

Verde Planning Area

Background

The Verde Planning Area is located within portions of Yavapai and Coconino counties in the central portion of the State. Nearly all of the Verde Planning Area is located within the Verde River Watershed. The eastern portion of the Planning Area contains a small portion of the headwaters of the Agua Fria River. The Planning Area includes a large portion of the Verde River Groundwater Basin and the entire Prescott Active Management Area (AMA) Groundwater Basin, which is divided into two groundwater Sub-basins: Little Chino and Upper Agua Fria in the north and south, respectively. The primary population centers within the Planning Area are Prescott, Prescott Valley, Chino Valley, Camp Verde, Clarkdale, Cottonwood, and Sedona. The balance of the Planning Area has limited population, largely residing in several relatively small communities.



A large majority of the land within this Planning Area is federally owned and managed by the USDA Forest Service (Forest Service) (see *Figure P.A. 19-1*), including part of the Tonto, Prescott, Coconino, and Kaibab National Forests. Land uses are recreation, livestock grazing and timber production. The majority of the private lands are distributed in a checkerboard pattern in the northwestern portion of the Planning Area and the Prescott AMA Basin. A large block of land is federally owned and operated by the US Military as the Navajo Army Depot, located in the vicinity of Bellemont in the northeastern portion of the Planning Area. Land uses include National Guard training and army equipment storage. There are also numerous small private land in-holdings in all forests, largely along watercourses. Land uses include domestic, commercial, mining, livestock grazing, and limited irrigated agriculture. The majority of State Trust Lands are collocated with the private lands in the checkerboard in the northwestern portion of the Planning Area and Prescott AMA Basin. State Trust Lands are also located in the vicinity of Cottonwood and south of the Navajo Army Depot. Primary land use is livestock grazing. Other small parcels of land are owned by the US Bureau of Land Management (BLM), the Yavapai-Prescott Tribe, Yavapai Apache Nation, National Park Service (NPS), and the Arizona Game and Fish Department.

Water Supply Conditions

Groundwater

The Verde Planning Area is located in the Transition Zone Physiographic Province. The groundwater system within this mountainous terrain is housed in relatively thin alluvial aquifers, and limited volumes of groundwater flowing in fractured crystalline, sedimentary, and volcanic rock. The Mogollon Rim is a notable geographic feature of the Planning Area, the escarpment that defines the southern boundary of the Colorado Plateau and serves as the northeastern border of the Planning Area.

The Verde Planning Area includes the Prescott AMA, one of four original AMAs established upon enactment of the Groundwater Code in 1980. The AMAs were designated as requiring specific, mandatory management practices to preserve and protect groundwater supplies for the future. The management goal for the Prescott AMA is to reach, and thereafter maintain, safe yield by 2025, which is accomplished when no more groundwater is being withdrawn from the AMA than is annually replaced

by natural or artificial means¹. By statute (A.R.S. §45-555), the City of Prescott can withdraw and transport groundwater from the Big Chino Sub-basin into the Prescott AMA. The volume that can be transported pursuant to the City of Prescott's designation of Assured Water Supply is 8,067.40 acre-feet per year. In addition, cities and towns in the Prescott AMA are allowed to withdraw groundwater associated with historically irrigated acres in the Big Chino Sub-basin of the Verde River Basin and transport that water into the Prescott AMA, although that volume is yet to be quantified.

Water level trends in the Prescott AMA include areas of declining water levels in most of the Prescott AMA Basin and significant recovery of water levels in one area where a major change in municipal pumping patterns occurred (see *Figure P.A. 19-2*). In the northern part of the Little Chino Sub-basin, north of the Town of Chino Valley, water levels were observed to decline by about 20 to 30 feet since 1994. Water level declines in this area were caused mainly by groundwater pumping at the City of Prescott's Chino Valley well field and to local agricultural, minor industrial and domestic pumping. In the southwestern portion of the Little Chino Sub-basin, water levels were observed to decline by 10 to 60 feet, or more, in wells drilled in basin-fill and/or fractured bedrock formations. Water level declines in this area are primarily due to domestic and small water company pumping. One well's hydrograph, (illustrated in *Figure P.A. 19-3 - B-15-02 30DCB*) exhibits a water level decline approaching 100 feet between 1998 and 2012.

In the northern part of the Upper Agua Fria Sub-basin, water levels have recovered by roughly 200 feet in some deep municipal wells located in the Prescott Valley-Santa Fe well field (see *Figure P.A. 19-4 - B-14-01 10DDA*). Recoveries at the Santa Fe well field are due to reductions in pumping from this well field made possible by the construction and operation of several new municipal wells in the Prescott Valley-North well field. Water level declines were observed in most other portions of the central and northern sections of the Upper Agua Fria sub-basin.

Groundwater conditions in the northern portion of the Planning Area (Big Chino Sub-basin) have historically been variable (see *Figure P.A. 19-2*). Water levels generally rose in the central portion of the Sub-basin along Big Chino Wash in the area of the City of Prescott's proposed Big Chino Water Ranch. Water levels in the lower portion of the Big Chino Sub-basin showed minor declines in some wells located near Paulden. Water levels were stable in the Williamson Valley portion of the Sub-basin.

Water levels historically have declined in many areas of the central portion of the Planning Area (Verde Valley Sub-basin of the Verde River Groundwater Basin). In general, water levels have remained stable, or showed only minor overall fluctuations along the Verde River downstream of Camp Verde. Near Cottonwood and Clarkdale, water levels declined by 20 to 40 feet, or more, in many wells. The water level declines in this area are generally due to increased municipal and industrial pumping. Near Lake Montezuma, Rimrock, Red Rock, Sedona and Oak Creek, water levels generally declined from 1994 to 2009. Water levels increased in several wells measured in the Bellemont-Camp Navajo area over this timeframe.

¹ Pursuant to the 1980 Groundwater Management Act, each AMA was given a statutory management goal. The goal of the Prescott AMA is safe-yield defined in A.R.S. §45-561(12) as "...a management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial recharge in the active management area."

Water quality throughout the Prescott AMA is generally good; however, arsenic levels exceeding water standards have been found in several locations within the AMA and across remaining portions of the Planning Area. One NPL Superfund site, the Iron King Mine and Humboldt Smelter, near Dewey-Humboldt, has arsenic and lead contaminated soil and groundwater. In addition, the Planning Area has one Resource Recovery and Conservation Act (RCRA) site, Camp Navajo, near Bellemont, with both soil and groundwater contamination.

Surface Water

Major surface water features in the Verde River Watershed portion of the Planning Area include the Verde River, which flows southeast to south (*see Figure P.A. 19-5*). Big Chino Wash and Granite Creek are tributaries to the Verde River in the northwest portion of the Planning Area. Several tributaries, including Sycamore Creek and Oak Creek feed the Verde from the north, draining the Mogollon Rim. The Verde River is perennial throughout its length. Springs feed the Verde headwaters near Paulden, below Sullivan Lake Dam. The Verde River flows through two reservoirs, Horseshoe and Bartlett Lakes south of the Verde Planning Area in the far southern portion of the Verde River Watershed, which are important flood control and water supply structures for the Phoenix area (part of the Salt River Project). Stream flows can be substantial and several streamgauge stations on the Verde and its tributaries have reported annual maximum flows under flood flow conditions exceeding 1,000,000 acre-feet per year.

The Agua Fria River-Lower Gila River Watershed is located within the Prescott AMA Basin. Major surface water features include the Agua Fria River and its tributary, Lynx Creek. There is one active streamgauge station along the Agua Fria River within the Prescott AMA Basin. The minimum and maximum annual flow in the Agua Fria River near Humboldt was 1,335 acre-feet (2003) and 10,911 acre-feet (2005), respectively. The Prescott AMA Basin also has significant local surface water resources, including the headwaters of the Agua Fria River. Flows from Granite Creek, Willow Creek, and Del Rio Springs in the AMA contribute significantly to the flow of the Verde River, whose headwaters is located just outside the boundary of the Prescott AMA Basin at Sullivan Lake. Much of the Verde's base flow is dependent on these creeks and springs.

Reclaimed Water

The majority of the reclaimed water produced is generated at several municipal and privately-owned wastewater treatment facilities. Three communities (Prescott, Prescott Valley, and Chino Valley) in the Prescott AMA have permitted reclaimed water recharge facilities. Reclaimed water is also utilized both directly and through recharge and recovery for multiple golf courses, a park, and a sand and gravel operation. Principal reclaimed water disposal methods in the remaining portions of the Planning Area include irrigation, discharge to a watercourse, evaporation ponds, and golf course irrigation.

Ecological Resources

A number of listed threatened and endangered species may be present in the Verde Planning Area. The Verde River and associated riparian vegetation provide wildlife and fish habitat (*see Figure P.A. 19-5*). The Verde River riparian zone is a critical flyway for migratory birds and supports a high density of breeding birds. Native fish populations in the upper Verde River are among the most diverse in Arizona. Page Springs State Fish Hatchery is located along the banks of Oak Creek and is the state's largest cold water fish hatchery. Watson and Willow Lakes, formed by impoundments on Granite Creek and its tributary Willow Creek, are listed as Important Bird Areas.

The Verde Planning Area has a significant number of acres under federal ownership, including National Forest and all or portions of 12 Wilderness Areas². Wilderness areas are designated under the 1964 Wilderness Act to preserve and protect the designated area in its natural condition. Two National Monuments that protect prehistoric dwellings are located in the Planning Area - Montezuma Castle and Tuzigoot National Monuments are small sites containing cliff dwellings or pueblos. Additionally, two streams in this Planning Area are designated as Wild and Scenic Rivers. Congress adopted the Wild and Scenic Rivers Act in October 1968 to preserve selected rivers that possess "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values" in their free-flowing condition for the benefit of present and future generations. About 40 miles of the 170-mile long Verde River has been designated a Wild and Scenic River. The Scenic River Area begins about six miles south of Camp Verde and extends to the boundary of the Mazatzal Wilderness; a reach of 18.3 miles. South of this reach, the Wild River Area continues for another 22.2 miles to the Verde's confluence with Red Creek. Under the Act, the river area must be managed in a manner that protects and enhances its "outstandingly remarkable values."

Approximately 1,000 acres of land at the headwaters of the Verde River are protected by the Arizona Game and Fish Department and The Nature Conservancy. These lands include the Verde River Springs Preserve (TNC) and the Upper Verde River Wildlife Area (AZGF). Oak Creek, including the West Fork of Oak Creek in the Verde River Basin, is designated by ADEQ, pursuant to A.C.C. R18-11-112, as a "unique waters," having exceptional recreational or ecological significance and/or providing habitat for threatened or endangered species.

Water Demands

Table P.A. 19-1, below, presents the baseline and projected water demands for the Verde Planning Area. Municipal use is the largest demand sector today and is expected almost double by the year 2060. Industrial uses related to turf irrigation for golf courses is also expected to increase by up to 25 percent by 2060. A significant increase related sand and gravel operations is also anticipated in the future. Mining uses are projected to increase although is contingent on the availability of productive ore bodies.

Characteristics Affecting Future Demands and Water Supply Availability

General Stream Adjudication

The general stream adjudication is a judicial proceeding to determine or establish the extent and priority of water rights in the Gila and Little Colorado River systems. The Verde River is a tributary to the Gila River and, therefore, is part of the Gila River adjudication proceedings. Over 84,000 claimants and water users are joined in the Gila River Adjudication that will result in the Superior Court issuing a comprehensive final decree of water rights. Until that process is complete, uncertainty regarding the extent and priority of water rights in this Planning Area will make it difficult to identify and execute strategies for meeting the projected water demands.

² Juniper Mesa, Apache Creek, Granite Mountain, Sycamore Canyon, Red Rock-Secret, Woodshoot, Munds Mountain, West Clear Creek, Wet Beaver Creek, Cedar Bench, Pine Mountain, and Matatzal Wilderness Areas.

TABLE P.A. 19-1 Projected Water Demands (in acre feet) – Verde Planning Area

Sector	2010	2035	2060
Agriculture	25,362	23,844	23,844
Dairy	0	0	0
Feedlot	0	0	0
Municipal	33,886	54,265	65,909
Other Industrial	567	567	567
Mining	0		
High		4,000	4,000
Low		1,000	1,000
Power Plants	0		
High		22	28
Low		16	19
Rock Production	1,070		
High		4,019	4,883
Low		1,674	2,035
Turf	3,366		
High		4,013	4,217
Low		3,509	4,223
Total (High)	64,251	90,730	103,448
Total (Low)	64,251	84,876	97,597

Unresolved Indian Water Rights Claims

Resolution of the water rights claims of the Yavapai-Apache Nation is being discussed through a possible settlement. Until these claims are quantified and settled, uncertainty regarding the extent and priority of water rights in this Planning Area will make it difficult to identify and execute strategies for meeting the projected water demands.

Prescott AMA

A portion of this Planning Area includes the Prescott AMA, which has a statutory management goal pursuant to the 1980 Groundwater Management Act to achieve safe-yield by 2025. Although current state law requires new growth in the Prescott AMA to be consistent with the management goal of safe-yield, many existing uses that were in place prior to the declaration that the AMA was out of safe-yield in the late 1990s have allowable groundwater pumping volumes in excess of the safe-yield volume. Additionally, the use of domestic/exempt wells³ is not subject to AMA management requirements. Exempt well pumping represents a significant percentage of water demand (approximately 25 percent) in the Prescott AMA Basin. This means that, under current regulations, groundwater overdraft may continue and could increase above current rates.

³ Exempt wells are defined as wells with a pump capacity of not more than 35 gallons per minute.

Groundwater is the primary water source within the Prescott AMA, there is no direct access to CAP water and surface water supplies are limited or inconsistently available. Although the statutes allow for the importation of groundwater from the Big Chino Sub-basin of the Verde River Groundwater Basin and the City of Prescott has demonstrated a Designation of Assured Water Supply for future uses of this supply, there has been significant public opposition to this project. Prescott is now working on a mitigation strategy that includes a monitoring and modeling study of the potential impacts of using this supply in cooperation with SRP. The outcome of those studies will be important to identify the long-term availability of this supply to meet the needs of the AMA.

Downstream Water Demands

The Verde Planning Area contains a portion of the watershed that is essential to the Phoenix area - through the Salt River Project. Verde River water, which originates in this Planning area and stored in the Verde River reservoirs, is primarily allocated for use outside of the Planning Area. Several court determinations govern surface water supply availability in the Planning Area. The Verde Ditch Decree (1909) proportionately divided ownership and maintenance responsibilities of the Verde Ditch, located along the Verde River near Camp Verde, without reference to a priority date or use. It also stipulates that water in the lower portion of the Ditch be one third of the flow of the upper portion to ensure adequate supplies for all ditch owners. The Kent Decree (1910) determined that almost 240,000 irrigable acres in the Salt River Valley (Basin and Range AMAs Planning Area – Phoenix AMA Groundwater Basin) have a right to waters of the Salt and Verde rivers and included certain tribal provisions, but did not establish rights along the Verde River within the Verde Planning Area. The Benson-Allison Decree (1917) concerns lands generally located downstream of the Kent Decree lands in the Phoenix AMA that are entitled to divert water from the Salt, Agua Fria and Gila rivers. Management of this watershed for forest health and water supply protection and development is important to ensuring a secure water supply for the Phoenix area, while at the same time balancing the needs of the water users in the Verde Planning Area.

Wildfire

Several years of drought, combined with high tree densities, resulted in the largest outbreak of pine bark beetle populations ever recorded in Arizona from 2002 through 2004. This outbreak killed millions of piñon and ponderosa pine trees. Data from aerial surveys recorded 2.1 million acres of piñon-juniper woodland and 1.3 million acres of ponderosa pine affected in Arizona and New Mexico during that period.

Wildfire risk increases with the number of dead trees in the landscape, which provide fuel for fires. The Cave Creek Complex Fire (2005) burned 243,800 acres in the Verde River Basin and adjacent areas in east-central part of the Agua Fria Basin and Basin & Range AMAs Planning Area (Phoenix AMA). In the Southwest, fire can be among the most significant watershed disturbance agents, particularly influencing peak stream flows. Wildfire and drought can result in vegetative changes in the Planning Area with implications for runoff, infiltration and the quantity and quality of downstream water supplies.

Protected Species and Habitat

The presence of a listed species and protected habitat may be a critical consideration in water resource management and supply development in a particular area.

Strategies for Meeting Future Water Demands

Resolution of Indian and Non-Indian Water Rights Claims

Efforts to complete the Yavapai-Apache Tribe's claims as well as the Gila River General Stream Adjudication is essential to not only provide a secure water supply for the tribe, but also to provide long-term certainty for water users in Arizona dependent on water supplies from the Gila River. A comprehensive focus on what is needed to complete the Adjudication is essential and could help provide guidance to ADWR so adequate funding can be identified and obtained to complete the necessary technical work to support completion of this process.

Watershed/Forest Management

Watershed management practices aimed at increasing watershed yield have been evaluated in Arizona, showing opportunities for success. Due to the significant acreage of forested land in this area, continuation of this process and implementation of safe and effective strategies are important to water users within and outside of this Planning Area. Combining efforts with other management initiatives (such as the Four Forest Restoration Initiative) may be a cost-effective way to advance this option and can provide multiple healthy benefits to this Planning Area and those dependent on its resources. The Four Forest Restoration Initiative (4FRI) is a collaborative effort to restore forest ecosystems on portions of four National Forests - Coconino, Kaibab, Apache-Sitgreaves, and Tonto - along the Mogollon Rim in northern Arizona. The vision of 4FRI is restored forest ecosystems that support natural fire regimes, functioning populations of native plants and animals, and forests that pose little threat of destructive wildfire to thriving forest communities, as well as support sustainable forest industries that strengthen local economies while conserving natural resources and aesthetic values⁴.

Weather Modification

Weather modification, or cloud seeding, is a potential strategy to either augment local water supplies or mitigate the impacts of groundwater development and should be explored in this Planning Area.

Reclaimed Water Reuse

Reclaimed water has been an important source of supply in this Planning Area. However, many areas are still reliant on septic systems, which reduce the amount of water that could be reclaimed and reused. In order to meet the long-term water needs in this Planning Area, efforts should focus on continuing to maximize the use of reclaimed water for non-potable uses and exploring and implementing options for direct potable reuse. Additionally, moving customers currently on septic systems, where practical, to centralized reclaimed water systems, converting lagoon-based mechanical treatment, and using artificial recharge in the winter months to store excess reclaimed water supplies will help to address future water needs.

Enhanced Stormwater Recharge

Local efforts are underway to evaluate the feasibility of increasing locally available water supplies through modification of stormwater management systems to increase aquifer replenishment. If successful, these efforts may increase the efficiency of local groundwater recharge, capturing flows that would, without these efforts, leave the Basin as flood flows.

⁴ <http://www.4fri.org/>

Local efforts are focused on technical feasibility. There are concerns expressed by some surface water right holders that inhibiting flows that otherwise would have entered the surface water system may reduce the water availability of supplies to which they have the rights. To address these issues, in 2012 the Arizona legislature passed House Bill 2363 establishing a Joint Legislative Study Committee on Macro-Harvested water to evaluate the issues arising from the collection and recovery of large-scale harvested water. The process to evaluate this program will be important in determining whether or not these projects can result in significantly enhancing water supplies beyond what is currently available for future uses.

Water Management

Currently, the Prescott AMA is the only area with water management requirements that include limitations on groundwater mining, assured water supply requirements for new development, and mandatory implementation of water conservation requirements for municipal, industrial and agricultural water users. While, many municipal water providers have implemented their own water conservation programs and the City of Clarkdale has adopted an ordinance that requires new development to demonstrate a 100-year adequate water supply (*see Appendix III, specifically Statewide Water Advisory Group recommendations*), groundwater mining is occurring in this Planning Area. Outside of the Prescott AMA there are no requirements for industrial or agricultural water users to meter and report their water use or reduce their dependence on groundwater supplies and the significant reliance on small exempt wells throughout the Planning Area continues to stress the groundwater system. Additionally, significant concerns exist in the community regarding the impacts of groundwater mining on the Verde River, which is a very important to the local economy. Continued reliance on groundwater supplies, and the impacts of long-term groundwater mining, may highlight need for State or local management of the existing supplies beyond the Prescott AMA boundaries.

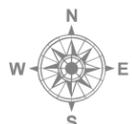
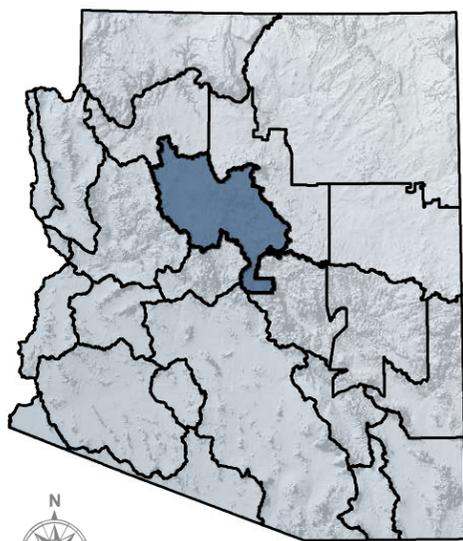
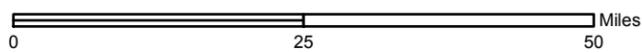
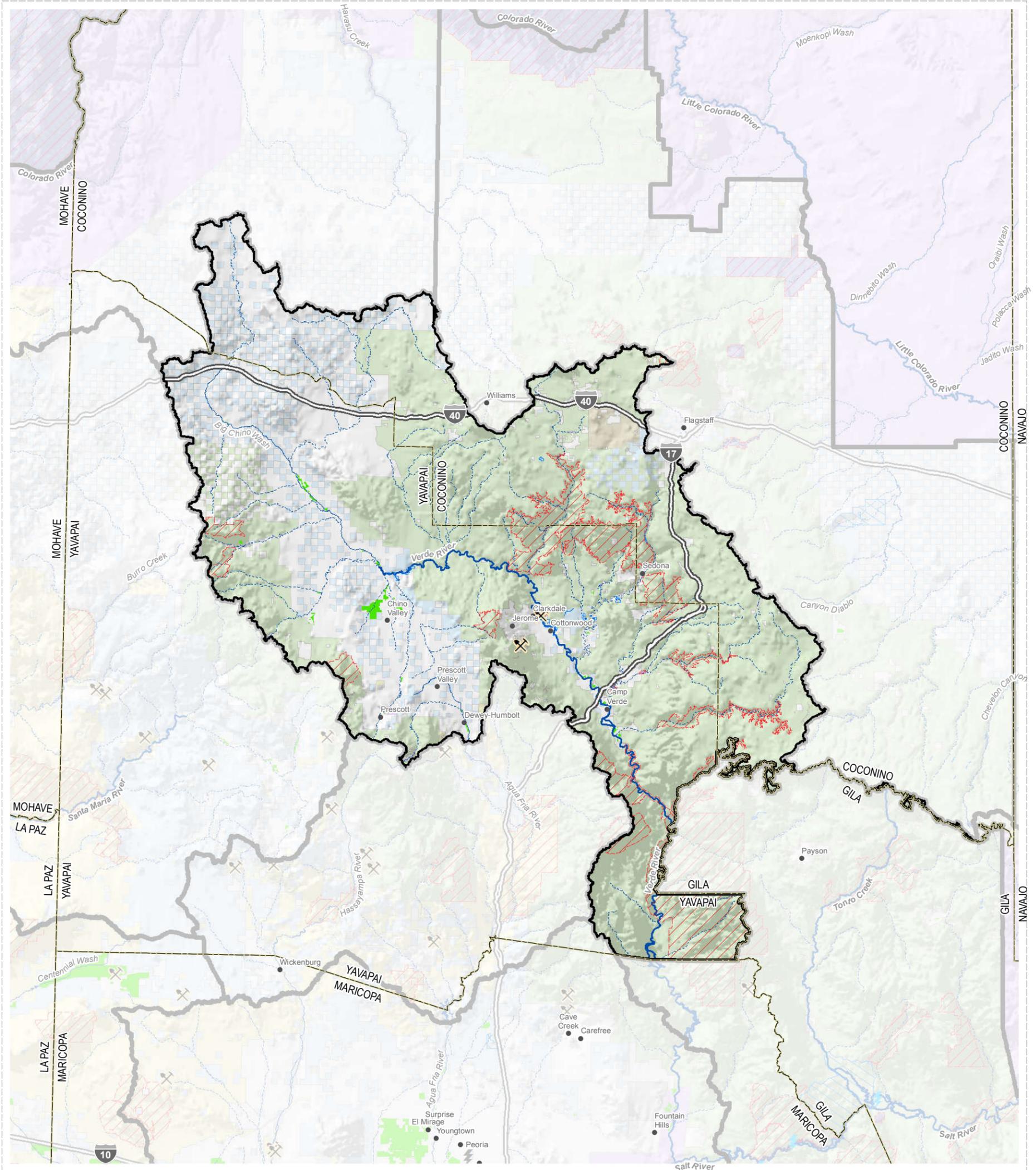
Importation

The projected growth in this Planning Area will continue to put stress on the existing limited water supplies. The extensive sensitive ecosystems in this Planning Area will limit the desire and ability to fully utilize resources in this area. While maximizing the direct and indirect use of reclaimed water will alleviate some of this pressure, if these growth projections and the demands associated with this increase are to be realized, importation of water from outside of this area is necessary. The transfer of water to the Prescott area from the Big Chino Sub-basin needs to be thoroughly analyzed and that process is currently underway.

Water transfers from other areas of the State could reduce the imbalance, specifically groundwater from the Harquahala INA, but this may not be a permanent solution.

A more permanent long-term solution may be participation in a seawater desalination plant, either on the Pacific Ocean or in the Sea of Cortez in conjunction with an exchange of Colorado River supplies with an entity that receives water from the Colorado River. To access this supply, a pipeline would have to be constructed to deliver water into the Planning Area. Alternatively, an exchange of Verde River water for the imported water could be considered, but has not been successful in the past due to environmental compliance.

NOTE: Because GIS data for this project were acquired from multiple sources employing different land base grids and varying accuracy standards, some inconsistencies were encountered. The user is responsible for understanding the accuracy limitations of GIS data layers and is responsible for the results of any application of the data for other than their intended purpose.



MAP LOCATION
(Planning Area Boundaries)

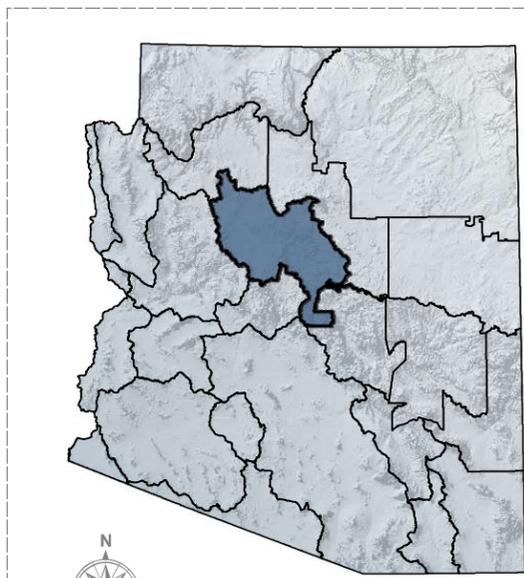
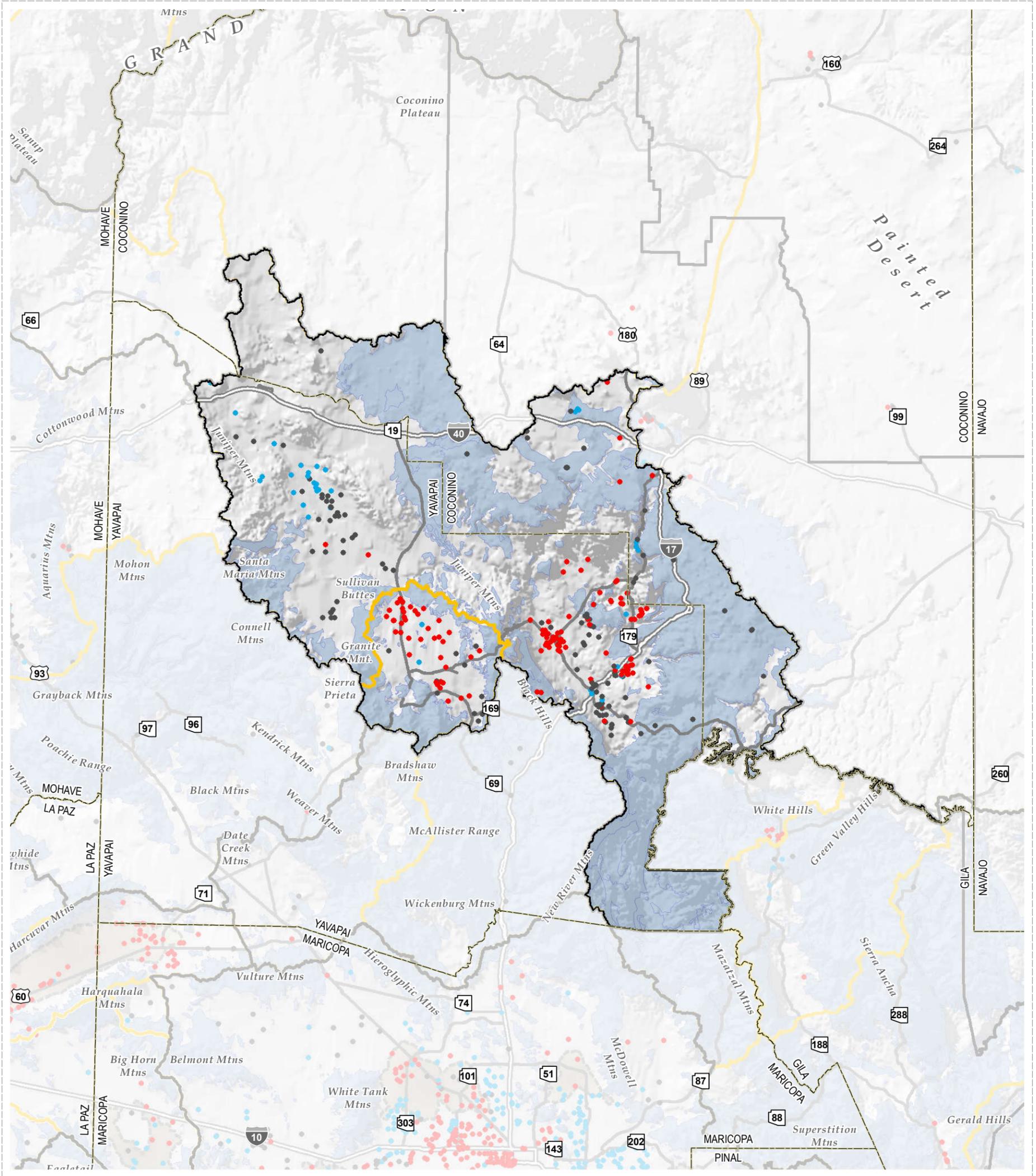
- Planning Area (ADWR)
- State (ALRIS)
- County (ALRIS)
- River or Stream (ASLD)
- Interstate (ADOT)
- Population Center (GNIS)
- Mine (ADMMR, ADWR)
- Hydroelectric Power Plant (ADEQ, ADWR)
- Thermoelectric Power Plant (ADEQ, ADWR)
- Agriculture (SWReGAP, 2004)
- Federal Conservation Land (USFS, BLM, NPS)
- State Managed Conservation Land (AZGFD, AZSP)
- BLM Land
- National Forest
- National Park
- Military Reserve
- Private and Other Land
- State Trust Land
- Tribal Land



Verde Land Ownership

Figure P.A.19-1

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(Planning Area Boundaries)

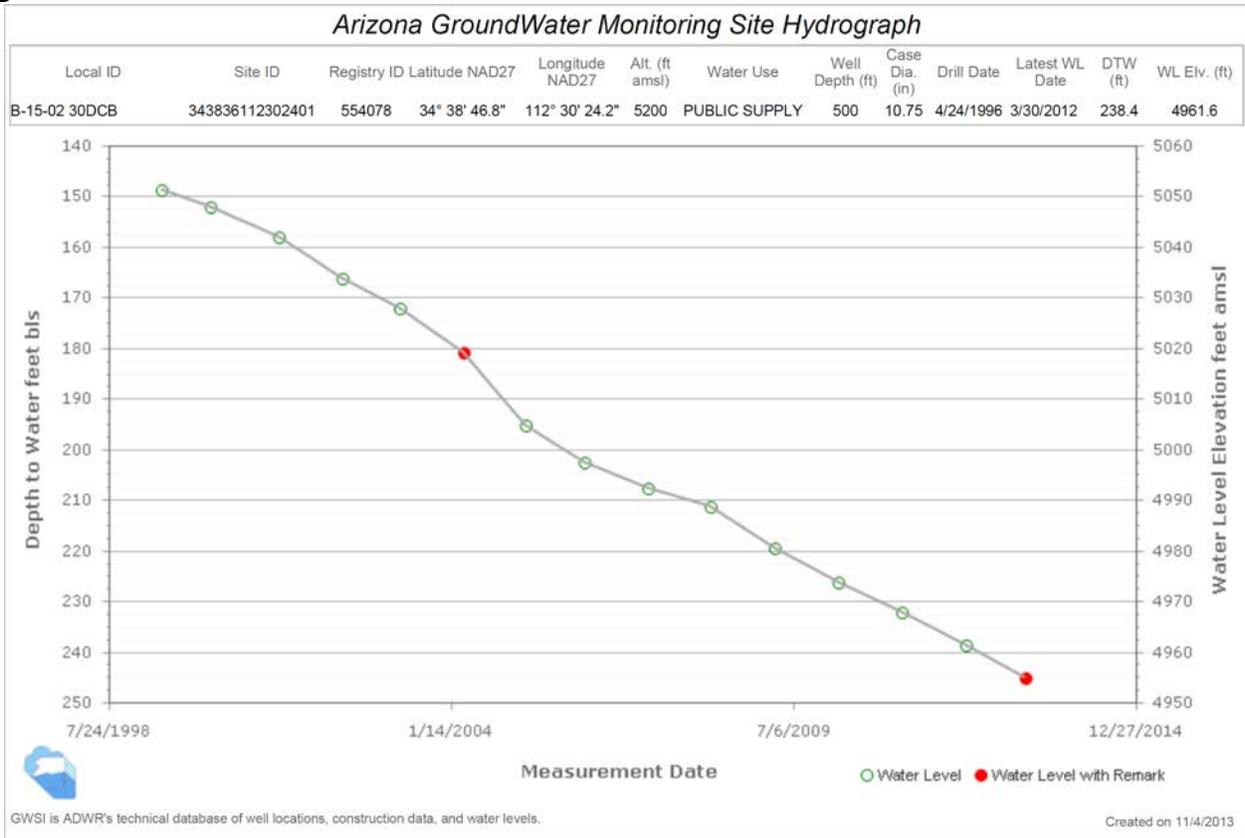
- Planning Area (ADWR)
 - State (ALRIS)
 - County (ALRIS)
 - Groundwater Basin (ADWR)
 - Area of Active Land Subsidence (ADWR)
 - Hard Rock Geology (AZ Bureau of Mines, UofA)
 - Interstate (ADOT)
- Recent Water Level Change * (1990's through 2000's)
 - Minor WL Change +5' to -5'
 - Negative
 - Positive
- * Data provided by ADWR



Verde Groundwater Hydrology

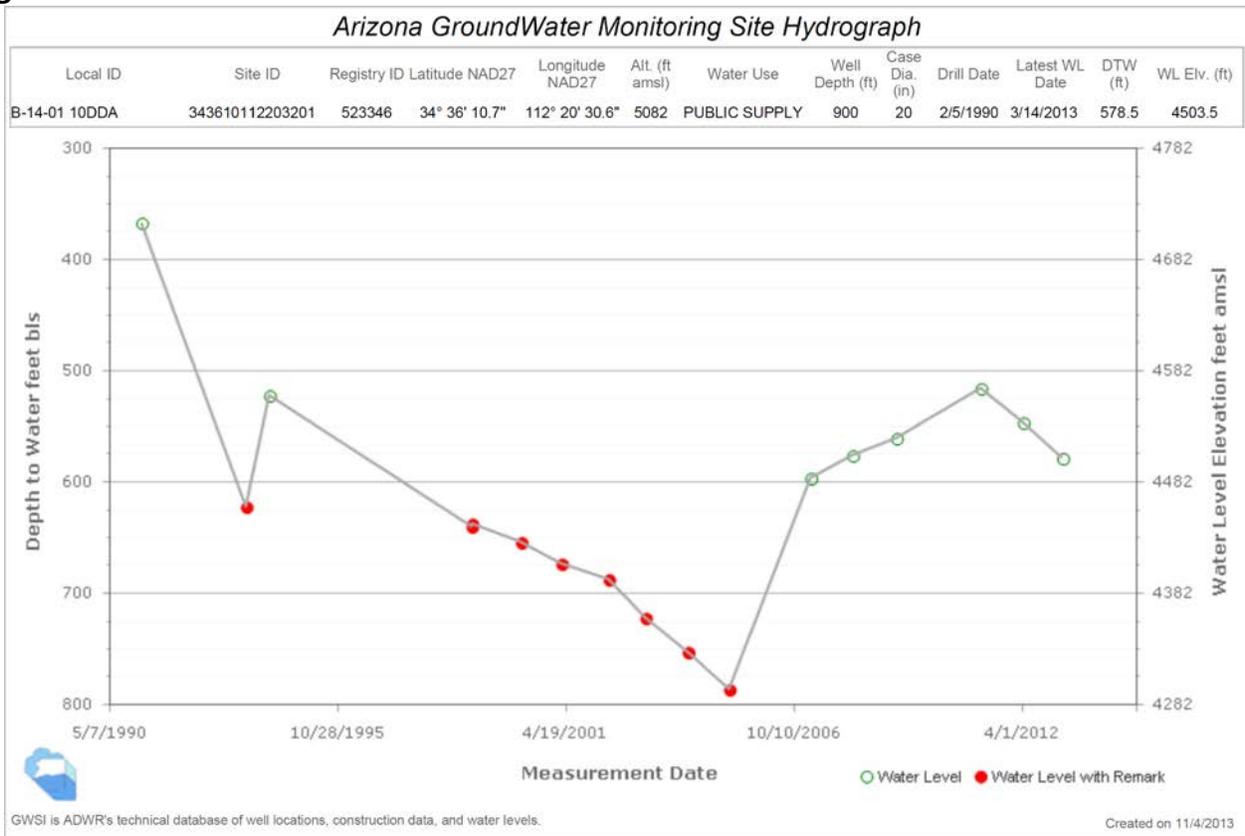
Figure P.A.19-2

Figure P.A.19-3



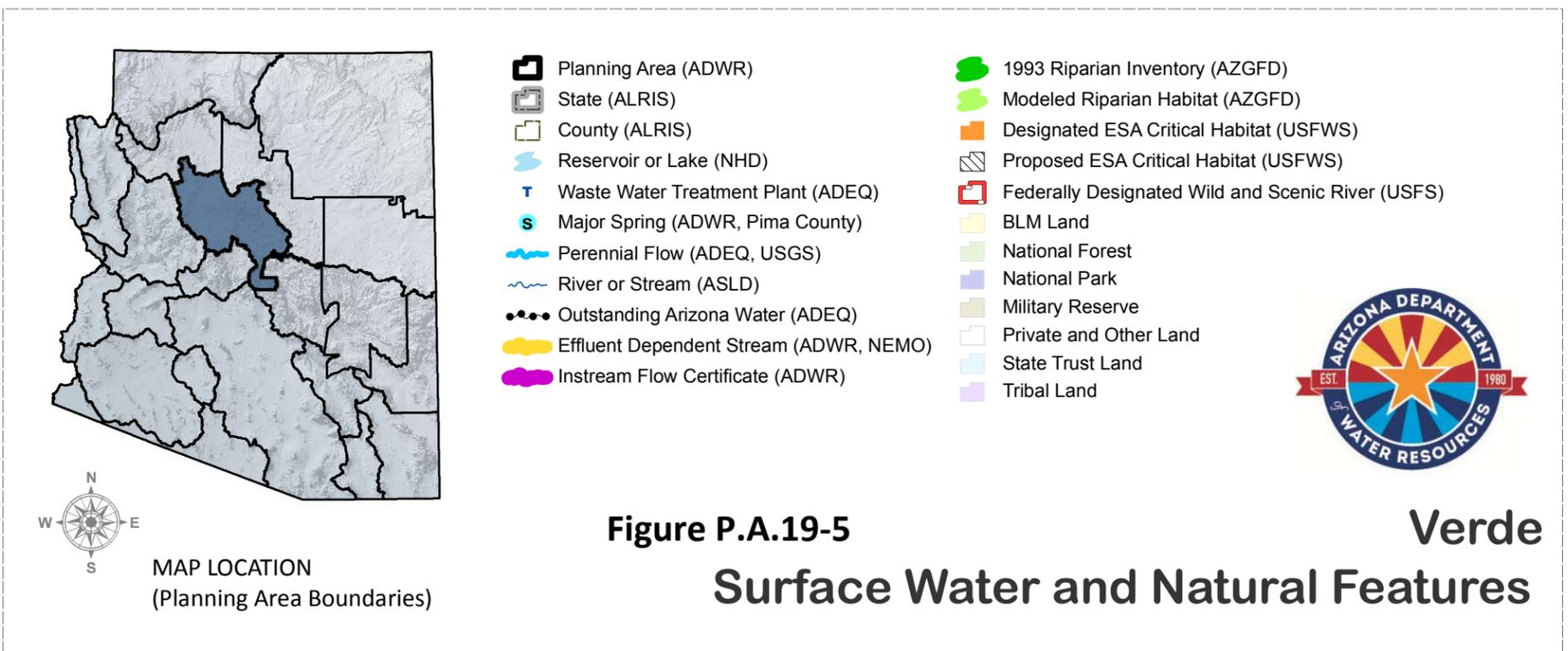
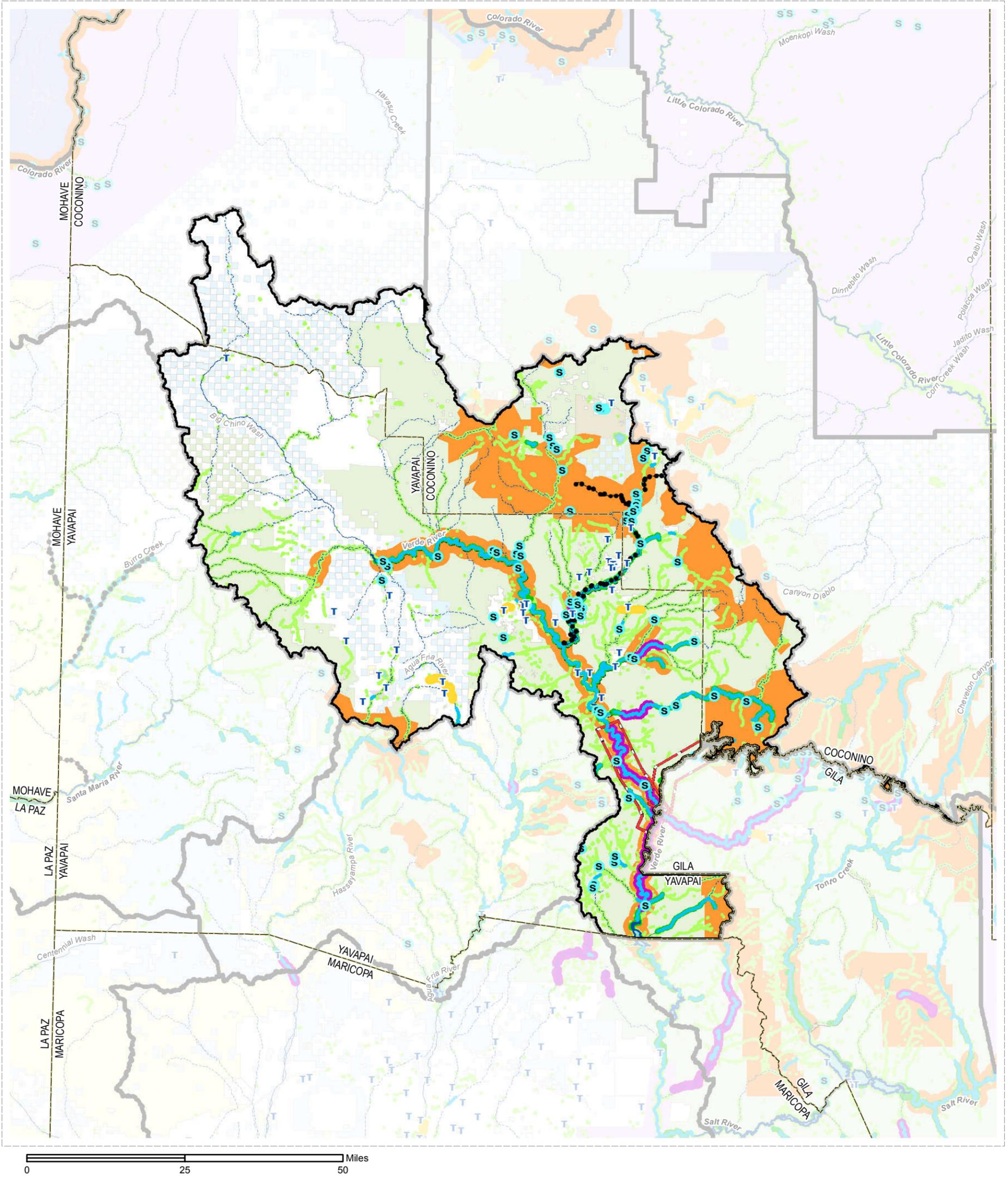
B-15-02 30DCB Prescott AMA – Little Chino sub-basin near Granite Mountain along Williamson Valley Road

Figure P.A.19-4

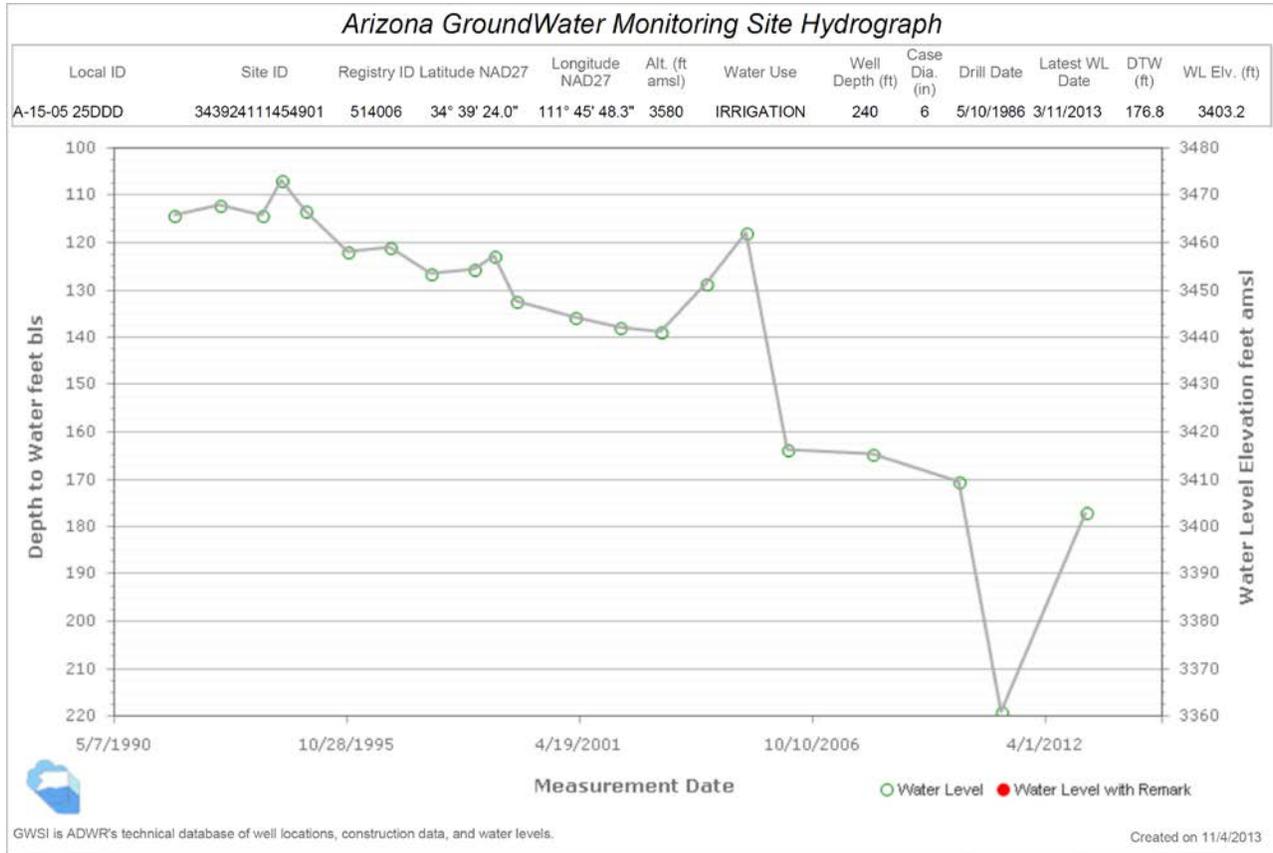


B-14-01 10DDA Prescott AMA – Upper Agua Fria sub-basin Prescott Valley Santa Fe well field area.

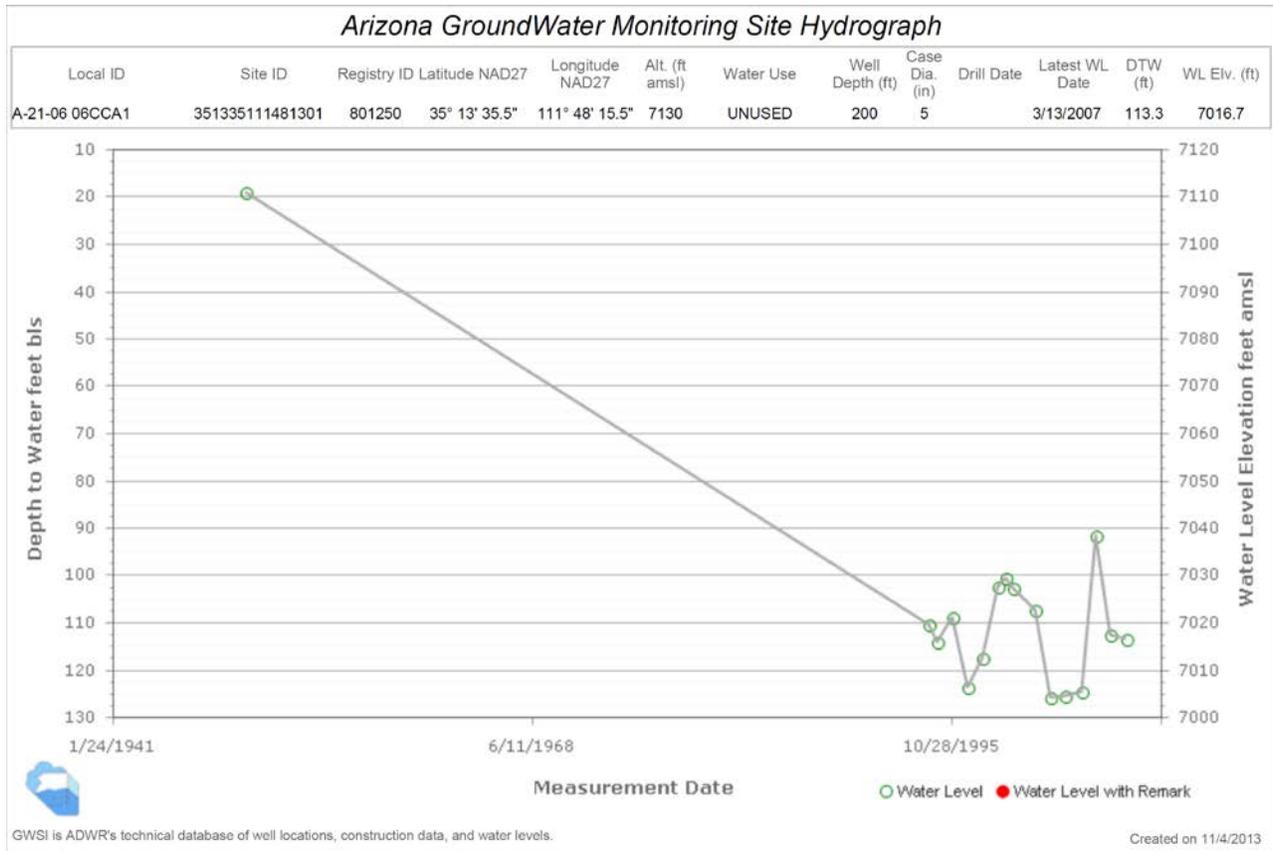
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Verde River Basin – Verde Planning Area



A-15-05 25DDD Verde River basin – Verde Valley sub-basin 2 miles NW of Rimrock.



A-21-06 06CCA1 Verde River basin – Verde Valley sub-basin Belmont – Camp Navajo area.