and the fact that it does not address the problem of most concern, i.e., the potential reduction in base flow of the upper Verde River resulting from Prescott's proposed ground-water withdrawal. Even so, the mitigation committee has agreed on a ground-water level monitoring program in the upper Big Chino Valley that will allow comparison of model-predicted ground-water level declines to those that actually occur. This effort has been the basic thrust of the mitigation committee. There has been no discussion of measuring base flow of the upper Verde River or of trigger points and mitigation action to be taken if these points are reached.

To the present time then, the activity of the mitigation committee has been limited to establishing, on paper, a ground-water level monitoring network for the upper Big Chino Valley. In this regard, the COP has committed \$500,000 for construction of three wells in the upper Big Chino Valley from which geologic information will be obtained and water levels will be measured. Other existing wells from which water levels can be obtained have also been identified. Given the existing failure to identify the source of water for mitigation, the fact that mitigation will ultimately require a source of water equal to Prescott's proposed withdrawal, the lack of predictive information for the middle and lower part of the valley and for the potential reduction in the base flow of the upper Verde River, as well as the lack of trigger points, it's evident that a considerable amount of work remains.

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