

Verde River Background and Policy Assessment

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This document is intended to be used by Riparian Systems Consulting as a brief outline of the current status of the threats to the flow of the Verde River, especially in the Verde Valley, and of the legal and institutional framework that may contribute to those threats. It is not intended to be a comprehensive or definitive analysis, but to provide a common basis for discussion of these issues and stimulate creative dialogue. While this document does not provide detailed citations, the reader can refer to the **references** at the end or contact the author for a more detailed discussion of the issues.

Current Status of Flows

The Verde River's headwaters are a complex of springs located approximately 21 miles north of the City of Prescott, Arizona, in Yavapai County. Approximately 99% of their discharge originates in two groundwater basins, the Big Chino (~85%) and Little Chino (~14%), which cover a large area in north central Arizona. These springs create an initial headwaters base flow of approximately 20 CFS. The river then flows generally southeast from its origin, and is a losing stretch (loses flow) from the headwaters until it reaches another set of springs called Mormon Pocket, approximately 24 miles downstream. After Mormon Pocket, the river continues to collect both surface flows from tributaries and direct groundwater discharge. The river enters the Verde Valley in central Arizona just upstream from the Town of Clarkdale at about river mile 47. Clarkdale is the first sizeable community the river encounters. At this point, base flow is approximately 59 CFS in the summer and 75 CFS in the winter (see USGS stream gauges for a complete record). In the 42 mile trip through the Verde Valley, the river continues to gain flow from both tributaries and groundwater discharge, and leaves the Verde Valley at about 110 CFS in the summer months and 210 or so in the winter. The river reaches its first impoundment at Horseshoe Dam, about 150 miles from the headwaters. The river flows from Horseshoe Dam to Bartlett Dam and Lake, and then joins the Salt River below Bartlett Lake. The base flow of the Salt River is totally consumed by users in Maricopa County, and is generally a dry streambed from that point. The Verde river provides about 40% of the surface water delivered by Salt River Project to Phoenix, the nation's 6th largest city.

Threats to Flows

The flows from the headwaters springs have been declining for many years due in part to groundwater extraction in the Big and Little Chino basins, but also due to the long-term drought, which started about 15 years ago. It is unclear exactly which stressor causes how much decline, but it is safe to say that both have a major impact. The primary threat to the springs is the increasing groundwater extraction and consumption in their source basins.

In the Little Chino, where the City of Prescott and most of the Town of Prescott Valley lie, the Arizona Department of Water Resources (DWR) has declared that groundwater extraction exceeds natural and artificial recharge and the storage in the basin is in decline. Most of this area is inside the Prescott Active Management Area (PRAMA), one of five Active Management Areas (AMAs) in Arizona where DWR has some regulatory authority over groundwater use. Groundwater use in the Little Chino will continue to

increase with new residential development. Since about 14% of the discharge in the headwater springs originates in the Little Chino, it is likely that any further decline in storage in the Little Chino will manifest itself in a concomitant decline in spring flows.

Threats in the Big Chino basin, as in the Little Chino, are primarily the result of current and future groundwater withdrawals. The largest groundwater user in the basin is currently agriculture, but new residential development is quickly catching up. The area is an attractive place for new development due to the large amount of private land and the relative low cost of buildable acreage.

Although groundwater transfers from one basin to another are generally illegal in Arizona's AMAs, in 1991 special legislation was passed to allow the City of Prescott to extract water from the Big Chino basin and transport it into the Little Chino for consumptive use. After years of litigation and threatened litigation, the courts have awarded Prescott the right to import approximately 8,600 acre-feet (a-f) per year from the Big Chino. Coincidentally, this is approximately 50% of the annual discharge from the headwaters springs. According to USGS and DWR, every gallon of water withdrawn and not mitigated from the Big Chino will have a 1:1 impact on the headwaters spring. This means that if Prescott withdraws its full allotment, and fails to mitigate that withdrawal, it will reduce the springs' discharge by 50%. To date, Prescott has acquired the land (the Big Chino Water Ranch) that it will use to develop its well field, but has yet to build the pipeline that will transport the water.

However, the extraction of these 8,600 a-f is not the most serious threat to the headwaters. Since there is so much private, buildable land in the Big Chino, and since the Big Chino is not in an AMA, the potential for groundwater withdrawals by new residential users far exceeds Prescott's potential consumption. Developers have proposed plans for individual developments housing up to 65,000 people (Monument Ranch, Mort Fleischer, Recreation Corporation of America, 2002), though none has yet come to fruition, due to current economic conditions. If a development of that size were to be built (and the area could support several), the projected groundwater use would exceed 12,000 a-f/yr. The total water use of this one development added to Prescott's adjudicated right equal more than 20,000 a-f/yr., or more than 115% of the headwaters springs' base flow. This means that the first 24 miles of the Verde River could become an intermittent or even ephemeral stream.

In the Verde Valley, the major influences on flows other than natural evapo-transpiration (ET) are groundwater consumption and inefficient surface water diversions for irrigation use. Although the definitive studies are still incomplete, DWR has estimated that the groundwater consumption in the Verde Valley exceeds natural and artificial recharge. In other words, the basin is in overdraft. Current consumption for domestic and municipal uses in the valley currently exceeds 13,000 a-f/yr., serving a population of approximately 65,000 people. Agricultural surface water diversions often render short sections of the river at best unnavigable, and at worst, almost dry. The first such large diversion is at the foot of Tuzigoot National Monument, in Clarkdale. It is clear that any unmitigated increase in groundwater extraction in the Verde Valley will cause a 1:1 reduction in the flows of the Verde River in the Verde Valley. Population projections (Bureau of Reclamation, "CYHWRMS", 2010) are that the valley will be home to 180,000 people by 2050, and will need almost 30,000 a-f/yr. (an increase of 17,000 a-f/yr., or about 22 CFS of flow) of potable water to serve that population.

From the foregoing, it is apparent that the Verde Valley's water consumption poses an enormous risk to the Verde River's flows. The combined demand in the Big and Little Chino and the Verde Valley could easily top 50,000 a-f/yr., which is equivalent to a reduction in river flows of 39 CFS, roughly 70% of the

base flow of the river at Clarkdale. This potential reduction in flows would be exacerbated by surface water diversion for agricultural and domestic uses, rendering the Verde River intermittent for its entire course through the Verde Valley. These projections do not include any reduction in flows or recharge due to climate change.

The foregoing is a bleak assessment and could be discouraging, except for a few important considerations. The projections in this assessment have so far assumed that no intervening strategies are employed in the future to prevent these dire predictions from coming true. Hopefully, this is an incorrect assumption. There are a number of possible interventions and mitigations that are cause for optimism.

The most important and effective intervention will undoubtedly be reducing, mitigating or at least stabilizing demand for groundwater in the Verde River basin. There are several ways this could be done:

- a. Encourage water conservation, thereby reducing demand. This is perhaps the “low hanging fruit”, and can be very effective, but cannot solve the problem alone.
- b. Find ways to reduce outdoor watering in the basin. Currently, half or more of all water used in municipal systems is applied to water landscaping. Simply requiring drought-tolerant or native landscaping and in some cases rainwater harvesting could reduce this significantly.
- c. Regulate groundwater withdrawals in the basin with a core management goal being the preservation of Verde River flows. This can be done using government regulation (such as implementation of a voluntary AMA in the Big Chino and Verde Valley) or by voluntary market-driven approaches.
- d. Implement effective reuse and recharge of treated effluent from all municipal wastewater treatment plants. Currently very little effluent is reused or recharged in the Verde Valley, although both Cottonwood and Clarkdale are planning to do so.
- e. Implement programs designed to encourage lower water consumption, such as a “Conserve to Enhance” program.
- f. Address the “Legal and Institutional Considerations, Barriers to Success and Opportunities,” below.
- g. Retire historically irrigated lands in the Big Chino basin as a mitigation condition for groundwater pumping and dedicate any saved water to aquifer recharge.
- h. Encourage Prescott Valley, a rapidly growing community, to recharge effluent back into source basin (Little Chino) rather than Agua Fria basin, as it does now.

Certainly other strategies exist that are not mentioned above, and all of them should be considered and analyzed for effectiveness, legality, and practicability.

Legal and Institutional Considerations, Barriers to Success, and Opportunities

There are several legal roadblocks to the success of a meaningful plan to conserve Verde River flows. One of the most pervasive and entrenched is the fact that Arizona water law is a “bifurcated” system, wherein there is no recognition of the connection of surface water (such as a river’s flow) and groundwater. These two types of water are treated by completely different sets of laws. The system has been in effect so long that there is considerable equity and inertia in it, and changes will necessarily be

incremental and probably expensive. Changing Arizona's legal framework to a system of conjunctive management of surface and groundwater is a worthy, but daunting, task.

Another challenge is the fact that Arizona's surface waters rights have not yet been perfected by adjudication. In effect, surface rights in Arizona consist of innumerable claims of right with no real legal definition. This situation means that rights holders must defend their presumed rights against upstream users on a case-by-case basis and with no presumption of quantified rights. In Arizona, the adjudication of most of the Gila River basin (which includes the Verde River) has been underway since 1979, and it could take another 30 years to complete. While some states, like Oregon, allow their Water Resources Department to adjudicate surface rights, this is done in Arizona by the state's Superior Court system. Furthermore, the judge working on adjudication has a regular docket in addition to adjudication, which slows the process tremendously. Adjudication of rights is important because only when rights holders are assured of their quantified right do their rights reach their full economic value. In essence, until rights are adjudicated, they have little market value or incentive to conserve.

Added to the above challenge is the fact that groundwater in Arizona is unregulated except in AMAs. This means that outside an AMA, a landowner can drill a well and consume as much water as desired without restriction (other than the vague and never-applied doctrine of "beneficial use.") This makes it very difficult to regulate future development in areas outside AMAs. In the Verde River's case, only a small part of the watershed is in the Prescott AMA, and the vast majority of it is unregulated.

Arizona law does not encourage in-stream flow rights transactions, such as the lease or sale of surface rights and conversion of those rights to in-stream flows. While it is possible to apply for and be granted an in-stream flow right, to date these have been new rights and are, therefore, junior to any existing surface right. If transactions were possible that allowed conversion of existing surface rights to in-stream flows, this "prior appropriation" problem would not exist since the right would ostensibly retain its priority date when converted. Furthermore, if all claims were adjudicated and perfected, a legal framework could also prevent downstream users from simply diverting the increased flows facilitated by the transaction. Another issue is that in-stream flow rights can only be held by an entity of government, discouraging participation by the NGO sector.

Except in AMAs and when specifically adopted by individual counties or municipalities, Arizona does not effectively demand proof of adequate water supplies for proposed developments. Because of this, a developer can build a large housing development with virtually no guarantee that the residents will have water in the future, and with absolutely no assurance that their consumption won't infringe upon anyone else's or damage the environment (such as river flows). This means that developments can and are built in areas where groundwater supplies are already in overdraft. Unless counties and municipalities adopt the legal right to demand adequacy from developers, they have no right to limit development based on water availability or environmental impairment due to water consumption. To date, only a handful of Arizona's municipalities and a few counties have adopted this right. Clarkdale is the only community in the Verde Valley that has adopted this ordinance, and Yavapai County has not. There is a mechanism in Arizona state law allowing a new "voluntary" AMA to be formed by initiative. Such an AMA could define its own goals and parameters, and may be a viable option for future regulation of groundwater usage in the Verde Valley.

Summary

As stated at the beginning, this assessment is in no way a comprehensive examination of the current status and challenges facing the health and sustainability of the Verde River. The hope is that this very basic primer might serve to stimulate creative discussion about the challenges and opportunities that exist, and the discovery and implementation of new solutions. While the Verde River is the principle focus of this document, for the most part, the challenges are common to most of Arizona's rivers, and the solutions that benefit the Verde can also be implemented in other basins.

The result of efforts by American Rivers, The Nature Conservancy, The Walton Family Foundation, the Town of Clarkdale, and many others to increase the value of a healthy and sustainable river to its constituents will be to encourage and incentivize them to take the steps necessary to conserve the river. The Verde River is a healthy, vibrant, diverse natural ecosystem. If the flows of the Verde River are to be stabilized or even improved, steps like those outlined above must be embraced and implemented.

References

Most of the documents used in preparation of this paper can be found on the website at <http://www.verdevalley.org>.

Verde River Economic Development Study (VREDS): <http://verdevalley.org/VREDS%20Final%20Report-public-8-12-2011-2.pdf>

Sources of springs supplying base flow to the Verde River headwaters, Yavapai County, Arizona: <http://verdevalley.org/Sources%20of%20Springs%20Supplying%20Base%20Flow.pdf>

Policy Options for Water Management in the Verde Valley, Arizona: <http://verdevalley.org/Policy%20Ops%20for%20Water%20Mgmt%20Verde%20Valley.pdf>

Northern Arizona Regional Groundwater Flow Model: <http://pubs.usgs.gov/sir/2010/5180/>

The Verde River – A Cautionary Tale of Two Streamgages: <http://verdevalley.org/the-verde-river-a-cautionary-tale-of-two-streamgages-full-version.pdf>

Central Yavapai Highlands Water Resources Management Study (CYHWRMS) - Bureau of Reclamation, Yavapai County Water Advisory Committee (WAC), DWR: <http://www.co.yavapai.az.us/Content.aspx?id=35958>