



Wet Water and Paper Water in the Upper Gila River Watershed

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As one of Arizona's principal surface water systems, the Gila River has and will continue to be a valuable and highly sought after water source. The river, its tributaries, and underlying groundwater reserves have enabled a robust farming, ranching, and mining heritage, while providing a rich and diverse riparian landscape in an arid region. However, as much as these water resources have shaped the history of the watershed, a variety of legal, economic, and climatic uncertainties will undoubtedly – and potentially drastically – influence future water supplies. An understanding of the area's water limits and a broad-based effort to more efficiently manage water usage are critically needed to cope with these uncertainties and maintain a secure water supply to support community health and preserve the rural lifestyle so central to the region.

Water Rights in the Upper Gila

In Arizona, as well as other water-scarce Western states, surface water rights are governed by the doctrine of prior appropriation, a system commonly described by the phrase “first in time, first in right”. This state law establishes priority for water rights based on the date the water was first put to beneficial use, so that during drought those with the most senior water rights are satisfied before those with more junior rights. Surface and groundwater use in the Upper Gila River Watershed (Figure 1) are also affected by a number of state and federal laws, court orders, and Congressionally-mandated settlements, principally the 1935 Globe Equity Decree No. 59, the San Carlos Apache Water Rights Settlements Act of 1992, Arizona Water Settlements Act of 2004, and the ongoing Gila River Stream Adjudication,

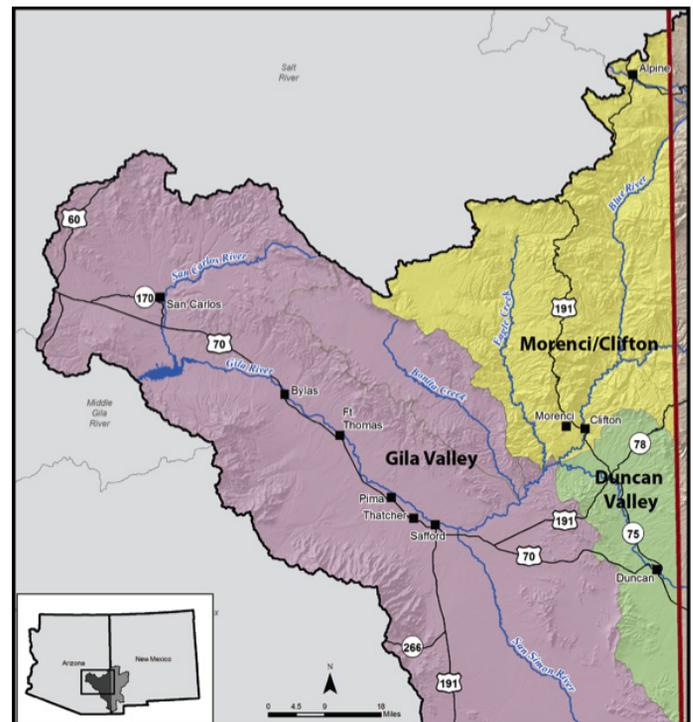


Figure 1: Upper Gila Watershed in Graham and Greenlee Counties with water supply and demand study areas. The watershed extends into Cochise County, however, that portion of the watershed is not included in this report.

which will adjudicate water rights not included in existing decrees or settlements.¹

The Globe Equity Decree governs the use of Gila River surface water from its headwaters in New Mexico to its confluence with the Salt River, west of Phoenix. The

¹ Other court decrees include the Doan and Jenkes decrees involving landowners, canal companies, and irrigation water users in the Safford Valley and the Ling Decree affecting the San Francisco River Valley and Duncan Valley.

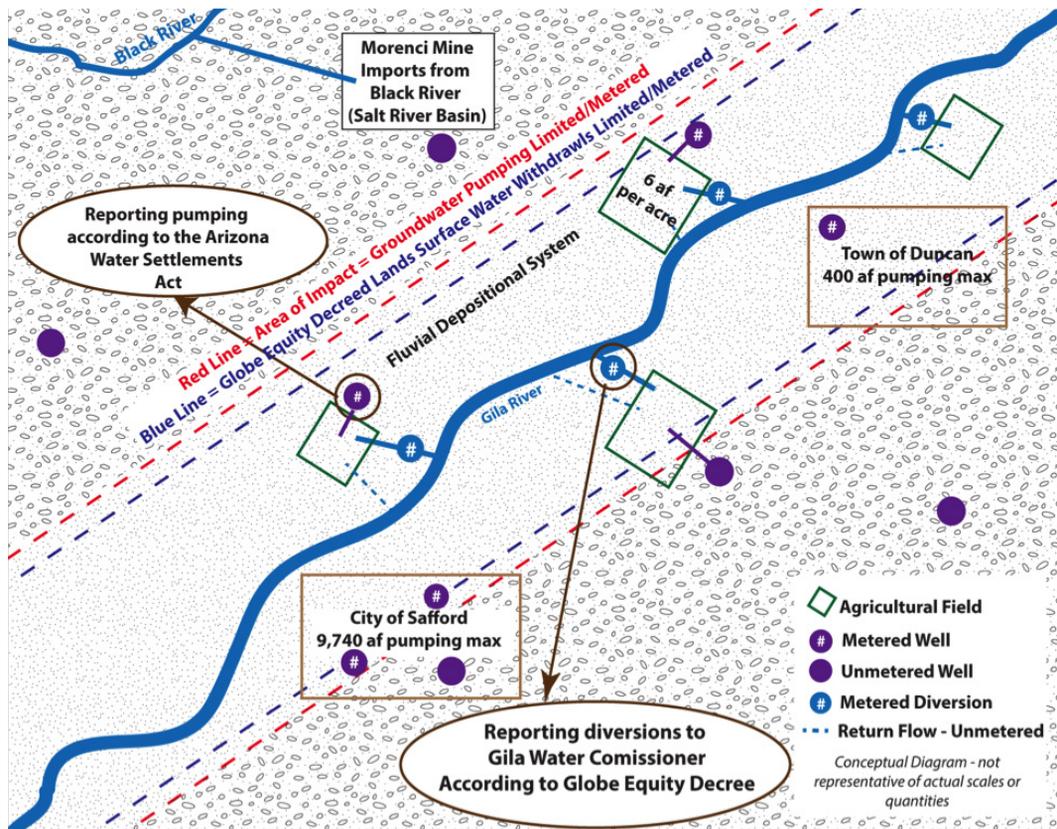


Figure 2: Conceptual diagram with depictions of typical legal constraints to water supply and demand

Notes: In addition to wells, the City of Safford also draws water from Bonita Creek, which is within the Upper Gila River Watershed but not subject to legal constraints. The Towns of Clifton and Morenci are not included in this figure because they are not subject to the Globe Equity Decree or Arizona Water Settlements Act. The Town of Clifton is supplied by wells, while the Town of Morenci draws its water from Eagle Creek.

Decree is administered by the federal court-appointed Gila Water Commissioner, who monitors the river's flow and reports monthly and annually on all diversions along this reach, including water diverted by the Gila River Indian Community (GRIC) and the San Carlos Apache reservations, as well as the Gila Valley and Franklin Irrigation Districts. The Arizona Water Settlements Act (AWSA) of 2004 (Public Law 108-451) addresses multiple water rights disputes throughout the state, including the settlement of GRIC water rights claims, which in turn impacts the quantity of Gila River water and groundwater available for use upstream of GRIC lands. Specifically, the AWSA limits groundwater pumping to six acre-feet of water per acre on lands subject to the Globe Equity Decree. Additionally, as part of the AWSA, 3,000 of acres of agricultural land have been retired in recent years. Many of the legal constraints discussed here are included on Figure 2, which provides a visual representation of the legal constraints and complexity of the legal system in the region.

Another aspect of the Arizona Water Settlements Act particularly relevant for the Upper Gila River Watershed is

that it grants New Mexico the right to divert an average of 14,000 acre-feet (AF) of Gila River water per year, through an exchange in which an equivalent amount of Central Arizona Project (CAP) water is delivered to the GRIC and the San Carlos Irrigation and Drainage District (SCIDD). The State of New Mexico determined in 2014 to undertake this diversion project, though the specifications and potential impacts of the project are currently under federal review. Although New Mexico can only divert water in years when there is at least 30,000 acre-feet of stored water in San Carlos Reservoir, among other limitations, it is likely that downstream users (aside from the GRIC reservation and the SCIDD, which will receive CAP water) will experience some level of increased stress on surface water and/or groundwater resources (US Department of the Interior and New Mexico Central Arizona Project Entity, 2015). The San Carlos Apache Tribe Water Rights Settlement Act of 1992 is significant in that it provided water rights for the Tribe to the Salt and Black Rivers and to CAP water, but did not impact rights under the Globe Equity Decree. Most of the water utilized by the Morenci Mine, operated by Freeport-

McMoRan, Inc. (FMI), is from the Black River according to a 50-year lease agreement pursuant to the San Carlos Apache Tribe Water Rights Settlement Act² (ADWR 2009).

A final water rights dispute with potential impacts to the watershed is the pending Gila River General Stream Adjudication. Involving over 38,000 parties, the adjudication requires all those that claim to have a right within the river system – including reserved water rights for public lands and Indian reservations – to file a statement of claimant, or risk losing their right. As the adjudication is still in progress, there is much uncertainty about how it could impact the rights of various water users in the watershed that are not already party to a decree or settlement such as the Globe Equity Decree or the AWSA (ADWR 2009). It is clear that the use of surface water and groundwater of the Upper Gila River Watershed is highly contested and strictly regulated, limiting availability of this already scarce resource.

Water Supply and Demand

In the fall of 2015 University of Arizona’s Water Resources Research Center (WRRC) conducted a water budget analysis in the Upper Gila River Watershed (Figure 1) to quantify the region’s available supply, relative to current and projected future demand. Data were gathered from various state and federal agencies to derive these supply and demand figures, including the Office of the Gila Water Commissioner, the Arizona Department of Water Resources, the Arizona Department of Administration, and the US Geological Survey. Once a draft water budget was developed, the WRRC spent several months verifying the current and projected data with experts from the watershed, including farmers, ranchers, Freeport McMoRan Inc. representatives, water utility managers, and local government officials.

Quantifying the region’s water supply proved to be a complex task requiring multiple strategies. Ultimately, an analysis was developed that presents both physically and legally available water. As many Arizonans know, and potentially have experienced first-hand, there can be a difference between “paper water” and “wet water”; one may have a legal water right, but whether that resource is actually available in the river or stream, or accessible from a groundwater well, may be a different story. The water supply data produced by WRRC quantify the estimated surface water and groundwater available in the watershed, compared with water that is legally available for use after accounting for regional water rights and obligations to downstream users. In addition to physically and legally available water, the amount of water recently available in the watershed was considered to account for the drought conditions of the past 16 years, as was a 20 percent reduction in water supply to account for uncertain impacts to water availability, such as persistent or worsening drought, the

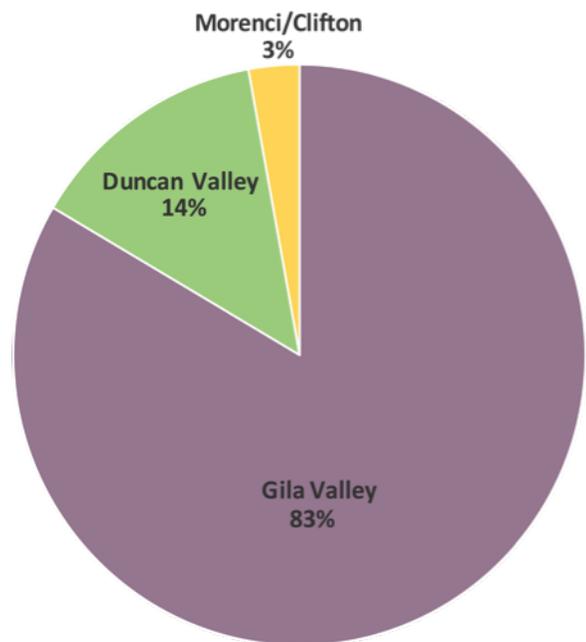


Figure 3: Percent of Total Water Demand by Region Based on Average Demand from 2009-2013

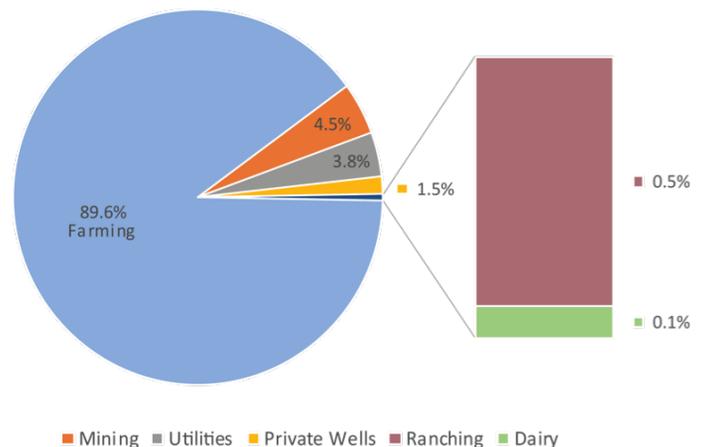


Figure 4: Water Demand by Water Use Sector Based on Average Demand from 2009-2013

proposed New Mexico diversion, or other legal constraints. These four estimations of water supply in the Upper Gila River Watershed allow stakeholders and water managers to analyze the regional water budget under various potential circumstances and plan accordingly.

Water demand for the region was quantified based on average demand between 2009-2013 (Figure 3). Figure 4 shows farming, mining, municipal, private well, ranching and dairy water demand. According to this baseline, farming

² FMI is also entitled to a total diversion of up to 250,000 acre-feet from the Black River under the 1944 Horseshoe Exchange Agreement. As of the beginning of 2009, Freeport-McMoRan had used almost 102,500 acre-feet of Horseshoe Reservoir credits (ADWR 2009).

diverted or pumped the most water in the Gila and Duncan Valleys, accounting for approximately 92% and 99% of water demand, respectively; the Morenci Mine was the most significant demand center in the Clifton area, representing 78% of demand. Once this baseline was established, demand was projected out to 2050 using Arizona Department of Administration’s Office of Employment and Population Statistics projections for population growth, and estimates of future use provided by representatives from local mining, farming, and ranching interests. The resulting demand projections were then alternately reduced and increased by ten percent to account for variations to the projected future baseline.

Once current and future estimations had been developed, the final step of the water budget analysis involved comparing supply and demand figures to assess whether there exists or may exist discrepancies between water legally and physically available and water demanded. With respect to 2050 supply-demand discrepancies, estimations for the Gila Valley suggest a range from a surplus of 35,000 AF to a deficit of 31,000 AF; the Duncan Valley suggests a range from a surplus of 20,500 AF to a deficit of 10,000 AF; and the Clifton/Morenci area suggests a surplus of 5,800 to 11,500 AF (Figure 5). Generally, water demand remained relatively constant through 2050 in each of the study locations. However, the wide ranges in these predictions in two of the three regions indicate a great amount of uncertainty about water supply over the next several decades, which

could be driven by multiple factors including possible legal constraints, shifting socio-economic conditions, and/or climate variability. A “worst case” water supply scenario (in which there exists the greatest deficit of locally available water) in the Gila Valley could involve a reduction of legally available water due to limitations established by the Gila River General Stream Adjudication, increased municipal water demand (due to population increase and/or limited water conservation efforts), and persistent or worsening drought conditions. In the Duncan Valley, the “best case” water supply scenario results in a water surplus because all surface water that is legally available is accessible to the community and there is little to no increase in demand because of population growth or limited water conservation efforts. In the Morenci/Clifton Region, best and worst case scenarios result in surplus because even assuming a worst case where there is a reduction in supplies, water demand increase for utilities and domestic uses, and historical maximum water use by the Morenci mine, the amount of water supply exceeds demand.³

Conclusion

Given the uncertainty of future water availability in the Upper Gila River Watershed and the inflexibility of the legal institutions governing water usage, the troubling prospect of a significant gap in supply and demand should spur broad-based, long-term planning. Several key stakeholders in the watershed are aware of the threats to their water

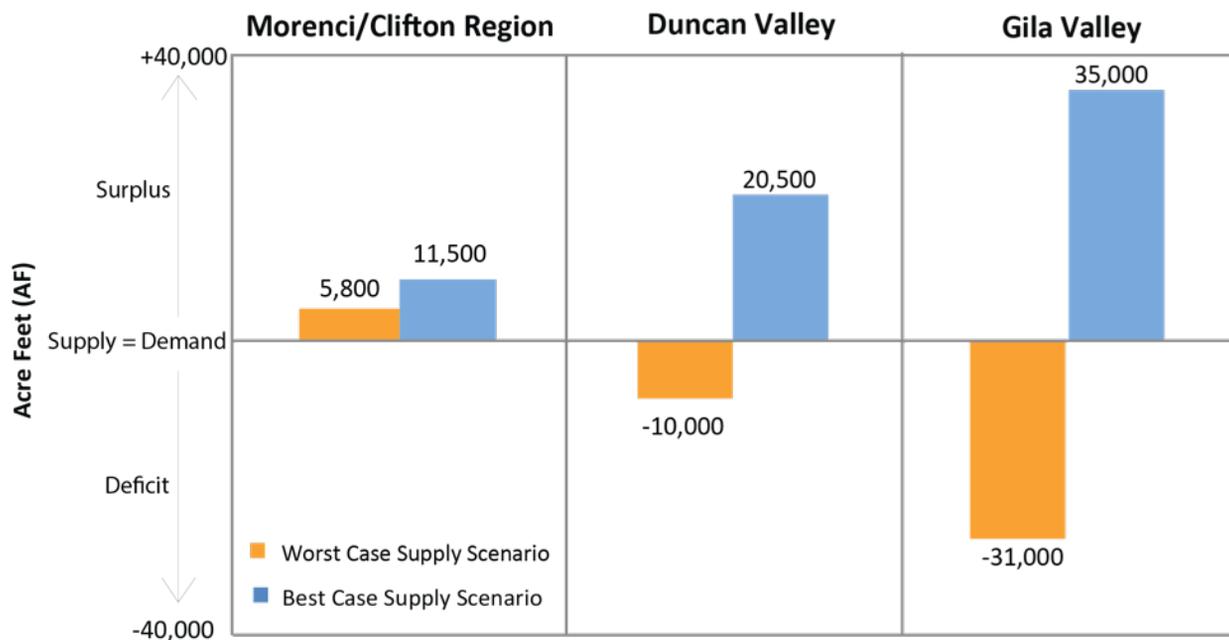


Figure 5: 2050 water supply estimation with “best case” and “worst case” scenarios

3 These figures are based on a detailed analysis of the range of water supplies and demands in the region. Generally, best case scenarios assumed all legally available water can be used and demand is similar to 2014. Worst case scenarios assumed at 20% reduction in all water supplies, 10% growth in demand by utilities and domestic wells, and either projected mining water use (for Safford mine) or historical maximum mine water use (for Morenci mine). In a high demand scenario only agricultural demand in the region is not assumed to increase because of the existing legal constraints on water use that restrict growth in water demand for agriculture.

supply and have begun taking action to address these concerns, including improvements in agricultural irrigation efficiency and increased municipal conservation efforts. However, in order to proactively address the threat of an uncertain water future, the first step must be to ensure a widespread awareness among the general public. Education will be critical not only to promote an understanding of water sources and limitations, but also to encourage an ethic of water conservation and watershed stewardship. Additionally, continued cooperation is necessary among the region's key water users to encourage information-sharing on water usage, create partnerships to address vulnerabilities to water shortages, and work toward a cohesive and sustainable water management plan that builds resilience across the entire watershed.

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