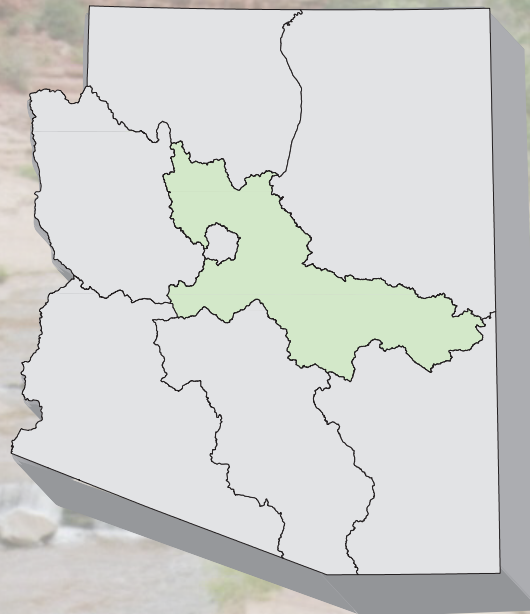


ARIZONA WATER ATLAS

VOLUME 5

CENTRAL HIGHLANDS PLANNING AREA



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Special note about the Atlas Team

Completion of the Atlas would not have been possible without the dedicated professionals that compose the Atlas Team. Most have been involved with the project from its inception in 2003 and their contributions to the success of the project cannot be overstated.

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ARIZONA WATER ATLAS VOLUME 5 – CENTRAL HIGHLANDS PLANNING AREA

Preface

Volume 5, the Central Highlands Planning Area, is the fifth in a series of nine volumes that comprise the Arizona Water Atlas. The primary objectives in assembling the Atlas are to present an overview of water supply and demand conditions in Arizona, to provide water resource information for planning and resource development purposes and help to identify the needs of communities. The Atlas also indicates where data are lacking and further investigation may be needed.

The Atlas divides Arizona into seven planning areas (Figure 5.0-1). There is a separate Atlas volume for each planning area, an executive summary volume composed of background information, and a resource sustainability assessment volume. “Planning areas” are an organizational concept that provide for a regional perspective on supply, demand and water resource issues. A complete discussion of Atlas organization, purpose and scope is found in Volume 1. Also included in Volume 1 is general background information for the state and a summary of water supply and demand data for all planning areas. Appendices in Volume 1 describe data sources and methods of analysis, provide information on water law, management and programs, and Indian water rights claims and settlements.

There are additional, more detailed data available to those presented in this volume. These data may be obtained by contacting the Arizona Department of Water Resources (Department).

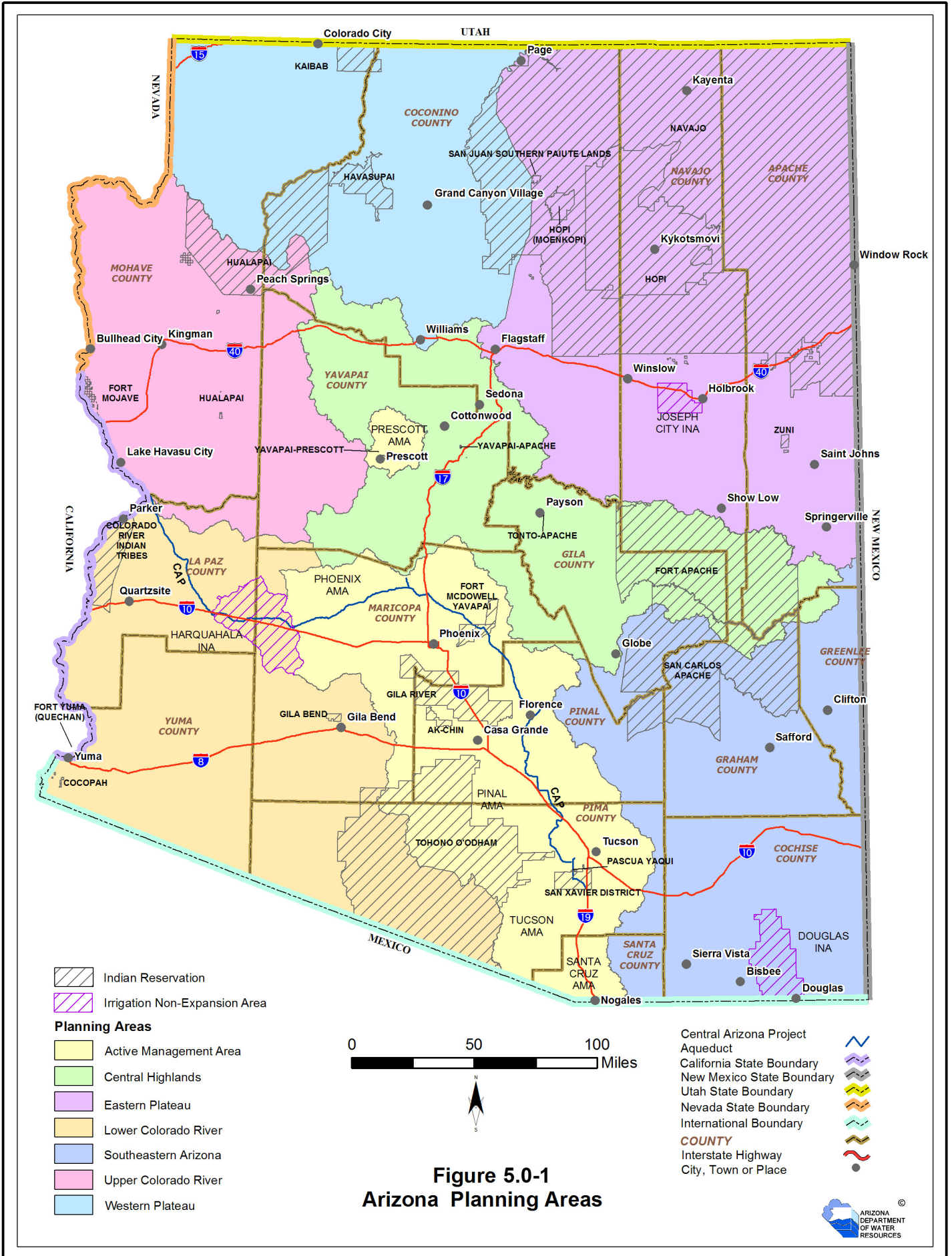
5.0 Overview of the Central Highlands Planning Area

The Central Highlands Planning Area is composed of five groundwater basins oriented east-west in central Arizona. (Figure 5.0-2) This planning area contains areas of higher elevation compared to many other parts of the state and is characterized by narrow valleys separated by steep mountain ranges. Elevation ranges from 1,500 feet to over 12,600 feet. Parts of nine counties are located within the planning area including Apache, Coconino, Gila, Graham, Greenlee, Maricopa, Navajo, Pinal, and Yavapai counties. There are four Indian reservations within the planning area; the Fort Apache (White Mountain Apache Tribe), San Carlos Apache, Tonto-Apache, and Yavapai-Apache Indian Reservations.

The 2000 Census planning area population was approximately 142,850. Basin population ranged from about 7,500 in the Tonto Creek Basin to over 88,000 in the Verde River Basin. Payson is the largest metropolitan area with



Agriculture in the Verde River Basin. In 2001-2005 the agricultural demand sector was the largest in the planning area with approximately 38,000 acre-feet per year, representing 49% of the total demand.



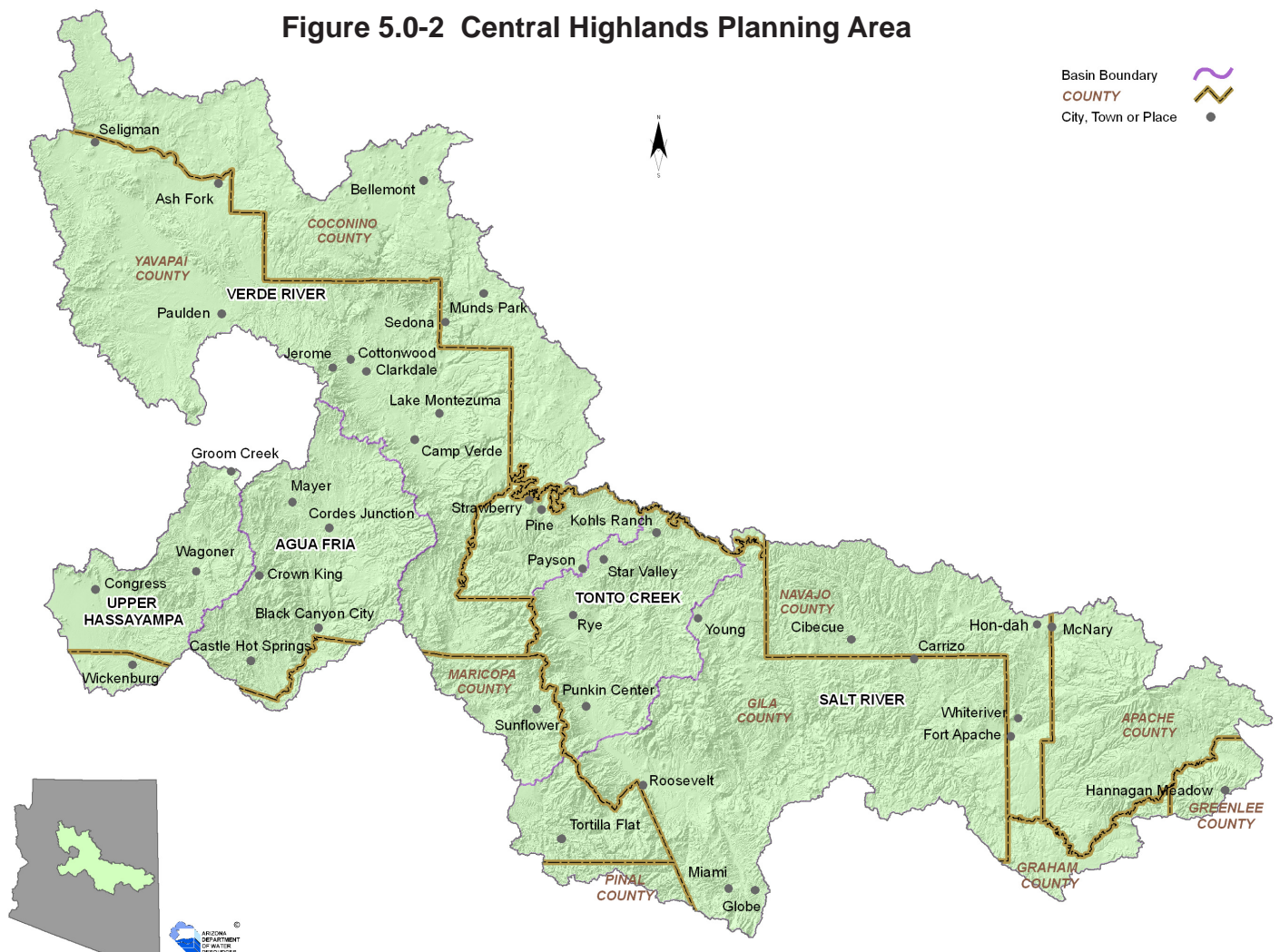
about 13,600 residents in 2000. Other population centers include Camp Verde, Cottonwood/Verde Village/Clarkdale, Globe/Miami and Sedona.

An average of about 83,200 acre-feet of water was used annually during the period 2001-2005 for agricultural, municipal and industrial uses (cultural water demand). Of this total, approximately 63% was groundwater, 36% was surface water and 1% was effluent. The agricultural sector had the largest with approximately 37,500 acre-feet of demand a year - 45% of the total demand. Demand from the municipal sector averaged about 27,400 acre-feet a year (AFA) and industrial demand averaged about 18,300 AFA.

5.0.1 Geography

The Central Highlands Planning Area encompasses about 13,900 square miles (sq. mi.) and includes the Agua Fria, Salt River, Tonto Creek, Upper Hassayampa and Verde River basins. Basin boundaries, counties and prominent cities, towns and places are shown in Figure 5.0-2. The planning area is bounded on the north by the Coconino Plateau Basin in the Western Plateau Planning Area, on the east by the Eastern Plateau Planning Area, on the south by the Southeastern Arizona Planning Area and the Phoenix Active Management Area (AMA), and on the west by the Prescott AMA and the Upper Colorado River Planning Area (Figure 5.0-1). The planning area includes all

Figure 5.0-2 Central Highlands Planning Area



or part of three watersheds, which are discussed in section 5.0.2. Within the planning area, the Fort Apache Indian Reservation encompasses about 2,500 sq. mi. and the San Carlos Apache Indian Reservation, most of which is within the Southeastern Arizona Planning Area, encompasses about 500 sq. mi. The two other reservations, Tonto-Apache and Yavapai-Apache, are relatively small, totaling only about 740 acres or 1.2 sq. mi.

Most of the planning area is within the Central Highlands transition zone, located between the Basin and Range Lowlands and Plateau Uplands Provinces (Figure 5.0-3). It is characterized by rugged mountains of igneous, metamorphic and sedimentary rocks. The extreme southwestern part of the planning area extends into the Basin and Range Lowlands physiographic province, which is characterized by northwest-southeast trending mountain ranges separated by broad alluvial valleys. The southern portions of the

Agua Fria and Upper Hassayampa basins are included in this province. The northwestern part of the planning area falls within the Plateau Uplands physiographic province, which is characterized by high desert plateaus and incised canyons. Included in this province are the northern part of the Verde River Basin, and the northern edge of the Tonto Creek and Salt River basins. Elevation ranges from 1,500 feet at Saguaro Lake in the Salt River Basin to 12,633 feet at Humphreys Peak in the San Francisco Mountains at the northeastern edge of the Verde River Basin. High-elevation mountains are also found in the White Mountains in the eastern portion of the Salt River Basin where Mt. Baldy, at 11,403 feet, is the highest point.

A unique geographic feature of the planning area is the Mogollon Rim, an escarpment that defines the southern boundary of the Colorado Plateau. The rim is approximately 7,000 feet in elevation with sheer drops of 2,000 feet at some locations. The rim stretches for over a hundred miles and forms much of the northeastern boundary of the planning area. The planning area contains diverse topography and a large elevational range, resulting in a wide diversity of vegetation types and ecosystems, the greatest of any planning area. Topography varies from desert basins in the Hassayampa Basin to deeply incised canyons along the Mogollon Rim and high mountain peaks. Because of the high elevations and associated higher rainfall and snowfall, this planning area contains the state's most important water producing watersheds, the Salt and Verde rivers. These watersheds contain the greatest concentration of perennial streams found in the state, which in turn support extensive riparian habitat.

Figure 5.0-3 Physiographic Regions of Arizona



Data source: Fenneman and Johnson, 1946

5.0.2 Hydrology¹

Groundwater Hydrology

The Central Highlands Planning Area is char-

¹ Except as noted, much of the information in this section is taken from the Arizona Water Resources Assessment, Volume II, ADWR August, 1994. (ADWR 1994a)

acterized by a band of mountains consisting of igneous, metamorphic and sedimentary rocks (Figure 5.0-4). High elevations, steep topography and extensive bedrock result in relatively high runoff and small water storage capabilities in the planning area as compared to alluvial basins in the southern part of the State. Alluvial and surficial deposits are relatively limited, occurring primarily in the western part of the planning area and along parts of the Verde River and Salt River drainages.

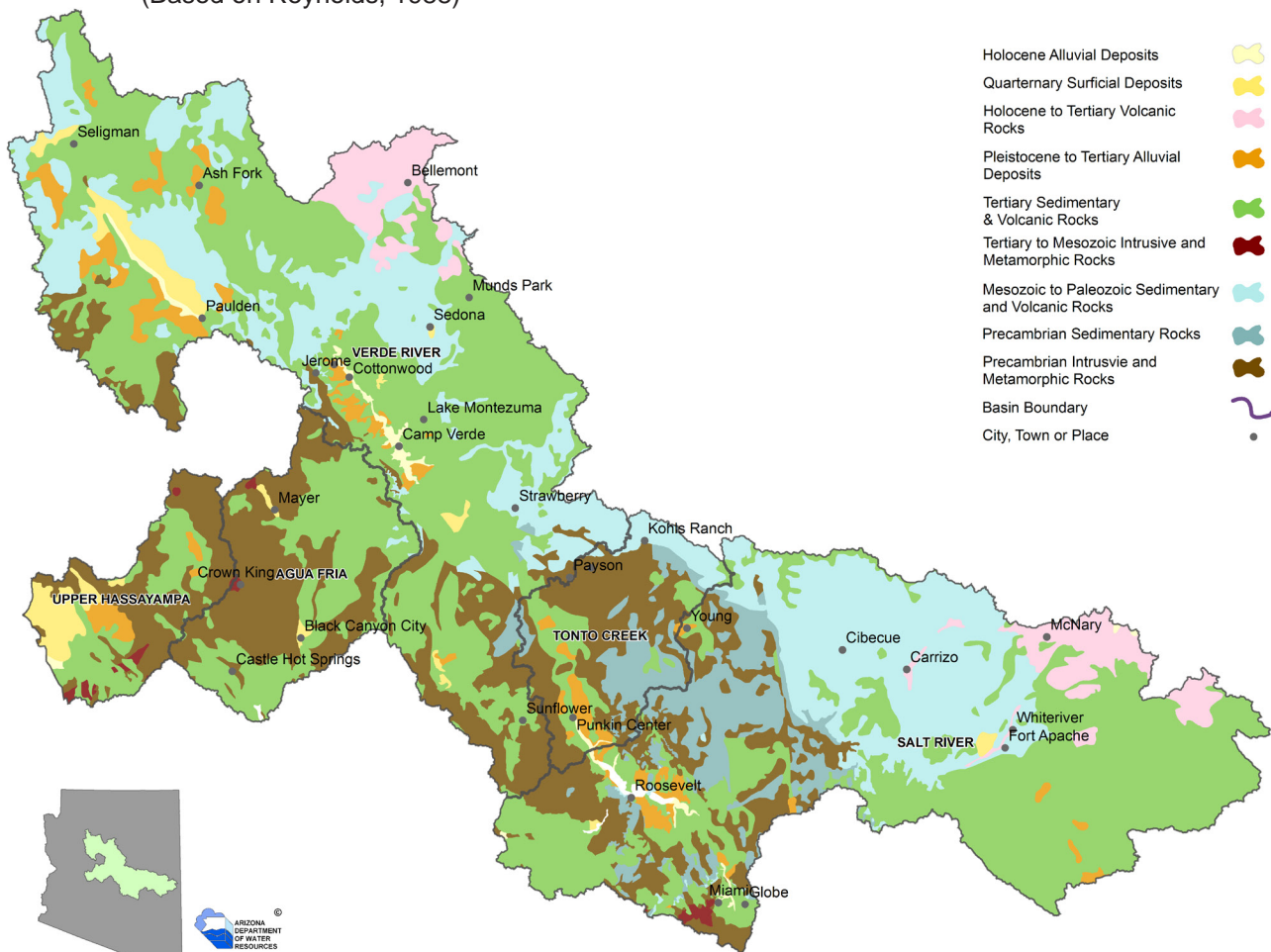
Anderson, Freethey and Tucci (1992) divided the alluvial basins in south-central Arizona into five categories based on similar hydrologic and geologic characteristics. One of these, the “Highland Basins”, covers most of the planning area with the exception of the Upper

Hassayampa Basin, categorized as a “West Basin”, and the southern half of the Agua Fria Basin, categorized as a “Central Basin”.

Highland Basins

The Highland Basins include the Salt River, Tonto Creek and Verde River basins, and the northern half of the Agua Fria Basin. Basin-fill aquifers in the highlands are limited in areal extent and are hydrologically connected with stream alluvium. Consolidated rock aquifers surround and underlie the basin-fill aquifers and contribute underflow. Basin-fill aquifers also receive inflow from stream infiltration and mountain front recharge. Where the basin-fill aquifers are discontinuous, underflow between them may be restricted (Anderson, et al., 1992).

Figure 5.0-4 Surface Geology of the Central Highlands Planning Area
(Based on Reynolds, 1988)



Agua Fria Basin (northern half)

Groundwater occurs in four geologic units in the Agua Fria Basin: basin-fill sands and gravels, volcanic rocks, conglomerates and igneous and metamorphic rocks. Groundwater occurs in volcanic rocks in the northeastern section of the basin that yield relatively small volumes of water. Conglomerates are found throughout the basin and contain the largest volumes of groundwater of any of the rock units. Due to faulting, this unit is separated into smaller discrete basins separated by low permeability crystalline rocks.

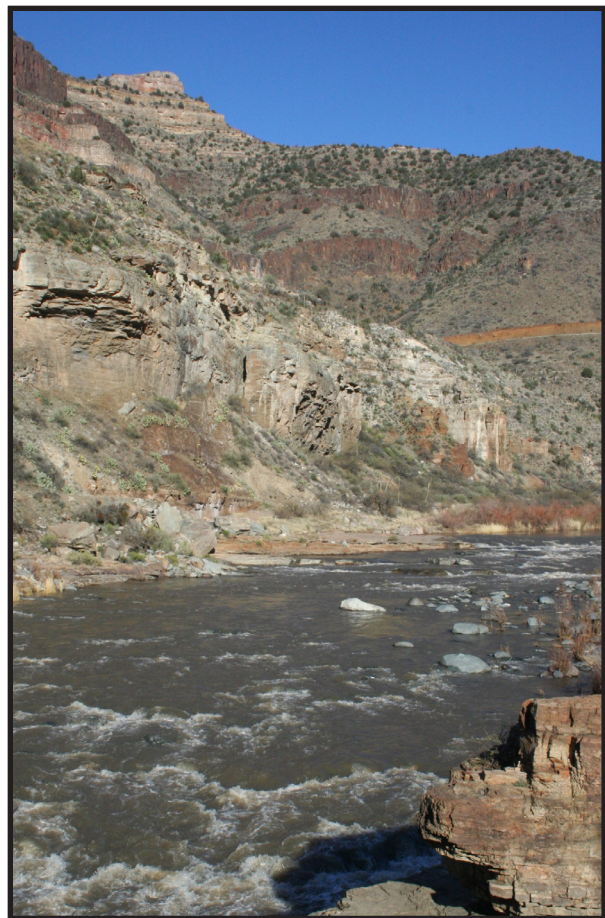
Groundwater flow in the northern part of the basin is from the basin margins toward the Agua Fria River drainage and then south (Figure 5.1-7). The estimated volume of groundwater recharge for the entire basin is 9,000 AFA. Groundwater storage estimates for the basin vary from 620,000 acre-feet to 3.5 million acre-feet (maf) (Table 5.1-6). The median well yield reported on registration forms for large (>10-inch) diameter wells in the basin is 300 gpm with relatively low yields found in the vicinity of Meyer and at other locations. Water levels in basin wells measured between 1990-'91 and 2003-'04 were less than 100 feet bls. Water levels in several wells increased by as much as 15 feet during this period, but declined in wells near Cordes Junction (Figure 5.1-6). Water quality in the basin is generally good. In the northern part of the basin, arsenic was the drinking water parameter most frequently exceeded in measured wells and springs (Table 5.1-7).

Salt River Basin

The Salt River Basin is bounded on the west and southwest by the Sierra Ancha and Superstition Mountains, on the south by the Natanes Plateau and on the east by the White Mountains (see Figure 5.2-1). The Mogollon Rim, a 2,000-foot high escarpment, forms a natural groundwater divide along much of the basin's northern

boundary. The Salt River Basin contains four sub-basins shown on Figures 5.2-7 and 5.2-9: Salt River Lakes, Salt River Canyon, Black River and White River. Principal aquifers differ between the sub-basins, with basin-fill and alluvial aquifers found in the western portion of the basin and limestone and volcanic aquifers in the eastern portion.

In the northern part of the basin, groundwater flow in the C-aquifer is from north to south. Groundwater flow has not been characterized in the rest of the basin. Groundwater data are shown in Table 5.2-6. Groundwater recharge is estimated at 178,000 AFA. The only estimate of groundwater in storage is 8.7 maf or more to a depth of 1,200 feet below land surface (bls). Water level change data are available for the Globe-Miami area and near Young, in the Salt



Salt River, Salt River Basin.

River Lakes and Salt River Canyon sub-basins, respectively. Water levels in these measured wells are relatively shallow, at less than 100 feet bls. Water levels declined in all wells for which change data were available during the period 1990-'91 and 2003-'04 (Figure 5.2-7). The median well yield from large (>10-inch diameter) wells is 170 gpm. Most of the water quality measurements in the basin are in the vicinity of Globe-Miami, a copper mining center. The most commonly exceeded drinking water standard was cadmium, although other metals and fluoride concentrations were also elevated in measured wells (Table 5.2-7). Groundwater conditions in each sub-basin, from west to east, are discussed below.

Salt River Lakes Sub-basin

The Salt River Lakes Sub-basin occupies the western part of the Salt River Basin. Unconsolidated sands and gravels within the floodplains of streams and washes form an alluvial aquifer that is generally the most productive aquifer. A basin-fill aquifer underlies a large part of the sub-basin including the area around Globe, lower Tonto Creek, the Salt River reservoirs and Pinto Valley west of Miami. Along the Salt River and around Roosevelt Lake, the basin fill is up to 2,000 feet thick (ADWR, 1992). Recharge to the basin-fill aquifer occurs primarily along mountain fronts and from streams and lake infiltration. Within the sub-basin groundwater is found in granitic, metamorphic and sedimentary rocks.

In the Globe-Miami area the Gila Conglomerate, composed of semi-consolidated to consolidated basin-fill sediments, forms a local aquifer. The Gila Conglomerate is up to 4,000 feet thick in this area and provides most of the area's municipal and industrial water supply. A limestone aquifer also supplies water in the Globe-Miami area, and west of Globe several small basin-fill deposits form isolated groundwater aquifers (ADWR, 1992). Well yields are generally low in the

southeast part of the sub-basin near Globe, and higher north of Globe. Granitic rocks provide small amounts of water for domestic and stock use in the sub-basin.

Mining activities in the Globe-Miami area have impacted water quality in the alluvial aquifer along Pinal Creek and Miami Wash including elevated concentrations of sulfate and metals. Drinking water standards for cadmium, chromium, fluoride, lead, other metals and for total dissolved solids (TDS) have been equaled or exceeded in a number of wells in the area.

Salt River Canyon Sub-basin

In the western portion of the Salt River Canyon Sub-basin, sedimentary and igneous rocks, similar to those in the adjacent Salt River Lakes Sub-basin, are found. The groundwater flow system is complex with disconnected recharge areas and many water-bearing zones (USGS, 2005a). The rest of the sub-basin is composed primarily of sedimentary rocks, including limestones, sandstones, siltstones, shales and thin conglomerates. These rocks are exposed along the Mogollon Rim and at other locations in the sub-basin. The Natanes Plateau, along the southern boundary of the sub-basin, is composed of volcanic rock. There is little aquifer data for the area, but based on similar rock units in other areas, there may be useable amounts of water in the Supai Formation, Redwall Limestone, Coconino Sandstone and the undivided sandstones in the sub-basin. These formations may yield moderate amounts of water, up to 100 gpm, however yields can vary widely depending on sub-surface geology (ADWR, 1992). Recharge to the sedimentary rocks occurs mainly along the Mogollon Rim.

Basin-fill and floodplain alluvial deposits are present along Cherry Creek near the western boundary of the sub-basin. The depth of basin-fill deposits in this sub-basin was estimated to be less than 400 feet thick (ADWR, 1992). The

only water level change data for the 1990-'91 to 2003-'04 time-period showed a modest water level decline in a shallow well near Young. Well yield data for the sub-basin show yields of less than 100 gpm to up to 2,000 gpm in the western part of the sub-basin (Figure 5.2-9). Water quality data are lacking for this sub-basin.

White River Sub-basin

The eastern portion of the White River Sub-basin is covered with volcanic rocks and the western portion contains sedimentary rocks similar to those found in the Salt River Canyon Sub-basin. Groundwater occurs in fracture zones and the various volcanic flows, including cinder beds. Groundwater flow in the volcanic aquifer is discontinuous and well yields and water levels may vary widely over short distances. Precipitation in the area is relatively high and recharges the volcanic aquifer through infiltration into the fractured rock. Groundwater discharged from the volcanic aquifer contributes to the baseflow of the White River. Groundwater level and water quality data are lacking for the sub-basin. The only well yield data shows a yield between 100 and 500 gpm in a well between Whiteriver and Hon-dah (Figure 5.2-9).

Black River Sub-basin

The Black River Sub-basin is covered almost entirely by volcanic rocks that include basalt flows, rhyolitic ash flows, tuffs and tuffaceous agglomerates that form layers over 3,000 feet thick in some areas. Wells in this area are generally low-yield and well depths of 400 to 800 feet are common. As in the White River Sub-basin, the volcanic aquifer is recharged through infiltration of precipitation. Discharge from the aquifer contributes to baseflow in the Black River. Groundwater level data are lacking for this sub-basin. Well yield data for two wells shows yields of less than 100 gpm in the northeastern part of the sub-basin and between 500 to 1,000 gpm south of Fort Apache. A single groundwater quality measurement taken at

Hannagan Meadow showed a nitrate concentration exceeding drinking water standards.

Tonto Creek Basin

In the Tonto Creek Basin groundwater is found in stream alluvium, basin-fill sand and gravel, Paleozoic sedimentary rocks and Precambrian igneous, metamorphic and sedimentary rocks. The primary aquifer occurs in basin fill, which underlies a large portion of the basin, from near Rye to the southern basin boundary. The basin fill consists of coarse-grained conglomerate in the lower part of the basin and along the basin margins and locally is overlain by fine-grained mudstone in the center of the basin. The conglomerate may be up to 500 feet thick. Groundwater is also found in the floodplain alluvium, which may be as much as 65 feet thick along Tonto Creek. Along this Creek, the basin



Tributary to the Black River, Salt River Basin. Discharge from the aquifer contributes to flow in the Black River.

fill and alluvial aquifers are recharged primarily by stream infiltration.

A limestone aquifer is utilized along the Mogollon Rim where groundwater movement and well yield are dependent on faults, fractures and solution cavities. Wells in the limestone aquifer generally yield less than 100 gpm. Fractured bedrock also yields small volumes of water to wells east of Payson (ADWR, 1992). These and other sedimentary-rock aquifers are recharged from precipitation on the southern edge of the Colorado Plateau (USGS, 2005a).

Groundwater flow directions are from the Mogollon Rim to the south in the C-aquifer and from north to south along the Rye Creek and Tonto Creek drainages in the alluvial aquifer (Figure 5.3-7). Natural recharge for the basin has been estimated at 17,000 to 37,000 AFA. Estimates of groundwater in storage range from 2.0 to 9.4 maf. With one exception, all wells measured in 2003-'04 had a water level below 100 feet. Water levels in wells measured between 1990-'91 and 2003-'04 were either slightly declining or slightly rising (Figure 5.3-7). The median well yield reported on registration forms for large (>10-inch) diameter wells was 120 gpm. Since most of the basin is National Forest land, there has been little basin-wide groundwater development and aquifer characteristics are not well defined. Groundwater quality is generally good, although drinking water standards for arsenic, radionuclides, nitrate and organics have been equaled or exceeded in some wells.

Verde River Basin

The Verde River Basin is a relatively large basin that encompasses part of the Coconino Plateau in its northern portion with the Mogollon Rim defining its eastern boundary. It is characterized by steep canyons, rugged mountains and by broad alluvial valleys in the north and west-central portions of the basin. The basin is divided into the Big Chino, Verde Valley and

Verde Canyon sub-basins as shown in Figures 5.5-6 and 5.5-8.

Natural recharge and groundwater in storage estimates for the basin, sub-basins and local areas are listed in Table 5.5-6. Groundwater recharge estimates for the entire basin range from 107,000 AFA to more than 138,000 AFA. Groundwater in storage is estimated to range from 13 maf to more than 22 maf for the entire basin. Few water level measurements were taken in the basin in both 1990-'91 and 2003-'04 (Figure 5.5-6). Water level change measurements taken during different time periods are shown for the Big Chino Sub-basin (Figure 5.5-6A) and the Verde Valley Sub-basin (Figure 5.5-6B) and are discussed in the sub-basin sections below. Well yield varies throughout the basin with the most productive wells located in the Big Chino Sub-basin (Figure 5.5-8). The median well yield for the entire basin is 260 gpm reported on registration forms for 262 large (>10-inch) diameter wells.

A number of hydrogeologic studies of the Big Chino and Verde Valley sub-basins, and to a lesser extent the Verde Canyon Sub-basin, have been conducted and are briefly referenced here. These studies, many of them recent, contain detailed information about the groundwater and surface water systems in the basin and are referenced in this section and in the Verde River Basin references and supplemental reading. Each sub-basin is discussed below from north to south across the basin.

Big Chino Sub-basin

The Big Chino Sub-basin has an area of about 1,850 square miles. The principal aquifer consists of basin-fill sediments interbedded with volcanic rocks of Cenozoic age that fill the sub-basin. This basin-fill aquifer is commonly referred to as the Chino Valley Unit and is the major source of water for irrigation and domestic purposes. Chino Valley runs northwest to south-

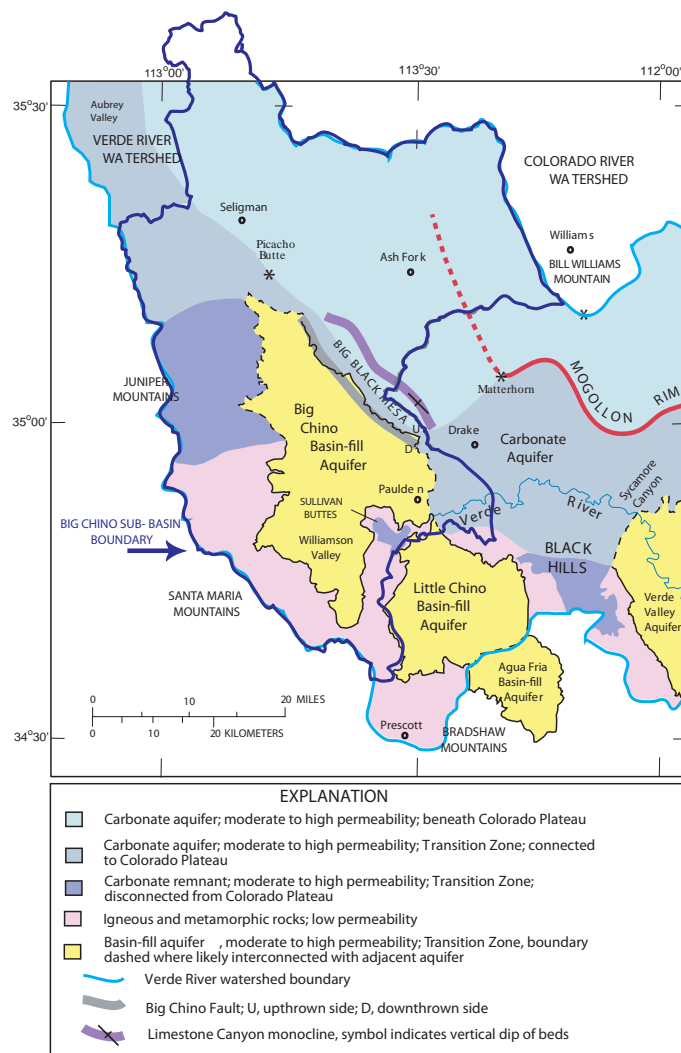
east from Seligman to Paulden. Well yields in Chino Valley wells are commonly greater than 1,000 gpm to greater than 2,000 gpm. A carbonate aquifer comprised of Paleozoic rocks underlies most of the Big Chino Valley Sub-basin and the area north of the Verde River near Paulden. It is assumed that there is a hydraulic connection between the two aquifers in the Big Chino Valley and the Williamson Valley, which runs north-south along the southeastern sub-basin boundary. The general location of aquifers and other features are shown in the graphic from Wirt, 2005.

Groundwater occurs under unconfined and confined (artesian) conditions in the basin-fill aquifer. Artesian conditions occur primarily where buried lava flows and coarse-grained sediments are interbedded with clays and volcanic ash. In the northwesternmost part of the sub-basin, basin-fill deposits may be as much as 2,500 feet thick. Further south and west of Paulden in the Williamson Valley, the thickness of the alluvium is estimated at 2,000 feet. In the eastern part of the Big Chino Sub-basin, the carbonate aquifer is the primary regional aquifer. This aquifer is dry west of the Mesa Butte Fault, which occurs north of Drake and runs northeastward, and between Williams and the Big Chino Valley (USGS, 2006). Alluvial sands and gravels along the major washes also yield water to wells and are utilized as a local water supply in the sub-basin.

Groundwater flow in the basin-fill aquifer is toward the Big Chino Wash drainage and then south. Groundwater flow in the carbonate aquifer is toward the north (Figure 5.5-6). Recharge occurs from mountain front recharge along the Juniper and Santa Maria Mountains on the west side of the sub-basin, from Gran-

ite Mountain on the south and from Big Black Mesa and Bill Williams Mountain on the east side and from runoff in major washes. Recharge also occurs via groundwater inflow from the Little Chino Sub-basin (Prescott AMA) north of Del Rio Springs. In 1999, this groundwater inflow was estimated at 1,800 AFA (Nelson, 2002). The Williamson Valley and Paulden areas are the most arid regions in the Verde River Basin.

Groundwater outflow from the Big Chino Sub-basin occurs as base flow in the Verde River



Regional aquifers in the vicinity of the Big Chino Basin. Modified figure from Wirt, 2005

and is currently estimated at about 17,700 AFA. Base flow at the Verde River near Paulden (gage number 9503700, see Figure 5.5-4) has declined at an annual rate of about 380 AFA since the mid-1990s (USGS, 2006). The average annual recharge volume for the sub-basin was estimated at 30,300 AFA for the period 1990-2003 (Blasch and others, 2006). McGavock (2003) estimated that there was 10 maf of groundwater in storage in the sub-basin to a depth of 1,200 feet bls.

Figure 5.5-6A shows water level changes in the sub-basin from 1992 to 2003-'04 and water level elevation during 2003-'04. More than half the wells measured showed some decline although water level increases of more than 15 feet were measured in wells south of Seligman. Well yields exceeding 2,000 gpm are found along the Big Chino Wash drainage (Figure 5.5-8). Water quality is generally good in the sub-basin with some occurrence of arsenic at levels that equal or exceed the drinking water standard in wells in the Paulden area.

Verde Valley Sub-basin

The Verde Valley Sub-basin is the largest sub-basin in the Verde River Basin with an area of about 2,500 square miles. The principal aquifer is the Verde Formation, which consists of a thick sequence of tertiary limestones and sandstones. The estimated depth of the formation reaches 4,200 feet based on aeromagnetic and gravity data (USGS, 2006). The formation flanks the Verde River for some distance from the Camp Verde area to north of Cottonwood. Other aquifers include the carbonate aquifer and an alluvial aquifer located along the Verde River. The carbonate aquifer, primarily sandstone of the Supai Formation and the underlying Redwall and Martin limestones is the main groundwater supply for Sedona. Locally perched groundwater in fractured or decomposed granite and in volcanic rocks provide small amounts of water in many locations. Groundwater occurs primar-

ily under unconfined conditions although confined conditions occur locally within the Verde Formation. All three aquifers are hydraulically connected.

Most groundwater enters the sub-basin from the Coconino Plateau. Groundwater moves through the carbonate aquifer and discharges at springs and seeps along tributaries of the Verde River, or flows into the Verde Formation and stream-channel alluvium (USGS, 2006). The Oak Creek Fault system is an important influence on the transmission of water between aquifers and to the surface, as evidenced by the large number of major springs along Oak Creek (see Figure 5.5-5). Groundwater primarily flows toward the Verde River drainage and exits the sub-basin in the southeast through alluvium and volcanic rocks along the river (Figure 5.5-6).

Groundwater recharge to the Verde Formation aquifer is from high elevation precipitation along the Mogollon Rim and on the Coconino Plateau with additional contributions from stream infiltration. The carbonate aquifer also receives recharge from high altitudes along the Mogollon Rim, and from an area between the San Francisco Peaks and Bill Williams Mountain (USGS, 2006). Most recharge comes from winter precipitation. Groundwater recharge was estimated at 167,470 AFA on average during the period 1990-2003 (Blasch and others, 2006). An estimate of groundwater in storage is not available for the sub-basin. Figure 5.5-6B shows water level changes in the sub-basin from 1994 to 2003-'04 and water level elevation during 2003-'04. More than half the wells measured showed some decline although water level increases of more than 30 feet were measured at a few scattered locations. Reported well yields generally range from less than 100 gpm to 1,000 gpm in the sub-basin (Figure 5.5-8). Groundwater is generally of good quality at most locations, although the drinking water standard for arsenic has been

equaled or exceeded in a number of wells (see Table 5.5-7).

Verde Canyon Sub-basin

There is relatively little groundwater development in the Verde Canyon Sub-basin with the exception of the Payson area. Basalt flows, conglomerates and semi-consolidated silt units cover a large part of the sub-basin. The groundwater system is complex, with disconnected recharge areas and multiple water-bearing zones. Because of its complexity, knowledge of the groundwater system is often limited to local analysis of spring and well data. Groundwater recharge originates primarily along the crest of the Mogollon Rim, where precipitation and snowmelt percolate through permeable volcanic, limestone or sandstone units (USGS 2005a). Spring discharge and stream base flow appear to be the largest components of aquifer outflow.

In Payson groundwater is withdrawn primarily from fractured and faulted granite. Most wells are shallow, although the Town of Payson has conducted exploratory drilling north of the town where deep water-bearing zones were found. A recent study suggests that a segment of the Diamond Rim fault system northeast of Payson may have groundwater supply potential (Gæaorama, 2006). The shallow water-bearing zones around Payson depend on winter recharge and are therefore very sensitive to drought. Water in deeper fracture systems in the area may be fed from the Mogollon Rim and less affected by drought. Water levels in wells measured in the Payson area in 2003-'04 varied from 115 feet to 339 feet bls. Water levels in most of these wells declined by more than 30 feet between 1990-'91 and 2003-'04 (Figure 5.5-6). Well yields in the area are typically less than 500 gpm.

In Strawberry, most wells are completed in the Schnebly Hill Formation, a sandstone unit that is the major component of the "Red Rocks" of

Sedona. Well yields in the area typically range from 20 to 80 gpm. An exploratory well drilled near Strawberry in 2000 encountered water in the Redwall Limestone at about 1,380 feet (Corkhill, 2000). At nearby Pine most wells are completed in the Supai Formation, which is composed of sandstone, siltstone and mudstone with some interbedded limestone. Well yields in Pine are typically lower than Strawberry and range from 10 to 30 gpm. These relatively low well yields suggest a more localized groundwater system (USGS, 2005a). Little water level change data are available with one well near Pine showing a modest water level increase between 1990-'91 and 2003-'04. However, a nearby domestic well experienced a decline of about 160 feet between 1993 and 2003-'04 (Figure 5.5-7, hydrograph V). There is little water use in the southern half of the sub-basin where unconsolidated sediments are found.

Water quality is generally good in the sub-basin although the drinking water standards for arsenic, beryllium, cadmium, lead, selenium and organics have been equaled or exceeded in wells in the Payson area and for arsenic in Pine.

West Basins

The Upper Hassayampa Basin was defined by Anderson, Freethy and Tucci (1992) as a "West Basin". These basins are generally arid and groundwater inflow and outflow are relatively small with little or no stream baseflow.

Upper Hassayampa Basin

The main aquifer in the Upper Hassayampa Basin is basin-fill deposits found along valleys between the mountains. These deposits consist of gravel, sand, silt and clay. In the mountainous, eastern part of the basin, fractured crystalline and consolidated sedimentary rocks yield small amounts of water to wells. Near Wagoner, stream deposits overlying crystalline rock are up to 135 feet thick. North of the Vulture Mountains, in

the southwestern part of the basin, the basin fill varies from a few tens of feet thick to over 1,000 feet thick near the middle of the valley.

Groundwater flow is generally from north to south. Groundwater recharge is estimated at 8,000 AFA and groundwater in storage is estimated to range from 1.0 to 1.1 maf. Water levels in wells measured in 2003-'04 varied from 20 feet bls near Wickenburg to 817 feet bls near Congress. Water level change data from wells measured in 1990-'91 and 2003-'04 show relatively stable groundwater levels (Figures 5.4-6 and 5.4-7). The median well yield in the basin was 125 gpm reported on registration forms for 61 large (>10-inch) diameter wells (Table 5.4-6). Groundwater quality is generally good although drinking water standards for arsenic and other metals have been equaled or exceeded in wells near Wickenburg.

Central Basins

The southern half of the Agua Fria Basin was categorized by Anderson, Freethey and Tucci (1992) as a "Central Basin". Central basins are characterized by deep alluvial sediments with small to moderate amounts of mountain front recharge and streamflow infiltration.

Agua Fria Basin (southern half)

The principal aquifers in the Agua Fria Basin are upper basin fill, which occurs under unconfined conditions, and sedimentary rock (conglomerate), which is found throughout the basin and contains the largest volume of groundwater. Water level data are sparse in this portion of the basin. A domestic well located in unconsolidated sediments near Black Canyon City had a measured water level of 43 feet bls in 2003-'04 (Figure 5.1-7). Well yields in the unconsolidated sediments may be as high as 1,000 gpm or more although most are less than 500 gpm (Figure 5.1-9). In Black Canyon City the Water Improvement District obtains water from wells completed in precambrian schist.

The wells yield less than 20 gpm and have water levels ranging from 21 to 23 feet below ground surface (Black Canyon City, 2006). Arsenic and fluoride concentrations at levels that equal or exceed drinking water standards have been detected in springs and wells near Black Canyon City and at Castle Hot Springs.

Surface Water Hydrology

The U.S. Geological Survey (USGS) divides and subdivides the United States into successively smaller hydrologic units based on hydrologic features. These units are classified into four levels. From largest to smallest these are: regions, subregions, accounting units and cataloging units. A hydrologic unit code (HUC) consisting of two digits for each level in the system is used to identify any hydrologic area (Seaber et al., 1987). A 6-digit code corresponds to accounting units, which are used by the USGS for designing and managing the National Water Data Network. There are portions of three watersheds in the planning area at the accounting unit level: the Agua Fria River-Lower Gila River, the Salt River and the Verde River (Figure 5.0-5).

The Agua Fria-Lower Gila River

The Agua Fria-Lower Gila River Watershed



Flood flow on the Agua Fria River near Black Canyon City.

extends from near Prescott to south of Gila Bend in the Lower Colorado River Planning Area. It includes the drainage areas of the Agua Fria River, the Hassayampa River and the Gila River from below its confluence with the Salt River to Painted Rock Dam. Within the planning area, this watershed covers the Agua Fria and the Upper Hassayampa basins.

The Agua Fria River drains an area of about 2,700 square miles with elevations ranging from 7,800 feet in the Bradshaw Mountains, which define part of its western boundary, to 1,570 feet at Lake Pleasant, which is impounded by New Waddell Dam at the southern boundary of the Agua Fria Basin. The Agua Fria River only flows below the dam when water is released

during major flood events and is tributary to the Gila River a short distance downstream of the confluence of the Salt and Gila Rivers near Goodyear in the Phoenix AMA. The Agua Fria River is perennial along several reaches within the Agua Fria Basin: above Lake Pleasant south of Black Canyon City; through portions of the Agua Fria National Monument; and in the northern part of the basin (see Figure 5.1-6). Tributaries to the Agua Fria River with perennial reaches include Little Ash, Sycamore and Silver creeks. Other tributaries to the river are generally intermittent or ephemeral.

The Hassayampa River originates in the northern Bradshaw Mountains and flows through the Upper Hassayampa Basin and the

Figure 5.0-5 Central Highlands USGS Watersheds
(USGS, 2005b)





The Agua Fria River is perennial at several reaches within the Agua Fria Basin: above Lake Pleasant south of Black Canyon City; through portions of the Agua Fria National Monument; and in the northern part of the basin

Phoenix AMA to its confluence with the Gila River. The river drains a total of about 1,470 square miles. It is perennial in the northern portion of the Upper Hassayampa Basin in the vicinity of Groom Creek, and in a reach south of Wickenburg. A major fault crosses the river seven miles downstream from Wickenburg at “the Narrows”, which forms the southern boundary of the basin. At this point, the entire flow of the river sinks into the streambed. The only other perennial reaches within the basin are short reaches of Minnehaha, Ash, Weaver and Antelope creeks (AGFD, 1993).

Three streamflow gages are currently active in the watershed; all located in the Agua Fria Basin. Included are real-time gages on the Agua Fria River near Humboldt, Mayer and Rock Springs. The maximum recorded annual flow in the watershed was 360,541 acre-feet at the Rock Springs gage in 1992. The median annual flow at this location is 19,692 acre-feet and the minimum annual flow was 1,528 acre-feet in 1975 (see Table 5.1-2). There are currently no operating streamflow gages in the Hassayampa River drainage of the watershed. The gage with the longest record (35 years), located north of Wickenburg, was discontinued in 1982. During its period of operation, the highest annual flow

recorded was 123,076 acre-feet in 1980, and its median flow was 7,457 acre-feet (see Table 5.4-2).

There are approximately 460 total springs in the watershed. Only five springs with a discharge of 10 gpm or greater have been reported; all located in the Agua Fria Basin. Discharges from those major springs were last measured during or prior to 1982, therefore these rates may not be indicative of current conditions. The largest spring, Castle Spring, discharges approximately 340 gpm from Precambrian rocks at a temperature of 131°F. Castle Spring is located northwest of Lake Pleasant at Castle Hot Springs, reportedly Arizona’s first resort, opened in 1896. The four other major springs have discharge rates less than 100 gpm and are located in the northeastern portion of the basin (see Figure 5.1-6). There are 14 minor springs (discharge of 1-10 gpm) in the watershed, also located in the Agua Fria Basin. While there are no major or minor springs reported in the Upper Hassayampa Basin, there are approximately 164 to 166 springs with a discharge of less than 1 gpm.

Within the watershed, reaches of Turkey Creek in the Agua Fria Basin, and Cash Mine Creek, French Gulch and the Hassayampa River in the Upper Hassayampa Basin have surface waters with impaired water quality. Parameters of concern include cadmium, copper, zinc, pH and lead due to mining activities in the area.

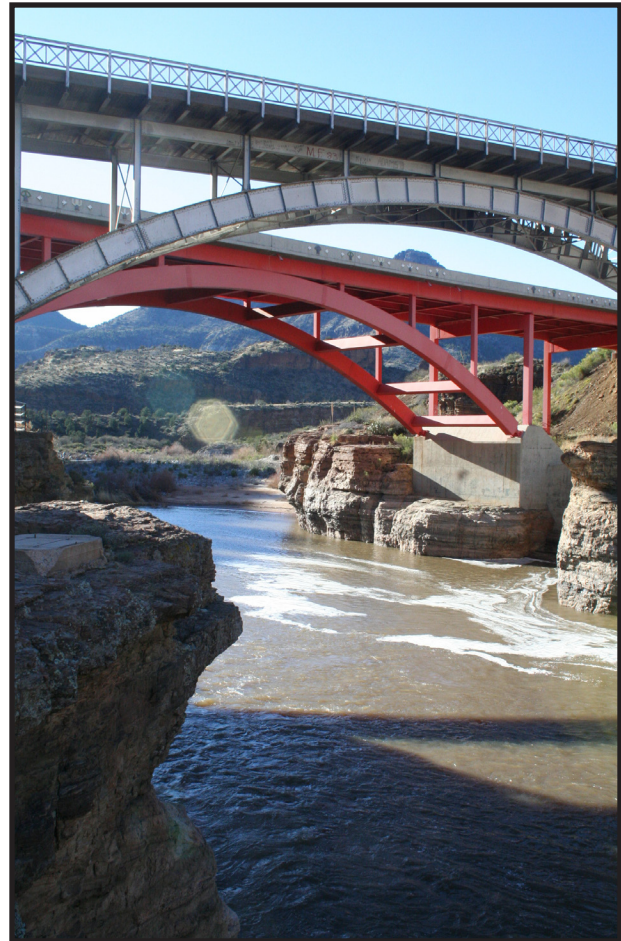
The Salt River

The surface water characteristics of the Salt River Watershed are influenced by precipitation patterns, topography and geology. The Salt River and Tonto Creek basins comprise most of the watershed with the exception of the westernmost part, which extends to the confluence of the Salt and Gila rivers in the Phoenix AMA. The Salt River is the largest tributary of the Gila River with a drainage area of about 5,980 square miles.

Its headwaters are the White and Black rivers that originate in the high elevations of the Salt River Basin where winter snow accumulation is critical to downstream water supplies. This area is the most prolific producer of surface water in Arizona with unit runoff values as high as 674 acre-feet/square mile (12.6 inches) in the drainage of the East Fork of the White River. (See Figure 5.2-4). By comparison, the Tonto Creek Basin has a unit runoff of about 160 acre-feet/square mile (3.1 inches). (ADWR, 1992) Within the planning area, the elevation of the watershed ranges from near 11,400 feet in the White Mountains to 1,500 feet at Saguaro Lake.

There are many perennial streams in the Salt River Watershed, particularly in the Salt River Basin (see Figures 5.2-5 and 5.3-6). The Salt River and Tonto Creek are both perennial throughout their lengths in the planning area. Numerous small streams that begin along the Mogollon Rim and the White Mountains feed tributaries of the Salt River and Tonto Creek. Perennial flow in these streams is primarily due to geologic features (e.g. joints and fractures) that cause groundwater to surface and discharge to streams.

Surface water from the watershed flows into Theodore Roosevelt Lake, and is subsequently released to a series of three downstream reservoirs along the Salt River, Apache Lake, Canyon Lake and Saguaro Lake. These reservoirs and their associated dams are operated by the Salt River Project (SRP) for the benefit of agricultural, municipal and industrial users in the Phoenix metropolitan area. Figure 5.0-6 shows the capacity of the SRP reservoir system on both the Salt and the Verde rivers. Also shown is C.C. Cragin Reservoir, formerly known as Blue Ridge Reservoir. Water stored at C.C. Cragin, located in the Eastern Plateau Planning Area, is diverted by pipeline to the East Verde River in the Verde River Watershed to supplement the



Salt River. There are many perennial streams in the Salt River Watershed, particularly in the Salt River Basin

SRP water supply and satisfy obligations to the Gila River Indian Community in accordance with the Arizona Water Settlement Act (Act). The Act also allocated 3,500 AFA from the reservoir to improve the water supply situation in northern Gila County, of which 3,000 AFA will be used by Payson. Surface water stored in the Salt and Verde reservoir system is generally not available for use in the Central Highlands Planning Area.

The Salt River system dams were constructed beginning in 1911 with completion of Roosevelt Dam. Mormon Flat Dam was completed in 1926, followed by Horse Mesa in 1927 and Stewart Mountain in 1930. Prior to dam construction, the flow in the Salt River was heavi-

Figure 5.0-6 SRP Reservoir System Capacity

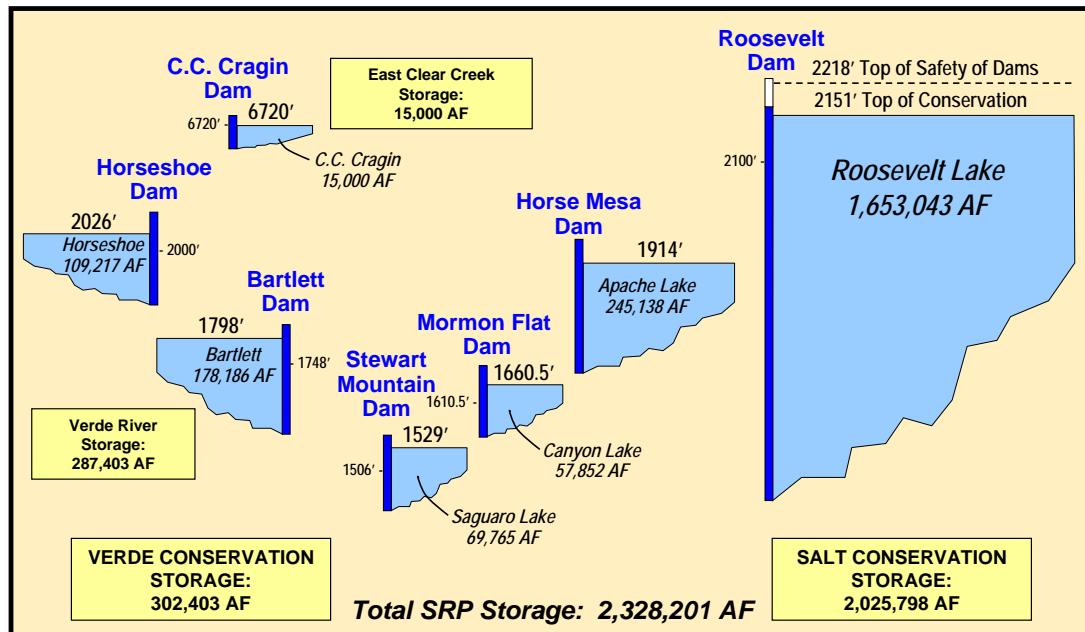


Figure courtesy of SRP (2006)

est in the spring and early summer. Flow is now regulated in response to flood control and downstream water demand. As a result, flows below the reservoirs are generally highest during June-August when water demand is greatest in the Phoenix metropolitan area or when high inflow to the reservoirs necessitates release of water from the dams. In February 1980, a wet winter combined with a storm that dropped up to ten inches of rainfall on the watershed resulted in the largest controlled flood ever to go down the Salt River. Releases from Roosevelt Dam peaked at 180,000 cfs and the water level behind the dam was inches from overflowing the crest (SRP, 2007a).

Annual streamflow of the Salt River fluctuates widely. The nearest gage upstream from Roosevelt Lake, with a contributing drainage area of 4,306 mi², has been in operation since 1913. The maximum annual flow was over 2.4 maf in 1916, median annual flow has been 518,499 acre-feet and mean annual flow 644,942 acre-feet. In 2002, an extreme drought year, flow into Roosevelt Lake was at its minimum, about

153,000 acre-feet (Table 5.2-2). Except for changes due to timber harvesting and beaver removal, the upstream reaches of the river have not been significantly altered (Tellman et al., 1997). Typically, timber harvesting and fire in mature forests temporarily increases watershed yields due to elimination of the plant cover. As woody and herbaceous vegetation becomes established, streamflows decline. Recent severe fires in the basin resulted in significant increases in peak flow at several locations. (Neary, et al., 2003)

In the Tonto Creek Basin there is one currently operating, real-time streamflow gage located near the community of Roosevelt north of Gun Creek. The maximum annual flow at this point was more than 469,000 acre-feet in 1978. The median annual flow has been about 66,000 acre-feet since 1940. Similar to the record low flow in the Salt River, the minimum annual flow was about 2,900 acre-feet in 2002 (Table 5.3-2).

There are a relatively large number of major springs in the Salt River Watershed. In the Tonto Creek Basin, several major springs are located below the Mogollon Rim where groundwater is discharged from southward dipping rocks of a limestone aquifer. Tonto Spring at the headwaters of Tonto Creek is the largest spring in the Tonto Creek Basin with a measured discharge of 1,291 gpm. Its flow has been relatively stable, and its isotopic and specific-conductance data are similar to those for Fossil Springs in the Verde River Watershed. This suggests that the same limestone aquifer supplies both springs, which are located approximately 20 miles apart (USGS, 2005a). In the Salt River Basin, a high concentration of major springs occurs near McNary, where springs emanate from fractured basalt. Alchey Spring, which issues from the Supai Formation along the North Fork of the White River, has the greatest reported discharge measurement in the watershed (over 9,000 gpm). Travertine deposition due to high

concentrations of calcium carbonate in source waters occurs at this spring and at Warm Spring along the Salt River (ADWR, 1992).

Several lakes and streams in the watershed have impaired water quality. Reaches of Tonto Creek and Christopher Creek in the Tonto Creek Basin have exceeded standards for E. coli and nitrate. The entire reach of Pinto Creek in the Salt River Basin has exceeded the standard for copper due to mining activities in the area. Two lakes in the Salt River Basin have impaired waters including Canyon Lake (dissolved oxygen) and Crescent Lake (high pH) (see Tables 5.2-7 and 5.3-7).

Verde River

Most of the Verde River watershed, and its major watercourse, the Verde River, is located within the boundaries of the Verde River Basin. Within the planning area, the elevation of the Verde River watershed ranges from about 12,600 feet at Humphrey's Peak to about 1,750



Verde River near Paulden Gage, Verde River Basin. The Central Highlands Planning Area contains the state's most important water producing watersheds, the Salt River and the Verde River which contain the greatest concentration of perennial streams in the state.

feet at Bartlett Dam. The entire watershed encompasses about 6,188 sq. mi. and extends into the Phoenix AMA to the confluence of the Verde River with the Salt River. The upper parts of the watershed include Big Chino Wash, which originates east of the Aubrey Cliffs northwest of Seligman, and Oak Creek which originates on the Coconino Plateau in the northeastern part of the watershed. Big Chino Wash is an ephemeral stream that flows southeasterly to Sullivan Lake while Oak Creek is a perennial stream that merges with the Verde River south of Cottonwood.

The Verde River originates in a steep-walled volcanic rock canyon near Paulden below Sullivan Lake Dam (now almost entirely filled with sediment). Springs feed the headwaters near the upper end of Stillman Lake. The lake is a narrow, 3,900 foot-long, 20-acre impoundment formed from sediment deposited in the river at the Granite Creek confluence causing the river to back-up in its channel. (USFWS, 2007). Just below the confluence with Granite Creek, a large diffuse spring network, including Big Chino Spring and Sullivan Lake Spring, sustain perennial flow in the river. A USGS study found that discharge from the springs below Sullivan Lake Dam are derived from three groundwater sources; the western part of the Coconino Plateau, the Big Chino Sub-basin and the Little Chino Sub-basin (part of the Prescott AMA) (USGS, 2006). Another USGS study used geochemical data to estimate the various base flow contributions to the Verde River. It reported that 80-86% of the base flow is from the Big Chino Sub-basin, 14% from the Little Chino Sub-basin, 10-15% from the Devonian-Cambrian zone of the regional carbonate aquifer and <6% from the Mississippi-Devonian sequence of the regional carbonate aquifer (USGS, 2005c).

Below Granite Creek, the Verde River flows eastward to Perkinsville, southeastward to Fossil

Creek, then southward through two reservoirs, Horseshoe and Bartlett, before its confluence with the Salt River. Bartlett Dam was constructed between 1936-1939 to store water for irrigation and other uses in the Phoenix metropolitan area. Ten miles upstream, Horseshoe Dam was completed in 1946 by Phelps Dodge for the Salt River Valley Water Users' Association under a water exchange agreement. Both reservoirs are operated by SRP.

The Verde River is perennial throughout its length from just below Sullivan Lake Dam. Almost all the major perennial tributaries to the river drain areas to the north and east. In addition to Oak Creek, other major tributaries are Wet Beaver Creek, West Clear Creek, Sycamore Creek (at Fort McDowell) and East Verde Riv-



Sullivan Lake Dam, Verde River Basin. The Verde River is perennial throughout its length from just below Sullivan Lake Dam.

er. Stream flows in the watershed can be substantial given the relatively high elevation and associated high rainfall and snowfall. Several stream gages on the Verde and its tributaries have reported annual maximum flows exceeding one million AFA. These gages are the Oak Creek gage near Cornville, the Verde River below Tangle Creek above Horseshoe Dam gage and the Verde River at Bartlett Reservoir near Cave Creek gage. The median flows at these gages are about 531,000 acre-feet, 131,000 acre-feet and 245,000 acre-feet, respectively (see Table 5.5-2). The lowest flow reported at the Oak Creek gage was about 214,500 acre-feet in 1956.

Many major and minor springs occur in the Verde River Basin (see Table 5.5-5) including Fossil Springs, near Strawberry, with a total discharge of over 21,000 gpm. Fossil Springs consist of several dozen discharge points with most of the flow emanating from about a half dozen points. The largest of the springs reportedly issues from the Fossil Springs fault while other springs issue from the Naco Formation near its contact with the underlying Redwall limestone (Gæaorama Inc., 2006). The Naco Formation consists of interbedded grayish limestone and limy claystone and is located between the overlying Supai Formation and the Redwall limestone in this area. The chemistry of the springs below the Mogollon Rim is characteristic of water from the Coconino Aquifer, suggesting its source. Fossil Springs contain elevated concentrations of calcium, magnesium, and bicarbonate as well as chloride and sulfate (USGS, 2005a). Calcium carbonate precipitates out below the springs and forms travertine dams along Fossil Creek.

Major springs also occur along upper and lower Oak Creek. In the north half of Oak Creek Canyon, water moves along fractured rock of the Oak Creek fault zone to discharge at springs along the creek (Owen-Joyce, 1983). Several springs are also found along lower Oak Creek,

south of Camp Verde and below the Mogollon Rim north of Payson. Here, water infiltrating through sedimentary rocks discharges at springs along the face of the rim at fractures or at the interface of permeable and less permeable rocks.

Impaired surface waters in the Verde Watershed occur along the East Verde River (selenium), Oak Creek (E. coli), Pecks and Stoneman lakes (dissolved oxygen, high pH and nutrients), Whitehorse Lake (dissolved oxygen) and along reaches of the Verde River (turbidity). (See Table 5.5-7 and Figure 5.5-9).



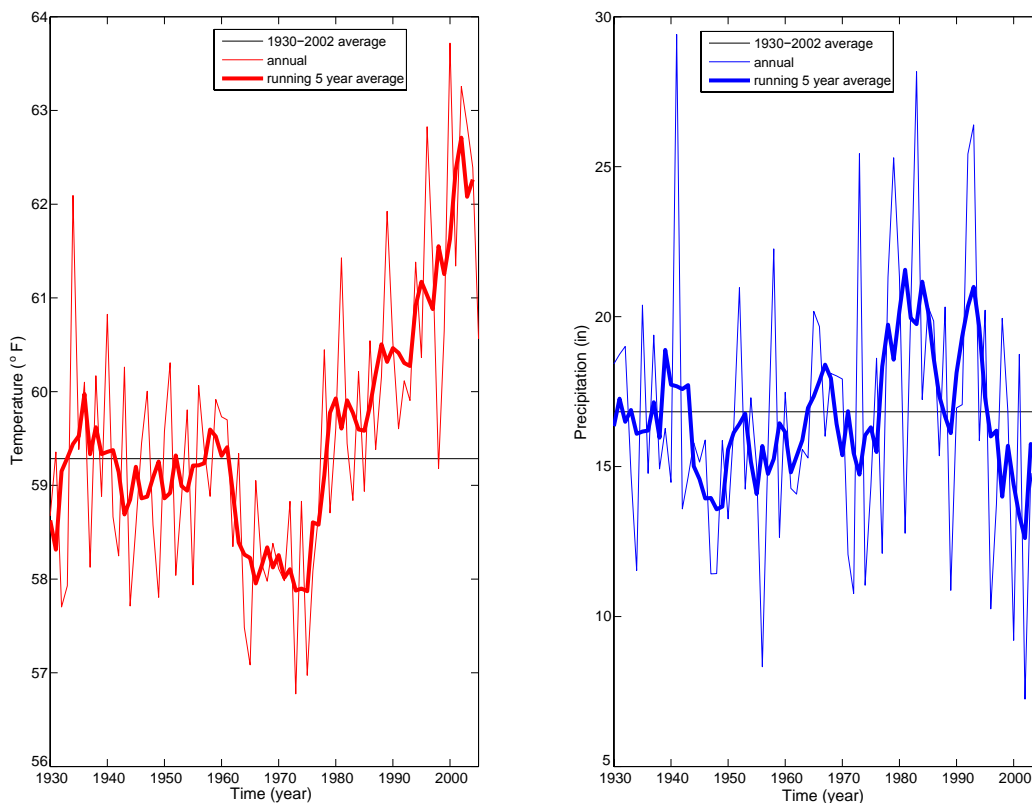
Oak Creek, Verde River Basin. In the north half of Oak Creek Canyon, water moves along fractured rock of the Oak Creek fault zone to discharge at springs along the creek

5.0.3 Climate²

The high country of the Mogollon Rim is a significant topographic barrier to regional airflow, making the climate of the Central Highlands Planning Area wetter and cooler than the rest of the state. The area-weighted average of water-year precipitation for the National Oceanic and Atmospheric Administration (NOAA) Arizona Climate Divisions 3 and 4 (covers Yavapai and Gila counties, respectively) is 16.8 inches, which is greater than the statewide average of 12.1 inches. A climate division is a region within a state that is generally climatically homogeneous. Arizona is divided into seven climate divisions.

The area-weighted average water-year temperature for the planning area is 59.3°F, compared to the statewide average of 59.9°F. While average temperatures are slightly cooler than the statewide average, they have been warming during the last 70+ years (Figure 5.0-7). Recent studies show an observed increase, throughout much of the West, in the fraction of winter precipitation falling as rain, rather than snow, at low-to-middle elevations (up to around 8,000 feet). If this trend continues, the timing, amount and distribution of spring runoff is likely to be affected.

Figure 5.0-7 Average Temperature and Total Precipitation in the Central Highlands Planning Area from 1930-2002



Horizontal lines are average temperature and precipitation, respectively. Light lines are yearly values and highlighted lines are 5-year moving average values, Data are from U.S. Historical Climatology Network. Figure author: CLIMAS

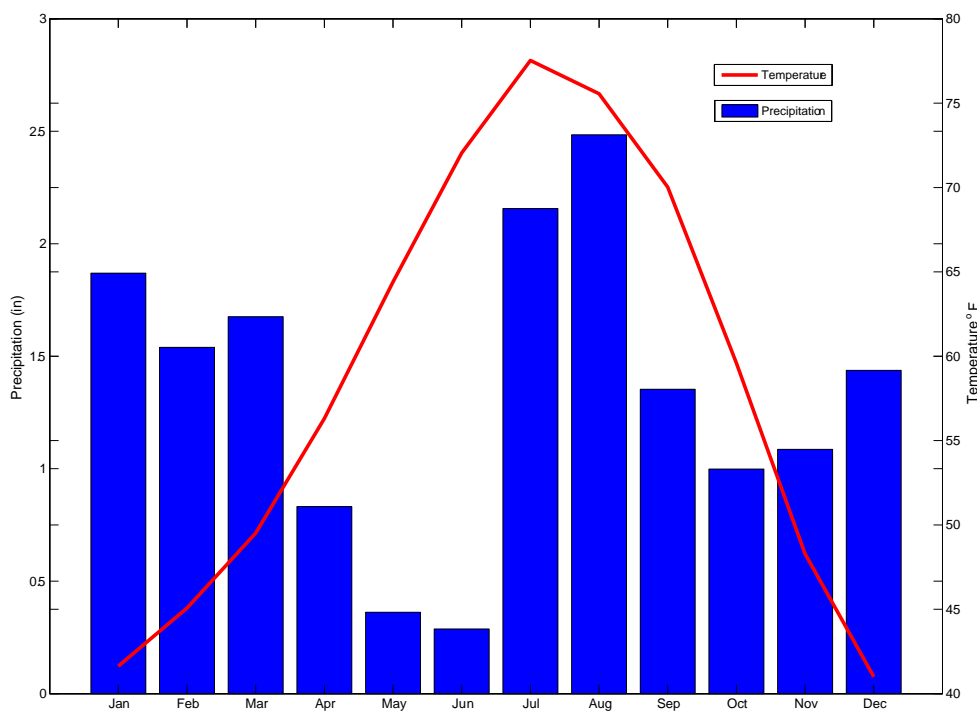
² Information in this section was provided by the Institute for the Study of Planet Earth, Climate Assessment for the Southwest (CLIMAS), University of Arizona, October 2006

Precipitation in the Central Highlands Planning Area has a bi-modal pattern (both winter and summer precipitation peaks) characteristic of Arizona (Figure 5.0-8); however, the planning area receives a greater fraction of its precipitation during the winter months than, for example, southeastern Arizona. During winter, precipitation comes during the passage of frontal storm systems moving west-to-east guided by the jet stream, typically located north of Arizona, but occasionally traversing the state. As moist air masses encounter the Mogollon Rim they are lifted and cooled, which condenses water vapor and enhances precipitation. Winter precipitation stored as snow is important for planning area water resources. Cooler temperatures and less intense sunlight during winter combine to reduce evaporation, and, in most years, allow snow cover to persist until spring, when

gradually melting snow replenishes surface water supplies.

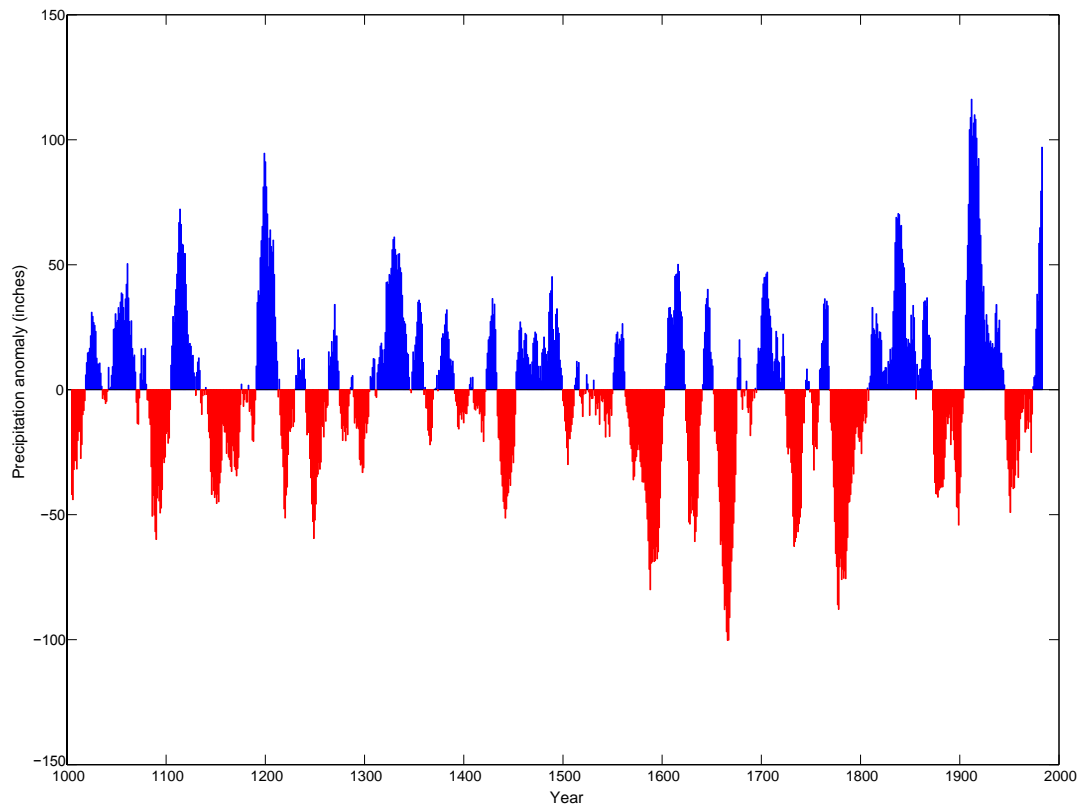
During the summer monsoon season, atmospheric circulation shifts and brings moisture from the south and east to the planning area. Storms during this season are driven primarily by convection (heat-driven upward motion), aided by topography, which can force air parcels upward to heights where water vapor condenses. Summer convective thunderstorms tend to occur in spatially scattered cells. Many storms originate over the high elevations in the Central Highlands Planning Area and move downward and outward over the deserts. The planning area receives over 37% of its annual precipitation during July-September, which helps replenish streamflow and recharge groundwater aquifers, especially in the shallow fractured aquifers

Figure 5.0-8 Average Monthly Precipitation and Temperature in the Central Highlands Planning Area 1930-2002



Data are from the U.S. Historical Climatology Network. Figure author: CLIMAS

Figure 5.0-9 Arizona NOAA Climate Divisions 3 & 4 Winter (November-April) Precipitation Departures from Average, 1000-1988, Reconstructed from Tree Rings



Data are presented as a 20-year moving average to show variability on decadal time scales. Data: Fenbiao Ni, The University of Arizona Laboratory of Tree-Ring Research and CLIMAS. Figure author: CLIMAS

near Payson. However, summer precipitation is generally less hydrologically effective than winter precipitation because of greater evaporation rates and the spatial discontinuity of the storms.

Figure 5.0-9 shows long-term changes in area-weighted average winter (November-April) precipitation for NOAA Arizona Climate Divisions 3 and 4 based on three-ring reconstructions. The record indicates recurrent drought in each century, with notable winter dry periods in the mid-1100s, late 1500s, late 1600s, and late 1700s. Notable winter wet periods include the early 1200s, the mid-1800s, and early 1900s. Precipitation variability on time scales of 10-30 years is likely related to shifts in Pacific Ocean circulation patterns, though recent research also points to the influence of the North Atlantic

Ocean. Shorter-term variations can be attributed to ocean-atmosphere variations related to the El Niño-Southern Oscillation. During El Niño episodes, there are greater chances for above-average winter precipitation, as storm tracks across North America are shifted farther south than normal. La Niña conditions are reliably associated with below-average winter precipitation.

5.0.4 Environmental Conditions

Environmental conditions reflect the effects of geography, climate and cultural activities and may be a critical consideration in water resource management and supply development. Discussed in this section is vegetation, riparian protection through the Arizona Water Protection Fund Program, instream flow claims, threatened and endangered species, public lands protected

from development as national monuments, wilderness areas and preserves and unique and other managed waters.

Vegetation³

Three of Arizona's five ecoregions are included in the planning area: the Arizona mountains forests, which cover most of the area, the Sonoran Desert in the southwest, and an extension of the Colorado Plateau shrublands in the norther Verde River Basin. Because of the wide elevation range in the planning area, there are many biotic communities, ranging from Sonoran desertscrub in the Upper Hassayampa Basin to subalpine grassland and subalpine conifer forest in the high elevations of the Salt River and Verde River basins. A very small area of alpine tundra is found above 12,000 feet on the San Francisco Peaks in the Verde River Basin (this small area is not distinguishable on Figure 5.0-10). Much of the planning area is covered by Rocky Mountain and Madrean montane conifer forests, interior chaparral and Great Basin conifer woodlands.

Areas of subalpine grassland and subalpine forests are found at high elevations in the White Mountains and on the San Francisco Peaks. The subalpine conifer forests are limited to relatively small isolated mountaintop stands at elevations of 8,500 to almost 12,000 feet with annual precipitation from 30 to 40 inches a year. These forests consist of dense stands of fir, spruce and aspen trees. Bristlecone pine stands occur at elevations around 11,000 feet on the San Francisco Peaks (Brown, 1982). Significant stands of aspen occur in places, especially in areas that have been burned. Natural fires are relatively uncommon in subalpine conifer forests (Grahame and Sisk, 2002). Recent surveys of aspen sites show that low-elevation dry sites on the Coconino National Forest (<7,500 feet) experienced 95% mortality since 2000. Sites

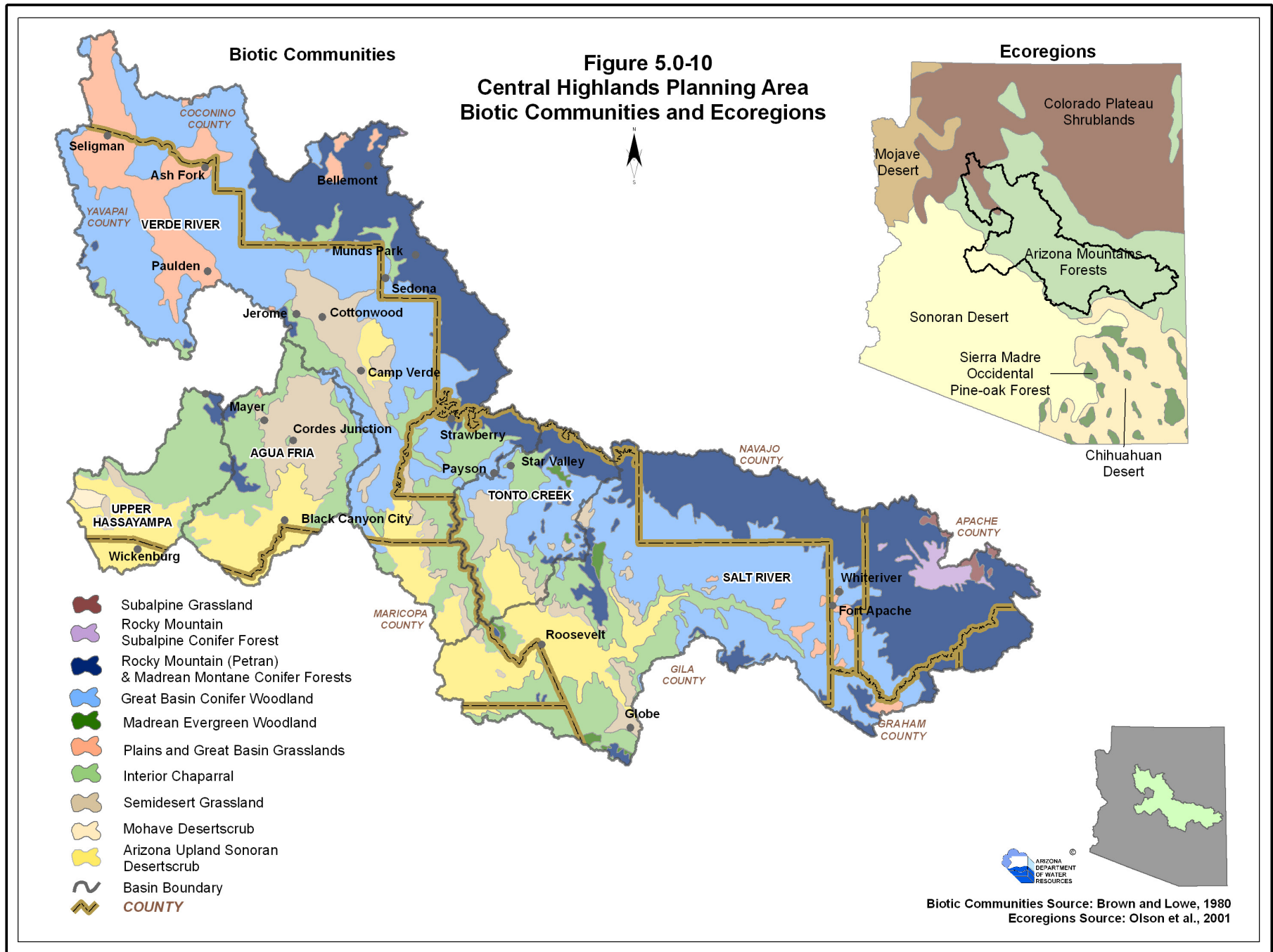
surveyed on the Apache-Sitgreaves National Forest above 7,500 feet showed 40% mortality in both mid-and high-elevation sites. Researchers found that while insects and disease were associated with the mortality, they appeared to be secondary agents on already drought-stressed trees (USDA, 2008)

Rocky Mountain (Petran) and Madrean montane conifer forests commonly occur between about 7,200 to 8,700 feet. Above 8,000 feet in areas that receive from 25 to 30 inches of annual rainfall, the forest contains a mix of conifers that may include Douglas-fir, white fir, limber pine, blue spruce and white pine, with ponderosa pine on warmer slopes. Aspen and Gambel oak are prominent in these forests following disturbances. Below 8,000 feet in areas that receive about 18 to 26 inches of annual precipitation, the mix of species gives way to almost pure stands of ponderosa pine. The forest stretching from near Flagstaff along the Mogollon Rim to the White Mountains region is the largest ponderosa pine forest on the continent (Grahame and Sisk, 2002). About half of the precipitation occurs during the growing season, which permits forests to exist on less than 25 inches of annual rainfall, making them some of the driest forests in North America (Brown, 1982). In the planning area these forests extend



Rocky Mountain (Petran) and Madrean montane conifer forest, Clover Springs Area, Verde River Basin.

³ Except as noted, information in this section is from Brown and Lowe, 1980 and from AZGF, 2004.



across the entire northern boundary and are also found at higher elevations in other locations in the planning area (Figure 5.0-10).

The high elevation subalpine and montane conifer forests receive much of their annual precipitation as snow. Because of forest density, sunlight reaches the ground and snow melts slowly, releasing snowmelt gradually to streams. Snowfall accumulations in this area of the state are critical to the Phoenix metropolitan area water supply.

Great Basin conifer (piñon-juniper) woodlands cover areas below the ponderosa pine forest at elevations between about 5,000 and 7,500 feet that receive about 10 to 20 inches of annual precipitation. Extensive stands exist throughout the planning area as shown on Figure 5.0-10. Bark beetle infestations have affected large areas of piñon pine in the White Mountains in recent years although activity decreased in most areas in 2007 (USDA, 2008).

Madrean evergreen woodland occurs in small areas in the eastern part of the Tonto Creek and western part of the Salt River basins at elevations of about 5,000 to 6,000 feet. This mild winter-wet summer woodland consists of evergreen oak, juniper and piñon pine. This community is more commonly found in southeastern Arizona and the Sierra Madre of Mexico. In this northern reach it occurs above or within interior chaparral and below and along drainages within the Great Basin conifer woodland (Brown, 1982).

Plains and Great Basin grasslands, primarily composed of mixed or short-grass communities, occur in several parts of the planning area at elevations between 5,000 and 7,000 feet that receive between 11 and 18 inches of annual precipitation. These areas are located primarily in Chino Valley and in small areas on the Fort Apache Indian Reservation south of Fort Apache. The piñon-juniper woodland is often intermixed with this grassland.

Interior chaparral is found at lower elevations (4,000-6,000 feet) in areas that receive 13 to 23 inches of annual precipitation. Chaparral consists of dense shrubs that grow around the same height with occasional taller shrubs or small trees. Chaparral communities typically are a mix of several shrubby species such as mountain mahogany, shrub live oak, and manzanita and commonly include cactus, agave, and yucca. Chaparral plants are well adapted to drought conditions.

Semi-desert grasslands occur in valleys between the desert and woodlands or chaparral at elevations between 3,500 and 5,000 feet that receive annual precipitation of 10 to 15 inches. Semi-desert grasslands are found in the Upper Hassayampa and Agua Fria basins and south of Payson in the Tonto Creek Basin. Desert grasslands often contain a mixture of grasses, shrubs and small trees.

A small extension of Mohave desertscrub is found in the western part of the Upper Hassayampa Basin. While many of the same plants found in the other Arizona deserts occur here, some are indicative of the Mohave Desert such as the Joshua tree and certain cacti and endemic ephemeral plants, most of which are winter annuals (Brown, 1982). The community is shrub-dominated and creosote bush and bursage are often dominant species. Mohave desertscrub is typically found at elevations



Interior chaparral, Salt River Basin.

below about 3,500 feet that receive 5 to 11 inches of annual rainfall.

Arizona Upland Sonoran desertscrub covers parts of the planning area below about 3,500 feet in the Upper Hassayampa, Agua Fria, Tonto Creek and Salt River basins. The community occurs primarily on slopes and sloping plains at elevations of 980 to over 3,000 feet where it merges with interior chaparral or semidesert grassland with average annual precipitation between 8 to 16 inches. Vegetation is scrubland or low woodland in appearance with blue and foothill palo verde, ironwood, mesquite and cat-claw acacia as common tree species. Cacti are extremely important in this subdivision including saguaro, cholla and barrel cacti. (Brown, 1982)

Extensive reaches of riparian vegetation occur throughout the planning area. Areas that have been mapped along perennial streams are shown in Figure 5.0-12. Along the Verde River and several of its tributaries, riparian vegetation is composed of mixed broadleaf, cottonwood-willow, mesquite and strand vegetation (riparian obligate plants adapted to periodic flooding, scouring, or soil deposition). Conifer-Oak riparian obligate habitat is found at higher elevations along West Clear Creek and the East Verde River. Mixed broadleaf, mesquite and strand vegetation is found along three perennial reaches of the Agua Fria River. Two tributaries to the Agua Fria River, Little Ash Creek and Sycamore Creek also contain significant mixed broadleaf vegetation (NEMO, 2006). In the higher elevation headwaters area of the Black River, riparian habitat is composed of wet meadow, mountain scrub and conifer-oak vegetation. At lower elevations mixed broadleaf and strand vegetation are found along the Black River. Along the Salt River, riparian vegetation is composed of mesquite, strand and tamarisk. In the Tonto Creek Basin, mixed broadleaf, cottonwood-willow, strand and mesquite vegetation are found along

Tonto Creek. Along the Hassayampa River at Wickenburg, riparian vegetation consists of cottonwood-willow, mesquite and strand while conifer-oak and mixed broadleaf are found at the Hassayampa River headwaters.

In their study of the change in riparian vegetation in the southwest, Webb and others (2007) remarked that “The Verde River...has the largest number of species of woody riparian vegetation that we observed...” They found that riparian vegetation had generally increased along the entire length of the Verde River and its tributaries, following a series of large floods between 1891 and 1940. They noted that riparian vegetation along the Salt River had increased somewhat upstream from Roosevelt Dam despite a number of severe floods between 1978 and 1995. Riparian vegetation also increased along the Agua Fria River upstream from New Waddell Dam. Riparian vegetation along the Hassayampa River was also found to have increased at several sites although the impact of drought, resulting in mortality of young trees, was noted near the downstream end of the Hassayampa River Preserve south of Wickenburg.

Several years of drought combined with high tree densities resulted in the largest outbreak of pine bark beetle populations ever recorded in Arizona during 2002 – 2004. This outbreak



Riparian vegetation along the Agua Fria River.

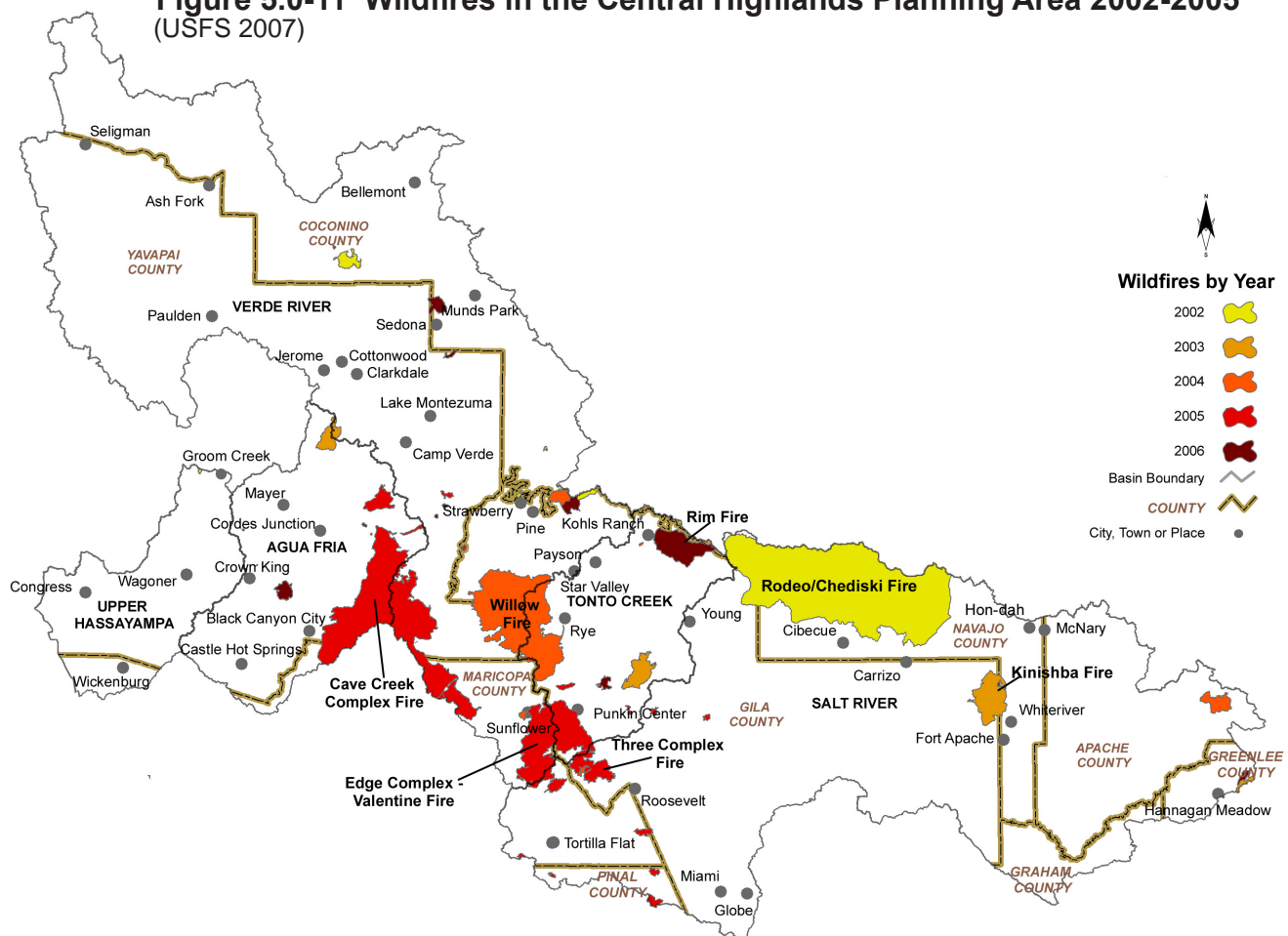
killed millions of piñon and ponderosa pine trees. In 2003 bark beetle mortality was detected on about 763,000 acres in Arizona and New Mexico, with most of the mortality occurring in Arizona (USFS, 2003). Areas most affected were trees at the lower end of their elevational range. Drought conditions improved in 2004 and 2005, and mortality decreased substantially as a result of both higher precipitation and because many of the trees in the most susceptible areas were already dead.

Based on aerial surveys conducted in 2004 by the U.S. Forest Service, there were several areas of ponderosa pine infestation in the planning area. Areas with substantial bark beetle-caused ponderosa pine mortality occurred on parts of the Fort Apache Indian reservation, on lands west and north of the reservation, areas southwest of

Bellemont, and areas west of Interstate 17 in the vicinity of Crown King. Data from aerial surveys recorded 2.1 million acres of piñon-juniper woodland and 1.3 million acres of ponderosa pine were affected in Arizona and New Mexico during 2002 – 2004 (USDA, 2007).

Wildfire risk increases with the number of dead trees in the landscape, which provide fuel for fires. There were several major wildfires in the Central Highlands Planning Area during the severe drought years between 2002 and 2005 (see Figure 5.0-11). The Rodeo-Chediski fire in 2002, Arizona’s largest ever, consumed about 462,600 acres, much of it in the north-central part of the Salt River Basin. The Willow Fire (2004) burned almost 120,000 acres southwest of Payson in the Tonto Creek and Verde River basins and the Cave Creek Complex Fire (2005)

Figure 5.0-11 Wildfires in the Central Highlands Planning Area 2002-2005 (USFS 2007)



burned 243,800 acres in the east-central part of the Agua Fria Basin and adjacent areas in the Verde River Basin and Phoenix AMA.

In the Southwest, fire can be among the most significant watershed disturbance agents, particularly to peak stream flows. In areas severely burned by the Rodeo-Chedeski Fire, peak flows were as much as 2,350 times greater than previously measured, the highest known post-fire peak flow in the Southwest. Increased peak flows can degrade stream channels and make them unstable, increase sediment production and cause flood damage. (Neary and others, 2003) Drought, wildfire and long-term climate change involving warmer temperatures with earlier springs and less snow cover could result in vegetative changes in the planning area with implications for runoff, infiltration and water supplies.

Arizona Water Protection Fund Programs

The objective of the Arizona Water Protection Fund (AWPF) program is to provide funds for protection and restoration of Arizona's rivers and streams and associated riparian habitats. Twenty-eight riparian restoration projects in the Central Highlands Planning Area have been funded by the AWPF through 2008. Nineteen of these projects were funded in the Verde River Basin, primarily involving research, fencing and stream restoration on the Verde River. Four projects were funded in the Salt River Basin including restoration projects on Cherry Creek, Canyon Creek and at Lofer Cienega. Two stream restoration projects in the Agua Fria Basin on Ash Creek and Lynx Creek, and an erosion research and fencing and revegetation project in Dakini Valley in the Tonto Creek Basin have also been funded. In the Upper Hassayampa Basin, one project has been funded involving a constructed wetland. A list of projects and project types funded in the Central Highlands Plan-

ning Area through 2008 is found in Appendix A of this volume. A description of the program, a complete listing of all projects funded, and a reference map is found in Volume 1.

Instream Flow Claims

An instream flow water right is a non-diversionary appropriation of surface water for recreation and wildlife use. An application to appropriate public water for instream flow purposes moves through a number of administrative steps culminating in the Department's approval or rejection of the application. Streamflow measurement data, a study that substantiates the streamflow volume requested and quantifies the relationship between the claimed beneficial use(s) and the requested streamflow rates are required before the Department will issue a permit to appropriate. Following approval of a permit, the permit holder has four years to demonstrate that the instream flow right is being used in a manner consistent with the terms of the issued permit. After the permit holder submits proof of the appropriation, the Department issues the permit holder a Certificate of Water Right (CWR) with a priority date that relates back to the date of the application. A CWR evidences a perfected surface water right that is superior to all other surface water rights with a later priority date, but junior to all right with an earlier (older) priority date. All permits and certificates are for specific uses at specific places and are endorsed with the priority date and extent and purpose(s) of the right(s). The right must be beneficially used or it may be subject to abandonment and forfeiture.

Thirty-nine applications for instream flow claims have been filed in the Central Highlands Planning Area. The applications are listed in Table 5.0-1 and shown on Figure 5.0-12. Claims have been filed in all the basins in the planning area and 11 certificates have been issued. Certificates have been issued for claims on: Ash Creek in the Agua Fria Basin; Christo-










Table 5.0-1 Instream Flow Claims in the Central Highlands Planning Area

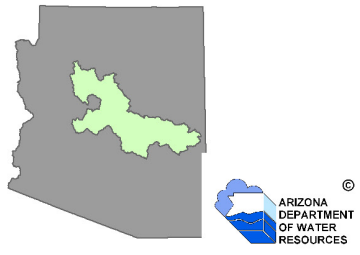
Map Key	Stream	Applicant	Application No.	Permit No.	Certificate No.	Filing Date
1	Apache Creek	Prescott National Forest	33-96801.0	Pending	Pending	7/22/2005
2	Ash Creek	BLM (Phoenix)	33-96411.0	96411	96411	1/5/1995
3	Big Bug Creek	Prescott National Forest	33-96802.0	Pending	Pending	7/22/2005
4	Canyon Creek	Tonto National Forest	33-96816.0	Pending	Pending	9/30/2005
5	Cherry Creek	Tonto National Forest	33-96609.0	Pending	Pending	6/30/1999
6	Christopher Creek	Tonto National Forest	33-96575.0	96575	96575	4/23/1998
7	Cienega Creek	Prescott National Forest	33-96803.0	Pending	Pending	7/22/2005
8	Coon Creek	Tonto National Forest	33-96742.0	Pending	Pending	6/18/2003
9	East Verde River	Tonto National Forest	33-90310.0	90310	90310	11/26/1985
10	Fossil Creek	Tonto National Forest	33-96622.0	Pending	Pending	12/1/1999
11	Foster Creek	Coconino National Forest	33-95370.0	Pending	Pending	2/2/1990
12	Haigler Creek	Tonto National Forest	33-96571.0	Pending	Pending	10/31/1997
13	Hassayampa River	Nature Conservancy	33-92304.0	92304	92304	1/20/1987
14	Jones Creek	Coconino National Forest	33-95371.0	Pending	Pending	2/2/1990
15	Oak Creek	Coconino National Forest	33-90106.0	Pending	Pending	7/29/1985
16	Pinto Creek	Tonto National Forest	33-89109.0	89109	89109	12/14/1983
17	Rarick Canyon	Coconino National Forest	33-90109.0	Pending	Pending	7/29/1985
18	Red Creek	Tonto National Forest	33-96743.0	Pending	Pending	6/18/2003
19	Reynolds Creek	Tonto National Forest	33-96570.0	96570	96570	10/31/1997
20	Sheepshead Creek	Coconino National Forest	33-90111.0	Pending	Pending	7/29/1985
21	Spring Creek	Coconino National Forest	33-90114.0	90114	90114	7/29/1985
22	Spring Creek	Tonto National Forest	33-96815.0	Pending	Pending	9/28/2005
23	Sycamore Creek	Coconino National Forest	33-90113.0	Pending	Pending	7/29/1985
24	Sycamore Creek	Tonto National Forest	33-96509.0	96509	96509	5/15/1996
25	Sycamore Creek	Prescott National Forest	33-96804.0	Pending	Pending	7/22/2005
26	Tangle Creek	Tonto National Forest	33-96743.0	Pending	Pending	1/31/2007
27	Tonto Creek	Tonto National Forest	33-96684.0	Pending	Pending	11/15/2000
28	Turkey Creek	Prescott National Forest	33-96708.0	Pending	Pending	1/29/2002
29	Verde River	Tonto National Forest	33-90309.0	90309	90309	11/26/1985
30	Verde River	Prescott National Forest	33-94374.0	Pending	Pending	12/2/1988
31	Verde River	Phelps Dodge Corp.	33-96760.0	Pending	Pending	6/3/2004
32	Verde River	Nature Conservancy	33-96876	Pending	Pending	7/18/2008
33	Verde River	Arizona Game & Fish	33-96877	Pending	Pending	8/6/2008
34	Walker Creek	Coconino National Forest	33-90108.0	Pending	Pending	7/29/1985
35	Walnut Creek	Prescott National Forest	33-96800.0	Pending	Pending	7/22/2005
36	West Clear Creek	Coconino National Forest	33-90110.0	90110	90110	7/29/1985
37	West Clear Creek	Johnson, James A.	33-96178.0	Pending	Pending	3/20/1992
38	Wet Beaver Creek	Coconino National Forest	33-90112.0	90112	90112	7/29/1985
39	Workman Creek	Tonto National Forest	33-96618.0	Pending	Pending	10/26/1999

Figure 5.0-12
Central Highlands Planning Area
Instream Flow Applications



Reach with Instream Flow

- Application Pending 
- Certificate Issued 
- Riparian Area 
- Stream Channel 
- Basin Boundary 
- COUNTY 
- Interstate Highway 
- Major Road 
- City, Town or Place 



Riparian Data Source: AGFD, 1993

pher Creek in the Tonto Creek Basin; the East Verde River, Spring Creek, Sycamore Creek (near Sunflower), the Verde River, West Clear Creek and Wet Beaver Creek in the Verde River Basin; the Hassayampa River in the Upper Hassayampa River Basin; and Pinto Creek and Reynolds Creek in the Salt River Basin. Some of the certificates cover extensive reaches of the streams as shown on Figure 5.0-12.

Threatened and Endangered Species

A number of listed threatened and endangered species may be present in the Central Highlands Planning Area. Those listed by the U.S. Fish and Wildlife Service (USFWS) as of 2008 are shown in Table 5.0-2. Presence of a listed species may be a critical consideration in water

resource management and supply development in a particular area. The USFWS should be contacted for details regarding the Endangered Species Act (ESA), designated critical habitat and current listings.

In the Salt River watershed, SRP has developed the Roosevelt Habitat Conservation Plan (Plan) to minimize and mitigate the impacts of operation of Roosevelt Dam and Lake to the southwestern willow flycatcher, bald eagle, Yuma clapper rail and western yellow-billed cuckoo (a candidate for ESA protection). Under the plan, SRP will acquire and protect at least 1,500 acres of riparian habitat in perpetuity along the San Pedro, Verde, and Gila rivers, or other river systems in Arizona, and implement other conservation measures to protect up to

Table 5.0-2 Threatened and endangered species in the Central Highlands Planning Area

Common Name	Threatened	Endangered	Elevation/Habitat
Apache (Arizona) Trout	X		>5000 ft./cold mountain streams
Arizona Agave		X	3,000 ft./steep, rocky granite slopes, or level hilltops, near chaparral; New River and Sierra Ancha Mountains
Arizona Cliff-rose		X	<4,000 ft./white soils of tertiary limestone lakebed deposits
Arizona hedgehog cactus		X	3,700-5,200 ft./ecotone between interior chaparral and madrean evergreen woodland
Bald Eagle	X		Varies/large trees or cliffs near water
California Brown Pelican		X	Varies/lakes and rivers
Chiricahua Leopard Frog	X		3,300-8,900ft./streams, rivers, backwaters, ponds and stock tanks
Desert pupfish		X	<5,000 ft./shallow springs, small streams and marshes. Tolerates saline and warm water
Gila Chub		X	2,000-5,500 ft./pools, springs, cienegas and streams
Gila topminnow		X	<4,500 ft./small streams, springs and cienegas and vegetated shallows

⁴ An “endangered species” is defined by the USFWS as “an animal or plant species in danger of extinction throughout all or a significant portion of its range,” while a “threatened species” is “an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.”

Table 5.0-2 Threatened and endangered species in the Central Highlands Planning Area (Cont)

Common Name	Threatened	Endangered	Elevation/Habitat
Gila trout	X		5,000-10,000 ft./small, high mountain streams
Lesser long-nosed bat		X	<6,000 ft./desert scrub with agave and columnar cacti
Loach Minnow	X		<8,000ft./benthic species of small to large perennial streams
Mexican Gray Wolf		X	4,000-12,000 ft. /chapparal, woodland and forests
Mexican Spotted Owl	X		4,100-9,000 ft./canyons and dense forests with multi-layered foliage structure
Razorback sucker		X	<6,000 ft./riverine and lacustrine areas; not in fast moving water
San Francisco Peaks groundsel	X		>10,900 ft./Alpine tundra
Southwestern Willow Flycatcher		X	<8,500 ft./cottonwood-willow and tamarisk along rivers and streams
Spikedace	X		<6,000 ft./moderate to large perennial streams with gravel cobble substrates
Yuma Clapper Rail		X	<4,500 ft./Fresh water and brackish marshes

Source: USFWS 2008, AZGF 2008

750 additional acres of habitat. The Plan also includes rescue of bald eagle eggs and nestlings whose nests are threatened by inundation, monitoring of the species and habitat at Roosevelt Lake and in the mitigation areas, and other measures. Following SRPs commitment to implementation of the Plan, the U.S. Fish and Wildlife Service issued a 50-year permit to SRP to “take” endangered southwestern willow flycatchers, threatened bald eagles, endangered Yuma clapper rails and yellow-billed cuckoos incidental to operation of Roosevelt Dam and Lake.⁵ (USFWS, 2003)

A habitat conservation plan (HCP) has also been adopted for Horseshoe and Bartlett reservoirs on the Verde River. Drought conditions resulted in establishment of riparian species in the

Horseshoe storage space that became colonized by a population of southwestern willow flycatchers and other covered species that may be adversely impacted by refilling the reservoir. The HCP will minimize and mitigate for take of the covered species by operating Horseshoe to maintain the riparian forest, acquiring 200 acres of replacement habitat and other actions (73 Federal Register 62525 et seq.).

National Monuments, Wilderness Areas and Preserves

Four national monuments that protect prehistoric dwellings are located in the planning area (see figure 5.0-13). Montezuma Castle, Tonto and Tuzigoot National Monuments are small sites containing cliff dwellings or pueblos. Ton-

⁵ As defined by the ESA, take means to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in other conduct.” (16 U.S.C. section 1531[18])

to National Monument is located along Tonto Creek in the Salt River Basin while the others are located in the Verde Valley in the Verde River Basin. Agua Fria National Monument, administered by the Bureau of Land Management, covers 71,700 acres in the Agua Fria Basin (see Figure 5.1-2). It contains at least 450 prehistoric sites, four major settlement areas and the Agua Fria River canyon, which contains a perennial reach of the river.

All or portions of 21 wilderness areas, encompassing 788,000 acres, are also found within the planning area. Wilderness areas are designated under the 1964 Wilderness Act to preserve and protect the designated area in its natural condition. Designated areas, their size, basin location and a brief description of the area

are listed in Table 5.0-3 and shown on Figure 5.0-13. All wilderness areas are located on National Forest Service lands with the exception of the Hassayampa River Canyon Wilderness which is administered by the Bureau of Land Management. Most of the wilderness areas protect riparian habitat, rivers and streams and are located in the Verde River Basin.

The Hassayampa River Preserve, located south of Wickenburg, was established in 1986 by The Nature Conservancy. The preserve protects spring-fed Palm Lake, a four-acre pond and marsh habitat that attracts water birds and provides habitat for endangered fish. The Hassayampa River is perennial within the preserve and supports lush streamside habitat.

Figure 5.0-13 Wilderness Areas in the Central Highlands Planning Area

(Wilderness Data Source: National Atlas of the United States 2005, Land Ownership Data Source: ALRIS 2006)

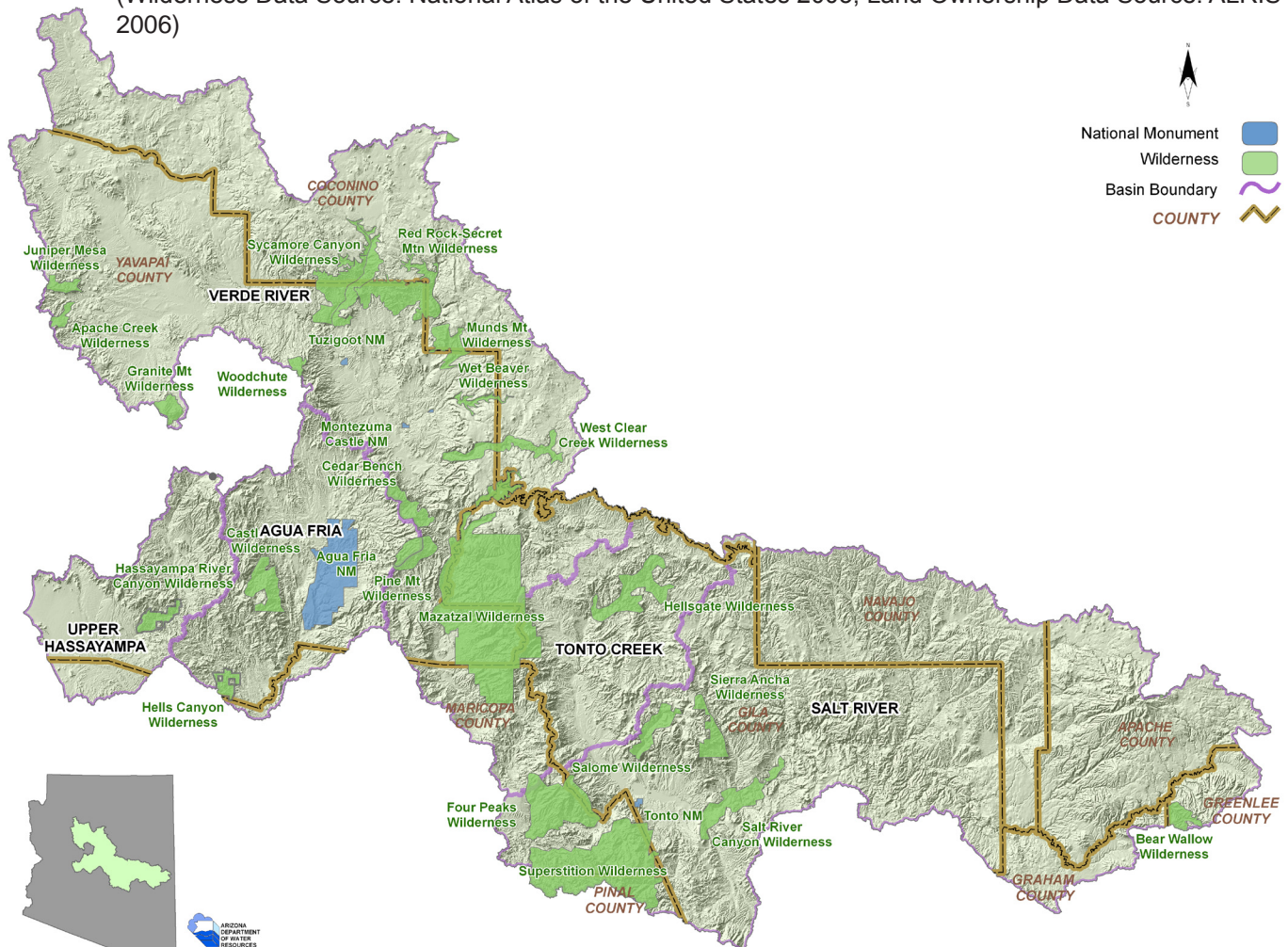


Table 5.0-3 Wilderness areas in the Central Highlands Planning Area

Wilderness Area	Acres	Basin	Description
Apache Creek	5,488	Verde River	Three springs and important riparian area including Apache Creek
Bear Wallow	11,336	Salt River (part)	Alpine forest of mixed conifers and aspens. Bear Wallow drainage with rich streamside habitat.
Castle Creek	25,536	Agua Fria	Bradshaw Mountains, prominent granite peaks, vegetation range from saguaro to pine
Cedar Bench	16,127	Verde River	Located along Verde Rim, borders portion of Verde Wild and Scenic River
Fossil Creek	10,400	Verde River	Extremely diverse riparian area, 1,600 foot deep canyon, travertine deposits, springs
Granite Mountain	9,747	Verde River	Mountain characterized by granite boulders, some the size of a house, stacked one atop the other to elevations that exceed 7,600 feet.
Hassayampa River Canyon	11,840	Upper Hassayampa	Includes several miles of the Hassayampa River and riparian habitat.
Hellsgate	37,399	Tonto Creek	Major canyon, Tonto Creek with deep pools of water and impassable falls
Juniper Mesa	7,708	Verde River	Flat topped mesa, great variety of wildlife
Mazatzal	250,053	Verde River, Tonto Creek	Mazatzal Mountains, chaparral and pine vegetation with narrow, vertical walled canyons. Includes portion of Verde Wild and Scenic River
Munds Mountain	18,069	Verde River	Munds and Lee mountains, Jacks, Woods and Rattlesnake canyons, Courthouse Butte and Bell Rock
Pine Mountain	20,100	Agua Fria, Verde River	Island of tall timber, surrounded by brush-covered desert mountains with hot, dry mesas and deep canyons.
Red Rock Secret Mountain	48,263	Verde River	Red rock pinnacles, arches and slot canyons, rock art and prehistoric dwellings
Salome	18,515	Salt River	Upper/perennial reaches of Salome Creek and Workman Creek
Salt River Canyon	32,088	Salt River	Portions of the Salt River and spectacular canyon
Sierra Ancha	21,007	Salt River	Box canyons, high cliffs, prehistoric dwellings
Superstition	160,135	Salt River (part)	Rugged mountains, rock formations, large vegetation range, prehistoric dwellings, riparian habitat
Sycamore Canyon	57,916	Verde River	Large canyon with desert riparian area. Extends from near Williams to Verde Valley
West Clear Creek	15,267	Verde River	Deep, narrow canyon with many pools of water
Wet Beaver Creek	6,178	Verde River	Major canyon in red rock rim country
Woodchute	5,553	Agua Fria	Views, ponderosa pine, pinon and juniper
Total Acres in Planning Area	788,000		

Source: BLM 2006, USFS 2007

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). (TNC, 2008)

Unique and Other Managed Waters

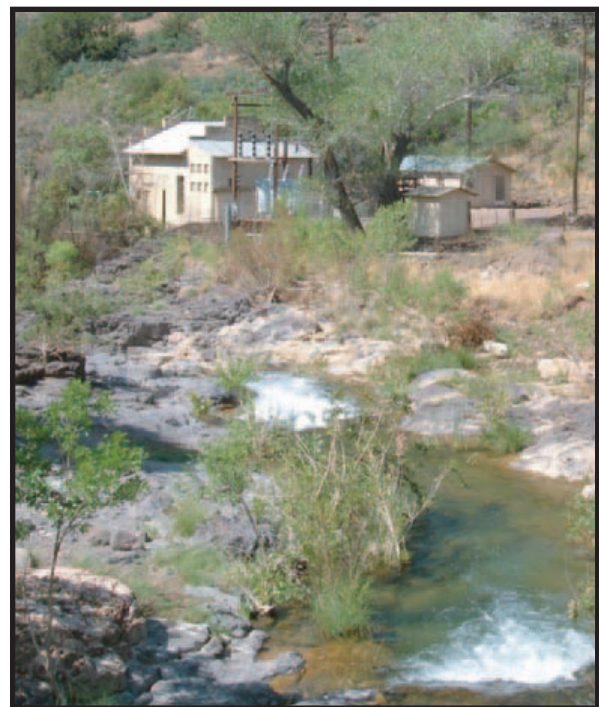
Several “unique waters”, designated by the Arizona Department of Environmental Quality (ADEQ) pursuant to A.C.C. R18-11-112, as having exceptional recreational or ecological significance and/or providing habitat for threatened or endangered species, have been identified in the planning area. These include:

- Oak Creek, including the West Fork of Oak Creek in the Verde River Basin
- Snake Creek, from its headwaters to its confluence with the West Fork of the Black River in the Salt River Basin
- Hay Creek, from its headwaters to its confluence with the West Fork of the Black River in the Salt River Basin
- Stinky Creek, from the Fort Apache Indian Reservation boundary to its confluence with the West Fork of the Black River in the Salt River Basin
- Bear Wallow Creek, from its headwaters to the boundary of the San Carlos Indian Reservation in the Salt River Basin.

Other managed surface water in the planning area include two streams designated as Wild and Scenic Rivers and a lake. 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 in T11N, R6E; a reach of 18.3 miles. South of this reach, the Wild River Area continues for another 22.2 miles to the river’s confluence with Red Creek within section 34, T9½N, R6E (see Figure 5.5-4). Under the Act the river area must be managed in a manner that protects and enhances its “outstandingly remarkable values” (NWSR, 2007)

In 2004, Arizona Public Service Company surrendered a license from the Federal Energy Regulatory Commission to operate hydroelectric power plants at Irving and Childs on Fossil Creek in the Verde River Basin near Strawberry. As part of the decommissioning they agreed to remove project features and restore the landscape. These two historic power plants were constructed beginning in 1908 and operated by turbines driven by water diverted from Fossil Creek. This diversion captured most of the natural spring fed flow of the creek and fundamentally changed the character of the stream. The springs that supply the base flow



Irving Power Plant and Fossil Creek, Verde River Basin.

of Fossil Creek are rich in calcium carbonate that precipitates out and forms travertine dams. Without the natural flow and travertine deposition the stream was no longer a series of pools impounded by travertine dams. Following restoration of flow, native fish were removed and non-native fish eradicated from the stream in order to reestablish fish native to the system. In March 2009, 16.8 miles of Fossil Creek became only the second watercourse in the state to be designated as a Wild and Scenic River. This designation requires that the USFS prepare a management plan to protect the creek.

Stillman Lake is a narrow, 20-acre water body in the Verde River Basin formed above a natural sediment dam near the headwaters of the Verde River south of Paulden and below Sullivan Dam. The Arizona Game and Fish Department, U.S. Fish and Wildlife Service, and the Bureau of Reclamation are working together to manage Stillman Lake for native fish by eliminating non-native species. A draft Environmental Impact Assessment was released in March 2007 that proposed using a chemical piscicide to remove non-native fish and then restock the lake with native species

(USFWS, 2007). In May 2009, a decision and finding of no significant impact for the environmental assessment was released, finding that the best alternative was that proposed in the Assessment. (USFWS, 2009)

5.0.5 Population

The 2000 Census populations for each basin and Indian reservation in the planning area, listed from highest to lowest, are shown in Table 5.0-4. The most populous basin by far is the Verde River Basin with more than 88,000 residents or 62% of the planning area total. The 2005 estimated population of the Verde River Basin was almost 102,000 residents. Historic, current and projected basin populations are shown in the basin cultural water demand tables. The Census 2000 planning area population was about 142,850 and Arizona Department of Economic Security (DES) population projections forecast another 100,000 residents by 2030 (see Table 5.0-5).

Shown in Table 5.0-5 are incorporated and unincorporated communities in the planning area with 2000 Census populations greater than 1,000 and growth rates for two time periods. Communities are listed from highest to lowest population in 2000 and their location is shown on Figure 5.0-14. The planning area population grew by 38.5% between 1990 and 2000 and by 16.6% between 2000 and 2006. A number of communities lack data for 1990 or 2006, but it appears that there has been considerable growth in smaller communities in the planning area. Of note is the large number of communities in this planning area with populations between 1,000 and 5,000. Many of these

Table 5.0-4 2000 Census population in the Central Highlands Planning Area

Basin/Reservation	2000 Census Population
Verde River	88,242
<i>Yavapai-Apache</i>	<i>743</i>
Salt River	31,381
<i>Fort Apache</i>	<i>10,385</i>
<i>San Carlos Apache</i>	<i>Unk</i>
Upper Hassayampa	10,479
Agua Fria	8,210
Tonto Creek	7,537
<i>Tonto Apache</i>	<i>132</i>

Unk = Unknown

Table 5.0-5 Communities in the Central Highlands Planning Area with a 2000 Census population greater than 1,000

Communities	Basin	1990 Census Pop.	2000 Census Pop.	Percent Change 1990-2000	2006 Pop. Estimate	Percent Change 2000-2006	Projected 2030 Pop.
Payson*	Verde River	8,377	13,620	62.6%	15,812	16.1%	22,631
Cottonwood-Verde Village	Verde River	7,037	10,610	50.8%	11,328	6.8%	18,765
Sedona*	Verde River	7,720	10,192	32.0%	11,080	8.7%	13,776
Camp Verde*	Verde River	6,243	9,451	51.4%	11,779	24.6%	19,131
Cottonwood*	Verde River	5,918	9,179	55.1%	11,201	22.0%	17,584
Globe*	Salt River	6,062	7,486	23.5%	7,497	0.1%	8,614
Big Park	Verde River	3,034	5,245	72.9%	6,566	25.2%	10,735
Whiteriver	Salt River	3,775	5,220	38.3%	5,931	13.6%	8,409
Wickenburg*	Upper Hassayampa	4,515	5,082	12.6%	6,195	21.9%	12,340
Clarkdale*	Verde River	2,144	3,422	59.6%	3,680	7.5%	4,712
Paulden	Verde River	NA	3,420	--	5,342	56.2%	11,411
Lake Montezuma	Agua Fria	1,841	3,344	81.6%	4,237	26.7%	7,059
Cornville	Verde River	2,089	3,335	59.6%	4,075	22.2%	6,413
Black Canyon City	Agua Fria	1,811	2,697	48.9%	3,224	19.5%	4,887
Central Hts./Midland City	Salt River	2,969	2,694	-9.3%	NA	--	NA
Kachina Village	Verde River	1,711	2,664	55.7%	3,302	23.9%	4,888
Cordes Lakes	Agua Fria	NA	2,058	--	2,877	39.8%	5,462
Miami*	Salt River	2,018	1,936	-4.1%	1,959	1.2%	2,100
Pine	Verde River	1,181	1,931	63.5%	NA	--	NA
Claypool	Salt River	1,942	1,794	-7.6%	NA	--	
Congress	Upper Hassayampa	NA	1,717	--	2,272	32.3%	4,026
Mayer	Agua Fria	NA	1,408	--	1,602	13.8%	2,254
Sun Valley/Star Valley	Tonto Creek	NA	1,536	--	2,973	93.6%	5,237
Cibecue	Salt River	1,254	1,331	6.1%	NA	--	1,382
Munds Park	Verde River	NA	1,250	--	1,876	50.1%	3,433
Parks	Verde River	NA	1,137	--	1,550	36.3%	2,575
Canyon Day	Salt River	857	1,092	27.4%	NA	--	NA
Strawberry	Verde River	630	1,028	63.2%	NA	--	NA
Spring Valley	Agua Fria	NA	1,019	--	1,332	30.7%	2,321
Mountaineer	Verde River	NA	1,014	--	1,222	20.5%	1,738
Total >1,000		UNK	117,912	--	UNK	---	UNK
Remainder		UNK	24,938	--	UNK	---	UNK
Total		103,150	142,850	38.5%	166,632	16.6%	243,585

Source: DES, 2005; U.S. Census Bureau, 2006; AZCommerce, 2008a and 2008b; Wickenburg, 2003

Notes: 2006 population is 2006 estimate for incorporated communities and 2006 projection for unincorporated communities

Gila and Maricopa county projections are limited

NA = not available

* = incorporated communities

smaller communities are “satellite” communities of nearby incorporated areas; e.g. Kachina Village, Munds Park, Parks and Mountainaire are all located near Flagstaff, just outside of the planning area. There were eight incorporated communities within the planning area in 2000. The community of Star Valley, east of Payson, incorporated in 2005 due to concerns that the Town of Payson would take water from that area to serve new developments (Payson Roundup, 2005). In 2006 Payson was the largest community in the planning area with more than 15,800 residents, followed by Cottonwood-Verde Village, Sedona, Camp Verde, Cottonwood and Globe. The median age in many communities is considerably older than the state average of 34.2 years. Sedona, Congress, Big Park, Black

Canyon City, and Clarkdale had median ages of over 45 reported in the 2000 Census.

Rapid growth occurred in several areas between 1990 and 2000 census including Big Park, Payson, Pine/Strawberry, Lake Montezuma and the Verde Valley communities of Cottonwood, Camp Verde, Clarkdale and Cornville. The Verde Valley area population represents about 32% of the population of Yavapai County (Dava & Associates, 2003). Between 2000 and 2006, Star Valley east of Payson, grew by almost 94%, the fastest growth rate reported in the planning area. Population projections for 2030 are not currently available for a number of communities; however, the planning area population is projected to increase by 46% by 2030.

Figure 5.0-14 Communities with a 2000 Census Population Greater than 1,000 in the Central Highlands Planning Area



Population Growth and Water Use

Growing Smarter and Local Planning

The state has limited mechanisms to address the connections between land use, population growth and water supply. A legislative attempt to link growth and water management planning is the Growing Smarter Plus Act of 2000 (Act), which requires that counties with a population greater than 125,000 (2000 Census) include planning for water resources in their comprehensive plans. Yavapai, Maricopa and Pinal counties fit the population criteria. There is relatively little population or water development within the Maricopa and Pinal county sections of the planning area. About 4,800 square miles (35%) of Yavapai County is located within the planning area, the largest area of any of the nine counties located within it. The Yavapai County water resources element includes an overview of the watersheds in the county, a statement of goals and objectives regarding water supply, water quality and protection of water resources, and an evaluation of existing water use data. Also included is a discussion of the Yavapai County Water Advisory Committee (WAC), a group tasked with development of a regional water management strategy that helps support the water resource goals in the general plan. (Dava & Associates, Inc., 2003).



City of Sedona, Verde River Basin. Sedona is one of five communities in the Central Highlands Planning Area required to have a water resources element in their general plan.

The Act also requires that twenty-three communities outside AMAs include a water resources element in their general plans. In the Central Highlands Planning Area this requirement applies to the communities of Camp Verde, Clarkdale, Cottonwood, Globe, and Sedona. As of August 2009 all communities had completed a water resource element. Plans must consider water demand and water resource availability in conjunction with growth, land use and infrastructure. References to completed plans are listed in basin references in this volume and may contain useful information for water resource planning.

Water System Plans and Annual Reports

Beginning in 2007, all community water systems in the state were required to submit Annual Water Use Reports and System Water Plans. The reports and plans are intended to reduce community water systems' vulnerability to drought, and to promote water resource planning to ensure that water providers are prepared to respond to water shortage conditions. In addition, the information will allow the State to provide regional planning assistance to help communities prepare for, mitigate and respond to drought. An Annual Water Use Report must be submitted each year by the systems that includes information on water pumped, diverted and received, water delivered to customers and effluent used or received. The System Water Plan must be updated and submitted every five years and consist of three components, a Water Supply Plan, a Drought Preparedness Plan and a Water Conservation Plan. By January 1, 2008 all systems were required to submit plans. By the end of 2008, plans had been submitted by 94 community water systems in the planning area. All of the larger systems submitted plans and were used to prepare this document. Annual water report information and a list of water plans are found in Appendix B.

Water Adequacy Program

The Department’s Water Adequacy Program also relates water supply and demand to growth to some extent, but does not control growth. Developers of subdivisions outside of AMAs are required to obtain a determination of whether there is sufficient water of adequate quality available for 100 years. If the supply is inadequate, lots may still be sold, but the condition of the water supply must be disclosed in promotional materials and in sales documents. Legislation adopted in June 2007 (SB 1575) authorizes a county board of supervisors to adopt a provision, by unanimous vote, which requires a new subdivision to have an adequate water supply in order for the subdivision to be approved by the platting authority. If adopted, cities and towns within the county may not approve a subdivision unless it has an adequate water supply. If the county does not adopt the provision, the legislation allows a city or town to adopt a local adequacy ordinance that requires a demonstration of adequacy before the final plat can be approved. In September 2008 the Town of Clarkdale adopted the provisions of SB 1575.

Subdivision adequacy determinations (Water Adequacy Reports), including the reason for

the inadequate determination, are provided in basin tables and maps and are summarized in Table 5.0-6. Also shown in the basin sections are approved applications for an Analysis of Adequate Water Supply (AAWS). This application is typically associated with large, master planned communities.

The service areas of seven water providers in the planning area have been designated as having an adequate water supply. If a subdivision is served by one of these designated water providers, a separate adequacy determination is not required. As of May, 2009 these included:

- City of Globe
- Town of Wickenburg
- Little Park Water Company (Village of Oak Creek)
- Big Park Water Company (Village of Oak Creek)
- American Ranch Domestic Water Improvement District (American Ranch Development near Prescott)
- Verde Santa Fe Water Company (Verde Santa Fe Development at Cornville)
- CDC Wickenburg Water, LLC (Wickenburg Ranch Estates)

Table 5.0-6 Water adequacy determinations in the Central Highlands Planning Area as of 12/2008

Basin	Number of Subdivisions	Number of Lots ¹	Number of Adequate Determinations	Number of Inadequate Determinations	Approx. Percent Inadequate
Agua Fria	15	>1,177	>973	204	17%
Salt River	17	>968	106	>862	89%
Tonto Creek	62	4,305	441	3,864	90%
Upper Hassayampa	28	2,235	1,896	339	15%
Verde River	430	>32,053	>24,218	>7,835	24%
TOTAL	552	>40,617	>27,634	>12,983	32%

Source: ADWR 2008b

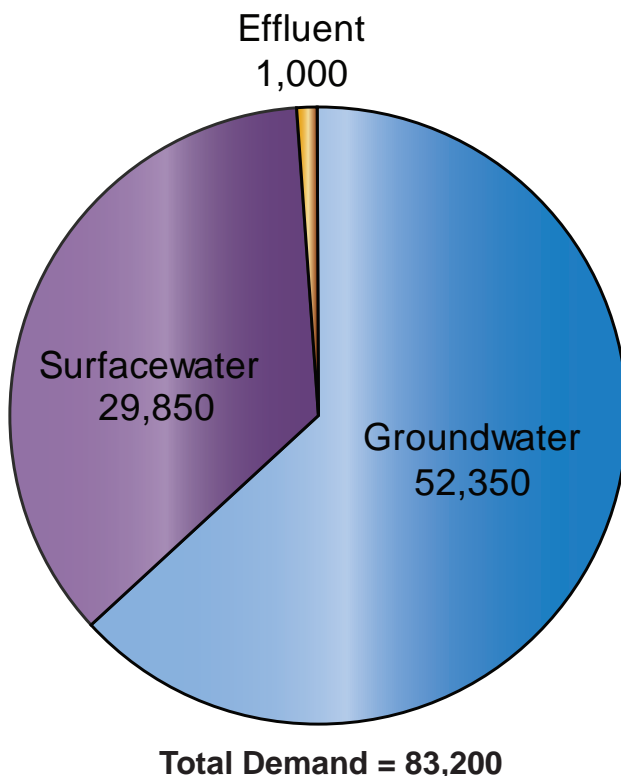
Notes:

¹ Data on number of lots are missing for some subdivisions; actual number is larger

5.0.6 Water Supply

Water supplies in the Central Highlands Planning Area include surface water, groundwater and effluent. Central Arizona Project (CAP) water diverted from the Colorado River via the CAP canal is stored in the planning area but is not utilized within it. Surface water from local streams is used extensively for agricultural irrigation in the Verde River Basin and to some extent in the Salt River Basin where it is also diverted to meet mining demand, primarily outside of the planning area. It is estimated that about 36% of the total water demand in the planning area is met with surface water. Groundwater is the primary water supply in the planning area, accounting for about 63% of the demand. Effluent is utilized for golf course irrigation in the Tonto Creek and Verde River basins, contributing 1% of the planning area's water supply.

Figure 5.0-15 Average Annual Water Supply Utilized in the Central Highlands Planning Area, 2001-2005 (in acre-feet)



For purposes of the Atlas, water diverted from a watercourse or spring is considered surface water and if it is pumped from wells it is accounted for as groundwater. This is reflected in the cultural water demand tables in each basin section.

Central Arizona Project Water

New Waddell Dam, located on the Agua Fria River in the Phoenix Active Management Area, stores CAP water in Lake Pleasant located in the Agua Fria Basin. This water is not a direct supply for the planning area. The dam also stores Agua Fria River water and provides flood control. In the winter, water is pumped from the CAP canal to Lake Pleasant. When demand increases in the summer, water is released through the same canal to downstream CAP contractors within the Central Arizona Water Conservation District (CAWCD) service area; Maricopa, Pima and Pinal counties.

Six municipal and industrial water providers or water users and three Indian Tribes in the planning area were allocated an entitlement of CAP water (Table 5.0-7). In order to physically acquire water under their respective subcontracts, it was anticipated that subcontractors located outside of the CAP service area would exchange their CAP entitlement for a locally available surface water supply that was held by a downstream senior water right holder located within the CAP service area. The CAP entitlements held by Indian Tribes could also be included in any future, potential water settlement.

Due to environmental issues associated with the potential exchange of its CAP entitlement for East Verde River water rights held by SRP, the town of Payson chose to sell its CAP entitlement to the City of Scottsdale. The transfer process was completed in 1994. The money ac-

Table 5.0-7 CAP subcontractors and transferred entitlements in the Central Highlands Planning Area¹

CAP Subcontractor	CAP Entitlement (acre-feet)	CAP Entitlement Transferred (acre-feet)	Gross Proceeds from Transfer ¹
Camp Verde Water System, Inc.	1,443	1,443	\$1,443,000
Cottonwood Water Works, Inc.	1,789	1,789	\$1,789,000
Mayer Domestic Water Improvement District	332	332	\$332,000
Town of Payson	4,995	4,995	\$4,995,000
Phelps Dodge Miami, Inc.	2,916		
Pine Water Co.	161		
San Carlos Apache Tribe	61,645		
Tonto-Apache Tribe	128		
Yavapai-Apache Tribe	1,200		

¹ Does not reflect the reduction associated with equivalency charges and capital costs due to CAWCD or other fees associated with the entitlement transfer actions.

quired from the sale was deposited into a trust fund managed by the U.S. Bureau of Reclamation for the purpose of developing alternative water supplies for Payson.

In response to the proposed transfer of Payson’s CAP subcontract to Scottsdale, the Department developed a transfer policy to govern the transfer of a CAP entitlement from a subcontractor located outside of the CAP service area. Subsequent to the adoption of this policy, Camp Verde Water System, Inc., Cottonwood Water Works, Inc. and the Mayer Domestic Water Improvement District decided to transfer their subcontracts to Scottsdale. Monies resulting from the sale of these entitlements were also placed in separate trust fund accounts for each entity. Table 5.0-7 lists the entitlement volumes that were eventually transferred to Scottsdale and the gross proceeds that resulted from the respective transactions.

In accordance with each trust fund agreement, the Department provides oversight regarding expenditures from these accounts to ensure that trust fund monies are used to defray expenses associated with “designing, constructing, acquiring and/or developing an alternative water supply in an amount which may include, but is not limited to, a combined net increase” in the subcontractor’s “water system capacity to replace the CAP allocation” that it sold.

Plans regarding the CAP entitlements held by Phelps Dodge Miami, Inc. and Pine Water Company are not known. The San Carlos Apache Tribe leases a portion of its CAP allocation to the City of Scottsdale and as exchange water for use by Freeport McMoRan at Morenci in the Southeastern Arizona Planning Area. The Tonto-Apache and the Yavapai-Apache tribes have no current uses or exchanges.

Surface Water

Surface water in the planning area is subject to complex legal conditions which affect use of the supply. Discussed in this section are the surface water supplies that are physically available, the legal framework that regulates its use and a discussion of the surface water rights system in Arizona.

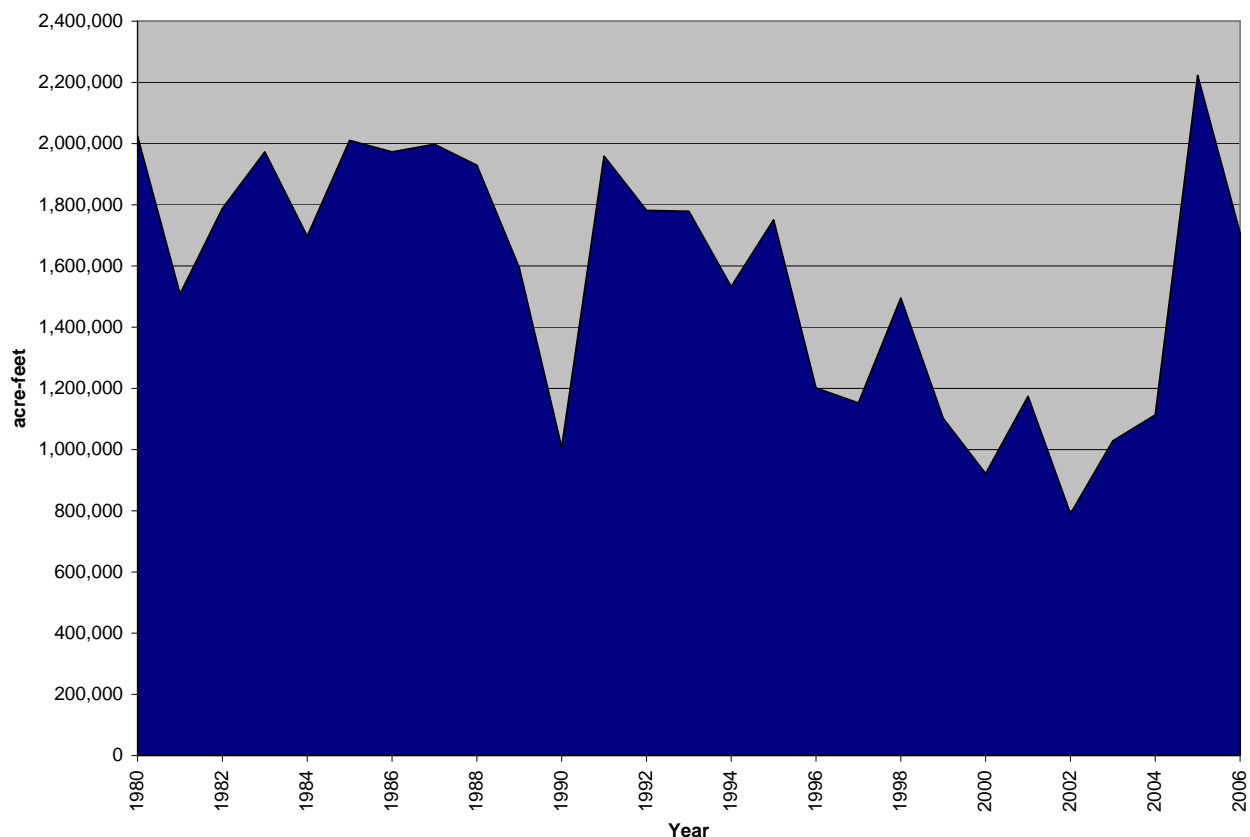
Physical Supplies

The Salt and Verde rivers, as well as the Gila River located south of the planning area, are the primary in-state sources of surface water in Arizona. Relatively high elevations along the Mogollon Rim and in the White Mountains, with associated rainfall and snowfall, make the Salt and Verde watersheds extremely productive. However, because flows in the Salt and Verde rivers are strongly influenced by precipi-

tation, the quantity of flow and water levels in reservoirs along the rivers can fluctuate widely due to climatic variations.

Dams and reservoirs on the Salt and Verde rivers are operated by SRP to store and release water for the benefit of agricultural, municipal and industrial users in the Phoenix metropolitan area. These supplies are generally not available for use in the planning area except for small amounts used for recreation and other purposes at each reservoir. The water stored in the SRP reservoir system illustrates the relationship between downstream water demand and precipitation and snowfall in the watershed. As shown in Figure 5.0-16, storage has fluctuated as water is collected and then released to meet water demands. For example, the impact of drought conditions can be observed during 1989 and again beginning in the late 1990s, and storage recov-

Figure 5.0-16 Water Stored on May 1st in SRP Reservoirs on the Verde and Salt Rivers, 1980-2006



ery is seen in 2005 following a wet winter. As of July 1, 2009, storage in the Salt River system was 94% of capacity.

The total capacity of the SRP reservoir system is shown on Figure 5.0-6. Capacity on the Salt River system is over 2.0 maf, primarily at Roosevelt Lake. The capacity of the reservoir was increased by 20% with completion of a 77-foot dam heightening project in 1996. By comparison, the Verde River system reservoirs are considerably smaller with a storage capacity of about 302,000 acre-feet and average annual inflows exceeding storage capacity. Consequently, the Verde reservoirs are managed to minimize the potential for spill during the winter months, with releases of water during the fall, winter and spring (Ester and Reigle, 2001). Storage volumes in the Verde River reservoirs, particularly in Horseshoe Lake, have been reduced to almost zero at times during recent drought years. On June 1, 2007, storage in the total Verde system had been reduced to 27% of capacity but by June 1, 2009 had increased to 63% of capacity.

In addition to providing a major source of water to the Phoenix metropolitan area, surface water generated in the planning area is an important supply for cultural water uses in the Salt River, Tonto Creek and Verde River basins where it also supports extensive riparian habitat. In the Verde River Basin surface water is used for golf course irrigation and springs supply Jerome's municipal water supply. Surface water is diverted from the Verde River for agricultural use primarily in the Verde Valley Sub-basin of the Verde River Basin where most farming occurs along the river. During periods of drought, surface water shortfalls are met by groundwater pumping. (ADWR, 2000) Reportedly, a relatively small volume of surface water is also utilized for irrigation in the Big Chino Valley (WAC, 2004).



Agriculture in the Verde River Basin. Surface water is diverted from the Verde River for agricultural use primarily in the Verde Valley Sub-basin of the Verde River Basin where most farming occurs along the river.

In the Salt River drainage upstream of the Salt River reservoirs, surface water diversions are primarily for irrigation from Tonto Creek and its tributaries and along the Salt River. At elevations above 4,000 feet, surface water from springs and streams has supplied small irrigated parcels (ADWR, 1992). It is not known if surface water availability has been an issue for surface water users upstream of Roosevelt Dam during periods of drought. A relatively small amount of surface water has been diverted from Pinal Creek for operations at the Miami Mine in the Salt River Basin. Larger volumes of surface water, often more than 5,000 AFA have been transferred from the Salt River Basin via the Black River to the Morenci Mine in the Southeastern Arizona Planning Area pursuant to water exchange agreements described below.

The location of surface water resources are shown on surface water condition maps and maps showing perennial and intermittent streams and major springs for each basin. Data on streamflow, flood ALERT equipment, reservoirs, stockponds and springs are listed in tables in the Water Resource Characteristics sections for each basin.

Legal Availability

Ongoing water rights adjudications, court decrees, water exchange agreements, settlements and state statutes all affect the use of surface water supplies in the planning area and are discussed below. In addition, environmental laws, instream flow rights and environmental protection designations assign surface water supplies to environmental purposes. These are discussed further in Section 5.0.4 and include the Endangered Species Act and associated habitat conservation plans, and the designation of waterways as preserves, wild and scenic rivers and unique waters.

In Arizona rights to surface water are subject to the doctrine of prior appropriation, which is based on the tenet “first in time, first in right”. This means that the person who first put the water to a beneficial use acquires a right that is superior to all other surface water rights with a later priority date. Under the Public Water Code, beneficial use is the basis, measure and limit to the use of water. The surface water rights system is further discussed in a later sub-section.

Arizona has two general stream adjudications in progress to determine the nature, extent and priority of water rights across the entire Gila River and Little Colorado River systems. The adjudications will recognize existing water right settlements and decrees (see discussion below) and adjudicate all remaining water rights claims in the river systems. Pertinent to the Central Highlands Planning Area, the Gila River Adjudication is being conducted in the Superior Court of Arizona in Maricopa County. The Gila Adjudication was initiated by petitions filed by several parties in the 1970’s, including Salt River Project, Phelps Dodge Corporation and the Buckeye Irrigation Company. The petitions were consolidated in 1981 into a single proceeding. The Gila Adjudication includes seven adjudication watersheds - Upper Salt, San Pedro, Agua Fria, Up-

per Gila, Lower Gila, Verde, and Upper Santa Cruz. The entire Upper Salt, Agua Fria and almost all of the Verde adjudication watersheds and part of the Lower Gila adjudication watershed are within the planning area boundaries (see Figure 5.0-17). These watersheds do not coincide with the 6-digit HUC watersheds discussed previously and shown in Figure 5.0-5. The entire Gila Adjudication includes over 24,000 parties.

Several court determinations currently affect surface water supply availability in the planning area including the Verde Ditch, Kent and Benson-Allison decrees. The Verde Ditch extends approximately 17 miles along the Verde River from north of I-17 to south of Camp Verde. The Verde Ditch Decree (1909) proportionately divided ownership and maintenance responsibilities of the Verde Ditch 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 had a right to water diverted from the Salt and Verde rivers and included certain tribal provisions, but did not establish rights along the Verde River. Determination of Verde River water rights has been included in the Gila Adjudication proceedings. The Benson-Allison Decree (1917) concerns lands in the Phoenix AMA that are entitled to divert water from the Salt, Agua Fria and Gila rivers.

Certain legal agreements and settlements that operate within the Central Highlands Planning Area allow for the movement of surface water between groundwater basins and planning areas. As previously mentioned, surface water stored in the Salt and Verde reservoirs are primarily allocated for use outside of the planning area. In addition, surface water from the Black

River in the Salt River Basin is diverted for use in the Southeastern Arizona Planning Area. Pursuant to complex exchange agreements with the San Carlos Apache Tribe, SRP and the Central Arizona Project, Freeport McMoRan (previously Phelps Dodge) diverts surface water from the Black River for use at the Morenci Mine. The Freeport McMoRan surface water diversions are located at the Black River Pump Station and conveyed over the Natanes Plateau and into Willow Creek. In 2005, approximately 5,372 acre-feet were diverted from the Black River for this purpose. In 2007, this volume was only 271 acre-feet.

To compensate downstream water users for diversions from the Black River, Phelps Dodge historically diverted water into the Central Highlands Planning Area from two locations in the Little Colorado River Planning Area; Show Low Lake and Blue Ridge Reservoir (now C.C. Cragin Reservoir). Water from Show Low Lake, located five miles south of the Town of Show Low, was transferred to Forestdale Creek, a tributary to the Salt River. This transfer ceased in 2005 with Phelps Dodge's decision to permanently abandon its Show Low Lake water rights, and transfer its property interests in Show Low Lake and dam to the City of Show Low. The Salt River Basin water demand table takes into account both the water removed from and replaced into the Salt River Basin.

C.C. Cragin Reservoir, located approximately 25 miles north of Payson, was acquired by SRP from Phelps Dodge Corporation in February 2005 as part of the Arizona Water Settlement Act. The reservoir satisfies obligations to the Gila River Indian Community, and will be used to supplement SRP's water supply and to assist in improving the water supply situation in northern Gila County in accordance with the Act (SRP, 2007b). The Town of Payson has a long-term agreement with SRP to utilize a portion of



C.C. Cragin Reservoir, Photo courtesy of SRP

the water stored at C.C. Cragin Reservoir as a water supply for the town. It proposes to construct a \$30 - \$40 million pipeline and treatment plant to transport and deliver 3,000 acre-feet of water annually to the community. Another 500 acre-feet is dedicated to other northern Gila County communities. Water diverted from C.C. Cragin Reservoir that passes through the Verde River Basin (via East Verde River) and is not used in the basin, is not reflected in the surface water use estimates and water demand table for the Verde River Basin.

In addition to the Arizona Water Settlement Act, a tribal water rights claim that affects water supply availability in the planning area is the White Mountain Apache Tribe Water Rights Quantification Act (Act). The Act was introduced in 2009 to resolve the tribe's water claims and provide a reliable drinking water supply. If adopted as introduced, it would allocate an annual water right of 52,000 AFA to the tribe through a combination of surface water and CAP water. It would also authorize funding for a needed drinking water project, the Miner Flat Project. The project consists of a small dam, reservoir and pipeline, estimated to cost approximately \$128 million.

Surface water supply availability may also be affected by state statute. Arizona Revised Statutes (A.R.S. 45-555) allows the transportation of groundwater pumped from the Big Chino Sub-basin into the Prescott AMA. There are concerns that increased groundwater withdrawals in this sub-basin may contribute to reduced flows in the headwaters of the Verde River and affect availability of surface water. The relative contribution of the proposed pumping to Verde River flow is the matter of considerable debate (see Groundwater section below).

Surface Water Right System

In addition to rights to surface water that exist through decrees, settlements, agreements and statutes, there are many existing uses whose rights have not been adjudicated. As described in detail in Appendix C, the legal framework and process under which surface water right applications and claims are administered and

determined is complex. Each type of surface water right filing is assigned a unique number as explained in Appendix C and shown in Table 5.0-8. All parties who use water or claim to have a water right within the river system are required to file a statement of claimant or SOC (39) in the adjudication, or risk loss of their right. This includes reserved water rights for public lands and Indian reservations, of which only some have been quantified or prioritized. Other surface water right filings are discussed below.

A Certificate of Water Right (CWR) may be issued if the terms of the permit to appropriate water (3R, 4A or 33, and in certain cases 38) are met. CWRs retain the original permit application number. Statements of claim of right to use public waters (36) have also been filed, but their filing does not in itself create a water right. Surface water rights can also be determined

Table 5.0-8 Inventory of surface water right and adjudication filings in the Central Highlands Planning Area¹

Basin	Type of Filing							Total
	BB ²	3R ³	4A ³	33 ³	36 ⁴	38 ⁵	39 ⁶	
Agua Fria	0	27	104	208	1,153	518	2,792	4,802
Salt River	1	17	162	96	2,235	712	4,294	7,517
Tonto Creek	0	15	79	37	678	341	2,353	3,503
Upper Hassayampa	0	48	76	130	718	210	1,963	3,145
Verde River	0	180	204	426	3,733	2,147	14,041	20,731
Total	1	287	625	897	8,517	3,928	25,443	39,698

Notes:

- ¹ Based on a query of ADWR's surface water right and adjudication registries in February 2009. A file is only counted in this table if it provides sufficient information to allow a point of diversion (POD) to be mapped within the basin. If a file lists more than one POD in a given basin, it is only counted once in the table for that basin. Numerous surface water right filings are not counted here due to insufficient information on POD locations. However, multiple filings for the same POD are counted.
- ² Court decreed rights; not all of these rights have been identified and/or entered into ADWR's surface water rights registry.
- ³ Application to construct a reservoir, filed before 1972 (3R); application to appropriate surface water, filed before 1972 (4A); and application for permit to appropriate public water or construct a reservoir, filed after 1972 (33).
- ⁴ Statement of claim of right to use public waters of the state, filed pursuant to the Water Rights Registration Act of 1974.
- ⁵ Claim of water right for a stockpond and application for certification, filed pursuant to the Stockpond Registration Act of 1977.
- ⁶ Statement of claimant, filed in the Gila or LCR General Stream Adjudications.

through judicial action in state or federal court in which the court process establishes or confirms the validity of the rights and claims and ranks them according to priority. Court decreed rights are considered the most certain surface water right.

Table 5.0-8 summarizes the number of surface water right and adjudication filings in the planning area. The methodology used to query the Department's surface water right and SOC registries is described in Appendix C. Of the 39,698 filings that specify surface water diversion points and places of use in the planning area, 3,184 CWRs have been issued to date. Figure 5.0-17 shows the location of surface water diversion points listed in the Department's surface water rights registry. The numerous points reflect the large number of stockponds and reservoirs that have been constructed in the planning area as well as diversions from streams and springs. Locations of registered wells, many of which are referenced as the basis of claim in SOCs are also shown in Figure 5.0-17.

Results from the Department's investigation of surface water right and adjudication filings are presented in Hydrographic Survey Reports (HSRs). Within the Central Highlands Planning Area, a preliminary HSR has been published for the Upper Salt River Watershed (ADWR, 1992).

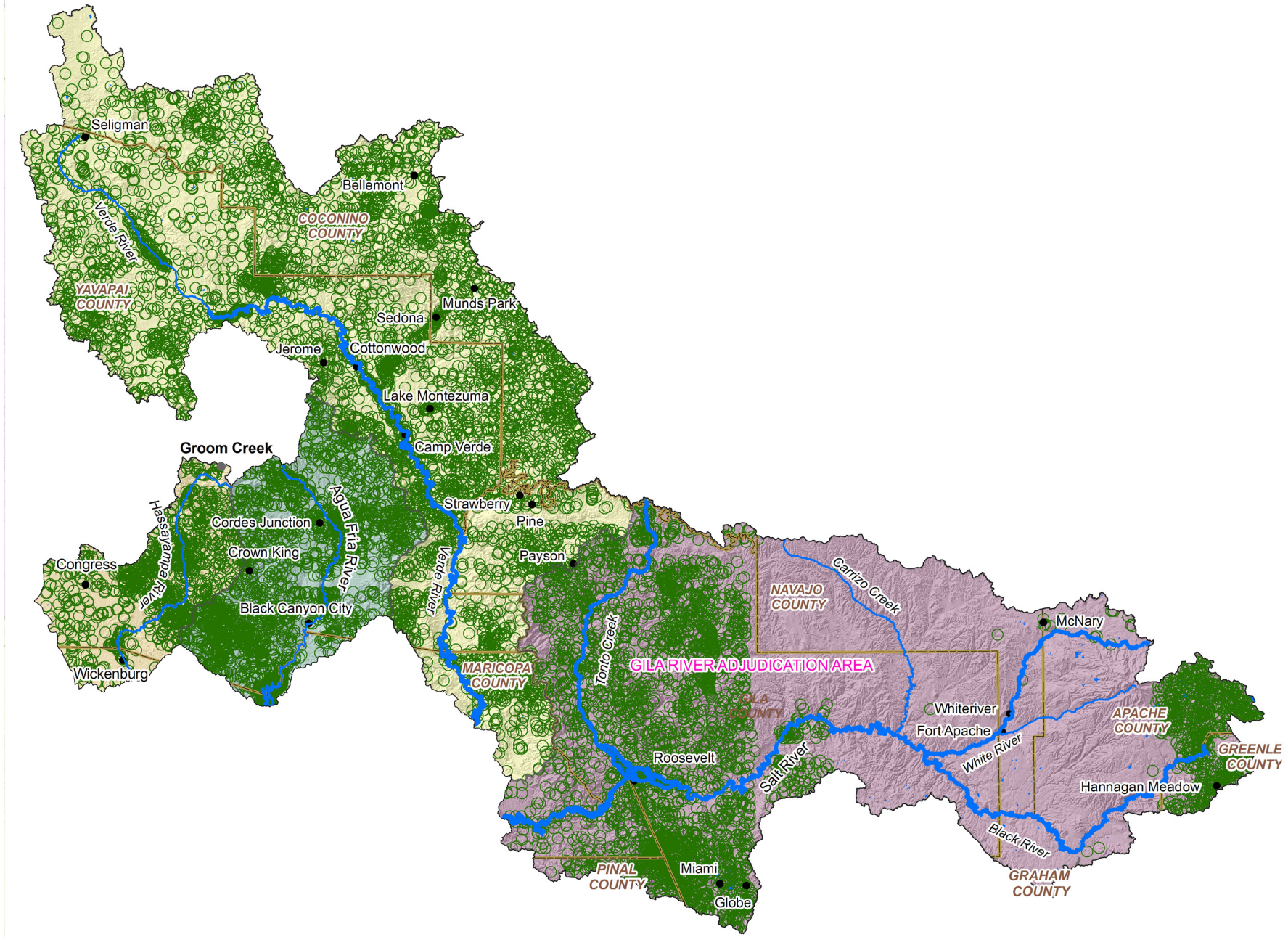
The location of surface water resources are shown on surface water condition maps and maps showing perennial and intermittent streams and major springs for each basin, and in basin tables that contain data on streamflow, flood ALERT equipment, reservoirs, stockponds and springs in the Water Resource Characteristics sections for each basin.

Groundwater

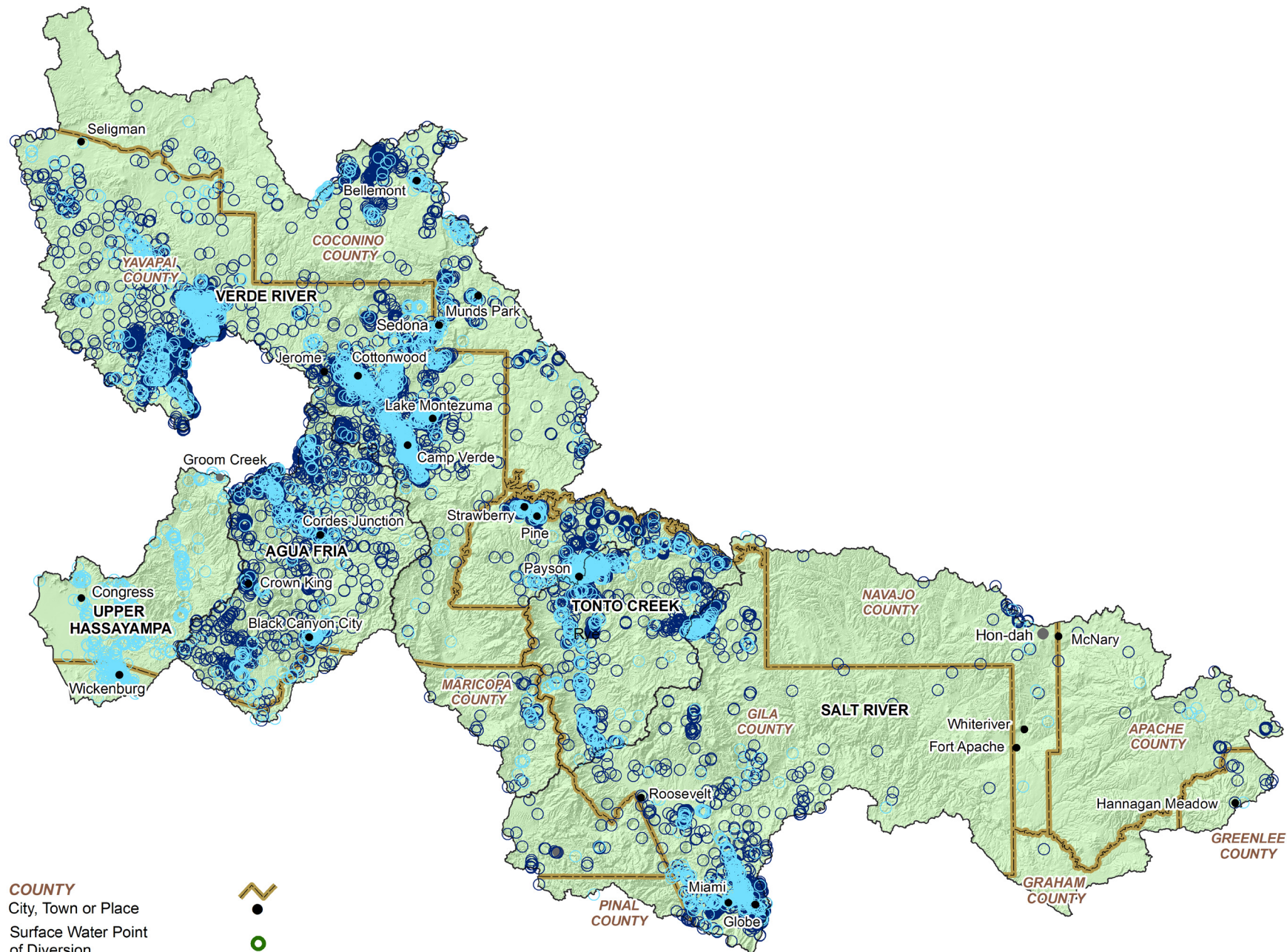
Compared to the deep alluvial basins found in the southern part of Arizona, high elevations, steep topography and extensive areas of bedrock in the Central Highlands Planning Area translate into relatively minimal groundwater storage capabilities and high runoff. These conditions result in limited, drought-sensitive water supplies for some communities, such as Pine, Strawberry, Payson, Black Canyon City and Mayer. Areas of unconsolidated sediments are relatively limited as shown on the groundwater conditions maps for each basin in sections 5.1-5.5. Many basin-fill aquifers in the planning area are narrow and surrounded by low water yielding consolidated rocks. Areas of relatively high water yield include basin-fill deposits in the Big Chino Sub-basin, Verde Valley Sub-basin, north of Globe in the Salt River Lakes Sub-basin and near Wickenburg in the Upper Hassayampa Basin.

In much of the northern half of the Agua Fria Basin, parts of the Salt River Basin including the entire eastern portion, and the Verde Canyon Sub-basin, groundwater occurs in volcanic rocks that yield relatively small volumes of water. These conditions pose groundwater supply challenges for Payson and other communities in the planning area. In Pine, Strawberry and near Globe, groundwater is found in relatively low yield sedimentary rocks.

Water availability problems resulted in an ACC-imposed moratorium on the installation of any new meters by Pine Water Company in 2006. Recently, deep wells in the area have encountered a more productive aquifer than that found in the currently utilized shallow wells. In July 2009 the Pine/Strawberry Water Improvement District voted to purchase Brooke Utilities, which serves the communities, with the intent to obtain water from deeper, more productive wells. (Payson Roundup, 2009)



Surface Water Diversion Points



- COUNTY**
- City, Town or Place
- Surface Water Point of Diversion
- Agua Fria River Watershed
- Lower Gila River Watershed
- Salt River Watershed
- Verde River Watershed
- Non-Exempt Well
- Exempt Well
- Groundwater Basin Boundary



Wells



Figure 5.0-17
Central Highlands Planning Area
Registered Wells and Surface Water Diversion Points



Sedimentary rocks with moderate yields are found in the southern half of the Agua Fria Basin, while Precambrian schist near Black Canyon City yields relatively small volumes of water to wells.

Although groundwater supplies may be limited in some areas, it is the primary water supply in the planning area. Well pumpage averaged about 52,350 AFA during the period 2001 to 2005.

The Department's Groundwater Site Inventory (GWSI) database, the main repository for statewide groundwater well data, is available on the Department's website (www.azwater.gov). The GWSI database contains over 42,000 records of wells and over 210,000 groundwater level records statewide. GWSI contains spatial and geographical data, owner information, well construction and geologic data and historic groundwater data including water level, water



Automated Groundwater Monitoring Site in the Upper Hassayampa Basin.

quality, well lift and pumpage records. Included are hydrographs for statewide Index Wells and Automated Groundwater Monitoring Sites (Automated Wells), which can be searched and downloaded to access local information for planning, drought mitigation and other purposes.

Approximately 1,700 wells are designated as Index Wells statewide out of over 43,700 GWSI sites (GWSI sites are primarily wells but include other types of sites such as springs and drains). Typically, Index Wells are visited once each year by the Department's field staff to obtain a long-term record of groundwater level fluctuations. Approximately 200 of the GWSI sites are designated as Automated Wells. These systems measure water levels four times daily and store the data electronically. Automated wells are established to better understand the water supply situation in areas of the state where data are lacking. These devices are located based on areas of growth, subsidence, type of land use, proximity to river/stream channels, proximity to water contamination sites or areas affected by drought.

Volume 1 of the Atlas shows the location of Index Wells and Automated Wells as of January 2009. At that time there were a total of 156 Index Wells and 13 Automated Sites in the Central Highlands Planning Area. The latter are located in all but the Salt River Basin. Updated maps showing the location of Index and Automated wells may be viewed at the Department's website.

Information on major aquifers, well yields, estimated natural recharge, estimated water in storage, aquifer flow direction and water level changes are found in groundwater data tables, groundwater conditions maps, hydrographs and well yield maps for each basin in the Water Resource Characteristics sections.

Transportation of groundwater between groundwater basins is prohibited in Arizona unless specifically allowed in statute. In 1991, the Arizona statutes were amended to allow certain governmental entities to transport groundwater from the Big Chino Sub-basin of the Verde River groundwater basin into the Prescott AMA. Under A.R.S. 45-555(E), the City of Prescott can withdraw and transport an amount not to exceed 14,000 AFA from the Big Chino Sub-basin into the Prescott AMA. The actual volume that can be transported during a year depends on several factors listed in the statute. With respect to the City of Prescott's 2007 Application for Modification of Designation of Assured Water Supply, the Director of ADWR issued a determination that recognized 8,067.4 acre-feet per year as the volume of groundwater Prescott is legally entitled to transport from the Big Chino Sub-basin under A.R.S. § 45-555(E). This decision and order is currently under appeal with the Office of Administrative Hearings and the Director's final decision is expected in late 2009.

In addition to the groundwater the City of Prescott is allowed to transport under A.R.S. § 45-555(E), cities and towns in the Prescott AMA are allowed to withdraw groundwater associated with historically irrigated acres (HIA) in the Big Chino Sub-basin and transport the groundwater into the Prescott AMA. (A.R.S. §45-555 (A) through (D)) The Department will make a determination regarding the volume of groundwater that a city or town can transport from HIA lands after it has finalized Administrative Rules for this process. The allotment associated with HIA is three acre-feet per acre per year.

An important issue facing the Central Highlands Planning Area is the potential for additional groundwater withdrawals from the Big Chino Sub-basin to reduce flows in the headwaters area of the Verde River with possible environmental impacts associated with reduced flows and the

construction of pipelines and other infrastructure to transport the groundwater. Although a number of studies have been conducted to investigate the connection of Big Chino Sub-basin groundwater with the headwaters of the Verde River, the relative contribution of the various potential sources is still a matter of speculation (McGavock, 2003).

Effluent

Effluent is a water supply for golf course irrigation in the Tonto Creek and Verde River basins, totaling about 1,000 acre-feet within the planning area. Effluent used in the Tonto Creek Basin is generated in the Verde River Basin at the American Gulch WWTP (Table 5.5-9). Data were not available to the Department for all wastewater treatment facilities. From data that were available, it appears that limited volumes of effluent are produced in the Agua Fria and Tonto Creek basins. Approximately 2,600 acre-feet are generated in the Salt River Basin, primarily on the White Mountain Apache Reservation and at Globe and Miami. In the Upper Hassayampa Basin, the Wickenburg wastewater treatment plant generates about 580 acre-feet of effluent a year. About 6,200 acre-feet of effluent is generated annually in the Verde River Basin, primarily at facilities located in Cottonwood, Kachina Village, Payson and Sedona. Effluent is discharged to watercourses, wildlife areas, evaporation ponds and infiltration basins. The Town of Clarkdale wastewater treatment plant discharges effluent onto mine tailings for dust control (USBOR, 2003). In total, about 9,500 acre-feet of effluent are currently generated annually within the planning area.

Contamination Sites

Sites of environmental contamination may impact the use of some water supplies. An inventory of Department of Defense (DOD), Resource Conservation and Recovery Act (RCRA), Su-

perfund (Environmental Protection Agency designated sites), Water Quality Assurance Revolving Fund (WQARF, state designated sites), Voluntary Remediation Program (VRP) and Leaking Underground Storage Tank (LUST) sites was conducted for the planning area. All are found in the planning area. Table 5.0-9 lists the contaminant and affected media and the basin location of each site except LUST sites. The location of all contamination sites is shown on Figure 5.0-18.

The Iron King Mine and Humboldt Smelter Superfund site was listed in September 2008. The mine was active from 1904 until 1969 and extracted lead, gold, silver, zinc and copper. More recently, fertilizer was made from the

tailings. The mine site covers about 153 acres and includes tailings, retention ponds and mine shafts. The adjacent smelter site occupies about 182 acres of tailings, smelter ash and slag. The smelter operated from the late 1800s until the early 1960s. Contaminants are a result of the mining and smelter activities and include arsenic, lead and other metals. A remedial investigation and a feasibility study to evaluate remedial actions are underway. (EPA, 2009)

There is one DOD site, Camp Navajo, located near Bellemont in the Verde River Basin. This site was used for over 50 years for land disposal of excess, obsolete and unserviceable munitions where they were destroyed by burning or by detonation. The site is being cleaned up

Table 5.0-9 Contamination sites in the Central Highlands Planning Area

SITE NAME	MEDIA AFFECTED AND CONTAMINANT	GROUNDWATER BASIN
Superfund Sites		
Iron King Mine and Humboldt Smelter	Soil, Groundwater - Arsenic, Lead, Other Metals	Verde River
Department of Defense Sites/Resource Recovery and Conservation Act (RCRA) Sites		
Camp Navajo, Bellemont	Soil, Groundwater - Metals, Volatile Organic Compounds, Solvents, White Phosphorous, Unexploded Ordnance	Verde River
WQARF Sites		
Payson PCE	Groundwater - Tetrachloroethene (PCE)	Verde River
Tonto/Cherry	Groundwater - Tetrachloroethene (PCE) and trichloroethene (TCE)	Verde River
Pinal Creek	Groundwater, Surface Water - Metals, Radiochemicals, TDS, Acidity	Salt River
Voluntary Remediation Sites		
APS Globe Manufactured Gas Plant	Soil, Groundwater - Hydrocarbons, Cyanide, Arsenic, Lead	Salt River
Former Bunker C AST Location	Soil - Total petroleum hydrocarbons, Polycyclic aromatic hydrocarbons	Verde River
Former Shell Service Station	Groundwater - PAHs (Benzo(a)pyrene)	Verde River

Sources: ADEQ 2006a, ADEQ 2006b



Camp Navajo, Verde River Basin. This site was used for over 50 years for land disposal of excess, obsolete and unserviceable munitions where they were destroyed by burning or by detonation.

according to RCRA standards under the DOD's Installation Restoration Program. The RCRA program regulates the management of hazardous waste handlers which includes generators, transporters and facilities for treatment, storage and disposal (ADEQ, 2002).

The Pinal Creek WQARF Site, located in the vicinity of Miami-Globe, is contaminated from mining and mineral processing in the area that began in 1878. Groundwater contamination was first observed in the 1930s in the alluvial aquifer of Miami Wash. By the time the first area-wide investigation of groundwater and surface water was conducted in 1979-81, there was widespread contamination. By the end of 2007, approximately 107 million pounds of heavy metals had been removed from area aquifers. Following treatment, this water was released to Pinal Creek, reused for mining purposes, or evaporated at the mines. As a result of remediation activities, the perennial and ephemeral reaches of Pinal Creek, Miami Wash and Bloody Tanks Wash were removed from the State's list of impaired water bodies. Site-wide monitoring is on going including monthly sampling of 80-100 wells, four surface water sites and treated effluent at the Lower Pinal Creek treatment plant. (ADEQ, 2008)














There are also two WQARF sites in the Payson area. At the Payson PCE site, groundwater is contaminated with tetrachloroethene (PCE). Two groundwater treatment systems capture and treat the contaminated water, which following treatment is delivered to the town as drinking water. The treatment system will operate until approximately 2033 or until PCE concentrations are below the Aquifer Water Quality Standard (AWQS). (ADEQ, 2009a) PCE and trichloroethene (TCE) contaminate groundwater at the Tonto and Cherry site where well monitoring and soil gas surveys have been conducted. A Proposed Remedial Action Plan and Record of Decision (ROD) were completed in 2008. PCE concentrations have been decreasing as the compound naturally breaks down and all domestic drinking water wells at the site are now below the AWQS. (ADEQ, 2009b)

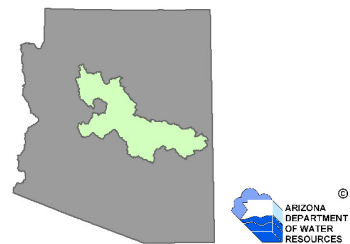
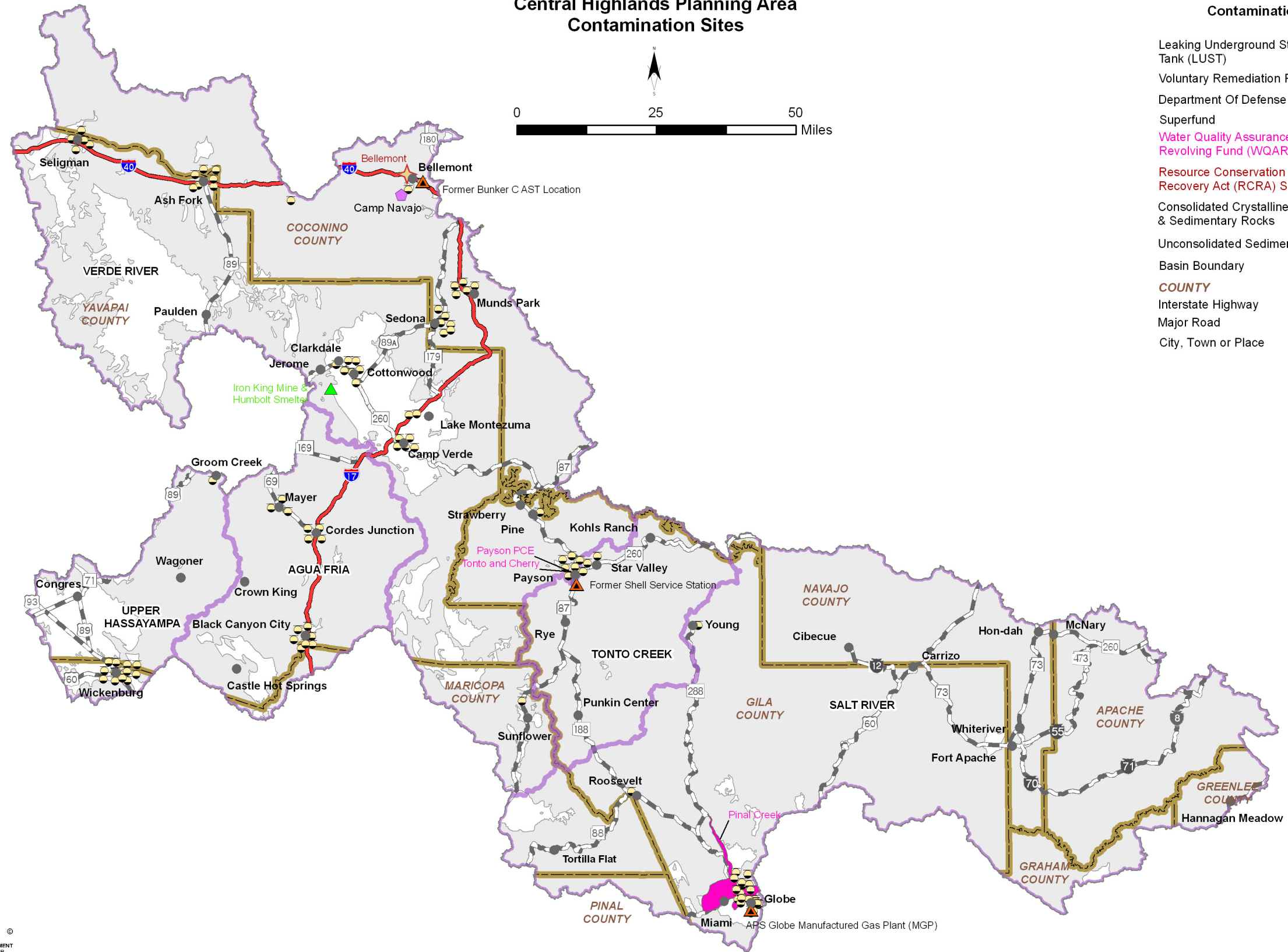
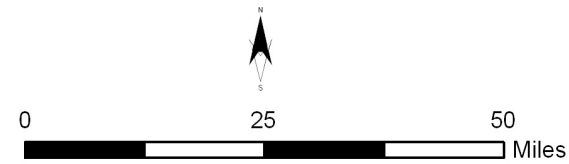
Four active VRP sites are located in the planning area with hydrocarbon and metal contamination of soil, groundwater and surface water. The VRP is a state administered and funded voluntary cleanup program. Any site that has soil and/or groundwater contamination, provided that the site is not subject to an enforcement action by another program, is eligible to participate. To encourage participation, ADEQ provides an expedited process and a single point of contact for projects that involve more than one regulatory program (Environmental Law Institute, 2002).

There are 143 active LUST sites in the planning area. Thirty one sites are located near Globe in the Salt River Basin, 22 sites are located in and around Wickenburg in the Upper Hassayampa Basin, 21 sites occur in the vicinity of Payson and Star Valley in the Verde River and Tonto Creek basins, and there are ten sites near Clarkdale and Cottonwood in the Verde River Basin. Ash Fork, Black Canyon City, Camp Verde, Munds Park, Sedona and Seligman each contain another 5 to 10 sites.

**Figure 5.0-18
Central Highlands Planning Area
Contamination Sites**

Contamination Site Type

- Leaking Underground Storage Tank (LUST) 
- Voluntary Remediation Program (VRP) 
- Department Of Defense (DOD) 
- Superfund 
- Water Quality Assurance Revolving Fund (WQARF) 
- Resource Conservation and Recovery Act (RCRA) Site 
- Consolidated Crystalline & Sedimentary Rocks 
- Unconsolidated Sediments 
- Basin Boundary 
- COUNTY 
- Interstate Highway 
- Major Road 
- City, Town or Place 



5.0.7 Cultural Water Demand

Cultural water demand in the Central Highlands Planning Area averaged approximately 83,200 AFA during the period from 2001 to 2005. As shown in Figure 5.0-19, the agricultural demand sector was the largest use sector with approximately 37,500 acre-feet of demand, 45% of the total. Most agricultural demand was located in the Verde River and Salt River basins. About 62% of the agricultural demand was met by surface water diverted primarily from the Verde and Salt rivers and from Tonto Creek. Municipal demand was the second largest water demand sector with about 33% of the total planning area demand or an annual average of 27,400 acre-feet during the period 2001-2005. Municipal demand is primarily met by groundwater. Industrial demand, mainly related to mining, accounted for 18,300 acre-feet, 22% of the total average demand during this period. Almost all

the surface water diverted for industrial purposes, about 5,700 AFA during 2001-2005, was transported out of the planning area for use at the Morenci Mine in the Southeastern Arizona Planning Area.

As shown in Figure 5.0-20 basin demand varied substantially in the planning area. More than half of the water demand in the planning area was in the Verde Basin, 29% is in the Salt River Basin and the remaining basins have smaller and comparable volumes of water demand.

Several recent studies provide detailed information on irrigation water use in the Verde River Basin. The Verde River Watershed Study Report (ADWR, 2000) contains information on water demand for most of the basin. The Yavapai County Water Advisory Committee (WAC)

Figure 5.0-19 Average Annual Central Highlands Planning Area Cultural Water Demand by Sector, 2001-2005 (in acre-feet)

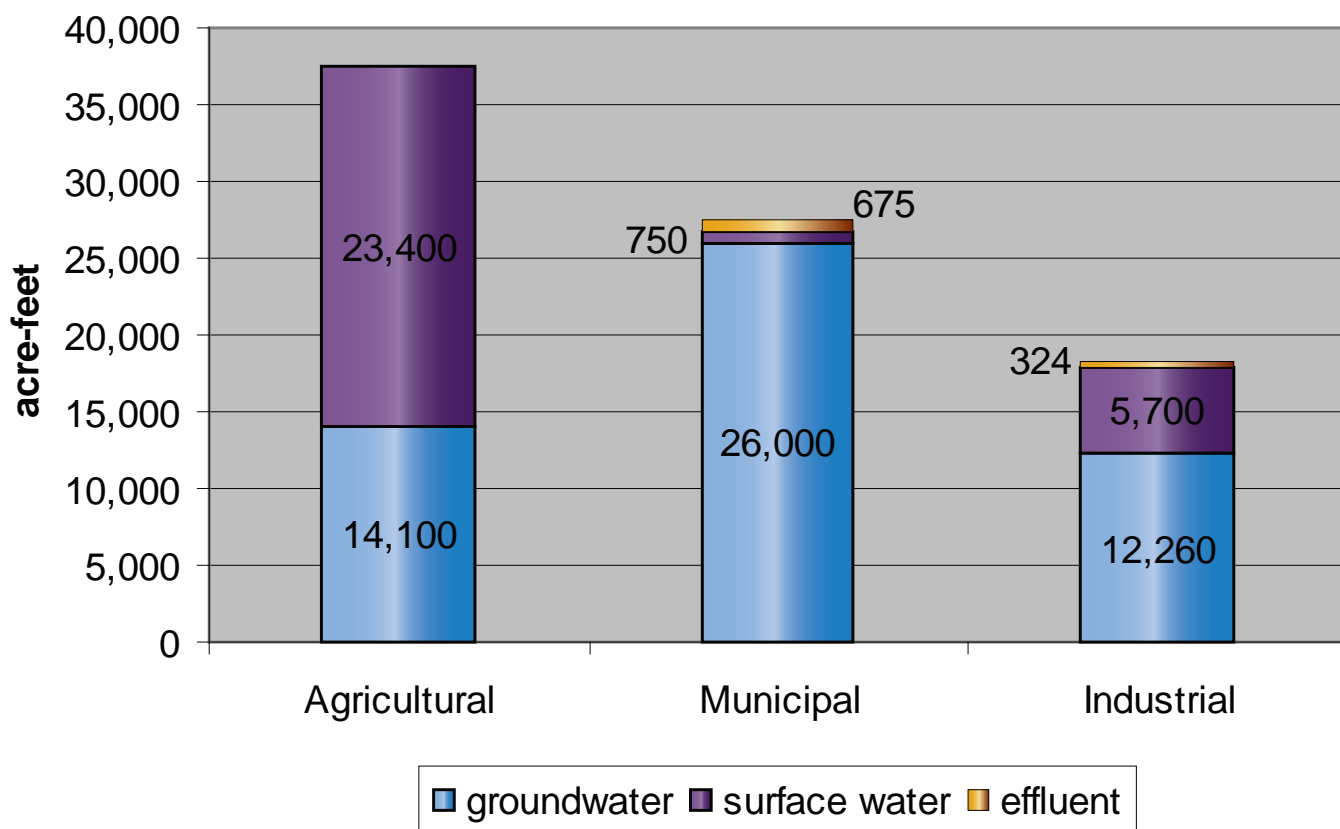
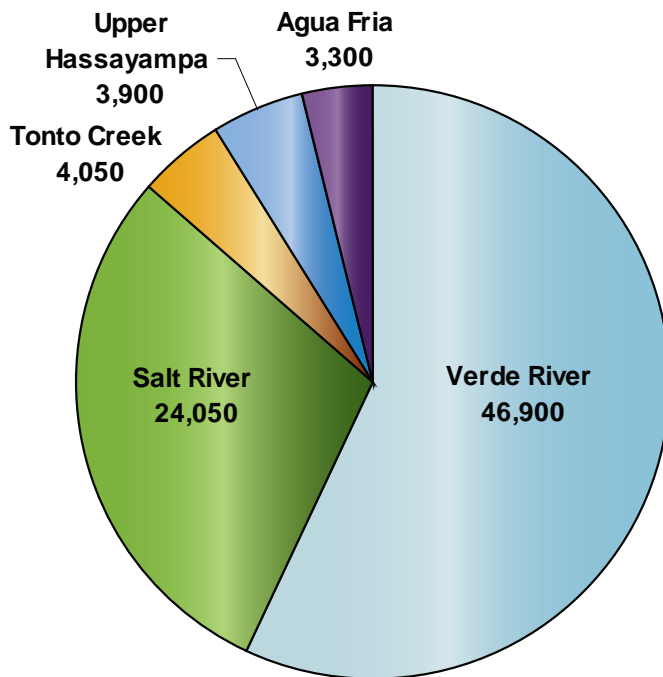


Figure 5.0-20 Average Annual Basin Water Demand, 2001-2005 (in acre-feet)



completed a water use study of the Big Chino Sub-basin in 2004 and participated in a USBOR study of the Verde Valley in 2003 that are useful sources of water demand information.

Tribal Water Demand

The largest Indian reservation in the planning area is the Fort Apache (White Mountain Apache Tribe), the fourth largest reservation in terms of size within Arizona. Although the northern part of the San Carlos Apache Indian Reservation is within the planning area directly south of the Fort Apache Indian Reservation, almost all its population and water demand is in the Southeastern Arizona Planning Area.

Water demand on the Fort Apache Indian Reservation is associated with domestic and agricultural uses as well as a number of tribal enterprises including timber industries, a ski resort and a casino/hotel at Hon-dah. In 2006, there were approximately 12,000 tribal members

residing on the reservation with about 5,900 residents at Whiteriver, the tribal capital. Other residents reside in smaller communities and on rural lands. Water service is provided to an unknown number of customers by the Whiteriver Regional System.

Production from system wells has declined over the last few years, resulting in summer drinking water shortages. The tribe plans to construct a relatively small diversion project on the North Fork of the White River in 2009 and is pursuing a long term water development project, the Miner Flat Project, through the White Mountain Apache Tribe Water Rights Quantification Act introduced in 2008. The settlement would also allocated 52,000 AFA through a combination of surface water and CAP (Kyl, 2008).

There are no recent agricultural surface water demand estimates available for the Fort Apache Reservation. Table 5.0-10 shows an estimate from the 1992 Preliminary HSR for the Upper Salt River Watershed. Agricultural groundwater demand is estimated at approximately 200 AFA. (USGS, 2007)

Water demand on the San Carlos Apache Reservation portion within the planning area is assumed to be primarily due to agricultural irrigation of orchard crops. Using agricultural and industrial demand estimates in the Hydrograph-

Table 5.0-10 Estimated water demand on the for Apache and San Carlos Apache Indian Reservations, c. 2005 (in acre-feet)

	Agricultural (groundwater/ surface water)	Municipal (groundwater/ surface water)
Fort Apache	200/3690	700/60 ¹
San Carlos Apache	0/70	0
Total	200/3760	700/60

Sources: ADWR 1992, Truini et al 2005, USGS 2007

¹ Assumes 94 gpcd at Whiteriver and 40 gpcd elsewhere. Commercial demand outside of Whiteriver not included. Sixty acre-feet of surface water is used at Cedar Creek.

ic Survey Report for the Upper Salt River Watershed, (ADWR 1992) and per capita assumptions derived from a 2005 study by Truini et al. (2005) on other reservations, it is estimated that the annual demand of the two largest tribes in the planning area was about 4,500 acre-feet (Table 5.0-10).

The Tonto Apache and Yavapai-Apache Indian Reservations and tribal populations are relatively small and demand estimates were not available to the Department. The Tonto Apache Indian Reservation is the smallest land base reservation in Arizona at 85 acres. Principal water demands are associated with the Mazatzal Casino and restaurant, and tribal offices. Water service is provided by the Tonto Apache Water System. The 656-acre Yavapai-Apache Indian Reservation is located on five separate parcels with its tribal headquarters at Middle Verde. This parcel is served water by the Middle Verde Indian Water System while other parcels are served by private water companies that also serve adjacent, non-reservation lands. Tribal lands include irrigated farmland, residences and commercial businesses. The tribe operates the Cliff Castle Casino and motel north of Camp Verde (see Figure 5.5-2). (ITCA, 2003)

Municipal Demand

Municipal demand is summarized by groundwater basin and water supply in Table 5.0-11. Average annual demand during the period 2001

to 2005 was 27,425 acre-feet. Ninety-five percent of this demand was met by groundwater. A small amount of surface water is used in the Salt River Basin at Salt River lake facilities and on the Fort Apache Indian Reservation at Cedar Creek, a small community southeast of Carrizo. In the Verde River Basin surface water is used at several locations including the Beaver Valley Water Company, Bonita Water Company (Payson), Camp Navajo, Kohl's Ranch, Pine Water Association, Stoneman Lake Water Company and the Town of Jerome, which uses about 80 AFA of the 400 AFA it diverts from 12 springs (Town of Jerome, 2008). Effluent is used for turf irrigation in the Verde River and Tonto Creek basins.

Primary municipal demand centers are located around Cottonwood, Globe-Miami, Payson, Sedona and Wickenburg. Municipal demand in the Verde River Basin accounts for 59% of the total municipal demand. By comparison, there is relatively little municipal water demand in the Agua Fria Basin. It is estimated that about eleven percent of the planning area population is not served by a municipal water provider.

Eight water providers served 450 acre-feet or more in 2006 for a total of 14,158 acre-feet. Their demand in 1991, 2000 and 2006 are shown in Table 5.0-12 and discussed briefly below. Prior to 2006, municipal utilities served only Globe, Payson and Wickenburg. Beginning in 2005, the City of Cottonwood began acquisi-

Table 5.0-11 Average annual municipal water demand in the Central Highlands Planning Area, 2001-2005 (in acre-feet)

Basin	Groundwater	Surface Water	Effluent ¹	Total
Agua Fria	1,800			1,800
Salt River	4,000	<300 ²		<4150
Tonto Creek	2,400		215	2,600
Upper Hassayampa	2,600			2,600
Verde River	15,200	600	460	16,260
Total Municipal	26,000	750	675	27,425

Sources: USGS 2007, ADWR 2008c

¹ Effluent figures are for golf course and other turf irrigation in 2006

² Assume 150 acre-feet for computation purposes

Table 5.0-12 Water providers serving 450 acre-feet or more of water per year in 2006, excluding effluent, in the Central Highlands Planning Area

Basin/Water Provider	1991 (acre-feet)	2000 (acre-feet)	2006 (acre-feet)
Salt River			
Arizona Water Company-Miami	1,031	1,194	968
City of Globe	1,446	1,558	1,603
Upper Hassayampa			
Town of Wickenburg	1,249	1,717	1,944
Verde River			
Arizona Water Company - Sedona	1,764	2,816	3,332
Big Park Water Company - Village of Oak Creek	539	799	879
Camp Verde Water System Inc.	248	357	472
City of Cottonwood (Cottonwood Water Works, Clemenceau W.C., Verde Santa Fe, Cordes Lakes Cottonwood Systems)	NA	NA	3,145
Cottonwood Water Works - Cottonwood and Clarkdale	1,321	2,065	NA
Cordes Lakes Water Company	590	1,128	NA
Town of Payson	1,089	1,550	1,815

Sources: ADWR 2007 and 2004

Notes: City of Cottonwood acquired several systems in 2006. The combined system withdrawals are shown for all years)

Payson and Globe receive water from outside their basins.

NA=not applicable

tion of the four private water companies serving the town; Clemenceau Water Company, Cordes Lakes Water Company (Cottonwood Systems), Cottonwood Water Works and the Verde Santa Fe Water Company. By 2007, the City of Clarkdale had acquired the Cottonwood Water Works system serving Clarkdale. Municipally-owned systems have more flexible water rate-setting ability than private water companies, which are regulated by the Arizona Corporation Commission. In addition, municipal utilities have the authority to enact water conservation ordinances. These authorities may enable municipal utilities to better manage water resources within water service areas. Water provider issues are discussed in section 5.0.8.

Arizona Water Company-Miami

The towns of Miami-Claypool are served by

Arizona Water Company. About 87% of the approximately 3,250 connections are residential. The Miami water system is served by 17 wells and has a two-way emergency interconnection with the City of Globe. Water levels in wells ranged from 109 feet to 860 feet below land surface in 2006. (Arizona Water Company, 2007a) In 2006, 968 acre-feet was pumped from 13 wells. Of this total, 641 acre-feet was delivered for residential use, 245 for commercial use and 10 for “other”.

City of Globe

The City of Globe has an adequate water supply designation and serves about 7,700 customers from five active wells. Four of these wells are located in the Safford Basin in the Southeastern Arizona Planning Area. About two-thirds of the water demand is residential and one-third is non-



Arizona Water Company Offices in Miami ,Arizona.

residential. The City has a water conservation plan that it credits with helping to keep water demand in check. Water levels in wells ranged from 40 feet to 650 feet below land surface in 2005. (City of Globe, 2005) In 2006, Globe withdrew 1,603 acre-feet from five wells and delivered 938 acre-feet to residential, 353 acre-feet to commercial, 60 acre-feet to turf and 90 acre-feet to “other”.

Town of Wickenburg

The Wickenburg municipal water system serves groundwater to about 5,100 residents. In 2007 it withdrew almost 1,730 acre-feet from four wells. Of this, 895 acre-feet was delivered to residential customers, 630 to commercial and 204 to “other”. It operates the Wickenburg WWTP which treated 444 acre-feet of effluent in 2007, all of which was discharged to infiltration ponds.

Arizona Water Company-Sedona

Arizona Water Company serves the town of Se-

dona. The system has 14 active wells and about 5,500 connections, of which 78% are residential. Sedona has a high percentage of seasonal residents, and daily visitors contribute to a relatively high use rate of 244 gallons per capita per day (gpcd) (USBOR, 2003). The system also serves commercial customers and turf facilities. The service area includes central Sedona from Red Rock Loop Road to east of downtown. The Valley Vista “sub-system” serves an area south of Verde Valley School Road, mostly west of Highway 179. Arizona Water Company maintains an emergency two-way interconnection with the Oak Creek Water Company. Groundwater depth average about 220 feet in utility wells. (Arizona Water Company, 2007b) In 2006, 3,332 acre-feet was withdrawn from nine wells. Of this total, 2,077 acre-feet was delivered to residential customers, 938 to commercial customers and 58 to “other”.

Big Park Water Company

Big Park Water Company serves the Village of Oak Creek, an unincorporated community south of Sedona along Highway 179. It has about 2,800 connections, of which 91% are residential, and a per capita rate of about 198 gpcd (USBOR, 2003). It does not serve turf facilities. Depth to water in the seven system wells averages about 390 feet and water levels are reportedly stable. Big Park Water Company has an interconnection with Little Park Water Company. (BPWC and LPWC, 2007) Both companies have designations of Adequate Water Supply. In 2007, Big Park withdrew almost 880 acre-feet of water from six wells and delivered 0.3 acre-feet to Little Park Water Company, 684 acre-feet to residential and 150 acre-feet to commercial customers.

Camp Verde Water System, Inc.

The Camp Verde Water System is a private water company consisting of the larger Mongini System and smaller Verde River Estates System. There is no physical interconnection between

the two systems. There are a total of four active wells that serve both systems. In 2006, 460 acre-feet was withdrawn by the Mongini System, which served 265 acre-feet to residential and 183 acre-feet to commercial customers. Twelve acre-feet was withdrawn by the Verde River Estates System of which eight acre-feet was delivered to residential customers in 2007.

Cities of Cottonwood and Clarkdale

Prior to 2006, Cottonwood Water Works and Cordes Lakes Water Company were the two large private water companies serving the City of Cottonwood. The Cottonwood Water Works system also served the community of Clarkdale with a combined 4,600 connections of which 97% were residential. The Cordes Lakes Water Company served a population of almost 7,700 consisting of six separate systems in the Verde Village area. (A separate, smaller Cordes Lakes Water Company System serves the community of Cordes Lakes in the Agua Fria Basin). The estimated gpcd rate of Cottonwood was about 148 gpcd and Clarkdale about 193 gpcd (USBOR, 2003).

In 2006, the City of Cottonwood acquired four systems: Cottonwood Water Works, Cordes Lakes, Clemenceau and Verde Santa Fe. These systems withdrew a total of about 3,150 acre-feet of water from 28 wells in 2006. Separate deliveries to residential and non-residential customers were not reported on the 2006 Community Water System annual reports. In 2009, the City received a Designation of Adequate Water Supply for its water service area.

In 2007, The City of Clarkdale acquired the Cottonwood Water Works-Clarkdale system which served about 3,000 people and pumped about 400 acre-feet in 2006 (Cottonwood Water Works, 2007).

Town of Payson

The Town of Payson pumps groundwater from 32 active wells to about 14,000 residents. Most wells are located in the Verde River Basin and some are in the Tonto Creek Basin. It also supplies water to parts of the Tonto Apache Indian Reservation. The town estimates that there are also about 300 to 400 domestic wells operating within its service area. Because the local granite aquifer has limited storage capacity, Payson is drought-sensitive and dependent on sufficient rainfall and snowmelt for an adequate drinking water supply (City of Payson, 2007). Payson monitors water levels in its wells regularly to gauge water supply availability and has aggressive water conservation, effluent reuse and drought programs. Water levels in wells trigger the town's drought response. Payson's water demand declined by 7% between 2002 and 2003, which it attributes to conservation efforts (Maguire, 2005). In 2006 Payson withdrew 1,815 acre-feet from 35 wells. It delivered 31 acre-feet to the Tonto Apache Indian Reservation, 1,299 acre-feet to residential customers and 390 acre-feet to commercial customers.

About 80% of Payson's population is connected to the Northern Gila County Sanitary District sewer system that provides wastewater treatment for Payson and much of the surrounding area. Current system inflows are about 800,000 gallons daily, or 50% of capacity. The District's effluent is used for a variety of irrigation projects and ground water recharge, including the Green Valley Lake project. The 48-acre Green Valley Park was developed jointly by the Town of Payson Water Department and the Sanitary District. Treated effluent from the district's water treatment plant fills a 10.5-acre lake used for boating and fishing and adjacent irrigated areas and recreational facilities. (Payson Regional Economic Development Corporation, 2006) Another effluent recharge project, Rumsey Park, is in the pilot phase.

Table 5.0-13 Golf courses in the Central Highlands Planning Area (c. 2008)

Facility	Basin	# of Holes	Demand (acre-feet)	Water Supply
Cobre Valley Country Club - Globe*	Salt River	9	211	Groundwater
Chaparral Pines Golf Course - Payson	Tonto Basin	18	108/107	Groundwater/Effluent
Rim Golf Course - Payson	Tonto Basin	18	108/108	Groundwater/Effluent
Los Caballeros Golf Club - Wickenburg	Upper Hassayampa	18	423	Groundwater
Wickenburg Country Club	Upper Hassayampa	9	211	Groundwater
Beaver Creek Country Club - Lake Montezuma*	Verde River	18	490	Surface Water
Canyon Mesa Golf Course - Sedona*	Verde River	9	113	Groundwater
Forest Highlands	Verde River	36	150/150	Groundwater/Effluent
Oak Creek Country Club - Village of Oak Creek*	Verde River	18	701	Groundwater
Payson Golf Course - Payson	Verde River	18	132/309	Groundwater/Effluent
Pine Shadows - Cottonwood*	Verde River	9	98	Groundwater
Pinewood Country Club - Munds Park*	Verde River	18	270/269	Surface Water/Effluent
Poco Diablo Golf Course - Sedona*	Verde River	9	34	Surface Water
Sedona Golf Resort - Sedona*	Verde River	18	456	Groundwater
Seven Canyons Four Seasons Golf Course - Sedona	Verde River	18	423	Groundwater
Talking Rock - Northwest of Prescott*	Verde River	18	400	Groundwater
Verde Santa Fe - Cottonwood*	Verde River	18	401/55	Groundwater/Effluent

Source: ADWR 2000, ADWR 2008c

Notes:

* These golf courses are served by their own wells and considered to be industrial users

Golf course demand by municipal and industrial facilities, basin location and source of water is listed in Table 5.0-13. Total golf course demand was about 5,700 acre-feet in 2008, almost 7% of the total planning area demand. Effluent is an important water supply for golf course irrigation, accounting for 17% of the golf course demand in 2006. Municipal water providers served about 2,200 acre-feet to golf courses in 2008. Of this, 1,555 was groundwater and almost 680 acre-feet was effluent. Golf courses with their own facility wells, considered “industrial users”, used about 2,400 acre-feet of groundwater, 800 acre-feet of surface water and 300 acre-feet of effluent in 2008. The demand of these golf courses is included in the industrial category. Most golf courses are located in the Verde River Basin.

Agricultural Demand

Agricultural demand in the planning area averaged about 37,500 AFA, or 45% of the

total cultural demand during the 2001-2005 time-period. Most irrigation was for pasture. As listed in Table 5.0-14, there is agricultural demand in all basins but most (72%) was located in the Verde River Basin.

An estimated 6,400 acres were in agricultural production in the Verde River Basin, primarily in the Big Chino and Verde Valley sub-basins. Total demand was estimated at 27,100 AFA. The predominant crop grown was pasture, which is typically deficit irrigated. Groundwater was the primary supply in the Big Chino Sub-basin while surface water was predominantly utilized in the Verde Valley Sub-basin. Approximately 11,000 AFA of groundwater was withdrawn during 2001-2205 basin wide (USGS, 2007). An additional 15,200 AFA was diverted in the Verde Valley Sub-basin and 700 AFA in the Big Chino Sub-basin during this period. Detailed maps showing recent and historic irrigation in the Big Chino and Verde Valley sub-basins and much of the Verde Canyon Sub-basin are found

Table 5.0-14 Agricultural water demand in the Central Highlands Planning Area

	1991-1995 (acre-feet)	1996-2000 (acre-feet)	2001-2005 (acre-feet)
<i>Agua Fria</i>			
Groundwater	1,300	1,300	1,500
Total	1,300	1,300	1,500
<i>Salt River</i>			
Groundwater	<1,000	<1,000	<1,000
Surface Water	6,400	6,400	6,400
Total	6,900	6,900	6,900
<i>Tonto Creek</i>			
Groundwater	<1,000	<1,000	<1,000
Surface Water	1,000	1,000	1,000
Total	1,500	1,500	1,500
<i>Upper Hassayampa</i>			
Groundwater	<1,000	<1,000	<1,000
Total	<1,000	<1,000	<1,000
<i>Verde River</i>			
Groundwater	8,100	8,400	11,100
Surface Water	11,500	12,500	16,000
Total	19,600	20,900	27,100

Source: USGS 2007, ADWR 2005

Notes: Volumes <1,000 acre-feet assumed to be 500 acre-feet for computational purposes

in the Verde River Watershed Study Report (ADWR, 2000). This study also includes a description of the irrigation associations, including information on acreage, water supply and facilities. More recent maps of irrigated lands are found in the WAC and BOR Reports (WAC, 2004 and USBOR, 2003).

Most recent irrigation in the Big Chino Sub-basin is located along Big Chino Wash about 15 miles northwest of Paulden, along Williamson Valley Wash and near Paulden. A smaller number of acres have been irrigated in the Walnut Creek area near the western sub-basin boundary. Irrigation methods were predominantly flood or sprinkler irrigation. Pasture was the most prevalent crop as well as alfalfa, small grains and corn. (WAC, 2004)

About 30 irrigation associations recently diverted surface water in the Verde Valley Sub-basin. Most of the irrigated lands in the sub-basin

were located along the Verde River or its major tributaries. During drought, approximately 1,200 irrigation wells in the Verde Valley may have been used to meet irrigation demands. Agricultural lands were located primarily along the Verde River north and south of Camp Verde, where a number of ditch companies have served water to about 2,800 acres. Irrigated lands were also located near the communities of Cornville and Page Springs. Pasture was grown on about two-thirds of the irrigated land. Other crops included alfalfa, corn, wheat, vegetables and orchards. (ADWR, 2000)

Although agricultural demand estimates are uncertain in parts of the planning area due to a lack of both reporting and recent field studies, it does appear that agricultural demand

has declined in the Verde River Basin compared with demand prior to 1990. Agricultural demand may continue to decline in part due to groundwater transportation activities. In 2004, the City of Prescott, in partnership with the Town of Prescott Valley, purchased the JWK Ranch in the Big Chino Sub-basin for the anticipated purpose of retiring agricultural use and pumping groundwater to the Prescott Active Management Area pursuant to A.R.S. § 45-555. The final determination of the allowable transportation volume has not been made.

Small areas of irrigated acreage were located in the Agua Fria Basin north of Cordes Junction and in the Upper Hassayampa Basin north of Wagoner (see Figures 5.1-11 and 5.4-10). An estimated 1,500 AFA of groundwater was withdrawn during 2001-2005

In the Tonto Creek Basin the Gisela Community Ditch Association has delivered surface water

diverted from Tonto Creek through a 3-mile long ditch to about 144 acres near the community of Gisela, east of Rye (see Figure 5.3-10). Reportedly, much more water was diverted than used due to system configuration, but the excess was assumed to return to the creek. Agricultural lands consisted of pasture and orchard. Some acreage may have been irrigated with groundwater. (ADWR, 1992) A relatively small amount of groundwater-supplied irrigation also occurred in the lower reaches of Tonto Creek. A total of 1,500 AFA of groundwater and surface water was used during 2001-2005. The USGS recently estimated that about 270 acres were actively farmed in the Tonto Creek Basin (USGS 2007).

Annual agricultural demand in the Salt River Basin was estimated at about 7,200 acre-feet between 2001-2005 and was primarily associated with pasture irrigation for livestock raising operations. Most of the irrigated areas were in Pleasant Valley near Young and near the community of Fort Apache. An estimated 3,200 acre-feet of demand was located on non-reservation lands with about 650 acres in production. Approximately 2,700 acre-feet of surface water and 500 acre-feet of groundwater were used. Historically, small tracts of irrigated land were located throughout the basin including along the Salt River upstream of Roosevelt Lake, north of Globe and in the White Mountains. Recent field investigations have not been conducted in this basin and the USGS National Gap Analysis Program did not identify irrigated acreage in these areas (see Figure 5.2-10). Agricultural demand on the Fort Apache Indian Reservation was

estimated to be about 3,700 acre-feet of surface water with 1,050 acres in production. Only about 20 acres were irrigated with surface water and 200 acre-feet of groundwater on the portion of the San Carlos Apache Indian Reservation located in the planning area, with an associated demand of about 70 AFA. (ADWR, 1992)

Industrial Demand

Industrial demand in the planning area averaged almost 18,300 AFA during the period 2001-2005. As summarized in Table 5.0-15, industrial demand consists of mining (including sand and gravel operations and cement production), golf course irrigation served by facility water systems and a dairy. These same use categories that are served

Table 5.0-15 Industrial water demand in the Central Highlands Planning Area

Type/Basin	1991-1995	1996-2000	2001-2005
Mining Total	17,900	14,100	14,160
<i>Salt River</i>			
Groundwater	10,300	7,300	7,860
Surface Water ²	6,300	6,600	4,900
<i>Tonto Creek</i>			
Groundwater	0	200	200
<i>Verde River</i>			
Groundwater	1,300	0	1,200
Golf Course Total	2,910	3,010	3,334
<i>Salt River</i>			
Groundwater	210	210	210
<i>Verde River</i> ¹			
Groundwater	1,900	2,000	2,000
Surface Water	800	800	800
Effluent	UNK	UNK	324
Dairy/Feedlot Total	790	790	790
<i>Upper Hassayampa</i>			
Groundwater	790	790	790
Total	21,600	17,900	18,300

Source: ADEQ 2005, ADMMR 2005, ADWR 2000, ADWR 2008c, USGS 2007

UNK = Unknown

¹ Two golf courses also received effluent, see Table 5.0-9 for more information.

² Most of the surface water diverted for mining in the Salt River Basin

by a municipal water system are accounted for as municipal demand. There was likely other industrial demand in the planning area associated with additional sand and gravel operations and other types of industrial uses that are not reflected in Table 5.0-15 due to a lack of data.

Most of the industrial demand during the 2001-2005 time period was copper mining-related operations in the Salt River Basin and surface water exported from the basin via the Black River to the Morenci Mine in the Southeastern Arizona Planning Area. Average mining demand during 2001-2005 was comparable to that during 1996-2000 although the proportion of surface water utilized declined. Mining activity has, however declined from pre-1996 levels. Water use by the mining sector varies depending on the quantity of material mined and how it is processed. Outside of the AMAs, water use by mines is generally not required to be disclosed. Mining has been an important industry in the planning area for many years with a number of mines commencing operation in the late 1800s and early 1990s. Historically significant mines no longer in operation include the Vulture Gold Mine near Wickenburg that was in production sporadically for about a hundred years beginning in 1864, and the United Verde Mine at Jerome/Clarkdale, which operated from 1876 to 1953. The United Verde Mine was at one time the largest copper mine in Arizona, producing three million pounds of copper per month. A number of smaller mining operations were located around Crown King and north of Castle Hot Springs in the Agua Fria Basin. While some existing mines have been out of production in recent years, mining may resume at some sites (e.g. Miami) if determined to be economically feasible.

Mining operations at the Miami Mine, currently owned by Freeport-McMoRan, began in 1910. Active mining has ceased and current (2009) activity involves smelter operations and a copper

rod mill that produces continuous-cast copper rod used as the feedstock for the wire and cable industry. A planned 2008 restart of the mine was postponed due to economic conditions and the mine continues to be held on a care and maintenance status. (Freeport-McMoRan, 2009)

The BHP Pinto Valley Division includes the Pinto Valley Mine and the Miami Unit. The Pinto Valley Mine, an open-pit mine located northwest of Miami, began operation in 1974. Sulfide mining and milling operations ceased in 1998 although mining of a limited amount of waste rock continued. Full copper mining operations resumed in 2007, however by 2009, mining operations had been suspended and operations returned to care and maintenance (Home, 2009). The Miami Unit is a leach operation that recovers copper from the old Miami mine block cave area and leaching of the Miami No. 2 tailings pile (Phillips and others, 2000). The Miami unit is currently on care and maintenance status, although the SXEW unit is processing leach solutions that continue to be cycled through the leachable materials (Mining Technology, 2009).

The Quadra Carlota Copper Mine, an open pit mine located about six miles west of Miami, reopened in 2008. It produced ore intermittently from 1929 to 1964 (Mindat, 2009). The existing mine is a heap leach-solvent extraction-electrowinning (SXEW) operation that produces copper cathode. With an 11-year mine life, up to 75 million pounds per year of copper cathode may be produced (Quadra Mining LTD., 2009). Anticipated water use at the mine is estimated at 650 AFA (M3 Engineering & Technology Corp., 2006).

Available data for the most recent year (2007) show an estimated groundwater demand by mines in the Salt River Basin of approximately 7,200 acre-feet: 6,460 acre-feet at the Freeport-McMoran Miami Mine; 20 acre-feet at the BHP

Magma Miami Mine and 756 acre-feet at the BHP Pinto Valley Mine. There was no reported surface water use in the Miami area from 2004-2007. Annual water demand for 2001-2007 by each mine, as well as diversions from the Salt River Basin to the Morenci Mine are listed in Table 5.0-16.

In addition to metal mining, sand and gravel and cement operations are included in the mining category. During 2001-2005, an average of approximately 1,200 AFA of groundwater was used in the Verde River Basin by several sand and gravel operations and Phoenix Cement, a manufacturer of Portland Cement located near Clarkdale. A cement plant has recently commenced operations near Drake, northwest of Paulden, that may use about 80 acre-feet of water per year (Wirt, 2005).

As shown in Table 5.0-13, ten of the seventeen known golf courses in the planning area are “industrial” courses located primarily in the Verde River Basin. Industrial golf courses receive at least some water from facility wells and not from a municipal water provider. During 2001-2005, an average of more than 3,300 AFA was used by industrial golf courses. Of this total, groundwater demand averaged about 2,200 AFA. Three courses used a total of almost 800 acre-feet of surface water annually and two courses used a total of about 324 acre-feet of municipal effluent a year.



Cobre Golf Course, Salt River Basin. This golf course is one of the 10 golf courses in the basin served by its own wells and considered to be an “industrial” course.

The Parker Dairy, located east of Congress in the Upper Hassayampa Basin, began operations in 1987. It houses over 7,000 dairy cows and has an estimated annual groundwater demand of about 800 acre-feet.

5.0.8 Water Resource Issues in the Central Highlands Planning Area

A number of complex water resource issues exist in the Central Highlands Planning Area. Issues have been identified in water resource studies, by community watershed groups, through the distribution of surveys, and from other sources. Issues and planning, conservation and research activities are discussed in this section.

Table 5.0-16 Industrial mining demand in the Salt River Basin, 2001-2007

		2001	2002	2003	2004	2005	2006	2007
Mine	Water supply	Water Demand (acre-feet)						
		Freeport-McMoran Miami ¹	groundwater	8,513	7,092	6,460	6,460	6,460
	surface water	54	14	119	na	na	na	na
BHP Miami	groundwater	na	na	na	na	300	20	20
BHP Pinto Valley	groundwater	483	425	367	586	899	945	756
Freeport-McMoRan Morenci (diversions to the Southeastern Arizona Planning Area)	surface water	5,314	5,219	6,448	5,245	5,372	4,970	271

¹ 2004-2007 demand not reported. Shown is demand estimated by the USGS

na = not available

Source: ADWR 2008

Planning and Conservation

Many communities in the planning area are facing rapid population growth in a region of the state where physical and legal access to water supplies creates significant challenges. These challenges have resulted in the formation of several community watershed groups, water resource studies and planning and drought response and water conservation efforts. Yavapai County is a major governmental entity in the planning area with the largest county land base. Because the County had a population of over 125,000 in the 2000 Census, it is required to include a water resource element in its General Plan. Its plan recognizes the need for public education and sees the county's role as a facilitator of sound water resource management practices. The Yavapai County Board of Supervisors, along with cities, towns, tribes and the Department of Water Resources created the Yavapai County Water Advisory Committee (WAC) to provide a water management strategy for Yavapai County. The goals of the county's general plan as they compare with the activities of the WAC are included in Yavapai County's General Plan.

The City of Cottonwood acquired private water companies to improve water resource management. The town is a participant in the WAC as are a number of communities in the Verde River Basin including Sedona, Clarkdale and Camp Verde.

The Town of Payson is the largest community in the planning area. Because its water system is drought sensitive and the community faces rapid population growth, the Town has undertaken a variety of water resource management activities. It has adopted ordinances that place conservation and no-impact requirements on new developments including prohibitions on swimming pools, turf and evaporative coolers in buildings over 3,000 square feet. It also



Verde River Basin southwest of Sedona.

imposes a water-development impact fee on new development. New residential subdivisions are limited to 20 lots and builders must provide their own sources of water without impacting Payson's water supplies (Maguire, 2005). Payson has a conservation water rate structure, a water conservation education program and a drought plan. Supply augmentation activities include using effluent for turf irrigation and groundwater recharge, and development of a program to transport 3,000 acre-feet of water from C.C. Cragin reservoir to Payson as provided for under the Arizona Water Rights Settlement Act.

Local Drought Impact Groups (LDIGs) are county-level voluntary groups created to coordinate drought public awareness, provide impact assessment information to local and state leaders, and implement and initiate local drought mitigation and response actions. These groups are coordinated by local representatives of Arizona Cooperative Extension and County Emergency Management and supported by ADWR's Statewide Drought Program. To date, a group has been formed in Yavapai County. More information on LDIGs may be found at <http://www.azwater.gov/dwr/drought/LDIG.html>.

Watershed Groups and Studies

Several groups have formed in the planning area to address water resource issues. Among the most active groups are the Citizens Water Advocacy Group, Coconino Plateau Water Advisory Group, Mogollon Highlands Partnership, Northern Arizona Municipal Water Users Association, Upper Agua Fria Watershed Partnership, Verde Valley Water Users, Inc., Verde Watershed Association and the Yavapai County Water Advisory Committee. In 2005, Congress passed the Northern Arizona Land Exchange and Verde River Partnership Act, but to date no appropriations to fund the partnership have been made. A description of those groups that are part of the Department's Rural Watershed Initiative Program, including participants, activities and issues, is found in Appendix D. Two of the groups mentioned above and listed in Appendix D encompass more than one planning area. Primary issues identified by these groups that pertain to the Central Highlands Planning area are summarized as follows:

Growth:

- Unregulated lot splits
- Proposed growth in Mayer, Bensch Ranch, Spring Valley and elsewhere
- Thousands of private domestic wells and more pending
- Significant projected growth

Water Supplies and Demand:

- Limited and deep groundwater supplies
- Access to water development on public lands
- Limited groundwater data
- Limited supplies to meet projected demands
- Limited water resources to meet current demands
- Environmental, supply, treatment, transportation and financing costs associated with augmentation from C.C. Cragin reservoir

- Seasonal demand/peaking problems
- Potential impacts resulting from the transfer of Big Chino water to Prescott and Prescott Valley

Legal:

- Private water companies and domestic water improvement district conflicts
- Interbasin transfer conflicts resulting from Payson's ability to pump from two separate basins
- Unresolved Indian Water Rights settlements
- Subflow decision and impact on legal access to water

Water Quality:

- Water quality issues in Verde Valley
- Potential impacts from septic systems
- Ability to meet new arsenic standard

Funding:

- Limited funding resources for planning, projects, infrastructure and studies
- High cost of water augmentation projects
- Costs associated with hauling water
- Infrastructure needs for private and public water companies

Drought:

- Drought sensitive groundwater and surface water supplies
- Drought sensitivity in Pine and Strawberry

Environmental:

- ESA issues involving groundwater usage impacts on perennial streams
- Critical habitat area in Verde Valley for Willow Flycatcher
- Environmental issues pertaining to Fossil Creek and the Verde River
- Invasive species

Other:

- Poorly constructed and maintained infrastructure in some areas
- Competition between watershed groups for funding and technical support

A number of studies have been conducted in parts of the planning area, particularly in the Verde River Basin. Many of these studies were undertaken as a result of initiatives by watershed groups and communities. Some of the noteworthy regional studies have been mentioned in previous sections and an extensive list of studies are included in the references and suggested reading section found at the end of each basin section in this volume. In addition, several studies are in process or have recently been finalized. The USBOR along with Gila County, the Town of Payson and a number of participating agencies is finalizing the Mogollon Rim Water Resources Management Study, which covers the Payson, Pine, Strawberry and Star Valley area. Northern Arizona University used USGS geophysical data to construct a 3-D geologic model that represents the subsurface geologic framework within the Big Chino Subbasin and Prescott AMA. The model aids in understanding how groundwater flows within and between these areas (Fry, 2006) The USBOR in cooperation with Yavapai County WAC and the Department are in the process of developing the Central Yavapai Highlands Water Resource Management Study. The study group includes WAC members, NGOs and state and federal agencies.

The Natural Resources Conservation Service (NRCS) has produced a rapid watershed assessment (RWA) for three watersheds in the planning area: the Agua Fria River, Carrizo Creek and Hassayampa River watersheds. These watersheds extend beyond the planning area boundaries. An RWA is a concise report containing information on natural resource conditions and concerns at the 8-digit HUC level. They are intended to provide sufficient information and analysis to generate an appraisal of the conservation needs of the watershed as well as serve other uses. (Reports are available online at <http://www.az.nrcs.usda.gov/technical/rwa.html>).

Arizona NEMO (Non-point Education for Municipal Officials) has produced watershed based plans for the Salt, Upper Agua Fria and Verde Watersheds. These plans characterize and classify watershed features. The goal of NEMO is to educate land-use decision makers to make choices and take actions that will lessen nonpoint source pollution and protect natural resources. (Plans are available online at <http://www.srn.arizona.edu/nemo/>).

Issue Surveys

The Department conducted a rural water resources survey in 2003 to compile information for the public and help identify the needs of growing communities. This survey was also intended to gather information on drought impacts for incorporation into the Arizona Drought Preparedness Plan, adopted in 2004. Questionnaires were sent to almost 600 water providers, jurisdictions, counties and tribes. The Department completed a report of the findings from the survey in 2004 (ADWR, 2004).

There were 36 water provider and jurisdiction respondents in the Central Highlands Planning Area, and 24 numerically ranked issues. Respondents were asked to rank 18 issues. Infrastructure issues, particularly inadequate capital to pay for infrastructure improvements, were ranked among the top five issues by many respondents. Future water supply concerns and drought problems also ranked relatively high (Table 5.0-17). At the time of the survey, concerns about the utility's ability to meet the new arsenic standard (with a compliance date of 2006) and lowering water tables near wells ranked relatively high as concerns; 33% and 25% respectively.

In a separate question, about half of respondents noted at least one drought impact. Primary drought impacts noted were increased demand, increased peak demand and lowered groundwater levels.

The Department conducted another, more concise survey of water providers in 2004. This was done to supplement the information gathered in the previous year in support of developing the Arizona Water Atlas, and to reach a wider audience by directly contacting each water provider. Through this effort, 74 water providers in the Central Highlands Planning Area, with a total of approximately 60,600 service connections, were willing to participate and provide information on water supply, demand and infrastructure and to rank a list of seven issues.

Water providers were asked to rank 7 issues from 0 to 3 with 0 = no concern, 1 = minor concern, 2 = moderate concern and 3 = major concern. Of the 74 water providers that responded to the survey, 66 ranked issues. These respondents include some of the largest water providers in the planning area including the City of Globe, Payson Water Company, Big Park Water Company and City of Cottonwood.

Responses to the 2003 questionnaire are not directly comparable to the 2004 survey due to differences in the form and wording of the surveys. In addition, water quality and groundwater level conditions were not included as issues in the 2004 survey. Nevertheless, responses to certain issues are similar as shown in Table 5.0-16. The 2004 responses indicate that issues related to infrastructure, drought and inadequate supplies to meet future demands are the most prevalent concerns. The identification of drought related water supply problems was particularly the case for respondents in the Verde River Basin.

5.0.9 Groundwater Basin Water Resource Characteristics

Sections 5.1 through 5.5 present data and maps on water resource characteristics of the groundwater basins in the Central Highlands Planning Area. A description of the data sources and methods used to derive this information is

Table 5.0-17 Water resource issues ranked by survey respondents in the Central Highlands Planning Area

Issue	Percent of 2003 respondents that ranked the issue as one of the top 5 (of 18)	Percent of 2004 respondents reporting issue was a moderate or major concern
Inadequate storage capacity to meet peak demand	8%	13%
Inadequate well capacity to meet peak demand	4	18
Inadequate water supplies to meet current demand	8	15
Inadequate water supplies to meet future demand	29	32
Infrastructure in need of replacement	21	36
Inadequate capital to pay for infrastructure improvements	33	38
Drought related water supply problems	21	38

Source: ADWR, 2004

Note: 2003 respondents consist of 19 water providers and 5 jurisdictions. 2004 respondents included 66 water providers

found in Section 1.3 of Volume 1 of the Atlas. This section briefly describes general information that applies to all of the basins and the purpose of the information. This information is organized in the order in which the characteristics are discussed in Sections 5.1 through 5.5.

Geographic Features

Geographic features maps are included to present a general orientation to principal land features, roads, counties and cities, towns and places in the groundwater basin.

Land Ownership

The distribution and type of land ownership in a basin has implications for land and water use. Large amounts of private land typically translate into opportunities for land development and associated water demand, whereas federal lands are typically maintained for a purpose with little associated water use. State owned land may be sold or traded, and is often leased for grazing and farming. The extent of state owned lands is due to a number of legislative actions. The State Enabling Act of 1910 and the Act that established the Territory of Arizona in 1863 set aside sections 2, 16, 32 and 36 in each township to be held in trust by the state for educational purposes. Other legislation authorized additional state trust lands for specified purposes, which are identified for each basin (ASLD, 2006).

Climate

Climate data including temperature, rainfall, evaporation rates and snow are critical components of water resource planning and management. Averages and variability, seasonality of precipitation and long term climate trends are all important factors in demand and supply planning.

Surface Water Conditions

Depending on physical and legal availability, surface water may be a potential supply in a basin. Stream gage, flood gage, reservoir, stockpond

and runoff contour data provide information on physical availability of this supply. Seasonal flow information is relevant to seasonal supply availability. Annual flow volumes provide an indication of potential volumetric availability.

Surface water maps display runoff contours and the location of reservoirs and gages. Also shown are 1st and 2nd order streams, and 3rd order streams with gages.

Criteria for including stream gage stations in the basin tables are that there is at least one year of record, and annual streamflow statistics are included only if there are at least three years of record. There are different types of stations and those that only serve repeater functions were not included.

Flood gage information is presented to direct the reader to sources of additional precipitation and flow information that can be used in water resource planning. Large reservoir storage information provides data on the amount of water stored in the basin, its uses, and ownership. Because of the large number of small reservoirs, and less reliable data, individual small reservoir data is not provided. The number of stockponds is a general indicator of small scale surface water capture and livestock demand. Runoff contours reflect the average annual runoff in tributary streams. They provide a generalized indication of the amount of runoff that can be expected at a particular geographic location.

Perennial and Intermittent Streams and Major Springs

A map of perennial and intermittent streams is provided for each basin. For some basins, more than one source of information was used. Stream designations may not accurately reflect current conditions in some cases. Spring data was compiled from a number of sources in an effort to develop as comprehensive a list as possible. Spring data is important to many researchers

and to the environmental community due to their importance in maintaining habitat, even from small discharges.

Groundwater Conditions

Several indicators of groundwater conditions are presented for each basin. Aquifer type can be a general indicator of aquifer storage potential, accessibility of the supply, aquifer productivity, water quality and aquifer flux. Well yield information for large diameter wells is provided and is generally measured when the well is drilled and reported on completion reports. It was assumed that large diameter wells were drilled to produce a maximum amount of water and, therefore, their reported pump capacities are indicative of the aquifer's potential to yield water to a well. However, many factors can affect well yields including well design, pump size and condition and the age of the well. Reported well yields are only a general indicator of aquifer productivity and specific information is available from well measurements conducted as part of basin investigations.

Natural recharge is typically the least well known component of a water budget. Many of the estimates in the Atlas are derived from studies of larger geographic areas and all deserve further study. Similarly, estimates of storage are based on rough estimates and considerably more studies are needed in most basins. Components of storage include aquifer depth and specific yield.

Water level data is from measured wells, usually collected during the period when the wells were not actively being pumped or only minimally pumped. Depth to water measurements are shown on mapped wells if there was a measurement taken during 2003-2004. The basin hydrographs show water-level trends for selected wells over the 30-year period from January 1975 to January 2005. Not all basins have a sufficient number of representative hydrographs.

The flow directions that are shown generally reflect long-term, regional aquifer flow in the basin and are not meant to depict temporary or local-scale conditions. However, flow directions in some basins indicate how localized pumping has altered regional flow patterns.

Water Quality

Water quality conditions impact the availability of water supplies. Water quality data was compiled from a variety of sources as described in Volume 1 Section 1.3. The data indicate areas where water quality exceedences have previously occurred, however additional areas of concern may currently exist where water quality samples have not been collected or sample results were not reviewed by the Department (e.g. samples collected in conjunction with the ADEQ Aquifer Protection Permit programs). It is important to note also that the exceedences presented may or may not reflect current aquifer or surface water conditions.

Cultural Water Demand

Cultural water demand is an important component of a water budget. However, without mandatory metering and reporting of water uses, accurate demand data is difficult to acquire. Municipal demand includes water company and domestic (self-supplied) demand estimates. Basin demand information is from several sources in order to prepare as accurate an estimate as possible. Annual demand estimates have been averaged over a specific time period. This provides general trend information without focusing on potentially inaccurate annual demand estimates due to incomplete data.

Locations of major cultural water uses are primarily from a 2004 USGS land cover study using older satellite imagery that may not represent recent changes. The cultural demand maps provide only general information about the location of water users.

Effluent generation data was compiled from several sources to provide an estimate of how much of this renewable resource might be available for use. However, effluent reuse is often difficult both logistically and economically since a potential user may be far from the wastewater treatment plant.

Water Adequacy Determinations

Information on water adequacy and inadequacy determinations for subdivisions, with the reason for the inadequacy determination provides information on the number and status of subdivision lots. Listing the reason for the inadequacy identifies which subdivisions have a demonstrated physical or legal lack of water or may have elected not to provide the necessary information to the Department. Briefly, developers of subdivisions outside of AMAs are required to obtain a determination of whether there is sufficient water of adequate quality available for 100 years. If the supply is determined to be inadequate, lots may still be sold, but the condition of the water supply must be disclosed in promotional materials and in sales documents.

In addition to these subdivision determinations for which a water adequacy report is issued, water providers may apply for adequacy designations for their entire service area. If a subdivision is to be served water from one of these water providers, then a separate adequacy determination is not required. (See Section 5.0-5)

Developers of large, master-planned communities outside of AMAs may apply for an Analysis of Adequate Water Supply (AAWS). This type of application is generally used to prove that water will be physically available for the master-planned community. AAWS are issued based on the development plan or plat. If an AAWS is issued for groundwater, it reserves a specific volume of water for 10 years (for purposes of further adequacy reviews) only for the specific property that is the subject of the AAWS.

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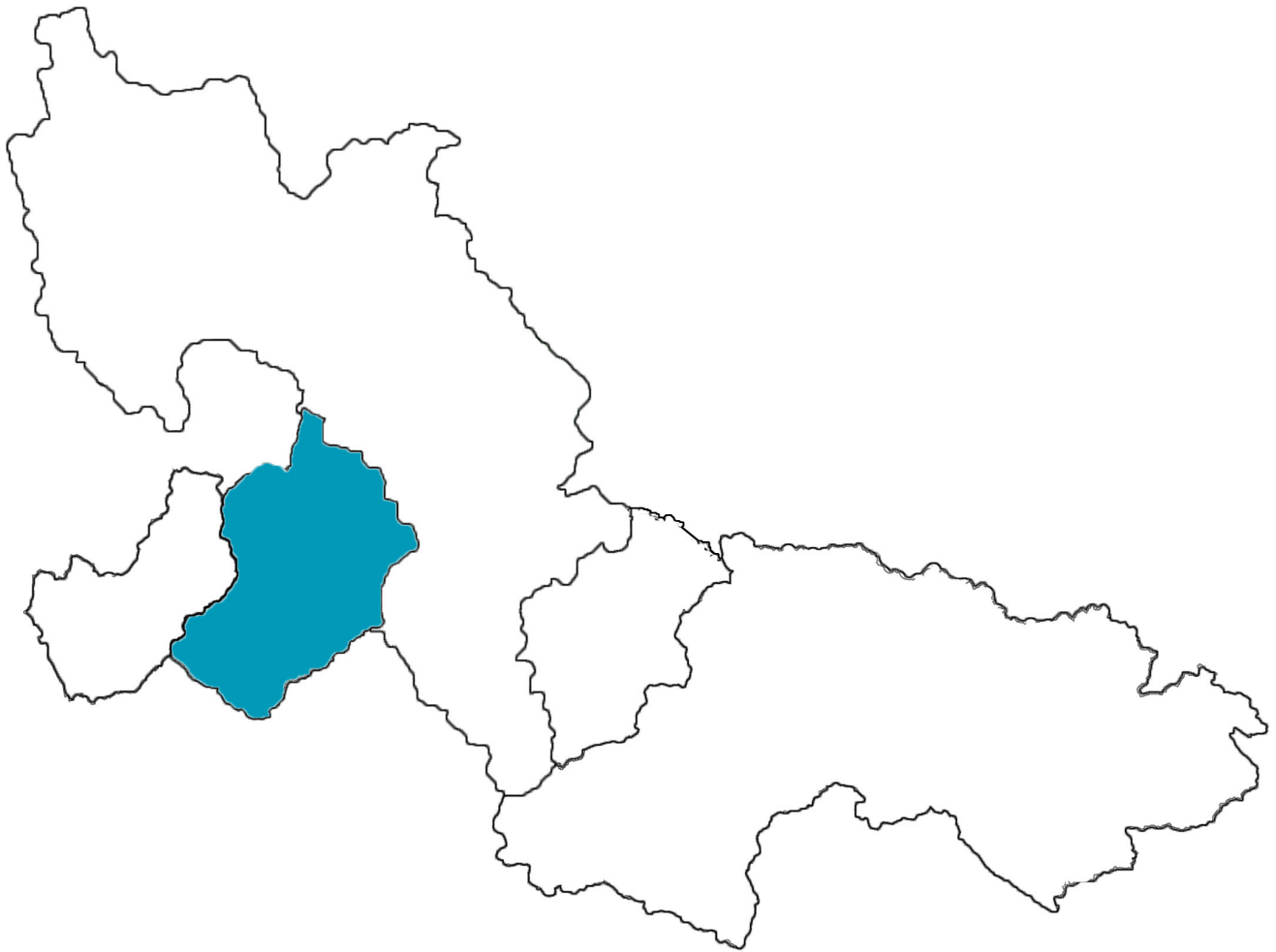
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Section 5.1

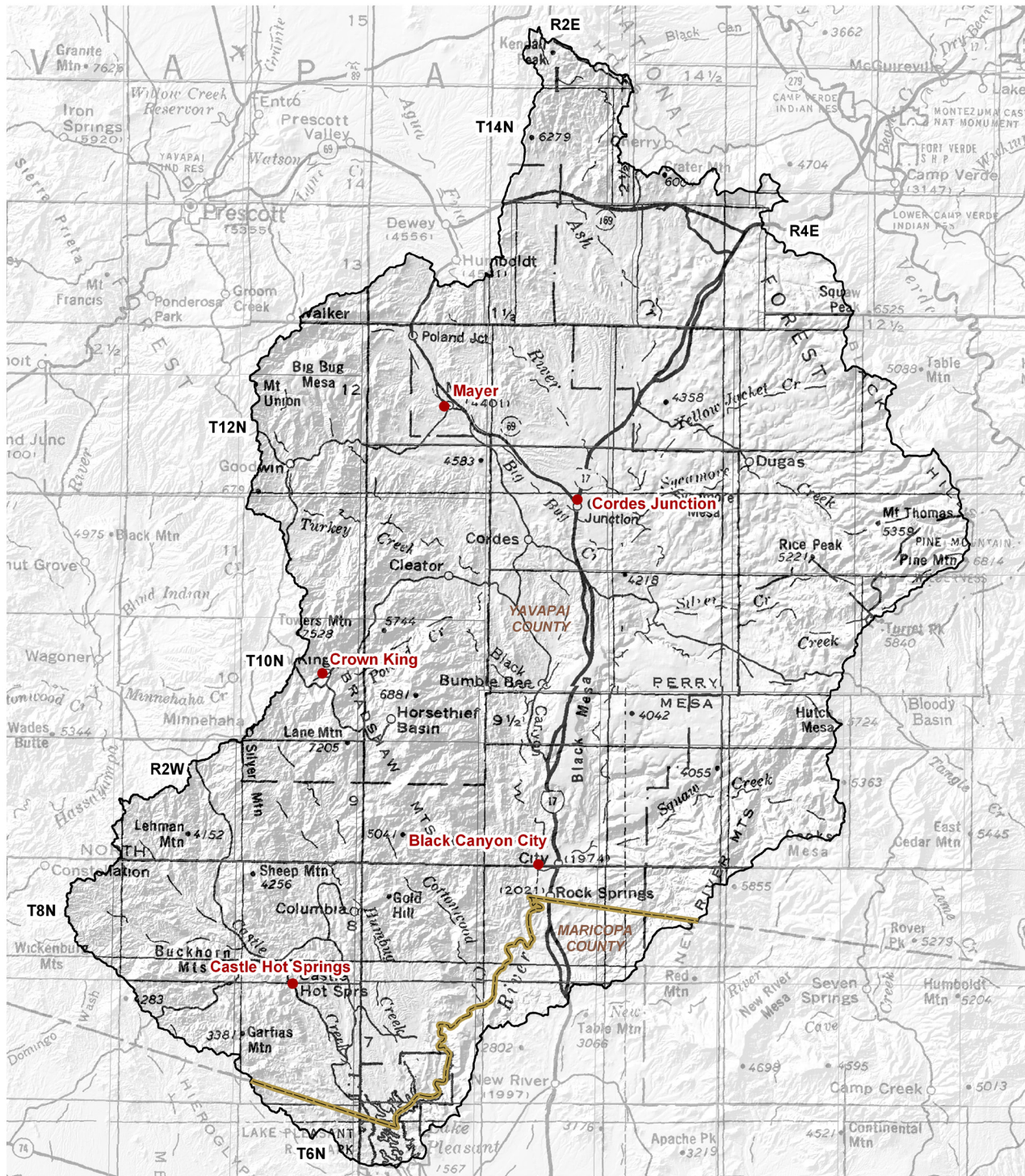
Agua Fria Basin



5.1.1 Geography of the Agua Fria Basin

The Agua Fria Basin, located in the west central part of the planning area is 1,263 square miles in area. Geographic features and principal communities are shown on Figure 5.1-1. The basin is characterized by mid-elevation mountain ranges and mesas. Vegetation types include Arizona upland Sonoran desertscrub, semidesert grassland, interior chaparral, montane conifer forests and Great Basin conifer woodland (see Figure 5.0-10). Riparian vegetation is found along the Agua Fria River including mixed broadleaf and cottonwood/willow.

- Principal geographic features shown on Figure 5.1-1 are:
 - Agua Fria River running north to south through the center of the basin
 - Numerous creeks that flow into the Agua Fria River including Castle Creek, Humbug Creek, Cottonwood Creek, Black Canyon Creek, Squaw Creek, Turkey Creek, Silver Creek, Sycamore Creek, Yellow Jacket Creek and Ash Creek
 - Horsethief Basin southeast of Crown King
 - Black Mesa along Interstate 17 west of Perry Mesa
 - Big Bug Mesa on the western basin boundary northwest of Mayer
 - Buckhorn Mountains in the southwestern and the New River Mountains in the southeastern portions of the basin
 - Bradshaw Mountains west of Interstate 17, which contain the highest point in the basin, Mt. Union at 7,528 feet
 - The lowest point in the basin is about 3,700 feet along the Agua Fria River



Base Map: USGS 1:500,000, 1981



0 3 6
Miles



Figure 5.1-1
Agua Fria Basin
Geographic Features

COUNTY
City, Town or Place



5.1.2 Land Ownership in the Agua Fria Basin

Land ownership, including the percentage of ownership by category, for the Agua Fria Basin is shown in Figure 5.1-2. Principal features of land ownership in this basin are the diversity of land ownership types and the large contiguous parcels of forest service lands. A description of land ownership data sources and methods is found in Volume 1, Appendix A. More detailed information on protected areas is found in Section 5.0.4. Land ownership categories are discussed below in the order from largest to smallest percentage in the basin.

National Forest

- 46.7% of the land is federally owned and managed by the United States Forest Service (USFS).
- Forest lands in the basin are part of the Prescott and Tonto National Forests.
- The basin contains two wilderness areas, the 25,536-acre Castle Creek Wilderness and the 20,100-acre Pine Mountain Wilderness. Both areas are in the Prescott National Forest. (see Figure 5.0-13)
- There are numerous small private in-holdings in the Prescott National Forest.
- National forest land is located in the northern, eastern and western portions of the basin, divided by Interstate 17 and other land uses in the central part of the basin.
- Land uses include recreation, grazing and timber production.

U.S. Bureau of Land Management (BLM)

- 28.8% of the land is federally owned and managed by the Hassayampa Field Office BLM.
- Most BLM lands are interspersed with private and state trust lands in the southern and central portions of the basin.
- BLM lands include 71,000 acres of the Agua Fria National Monument.
- Primary land uses are recreation and grazing.

State Trust Land

- 14.7% of the land in this basin is held in trust for the public schools and four other beneficiaries under the State Trust Land system.
- State land is interspersed with private and BLM lands and is found in the southern and north-central portions of the basin.
- Primary land use is grazing.

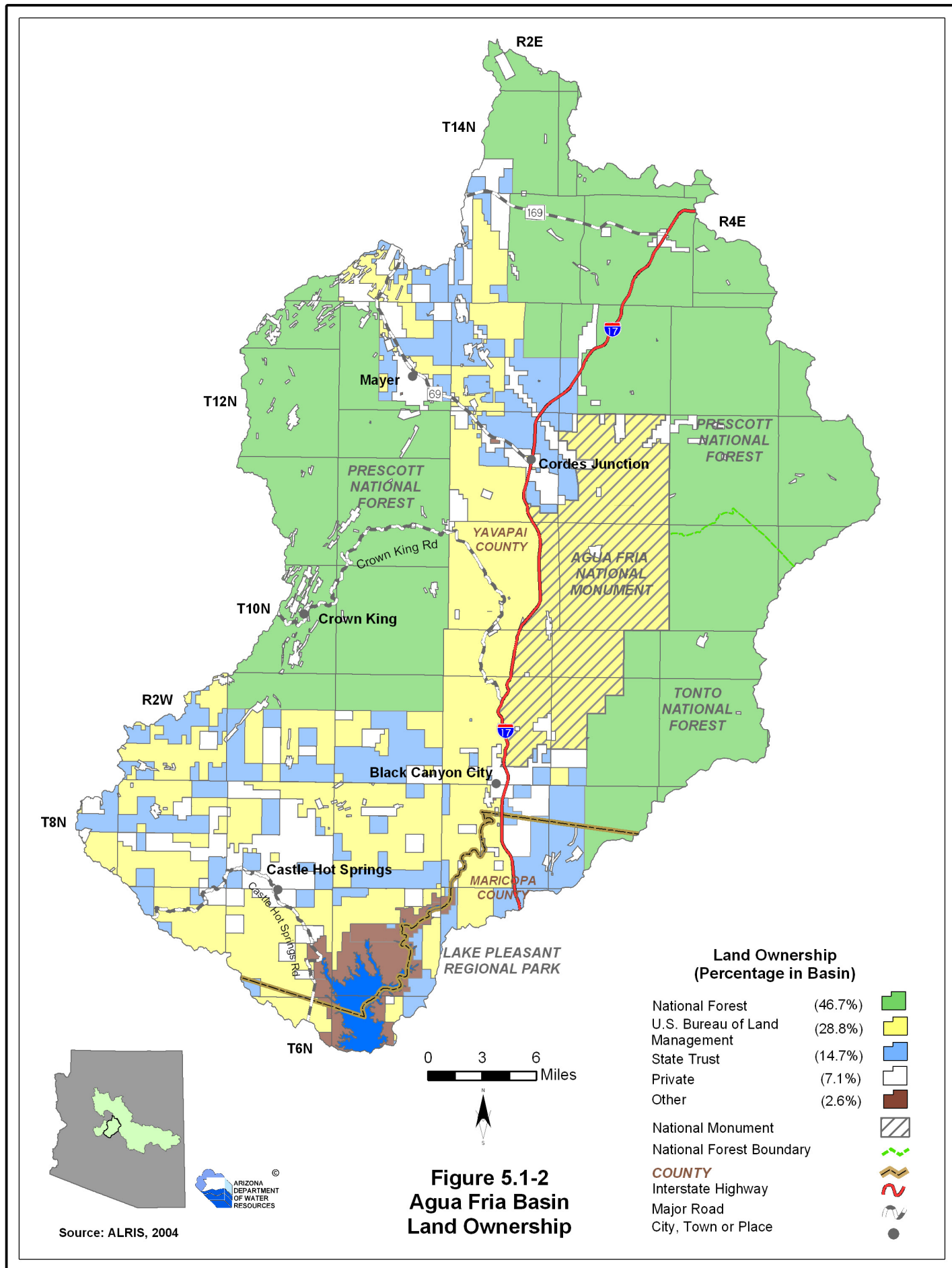
Private

- 7.1% of the land is private.
- Private land is found throughout the basin with the majority of the private land interspersed with state trust, national forest and BLM lands.
- The largest contiguous area of private lands is in the vicinity of Castle Hot Springs.
- Land uses include domestic, commercial and ranching.

Other (Game and Fish, County and Bureau of Reclamation Lands)

- 2.6% of the land is owned and managed by two counties.

- The largest portion of “other” land is owned and managed by Maricopa County as the Lake Pleasant Regional Park, located at the southernmost tip of the basin.
- A small portion of land northwest of Cordes Junction is owned by Yavapai County, its use is unknown.
- Primary land use at the Lake Pleasant Regional Park is recreation.



5.1.3 Climate of the Agua Fria Basin

Climate data from NOAA/NWS Co-op Network stations are compiled in Table 5.1-1 and the locations are shown on Figure 5.1-3. Figure 5.1-3 also shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Agua Fria Basin does not contain Evaporation Pan, AZMET or SNOTEL/Snowcourse stations. More detailed information on climate in the planning area is found in Section 5.0.3. A description of the climate data sources and methods is found in Volume 1, Appendix A.

NOAA/NWS Co-op Network

- Refer to Table 5.1-1A
- There are three NOAA/NWS Co-op network climate stations in the basin. The average monthly maximum temperature occurs in July at all stations and ranges between 72.6°F at Crown King and 88.8°F at Castle Hot Springs. The average monthly minimum temperature occurs in January and ranges between 53.2°F at Castle Hot Springs and 37.4°F at Crown King.
- Highest average seasonal rainfall occurs in the winter (January – March) at two of the three stations. For the period of record used, the highest annual rainfall is 28.41 inches at Crown King and the lowest is 15.47 inches at Castle Hot Springs.

SCAS Precipitation Data

- See Figure 5.1-3
- Additional precipitation data shows rainfall as high as 32 inches near Crown King and as low as 10 inches at the southernmost tip of the basin.

Table 5.1-1 Climate Data for the Agua Fria Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Total Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
Castle Hot Springs	1,990	1971 - 2000	88.8/Jul	53.2/Jan	6.23	1.03	4.52	3.69	15.47
Cordes	3,770	1971 - 2000	80.1/Jul	45.3/Jan	5.29	1.31	5.87	3.74	16.21
Crown King	5,920	1971 - 2000	72.6/Jul	37.4/Jan	11.39	2.13	8.62	6.27	28.41

Source: WRCC, 2005

B. Evaporation Pan:

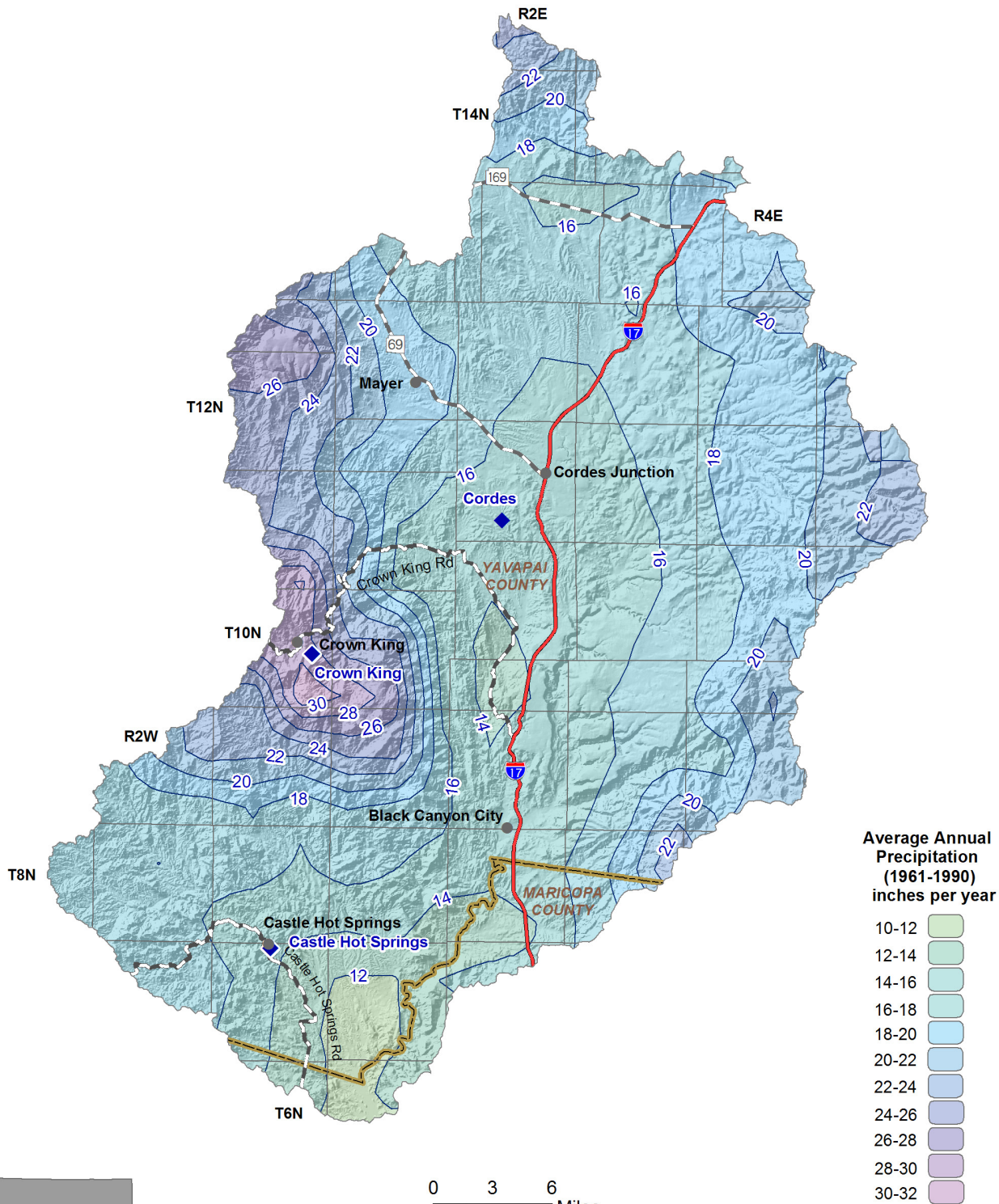
Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
None			

C. AZMET:

Station Name	Elevation (in feet)	Period of Record	Average Annual Reference Evapotranspiration, in inches (Number of years to calculate averages)
None			

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content (Number of measurements to calculate average)					
			Jan.	Feb.	March	April	May	June
None								



Average Annual Precipitation (1961-1990) inches per year

10-12	[Lightest Green Box]
12-14	[Light Green Box]
14-16	[Light Teal Box]
16-18	[Teal Box]
18-20	[Light Blue Box]
20-22	[Blue Box]
22-24	[Dark Blue Box]
24-26	[Purple-Blue Box]
26-28	[Purple Box]
28-30	[Dark Purple Box]
30-32	[Darkest Purple Box]

Meteorological Stations

- NOAA/NWS
- Precipitation Contour
- COUNTY
- Interstate Highway
- Major Road
- City, Town or Place

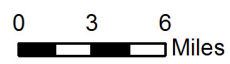


Figure 5.1-3
Agua Fria Basin
Meteorological Stations
and Annual Precipitation

Precipitation Data Source: Oregon State University, 1998

ARIZONA DEPARTMENT OF WATER RESOURCES

5.1.4 Surface Water Conditions in the Agua Fria Basin

Streamflow data, including average seasonal flow, average annual flow and other information is shown in Table 5.1-2. Flood ALERT equipment in the basin is shown in Table 5.1-3. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 5.1-4. The location of streamflow gages identified by USGS number, flood ALERT equipment and USGS runoff contours are shown on Figure 5.1-5. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Streamflow Data

- Refer to Table 5.1-2.
- Data from seven stations located at five watercourses are shown in the table and on Figure 5.1-5.
- The average seasonal flow at most stations is highest in the winter (January-March) and lowest is in the spring (April-June).
- The largest annual flow recorded in the basin is 360,541 acre-feet in 1992 at the Agua Fria near Rock Spring station and the lowest is 12 acre-feet in 1989 at Cottonwood Creek near Waddell Dam. For a hydrograph showing average annual streamflow from 1940 to 2007 on the Agua Fria near Mayer see Figure 5.1-4.

Flood ALERT Equipment

- Refer to Table 5.1-3.
- As of October 2005 there were 14 stations in the basin.

Reservoirs and Stockponds

- Refer to Table 5.1-4.
- The basin contains one large reservoir with a maximum capacity of 1,108,600 acre-feet. Lake Pleasant, created by the New Waddell Dam, is used for flood control, hydroelectric power generation, recreation and water supply purposes.
- Surface water is stored or could be stored in four small reservoirs in the basin.
- There are 527 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 5.1-5.
- Average annual runoff is one inch per year, or 53.3 acre-feet per square mile, in most of the basin and increases to two inches per year, or 106.6 acre-feet per square mile, in the northeast portion of the basin.

Figure 5.1-4 Annual Flows (acre-feet) at Agua Fria River near Mayer, water years 1940-2008 (Station #9512500)

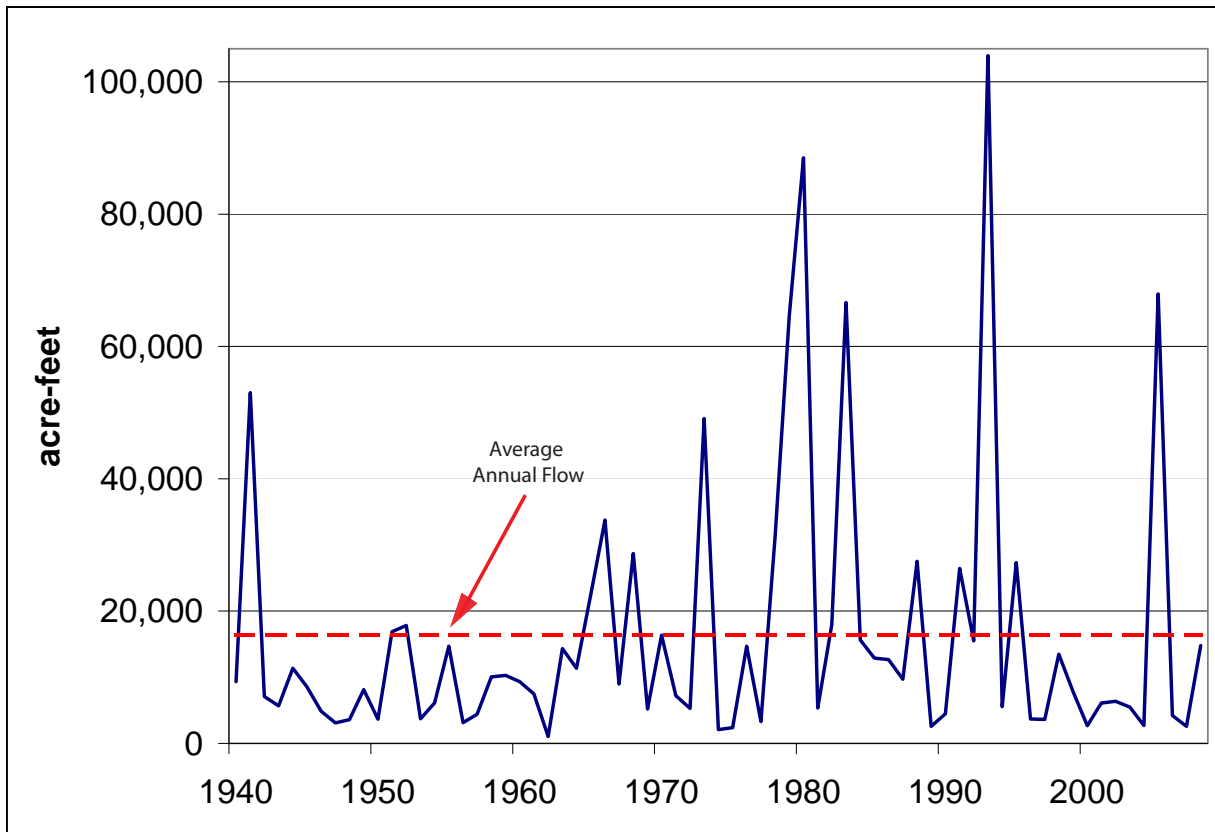


Table 5.1-2 Streamflow Data for the Agua Fria Basin

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow/Year (in acre-feet)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9512450	Agua Fria River near Humboldt	NA	4,400	1/2000-current (real-time)	19	9	40	32	1,332 (2003)	1,354	2,013	3,352 (2002)	3
9512500	Agua Fria River near Mayer	585	3,434	1/1940-current (real-time)	52	9	22	17	976 (1962)	9,197	16,327	103,555 (1993)	63
9512600	Turkey Creek near Cleator	89	3,140	10/1979 - 9/1990 (discontinued)	68	10	9	12	239 (1981)	4,164	8,154	33,882 (1980)	12
9512800	Agua Fria River near Rock Springs	1,111	1,800	1/1970-current (real-time)	75	7	7	11	1,528 (1975)	19,692	57,664	360,541 (1992)	31
9512830	Boulder Creek near Rock Springs	38	1,890	5/1983-9/1993 (discontinued)	80	9	3	9	14 (1989)	701	1,186	3,869 (1992)	9
9512860	Humbug Creek near Castle Hot Springs	60	1,790	5/1983-9/1994 (discontinued)	81	7	5	7	333 (1989)	1,948	5,334	34,896 (1993)	10
9512970	Cottonwood Creek near Waddell Dam	9	1,660	4/1983-3/1993 (discontinued)	82	1	13	4	12 (1989)	94	252	1,166 (1992)	9

Source: USGS (NWIS) 2005 & 2008

Notes:

Statistics based on Calendar Year
Annual Flow statistics based on monthly values
Summation of Average Annual Flows may not equal 100 due to rounding
Period of record may not equal Years of Record used for annual Flow/Year statistics due to only using years with a 12 month record
In Period of Record, current equals November 2008
Seasonal and annual flow data used for the statistics was retrieved in 2005

Table 5.1-3 Flood ALERT Equipment in the Agua Fria Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
3755	Brooklyn Peak	Precipitation	8/3/2005	Yavapai County FCD
3780	Black Canyon City	Repeater/Weather Station	8/1/2005	Yavapai County FCD
5335	Minnehaha	Precipitation	6/16/1981	Maricopa County FCD
5660	Lake Pleasant North	Weather Station	NA	Maricopa County FCD
5670	Garfias Mountain	Precipitation	8/14/1981	Maricopa County FCD
5685	Columbia Hill	Precipitation	7/1/1981	Maricopa County FCD
5700	Horsethief Basin	Weather Station	11/24/1986	Maricopa County FCD
5715	Crown King	Precipitation	10/18/1982	Maricopa County FCD
5730	Sunset Point	Precipitation	7/1/1981	Maricopa County FCD
5745	Horseshoe Ranch	Precipitation	5/1/1981	Maricopa County FCD
5760	Horner Mtn. Ranch	Precipitation	4/1/1981	Maricopa County FCD
5775	Arizona Hunt Club	Precipitation	4/1/1981	Maricopa County FCD
5790	I-17 @ 169	Precipitation	11/11/1987	Maricopa County FCD
5805	Dewey	Precipitation	11/1/1981	Maricopa County FCD

Source: ADWR 2005b

Notes:

FCD = Flood Control District

NA = Data not currently available to ADWR

Table 5.1-4 Reservoirs and Stockponds in the Agua Fria Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE ¹	JURISDICTION
1	Lake Pleasant (New Waddell Dam) ²	Bureau of Reclamation	1,108,600	C,H,R,S	Federal

B: Other Large Reservoirs (50 acre surface area or greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE	JURISDICTION
None identified by ADWR at this time					

Source: Compilation of databases from ADWR & others

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total Number: 2

Total maximum storage : 63

D. Other Small Reservoirs (between 5 and 50 acres surface area)³

Total Number: 2

Total surface area: 13

E. Stockponds (up to 15 acre-feet capacity)

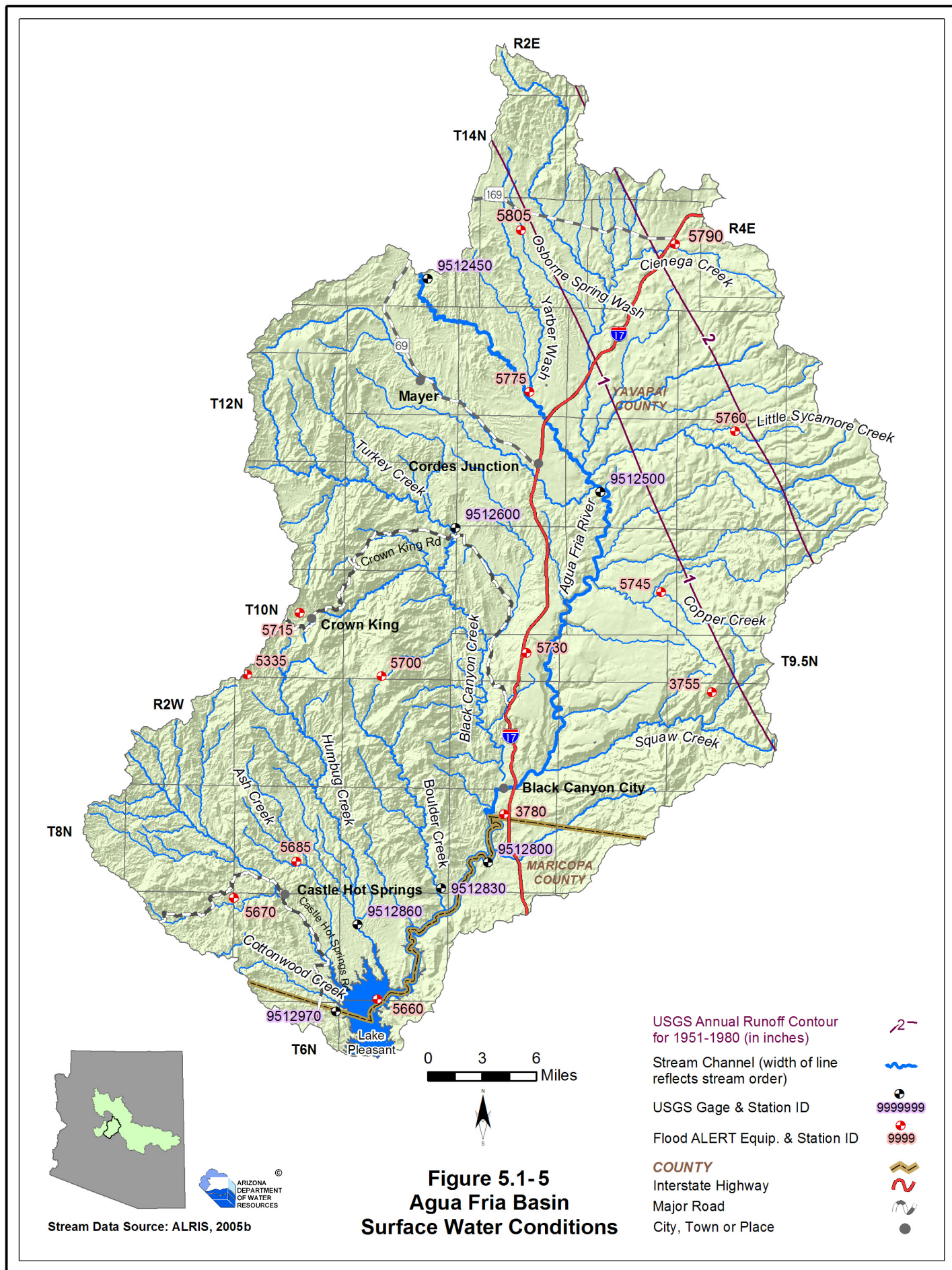
Total number: 527 (from water right filings)

Notes:

¹C=Flood Control; H=hydroelectric; R=recreation; S=water supply

²Dam is on the boundary for the Phoenix AMA but lake storage is in the Agua Fria Basin

³Capacity data is not available to ADWR



5.1.5 Perennial/Intermittent Streams and Major Springs in the Agua Fria Basin

Major and minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 5.1-5. The locations of major springs and perennial and intermittent streams are shown on Figure 5.1-6. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- Perennial streams in this basin include the Agua Fria River, Ash Creek, Sycamore Creek, Indian Creek, Silver Creek, a small reach of Humbug Creek, Yellow Jacket Creek and Grapevine Creek. Most perennial streams are in the northern portion of the basin.
- A number of intermittent streams are located throughout the basin.
- There are five major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time. The largest discharge rate is 340 gpm at Castle spring.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 5.1-5B. There are 14 minor springs identified in this basin.
- Listed discharge rates may not be indicative of current conditions. All of the measurements were taken during or prior to 1993.
- The total number of springs, regardless of discharge, identified by the USGS varies from 294 to 297, depending on the database reference.

Table 5.1-5 Springs in the Agua Fria Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
1	Castle	335908	1122134	340	During or prior to 1982
2	Nelson Place	341913	1114946	96	6/5/1981
3	Bee House	341846	1114945	50	12/13/1980
4	Brown	342302	1120049	40	8/31/1978
5	Willow	342119	1115343	14	10/23/1980

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Coyote	341800	1120248	6	9/16/1993
Larry Canyon ²	340821	1120331	6	Not available
Unnamed	342905	1126121	5	10/20/1978
Sombero Canyon	341753	1115945	5	9/9/1993
Sheep	341800	1120220	3	9/1993
Alkali	335933	1122212	3	6/22/1979
Charlie's	342002	1120230	3	9/28/1993
Government ²	342742	1120146	2	9/5/1978
Silver Creek	341515	1120146	2	8/1993
Badger	341356	1120633	2	4/9/1998
Unnamed	335558	1122126	1	8/9/1979
Unnamed	342857	1121704	1	10/20/1978
Unnamed	335559	1122124	1	8/9/1979
Little	342108	1120524	1	9/1985

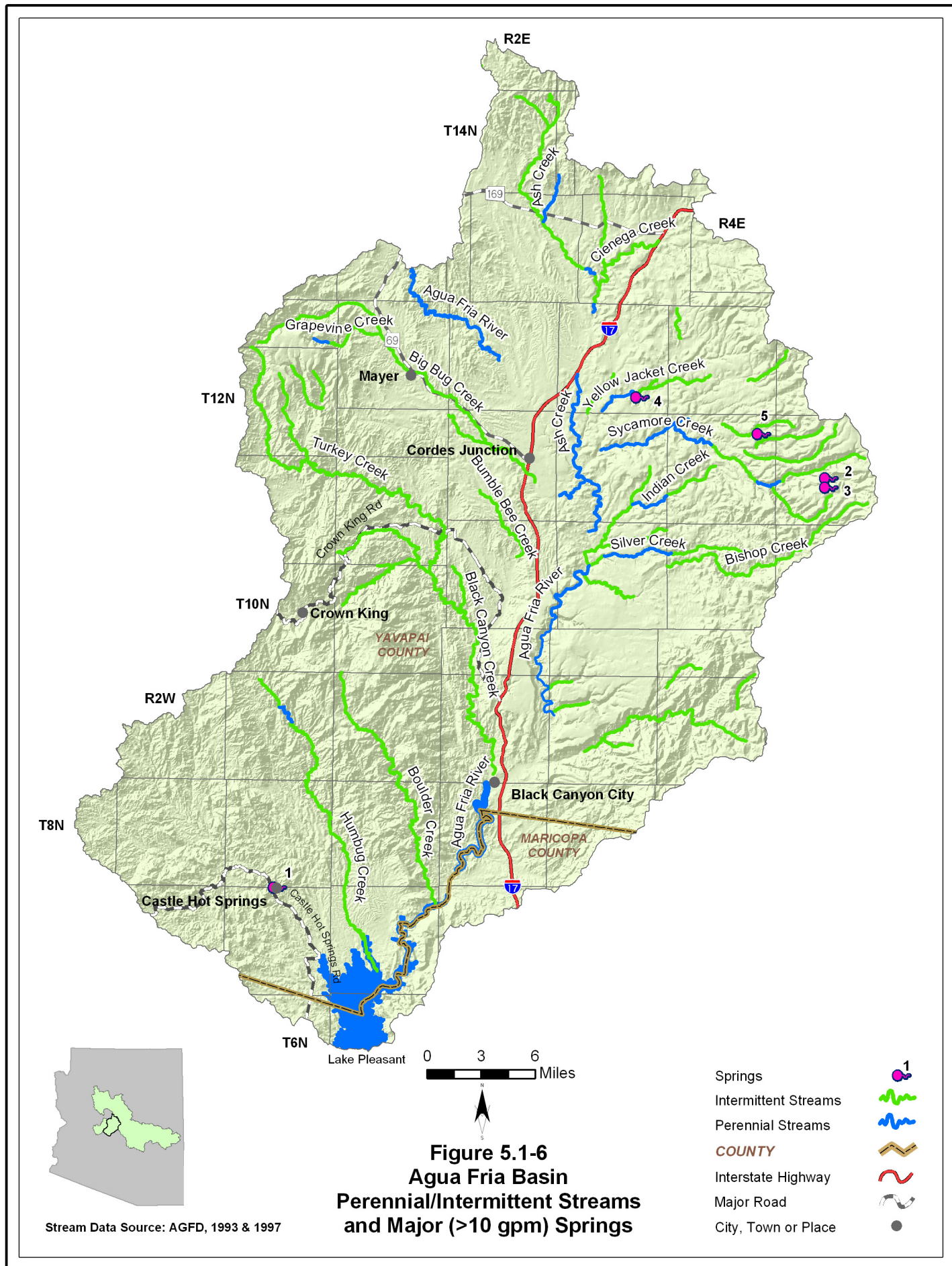
Source: Compilation of databases from ADWR & others

C. Total number of springs, regardless of discharge, identified by USGS (see ALRIS, 2005a and USGS, 2006a): 294 to 297

Notes:

¹Most recent measurement identified by ADWR

²Spring is not displayed on current USGS topo maps



5.1.6 Groundwater Conditions of the Agua Fria Basin

Major aquifers, well yields, estimated natural recharge, estimated water in storage, number of index wells and date of last water-level sweep are shown in Table 5.1-6. Figure 5.1-7 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 5.1-8 contains hydrographs for selected wells shown on Figure 5.1-7. Figure 5.1-9 shows well yields in four yield categories. A description of aquifer data sources and methods as well as well data sources and methods, including water-level changes and well yields are found in Volume 1, Appendix A.

Major Aquifers

- Refer to Table 5.1-6 and Figure 5.1-7.
- Major aquifers in the basin include basin fill and sedimentary rock (conglomerate).
- Flow direction in the northern portion of the basin is generally from the north to the south from the basin boundaries toward the center of the basin.

Well Yields

- Refer to Table 5.1-6 and Figure 5.1-9.
- As shown on Figure 5.1-9 well yields in this basin range from less than 100 gpm to 2,000 gpm at several locations.
- One source of well yield information, based on 49 reported wells, indicates that the median well yield in this basin is 300 gpm.
- Well yields vary throughout the basin, with a cluster of less than 100 gpm yields in the vicinity of Mayer.

Natural Recharge

- Refer to Table 5.1-6.
- The estimate of natural recharge for this basin is 9,000 acre-feet per year (AFA).

Water in Storage

- Refer to Table 5.1-6.
- Storage estimates for this basin range from 620,000 acre-feet to a depth of 1,200 feet to 3.5 million acre-feet to an unknown depth.

Water Level

- Refer to Figure 5.1-7. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures seven index wells in this basin. Hydrographs for five of these wells are shown in Figure 5.1-8.
- There is one ADWR automated groundwater level monitoring device in this basin as of May 2009.
- The deepest recorded water level in 2003-04 is 462 feet near Interstate 17 north of Black Canyon City and the shallowest is 21 feet east of Mayer.

Table 5.1-6 Groundwater Data for the Agua Fria Basin

Basin Area, in square miles:	1,263	
Major Aquifer(s):	Name and/or Geologic Units	
	Basin Fill	
	Sedimentary Rock (Conglomerate)	
Well Yields, in gal/min:	Range 210-625 (2 wells measured)	Measured by ADWR (GWSI) and/or USGS
	Range 5-1,500 Median 300 (49 wells reported)	Reported on registration forms for large (>10-inch) diameter wells (Wells55)
	Range 30-300	ADWR (1990)
	Range 0-500	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	9,000	Freethy and Anderson (1986)
Estimated Water in Currently in Storage, in acre-feet:	620,000 (to 1,200 ft) - 3,500,000 (depth N/A)	ADWR (1990 and 1994b)
	3,000,000 ¹ (to 1,200 ft)	Freethy and Anderson (1986)
Current Number of Index Wells:	7	
Date of Last Water-level Sweep:	2008 (207 wells measured)	

¹ Predevelopment Estimate
N/A not available

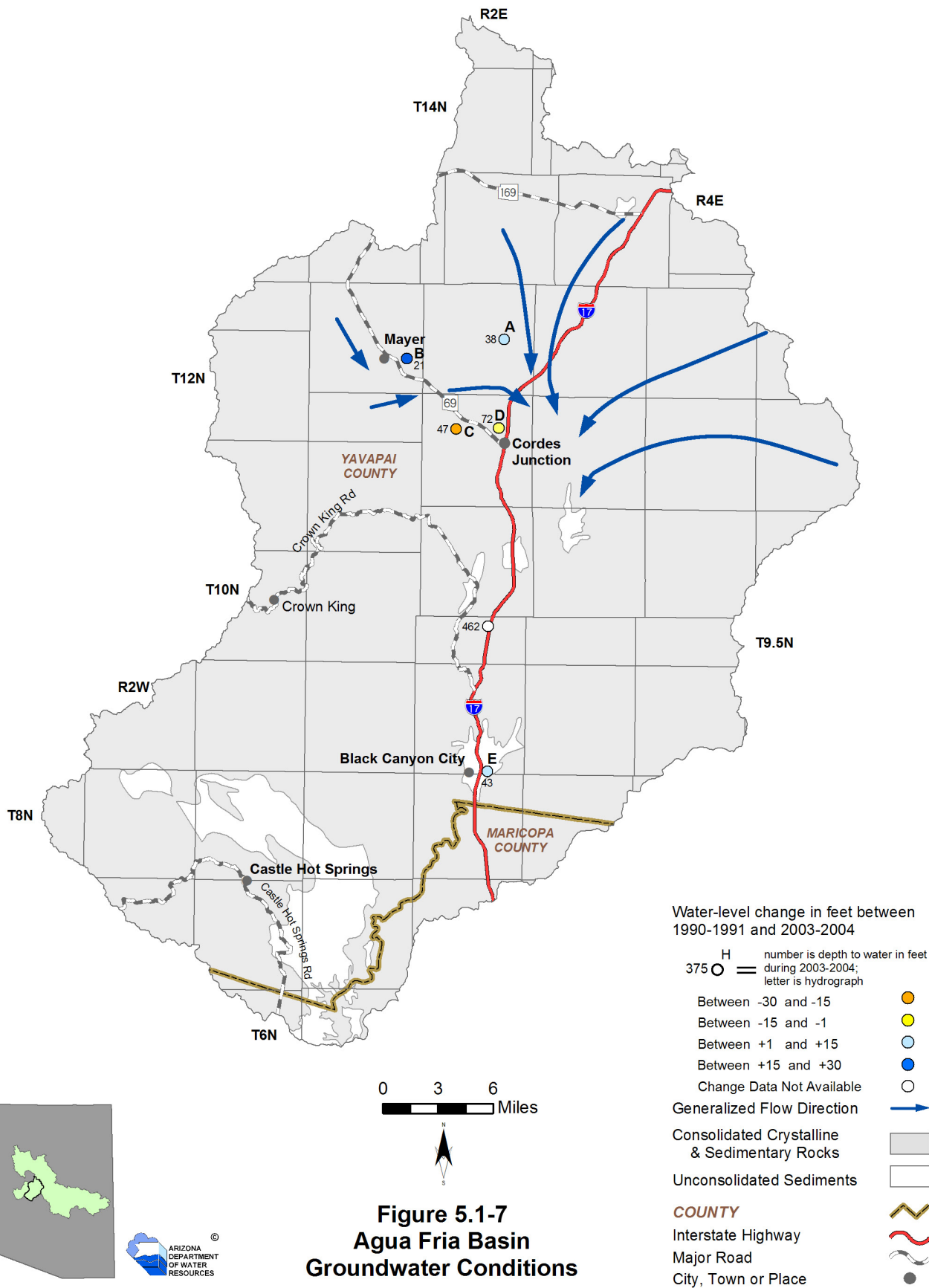
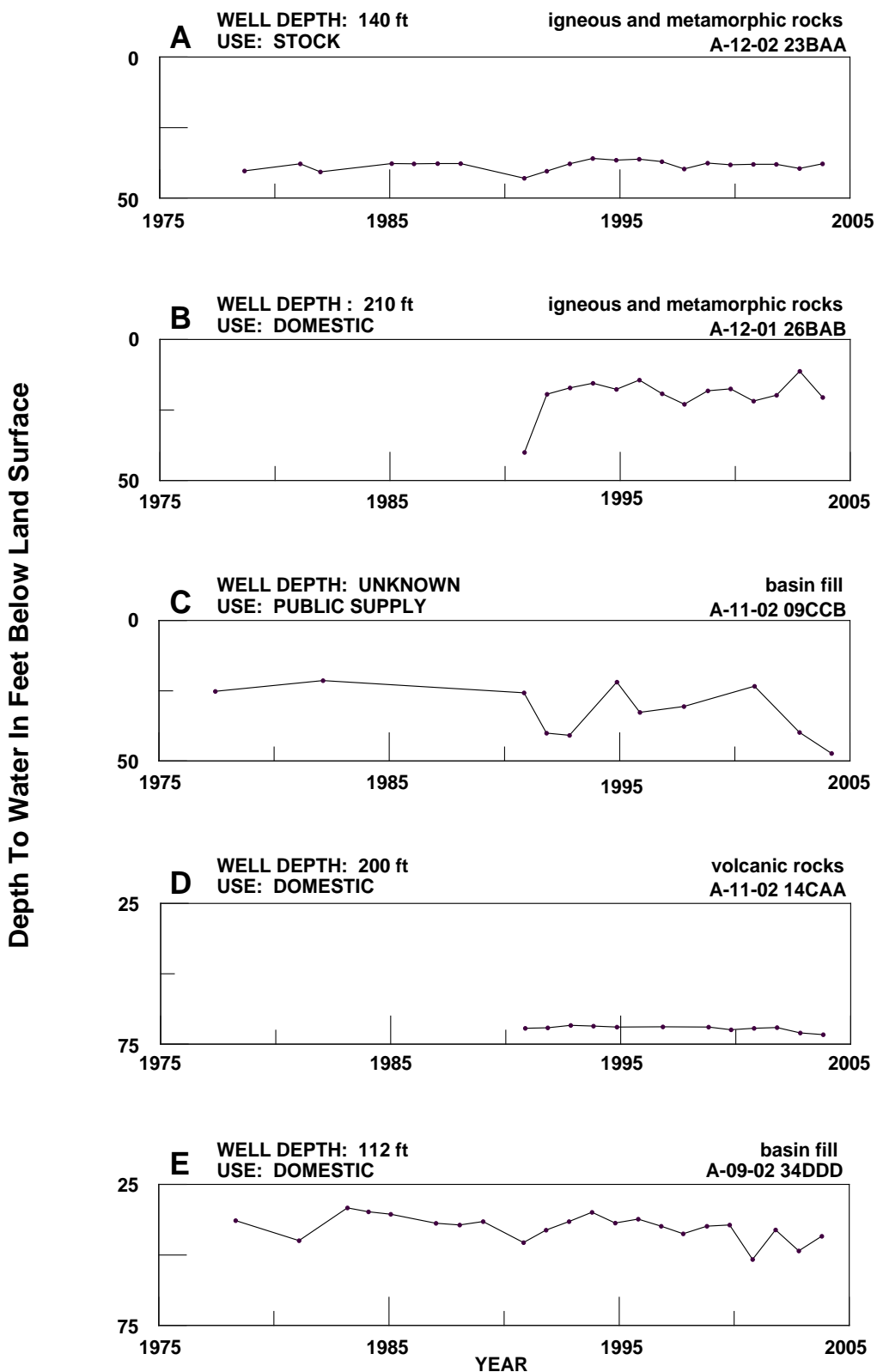
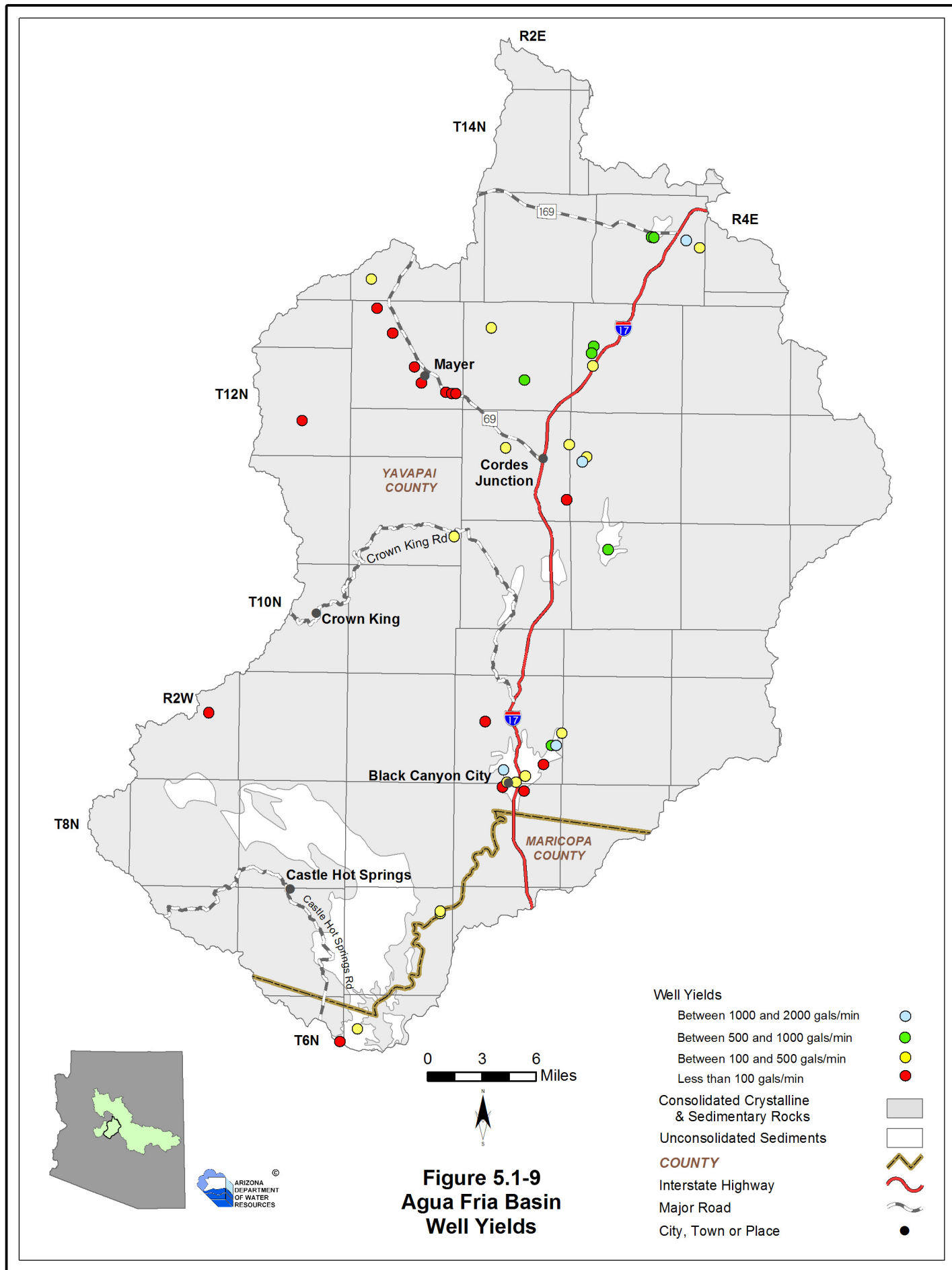


Figure 5.1-8
Agua Fria Basin
Hydrographs Showing Depth to Water in Selected Wells





5.1.7 Water Quality of the Agua Fria Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 5.1-7A. Impaired lakes and streams with site type, name, length of impaired reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 5.1-7B. Figure 5.1-10 shows the location of water quality occurrences keyed to Table 5.1.7. A description of water quality data sources and methods is found in Volume 1, Appendix A. Not all parameters were measured at all sites; selective sampling for particular constituents is common.

Well, Mine or Spring sites that have equaled or exceeded drinking water standards (DWS)

- Refer to Table 5.1-7A.
- Forty-nine well and spring sites have parameter concentrations that have equaled or exceeded drinking water standards
- The drinking water standard most frequently equaled or exceeded in the sites measured was arsenic. Other standards equaled or exceeded include cadmium, fluoride and radionuclides.

Lakes and Streams with impaired waters

- Refer to Table 5.1-7B.
- Water quality standards for cadmium, copper, lead and zinc were equaled or exceeded in a 21 mile reach of Turkey Creek from an unnamed tributary to Poland Creek.
- Turkey Creek is part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) program. The TMDL report has been completed and the United States Forest Service has completed remediation of the Golden Belt and Golden Turkey mines, which caused the contamination.

Table 5.1-7 Water Quality Exceedences in the Agua Fria Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section	
1	Spring	14 North	2 East	23	As
2	Spring	14 North	2 East	32	As
3	Spring	13 North	1 East	28	As
4	Well	13 North	2 East	12	As
5	Well	13 North	2 East	14	As
6	Spring	13 North	2 East	24	As
7	Well	13 North	2 East	33	As
8	Well	13 North	3 East	9	As
9	Well	13 North	3 East	14	As
10	Well	12 North	1 East	9	As
11	Well	12 North	1 East	26	As
12	Well	12 North	1 East	29	As
13	Well	12 North	1 East	36	As
14	Spring	12 North	2 East	17	As
15	Spring	12 North	3 East	35	As
16	Well	11 North	2 East	31	As
17	Well	9.5 North	2 East	26	As
18	Well	9.5 North	2 East	21	As
19	Well	9 North	2 East	27	F
20	Well	9 North	2 East	27	F
21	Well	9 North	2 East	27	As
22	Well	9 North	2 East	28	F
23	Well	9 North	2 East	28	F
24	Well	9 North	2 East	28	F
25	Well	9 North	2 East	28	As, F
26	Well	9 North	2 East	33	As
27	Well	9 North	2 East	34	As
28	Well	9 North	2 East	35	As
29	Well	9 North	2 East	35	As
30	Well	9 North	2 East	35	As
31	Well	9 North	2 East	35	As
32	Well	8 North	2 East	2	Rad
33	Well	8 North	2 East	4	As
34	Well	10 North	1 West	14	As
35	Well	10 North	1 West	15	Cd
36	Well	10 North	1 West	15	Cd
37	Well	10 North	1 West	15	Cd
38	Well	9 North	2 West	25	As
39	Well	8 North	1 West	4	As
40	Spring	8 North	1 West	14	As
41	Spring	8 North	1 West	25	As
42	Spring	8 North	1 West	33	As, F
43	Spring	8 North	1 West	33	F
44	Well	8 North	1 West	33	As, F
45	Spring	8 North	2 West	27	As
46	Well	8 North	3 West	13	As, Rad
47	Well	7 North	1 West	4	F
48	Spring	7 North	1 West	22	F
49	Spring	7 North	1 West	22	F

Source: Compilation of databases from ADWR & others

Table 5.1-7 Water Quality Exceedences in the Agua Fria Basin (Cont)¹

B. Lakes and Streams

Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard ³	Parameter(s) Exceeding Use Standard ²
a	Stream	Turkey Creek - unnamed tributary to Poland Creek	21	NA	A&W	Cd, Cu, Pb, Zn

Source: ADEQ 2005d

Notes:

¹ Water quality samples collected between 1978 and 2003.

²As = Arsenic

Cd = Cadmium

Cu = Copper

F= Fluoride

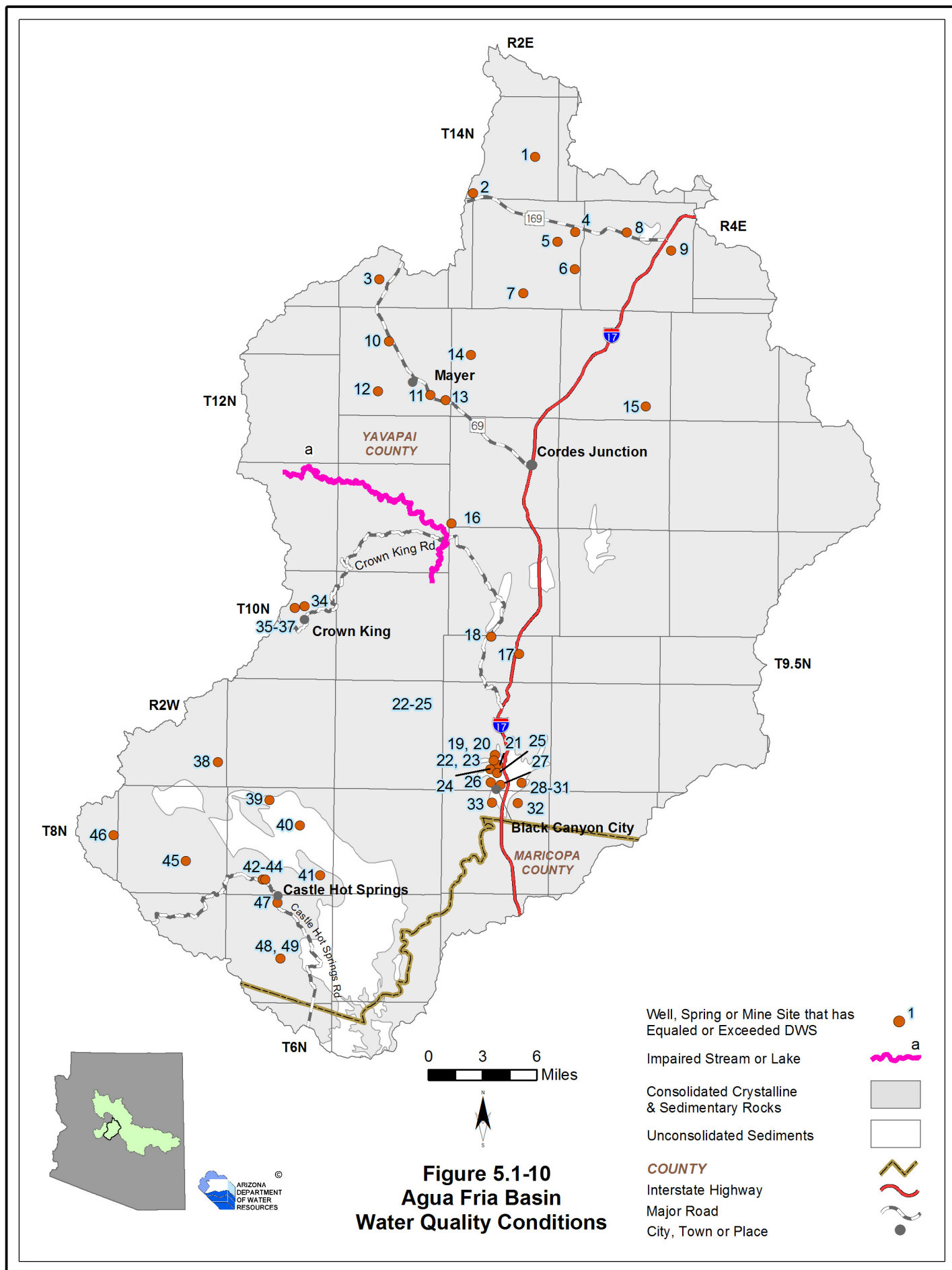
Pb = Lead

Rad = One or more of the following radionuclides - Gross Alpha, Gross Beta, Radium, and Uranium

Zn = Zinc

³A&W = Aquatic and Wildlife

NA = Not applicable



5.1.8 Cultural Water Demand in the Agua Fria Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 5.1-8. Effluent generation including facility ownership, location, population served and not served, volume treated, disposal method and treatment level is shown in Table 5.1-9. Figure 5.1-11 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Appendix A. More detailed information on cultural water demand is found in Section 5.0.7.

Cultural Water Demand

- Refer to Table 5.1-8 and Figure 5.1-11.
- Population in this basin increased from 2,839 people in 1980 to 8,210 in 2000.
- There are no reported surface water diversions in this basin. Groundwater use has increased since 1971, with an average of 2,000 AFA from 1971-1975 and an average of 3,300 AFA during 2001-2005. The highest average annual groundwater use, 5,000 AFA, occurred during 1981-1985.
- Municipal groundwater demand increased from an average of 1,100 AFA in 1991-1995 to an average of 1,800 AFA in 2001-2005.
- Agricultural demand has increased slightly from an average of 1,300 AFA in 1991-1995 to an average of 1,500 AFA in 2001-2005.
- Most municipal demand is found in the vicinity of Black Canyon City, Cordes Junction and Mayer.
- There are numerous small agricultural demand areas north and east of Cordes Junction.
- The basin contains two small mines or quarries; one northwest of Mayer and the other northeast of Castle Hot Springs. Water demands are unknown for these quarries.
- As of 2005 there were 1,776 registered wells with a pumping capacity of less than or equal to 35 gpm and 310 wells with a pumping capacity of more than 35 gpm.

Effluent Generation

- Refer to Table 5.1-9.
- There are four identified wastewater treatment facilities in this basin.
- Information on population served, effluent generation and disposal was available for two facilities. These facilities serve over 300 people and generate 27 acre-feet of effluent per year.

Table 5.1-8. Cultural Water Demand in the Agua Fria Basin¹

Year	Estimated and Projected Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						Data Source
				Well Pumpage			Surface-Water Diversions			
				Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Agricultural	Municipal	
1971										
1972										
1973						2,000			NR	
1974										
1975										
1976		718 ²	143 ²							
1977										
1978						3,000			NR	
1979										
1980	2,839									
1981	3,086									
1982	3,334									
1983	3,581	183	52			5,000			NR	
1984	3,829									
1985	4,076									
1986	4,323									
1987	4,571									
1988	4,818	140	38			4,000			NR	
1989	5,066									
1990	5,313									
1991	5,603									
1992	5,892									
1993	6,182	142	30	1,100	NR	1,300			NR	
1994	6,472									
1995	6,762									
1996	7,051									
1997	7,341									
1998	7,631	256	20	1,500	NR	1,300			NR	
1999	7,920									
2000	8,210									
2001	8,646									
2002	9,082									
2003	9,517	337	27	1,800	NR	1,500			NR	
2004	9,953									
2005	10,389									
2010	12,568									
2020	16,104									
2030	19,135									
TOTAL WELLS:		1,776	310							

Notes:

NR - Not reported

¹ Does not include evaporation losses from stockponds and reservoirs.

² Includes all wells through 1980.

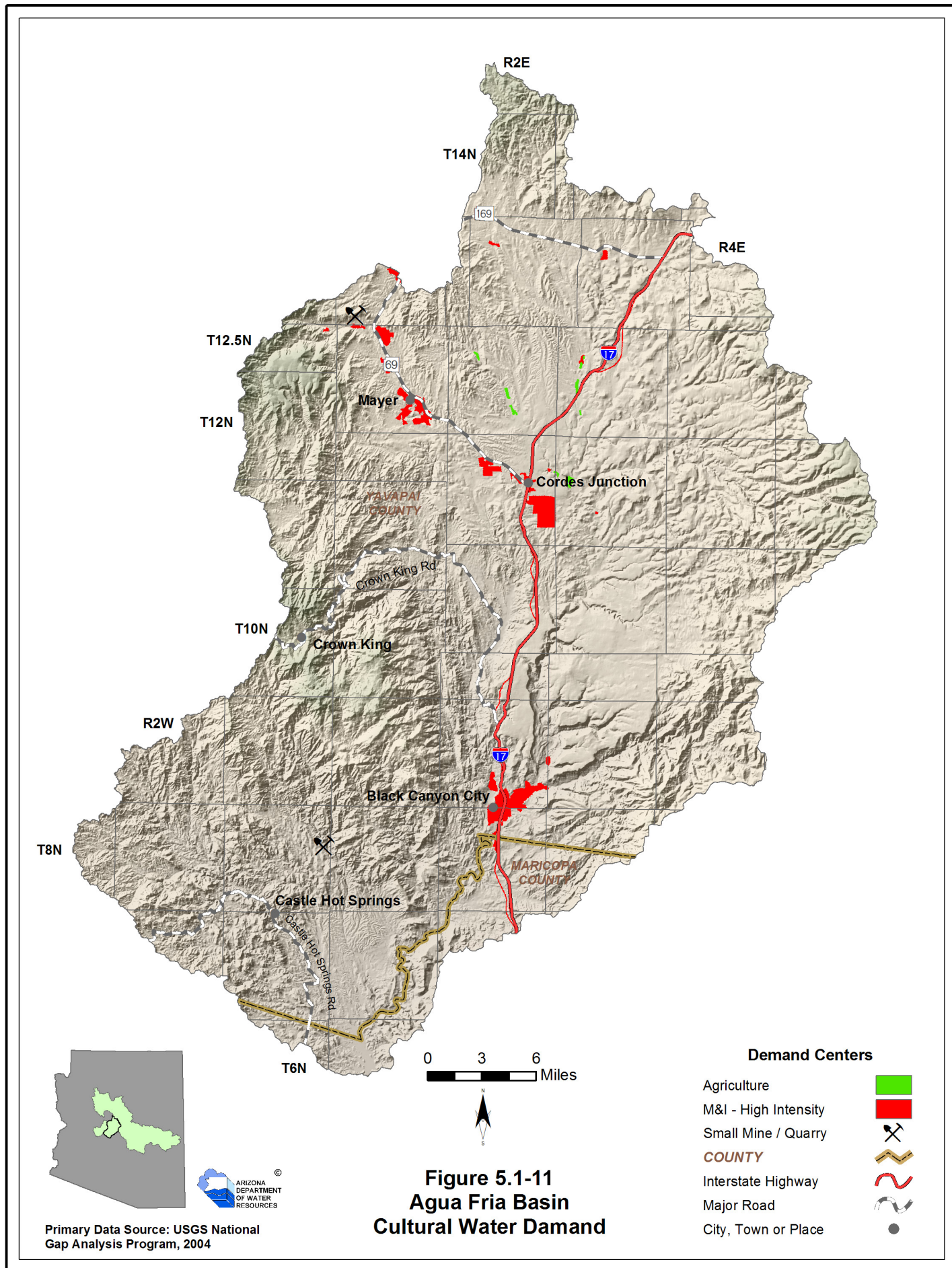
Table 5.1-9 Effluent Generation in the Agua Fria Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet/year)	Disposal Method						Current Treatment Level	Population Not Served	Year of Record
					Water-course	Evaporation Pond	Irrigation	Wildlife Area	Golf Course/Turf/Landscape	Discharge to Another Facility			
Arcosanti WWTF	Private	Arcosanti	273	22					NA			610	2001
Bensch Ranch	Private	Mayer	19	2	X							NA	2007
Crown King Work Center	Prescott NF	Site Facilities							NA				
Kings Ranch Unit II	Private	Black Canyon City	30	3	Agua Fria							NA	2006
Totals			322	27									

Sources: Compilation of databases from ADWR & others

Notes:

- Year of Record is for the volume of effluent treated/generated
- NA: Data not currently available to ADWR
- WWTF: Wastewater Treatment Facility



5.1.9 Water Adequacy Determinations in the Agua Fria Basin

Water adequacy determination information including the subdivision name, location, number of lots, adequacy determination, reason for the inadequacy determination, date of determination and subdivision water provider are shown in Table 5.1-10A and B for analysis of adequate water supply. Figure 5.1-12 shows the locations of subdivisions keyed to the Table. A description of the Water Adequacy Program is found in Volume 1, Appendix C. Adequacy determination data sources and methods are found in Volume 1, Appendix A.

- All subdivisions receiving an adequacy determination are in Yavapai County. Fifteen water adequacy determinations have been made in this basin through December 2008. Of the 1,177 lots in fourteen subdivisions for which lot information is available, 973 lots in nine subdivisions, or 83% of lots, were determined to be adequate.
- All inadequacy determinations were because the applicant chose not to submit the necessary information, and/or the available hydrologic data was insufficient to make a determination. One inadequate determination also stated the existing supply was unreliable or physically unavailable or groundwater exceeds the depth-to-water criteria.
- One Analysis of Adequate Water Supply application for 50 lots has been approved for this basin.

Table 5.1-10. Adequacy Determinations in the Agua Fria Basin¹

A. Water Adequacy Reports

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section						
1	Bensch Ranch Estates	Yavapai	11 North	2 East	6	411	Adequate		2/26/2001	Bradshaw Mountain View Water Company	
2	Black Canyon Estates	Yavapai	8 North	2 East	3, 4	142	Adequate		1/26/1976	Trail's End Water Service	
3	Black Canyon Estates #2	Yavapai	8 North	2 East	3, 4, 9	142	Adequate		8/20/1984	Trail's End Water Service	
4	Bradshaw Overlook	Yavapai	11 North	2 East	5, 8	23	Adequate		1/22/1990	Bradshaw Mountain View Water Company	
5	Cordes Lakes	Yavapai	11 North	2 East	23, 24, 25, 26	101	Inadequate	A1	5/16/1986	Cordes Lakes Water Company	
6	Cordes Lakes #8	Yavapai	11 North	2 East	24	7	Inadequate	A1	6/19/1986	Cordes Lakes Water Company	
8	Kings Ranch Units	Yavapai	8 North	2 East	4, 9	NA	Adequate		1/26/1976	Trail's End Water Service	
9	Mayer Estates	Yavapai	12 North	1 East	27	163	Adequate		1/7/1976	Mayer Water Company	
10	Oak Hills	Yavapai	12 North	1 East	35	18	Adequate		7/14/1994	Mayer Domestic Water Imp District	
11	Quail Hollow #1	Yavapai	12 North	1 East	22	50	Adequate		4/19/1990	Mayer Water Company	
12	Rancho Vista Estates LLC	Yavapai	12 North	1 East	3, 4	58	Inadequate	A1, A2	2/22/1995	Dry Lot Subdivision	
13	Spring Valley #3	Yavapai	11 North	2 East	8	18	Inadequate	A1	2/20/1981	Bradshaw Mountain View Water Company	
14	Spring Valley #4	Yavapai	11 North	2 East	8	5	Inadequate	A1	9/16/1985	Bradshaw Mountain View Water Company	
15	Sunrise Estates	Yavapai	12 North	1 East	2	15	Inadequate	A1	2/17/2000	Mayer Domestic Water Improvement District	
16	Westridge	Yavapai	8 North	2 East	4	24	Adequate		9/17/1987	Black Canyon City Water Association	

B. Analysis of Adequate Water Supply

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section				
7	Hidden Valley Ranch	Yavapai	12 North	1 East	1, 2	50	43-401625	1/3/2006	NA

Source: ADWR 2008a

Notes:

¹Each determination of the adequacy of water supplies available to a subdivision is based on the information available to ADWR and the standards of review and policies in effect at the time the determination was made. In some cases, ADWR might make a different determination if a similar application were submitted today, based on the hydrologic data and other information currently available, as well as current rules and policies.

² Prior to February 1995, ADWR did not assign file numbers to applications for adequacy. Between 1995-2006 all applications for adequacy were given a file number with a 22 prefix. In 2006 a 53 prefix was assigned to all water adequacy reports and applications regardless of their issue date.

³ A. Physical/Continuous

1) Insufficient Data (applicant chose not to submit necessary information, and/or available hydrologic data insufficient to make determination)

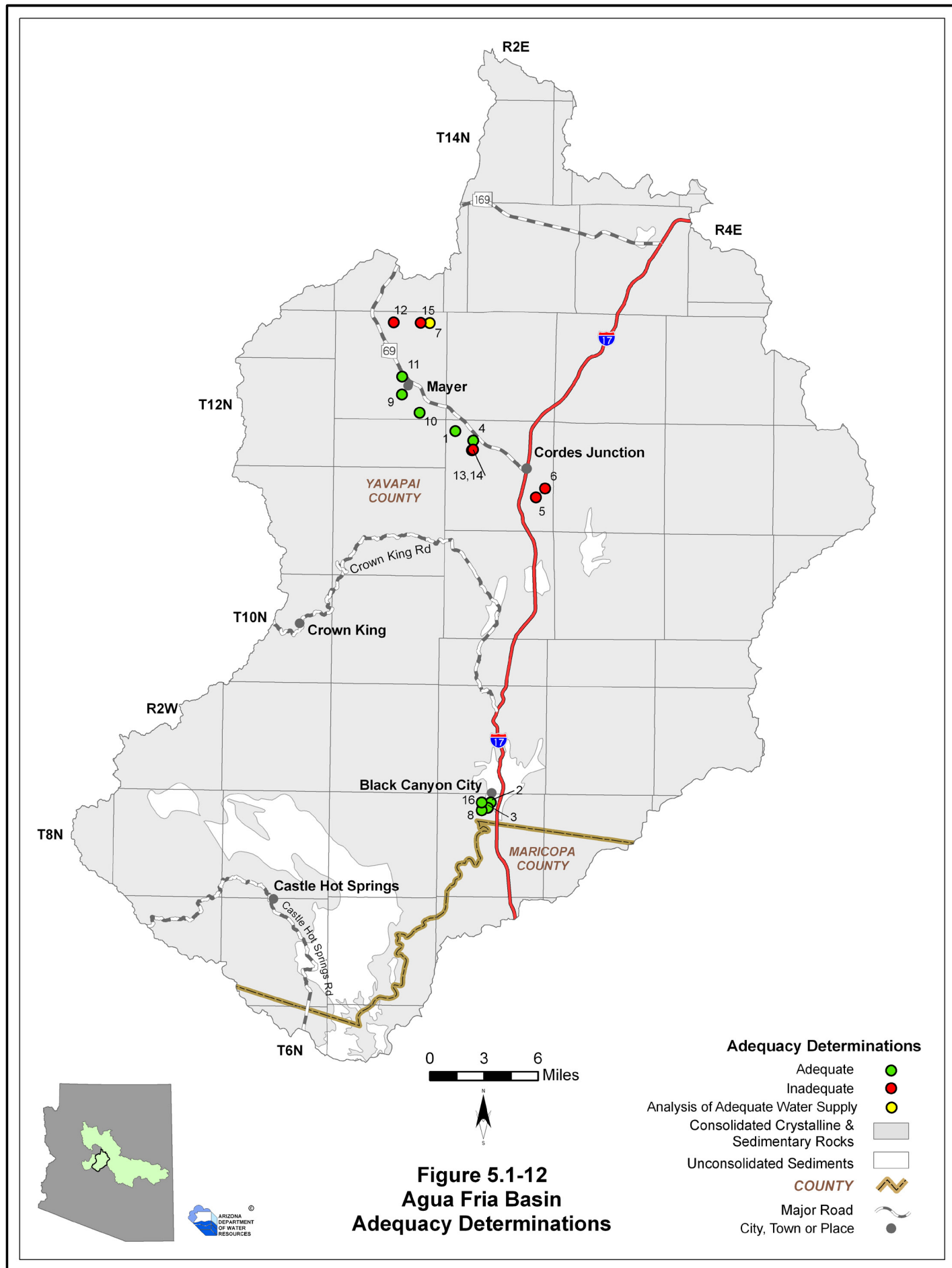
2) Insufficient Supply (existing water supply unreliable or physically unavailable; for groundwater, depth-to-water exceeds criteria)

3) Legal (applicant failed to demonstrate a legal right to use the water or failed to demonstrate the provider's legal authority to serve the subdivision)

B. Water Quality

C. Unable to locate records

D. Information not available to ADWR



Agua Fria Basin

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Section 5.2

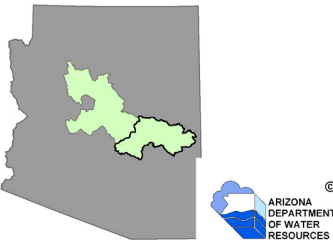
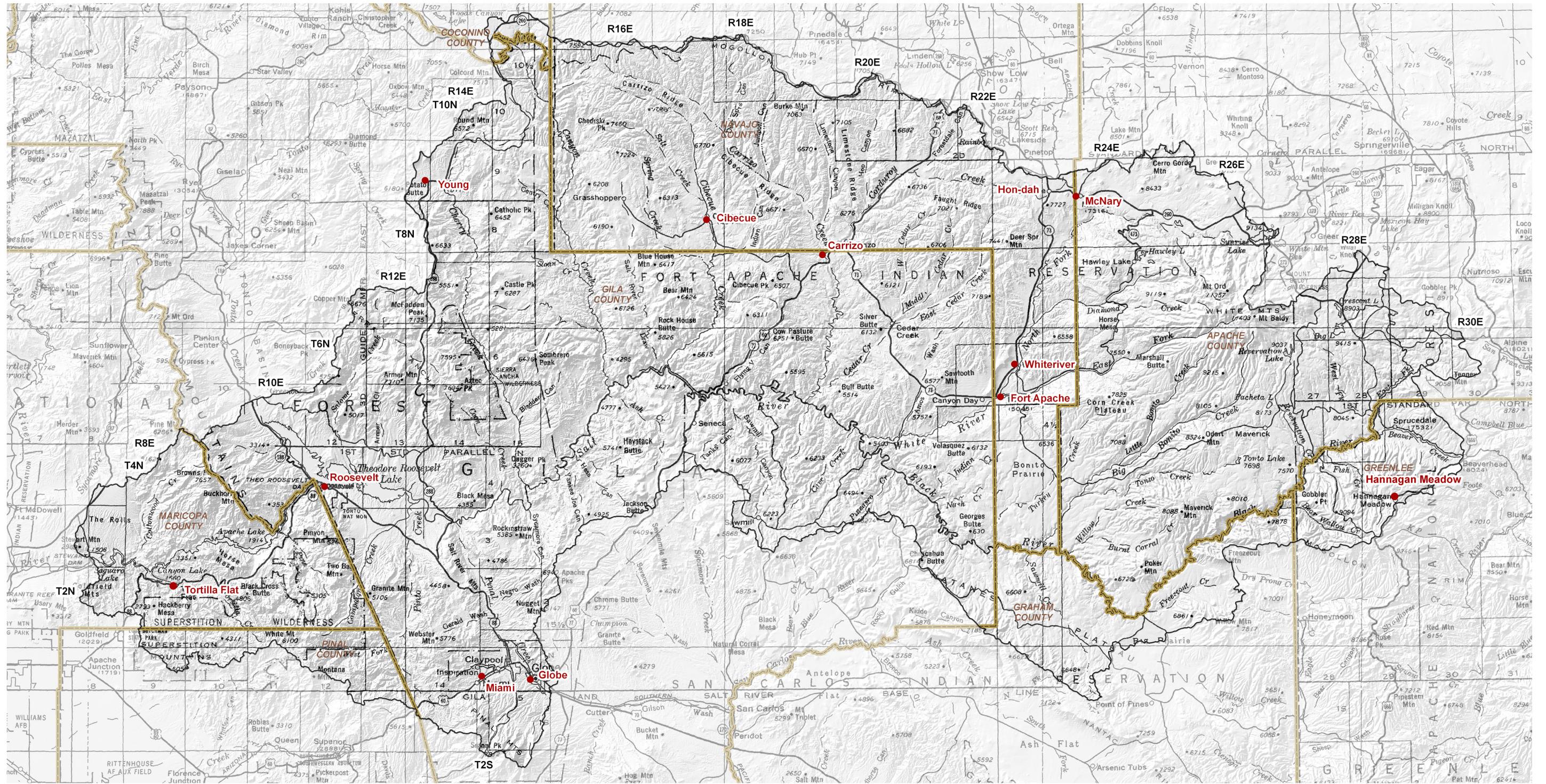
Salt River Basin



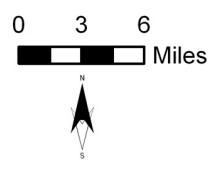
5.2.1 Geography of the Salt River Basin

The Salt River Basin occupies the eastern part of the planning area and is the second largest basin at 5,232 square miles. Geographic features and principal communities are shown on Figure 5.2-1. The basin is characterized by mid- to high-elevation mountain ranges, plateaus and canyons. Vegetation types include: Arizona upland Sonoran desertscrub; semi-desert, plains and Great Basin and subalpine grasslands; interior chaparral; madrean evergreen woodland; Great Basin conifer woodland; and montane and Rocky Mountain subalpine conifer forests. (see Figure 5.0-10) Riparian vegetation includes mesquite, mixed broadleaf and tamarisk along the Salt River and mixed broadleaf along the Black River.

- Principal geographic features shown on Figure 5.2-1 are:
 - Salt River running east to west through the southern part of the basin from the confluence of the White and Black Rivers
 - White River and its tributaries in the northeastern portion of the basin
 - Black River running from the eastern basin boundary to the Salt River, which also demarcates part of Graham, Apache, Navajo and Greenlee county boundaries
 - Other major tributaries to the Salt River including Cherry Creek, Canyon Creek, Cibecue Creek, Carrizo Creek and Cedar Creek
 - Theodore Roosevelt Lake in the western portion of the basin and Apache Lake, Canyon Lake and Saguaro Lake in the vicinity of Tortilla Flat
 - Hawley Lake, Sunrise Lake, Crescent Lake and Big Lake in the high-elevation northeastern portion of the basin
 - Salt River Canyon (not labeled on map) along the Salt River and numerous side canyons such as Sycamore Canyon and Sawmill Canyon
 - Superstition and Pinal Mountains and Natanes Plateau along the southern basin boundary
 - Mogollon Rim along the northern basin boundary
 - Bonito Prairie between the White and Black Rivers south of Fort Apache
 - Four Peaks along the Maricopa and Gila County line in the Mazatzal Mountains and the Sierra Ancha Mountains south of Young
 - White Mountains in Apache County which contain the highest peak in the basin Mt. Baldy at 11,403 feet
 - The lowest point at 1,200 feet where the Salt River exits the basin



Base Map: USGS 1:500,000, 1981



COUNTY
City, Town or Place

Figure 5.2-1
Salt River Basin
Geographic Features

5.2.2 Land Ownership in the Salt River Basin

Land ownership, including the percentage of ownership by category, for the Salt River Basin is shown in Figure 5.2-2. Principal features of land ownership in this basin are the large contiguous parcels of forest service and tribal lands. A description of land ownership data sources and methods is found in Volume 1, Appendix A. More detailed information on protected areas is found in Section 5.0.4. Land ownership categories are discussed below in the order from largest to smallest percentage in the basin.

Indian Reservation

- 59.4% of the land is under tribal ownership.
- The basin includes two reservations, the Fort Apache Reservation in the north-central portion north of the Black River and the San Carlos Apache Reservation in the south-central portion of the basin.
- All tribal lands are contiguous.
- This basin contains the largest percentage of tribal lands in the planning area.
- Land uses include domestic, commercial, recreation, timber and ranching.

National Forest

- 38.6% of the land is federally owned and managed by the United States Forest Service (USFS).
- Forest lands in the basin are part of the Tonto and Apache-Sitgreaves National Forests.
- The basin contains approximately 236,000 acres in five wilderness areas, four in the Tonto National Forest and one in the Apache-Sitgreaves National Forest. Wilderness areas in the Tonto include the 18,515-acre Salome Wilderness, 21,007-acre Sierra Ancha Wilderness, a significant portion of the 160,135-acre Superstition Wilderness and the 32,088-acre Salt River Wilderness. A portion of the 11,336-acre Bear Wallow Wilderness in the Alpine Ranger District of the Apache-Sitgreaves National Forest is also located in the basin. (see Figure 5.0-13)
- There are numerous small private in-holdings in both forests.
- Land uses include recreation, grazing and timber production.

Private

- 1.5% of the land is private.
- The majority of the private land in the basin is in the vicinity of Miami/Globe and around Young. There are also numerous small private land in-holdings in the Tonto and Apache-Sitgreaves National Forests.
- Land uses include domestic, commercial, mining and ranching.

U.S. Bureau of Land Management (BLM)

- 0.2% of the land is federally owned and managed by the Safford Field Office Bureau of Land Management.
- All BLM lands are in the vicinity of Miami and Globe.
- Primary land uses are mining and grazing.

State Trust Land

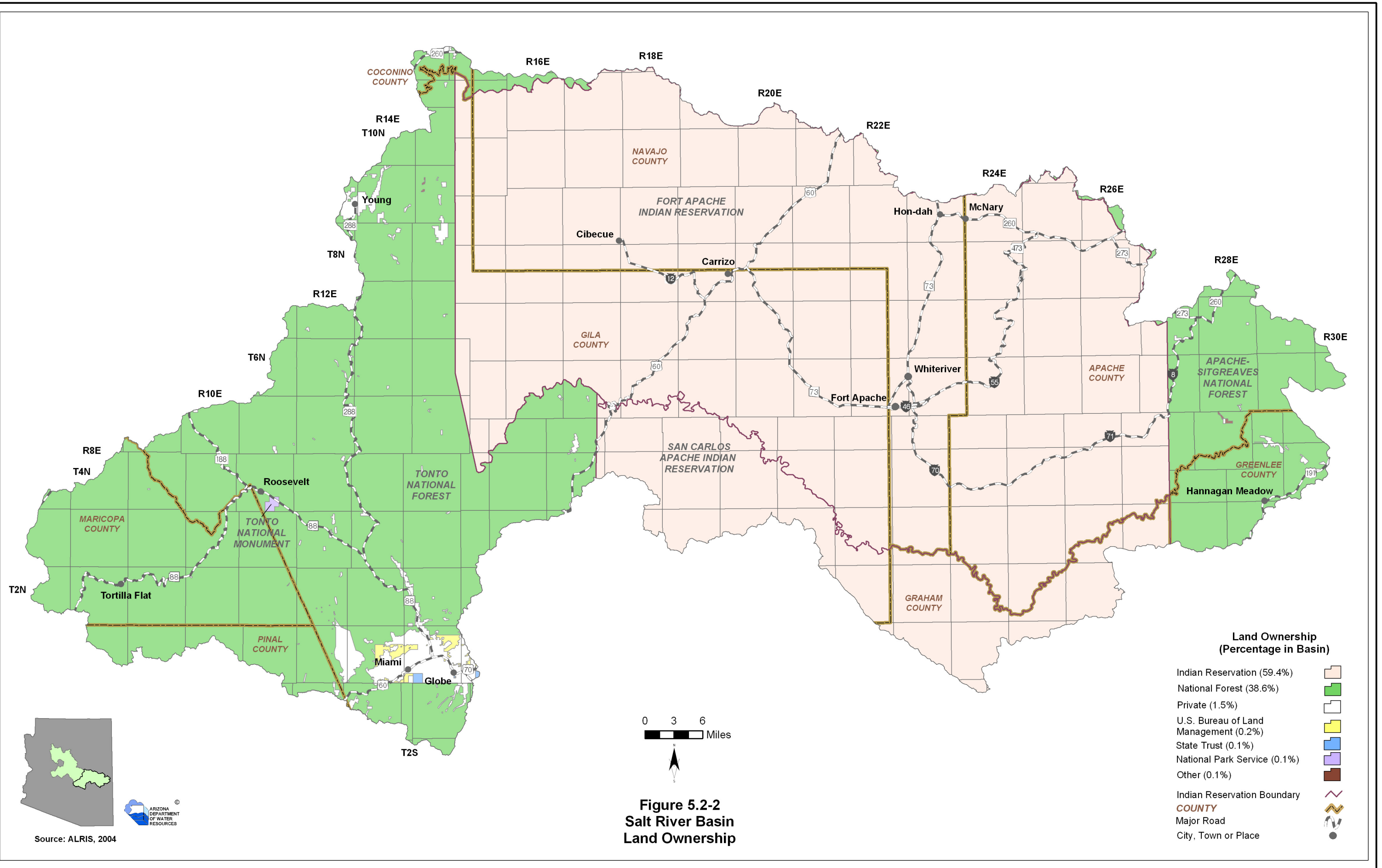
- 0.1% of the land in this basin is held in trust for the public schools under the State Trust Land system.
- All state land is in the vicinity of Miami and Globe.
- Primary land use is grazing.

National Park Service (NPS)

- 0.1% of the land is federally owned and managed by the National Park Service as the Tonto National Monument, located in the southwestern portion of the basin near Roosevelt.
- Primary land use is cultural preservation and recreation.

Other (Game and Fish, County and Bureau of Reclamation Lands)

- 0.1% of the land is owned and managed by the Arizona Game and Fish Department.
- All “other” land is located north of the Greenlee and Apache County line.
- Primary land use is unknown.



5.2.3 Climate of the Salt River Basin

Climate data from NOAA/NWS Co-op Network, Evaporation Pan and SNOTEL/Snowcourse stations are compiled in Table 5.2-1 and the locations are shown on Figure 5.2-3. Figure 5.2-3 also shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Salt River Basin does not contain AZMET stations. More detailed information on climate in the planning area is found in Section 5.0.3. A description of the climate data sources and methods is found in Volume 1, Appendix A.

NOAA/NWS Co-op Network

- Refer to Table 5.2-1A
- There are 13 NOAA/NWS Co-op network climate stations in the basin. The average monthly maximum temperature occurs in July and ranges between 90.3°F at Mormon Flat and 59.2°F at Hawley Lake. The average monthly minimum temperature occurs in January or December and ranges between 24.3°F at Hawley Lake and 52.6°F at Mormon Flat.
- Highest average seasonal rainfall occurs in the summer (June-September) at most stations. For the period of record used, the highest annual rainfall is 39.62 inches at Hawley Lake and the lowest is 13.78 inches at Globe.

Evaporation Pan

- Refer to Table 5.2-1B
- There are three evaporation pan sites in this basin. Elevation at the stations range from 2,200 feet to 8,180 feet and the corresponding annual average evaporation ranges from 96.71 inches to 33.17 inches.

SNOTEL/Snowcourse

- Refer to Table 5.2-1D
- There are 11 snow measurement sites in the basin. Five stations have been discontinued.
- The site elevation ranges from 6,900 feet at Workman Creek and Workman Creek SNOTEL to 9,200 feet at Maverick Fork SNOTEL.
- Seven sites record highest snowpack in March, three in February and one site, Workman Creek, has equally high snowpack in February and March.
- Highest average snowpack is 11.3 inches at Hannagan Meadows SNOTEL.

SCAS Precipitation Data

- See Figure 5.2-3
- Additional precipitation data shows rainfall as high as 36 inches in several places in the basin and as low as 10 inches west of Tortilla Flat.

Table 5.2-1 Climate Data for the Salt River Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Total Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
Black River Pumps	6,040	1971-2000	71.8/Jul	35.1/Jan	4.97	2.00	8.27	4.57	19.81
Cibecue	5,050	1927-1979 ¹	73.7/Jul	37.1/Jan	5.57	2.00	5.34	6.08	18.98
Globe	3,550	1894-1975 ¹	82.7/Jul	43.6/Jan	2.86	1.17	4.78	4.97	13.78
Globe 2	3,650	1971-2000	81.4/Jul	43.4/Dec	5.28	1.17	6.03	4.52	17.00
Hawley Lake	8,180	1967-1988 ¹	59.2/Jul	24.3/Jan	12.49	4.96	12.95	9.22	39.62
Maverick	7,810	1948-1967	60.1/Jul	26.2/Jan	7.07	2.56	12.02	6.21	27.86
Miami	3,560	1971-2000	83.4/Jul	45.5/Jan	6.38	1.36	6.45	5.30	19.49
Mormon Flat	1,710	1971-2000	90.3/Jul	52.6/Dec	5.15	1.02	4.39	4.01	14.57
Pleasant Valley R.S.	5,050	1971-2000	72.5/Jul	38.2/Jan	7.08	1.96	7.85	5.66	22.55
Roosevelt 1WNW	2,210	1971-2000	88.1/Jul	48.4/Jan	6.51	1.20	4.37	4.81	16.89
Sierra Ancha	5,100	1913-1979 ¹	77.1/Jul	41.6/Jan	9.45	2.58	7.39	8.67	28.09
Whiteriver 1 SW	5,120	1971-2000	72.4/Jul	39.9/Jan	5.55	2.02	7.81	4.76	20.14
Young	5,050	1903-1964	75.3/Jul, Aug	36.9/Jan	6.00	2.17	8.26	4.59	21.02

Source: WRCC, 2005

Notes:

¹Average temperature for period of record shown; average precipitation from 1971-2000

B. Evaporation Pan:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
Hawley Lake	8,180	1967 - 1988	33.17
Roosevelt 1 WNW	2,200	1905 - 2002	96.71
Whiteriver	5,280	1900 - 2002	77.65

Source: WRCC, 2005

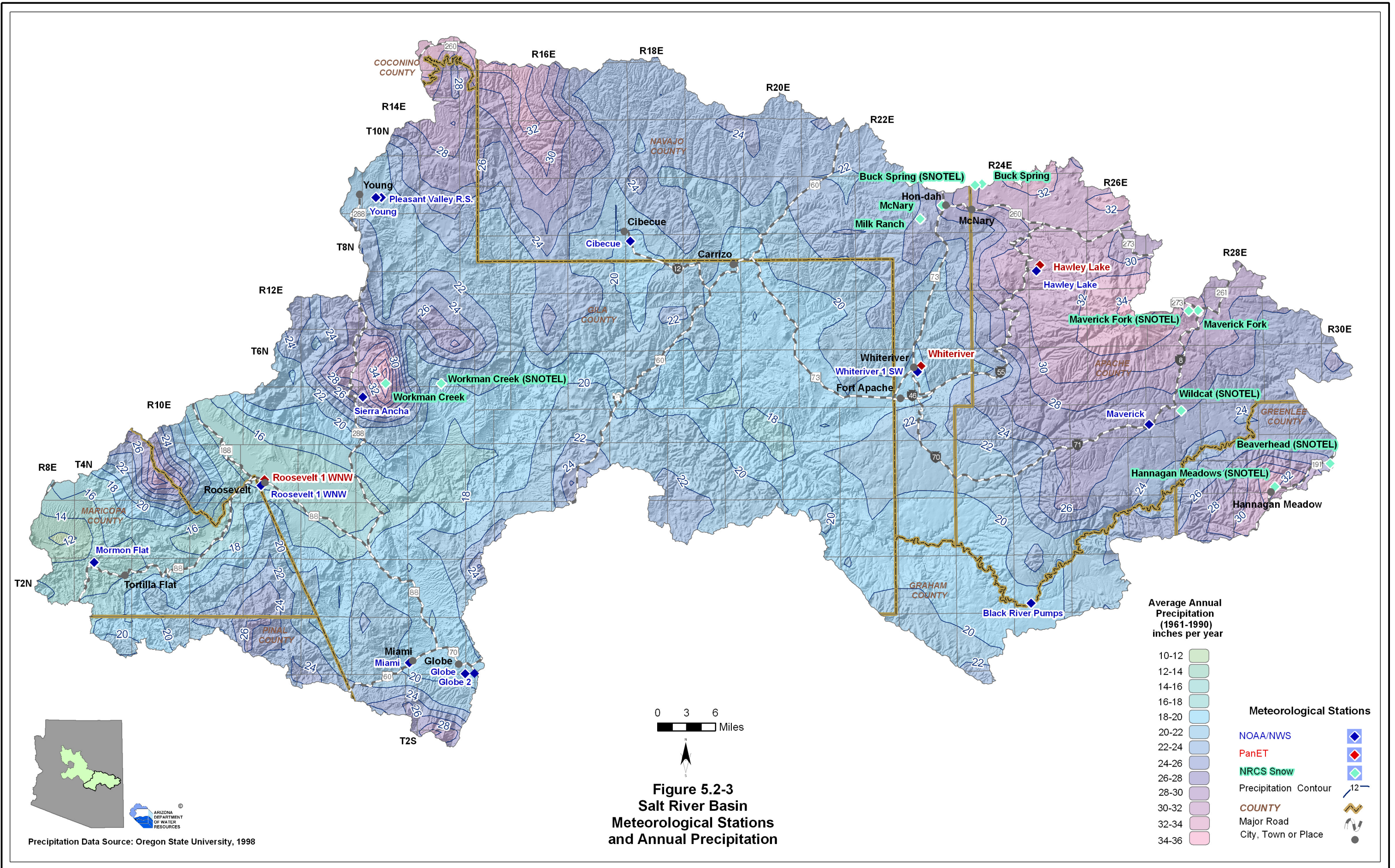
C. AZMET:

Station Name	Elevation (in feet)	Period of Record	Average Annual Reference Evapotranspiration, in inches (Number of years to calculate averages)
None			

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content (Number of measurements to calculate average)					
			Jan.	Feb.	March	April	May	June
Beaverhead SNOTEL	7,990	1995 - current	1.6 (12)	2.4 (12)	3.0 (12)	0.6 (12)	0 (12)	0 (12)
Buck Sping	7,400	1989 - current	0.8 (9)	0.9 (9)	1.3 (9)	0.2 (9)	0 (0)	0 (0)
Buck Spring SNOTEL	7,400	1985 - 1997 (discontinued)	2.6 (12)	4.5 (12)	4.0 (12)	0.8 (12)	0.1 (12)	0 (12)
Hannagan Meadows SNOTEL	9,020	1964 - current	5.2 (31)	8.6 (43)	11.3 (43)	10.4 (43)	2.1 (26)	0 (24)
Maverick Fork	9,150	1975 - 2003 (discontinued)	4.3 (26)	6.9 (48)	9.0 (49)	8.2 (47)	5.1 (1)	0 (0)
Maverick Fork SNOTEL	9,200	1950 - current	4.2 (33)	7.3 (55)	9.7 (56)	8.3 (54)	0.5 (20)	0 (19)
McNary	7,200	1939 - 1989 (discontinued)	1.9 (13)	2.8 (47)	2.5 (47)	0.8 (46)	0 (1)	0 (0)
Milk Ranch	7,000	1941 - 1989 (discontinued)	0.9 (9)	1.9 (46)	1.0 (45)	0.4 (42)	0 (0)	0 (0)
Wildcat SNOTEL	7,850	1985 - current	1.5 (22)	2.7 (22)	3.5 (22)	1.2 (22)	0 (22)	0 (22)
Workman Creek	6,900	1952 - 1993 (discontinued)	2.7 (12)	4.7 (42)	4.7 (42)	2.8 (40)	0 (0)	0 (0)
Workman Creek SNOTEL	6,900	1961 - current	2.1 (25)	5.1 (46)	5.3 (46)	2.9 (46)	0 (23)	0 (24)

Source: Natural Resources Conservation Service, 2006



5.2.4 Surface Water Conditions in the Salt River Basin

Streamflow data, including average seasonal flow, average annual flow and other information is shown in Table 5.2-2. Flood ALERT equipment in the basin is shown in Table 5.2-3. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 5.2-4. The location of streamflow gages identified by USGS number, flood ALERT equipment, USGS runoff contours and large reservoirs are shown on Figure 5.2-5. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Streamflow Data

- Refer to Table 5.2-2.
- Data from 33 stations located at 22 watercourses are shown in the table and on Figure 5.2-5.
- The average seasonal flow at 17 stations is highest in the winter (January-March) and at 14 stations, located primarily along the major tributaries to the Salt River in the eastern part of the basin and higher in the watershed, the average seasonal flow is highest in the spring (April-June). Two additional stations have the highest average seasonal flow in the summer (July-September).
- The average seasonal flow is lowest at most stations in the summer (July-September).
- The largest annual flow recorded in the basin is 3.2 maf in 1905 at the Salt River at Roosevelt gage with a contributing drainage area of 5,824 square miles. For a hydrograph of average annual flow for this gage from 1914-2007 see Figure 5.2-4.

Flood ALERT Equipment

- Refer to Table 5.2-3.
- As of October 2005 there were five stations in the basin.

Reservoirs and Stockponds

- Refer to Table 5.2-4.
- The basin contains 12 large reservoirs. The largest is Roosevelt with a maximum capacity of 1,653,043 acre-feet.
- The most common use of the large reservoirs is recreation.
- Surface water is stored or could be stored in 62 small reservoirs in the basin.
- There are 807 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 5.2-5.
- Average annual runoff is 10 inches per year, or 533 acre-feet per square mile, in the White Mountains in the eastern portion of the basin and decreases to one inch per year, or 53.3 acre-feet per square mile, in the southwestern portion of the basin.

Figure 5.2-4 Annual Flows (acre-feet) at Salt River near Roosevelt, water years 1914-2008 (Station #9498500)

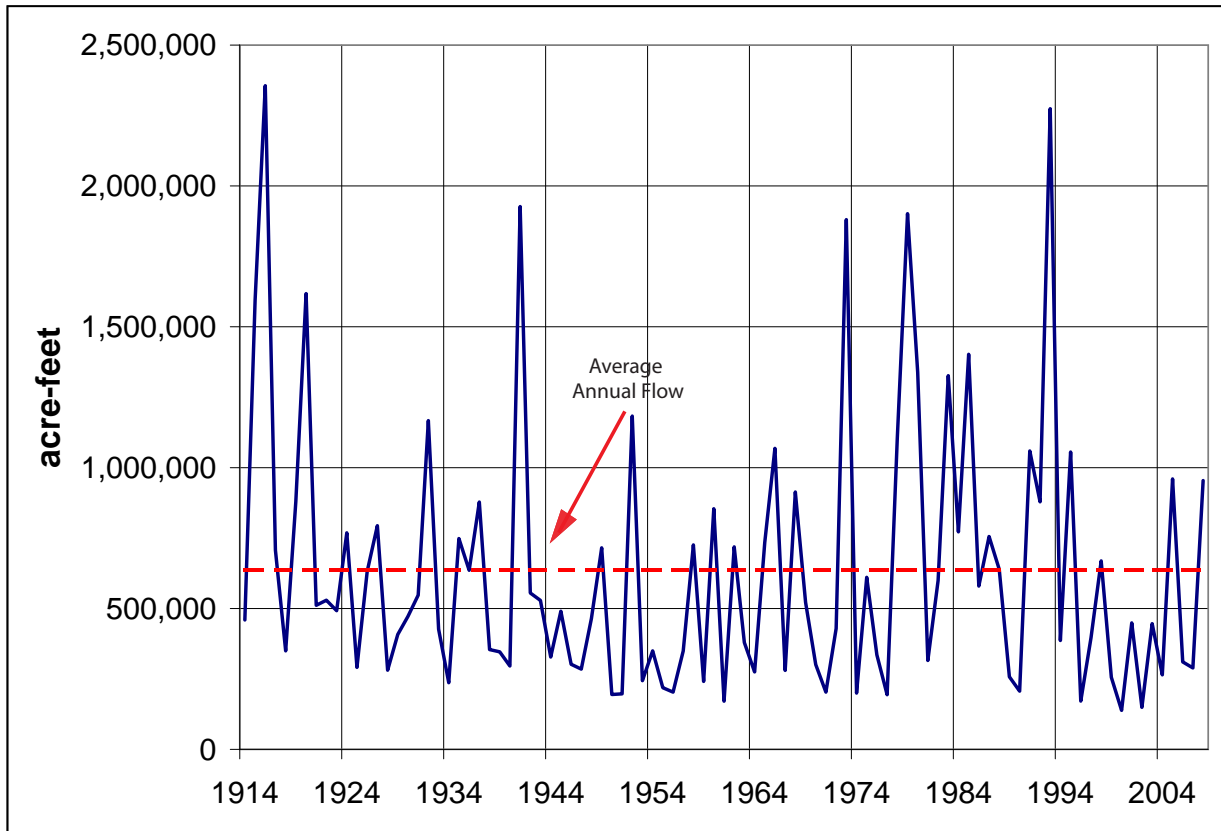


Table 5.2-2 Streamflow Data for the Salt River Basin

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow/Year (in acre-feet)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9489070	North Fork of East Fork Black River near Alpine	38	8,650	6/1965-9/1978 (discontinued)	18	68	6	7	1,767 (1967)	5,933	9,121	33,593 (1973)	12
9489082	North Fork of Thomas creek near Alpine	1	8,380	10/1985-9/2001 (reactivated, real time)	25	58	8	8	23 (1989)	62	85	180 (1991)	6
9489100	Black River near Maverick	315	6,850	10/1962-9/1982 (discontinued)	28	49	10	13	27,591 (1977)	86,899	102,892	225,938 (1973)	19
9489200	Pacheta Creek at Maverick	15	7,850	10/1957-9/1980 (discontinued)	22	63	7	8	789 (1961)	4,851	6,443	17,593 (1973)	22
9489500	Black River below Pumping Plant near Point of Pines	560	5,725	6/1953-current (real-time)	37	42	9	13	28,459 (2002)	127,452	151,168	434,496 (1993)	49
9489700	Big Bonito Creek near Fort Apache	119	5,910	10/1957-9/1981 (discontinued)	29	49	11	12	13,828 (1961)	41,267	49,530	102,805 (1979)	23
9490000	Turkey Creek near Fort Apache	13	NA	6/1955-9/1960 (discontinued)	68	18	6	8	442 (1957)	514	1,017	2,599 (1958)	4
9490500	Black River near Fort Apache	1,232	4,345	11/1912-current (real time)	42	35	9	15	45,188 (2002)	233,904	280,932	818,301 (1993)	45
9490800	North Fork White River near Greer	40	8,400	6/1965-9/1978 (discontinued)	14	52	20	15	9704 (1971)	15,569	17,842	40,915 (1973)	13
9491000	North Fork White River near McNary	78	7,723	6/1945-9/1985 (discontinued)	15	57	16	13	12,673 (1951)	32,442	34,855	73,140 (1983)	31
9492000	North Fork White River at White River	357	NA	10/1916 - 6/1922 (discontinued)	21	43	26	10	76,906 (1918)	109,638	118,159	167,933 (1919)	3
9492400	East Fork White River near Fort Apache	39	6,050	8/1957-current (real time)	18	53	16	13	6,930 (2002)	24,984	25,517	54,457 (1993)	45
9492500	Rock Creek near Fort Apache	20	NA	6/1955-9/1960 (discontinued)	50	34	9	8	217 (1958)	1,770	1,613	2,693 (1957)	4
9493500	White River at Fort Apache	499	NA	10/1912-6/1922 (discontinued)	28	44	22	7	110,217 (1918)	196,247	214,840	356,649 (1916)	4
9494000	White River near Fort Apache	632	4,366	10/1917-current (real time)	28	48	12	12	27,446 (2002)	149,177	144,517	345,424 (1993)	45
9494300	Carrizo Creek above Corduroy Creek near Show Low	225	4,800	10/1953-6/1967 (discontinued)	47	12	8	32	1,926 (1961)	6,501	8,683	28,886 (1965)	13
9494500	Corduoy Creek above Forestdale Creek near Show Low	57	6,334	9/1952-6/1961 (discontinued)	64	4	5	27	333 (1955)	2,404	2,867	6,306 (1960)	8
9495500	Forestdale Creek near Show Low	33	6,334	9/1952-6/1961 (discontinued)	28	34	27	11	87 (1956)	1,314	2,190	7,023 (1960)	8



Table 5.2-2 Streamflow Data for the Salt River Basin (Cont)

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow/Year (in acre-feet)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9496000	Corduoy Creek near mouth near Show Low	203	5,000	9/1951-9/2005 (discontinued)	54	17	7	21	1,600 (1970)	11,149	16,380	63,927 (1973)	23
9496500	Carrizo Creek near Show Low	439	4,749	6/1951-current (real time)	28	49	10	13	3,758 (1956)	22,232	35,030	124,556 (1993)	41
9496600	Cibecue 1 Tributary Carrizo Creek near Show Low	<0.1	5,400	6/1958-9/1971 (discontinued)	0	0	80	20	1 (1960)	6	8	22 (1964)	12
9496700	Cibecue 2 Tributary Carrizo Creek near Show Low	<0.1	5,240	6/1958-9/1971 (discontinued)	4	0	71	25	2 (1960-1961,1968)	4	6	17 (1963)	12
9497500	Salt River near Chrysotile	2,849	3,355	9/1924-current (real-time)	38	36	12	14	128,176 (2002)	393,581	474,817	1,459,907 (1993)	78
9497800	Cibecue Creek near Chysotile	295	3,200	5/1959-current (real time)	45	17	18	21	10,066 (1961)	23,535	32,597	128,176 (1993)	43
9497850	Canyon Creek near Globe	316	3,080	10/1975-9/1981 (discontinued)	66	15	4	15	13,759 (1981)	99,282	81,149	147,149 (1979)	5
9497900	Cherry Creek near Young	62	4,950	8/1963-9/1977 (discontinued)	49	13	8	29	1,289 (1964)	5,495	7,817	20,706 (1965)	13
9497980	Cherry Creek near Globe	200	3,200	5/1965-current (real-time)	57	11	9	23	2,600 (2002)	15,026	24,302	84,003 (1993)	36
9498400	Pinal Creek at Inspiration Dam near Globe	195	2,740	7/1980-current (real-time)	49	16	16	19	2,868 (1999)	6,087	8,980	61,481 (1993)	22
9498500	Salt River near Roosevelt	4,306	2,177	1/1913-current (real-time)	41	31	13	15	152,798 (2002)	518,499	644,942	2,422,315 (1916)	89
9498501	Pinto Creek below Haunted Canyon near Miami	37	3,180	10/1995-current (real-time)	70	12	3	14	130 (2002)	1,709	1,600	3,722 (1998)	7
9498502	Pinto Creek near Miami	102	2,820	9/1994-current (real-time)	68	15	8	9	449 (1996)	4,168	5,757	19,480 (1995)	8
9498503	South Fork Parker Creek near Roosevelt	1	5,440	11/1985-current (real-time)	73	15	3	10	3 (2002)	192	266	1,036 (1995)	14
9500500	Salt River at Roosevelt	5,824	NA	1/1904-12/1907 (discontinued)	45	29	9	17	254,840 (1904)	1,321,983	1,531,574	3,227,492 (1905)	4

Source: USGS (NWIS) 2005 & 2008

Notes:

Statistics based on Calendar Year
 Annual Flow statistics based on monthly values
 Summation of Average Annual Flows may not equal 100 due to rounding
 Period of record may not equal Year of Record used for annual Flow/Year statistics due to only using years with a 12 month record
 In Period of Record, current equals November 2008
 Seasonal and annual flow data used for the statistics was retrieved in 2005

Table 5.2-3 Flood ALERT Equipment in the Salt River Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
81	Roosevelt Fire Station	Precipitation	10/2/04	Gila County FCD
910	Beer Tree Crossing Pinal Creek	Precipitation/Stage	NA	Gila County FCD
920	Guzman Crossing Pinal Creek	Precipitation/Stage	NA	Gila County FCD
1712	Pinetop County Club	Precipitation	NA	Navajo County FCD
6780	Saguaro Lake	Weather Station	1/24/00	Maricopa County FCD

Source: ADWR 2005a

Notes:

FCD = Flood Control District

NA = Not available

Table 5.2-4 Reservoirs and Stockponds in the Salt River Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE ¹	JURISDICTION
1	Roosevelt	Bureau of Reclamation	1,653,043	H,I,R,S	Federal
2	Apache (Horse Mesa Dam)	Bureau of Reclamation	245,048	H,I,R,S	Federal
3	Saguaro (Stewart Mountain Dam)	Bureau of Reclamation	68,800	H,I,S	Federal
4	Canyon (Mormon Flat Dam)	Bureau of Reclamation	57,900	H,I,R,S	Federal
5	Sunrise	White Mountain Apache Tribe	15,000 ²	R	Tribal
6	Big	AZ Game & Fish	10,100	R	State
7	Reservation	San Carlos Apache Tribe	6,000 ²	R	Tribal
8	Crescent	AZ Game & Fish	5,800	F,R	State
9	Horseshoe Cienega	White Mountain Apache Tribe	1,170	R	Tribal
10	Cyclone	White Mountain Apache Tribe	775	R	Tribal
11	Hawley (Davis Dam)	White Mountain Apache Tribe	650	F,R	Tribal

B: Other Large Reservoirs (50 acre surface area or greater)³

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE	JURISDICTION
12	Nash Creek	White Apache Tribe	69	R	Tribal

Source: Compilation of databases from ADWR & others

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total number: 26

Total maximum storage: 3,239 acre-feet

D. Other Small Reservoirs (between 5 and 50 acres surface area)³

Total number: 36

Total surface area: 410 acres

E. Stockponds (up to 15 acre-feet capacity)

Total number: 807 (from water right filings)

Notes:

¹F=fish & wildlife pond; H=hydroelectric; I=irrigation; R=recreation; S=water supply

²Normal capacity < 500acre-feet

³Capacity data is not available to ADWR



5.2.5 Perennial/Intermittent Streams and Major Springs in the Salt River Basin

Major and minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 5.2-5. The locations of major springs and perennial and intermittent streams are shown on Figure 5.2-6. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- There are numerous perennial streams located throughout the basin, particularly in the high elevation eastern portion, and include the Salt River, Black River, White River, East Fork White River, North Fork White River, Carrizo Creek, Cibecue Creek, Canyon Creek and Cherry Creek.
- Most of the intermittent streams are found in the western portion of the basin.
- There are 26 major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time. The largest discharge rate is 8,980 at Alcheyay spring.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 5.2-5B. There is one minor spring identified in this basin.
- Listed discharge rates may not be indicative of current conditions. Many of the measurements were taken during or prior to 1952.
- The total number of springs, regardless of discharge, identified by the USGS varies from 624 to 822, depending on the database reference.

Table 5.2-5 Springs in the Salt River Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
1	Alchesay	335641	1095523	8,980	During or prior to 1952
2	Canyon ²	334040	1111242	2,224	During or prior to 2001
3	Mann ²	340340	1094810	1,980	10/24/1979
4	Gooseberry Creek	340654	1094117	1,000	5/22/1952
5	Warm	334403	1101256	874	During or prior to 1982
6	Unnamed	341740	1104858	480	11/5/2002
7	Unnamed	341738	1104853	410	11/5/2002
8	Unnamed	341738	1104853	310	11/5/2002
9	Blue Lake	340402	1094805	260	5/19/1952
10	Gomez ^{2,3}	340338	1095156	200	6/18/1946
11	Boy	340420	1094703	200	5/20/1952
12	Ess	334049	1093308	200	6/18/1952
13	Big	340539	1095932	150	6/20/1952
14	Upper Bull Cienega	340348	1095315	100 ⁴	6/20/1952
15	Government ²	340410	1095210	75	6/18/1946
16	Maurel ^{2,3}	332422	1104425	50	4/11/1946
17	Unnamed ^{2,3}	334942	1095100	40	2/19/1952
18	Haystack # 1 ²	340450	1095037	40 ⁴	6/18/1946
19	Warm	334358	1101253	30 ⁵	During or prior to 1992
20	Earl Spring # 3 ²	340424	1095123	20 ⁴	6/18/1946
21	Unnamed ³	340441	1094840	20 ⁴	6/20/1946
22	Haystack # 2 ²	340450	1095052	20	6/18/1946
23	Columbine	335631	1095510	Greater than 10	6/5/2005
24	White	341109	1103055	Greater than 10	6/6/2005
25	Williams (Fish Hatchery)	340341	1094832	Greater than 10	6/5/2005
26	Unnamed ³	334414	1101339	10 ⁵	During or prior to 1982

B. Minor Springs (1 to 10 gpm):

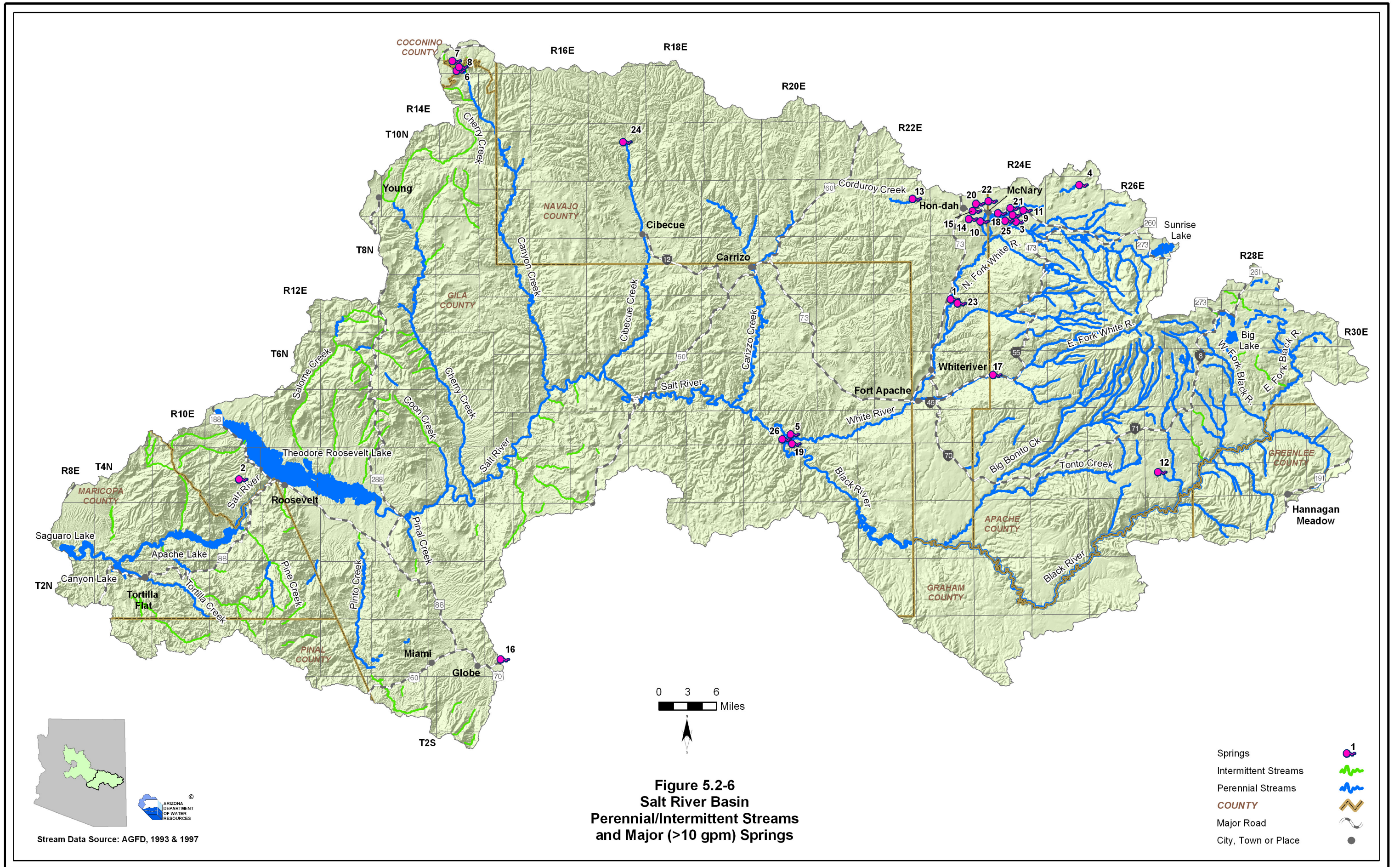
Name ¹	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Bull Cienega	340348	1095314	2	6/20/1952

Source: Compilation of databases from ADWR & others

**C. Total number of springs, regardless of discharge, identified by USGS
(see ALRIS, 2005a and USGS, 2006a): 624 to 822**

Notes:

- ¹Most recent measurement identified by ADWR
- ²Spring is not displayed on current USGS topo maps
- ³Location approximated by ADWR
- ⁴Estimated discharge
- ⁵Average discharge



5.2.6 Groundwater Conditions of the Salt River Basin

Major aquifers, well yields, estimated natural recharge, estimated water in storage, number of index wells and date of last water-level sweep are shown in Table 5.2-6. Figure 5.2-7 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 5.2-8 contains hydrographs for selected wells shown on Figure 5.2-7. Figure 5.2-9 shows well yields in five yield categories. A description of aquifer data sources and methods as well as well data sources and methods, including water-level changes and well yields are found in Volume 1, Appendix A.

Major Aquifers

- Refer to Table 5.2-6 and Figure 5.2-7.
- Major aquifers in the basin include recent stream alluvium, volcanic rock (Pinetop-Lakeside Aquifer) and sedimentary rock (Gila Conglomerate, and C and R Aquifers).
- Most of the basin geology consists of consolidated crystalline and sedimentary rock.
- The basin contains four sub-basins: Black River, White River, Salt River Canyon and Salt River Lakes.
- Flow directions are generally not available due to the consolidated nature of the basin geology. Groundwater flow in the C-aquifer in the northwestern portion of the basin is from north to south.

Well Yields

- Refer to Table 5.2-6 and Figure 5.2-9.
- As shown on Figure 5.2-9, well yields in this basin range from less than 100 gpm to greater than 2,000 gpm.
- One source of well yield information, based on 140 reported wells, indicates that the median well yield in this basin is 170 gpm.

Natural Recharge

- Refer to Table 5.2-6.
- The natural recharge estimate for this basin is 178,000 acre-feet per year (AFA).

Water in Storage

- Refer to Table 5.2-6.
- The storage estimate for this basin is more than 8.7 million acre-feet to a depth of 1,200 feet.

Water Level

- Refer to Figure 5.2-7. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures one index well in this basin, located near Young. Hydrographs for this well and two additional wells are shown in Figure 5.2-8.
- All water level information is from the western portion of the basin. These data show the deepest recorded water level at 82 feet and the shallowest at eight feet, both located north of Miami-Globe.

Table 5.2-6 Groundwater Data for the Salt River Basin

Basin Area, in square miles:	5,232	
Major Aquifer(s):	Name and/or Geologic Units	
	Recent Stream Alluvium	
	Volcanic Rock (Pinetop-Lakeside Aquifer)	
	Sedimentary Rock (Gila Conglomerate)	
	Sedimentary Rock (C and R Aquifers)	
Well Yields, in gal/min:	60 (1 well measured)	Measured by ADWR (GWSI) and/or USGS
	Range 2-2,000 Median 170 (140 wells reported)	Reported on registration forms for large (>10-inch) diameter wells (Wells55)
	Range 10-300	ADWR (1990 and 1994b)
	Range 0-500	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	178,000	Freethy and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	>8,700,000 (to 1,200 ft)	ADWR (1992)
Current Number of Index Wells:	1	
Date of Last Water-level Sweep:	NA	

NA - Not applicable

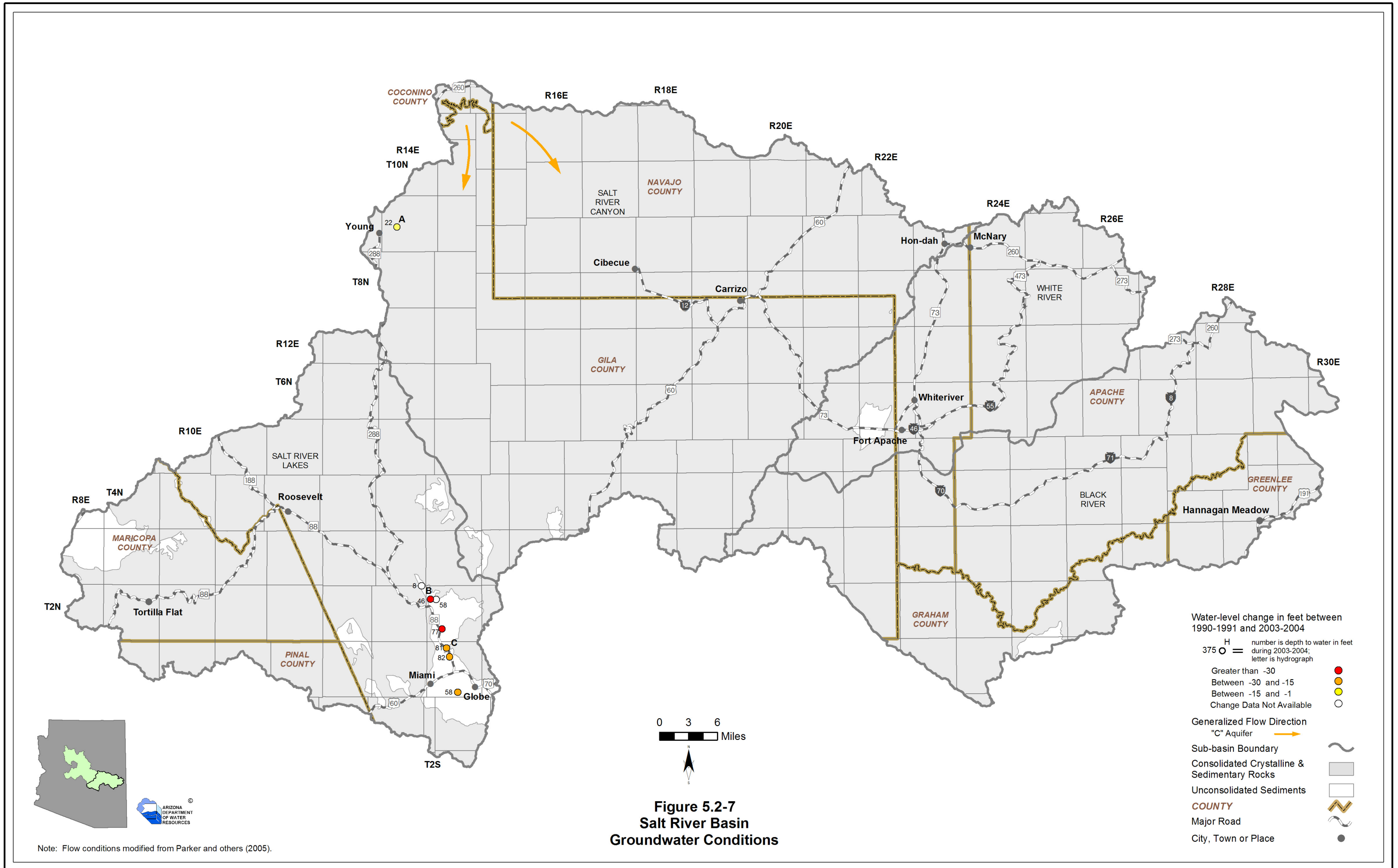
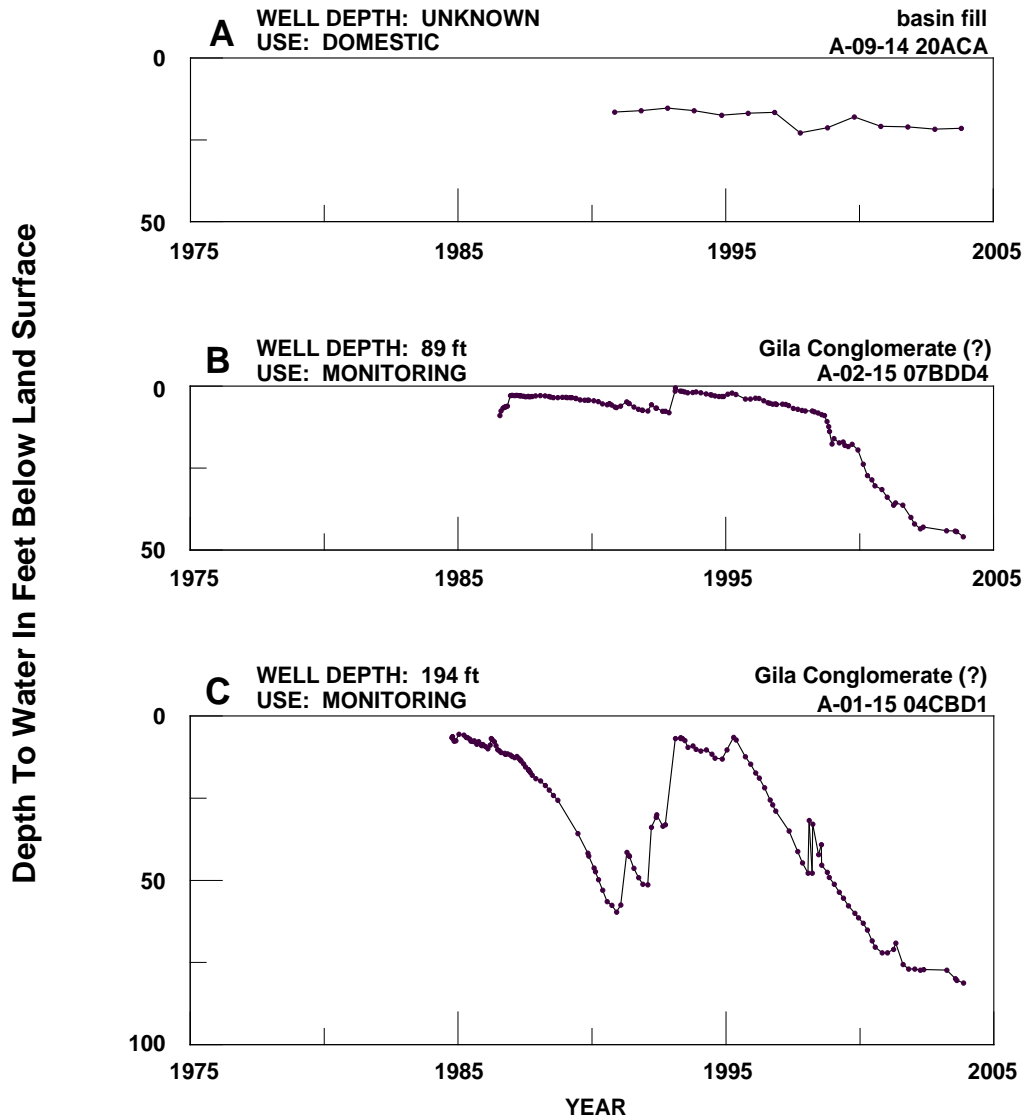


Figure 5.2-8
Salt River Basin
Hydrographs Showing Depth to Water in Selected Wells



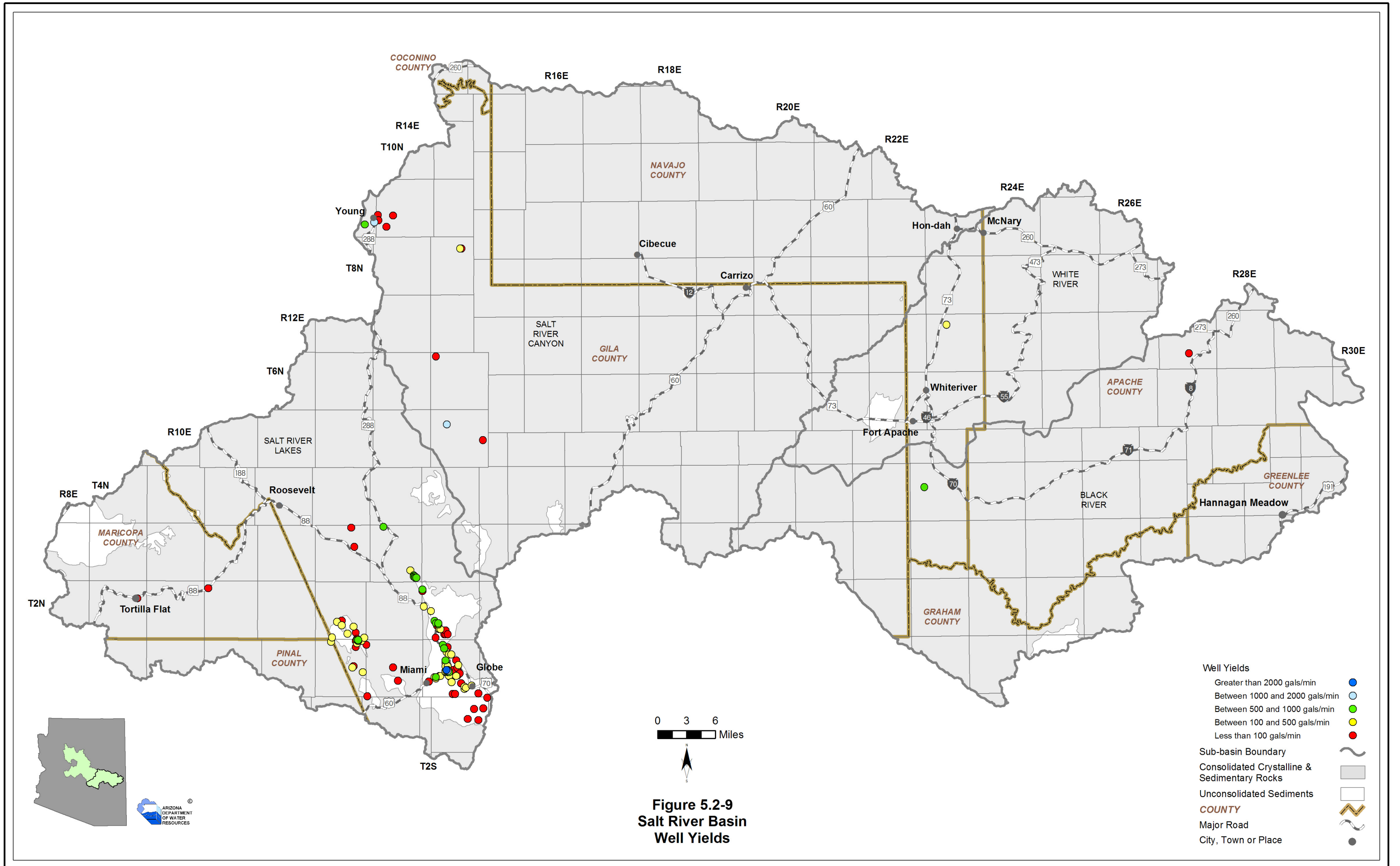


Figure 5.2-9
Salt River Basin
Well Yields

5.2.7 Water Quality of the Salt River Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 5.2-7A. Impaired lakes and streams with site type, name, length of impaired reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 5.2-7B. Figure 5.2-10 shows the location of water quality occurrences keyed to Table 5.2-7. All community water systems are regulated under the Safe Drinking Water Act and treat water supplies to meet drinking water standards. Not all parameters were measured at all sites; selective sampling for particular constituents is common. A description of water quality data sources and methods is found in Volume 1, Appendix A.

Well, Mine or Spring sites that have equaled or exceeded drinking water standards (DWS)

- Refer to Table 5.2-7A.
- Seventy sites have parameter concentrations that have equaled or exceeded drinking water standards. All but one occurrence is in the southwest portion of the basin.
- The most commonly equaled or exceeded parameter was cadmium.
- Other standards equaled or exceeded in the basin include fluoride, beryllium, copper, lead, chromium, total dissolved solids, nitrates, arsenic and radionuclides.

Lakes and Streams with impaired waters

- Refer to Table 5.2-7B.
- Water quality standards in this basin were exceeded for two lakes and four stream reaches on two streams.
- The most commonly equaled or exceeded standard was copper. Other standards equaled or exceeded include dissolved oxygen, high pH and selenium.
- The three impaired reaches of Pinto Creek are part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) program. Phase I of the TMDL reports have been approved and specific site standards are being developed.
- Canyon Lake, Crescent Lake and the Gibson Mine tributary are not a part of the TMDL program at this time.

Effluent Dependent Reaches

- Refer to Figure 5.2-10
- There is one effluent dependent reach in this basin, Pinal Creek, located north of Globe.

Table 5.2-7 Water Quality Exceedences in the Salt River Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section	
1	Well	4 North	29 East	34	NO3
2	Well	3 North	12 East	14	Rad
3	Well	3 North	13 East	2	As
4	Well	3 North	13 East	9	As
5	Well	3 North	13 East	10	As
6	Well	3 North	13 East	15	As
7	Well	3 North	13 East	15	As
8	Well	3 North	14 East	26	Pb, TDS
9	Well	3 North	14 East	26	Pb, TDS
10	Well	2 North	9 East	11	As, F
11	Well	2 North	11 East	6	Rad
12	Spring	2 North	13 East	16	Rad
13	Well	2 North	14 East	1	F
14	Well	2 North	15 East	6	F
15	Well	2 North	15 East	6	F
16	Well	2 North	15 East	6	F
17	Well	2 North	15 East	6	F
18	Well	2 North	15 East	6	F
19	Well	2 North	15 East	7	Be, Cd, Cu, F, Pb
20	Well	2 North	15 East	7	Be, Cd, Cu, Pb
21	Well	2 North	15 East	7	Be, Cd, Cu, F, Pb
22	Well	2 North	15 East	7	Be, Cd, Cu, F
23	Well	2 North	15 East	7	Cd
24	Well	2 North	15 East	7	Be, Cd, Cr, Pb, TDS
25	Well	2 North	15 East	7	Pb
26	Well	2 North	15 East	7	Be, Cd, Cr, Pb, TDS
27	Well	2 North	15 East	7	Pb
28	Well	2 North	15 East	7	Cd, Pb, TDS
29	Well	2 North	15 East	7	Cd, Pb, TDS
30	Well	2 North	15 East	7	Cd
31	Well	2 North	15 East	18	Be, Cd, Cu, F, Pb, TDS
32	Well	2 North	15 East	18	Be, Cd, Cu, F, Pb, TDS
33	Well	2 North	15 East	18	Be, Cd, F, Pb
34	Well	2 North	15 East	29	TDS
35	Well	2 North	15 East	29	Be, Cd, Cu, F, Pb, TDS
36	Well	2 North	15 East	29	Be, Cd, Cu, F, Pb, TDS
37	Well	2 North	15 East	29	Be, Cd, Cu, F, Pb, TDS
38	Well	2 North	15 East	29	Cd
39	Well	2 North	15 East	32	As
40	Well	1 North	14 East	27	As
41	Well	1 North	15 East	4	Be, Cd, Cr, F, Pb, TDS
42	Well	1 North	15 East	4	Be, Cd, Cu, Cr, F, Pb, TDS
43	Well	1 North	15 East	4	Be, Cd, Cu, Cr, F, Pb, TDS
44	Well	1 North	15 East	4	Be, Cd, Cu, F, Pb
45	Well	1 North	15 East	4	Pb
46	Well	1 North	15 East	9	Be, Cd, Cu, Cr, F, Pb, TDS
47	Well	1 North	15 East	9	Be, Cd, Cu, Cr, F, Pb, TDS
48	Well	1 North	15 East	9	Be, Cd, Cu, Cr, F, Pb, TDS
49	Well	1 North	15 East	9	Be, Cd, Cu, F, Pb, TDS
50	Well	1 North	15 East	9	Pb
51	Well	1 North	15 East	9	Be, Cd, Cu, F, Pb
52	Well	1 North	15 East	9	Cu
53	Well	1 North	15 East	9	Cu
54	Well	1 North	15 East	9	Be, Cd, Cu, Cr, F, Pb, TDS
55	Well	1 North	15 East	9	Be, Cd, Cu, F, TDS
56	Well	1 North	15 East	9	Be, Cd, Cu, F, TDS
57	Well	1 North	15 East	9	Be, Cd, Cu, F, TDS

Table 5.2-7 Water Quality Exceedences in the Salt River Basin (Cont)¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section	
58	Well	1 North	15 East	9	Be, Cd, Cu, Pb
59	Well	1 North	15 East	9	Be, Cd, Cu, TDS
60	Well	1 North	15 East	23	Cd
61	Well	1 North	15 East	23	Cd
62	Well	1 North	15 East	23	Cd
63	Well	1 North	15 East	23	Cd
64	Well	1 North	15 East	23	Cd
65	Well	1 North	15 East	34	Cd
66	Well	1 North	15 East	34	Cd, Pb
67	Well	1 North	15 East	35	Cd
68	Well	1 South	13 East	12	NO3
69	Well	1 South	14 East	2	F
70	Well	1 South	15 East	12	NO3

Source: Compilation of databases from ADWR & others

B. Lakes and Streams

Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard ³	Parameter(s) Exceeding Use Standard ²
a	Lake	Canyon Lake	NA	450	A&W	DO
b	Lake	Crescent Lake	NA	150	A&W, FBC, AgL, AgI	pH
c	Stream	Gibson Mine tributary (headwaters to Pinto Creek)	1	NA	A&W	Cu
d	Stream	Pinto Creek (headwaters to tributary latitude 331927, longitude 1105456)	3	NA	A&W	Cu
e	Stream	Pinto Creek (Ripper Spring Canyon to Roosevelt Lake)	18	NA	A&W	Cu, Se
f	Stream	Pinto Creek tributary (latitude 331927, longitude 1105456 to Ripper Spring)	16	NA	A&W	Cu

Source: ADEQ 2005d

Notes:

¹ Water quality samples collected between 1984 and 2002.

²As = Arsenic

Be = Beryllium

Cd = Cadmium

Cr = Chromium

Cu = Copper

DO = Dissolved oxygen

F= Fluoride

Pb = Lead

NO3 = Nitrate

pH = Measurement of acidity or alkalinity

Rad = One or more of the following radionuclides - Gross Alpha, Gross Beta, Radium, and Uranium

Se = Selenium

TDS = Total Dissolved Solids

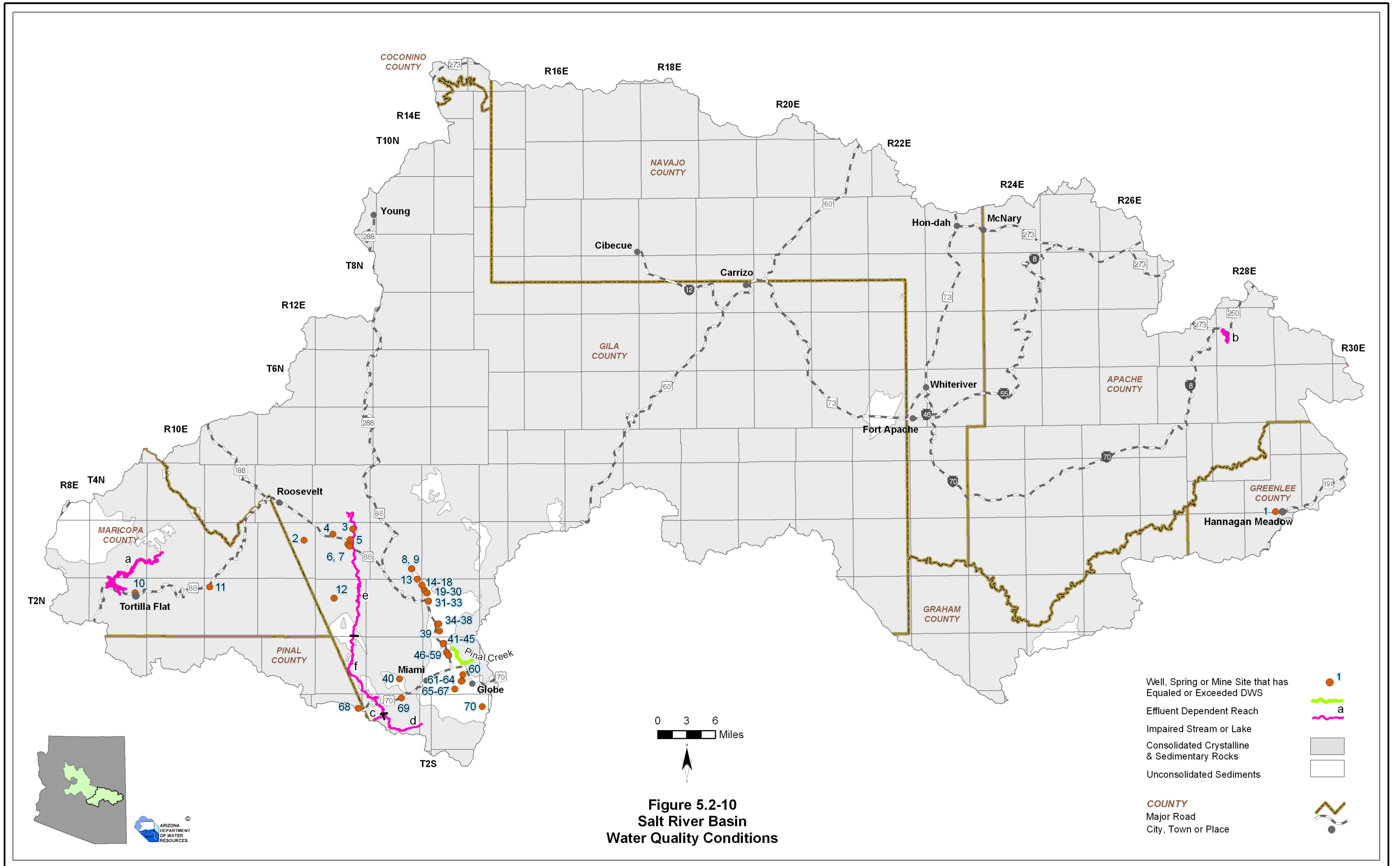
³A&W = Aquatic and Wildlife

FBC = Full Body Contact

AgL - Agricultural - livestock watering

AgI = Agricultural - irrigation

NA = Not Applicable



5.2.8 Cultural Water Demand in the Salt River Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 5.2-8. Effluent generation including facility ownership, location, population served and not served, volume treated, disposal method and treatment level is shown in Table 5.2-9. Figure 5.2-11 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Appendix A. More detailed information on cultural water demand is found in Section 5.0.7.

Cultural Water Demand

- Refer to Table 5.2-8 and Figure 5.2-11.
- Population in this basin has increased from 27,318 in 1980 to 29,057 in 2000.
- Total groundwater use has decreased in this basin since 1971, from an average of 20,000 AFA from 1971-1975 to an average of 12,600 AFA in 2001-2005.
- From 1991-2005 municipal groundwater use averaged 4,000 AFA.
- Groundwater use for industrial purposes has decreased from 10,500 AFA during 1991-1995 to 8,100 AFA in 2001-2005.
- Groundwater use for irrigation occurs on non-reservation lands and has remained constant at less than 1,000 AFA during 1991-2005.
- Information on surface water diversions is not available from 1971-1990. Surface water diversions for both municipal and irrigation uses are assumed to have remained constant from 1991-2005. Municipal use averaged less than 300 AFA and irrigation use averaged 6,400 AFA.
- Surface water diversions for industrial use have decreased from an average of 6,300 AFA during 1991-1995 to 4,900 AFA in 2001-2005.
- Municipal and industrial demand is found in the Globe – Miami area, around Young and near Fort Apache and Whiteriver on the Fort Apache Indian Reservation.
- There are three large copper mines, Pinto Valley, Carlotta and Miami Mine, and two small mines or quarries located in the vicinity of Miami. Not all mines are currently in production.
- As of 2005 there were 1,593 registered wells with a pumping capacity of less than or equal to 35 gpm and 412 wells with a pumping capacity of more than 35 gpm.

Effluent Generation

- Refer to Table 5.2-9.
- There are twelve wastewater treatment facilities in this basin.
- Information on population served was available for seven facilities and information on effluent generation was available for six facilities. These facilities serve over 18,000 people and generate over 2,600 acre-feet of effluent per year.
- Of the seven facilities with information on the effluent disposal method: two discharge to evaporation ponds; two discharge for irrigation; one facility discharges to the Globe WWTF and two discharge into a watercourse.

Table 5.2-8 Cultural Water Demand in the Salt River Basin¹

Year	Estimated and Projected Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						Data Source															
				Well Pumpage			Surface-Water Diversions																		
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Agricultural	Municipal	Industrial	Agricultural																
1971		821 ²	231 ²	20,000			NR			ADWR (1994b)															
1972																									
1973																									
1974																									
1975																									
1976																									
1977																									
1978		20,000			NR																				
1979																									
1980	27,318	187			34			20,000																	
1981	27,453																								
1982	27,589																								
1983	27,724																								
1984	27,859																								
1985	27,995																								
1986	28,130																								
1987	28,265	91			49			22,000																	
1988	28,401																								
1989	28,536																								
1990	28,671																								
1991	28,710	131			24			3,900			<1,000			<300			6,300			6,400					
1992	28,748																								
1993	28,787																								
1994	28,825																								
1995	28,864																								
1996	28,903	223			63			4,100			7,500			<1,000			<300			6,600			6,400		
1997	28,941																								
1998	28,980																								
1999	29,018																								
2000	29,057	140			11			4,000			8,100			<1,000			<300			4,900			6,400		
2001	29,305																								
2002	29,554																								
2003	29,802																								
2004	30,051																								
2005	30,299																								
2010	31,541																								
2020	33,978																								
2030	36,094																								
WELL TOTALS:		1,593	412																						

Notes:

NR - Not reported

¹ Does not include effluent or evaporation losses from stockponds and reservoirs.

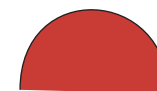
² Includes all wells through 1980.

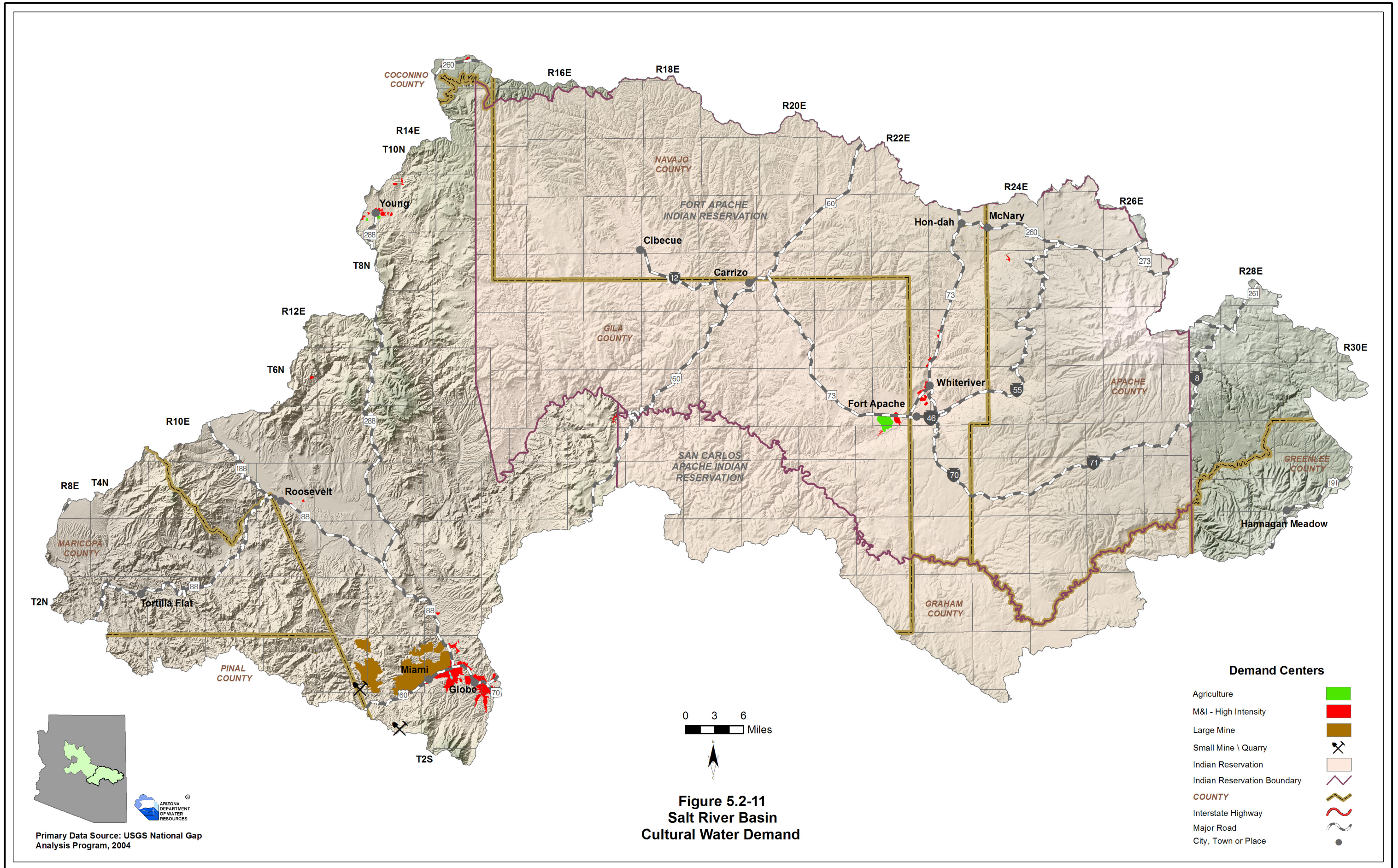
Table 5.2-9 Effluent Generation in the Salt River Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet/year)	Disposal Method							Current Treatment Level	Population Not Served	Year of Record
					Water-course	Evaporation Pond	Irrigation	Wildlife Area	Golf Course/Turf/Landscape	Discharge to Another Facility	Infiltration Basins			
Arizona DOC/Globe	Department of Corrections	Prison			NA									
Cobra Valley Plaza	Cobra Valley SD	Claypool	100	11	Miami Wash							Secondary	NA	2000
Globe Central Heights Collection Systems	Globe	Globe	190	NA						Globe WWTF		NA		2001
Globe Holgate STP	Globe	Globe	190	22	NA							Secondary	NA	2000
Globe WWTF	Globe	Globe	190	784	Unnamed wash to Pinal Creek		X					Secondary	NA	2001
Hon-Dah WWTP	White Mountain Apache Tribe	Resort			NA									
Houston Creek Landing	Private	Star Valley			NA									
Miami WWTF	Miami	Miami	5,238	488			X					Secondary	762	2000
Pinal Creek	Globe	Globe	NA	NA				Reuse				NA		2004
Roosevelt WWTP	Tonto National Forest	Recreation Area			NA									
White Mountain Apache	White Mountain Apache Tribe	Reservation	2,000	224		X						Secondary	1,250	2000
White River	White Mountain Apache Tribe	White River	10,700	1,120		X						Secondary	2000	2000
Total			18,608	2,649										

Source: Compilation of databases from ADWR & others

Notes:
 Year of Record is for the volume of effluent treated/generated
 NA: Data not currently available to ADWR
 WWTF: Waste Water Treatment Facility
 WWTP: Waste Water Treatment Plant
 STP: Sewage Treatment Plant
 SD: Sanitation District





5.2.9 Water Adequacy Determinations in the Salt River Basin

Water adequacy determination information including the subdivision name, location, number of lots, adequacy determination, reason for the inadequacy determination, date of determination and subdivision water provider are shown in Table 5.2-10. Figure 5.2-12 shows the locations of subdivisions keyed to the Table. A description of the Water Adequacy Program is found in Volume 1, Appendix C. Adequacy determination data sources and methods are found in Volume 1, Appendix A.

- A total of seventeen water adequacy determinations for 968 lots have been made in this basin through December 2008.
- Fifteen subdivisions received inadequate determinations. The most common reason for an inadequacy determination is because the applicant did not submit the necessary information and/or the available hydrologic data was insufficient to make a determination.
- There is one designated provider, City of Globe, with an undetermined projected or annual estimated demand.
- The number of lots receiving a water adequacy determination, by county, are:

County	Number of Subdivision Lots	Number of Lots Determined to be Adequate	Percent Adequate
Apache County	0	0	NA
Coconino County	0	0	NA
Gila County	909	47	5%
Greenlee County	0	0	NA
Graham County	0	0	NA
Navajo County	59	59	100%
Maricopa County	0	0	NA

Table 5.2-10. Adequacy Determinations in the Salt River Basin¹

A. Water Adequacy Reports

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section						
1	Cherry Creek Estates Amended	Gila	9 North	14 East	4	55	53-500451	Inadequate	A1	04/18/88	Dry Lot Subdivision
2	Copper Canyon Ranches #1	Gila	1 North	15 East	2, 3, 10	53	53-500504	Inadequate	A1	10/16/90	Dry Lot Subdivision
3	Country Club Annex	Gila	1 North	15 East	22	46	53-500521	Inadequate	A1	07/30/85	Arizona Water Company
4	Country Club Annex Unit 1	Gila	1 North	15 East	22	34	53-300428	Inadequate	A1	03/27/98	Arizona Water Company
5	Dream Catcher Ranch	Gila	6 North	13 East	24, 25	63	53-300058	Inadequate	A2	10/20/95	Dry Lot Subdivision
6	Kristy Terrace	Gila	1 North	15 East	22	10	53-500849	Inadequate	A1, A2	06/10/76	Arizona Water Company
7	Kristy Terrace # 2	Gila	1 North	15 East	22	7	53-500850	Inadequate	A1	04/20/84	Arizona Water Company
8	Miami Gardens	Gila	1 North	15 East	21, 27	40	53-500975	Inadequate	A2	07/07/75	Arizona Water Company
9	Morning Shadow Estates	Gila	1 North	15 East	22	50	53-501015	Inadequate	A2	02/23/77	Arizona Water Company
10	Mountain Gate Unit One	Navajo	9 North	22 East	16	59	53-400802	Adequate		10/09/02	Arizona Water Company - Lakeside
11	Pinto Creek Valley	Gila	3 North	13 East	11	NA	53-501193	Inadequate	A1	05/22/92	Roosevelt Lake Resort Water Company
12	Pioneer Hills	Gila	1 North	15 East	15, 22	170	53-501195	Inadequate	A1, A2	09/03/74	Arizona Water Company
13	Quail Run Mobile Home Subdivision	Gila	3 North	13 East	15	74	53-300053	Inadequate	A1	10/11/95	Quail Run Homeowners' Association
14	Quail Run Subdivision	Gila	3 North	13 East	15	74	53-300174	Inadequate	A1	07/17/96	Quail Run Homeowners' Association
15	Roosevelt Lake RV Resort	Gila	3 North	13 East	15	167	53-501342	Inadequate	A1	03/11/93	Utility Management Services and Operations.
16	Sierra Grande	Gila	1 North	15 East	14	19	53-501400	Inadequate	A2	02/07/75	Arizona Water Company
17	Tierra Madre	Gila	9 North	13 East	24	47	NA	Adequate		02/23/77	Dry Lot Subdivision
				14 East	19						

B. Designated Adequate Water Supply

Map Key	Water Provider Name	County	Designation No.	Projected or Annual Estimated Demand (af/yr)	Date Application Received	Date Application Issued	Year of Projected or Annual Demand
a	City of Globe	Gila	40-900003	No amount designated	NA	5/15/1973	No data, hydrologic study needed

Source: ADWR 2008a

Notes:

- ¹ Each determination of the adequacy of water supplies available to a subdivision is based on the information available to ADWR and the standards of review and policies in effect at the time the determination was made. In some cases, ADWR might make a different determination if a similar application were submitted today, based on the hydrologic data and other information currently available, as well as current rules and policies.
- ² Prior to February 1995, ADWR did not assign file numbers to applications for adequacy. Between 1995-2006 all applications for adequacy were given a file number with a 22 prefix. In 2006 a 53 prefix was assigned to all water adequacy reports and applications regardless of their issue date.
- ³ A. Physical/Continuous
- 1) Insufficient Data (applicant chose not to submit necessary information, and/or available hydrologic data insufficient to make determination)
 - 2) Insufficient Supply (existing water supply unreliable or physically unavailable; for groundwater, depth-to-water exceeds criteria)
 - 3) Insufficient Infrastructure (distribution system is insufficient to meet demands or applicant proposed water hauling)
- B. Legal (applicant failed to demonstrate a legal right to use the water or failed to demonstrate the provider's legal authority to serve the subdivision)
- C. Water Quality
- D. Unable to locate records
- NA = Not Available

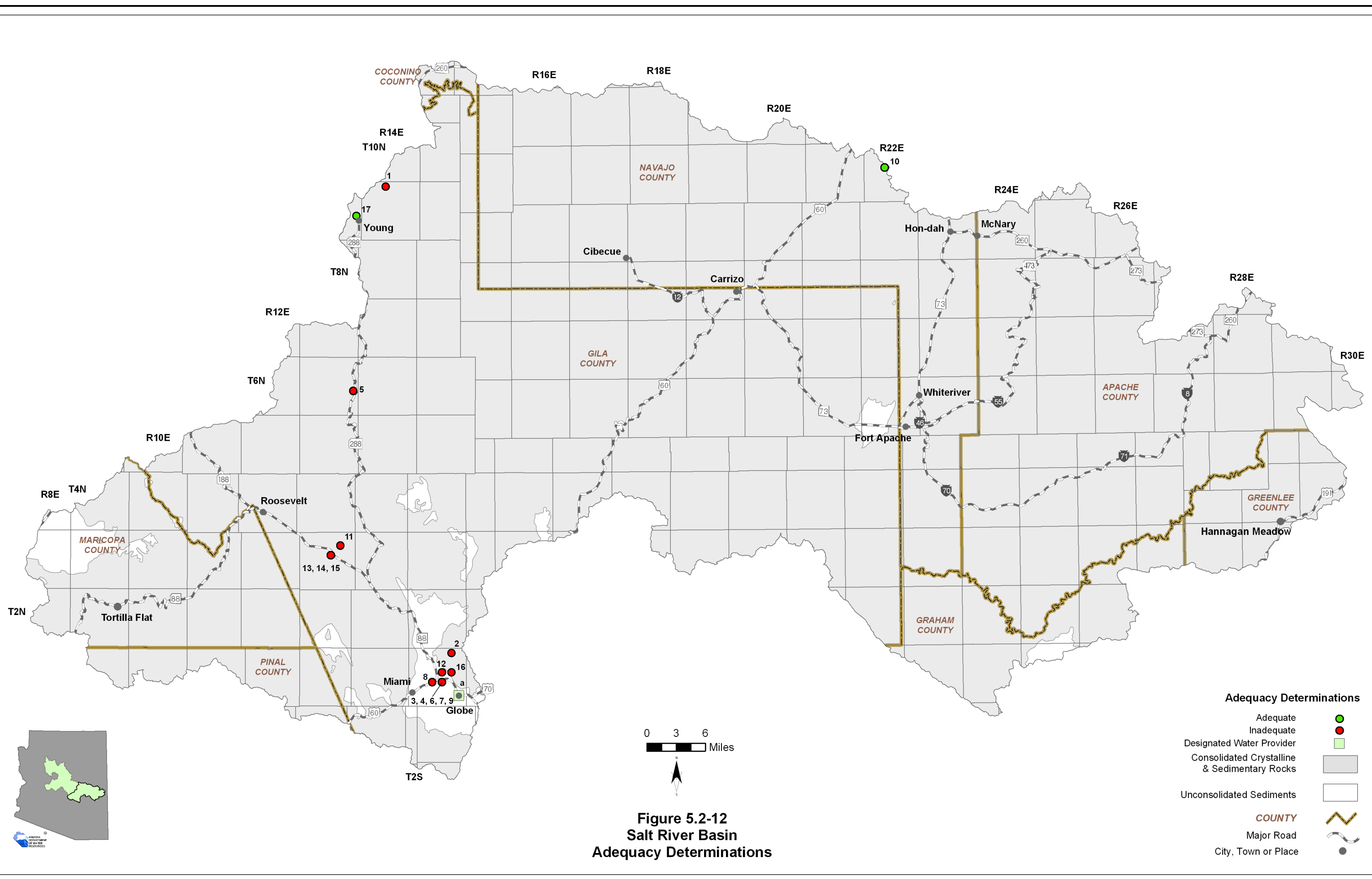
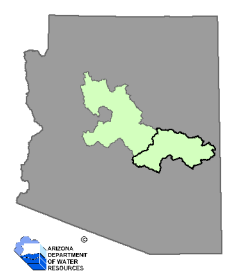
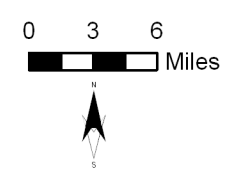


Figure 5.2-12
Salt River Basin
Adequacy Determinations



Salt River Basin

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Section 5.3

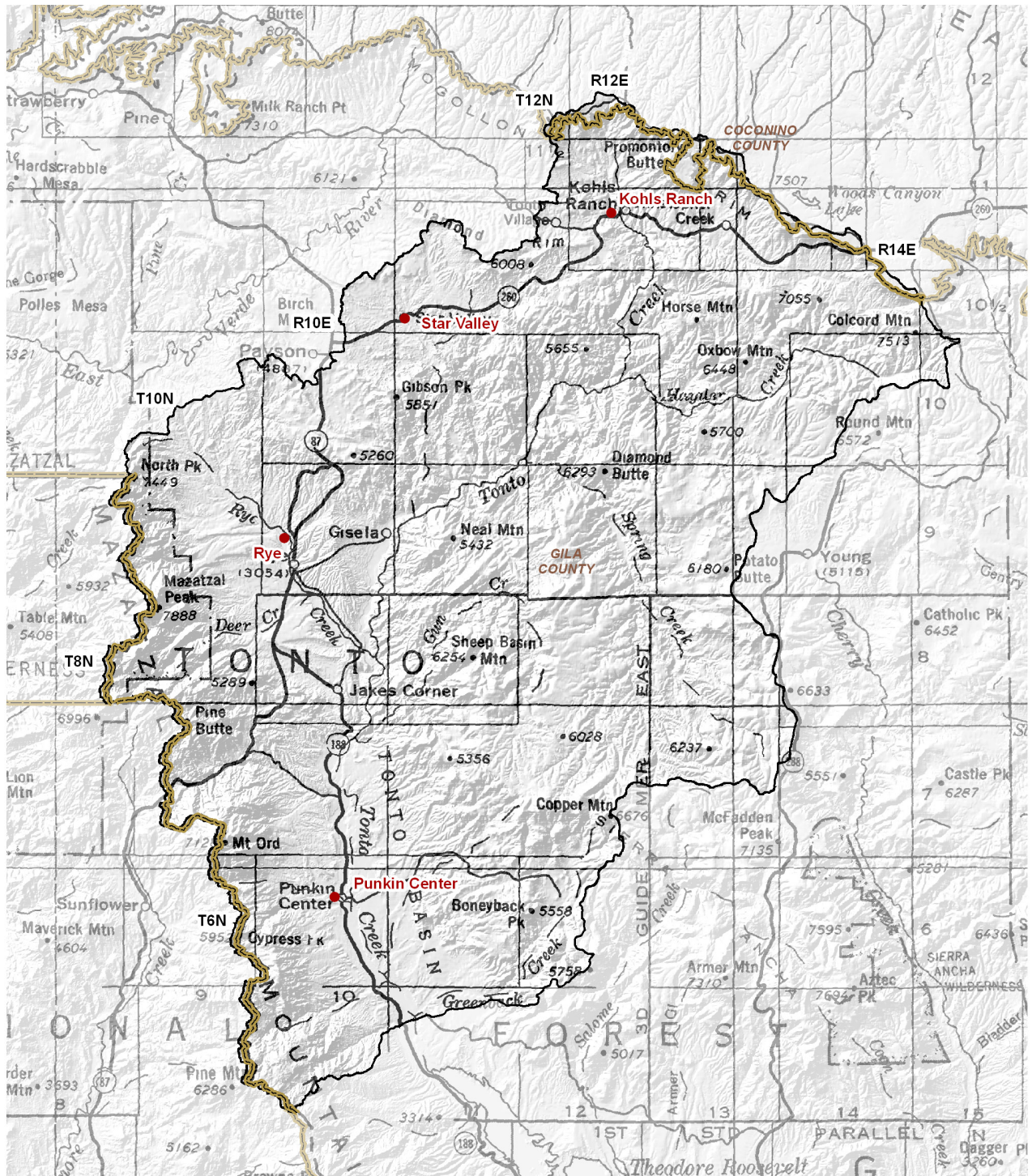
Tonto Creek Basin



5.3.1 Geography of the Tonto Creek Basin

The Tonto Creek Basin, located in the east central part of the planning area is 955 square miles in area. Geographic features and principal communities are shown on Figure 5.3-1. The basin is characterized by mid-elevation mountain ranges. Vegetation types include Arizona uplands Sonoran desertscrub, semi-desert grassland, interior chaparral, Great Basin conifer and madrean evergreen woodlands and montane conifer forests. (see Figure 5.0-10) Riparian vegetation is found along streams including mixed broadleaf, tamarisk and mesquite along Tonto Creek.

- Principal geographic features shown on Figure 5.3-1 are:
 - Tonto Creek running north to south through the center of the basin from Kohls Ranch and exiting the basin about eight miles south of Punkin Center
 - Rye Creek flowing through Rye in the western portion of the basin
 - Spring Creek and Hayler Creek flowing from the eastern basin boundary to Tonto Creek
 - Tonto Basin located in the south central part of the basin along Tonto Creek
 - Mogollon Rim along the northern basin boundary and the Sierra Ancha Mountains (not labeled on the map) along the eastern boundary
 - Mazatzal Mountains along the western boundary, which contain the highest point in the basin, Mazatzal Peak at 7,888 feet
 - The lowest point in the basin is about 5,000 feet along Tonto Creek where it exits the basin



Base Map: USGS 1:500,000, 1981

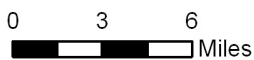


Figure 5.3-1
Tonto Creek Basin
Geographic Features

COUNTY
City, Town or Place



5.3.2 Land Ownership in the Tonto Creek Basin

Land ownership, including the percentage of ownership by category, for the Tonto Creek Basin is shown in Figure 5.3-2. The principal feature of land ownership in this basin is the large amount of forest service land. A description of land ownership data sources and methods is found in Volume 1, Appendix A. More detailed information on protected areas is found in Section 5.0.4. Land ownership categories are discussed below in the order from largest to smallest percentage in the basin.

National Forest

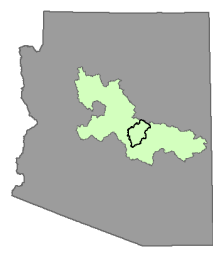
- 97.5% of the land is federally owned and managed by the United States Forest Service (USFS); the largest percentage of any basin in the planning area.
- Forest lands in the basin are part of the Tonto National Forest.
- The basin contains two wilderness areas, a portion of the 250,053-acre Mazatzal Wilderness and the entire 37,399-acre Hellsgate Wilderness. (see Figure 5.0-13)
- There are numerous small private in-holdings.
- Land uses include recreation, grazing and timber production.

Private

- 2.4% of the land is private.
- Small in-holdings of private land are scattered throughout the basin with a number of larger parcels in the vicinity of Punkin Center and Star Valley.
- Land uses include domestic, commercial and ranching.

Indian Reservation

- 0.1% of the land is under ownership of the Tonto Apache tribe, located southwest of Star Valley.
- Land use includes domestic and ranching.



Source: ALRIS, 2004

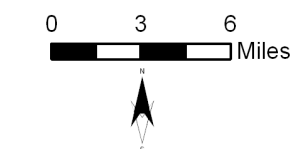


Figure 5.3-2
Tonto Creek Basin
Land Ownership

- Land Ownership**
(Percentage in Basin)
- National Forest (97.5%)
 - Private (2.4%)
 - Indian Reservation (0.1%)
- COUNTY**
- Major Road
 - City, Town or Place

5.3.3 Climate of the Tonto Creek Basin

Climate data from NOAA/NWS Co-op Network and SNOTEL/Snowcourse stations are compiled in Table 5.3-1 and the locations are shown on Figure 5.3-3. Figure 5.3-3 also shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Tonto Creek Basin does not contain Evaporation Pan or AZMET stations. More detailed information on climate in the planning area is found in Section 5.0.3. A description of the climate data sources and methods is found in Volume 1, Appendix A.

NOAA/NWS Co-op Network

- Refer to Table 5.3-1A
- There are three NOAA/NWS Co-op network climate stations in the basin. The average monthly maximum temperature occurs in July at all stations and ranges between 86.8°F at Reno R.S. and 81.9°F at Gisela. The average monthly minimum temperature occurs in January or December and ranges between 40.8°F at Gisela and 45.3°F at Punkin Center.
- Highest average seasonal rainfall occurs in the winter (January – March) and fall (October–December). For the period of record used, the highest annual rainfall is 19.77 inches at Reno R.S. and the lowest is 18.23 inches at Punkin Center.

SNOTEL/Snowcourse

- Refer to Table 5.3-1D
- There are two stations in this basin, Promontory Butte and Promontory (SNOTEL). The Promontory Butte station was discontinued in 1989.
- Both stations are at an elevation of 7,930 feet and record highest average snowpack in April.
- The highest average snowpack at Promontory Butte is 15.1 inches and at Promontory (SNOTEL) is 13.8 inches.

SCAS Precipitation Data

- See Figure 5.3-3
- Additional precipitation data shows rainfall as high as 38 inches on the northern basin boundary at the Mogollon Rim and as low as 14 inches on the southern basin boundary south of Punkin Center.

Table 5.3-1 Climate Data for the Tonto Creek Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Total Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
Gisela	2,900	1895-2004 ¹	81.9/Jul	40.8/Dec	6.53	1.39	6.10	4.89	18.91
Reno R.S.	2,420	1915-1973 ¹	86.8/Jul	45.1/Jan	3.51	1.05	6.58	8.61	19.77
Punkin Center	2,360	1971-2000	85.9/Jul	45.3/Dec	6.92	1.23	4.83	5.24	18.23

Source: WRCC, 2005

Notes:

¹Average temperature for period of record shown; average precipitation from 1971-2000

B. Evaporation Pan:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
None			

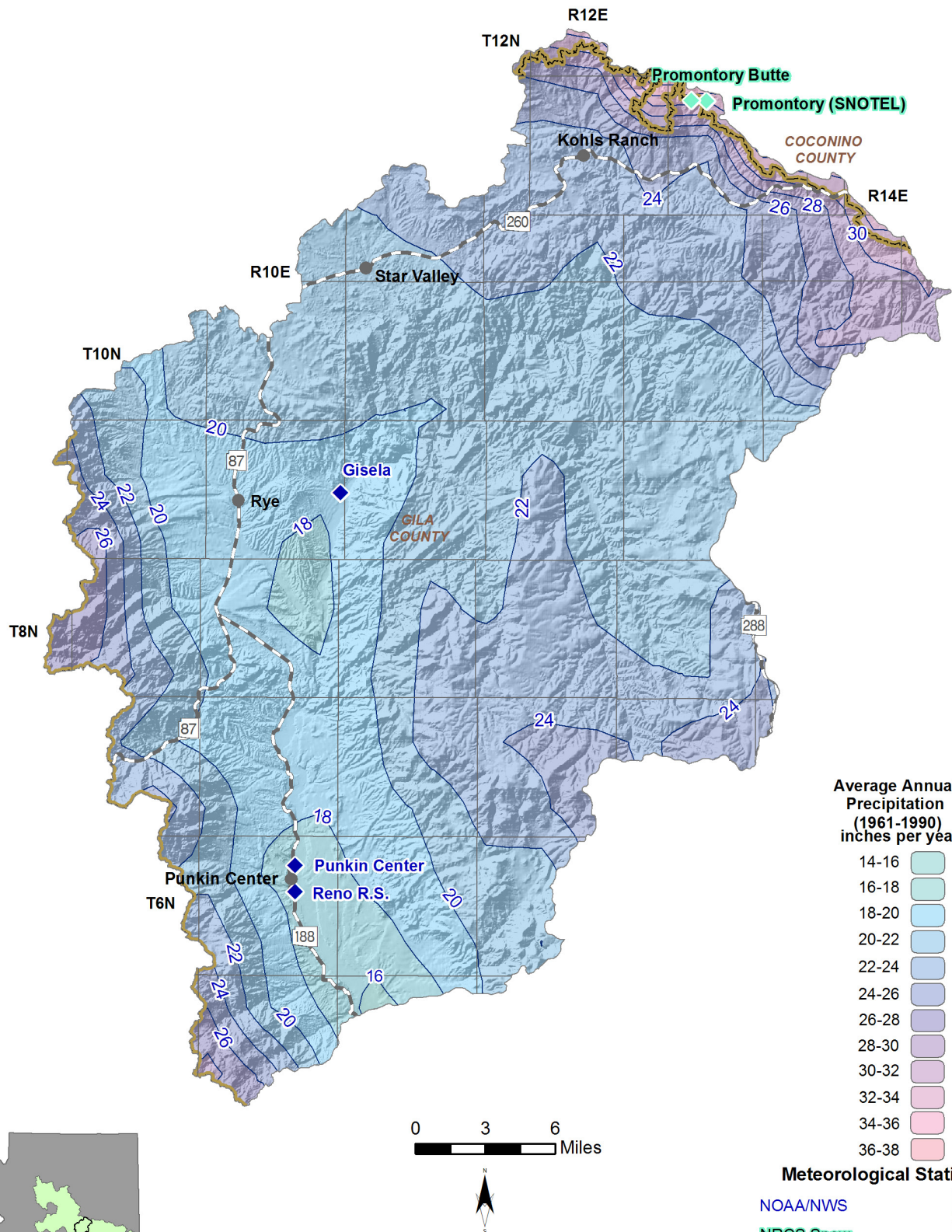
C. AZMET:

Station Name	Elevation (in feet)	Period of Record	Average Annual Reference Evapotranspiration, in inches (Number of years to calculate averages)
None			

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content (Number of measurements to calculate average)					
			Jan.	Feb.	March	April	May	June
Promontory Butte	7,930	1973 - 1989 (discontinued)	4.2 (10)	8.4 (13)	13.7 (16)	15.1 (15)	11.3 (1)	0 (0)
Promontory SNOTEL	7,930	1973 - current	3.7 (27)	8.0 (30)	13.4 (33)	13.8 (32)	2.1 (24)	0 (23)

Source: Natural Resources Conservation Service, 2006



Average Annual Precipitation (1961-1990) inches per year

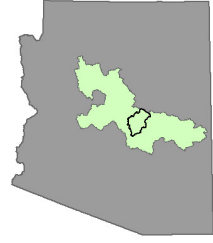
14-16	[Lightest Blue]
16-18	[Light Blue]
18-20	[Medium-Light Blue]
20-22	[Medium Blue]
22-24	[Medium-Dark Blue]
24-26	[Dark Blue]
26-28	[Purple-Blue]
28-30	[Purple]
30-32	[Dark Purple]
32-34	[Dark Blue-Black]
34-36	[Black]
36-38	[Darkest Blue]

Meteorological Stations

- NOAA/NWS ◆
- NRCS Snow ◆
- Precipitation Contour 12"
- COUNTY
- Major Road
- City, Town or Place

0 3 6 Miles

Figure 5.3-3
Tonto Creek Basin
Meteorological Stations
and Annual Precipitation



Precipitation Data Source: Oregon State University, 1998



5.3.4 Surface Water Conditions in the Tonto Creek Basin

Streamflow data, including average seasonal flow, average annual flow and other information is shown in Table 5.3-2. Flood ALERT equipment in the basin is shown in Table 5.3-3. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 5.3-4. The location of streamflow gages identified by USGS number, flood ALERT equipment and USGS runoff contours are shown on Figure 5.3-5. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Streamflow Data

- Refer to Table 5.3-2.
- Data from four stations located on two watercourses are shown in the table and on Figure 5.3-5.
- The average seasonal flow at all stations is highest in the winter (January-March) and lowest in the summer (July-September).
- The largest annual flow recorded is 469,256 acre-feet in 1978 at the Tonto Creek above Gun Creek near Roosevelt station and the smallest is 1,245 acre-feet in 1971 at the Rye Creek near Gisela station. For a hydrograph of Tonto Creek above Gun Creek near Roosevelt station from 1941-2008 see Figure 5.3-4.

Flood ALERT Equipment

- Refer to Table 5.3-3.
- As of October 2005 there were nine stations in the basin.

Reservoirs and Stockponds

- Refer to Table 5.3-4.
- The basin does not contain any large reservoirs.
- Surface water is stored or could be stored in one small reservoir in the basin.
- There are 389 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 5.3-5.
- Average annual runoff is two inches per year, or 106.6 acre-feet per square mile, in the southern tip of the basin and increases to five inches per year, or 266.5 acre-feet per square mile, in the northern portion of the basin.

Figure 5.3-4 Annual Flows (acre-feet) at Tonto Creek above Gun Creek near Roosevelt, water years 1941-2008 (Station #9499000)

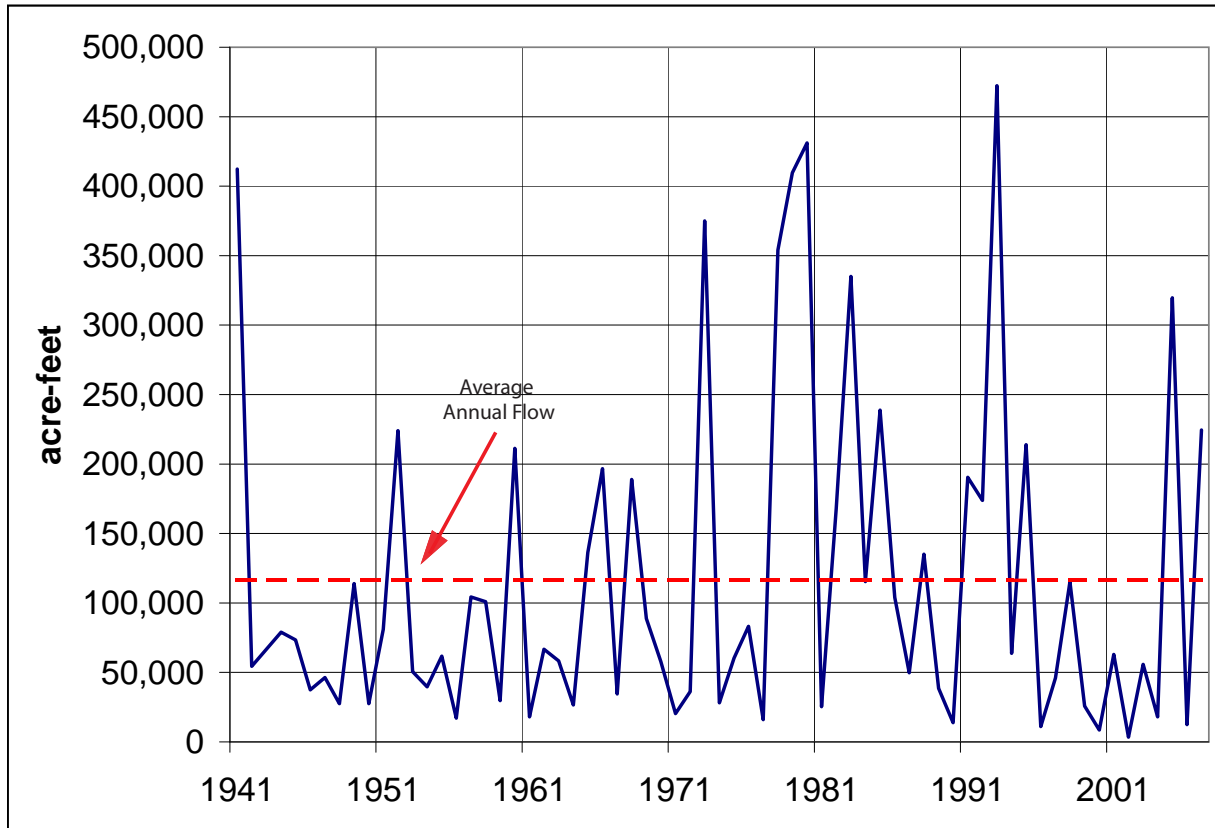


Table 5.3-2 Streamflow Data for the Tonto Creek Basin

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow (in acre-feet/year)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9498800	Tonto Creek near Gisela	430	2,940	12/1964-9/1975 (discontinued)	43	15	8	33	32,796 (1974)	68,705	93,147	236,741 (1965)	10
9498870	Rye Creek near Gisela	122	2,730	12/1965-9/1985 (discontinued)	65	10	7	18	1,245 (1971)	9,267	19,030	64,289 (1978)	19
9499000	Tonto Creek above Gun Creek near Roosevelt	675	2,523	12/1940-current (real-time)	61	12	8	19	2,853 (2002)	66,297	113,232	469,256 (1978)	62
9499500	Tonto Creek near Roosevelt	841	NA	10/1913-12/1940 (discontinued)	59	17	10	15	17,452 (1934)	89,796	104,292	225,214 (1916)	27

Source: USGS (NWIS), 2005 & 2008

Notes:

- Statistics based on Calendar Year
- Annual Flow statistics based on monthly values
- Summation of Average Annual Flows may not equal 100 due to rounding
- Period of record may not equal Year of Record used for annual Flow/Year statistics due to only using years with a 12 month record
- In Period of Record, current equals November 2008
- Seasonal and annual flow data used for the statistics was retrieved in 2005
- NA = Data not currently available to ADWR



Table 5.3-3 Flood ALERT Equipment in the Tonto Creek Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
51	Upper Deer Creek	Precipitation	NA	Gila County FCD
54	Christopher Creek	Precipitation	5/1/2005	Gila County FCD
67	Rock Creek (Rye Tributary)	Precipitation	NA	Gila County FCD
80	Hardt Creek @ SR 87	Precipitation/Stage	NA	Gila County FCD
92	Little Pine Flat	Precipitation	8/29/2005	Gila County FCD
930	Deer Creek Shake Ridge (Bar T Bar North)	Precipitation	NA	Gila County FCD
931	Upper Rye Creek	Precipitation	NA	Gila County FCD
3900	Houston Creek	Precipitation/Stage	10/26/2005	Gila County FCD
5960	Mt. Ord Repeater	Repeater/Precipitation	10/28/1982	Maricopa County FCD

Source: ADWR 2005b

Notes:

FCD = Flood Control District

NA = Data not currently available to ADWR

Table 5.3-4 Reservoirs and Stockponds in the Tonto Creek Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE	JURISDICTION
None identified by ADWR at this time					

B. Other Large Reservoirs (50 acre surface area or greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE	JURISDICTION
None identified by ADWR at this time					

Source: Compilation of databases from ADWR & others

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total number: 1

Total maximum storage: 20 acre-feet

D. Other Small Reservoirs (between 5 and 50 acres surface area)

Total number: 0

Total surface area: 0 acres

E. Stockponds (up to 15 acre-feet capacity)

Total number: 389 (from water right filings)



Stream Data Source: ALRIS, 2005b

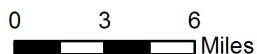


Figure 5.3-5
Tonto Creek Basin
Surface Water Conditions

USGS Annual Runoff Contour
for 1951-1980 (in inches)



Stream Channel (width of line
reflects stream order)



USGS Gage & Station ID



Flood ALERT Equip. & Station ID



COUNTY



Major Road



City, Town or Place



5.3.5 Perennial/Intermittent Streams and Major Springs in the Tonto Creek Basin

Major and minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 5.3-5. The locations of major springs and perennial and intermittent streams are shown on Figure 5.3-6. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- Perennial streams in this basin include Tonto Creek, Haigler Creek, Spring Creek, Dell Shay Creek, Houston Creek, Christopher Creek and Greenback Creek.
- There are numerous intermittent streams located throughout the basin.
- There are 10 major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time. The largest discharge rate is 1,291 gpm at Tonto spring.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 5.3-5B. There are seven minor springs identified in this basin.
- Listed discharge rates may not be indicative of current conditions. Only six springs have measured discharges in the past decade.
- The total number of springs, regardless of discharge, identified by the USGS varies from 169 to 175, depending on the database reference.

Table 5.3-5 Springs in the Tonto Creek Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
1	Tonto	342312	1110541	1,291	During or prior to 2001
2	R-C	341827	1110311	800	5/14/1952
3	Horton	342217	1110333	392	10/2/2002
4	See	342108	1110039	84	During or prior to 2002
5	Nappa	342118	1110111	70	8/17/1966
6	Henturkey ²	342037	1110541	60	10/17/1952
7	Wildcat/Arsenic	341726	1111031	59	10/20/1952
8	Indian Gardens	341926	1110610	26	During or prior to 2002
9	Winters # 3	342235	1110633	20	5/16/1952
10	Unnamed ²	342043	1110054	15	8/17/1966

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Bootleg	341852	1110358	8	During or prior to 2001
Allenbaugh	341620	1105353	8 ³	4/19/2001
Turkey-south	341356	1111752	5 ⁴	5/14/1952
Blue-south	341007	1111943	4	5/14/1952
Bear Flat/ Columbine	341716	1110357	4	7/16/1975
Winters # 1	342233	1110634	1	5/16/1952
Winters # 2	342233	1110634	1	During or prior to 1952

Source: Compilation of databases from ADWR & others

**C. Total number of springs, regardless of discharge, identified by USGS
(see ALRIS, 2005a and USGS, 2006a): 169 to 175**

Notes:

¹Most recent measurement identified by ADWR

²Spring is not displayed on current USGS topo maps

³Discharge measurements vary. Shown is greatest measured discharge; most recent measurement < 1 gpm







⁴Average gpm



Stream Data Source: AGFD, 1993 & 1997



Figure 5.3-6
Tonto Creek Basin
Perennial/Intermittent Streams
and Major (>10 gpm) Springs

- Springs 
- Intermittent Streams 
- Perennial Streams 
- COUNTY 
- Major Road 
- City, Town or Place 

5.3.6 Groundwater Conditions of the Tonto Creek Basin

Major aquifers, well yields, estimated natural recharge, estimated water in storage, number of index wells and date of last water-level sweep are shown in Table 5.3-6. Figure 5.3-7 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 5.3-8 contains hydrographs for selected wells shown on Figure 5.3-7. Figure 5.3-9 shows well yields in five yield categories. A description of aquifer data sources and methods as well as well data sources and methods, including water-level changes and well yields are found in Volume 1, Appendix A.

Major Aquifers

- Refer to Table 5.3-6 and Figure 5.3-7.
- The major aquifers in the basin are basin fill and sedimentary rock (C and R aquifers).
- Most of the basin geology consists of consolidated crystalline and sedimentary rocks.
- Flow direction is generally from the north to the south.

Well Yields

- Refer to Table 5.3-6 and Figure 5.3-9.
- As shown on Figure 5.3-9, well yields in this basin range from less than 100 gallons per minute (gpm) to greater than 2,000 gpm.
- One source of well yield information, based on 51 reported wells, indicates that the median well yield in this basin is 120 gpm.
- The highest well yields in the basin are located along Highway 188 north of Punkin Center.

Natural Recharge

- Refer to Table 5.3-6.
- Natural recharge estimates for this basin range from 17,000 acre-feet per year (AFA) to 37,000 AFA.

Recharge Sites

- Refer to Figure 5.3-7.
- There is one permitted recharge facility in this basin, ADOT-Payson (permit no. 71-579155.0001), that recharges surface water to the aquifer.
- Under the permit the facility's maximum annual storage is 150 acre-feet.

Water in Storage

- Refer to Table 5.3-6.
- Storage estimates for this basin range from 2.0 million acre-feet (maf) to 9.4 maf to a depth of 1,200 feet.

Water Level

- Refer to Figure 5.3-7. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures 13 index wells in this basin. Hydrographs for three of these wells are shown in Figure 5.3-8.
- There is one ADWR automated water-level recording device in this basin located near Star

- Valley.
- These data show the deepest recorded water level in the basin is 106 feet east of Kohls Ranch and the shallowest is 14 feet near Punkin Center.

Table 5.3-6 Groundwater Data for the Tonto Creek Basin

Basin Area, in square miles:	955	
Major Aquifer(s):	Name and/or Geologic Units	
	Basin Fill	
	Sedimentary Rock (C and R Aquifers)	
Well Yields, in gal/min:	N/A	Measured by ADWR (GWSI) and/or USGS
	Range 5-2,200 Median 120 (51 wells reported)	Reported on registration forms for large (>10-inch) diameter wells (Wells55)
	Range 10-50	ADWR (1990)
	Range 0-500	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	17,000	ADWR (1994b)
	37,000	Freethy and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	3,000,000 (to 1,200 feet)	ADWR (1994b)
	9,400,000 (to 1,200 feet)	ADWR (1992)
	2,000,000 ¹ (to 1,200 feet)	Freethy and Anderson (1986)
Current Number of Index Wells:	13	
Date of Last Water-level Sweep:	2008 (216 wells measured)	

¹ Predevelopment Estimate

N/A = not available

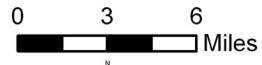
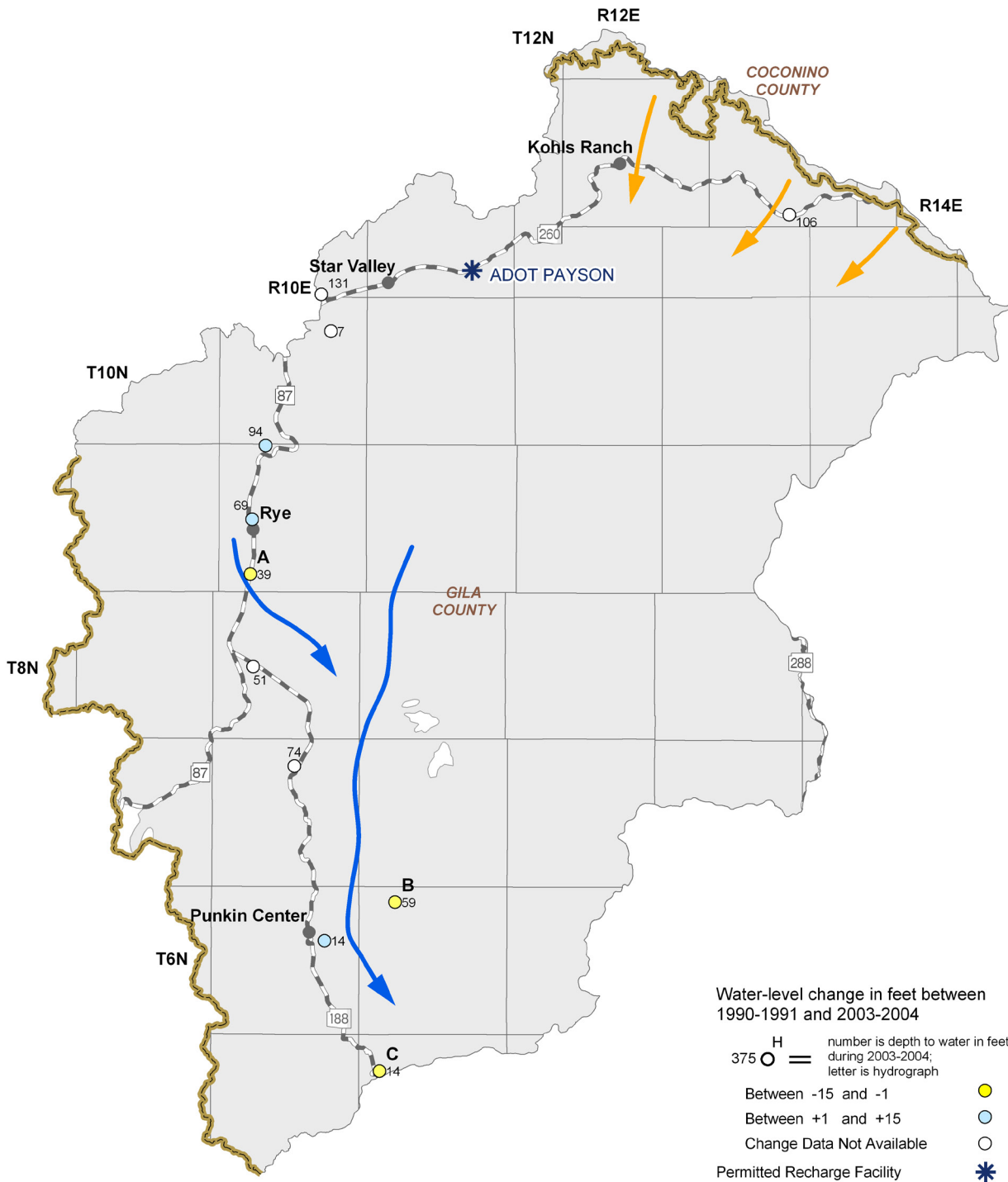
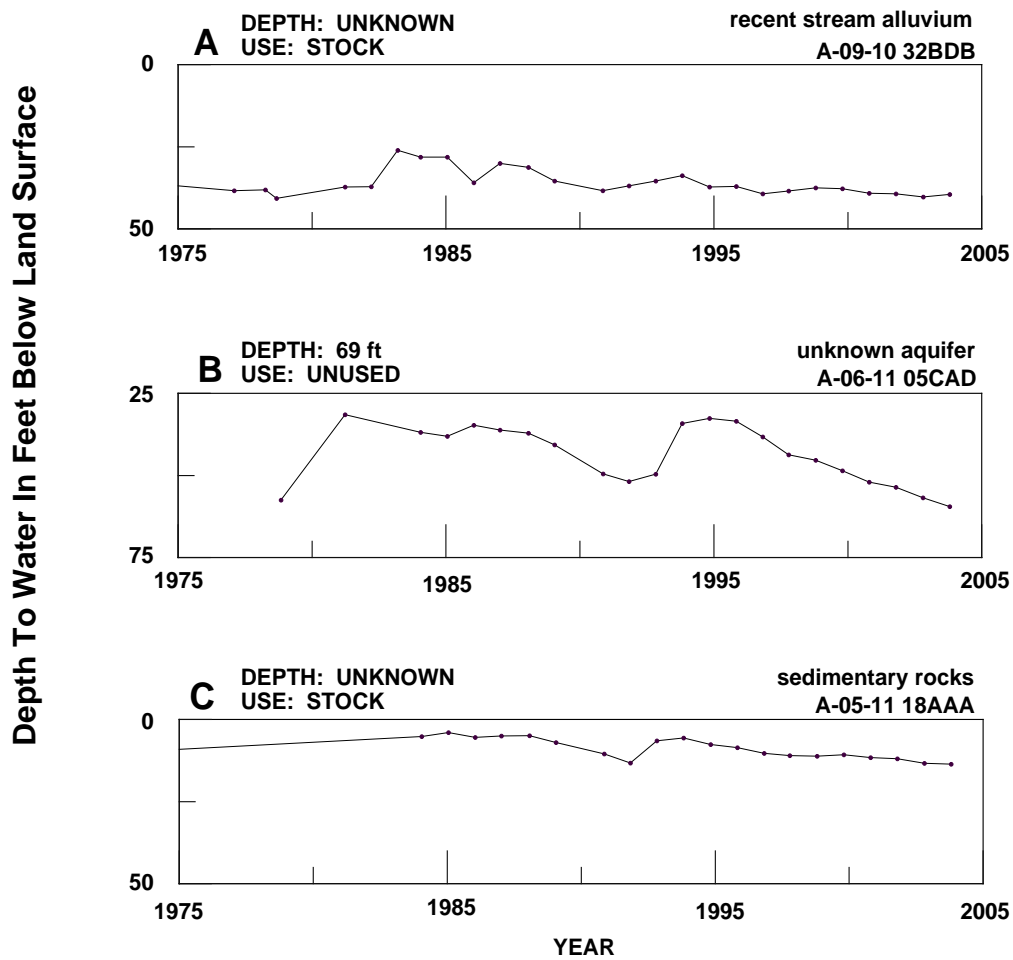
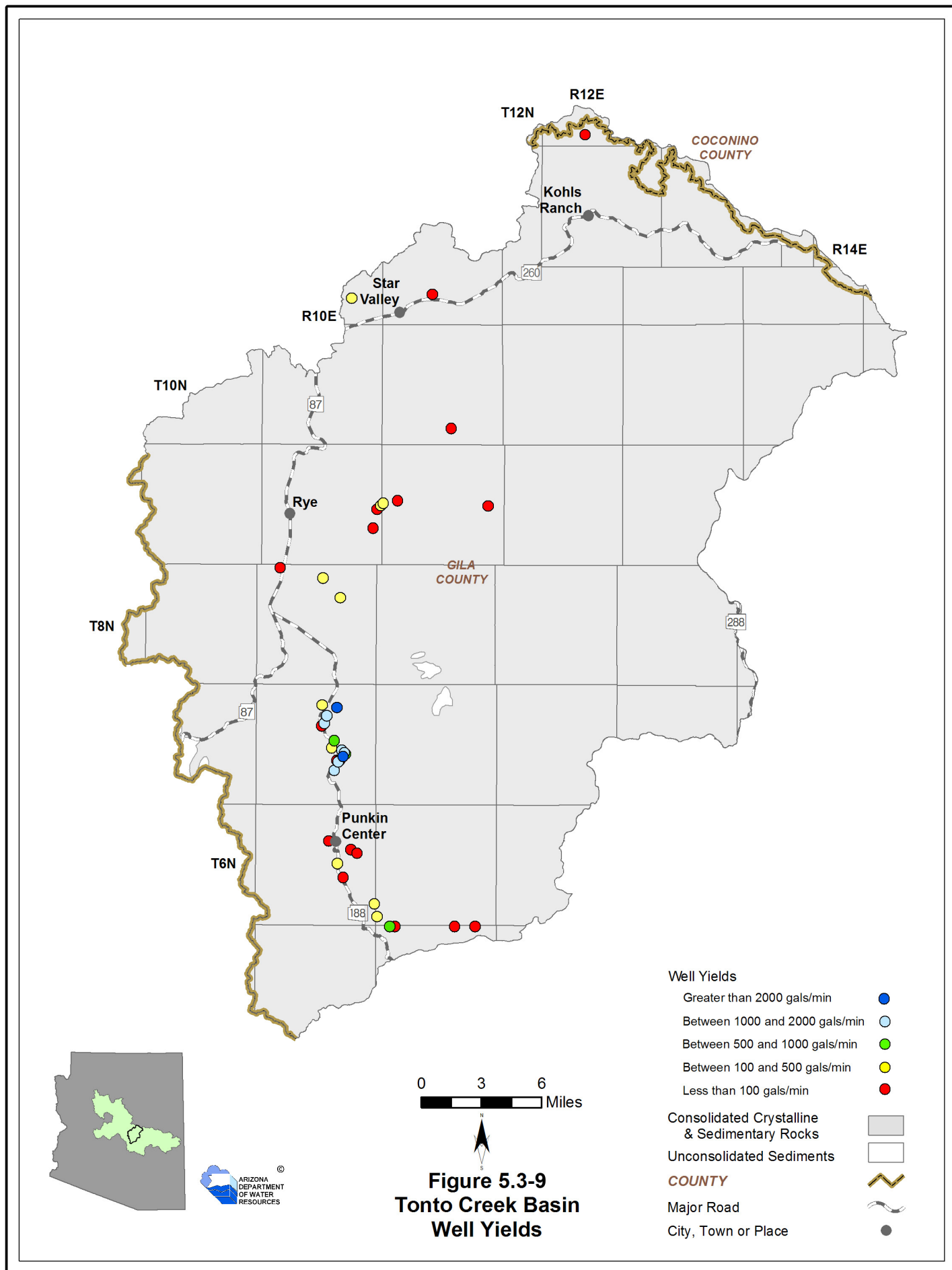


Figure 5.3-7
Tonto Creek Basin
Groundwater Conditions

- Water-level change in feet between 1990-1991 and 2003-2004
- 375 ○ = number is depth to water in feet during 2003-2004; letter is hydrograph
- Between -15 and -1 ●
 - Between +1 and +15 ●
 - Change Data Not Available ○
- Permitted Recharge Facility ✱
- Generalized Flow Direction
- "Alluvial" Aquifer →
 - "C" Aquifer →
- Consolidated Crystalline & Sedimentary Rocks
- Unconsolidated Sediments
- COUNTY —
- Major Road
- City, Town or Place ●

Figure 5.3-8
Tonto Creek Basin
Hydrographs Showing Depth to Water in Selected Wells





5.3.7 Water Quality of the Tonto Creek Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 5.3-7A. Impaired lakes and streams with site type, name, length of impaired reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 5.3-7B. Figure 5.3-10 shows the location of water quality occurrences keyed to Table 5.3-7. All community water systems are regulated under the Safe Drinking Water Act and treat water supplies to meet drinking water standards. Not all parameters were measured at all sites; selective sampling for particular constituents is common. A description of water quality data sources and methods is found in Volume 1, Appendix A.

Well, Mine or Spring sites that have equaled or exceeded drinking water standards (DWS)

- Refer to Table 5.3-7A.
- Nine sites have parameter concentrations that have equaled or exceeded drinking water standards
- Standards equaled or exceeded in this basin include arsenic, nitrate, beryllium, radionuclides and organic compounds.

Lakes and Streams with impaired waters

- Refer to Table 5.3-7B.
- Water quality standards were equaled or exceeded in three stream reaches on two streams.
- The standard exceeded in all reaches was E. coli. The two reaches on Tonto Creek also exceeded the standard for nitrogen.
- All three impaired reaches are part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) program. The final TMDL reports for the streams have been completed and draft implementation plans are available for the two reaches on Tonto Creek.

Table 5.3-7 Water Quality Exceedences in the Tonto Creek Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section	
1	Well	11 North	12 East	34	Rad
2	Well	9 North	10 East	25	As
3	Well	9 North	11 East	18	Rad
4	Well	9 North	12 East	23	As, NO3
5	Well	8 North	10 East	13	NO3
6	Well	8 North	10 East	26	Be
7	Well	8 North	10 East	26	As
8	Well	8 North	10 East	27	As
9	Well	5 North	11 East	8	Organics

Source: Compilation of databases from ADWR & others

B. Lakes and Streams

Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard ³	Parameter(s) Exceeding Use Standard ²
a	Stream	Christopher Creek (headwaters to Tonto Creek)	8	NA	FBC	E. coli
b	Stream	Tonto Creek (headwaters to unnamed tributary latitude 341810, longitude -1110414)	8	NA	A&W, FBC	E. coli, N, DO
c	Stream	Tonto Creek (unnamed tributary latitude 341810, longitude -1110414 to Haigler Creek)	9	NA	A&W, FBC	E. coli, N

Source: ADEQ 2005d

Notes:

¹ Water quality samples taken from 1979 to 2002

²As = Arsenic

Be = Beryllium

DO = Dissolved Oxygen

N = Nitrogen

NO3 = Nitrate

Organics = One or more of several volatile and semi-volatile organic compounds and pesticides

Rad = One or more of the following radionuclides - Gross Alpha, Gross Beta, Radium, and Uranium

³ A&W = Aquatic and Wildlife

FBC = Full Body Contact

NA = Not Applicable

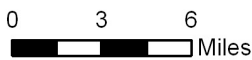
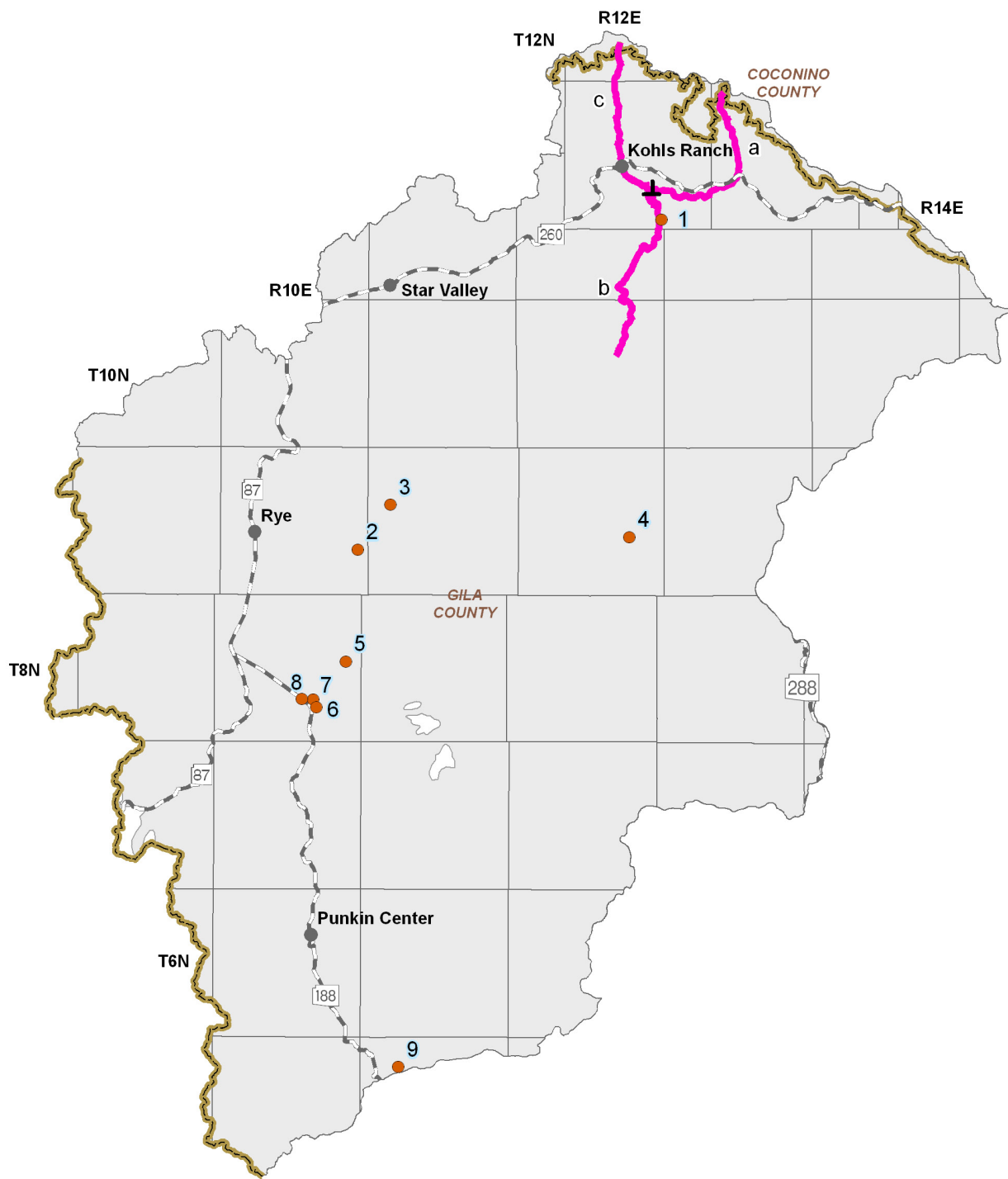


Figure 5.3-10
Tonto Creek Basin
Water Quality Conditions

- Well, Spring or Mine Site that has Equaled or Exceeded DWS ● 1
- Impaired Stream or Lake ~ a
- Consolidated Crystalline & Sedimentary Rocks
- Unconsolidated Sediments
- COUNTY** ~
- Major Road
- City, Town or Place



5.3.8 Cultural Water Demand in the Tonto Creek Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 5.3-8. Effluent generation including facility ownership, location, population served and not served, volume treated, disposal method and treatment level is shown in Table 5.3-9. Figure 5.3-11 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Appendix A. More detailed information on cultural water demand is found in Section 5.0.7.

Cultural Water Demand

- Refer to Table 5.3-8 and Figure 5.3-11.
- Population in this basin has increased from 1,934 in 1980 to 7,975 in 2000.
- Groundwater use has fluctuated from a low of 2,000 AFA in the 1970s to an average of 4,000 AFA from 1986-1990. During 2001-2005 the average annual groundwater demand was 3,050 AFA.
- Municipal groundwater use has increased from an average of 1,600 AFA in 1991-1995 to 2,400 AFA in 2001-2005.
- There was no reported industrial groundwater use in 1991-1995. In 2001-2005, industrial demand was less than 300 AFA.
- Groundwater demand for irrigation was less than 1,000 AFA during 1991-2005.
- Information on surface water diversions is not available from 1971-1990. From 1991-2005, 1,000 AFA was used for irrigation.
- Municipal and industrial demand is principally found in the vicinity of Payson and Star Valley with smaller demand centers scattered along State Highways 188 and 260 as well as east of Rye.
- A small amount of agriculture is located east of Rye and in T9N, R10E.
- There is one small mine or quarry in this basin along Highway 87 south of Payson.
- As of 2005 there were 1,948 registered wells with a pumping capacity of less than or equal to 35 gpm and 280 wells with a pumping capacity of more than 35 gpm.

Effluent Generation

- Refer to Table 5.3-9.
- There are three wastewater treatment facilities in this basin. Data on population served, volume treated and disposal method was only available for one facility. This facility serves approximately 100 people, generates 13 acre-feet of effluent each year and discharges to Houston Creek.

Table 5.3-8 Cultural Water Demand in the Tonto Creek Basin¹

Year	Estimated and Projected Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						Data Source
				Well Pumpage			Surface-Water Diversions			
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Agricultural	Municipal	Industrial	Agricultural	
1971										
1972										
1973										
1974										
1975										
1976										
1977										
1978										
1979										
1980	1,934									
1981	2,202									
1982	2,470									
1983	2,738									
1984	3,006									
1985	3,275									
1986	3,543									
1987	3,811									
1988	4,079									
1989	4,347									
1990	4,615									
1991	4,951									
1992	5,287									
1993	5,623									
1994	5,959									
1995	6,295									
1996	6,631									
1997	6,967									
1998	7,303									
1999	7,639									
2000	7,975									
2001	8,186									
2002	8,398									
2003	8,609									
2004	8,820									
2005	9,032									
2010	10,088									
2020	12,641									
2030	14,538									
WELL TOTALS:		1,948	280							

Notes:

NR - Not reported

¹ Does not include effluent or evaporation losses from stockponds and reservoirs.

² Includes all wells through 1980.

Table 5.3-9 Effluent Generation in the Tonto Creek Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet/year)	Disposal Method						Current Treatment Level	Population Not Served	Year of Record	
					Water-course	Evaporation Pond	Irrigation	Golf Course/Turf/Landscape	Wildlife Area	Discharge to another Facility				Infiltration Basins
Houston Creek Landing WWTP	NA	Star Valley												
Hunter Creek WWTP	Private	Hunter Creek												
Pine Meadows WWTP	Private	Star Valley	108 ¹	13	Houston Creek							Tertiary	NA	2007

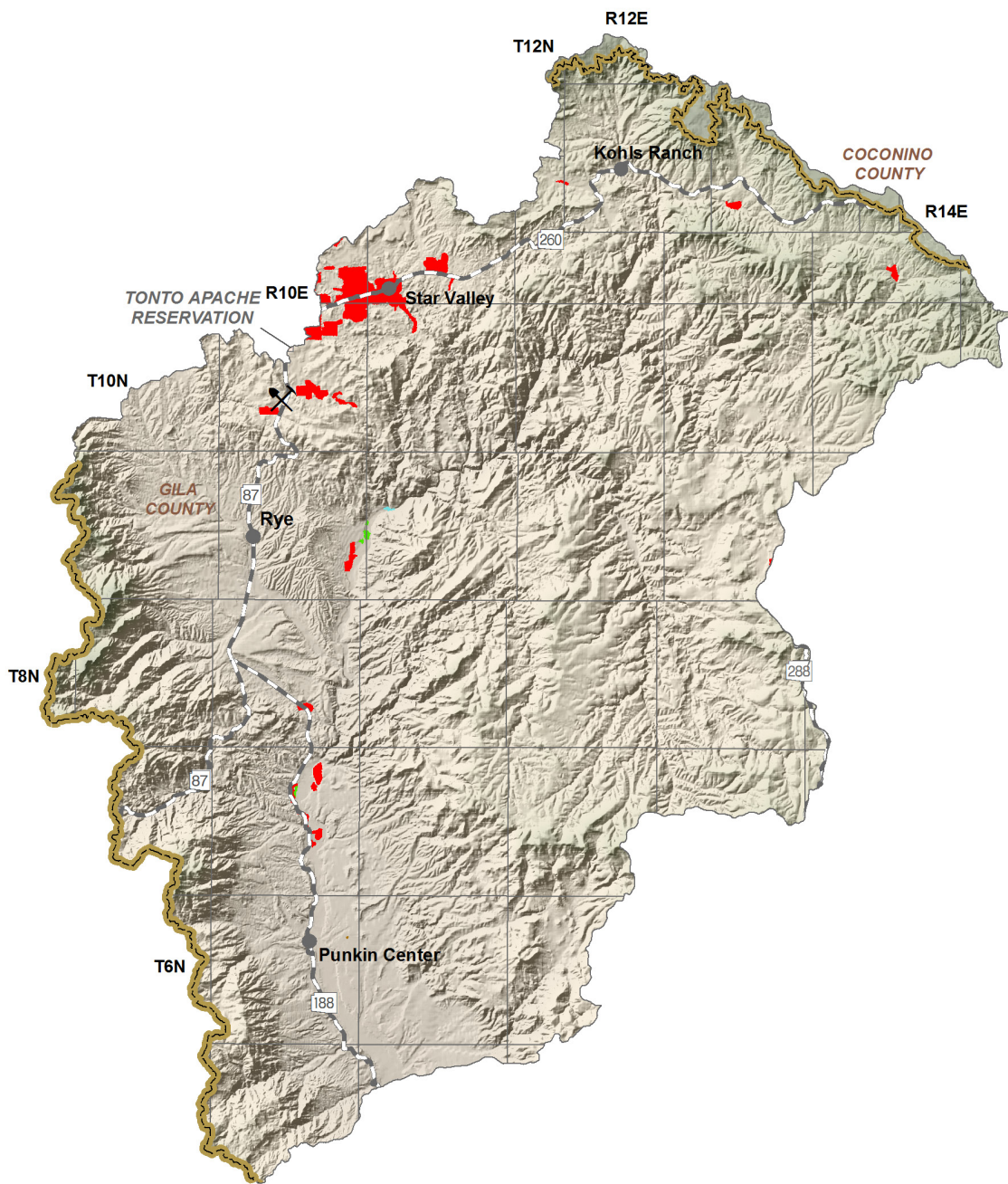
Source: Compilation of databases from ADWR & others

Notes:

NA: Data not currently available to ADWR

WWTP: Waste Water Treatment Plant

¹Population increases in the summer



Primary Data Source: USGS National Gap Analysis Program, 2004

0 3 6 Miles



Figure 5.3-11
Tonto Creek Basin
Cultural Water Demand

Demand Centers

- Agriculture
- M&I - High Intensity
- M&I - Low Intensity
- Small Mine / Quarry
- Indian Reservation
- COUNTY
- Major Road
- City, Town or Place



5.3.9 Water Adequacy Determinations in the Tonto Creek Basin

Water adequacy determination information including the subdivision name, location, number of lots, adequacy determination, reason for the inadequacy determination, date of determination and subdivision water provider are shown in Table 5.3-10A and B for water reports and analysis of adequate water supply. Figure 5.3-12 shows the locations of subdivisions keyed to the Table. A description of the Water Adequacy Program is found in Volume 1, Appendix C. Adequacy determination data sources and methods are found in Volume 1, Appendix A.

- All subdivisions receiving an adequacy determination are in Gila County. Sixty-two water adequacy determinations for 4,184 lots have been made in this basin through December 2008. Four hundred and forty-one lots in eight subdivisions, or 13% of lots, were determined to be adequate.
- The most common reason for an inadequate determination was because the applicant did not submit the necessary information and/or available hydrologic data were insufficient to make a determination.
- One Analysis of Adequate Water Supply application for 34 lots has been approved for this basin.

Table 5.3-10 Adequacy Determinations in the Tonto Creek Basin¹

Map Key	Subdivision Name	County	Location		No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application	
			Township	Range							Section
1	Alpine Heights	Gila	11 North	10 East	26,27,34,35	257	Inadequate	A1,A2	7/1/1978	United Utilities Company	
2	Boulder Creek	Gila	10 North	10 East	11	20	Inadequate	A1	11/18/2004	Town of Payson	
4	Chaparral Estates	Gila	11 North	10 East	35	88	Inadequate	A1	6/29/2001	Town of Payson	
5	Chaparral Highlands	Gila	11 North	10 East	26	19	Inadequate	A1	11/20/2006	Town of Payson	
6	Chaparral Pines #1	Gila	11 North	10 East	25, 35, 36	475	Inadequate	A1, A2	4/26/1996	Town of Payson	
7	Chaparral Pines #2	Gila	11 North	10 East	25, 35, 36	281	Inadequate	A1	4/3/1997	Town of Payson	
8	Chaparral Ranch	Gila	11 North	10 East	25, 26	14	Inadequate	A2, C	2/23/1995	Town of Payson	
9	Collins Ranch	Gila	12 North	12 East	32	36	Inadequate	A1	1/15/1980	Dry Lot Subdivision	
10	Deer Creek Village	Gila	8 North	10 East	5	154	Inadequate	A1,A2	4/9/1982	NA	
11	East Gateway	Gila	10 North	10 East	2	19	Inadequate	A1	2/9/2006	Town of Payson	
12	East Gateway Phase 2, Lots 20 thru 25	Gila	10 North	10 East	2	6	Inadequate	A1	1/18/2007	Town of Payson	
13	Elk Ridge	Gila	10 North	10 East	10	108	Inadequate	A2, C	10/5/1995	Town of Payson	
14	Evergreen Meadows	Gila	10 North	11 East	5, 8	63	Inadequate	B	8/11/1975	Dry Lot Subdivision	
15	Foothills East	Gila	11 North	10 East	35	6	Inadequate	A1	10/19/1998	Town of Payson	
16	Forest Edge	Gila	10 North	10 East	11	31	Inadequate	A1	7/5/2007	Town of Payson	
17	Gisela Heights	Gila	9 North	10 East	24, 25	47	Adequate		3/30/1977	Dry Lot Subdivision	
18	Golden Frontier #1	Gila	10 North	10 East	10	112	Inadequate	A1, A2	1/17/1980	United Utilities Company	
19	Golden Frontier #2	Gila	10 North	10 East	10	87	Inadequate	A1, A2	8/15/1984	Town of Payson	
20	Gordon Canyon Creek	Gila	10.5 North 11 North	14 East 13 East	20 36	7	Inadequate	A1, A2	8/10/1976	Dry Lot Subdivision	
21	Granite Dells Estates	Gila	10 North	10 East	2, 11	20	Inadequate	A1, A2	1/19/1977	Dry Lot Subdivision	
22	Greenback Vista Estates	Gila	6 North	10 East	14	35	Adequate		9/22/1998	United Utilities Company	
23	Green Valley Estates	Gila	10 North	31 East	NA	53	Inadequate	A1	4/26/1994	Town of Payson	
24	Haigler Creek Haciendas	Gila	10 North	13 East	13	29	Inadequate	A1, B	4/11/1983	Dry Lot Subdivision	
25	Highlands at the Rim	Gila	10 North	10 East	2	130	Inadequate	A1	2/12/2002	Town of Payson	
26	Houston Creek Landing	Gila	11 North	11 East	32	91	Inadequate	A1	8/25/2000	Brooke Utilities	
27	Hunter Creek Ranch	Gila	11 North	13 East	29, 30, 31, 32	118	Adequate		2/27/1990	Hunter Creek Ranch HOA	
28	Juniper Ridge	Gila	11 North	10 East	26	6	Inadequate	A1	2/9/1999	Town of Payson	
29	Knolls, The #01	Gila	11 North	11 East	31	34	Inadequate	A1, A2	8/24/1993	United Utilities Company	
30	Knolls, The #02	Gila	11 North	11 East	31	22	Inadequate	A1, A2	3/28/1994	United Utilities Company	
31	Knolls, The #03	Gila	11 North	11 East	31	27	Inadequate	A2	1/11/1996	United Utilities Company	
32	Kohl's Ranch	Gila	11 North	12 East	21	123	Inadequate	A1, A2	5/16/1995	Kohl's Ranch Water Company	
33	Kohl's Tonto Creek Ranch	Gila	11 North	12 East	21	20	Adequate		7/8/1977	Kohl's Ranch Water Company	
34	Oak Ridge Hills	Gila	11 North	10 East	26	9	Inadequate	A2	7/1/1996	Town of Payson	
35	Pine Gate	Gila	11 North	10 East	36	11	Inadequate	A1	4/21/1998	Town of Payson	
36	Pine Island at Chaparral Pines	Gila	11 North	10 East	36	43	Inadequate	A1, A2	4/26/1996	Town of Payson	
37	Pine Ridge	Gila	11 North	11 East	32	36	Inadequate	A1, A2	2/2/1999	Brooke Utilities	
38	Pinon Ridge #1	Gila	10 North	10 East	10	41	Inadequate	A1	5/14/1997	Town of Payson	
39	Pinon Ridge Unit Two	Gila	10 North	10 East	10	39	Inadequate	A1	3/20/1998	Town of Payson	

Table 5.3-10 Adequacy Determinations in the Tonto Creek Basin (Cont)¹

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section						
40	Ponderosa Springs (Colcord Spgs)	Gila	11 North	14 East	28, 27, 34, 35	53-501205	Adequate		1/2/1980	Dry Lot Subdivision	
41	Preserve, The, on Haigler Creek	Gila	10 North	13 East	13	53-501212	Inadequate	A1	1/13/1986	Dry Lot Subdivision	
42	Punkin Center Village	Gila	6 North	10 East	13, 14	53-501228	Inadequate	A1	10/15/1984	Sheer Speed Water Company	
43	Quail Valley	Gila	11 North	11 East	34	53-501239	Inadequate	A1, A2	4/30/1982	United Utilities Company	
44	Quail Valley #2	Gila	11 North	11 East	32	53-501240	Inadequate	A1, A2	3/17/1987	United Utilities Company	
45	Ridge at Hunter Creek	Gila	11 North	13 East	29	53-300505	Adequate		8/10/1998	Hunter Creek Ranch HOA	
46	Rim Club Cabins, Unit One	Gila	10 North	10 East	1	53-401384	Inadequate	D	9/2/2004	Town of Payson	
47	Rim Golf Club	Gila	11 North	10 East	36, 1	53-300426	Inadequate	A1	4/21/1998	Town of Payson	
48	Rim View Heights Estates	Gila	10 North	10 East	10, 11	53-501299	Inadequate	A1, A2	3/21/1988	Town of Payson	
49	San Gianni Hills	Gila	11 North	10 East	26	53-401759	Inadequate	A1	5/31/2005	Town of Payson	
50	Settle in at Pine Meadows	Gila	11 North	12 East	32, 33	53-400482	Inadequate	A1	4/6/2001	Pine Meadows Domestic Water System	
51	Siena Creek	Gila	11 North	10 East	36	53-400859	Inadequate	A1	12/23/2002	Town of Payson	
52	Star Valley Vista	Gila	11 North	11 East	31, 32	53-501450	Inadequate	A1, A2	3/18/1987	United Utilities Company	
53	Tonto Creek Shores	Gila	9 North	10 East	25	53-300532	Inadequate	A1	9/9/1998	United Utilities Company	
54	Tonto Creek Shores B	Gila	9 North	10 East	25	53-400392	Inadequate	A1	9/18/2000	NA	
55	Tonto Rim Ranch	Gila	11 North	12 East	4, 9	53-300557	Inadequate	A1	11/13/1998	Tonto Creek Utility Co.	
56	Tonto Village #3	Gila	11 North	12 East	5, 8	53-501565	Adequate		7/17/1978	Tonto Village Water Co.	
57	Walnut Springs	Gila	6 North	10 East	26	53-501664	Adequate		1/6/1998	United Utilities Company	
58	Whisper Ridge	Gila	10 North	10 East	2	53-400774	Inadequate	A1	8/8/2002	Town of Payson	
59	Wilderness Rim	Gila	11 North	10 East	36	53-700531	Inadequate		6/17/2008	NA	
60	Wildflower Ridge	Gila	11 North	10 East	35	53-401559	Inadequate	A1	11/17/2004	Town of Payson	
61	Wood Canyon Ranch	Gila	11 North	12 East	32	53-401556	Inadequate		3/16/2005	NA	
62	Woods of Payson, The	Gila	11 North	10 East	26	53-300372	Inadequate	A1	10/8/1997	Town of Payson	
63	Zane Grey Ranch	Gila	12 North	12 East	32	53-501717	Inadequate	A1	8/5/1993	Zane Grey Ranch Homeowners	

B. Analysis of Adequate Water Supply

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section				
3	Boulder Ridge	Gila	11 North	10 East	35	53-700562	9/8/2008	Town of Payson	

Source: ADWR 2008a

Notes:

¹Each determination of the adequacy of water supplies available to a subdivision is based on the information available to ADWR and the standards of review and policies in effect at the time the determination was made. In some cases, ADWR might make a different determination if a similar application were submitted today, based on the hydrologic data and other information currently available, as well as current rules and policies.

² Prior to February 1995, ADWR did not assign file numbers to applications for adequacy. Between 1995-2006 all applications for adequacy were given a file number with a 22 prefix.

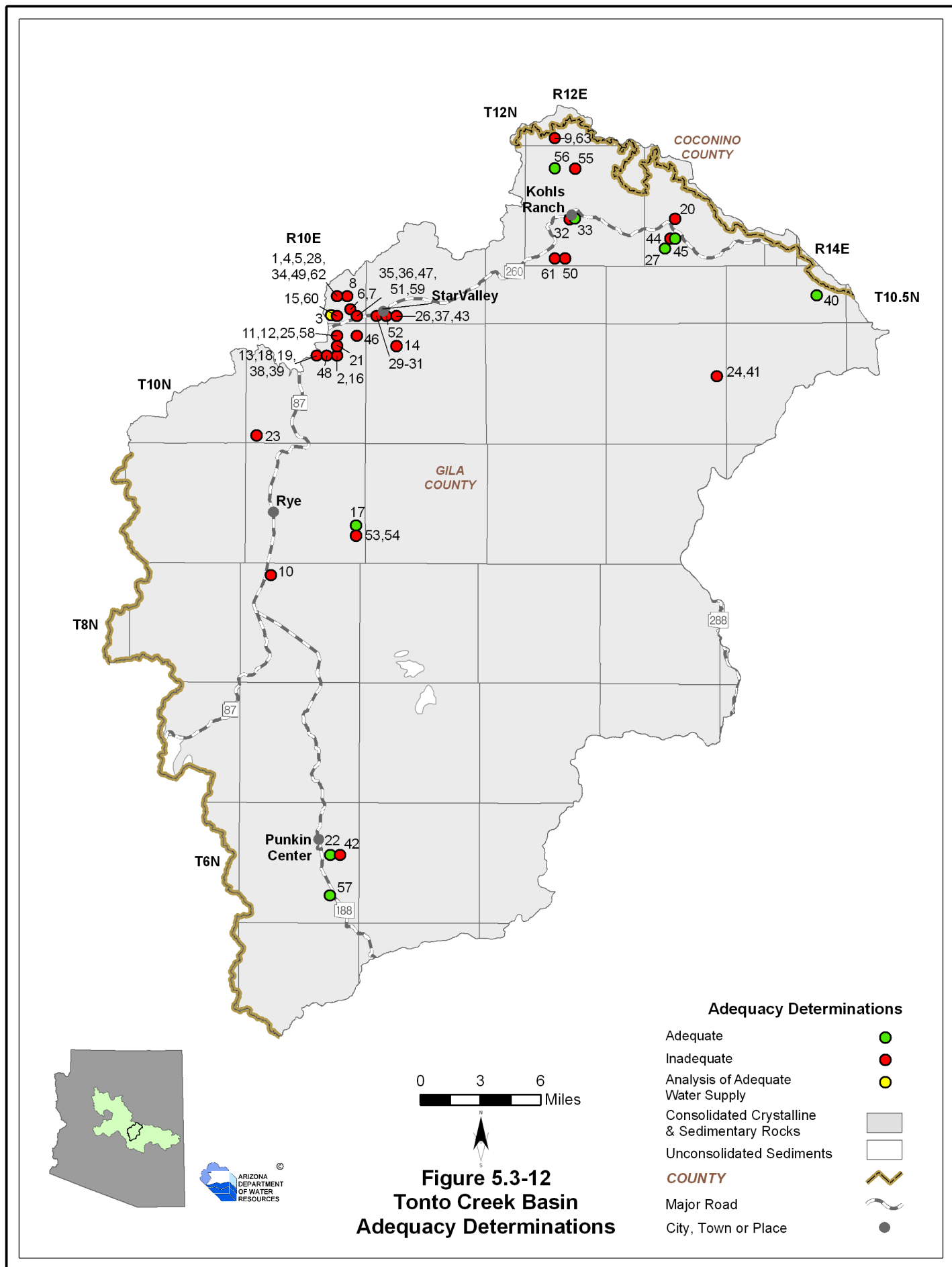
³ A. Physical/Continuous
1. Insufficient Data (applicant chose not to submit necessary information, and/or available hydrologic data insufficient to make determination)
2. Insufficient Supply (existing water supply unreliable or physically unavailable; for groundwater, depth-to-water exceeds criteria)
3. Insufficient Infrastructure (distribution system is insufficient to meet demands or applicant proposed water hauling)

B. Legal (applicant failed to demonstrate a legal right to use the water or failed to demonstrate the provider's legal authority to serve the subdivision)

C. Water Quality

D. Unable to locate records

NA = Not Available



Tonto Creek Basin

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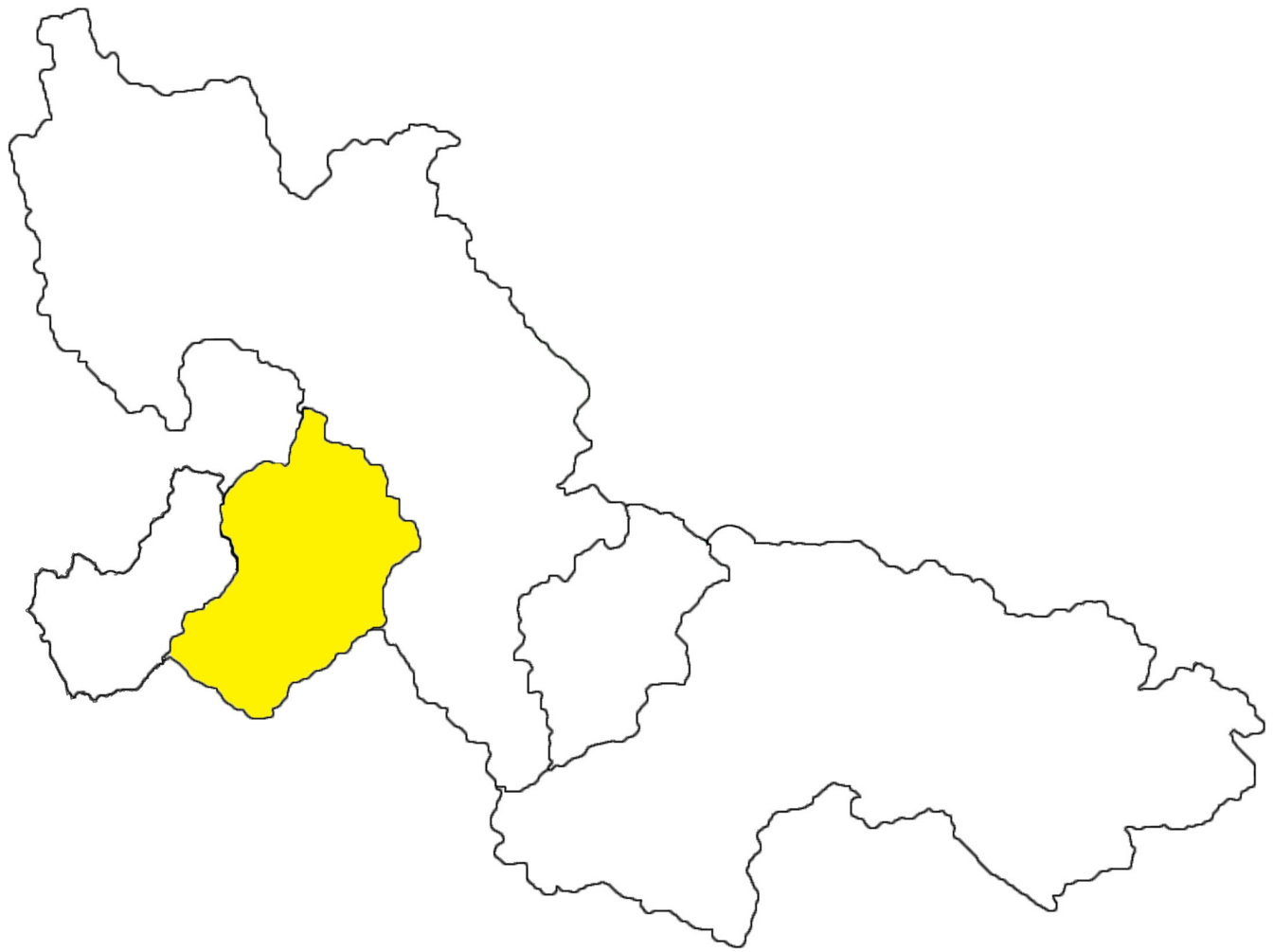
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Section 5.4

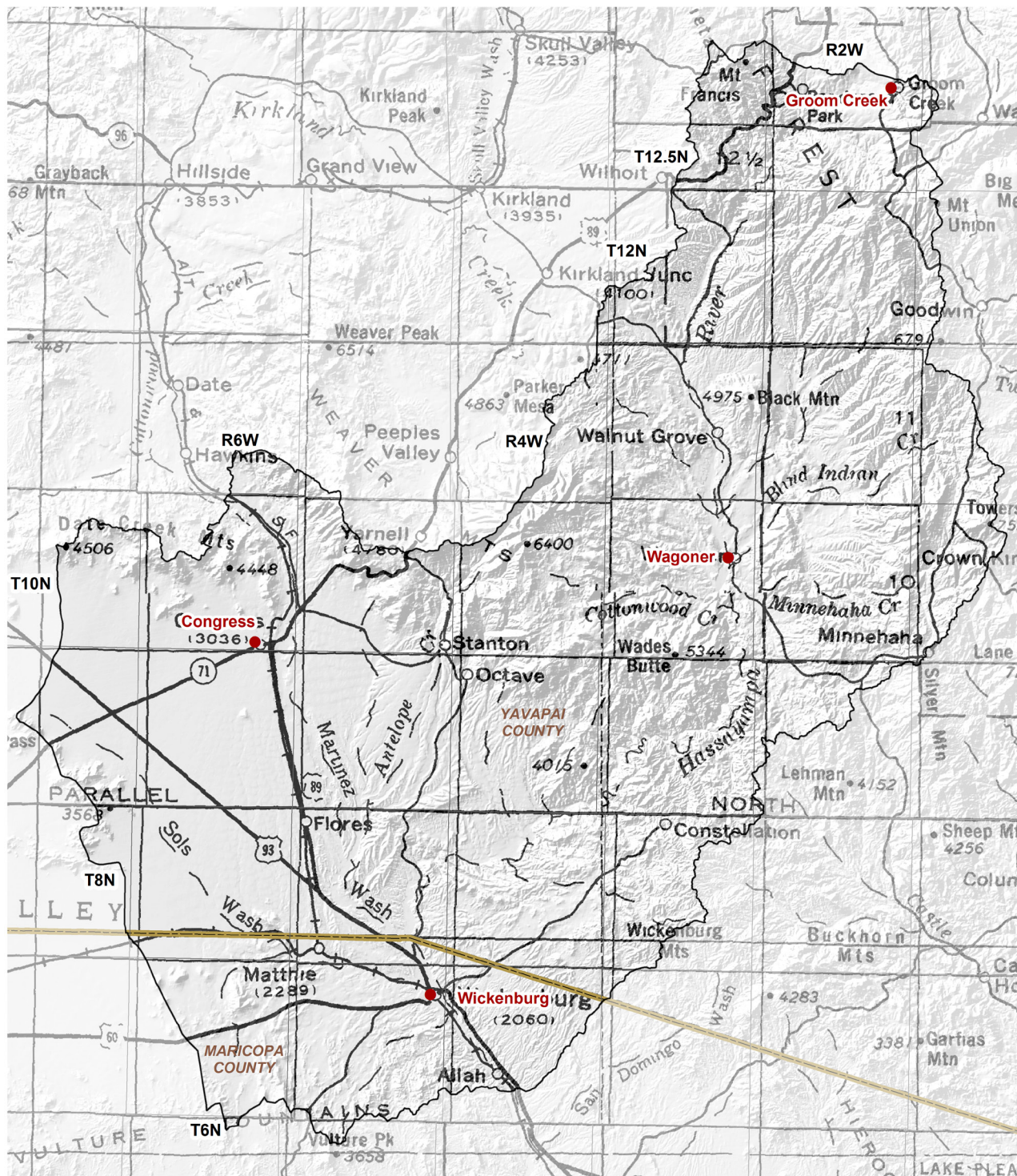
Upper Hassayampa Basin



5.4.1 Geography of the Upper Hassayampa Basin

The Upper Hassayampa Basin, located in the eastern part of the planning area is the smallest basin in the planning area at 787 square miles. Geographic features and principal communities are shown on Figure 5.4-1. The basin is characterized by mid-elevation mountains and valleys. Vegetation types include Arizona upland Sonoran and Mohave desertscrub, semi-desert grassland, interior chaparral and small areas of montane conifer forest. (see Figure 5.0-10) Riparian vegetation including mesquite and cottonwood/willow is found along the perennial portions of the Hassayampa River.

- Principal geographic features shown on Figure 5.4-1 are:
 - Hassayampa River running north to south through the center of the basin and Wickenburg
 - Martinez Wash and Antelope Creek in the center of the basin
 - Weaver Mountains northeast of Congress, the Bradshaw Mountains along the eastern basin boundary and the Date Creek Mountains north of Congress.
 - The highest point in the basin is about 7,000 feet in the Bradshaw Mountains east of Wagoner
 - The lowest point in the basin at 1,900 feet at Allah where the Hassayampa River exits the basin



Base Map: USGS 1:500,000, 1981

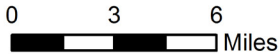


Figure 5.4-1
Upper Hassayampa Basin
Geographic Features

COUNTY 
City, Town or Place 

5.4.2 Land Ownership in the Upper Hassayampa Basin

Land ownership, including the percentage of ownership by category, for the Upper Hassayampa River Basin is shown in Figure 5.4-2. The principal feature of land ownership in this basin is the relatively large portion of state trust land. A description of land ownership data sources and methods is found in Volume 1, Section 1.3.8. More detailed information on protected areas is found in Section 5.0.4. Land ownership categories are discussed below in the order from largest to smallest percentage in the basin.

State Trust Land

- 38.3% of the land in this basin is held in trust for the public schools and three other beneficiaries under the State Trust Land system.
- State land is located throughout most of the basin. In the western portion of the basin state land is contiguous and in the remainder of the basin it is interspersed with private and Bureau of Land Management (BLM) lands.
- Primary land use is grazing.

National Forest

- 24.7% of the land is federally owned and managed by the United States Forest Service (USFS).
- Forest lands in the basin are part of the Prescott National Forest.
- The basin contains one National Forest wilderness area, the 25,536-acre Castle Creek Wilderness. (see Figure 5.0-13)
- All forest lands are in the northern portion of the basin and contain numerous private in-holdings.
- Land uses include recreation, grazing and timber production.

U.S. Bureau of Land Management (BLM)

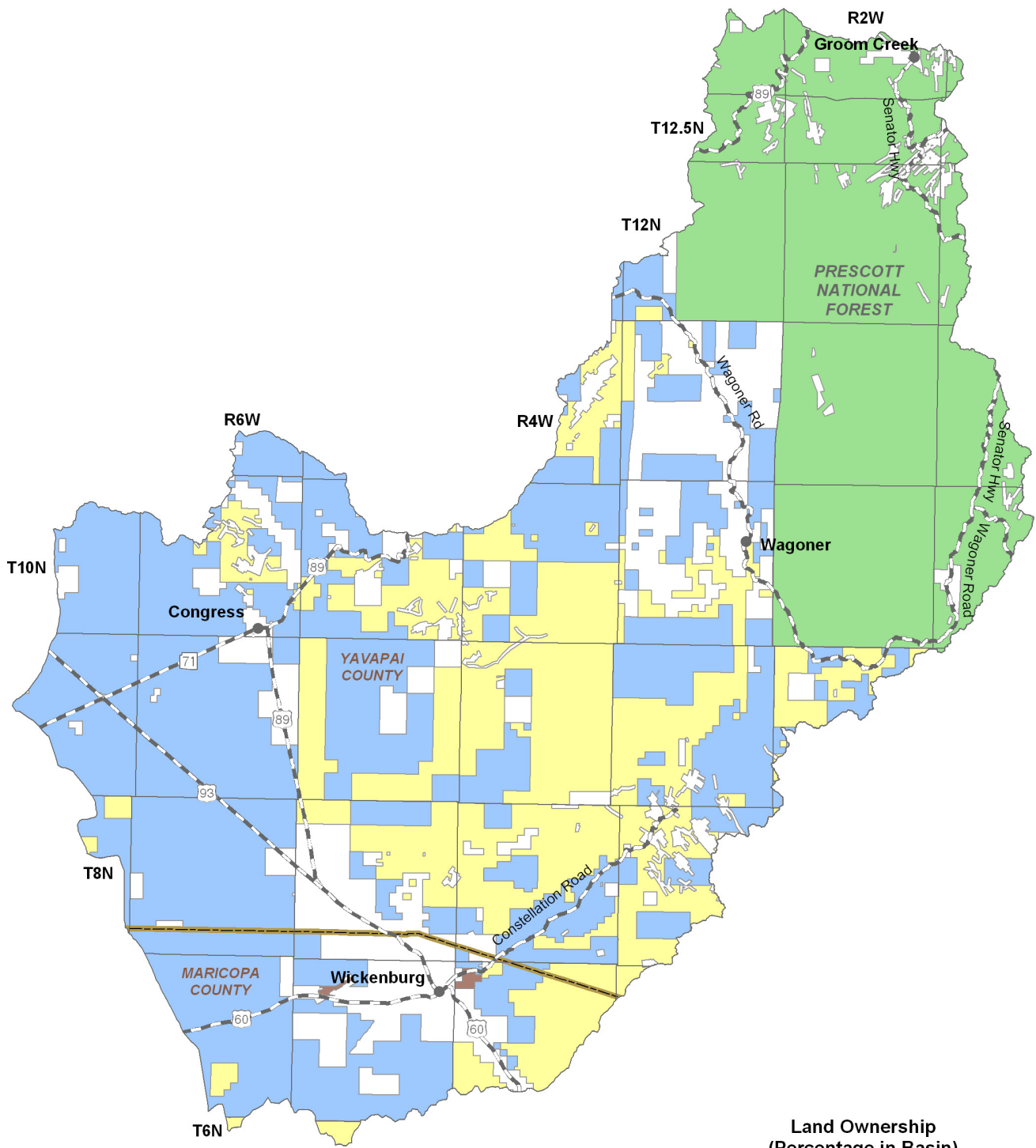
- 20.7% of the land is federally owned and managed by the Hassayampa Field office of the BLM.
- Large, contiguous parcels of BLM lands are located in the center of the basin.
- The basin includes the 11,840-acre Hassayampa River Canyon Wilderness Area. (see Figure 5.0-13)
- Land uses include recreation and grazing.

Private








- 16.2% of the land is private.
- Private land is located throughout the basin interspersed with state, BLM and National Forest lands. Larger portions of private land are located in the vicinity of Wickenburg and along Wagoner Road.
- Land uses include domestic, commercial and ranching.

Other (Game and Fish, County and Bureau of Reclamation Lands)

- 0.1% of the land is owned and managed by the City of Wickenburg as local parks.
- Primary land use is recreation.



**Land Ownership
(Percentage in Basin)**

- State Trust (38.3%) 
 - National Forest (24.7%) 
 - U.S. Bureau of Land Management (20.7%) 
 - Private (16.2%) 
 - Other (0.1%) 
- COUNTY**
- Major Road 
 - City, Town or Place 

0 3 6
Miles



**Figure 5.4-2
Upper Hassayampa Basin
Land Ownership**



Source: ALRIS, 2004



5.4.3 Climate of the Upper Hassayampa Basin

Climate data from NOAA/NWS Co-op stations are compiled in Table 5.4-1 and the locations are shown on Figure 5.4-3. Figure 5.4-3 also shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Upper Hassayampa Basin does not contain Evaporation Pan, AZMET or SNOTEL/Snowcourse stations. More detailed information on climate in the planning area is found in Section 5.0.3. A description of the climate data sources and methods is found in Volume 1, Appendix A.

NOAA/NWS Co-op Network

- Refer to Table 5.4-1A
- There are three NOAA/NWS Co-op network climate stations in the basin. The average monthly maximum temperature occurs in July at all stations and ranges between 68.9°F at Groom Creek and 87.2°F at Wickenburg. The average monthly minimum temperature occurs in January or December and ranges between 49.4°F at Wickenburg to 34.2°F at Groom Creek.
- Highest average seasonal rainfall occurs in the winter (January – March) and summer (July-September). For the period of record used, the highest annual rainfall is 22.08 inches at Groom Creek and the lowest is 12.25 inches at Wickenburg.

SCAS Precipitation Data

- See Figure 5.4-3
- Additional precipitation data shows rainfall as high as 32 inches on the east central basin boundary and as low as 10 inches in the southern portion of the basin around Wickenburg.

Table 5.4-1 Climate Data for the Upper Hassayampa Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Total Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
Groom Creek	6,110	1948-1976 ¹	68.9/Jul	34.2/Jan	5.15	3.12	8.79	5.02	22.08
Wickenburg	2,050	1971-2000	87.2/Jul	49.4/Dec	4.48	0.86	4.36	2.55	12.25
Stanton	3,480	1948-1969	83.5/Jul	48.0/Jan	4.27	1.35	6.09	3.65	15.35

Source: WRCC, 2005

Notes:

¹Average temperature for period of record shown; average precipitation from 1971-2000

B. Evaporation Pan:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
None			

C. AZMET:

Station Name	Elevation (in feet)	Period of Record	Average Annual Reference Evapotranspiration, in inches (Number of years to calculate averages)
None			

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content (Number of measurements to calculate average)					
			Jan.	Feb.	March	April	May	June
None								

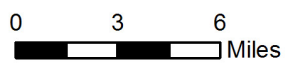
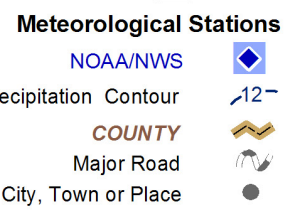
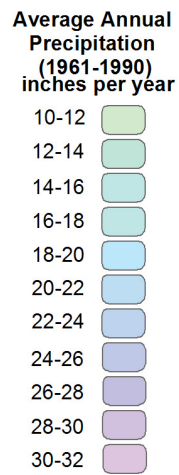
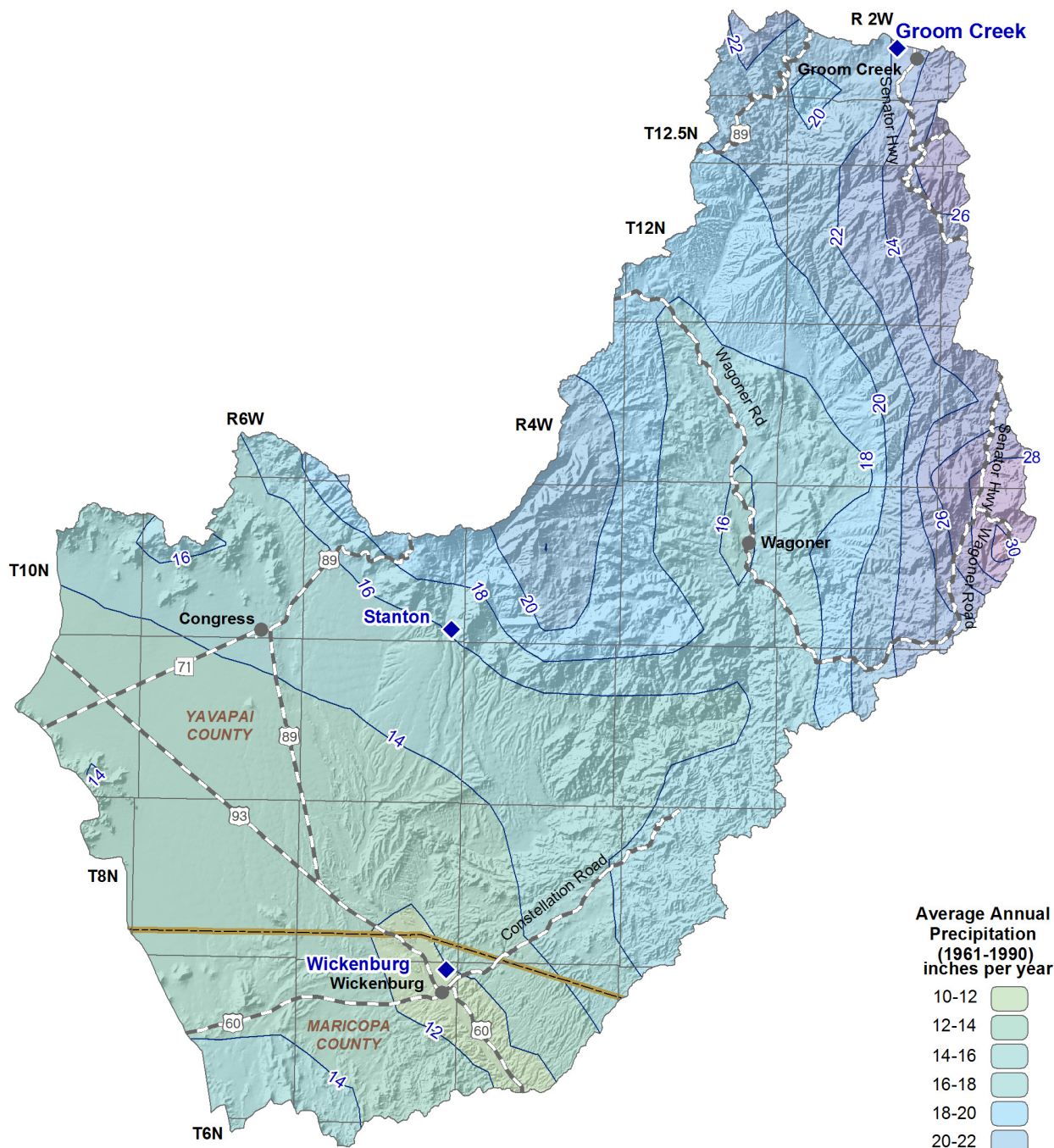
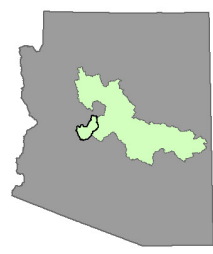


Figure 5.4-3
Upper Hassayampa Basin
Meteorological Stations
and Annual Precipitation



Precipitation Data Source: Oregon State University, 1998



5.4.4 Surface Water Conditions in the Upper Hassayampa Basin

Streamflow data, including average seasonal flow, average annual flow and other information is shown in Table 5.4-2. Flood ALERT equipment in the basin is shown in Table 5.4-3. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 5.4-4. The location of streamflow gages identified by USGS number, flood ALERT equipment and USGS runoff contours are shown on Figure 5.4-4. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Streamflow Data

- Refer to Table 5.4-2.
- Data from three stations located at the Hassayampa River are shown in the table and on Figure 5.4-4. All of the stations have been discontinued.
- The average seasonal flow at most stations is highest in the winter (January-March) and the average seasonal flow is lowest at all stations in the fall (October-December).
- The highest annual flow recorded in the basin is 123,076 acre-feet in 1980 at the Hassayampa River at Box Damsite near Wickenburg station. The minimum annual flow was 731 acre-feet in 1981 at the Hassayampa River at Walnut Grove near Wagoneer station.

Flood ALERT Equipment

- Refer to Table 5.4-3.
- As of October 2005 there were 34 stations in the basin.

Reservoirs and Stockponds

- Refer to Table 5.4-4.
- The basin does not contain any large reservoirs.
- Surface water is stored or could be stored in seven small reservoirs.
- There are 266 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 5.4-4.
- Average annual runoff is 0.5 inches per year, or 26.5 acre-feet per square mile, in most of the basin with one inch of runoff, or 53.3 acre-feet per square mile, in a small area along the west central basin boundary. There is a small portion on the southwest tip of the basin where the average annual runoff is 0.2 inches per year, or 10.66 acre-feet per square mile.

Table 5.4-2 Streamflow Data for the Upper Hassayampa Basin

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow (in acre-feet/year)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9514500	Hassayampa River near Wagoner	79	3,742	1/1940-9/1946 (discontinued)	41	41	9	8	1,499 (1940)	3,015	6,552	23,022 (1941)	6
9515000	Hassayampa River at Walnut Grove near Wagoner	107	NA	11/1912-10/1983 (discontinued)	55	23	14	9	731 (1981)	2,907	3,989	9,412 (1982)	4
9515500	Hassayampa River at Box Damsite near Wickenburg	417	2,236	1/1938-9/1982 (discontinued)	59	15	14	11	883 (1962)	7,457	17,585	123,076 (1980)	35

Source: USGS (NWIS) 2005 & 2008

Notes:

Statistics based on Calendar Year

Annual Flow statistics based on monthly values

Summation of Average Annual Flows may not equal 100 due to rounding

Period of record may not equal Year of Record used for annual Flow/Year statistics due to only using years with a 12 month record

In Period of Record, current equals November 2008

Seasonal and annual flow data used for the statistics was retrieved in 2005

NA = Not available

Table 5.4-3 Flood ALERT Equipment in the Upper Hassayampa Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
320	Saw Mountain	Precipitation	11/8/90	Yavapai County FCD
358	Mt. Union Repeater	Repeater/Weather Station	4/28/92	Maricopa County FCD
5225	Hassayampa River @ US 60	Precipitation/Stage	3/14/94	Maricopa County FCD
5230	Sunset FRS	Precipitation/Stage	5/11/89	Maricopa County FCD
5245	Sunnycove FRS	Precipitation/Stage	7/1/86	Maricopa County FCD
5260	Vulture Mine Road	Precipitation	10/14/81	Maricopa County FCD
5275	Sols Wash @ SR 71	Precipitation/Stage	9/24/81	Maricopa County FCD
5290	Yarnell Hill	Repeater/Precipitation	7/13/81	Maricopa County FCD
5305	Hassayampa River @ Box Canyon	Precipitation/Stage	11/17/83	Maricopa County FCD
5320	O'Brien Gulch	Precipitation	9/1/81	Maricopa County FCD
5340	Towers Mountain Repeater	Repeater/Precipitation	5/1/92	Maricopa County FCD
5350	Hassayampa River @ Wagoner Rd.	Precipitation/Stage	12/19/83	Maricopa County FCD
7000	Stanton	Precipitation	6/16/94	Maricopa County FCD
7005	Mid-Martinez Creek	Precipitation	4/27/95	Maricopa County FCD
7010	Martinez Creek	Precipitation/Stage	11/23/94	Maricopa County FCD
7020	Congress	Precipitation	6/16/94	Maricopa County FCD
7025	Sols Tributary @ US 93	Precipitation/Stage	5/2/05	Maricopa County FCD
7030	Sols Tank	Precipitation	7/25/95	Maricopa County FCD
7035	Black Hill	Precipitation	6/15/95	Maricopa County FCD
7040	Sols Wash near Matthie	Precipitation/Stage	8/4/95	Maricopa County FCD
7050	Black Mountain	Precipitation	7/6/94	Maricopa County FCD
7060	Hartman Wash	Precipitation/Stage	7/6/94	Maricopa County FCD
7070	Flying E Tank	Precipitation	5/9/95	Maricopa County FCD
7080	Flying E Wash	Precipitation/Stage	7/12/94	Maricopa County FCD
7090	Casandro Wash	Precipitation/Stage	7/12/94	Maricopa County FCD
7100	Constellation Road	Precipitation	8/3/94	Maricopa County FCD
7110	Powder House Wash	Precipitation/Stage	5/18/95	Maricopa County FCD
7120	Wickenburg Airport	Weather Station	8/3/94	Maricopa County FCD
7130	Casandro Dam	Precipitation/Stage	3/26/91	Maricopa County FCD
7135	Centennial Divide	Precipitation	8/21/01	Maricopa County FCD
7155	Burton Tank	Precipitation	3/19/02	Maricopa County FCD
7160	Bucks Well	Precipitation	12/11/02	Maricopa County FCD
7165	Antelope Creek	Precipitation/Stage	7/9/03	Maricopa County FCD
7170	Upper Martinez Creek	Precipitation	2/26/02	Maricopa County FCD

Source: ADWR 2005b

Notes:

FCD = Flood Control District
FRS = Flood Retarding Structure

Table 5.4-4 Reservoirs and Stockponds in the Upper Hassayampa Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE	JURISDICTION
None identified by ADWR at this time					

B. Other Large Reservoirs (50 acre surface area or greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE	JURISDICTION
None identified by ADWR at this time					

Source: Compilation of databases from ADWR & others

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total number: 7

Total maximum storage: 1,684 acre-feet

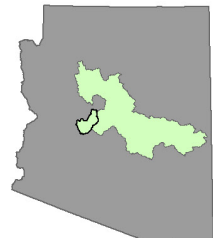
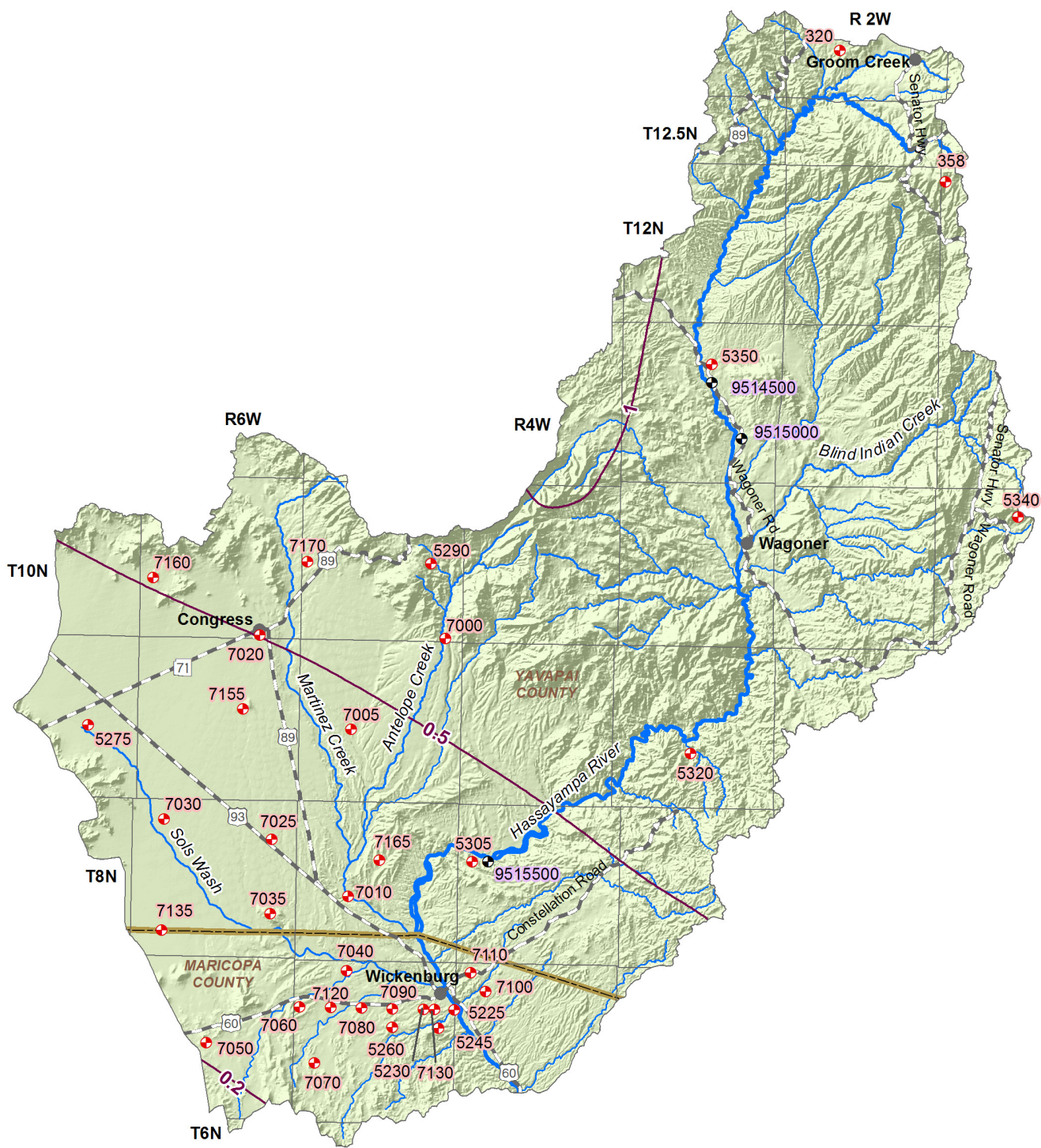
D. Other Small Reservoirs (between 5 and 50 acres surface area)

Total number: 0

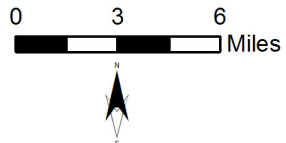
Total surface area: 0 acres

E. Stockponds (up to 15 acre-feet capacity)

Total number: 266 (from water right filings)



Stream Data Source: ALRIS, 2005b



- USGS Annual Runoff Contour for 1951-1980 (in inches) 0.2
- Stream Channel (width of line reflects stream order) [blue line symbol]
- USGS Gage & Station ID 9999999
- Flood ALERT Equip. & Station ID 9999
- COUNTY [yellow and brown symbols]
- Major Road [dashed line symbol]
- City, Town or Place [black dot symbol]

Figure 5.4-4
Upper Hassayampa Basin
Surface Water Conditions

5.4.5 Perennial/Intermittent Streams and Major Springs in the Upper Hassayampa Basin

There are no data on major or minor springs in this basin (Table 5.4-5). The locations of perennial and intermittent streams are shown on Figure 5.4-5. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- Perennial reaches in this basin include portions of the Hassayampa River, Ash Creek, Weaver Creek, Minnehaha Creek and Antelope Creek.
- Intermittent streams are located predominantly in the northern portion of the basin.
- All perennial streams are intermittent for most of their length.
- The total number of springs with discharges of less than one gpm identified by the USGS ranges from 164 to 166, depending on the database reference.

Table 5.4-5 Springs in the Upper Hassayampa Basin

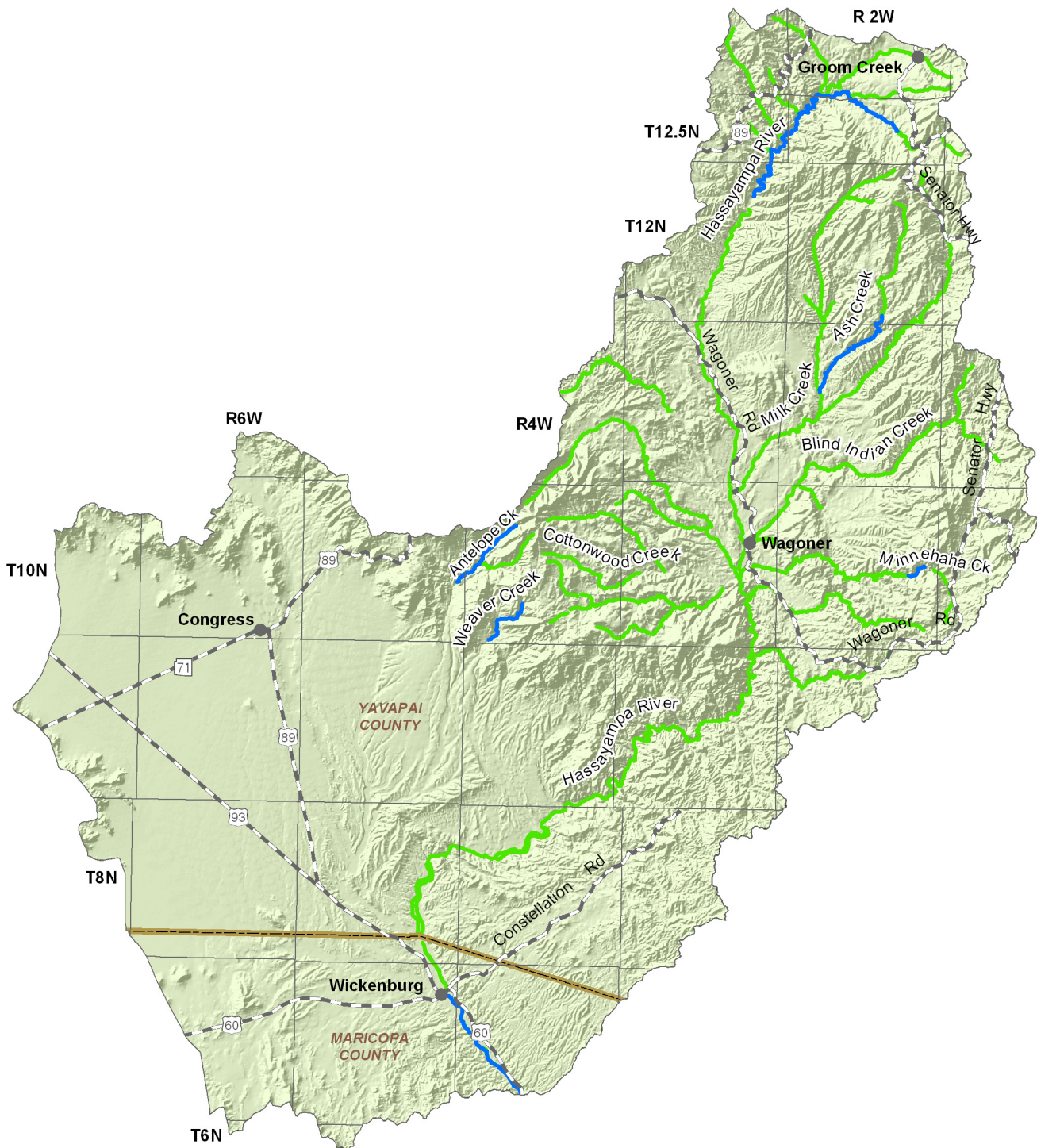
A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm)	Date Discharge Measured
		Latitude	Longitude		
None identified by ADWR at this time					

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm)	Date Discharge Measured
	Latitude	Longitude		
None identified by ADWR at this time				

**C. Total number of springs, regardless of discharge, identified by USGS
(see ALRIS, 2005a and USGS, 2006a): 164 to 166**



Stream Data Source: AGFD, 1993 & 1997

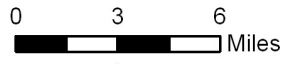


Figure 5.4-5
Upper Hassayampa Basin
Perennial/Intermittent Streams
and Major (>10 gpm) Springs

- Intermittent Streams
- Perennial Streams
- COUNTY
- Major Road
- City, Town or Place

5.4.6 Groundwater Conditions of the Upper Hassayampa Basin

Major aquifers, well yields, estimated natural recharge, estimated water in storage, number of index wells and date of last water-level sweep are shown in Table 5.4-6. Figure 5.4-6 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 5.4-7 contains hydrographs for selected wells shown on Figure 5.4-6. Figure 5.4-8 shows well yields in four yield categories. A description of aquifer data sources and methods as well as well data sources and methods, including water-level changes and well yields are found in Volume 1, Appendix A.

Major Aquifers

- Refer to Table 5.4-6 and Figure 5.4-6.
- The major aquifer in the basin is basin fill.
- Flow direction is generally from the north to the south.

Well Yields

- Refer to Table 5.4-6 and Figure 5.4-8.
- As shown on Figure 5.4-8 well yields in this basin range from less than 100 gallons per minute (gpm) to 2,000 gpm.
- One source of well yield information, based on 61 reported wells, indicates that the median well yield in this basin is 125 gpm.

Natural Recharge

- Refer to Table 5.4-6.
- The natural recharge estimates for this basin is 8,000 acre-feet per year (AFA).

Water in Storage

- Refer to Table 5.4-6.
- Storage estimates for this basin range from 1.0 million acre-feet (maf) to 1.1 maf to a depth of 1,200 feet.

Water Level

- Refer to Figure 5.4-6. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures five index wells in this basin. Hydrographs for three index wells (B-D) and one other well are shown in Figure 5.4-7.
- There is one ADWR automated groundwater level monitoring device located near Congress.
- These data show the deepest recorded water level is 817 feet west of Congress and the shallowest is 20 feet in the vicinity of Wickenburg.

Table 5.4-6 Groundwater Data for the Upper Hassayampa Basin

Basin Area, in square miles:	787	
Major Aquifer(s):	Name and/or Geologic Units	
	Basin Fill	
Well Yields, in gal/min:	Range 1-1,324 Median 125 (61 wells reported)	Reported on registration forms for large (>10-inch) diameter wells (Wells55)
	Range 100-500	ADWR (1990)
	Range 0-500	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	8,000	Freethy and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	1,100,000 (to 1,200 feet)	ADWR (1994b)
	1,000,000 ¹ (to 1,200 feet)	Freethy and Anderson (1986)
Current Number of Index Wells:	5	
Date of Last Water-level Sweep:	2004 (101 wells measured)	

¹ Predevelopment Estimate

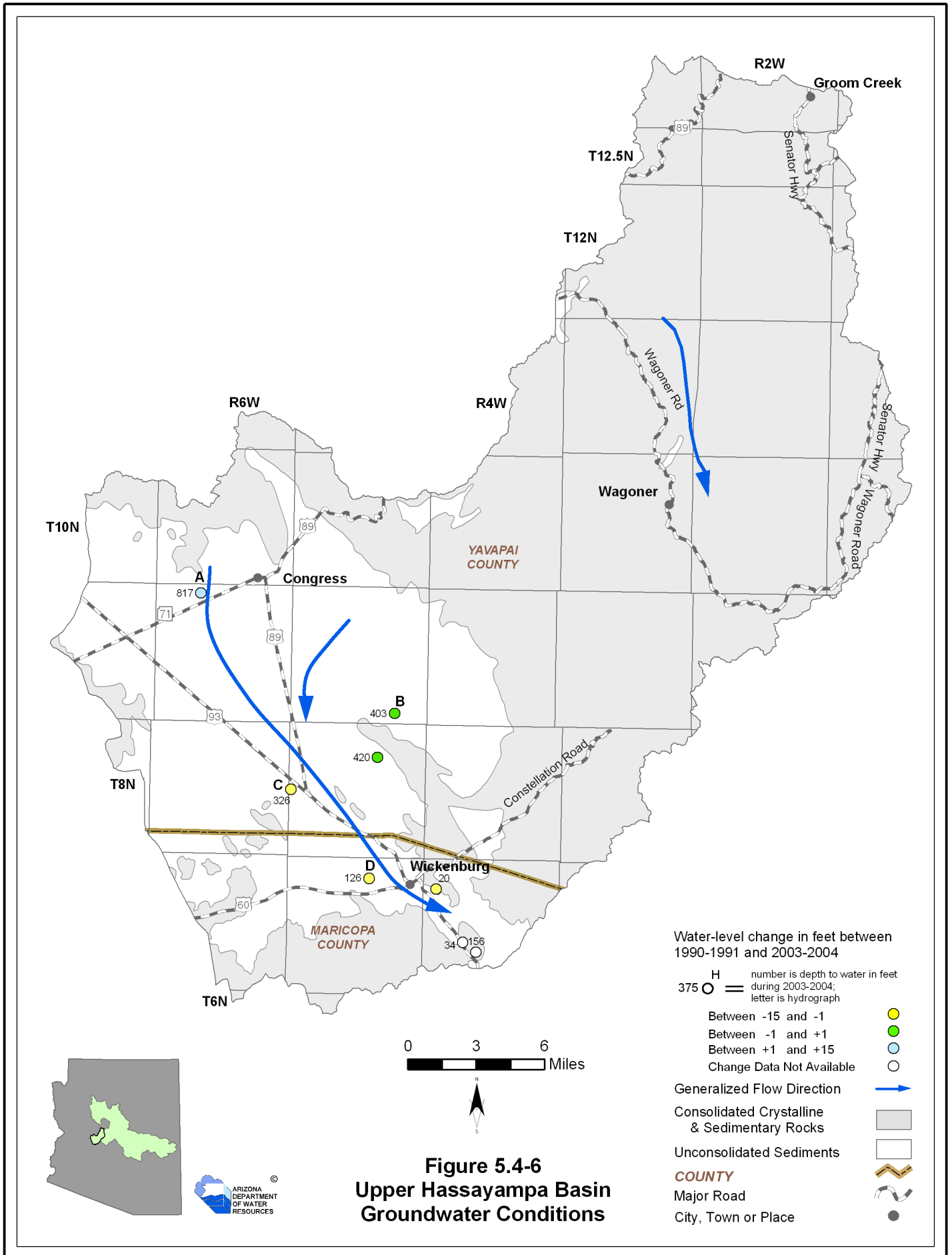
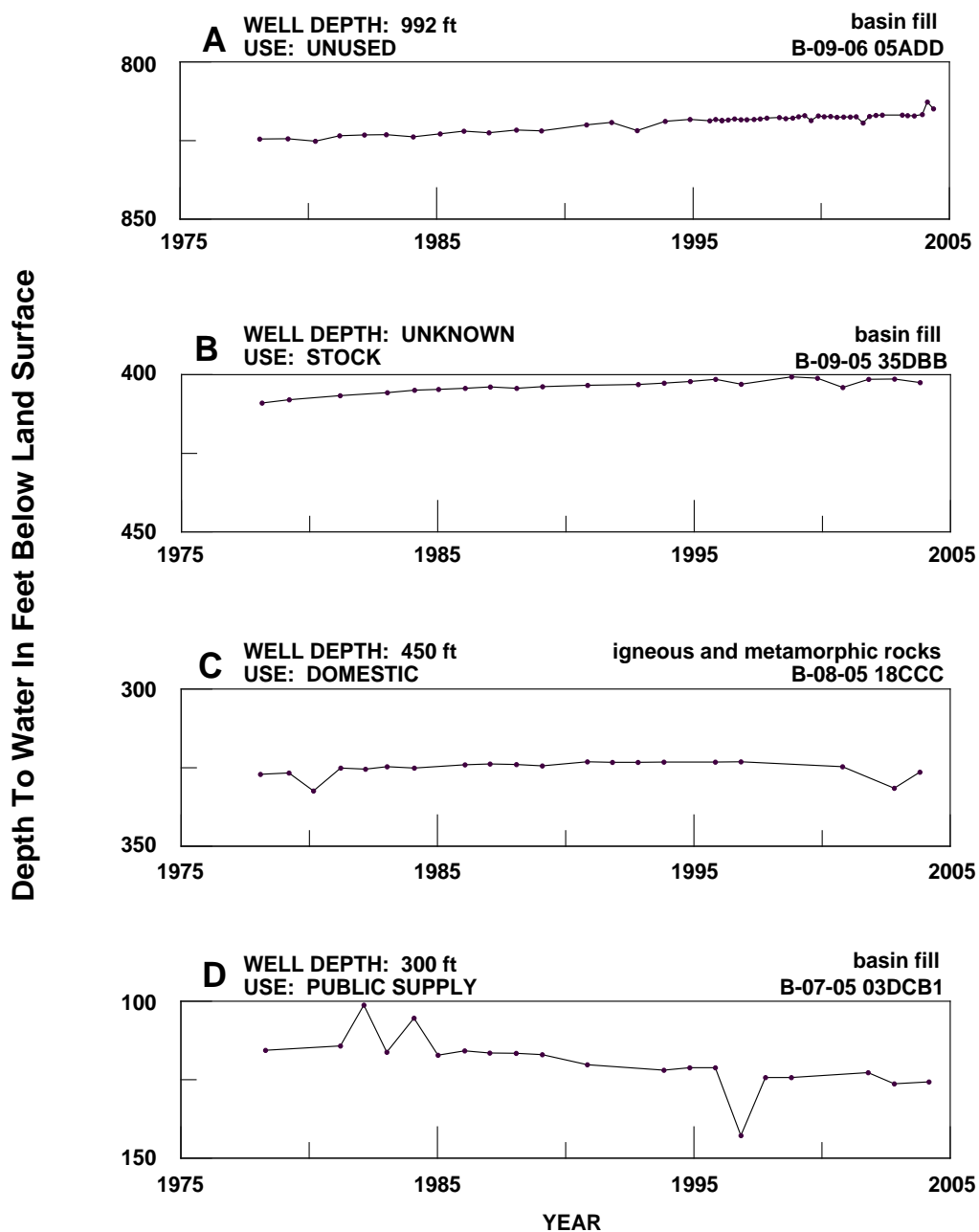


Figure 5.4-6
Upper Hassayampa Basin
Groundwater Conditions

Figure 5.4-7
Upper Hassayampa Basin
Hydrographs Showing Depth to Water in Selected Wells



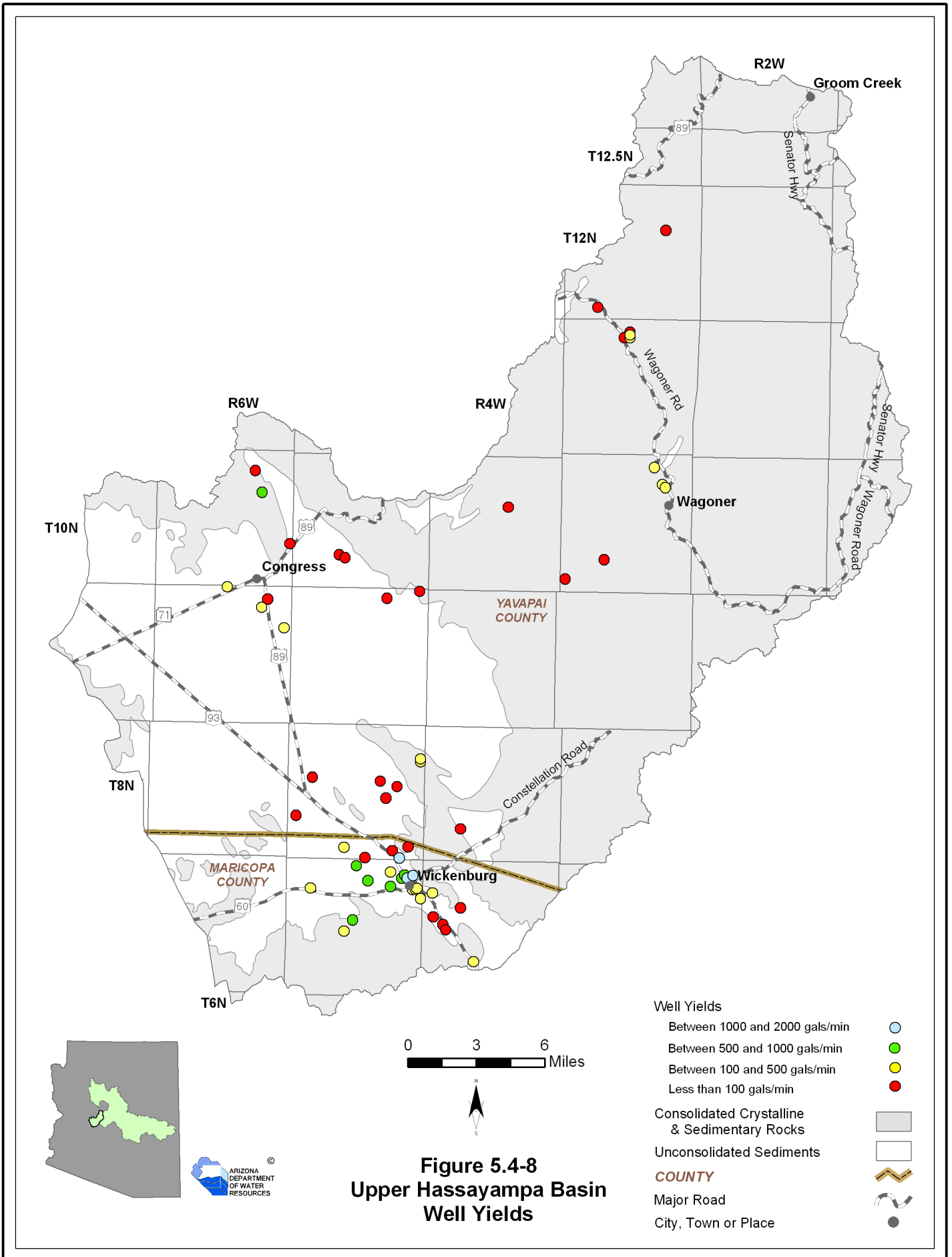


Figure 5.4-8
Upper Hassayampa Basin
Well Yields

5.4.7 Water Quality of the Upper Hassayampa Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 5.4-7A. Impaired lakes and streams with site type, name, length of impaired reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 5.4-7B. Figure 5.4-9 shows the location of water quality occurrences keyed to Table 5.4-7. A description of water quality data sources and methods is found in Volume 1, Appendix A. Not all parameters were measured at all sites; selective sampling for particular constituents is common.

Well, Mine or Spring sites that have equaled or exceeded drinking water standards (DWS)

- Refer to Table 5.4-7A.
- Forty-five sites have parameter concentrations that have equaled or exceeded drinking water standards. The majority of the sites are in the vicinity of Wickenburg.
- The most commonly equaled or exceeded standard was arsenic. Other standards equaled or exceeded include cadmium, lead, radionuclides, barium, beryllium, nitrate, copper and mercury.

Lakes and Streams with impaired waters

- Refer to Table 5.4-7B.
- Water quality standards were exceeded in four stream reaches on three streams in the basin.
- All reaches exceeded standards for copper and zinc. Other standards exceeded were cadmium and pH.
- The French Gulch and Hassayampa River impaired reaches are part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) program. The final reports have been completed for these reaches.
- Impaired reaches on Cash Mine Creek are not part of the TMDL program at this time.

Table 5.4-7 Water Quality Exceedences in the Upper Hassayampa Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section	
1	Well	13 North	2 West	26	Cd
2	Well	13 North	2 West	26	Pb
3	Well	12.5 North	3 West	35	Rad
4	Well	11 North	4 West	12	Cd
5	Spring	10 North	1 West	21	As
6	Well	10 North	3 West	14	NO3
7	Well	10 North	5 West	28	NO3, Rad
8	Well	10 North	6 West	25	NO3
9	Well	10 North	7 West	23	Rad
10	Well	9 North	5 West	1	As
11	Well	8 North	3 West	30	Rad
12	Well	8 North	4 West	27	NO3
13	Well	8 North	4 West	27	As
14	Well	8 North	5 West	16	NO3
15	Well	8 North	5 West	17	NO3
16	Well	7 North	4 West	18	NO3
17	Well	7 North	4 West	18	NO3
18	Well	7 North	5 West	1	As, Ba, Be, Cd, Cu, Pb
19	Well	7 North	5 West	1	As, Ba, Be, Cu, Pb
20	Well	7 North	5 West	1	As, Ba, Be, Pb
21	Well	7 North	5 West	1	As, Ba, Be, Pb, Hg
22	Well	7 North	5 West	1	As, Ba, Be, Cd, Pb
23	Well	7 North	5 West	1	As, Ba, Be, Cu
24	Well	7 North	5 West	1	As, Be, Pb
25	Well	7 North	5 West	1	As, Ba, Be, Pb
26	Well	7 North	5 West	1	As, Ba, Be, Cu, Pb
27	Well	7 North	5 West	1	As, Pb
28	Well	7 North	5 West	1	As, Pb
29	Well	7 North	5 West	1	Ba, Be
30	Well	7 North	5 West	1	As, Pb
31	Well	7 North	5 West	1	As, Pb
32	Well	7 North	5 West	1	As, Ba, Be, Cu, Pb
33	Well	7 North	5 West	1	As, Pb
34	Well	7 North	5 West	1	As, Ba, Be, Cd, Cu, Pb
35	Well	7 North	5 West	1	As, Ba, Be, Cu, Pb
36	Well	7 North	5 West	1	As, Ba, Be, Pb
37	Well	7 North	5 West	1	As, Ba, Pb
38	Well	7 North	5 West	1	Pb
39	Well	7 North	5 West	1	As, Ba, Be, Pb
40	Well	7 North	5 West	1	As, Cd, Pb, Hg
41	Well	7 North	5 West	2	As, Pb
42	Well	7 North	5 West	2	Pb
43	Well	7 North	5 West	12	As, Ba, Be, Pb
44	Well	7 North	5 West	12	As, Ba, Be, Pb
45	Well	7 North	5 West	12	As, Ba, Be, Pb

Source: Compilation of databases from ADWR & others

Table 5.4-7 Water Quality Exceedences in the Upper Hassayampa Basin (Cont)¹

B. Lakes and Streams

Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard ³	Parameter(s) Exceeding Use Standard ²
a	Stream	Cash Mine Creek (headwaters to Hassayampa River)	1	NA	A&W, FBC	Cu, Zn
b	Stream	Cash Mine Creek (unnamed tributary to headwaters of Cash Mine Creek)	1	NA	A&W	Cd, Cu, Zn
c	Stream	French Gulch (headwaters to Hassayampa River)	10	NA	A&W	Cd, Cu, Zn
d	Stream	Hassayampa River (headwaters to Copper Creek)	11	NA	A&W, FC, FBC, AgL, AgI	Cd, Cu, pH, Zn

Source: ADEQ 2005d

Notes:

¹ Water quality samples collected between 1993 and 2003.

²As = Arsenic

Ba = Barium

Be = Beryllium

Cd = Cadmium

Cu = Copper

Pb = Lead

Hg = Mercury

NO₃ = Nitrate

pH = Measurement of acidity or alkalinity

Rad = One or more of the following radionuclides - Gross Alpha, Gross Beta, Radium, and Uranium

Zn = Zinc

³A&W = Aquatic and Wildlife

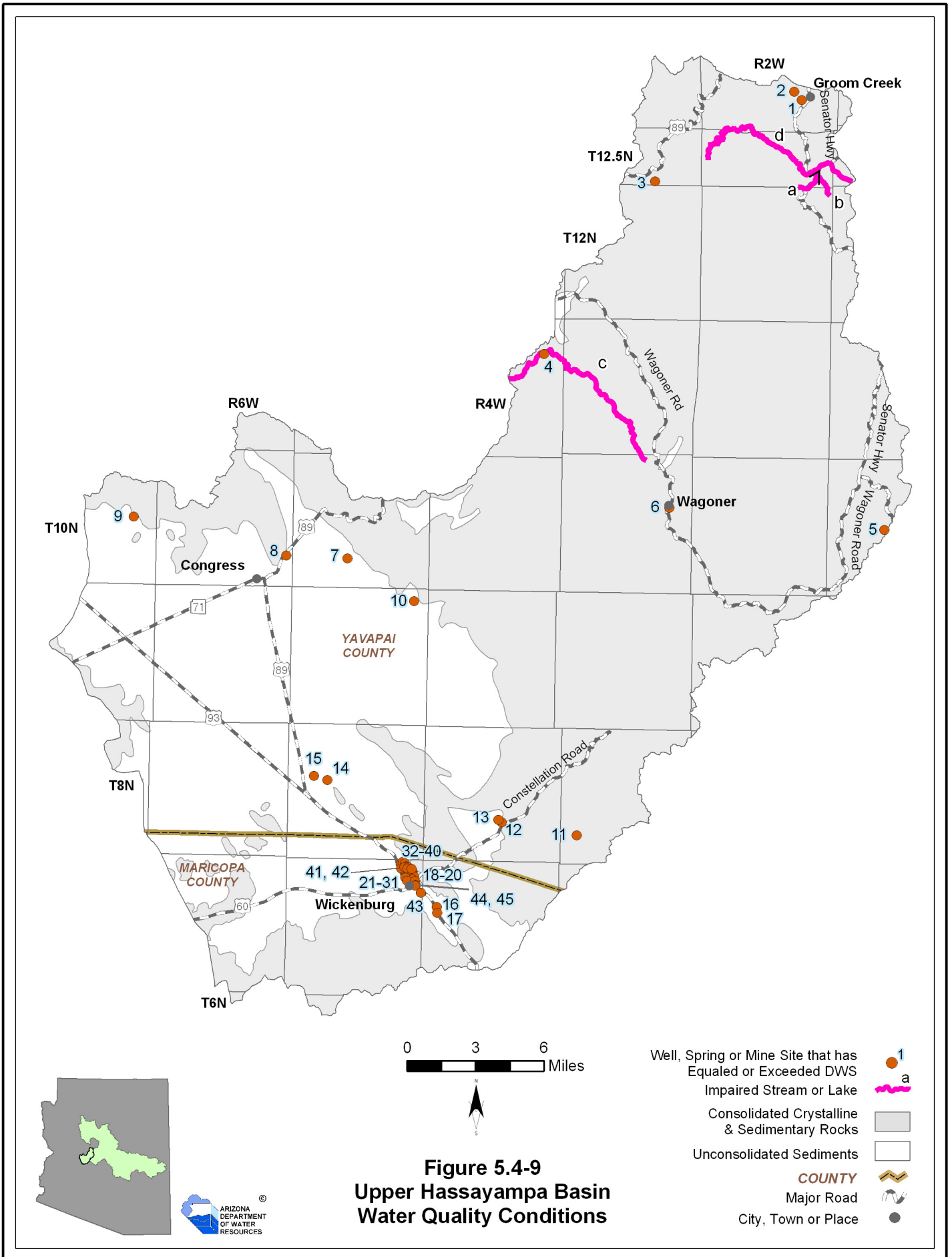
FBC = Full Body Contact

FC = Fish Consumption

AgL = Agricultural - livestock watering

AgI = Agricultural - irrigation

NA = Not applicable



5.4.8 Cultural Water Demand in the Upper Hassayampa Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 5.4-8. Effluent generation including facility ownership, location, population served and not served, volume treated, disposal method and treatment level is shown in Table 5.4-9. Figure 5.4-10 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Appendix A. More detailed information on cultural water demand is found in Section 5.0.7.

Cultural Water Demand

- Refer to Table 5.4-8 and Figure 5.4-10.
- Population in this basin has increased from 6,050 in 1980 to 10,479 in 2000.
- There are no recorded surface water diversions in this basin. Total groundwater use has increased in this basin since 1971, with an average of 3,000 AFA during 1971-1975 to an average of about 3,900 AFA in 2001-2005.
- Municipal groundwater use has increased slightly from an average of 2,200 AFA in 1991-1995 to 2,600 AFA in 2001-2005.
- Industrial use of groundwater has remained a constant 800 AFA from 1991-2005, primarily due to dairy use.
- Groundwater use for irrigation located north of Wagoner was less than 1,000 AFA during 1991-2005.
- The only demand centers identified by USGS Gap in the basin are in the vicinity of Wickenburg, north of Congress and near Groom Creek, however low intensity M&I is also found in the vicinity of Congress.
- The basin contains a large, currently inactive copper mine, the Zonia Property, and three small mines or quarries near Wagoner Road. Two small mines or quarries are located north of Congress.
- As of 2005 there were 1,890 registered wells with a pumping capacity of less than or equal to 35 gpm and 312 wells with a pumping capacity of more than 35 gpm.

Effluent Generation

- Refer to Table 5.4-9.
- There are two treatment facilities in this basin serving over 5,800 people that generate almost 600 acre-feet of effluent per year.
- Information on disposal method is only available for the Wickenburg facility. Effluent at this facility is discharged to unlined impoundments that recharge the aquifer.

Table 5.4-8 Cultural Water Demand in the Upper Hassayampa Basin¹

Year	Estimated and Projected Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						Data Source			
				Well Pumpage			Surface-Water Diversions						
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Agricultural	Municipal	Industrial	Agricultural				
1971		747 ²	133 ²	3,000			NR			ADWR (1994a)			
1972													
1973													
1974													
1975													
1976													
1977													
1978				3,000			NR						
1979													
1980	6,050	171	51	3,000			NR						
1981	6,251												
1982	6,452												
1983	6,653												
1984	6,855												
1985	7,056												
1986	7,257												
1987	7,458			3,000			NR						
1988	7,659												
1989	7,860	232	66	3,000			NR						
1990	8,062												
1991	8,303			190	29	2,200	800	<1,000	NR				
1992	8,545												
1993	8,787												
1994	9,029												
1995	9,270												
1996	9,512												
1997	9,754	2,600				800			<1,000			USGS (2007) ADWR (2008b)	
1998	9,996												
1999	10,237	281	19	2,600			800			<1,000			
2000	10,479												
2001	10,666												
2002	10,853												
2003	11,040												
2004	11,227												
2005	11,414												
2010	12,348			269	14	2,600			800			<1,000	
2020	15,072												
2030	18,362												
WELL TOTALS:		1,890	312										

Notes:

NR - Not reported

¹ Does not include effluent or evaporation losses from stockponds and reservoirs.

² Includes all wells through 1980.

Table 5.4-9 Effluent Generation in the Upper Hassayampa Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet/year)	Disposal Method							Current Treatment Level	Population not served	Year of Record
					Water-course	Evaporation Pond	Irrigation	Golf Course/ Turf/ Landscape	Wildlife Area	Discharged to Another Facility	Infiltration Basins			
Escapeses at North Ranch	Private	Congress	378	17	NA							Secondary	NA	2007
Wickenburg WWTP	Wickenburg	Wickenburg	5,500	560							X	Adv. Trt. I & Nutrient Removal	3,837	2004
Totals			5,878	577										

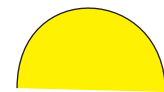
Source: Compilation of databases from ADWR & others

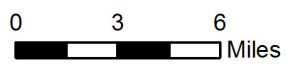
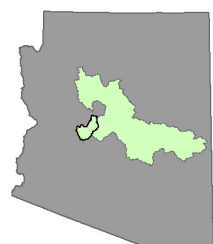
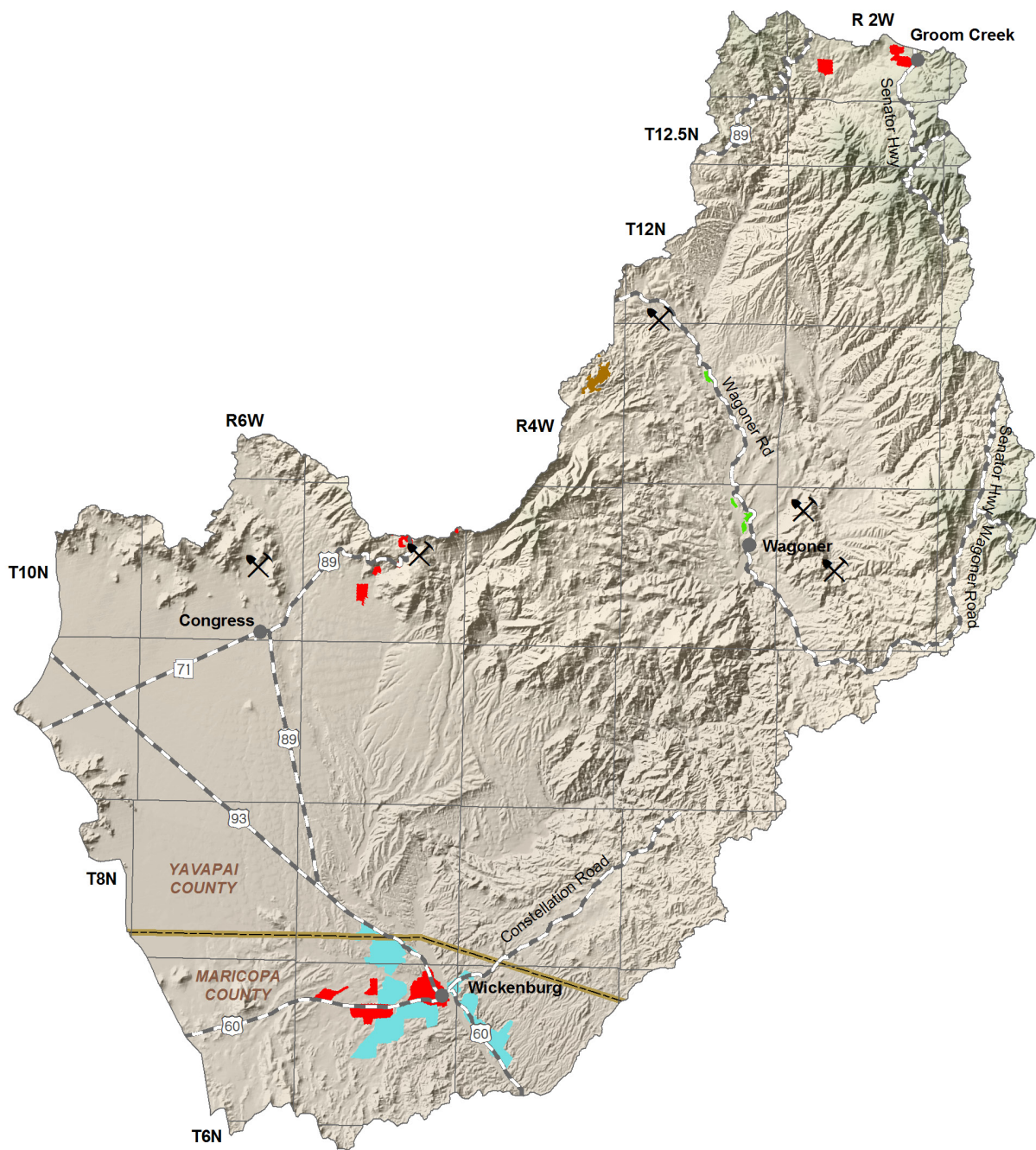
Notes:

Year of Record is for the volume of effluent treated/generated

NA: Data not currently available to ADWR

WWTP: Waste Water Treatment Plant





Demand Centers

- Agriculture
- M&I - High Intensity
- M&I - Low Intensity
- Large Mine
- Small Mine / Quarry
- COUNTY
- Major Road
- City, Town or Place

Figure 5.4-10
Upper Hassayampa Basin
Cultural Water Demand

Primary Data Source: USGS National Gap Analysis Program, 2004

5.4.9 Water Adequacy Determinations in the Upper Hassayampa Basin

Water adequacy determination information including the subdivision name, location, number of lots, adequacy determination, reason for the inadequacy determination, date of determination and subdivision water provider are shown in Table 5.4-10A and B for water reports and analysis of adequate water supply. Designated water provider information is shown in Table 5.4-10C with date of application, date the designation was issued and projected or annual estimated demand. Figure 5.4-11 shows the locations of subdivisions and designated providers keyed to the Table. A description of the Water Adequacy Program is found in Volume 1, Appendix C. Adequacy determination data sources and methods are found in Volume 1, Appendix A.

- All subdivisions receiving an adequacy determination are in Yavapai County. Twenty-eight water adequacy determinations for 2,235 lots have been made in this basin through December 2008. One thousand eight hundred and ninety-six lots in 19 subdivisions, or 85% of lots, were determined to be adequate.
- All determinations of inadequacy were because the applicant did not submit the necessary information and/or the available hydrologic data was insufficient to make a determination. Two subdivisions receiving inadequate determinations also had existing supplies that were unreliable or physically unavailable or the groundwater exceeded the depth-to-water criteria.
- One Analysis of Adequate Water Supply application for 2,324 lots has been approved in this basin.
- There are two designated water providers, CDC Wickenburg Water and Town of Wickenburg. The total projected or annual estimated demand for CDC Wickenburg Water is 1,224 acre-feet. The Town of Wickenburg does not have a projected or annual estimated demand.

Table 5.4-10 Adequacy Determinations in the Upper Hassayampa Basin¹

A. Water Adequacy Reports

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section						
1	Antelope Creek	Yavapai	9 North	6 West	13, 24	194	53-401863	Adequate		3/6/2006	Congress Domestic Water Company
2	Berry's-Groom Creek, The	Yavapai	13 North	2 West	26	1	53-500328	Adequate		8/6/1975	Spring
3	Bird's Eye View	Yavapai	8 North	5 West	27	11	53-300086	Adequate		5/1/1996	Dry Lot Subdivision
4	Black Mountain Ranches	Maricopa	7 North	5 West	7	40	53-400862	Inadequate	A1	12/24/2002	Dry Lot Subdivision
5	Brough Subdivision #1	Yavapai	10 North	6 West	35	24	53-500362	Inadequate	A1	5/7/1979	Congress Water Company
6	Chaparral Estates #1	Yavapai	10 North	6 West	35	86	53-500439	Inadequate	A1	5/7/1979	Congress Water Company
7	Congress Ranches	Yavapai	9 North	6 West	3	106	53-700283	Adequate		10/11/2007	Congress Water Company
8	Congress Village	Yavapai	9 North	6 West	3	36	53-500500	Adequate		8/28/1990	Congress Water Company
9	Congress Village #2	Yavapai	9 North	6 West	3	36	53-300110	Adequate		3/7/1996	Congress Water Company
10	Escapees at North Ranch	Yavapai	9 North	6 West	24	436	53-400004	Adequate		2/10/1999	Rainbow Parks
11	Gold Dollar Estates	Yavapai	10 North	6 West	26, 27	21	53-500708	Adequate		10/18/1982	Congress Water Company
12	Groom Creek Pines Plat B	Yavapai	13 North	2 West	26	5	53-500766	Inadequate	A1	6/1/1987	Groom Creek Water Users Association
13	Hacienda Heights	Yavapai	10 North	6 West	35	24	53-500769	Inadequate	A1	5/7/1979	Congress Water Company
14	High Desert One Unit One and Unit Two	Yavapai	9 North	6 West	12, 13, 24	51	53-400656	Adequate		9/24/2002	Congress Domestic Water Improvement District
15	High Desert One, Unit One and Two	Yavapai	9 North	6 West	12, 13	50	53-400434	Adequate		12/14/2000	Dry Lot Subdivision
16	Loma Estates	Yavapai	13 North	2 West	26	47	53-500911	Adequate		12/4/1973	Loma Estate Water Company
17	Millsite Village	Yavapai	13 North	2 West	36	35	53-500976	Inadequate	A1	6/24/1986	Millsite Water Users, Inc.
18	Mira Monte Vistas	Yavapai	9 North	6 West	2	57	53-500985	Adequate		10/29/1990	Congress Water Company
19	Quail Village Unit 1	Yavapai	9 North	6 West	3	25	53-300516	Adequate		9/10/1999	Congress Water Company
20	Rancho de los Caballeros #2	Maricopa	7 North	5 West	21	15	53-501255	Inadequate	A1, A2	10/20/1994	Caballeros Water Company
21	Ranchos de Los Caballeros, #3	Maricopa	7 North	5 West	15, 16, 21	100	53-501282	Inadequate	A1, A2	2/1/1983	Caballeros Water Company
22	S J Claims	Yavapai	12 North	2 West	36	10	53-300404	Inadequate	A1	1/20/1998	Homeowners Association Wells
23	Smoke Tree Ranch #1	Yavapai	11 North	3 West	26	61	53-501420	Adequate		3/6/1989	Dry Lot Subdivision
24	Vista Royale	Yavapai	8 North	6 West	13	138	53-300141	Adequate		6/3/1996	Dry Lot Subdivision
25	Vista Royale Phase 1-B	Yavapai	8 North	6 West	13	61	53-300499	Adequate		9/9/1998	Dry Lot Subdivision
26	Vista Royale Phase II	Yavapai	8 North	6 West	13	61	53-400378	Adequate		8/15/2000	Dry Lot Subdivision
27	Weaver Mountain Estates	Yavapai	10 North	6 West	35	171	53-400493	Adequate		2/26/2001	Congress Water Company
28	Wickenburg Inn, The	Yavapai	8 North	5 West	7, 8, 16, 17, 18, 19, 20, 21	333	53-501682	Adequate		7/1/1986	Yavapai Hills Water Company

Table 5.4-10 Adequacy Determinations in the Upper Hassayampa Basin¹ (Cont)

B. Analysis of Adequate Water Supply

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section				
29	Wickenburg Ranch Estates	Yavapai	8 North	5 West	8, 17, 18, 19, 20	2,324	43-402011	5/18/2006	CDC Wickenburg Water LLC.

C. Designated Adequate Water Supply

Map Key	Basin	County	Designation No.	Projected or Annual Estimated Demand (af/yr)	Date Application Received	Date Application Issued	Year of Projected or Annual Demand
a	CDC Wickenburg Water, LLC	Yavapai	40-700417	1,224	9/25/2007	2/11/2008	2013
b	Town of Wickenburg	Maricopa	40-900016	No amount designated	NA	5/17/1973	No data, hydrologic study needed

Source: ADWR 2008a

Notes:

¹Each determination of the adequacy of water supplies available to a subdivision is based on the information available to ADWR and the standards of review and policies in effect at the time the determination was made. In some cases, ADWR might make a different determination if a similar application were submitted today, based on the hydrologic data and other information currently available, as well as current rules and policies.

² Prior to February 1995, ADWR did not assign file numbers to applications for adequacy. Between 1995-2006 all applications for adequacy were given a file number with a 22 prefix. In 2006 a 53 prefix was assigned to all water adequacy reports and applications regardless of their issue date.

³ A. Physical/Continuous

- 1) Insufficient Data (applicant chose not to submit necessary information, and/or available hydrologic data insufficient to make determination)
- 2) Insufficient Supply (existing water supply unreliable or physically unavailable; for groundwater, depth-to-water exceeds criteria)
- 3) Insufficient Infrastructure (distribution system is insufficient to meet demands or applicant proposed water hauling)

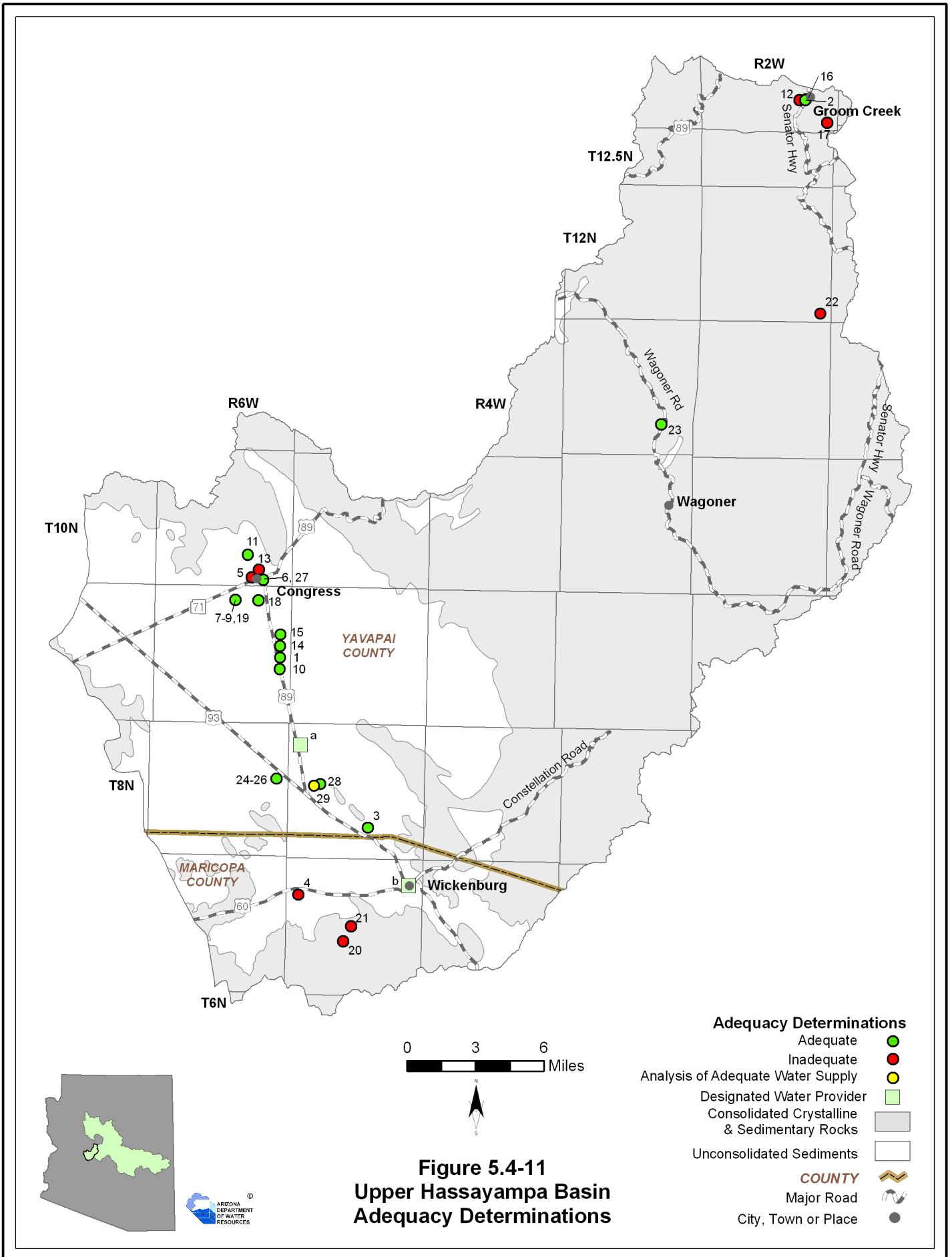
B. Legal (applicant failed to demonstrate a legal right to use the water or failed to demonstrate the provider's legal authority to serve the subdivision)

C. Water Quality

D. Unable to locate records

NA = Not available





Upper Hassayampa Basin

References and Supplemental Reading

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A

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Supplemental Reading

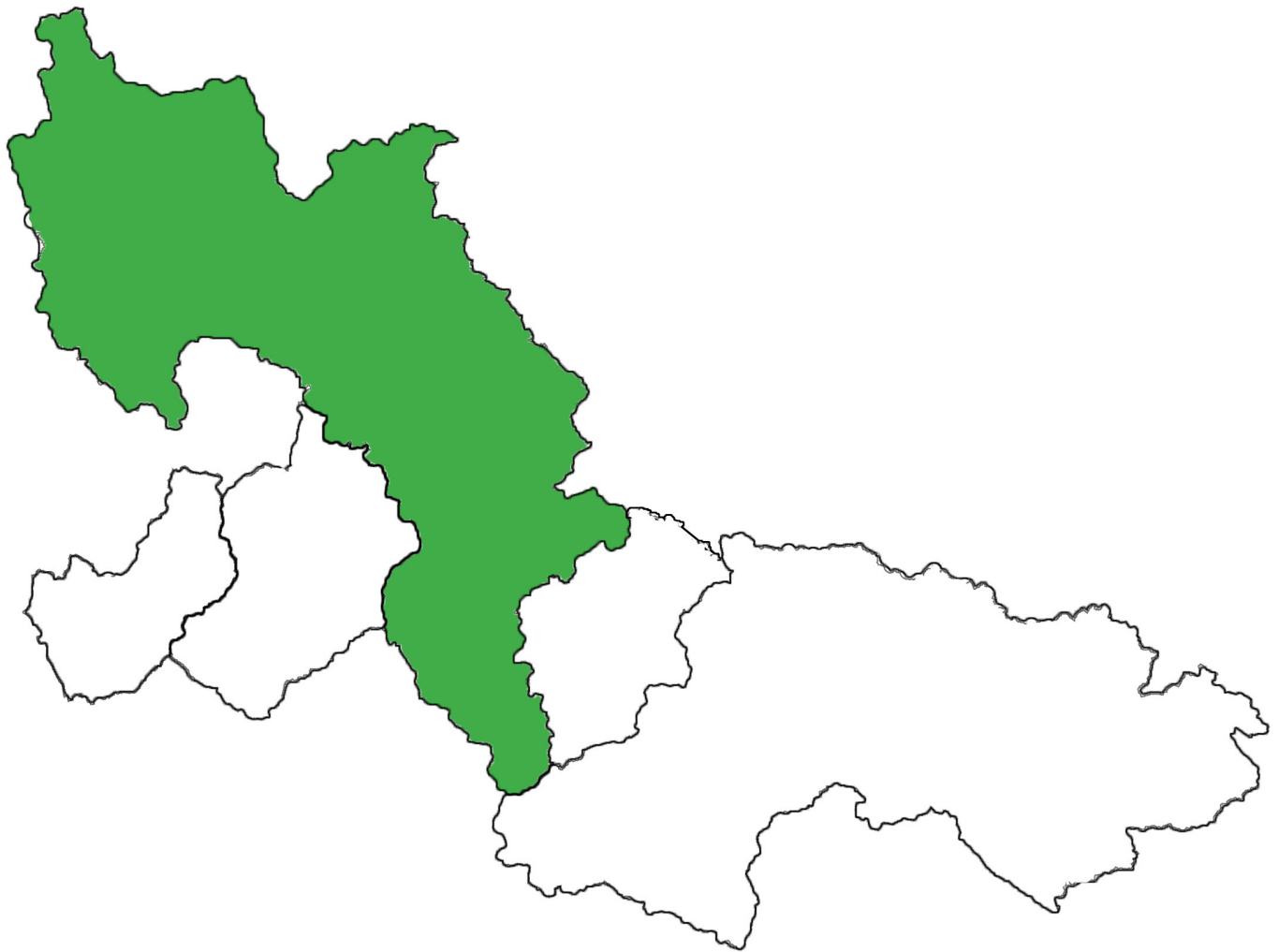
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Section 5.5

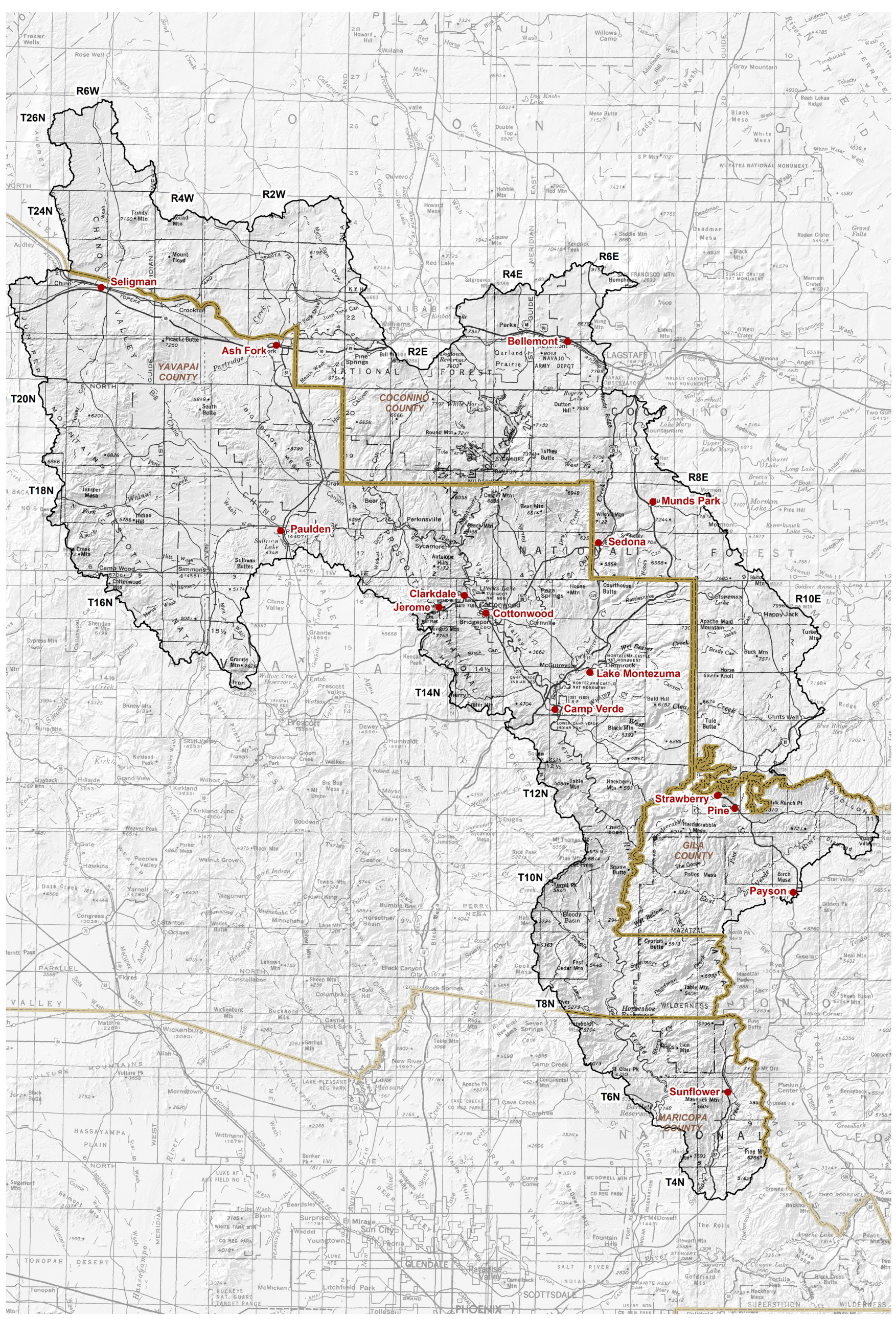
Verde River Basin



5.5.1 Geography of the Verde River Basin

The Verde River Basin, located in the northern and central part of the planning area is the largest basin in the planning area at 5,661 square miles. Geographic features and principal communities are shown on Figure 5.5-1. The basin is characterized by mid-elevation mountain ranges and valleys with high elevation areas along its north central boundary. Vegetation types include Arizona upland Sonoran desertscrub, semi-desert and plains and Great Basin grasslands, interior chaparral, Great Basin conifer woodland, montane conifer forests and a very small area of Rocky Mountain subalpine conifer forest in the vicinity of Humphreys Peak. (see Figure 5.0-10) Riparian vegetation is found along streams including mixed broadleaf and mesquite along the Verde River and mixed broadleaf along other streams such as West Clear Creek, Wet Beaver Creek and Oak Creek.

- Principal geographic features shown on Figure 5.5-1 are:
 - Verde River beginning from south of Paulden and running southeast through the basin and the communities of Clarkdale, Cottonwood and Camp Verde
 - Notable tributaries to the Verde River include Sycamore Creek, Oak Creek, Wet Beaver Creek, West Clear Creek, Fossil Creek and East Verde River
 - Big Chino Wash entering the basin at the northernmost basin boundary and exiting south of Paulden
 - Horseshoe Reservoir on the Verde River northwest of Sunflower and Bartlett Reservoir on the Verde west of Sunflower. Bartlett Reservoir is also the lowest point in the basin at 1,700 feet.
 - Chino Valley in the northwestern portion of the basin, extending from Seligman to Paulden
 - Verde Valley in the center of the basin around Clarkdale and Cottonwood
 - Mogollon Rim along the east central basin boundary
 - Mazatzal Mountains in the southeastern portion of the basin
 - Humphreys Peak, the highest point in the basin at 12,633 feet, on the north central basin boundary northeast of Bellemont




0 3 6
Miles



Figure 5.5-1
Verde River Basin
Geographic Features



Base Map: USGS 1:500,000, 1981

COUNTY 
City, Town or Place 

5.5.2 Land Ownership in the Verde River Basin

Land ownership, including the percentage of ownership by category, for the Verde River Basin is shown in Figure 5.5-2. Principal features of land ownership in this basin are the large contiguous parcels of forest service lands and the relatively large portion of private land. A description of land ownership data sources and methods is found in Volume 1, Appendix A. More detailed information on protected areas is found in Section 5.0.4. Land ownership categories are discussed below in the order of largest to smallest percentage in the basin.

National Forest

- 71.3% of the land is federally owned and managed by the United States Forest Service (USFS).
- Forest lands in the basin are part of the Prescott, Kaibab, Coconino and Tonto National Forests.
- The basin contains approximately 434,000 acres in eleven wilderness areas. The 57,916-acre Sycamore Canyon Wilderness is located in the Prescott, Kaibab and Coconino National Forests. There are five Coconino National Forest wilderness areas and four Prescott National Forest wilderness areas. Most of the 250,053-acre Mazatzal Wilderness in the Tonto National Forest is located in the southern part of the basin. (see Figure 5.0-13 and Table 5.0-3)
- There are numerous small private in-holdings in all forests.
- Land uses include recreation, grazing and timber production.

Private

- 20.2% of the land is private.
- The majority of the private land in the basin is in a checkerboard pattern in the northwestern portion of the basin. There are also parcels of private land in the vicinity of Cottonwood, Camp Verde, Sedona and other communities.
- Land uses include domestic, commercial, mining, farming and ranching.

State Trust Land

- 7.4% of the land in this basin is held in trust for the public schools and many other beneficiaries under the State Trust Land system.
- The majority of state land is located in a checkerboard pattern in the northwestern portion of the basin interspersed with private lands. State lands are also located in the vicinity of Cottonwood and south of the Navajo Army Depot.
- Primary land use is grazing.

U.S. Military

- 0.7% of the land is federally owned and operated by the U.S. Military as the Navajo Army Depot located in the vicinity of Bellemont in the northeastern portion of the basin.
- Land uses include National Guard training and army equipment storage.

Indian Reservation

- 0.2% of the land is under ownership of the Yavapai Apache Tribe.

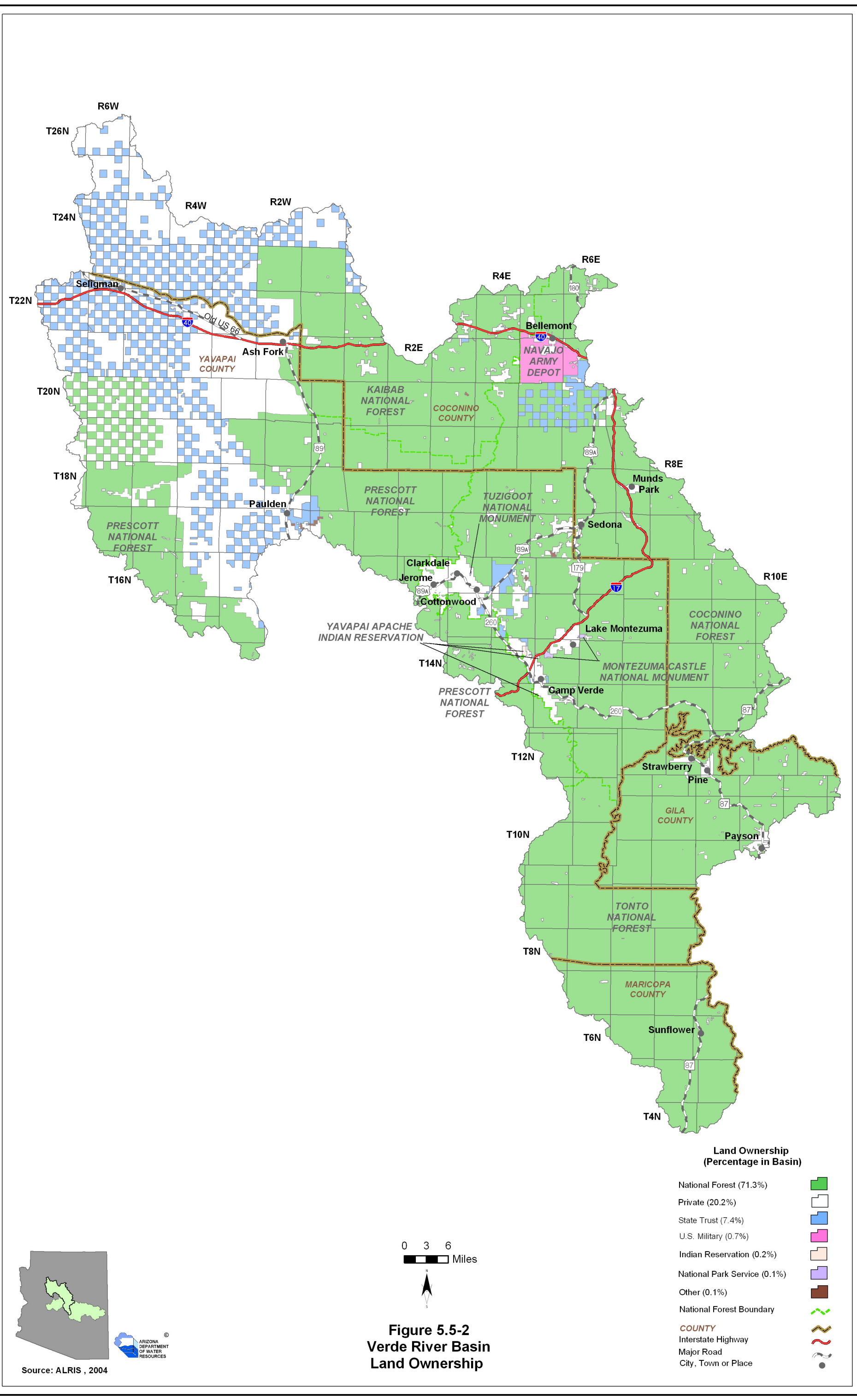
- Tribal lands are composed of five separate parcels located in the vicinity of Camp Verde.
- Land uses include domestic and commercial.

National Park Service (NPS)

- 0.1% of the land is federally owned and managed by the NPS as the Montezuma Castle National Monument located near Interstate 17 in the center of the basin and the Tuzigoot National Monument east of Clarkdale.
- Land uses include cultural preservation and recreation.

Other (Game and Fish, County and Bureau of Reclamation Lands)

- 0.1% of the land is owned and managed by the Arizona Game and Fish Department as the Upper Verde River Wildlife Area located in the vicinity of Paulden.
- Land uses include wildlife preservation and recreation.



5.5.3 Climate of the Verde River Basin

Climate data from NOAA/NWS Co-op Network, AZMET and SNOTEL/Snowcourse stations are compiled in Table 5.5-1 and the locations are shown on Figure 5.5-3. Figure 5.5-3 also shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Verde River Basin does not contain Evaporation Pan stations. More detailed information on climate in the planning area is found in Section 5.0.3. A description of the climate data sources and methods is found in Volume 1, Appendix A.

NOAA/NWS Co-op Network

- Refer to Table 5.5-1A
- There are 18 NOAA/NWS Co-op network climate stations in the basin. The average monthly maximum temperature occurs in July at all stations and ranges between 84.5°F at Childs and 63.7°F at Happy Jack R.S. The average monthly minimum temperature occurs in January or December and ranges between 27.5°F at Happy Jack R.S. and 45.6°F at Childs.
- Highest average seasonal rainfall occurs at most stations in the summer (July-September) and the lowest in the spring (April-June). For the period of record used, the highest annual rainfall is 28.46 inches at Junipine and the lowest is 10.55 inches at Cottonwood.

AZMET

- Refer to Table 5.5-1C
- There is one AZMET station in the basin at Payson at 4,849 feet and reported an average annual evapotranspiration of 61.26 inches.

SNOTEL/Snowcourse

- Refer to Table 5.3-1D
- There are 14 SNOTEL/Snowcourse stations in the basin. Five stations have been discontinued.
- The highest average monthly snowpack at most stations is in March.

SCAS Precipitation Data

- See Figure 5.5-3
- Additional precipitation data shows rainfall as high as 38 inches in the southern portion of the basin north of Pine and as low as 10 inches in the Big Chino Valley in the vicinity of Paulden.

Table 5.5-1 Climate Data for the Verde River Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Total Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
Ashfork 6N	5,310	1902-1987 ¹	74.0/Jul	36.1/Jan	1.91	1.42	5.37	3.98	12.69
Beaver Creek R.S.	3,820	1971-2000	80.8/Jul	43.1/Dec	5.25	1.63	5.75	4.08	16.71
Childs	2,650	1971-2000	84.5/Jul	45.6/Dec	6.67	1.56	6.40	4.90	19.53
Cottonwood	3,380	1949-1977 ¹	82.2/Jul	43.1/Jan	2.15	1.25	3.76	3.40	10.55
Happy Jack R.S.	7,480	1971-2000	63.7/Jul	27.5/Jan	10.05	2.96	7.92	6.60	27.53
Jerome	4,950	1971-2000	78.7/Jul	41.4/Jan	6.11	2.23	7.26	4.15	19.75
Junipine	5,130	1948-1982 ¹	74.4/Jul	39.0/Jan	10.69	3.25	6.92	7.60	28.46
Montezuma Castle N.M.	3,180	1971-2000	81.9/Jul	42.5/Dec	4.13	1.45	5.49	3.42	14.49
Natural Bridge	4,610	1893-1972	76.8/Jul	40.9/Jan	7.34	2.35	8.30	6.16	24.17
Oak Creek Canyon	5,080	1971-2000	73.4/Jul	39.2/Jan	11.14	2.99	7.48	6.84	28.45
Payson	4,910	1971-2000	75.4/Jul	39.9/Jan	7.35	2.18	7.20	5.34	22.01
Payson 12 NNE	5,510	1952-1976 ¹	70.6/Jul	36.0/Jan	7.15	3.03	9.12	8.93	28.24
Payson R.S.	4,850	1893-1974 ¹	73.1/Jul	36.3/Jan	4.01	1.88	5.70	7.57	19.14
Sedona R.S.	4,220	1971-2000	80.3/Jul	43.5/Jan	6.73	2.23	5.49	4.56	19.01
Seligman	5,250	1971-2000	73.5/Jul	37.1/Jan	3.67	1.41	5.13	2.61	12.82
Seligman 13 SSW	5,240	1962-1982 ¹	73.8/Jul	35.1/Jan	3.89	1.21	4.94	3.02	13.06
Tuzigoot	3,470	1971-2000	83.1/Jul	44.8/Dec	3.51	1.19	5.29	2.75	12.74
Walnut Creek	5,090	1971-2000	72.1/Jul	36.0/Dec	5.16	1.45	5.73	3.45	15.79

Source: WRCC, 2005

Notes:

¹ Average temperature for period of record shown; average precipitation from 1971-2000

B. Evaporation Pan:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
None			

C. AZMET:

Station Name	Elevation (in feet)	Period of Record	Average Annual Reference Evapotranspiration, in inches (Number of years to calculate averages)
Payson	4,849	2003 - current	61.26 (4)

Source: Arizona Meteorological Network, 2007

D. SNOTEL/Snowcourse:

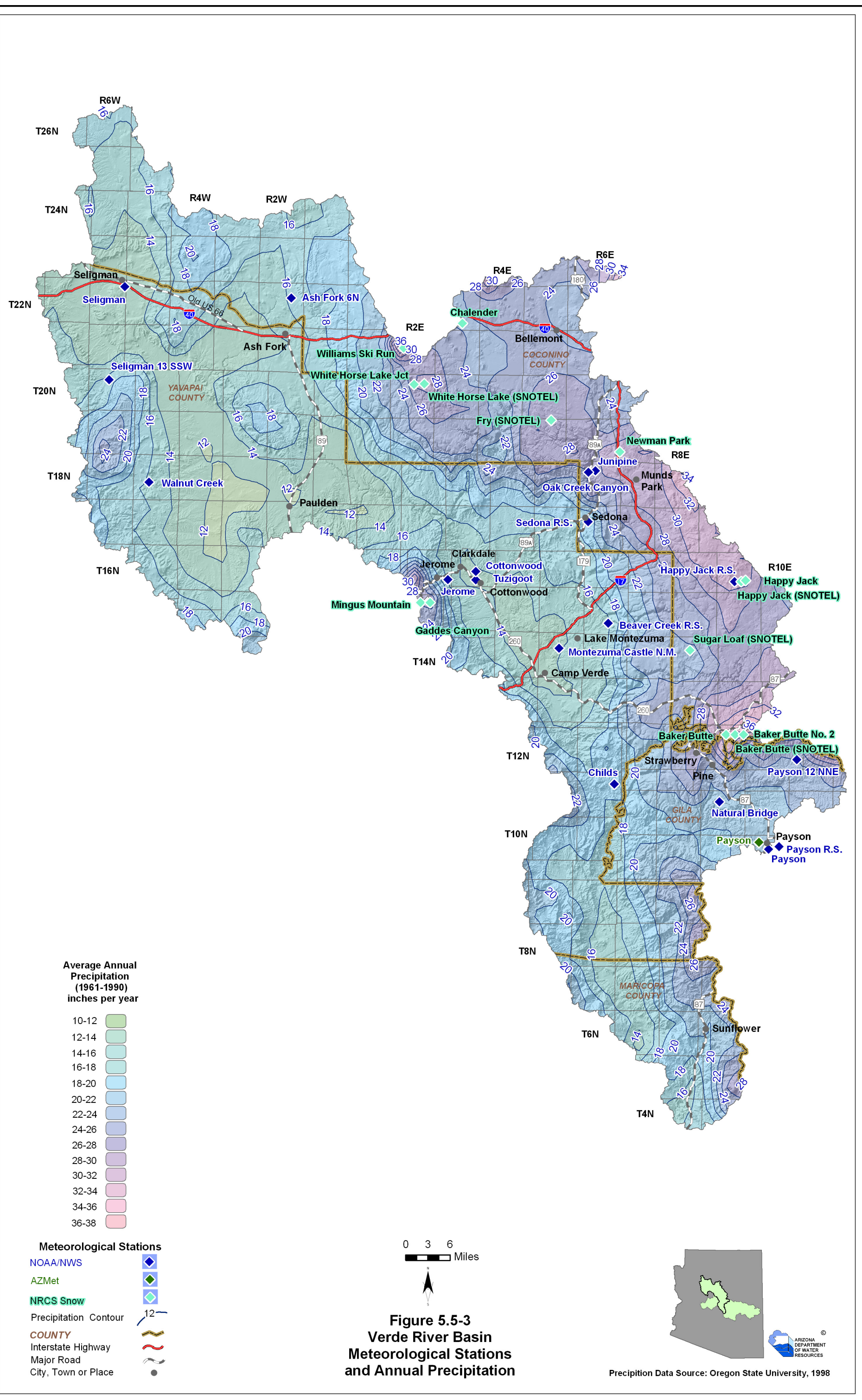
Station Name	Elevation (in feet)	Period of Record	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content (Number of measurements to calculate average)					
			Jan.	Feb.	March	April	May	June
Baker Butte	7,300	1966 - 1999 (discontinued)	2.4 (32)	5.2 (34)	6.3 (34)	4.5 (34)	12.1 (1)	0 (0)
Baker Butte No. 2	7,700	1972 - current	3.9 (32)	7.6 (35)	11.4 (35)	12.7 (35)	12.1 (1)	0 (0)
Baker Butte SNOTEL	7,300	1966 - current	2.2 (39)	4.6 (41)	5.8 (41)	3.9 (41)	0.7 (25)	0 (24)
Chalender	7,100	1947 - current	1.3 (32)	2.5 (60)	2.8 (60)	1.3 (60)	0.2 (1)	0 (0)

Table 5.5-1 Climate Data for the Verde River Basin (Cont)

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content (Number of measurements to calculate average)					
			Jan.	Feb.	March	April	May	June
Fry SNOTEL	7,200	1983 - current	2.6 (24)	4.6 (24)	5.9 (24)	2.2 (24)	0 (24)	0 (24)
Gaddes Canyon	7,600	1954 - 1989 (discontinued)	2.6 (10)	4.0 (36)	5.4 (36)	5.1 (35)	0 (0)	0 (0)
Happy Jack	7,630	1951 - current	1.9 (31)	3.4 (51)	4.1 (52)	2.5 (49)	6.6 (1)	0 (0)
Happy Jack SNOTEL	7,630	2000 - current	1.5 (7)	3.0 (7)	4.0 (7)	1.6 (7)	0 (7)	0 (7)
Mingus Mountain	7,100	1947 - 1989 (discontinued)	0.5 (10)	1.2 (42)	0.7 (40)	0.3 (40)	0 (1)	0 (0)
Newman Park	6,750	1963 - current	1.1 (33)	2.2 (44)	2.2 (44)	0.8 (44)	0.3 (1)	0 (0)
Sugar Loaf SNOTEL	6,120	1983-1999 (discontinued)	0.1 (16)	0.3 (16)	0.5 (15)	0 (16)	0 (17)	0 (17)
White Horse Lake Jct	7,180	1967 - 1999 (discontinued)	1.4 (25)	3.1 (31)	3.8 (33)	2.1 (33)	0.9 (33)	0 (0)
White Horse Lake SNOTEL	7,180	1967 - current	1.7 (33)	3.5 (38)	4.8 (40)	2.5 (40)	0.2 (27)	0 (24)
Williams Ski Run	7,720	1967 - current	2.8 (23)	5.8 (50)	8.2 (40)	8.6 (39)	0 (0)	0 (0)

Source: Natural Resources Conservation Service, 2006



5.5.4 Surface Water Conditions in the Verde River Basin

Streamflow data, including average seasonal flow, average annual flow and other information is shown in Table 5.5-2. Flood ALERT equipment and SRP low-flow gages in the basin are shown in Table 5.5-3. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 5.5-4. The location of streamflow gages identified by USGS number, flood ALERT equipment, SRP gages, USGS runoff contours and large reservoirs are shown on Figure 5.3-4. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Streamflow Data

- Refer to Table 5.5-2.
- Data from 36 stations located at 22 watercourses are shown in the table and on Figure 5.5-4.
- The average seasonal flow at all stations but one is highest in the winter (January-March) and lowest at most stations in the summer (July-September).
- The largest annual flow recorded is 1,583,014 acre-feet in 1993 at the Verde River below Tangle Creek above Horseshoe Dam station and the smallest was seven acre-feet in 1964 at the East Fork Sycamore Creek near Sunflower station
- Seventeen streams in this basin have a mean annual flow of over 10,000 acre-feet. One river, Verde River, has a mean annual flow of over 100,000 acre-feet.

Flood ALERT Equipment

- Refer to Table 5.5-3.
- As of October 2005 there were 41 stations in the basin.

Salt River Project (SRP) Low-Flow Gages

- Refer to Table 5.5-3B
- There are four SRP low-flow gages in this basin. These gages are a project of SRP, Prescott National Forest and Arizona Game and Fish, designed to provide real-time information to the public about the Verde River streamflow.

Reservoirs and Stockponds

- Refer to Table 5.5-4.
- The basin contains 13 large reservoirs. The largest, Bartlett, has a maximum storage of 178,186 acre-feet.
- Surface water is stored or could be stored in 59 small reservoirs in the basin.
- There are 2,328 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 5.5-4.
- Average annual runoff is 0.1 inches per year, or 5.33 acre-feet per square mile, in the northwestern portion of the basin and 1 inch, or 53.3 acre-feet per square mile, in the southwestern portion of the basin. Average annual runoff increases to five inches per year, or 266.5 acre-feet per square mile, in the west central portion of the basin.

Table 5.5-2 Streamflow Data for the Verde River Basin

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow (in acre-feet/year)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9403990	Dogtown Wash above Dogtown Reservoir near Williams	4.7	NA	2/1964-5/1965 (discontinued)	No statistics run; less than 3 years of data								1
9502800	Williamson Valley Wash near Paulden	255	4,455	3/1965-current (real time)	64	7	10	19	770 (2002)	2,064	5,199	22,959 (1980)	20
9503700	Verde River near Paulden	2,507	4,117	7/1963-current (real time)	46	16	16	19	16,511 (2002)	20,783	30,743	156,015 (1993)	39
9503720	Hell Canyon near Williams	15	6,750	8/1965-9/1972 (discontinued)	49	6	8	37	123 (1967)	1,444	2,316	5,017 (1966)	6
9503800	Volunteer Wash near Bellemont	131	6,820	8/1965-9/1972 (discontinued)	59	7	1	33	61 (1967)	1,792	2,709	6,719 (1966)	6
9504000	Verde River near Clarkdale	3,503	3,500	6/1915-current (real time)	50	16	14	20	54,529 (2002)	104,279	128,062	458,393 (1993)	40
9504420	Oak Creek near Sedona	233	4,169	10/1981-current (real time)	54	18	10	17	22,587 (2002)	46,298	58,873	164,776 (1993)	21
9504430	Oak Creek at Sedona	233	4,169	10/1981-9/1995 (discontinued)	58	16	9	18	24,108 (1989)	53,792	67,074	165,067 (1993)	13
9504500	Oak Creek near Cornville	355	3,470	7/1940-current (real time)	50	20	9	21	21,357 (1956)	51,402	61,972	182,440 (1978)	56
9505000	Verde River at Camp Verde	4,214	NA	1/1913-3/1920 (discontinued)	55	20	12	14	149,139 (1913)	309,138	305,312	545,879 (1916)	7
9505200	Wet Beaver Creek near Rimrock	111	4,020	10/1961-current (real time)	55	22	8	15	5,489 (1977)	18,176	23,659	64,667 (1993)	33
9505220	Rocky Gulch near Rimrock	1	6,750	10/1985-9/1994 (discontinued)	66	25	4	6	62 (1989)	210	215	376 (1991)	4
9505250	Red Tank Draw near Rimrock	48	3,920	4/1957-9/1978 (discontinued)	58	16	4	22	33 (1963)	3,183	4,666	22,304 (1965)	20
9505300	Rattlesnake Canyon near Rimrock	25	4,870	6/1957-9/1980 (discontinued)	59	22	2	17	101 (1963)	4,345	5,763	21,652 (1965)	22
9505350	Dry Beaver Creek near Rimrock	142	3,694	10/1960-current (real time)	61	21	3	15	253 (1996)	21,978	31,271	105,727 (1978)	42
9505500	Beaver Creek at Camp Verde	433	NA	12/1912-3/1920 (discontinued)	64	21	6	9	26,715 (1913)	64,072	70,274	132,488 (1915)	6
9505550	Verde River below Camp Verde	4,653	3,045	11/1971-11/1981 (discontinued)	42	24	7	27	67,620 (1977)	192,578	267,706	603,073 (1978)	7

Table 5.5-2 Streamflow Data for Verde River Basin (Cont)

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow (in acre-feet/year)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9505800	West Clear Creek near Camp Verde	241	3,630	12/1964-current (real time)	54	20	8	18	11,152 (2002)	34,542	45,858	133,245 (1993)	38
9506000	Verde River near Camp Verde	5,009	2,874	4/1934-current (real time)	59	17	11	14	99,934 (2002)	222,679	299,621	990,650 (1993)	24
9507600	East Verde River near Pine	6	5,400	9/1961-9/1971 (discontinued)	26	32	24	19	521 (1963)	10,208	8,860	16,507 (1968)	9
9507700	Webber Creek above West Fork Webber Creek near Pine	5	5,530	7/1959-9/1974 (discontinued)	37	36	7	20	478 (1967)	1,814	1,876	4,547 (1965)	14
9507800	West Fork Webber Creek near Pine	4	NA	7/1959-9/1965 (discontinued)	51	36	4	9	181 (1963)	348	586	1,115 (1962)	5
9507900	Webber Creek below WF Webber Creek near Pine	10	NA	7/1959-9/1965 (discontinued)	46	40	6	9	557 (1963)	1,050	1,775	3,424 (1960)	5
9507950	East Verde River near Payson	272	NA	7/1961-9/1965 (discontinued)	50	33	16	2	4,684 (1964)	10,425	9,211	12,544 (1962)	3
9507980	East Verde River near Childs	331	2,500	9/1961-current (real time)	59	16	10	15	1,499 (2002)	34,036	46,674	208,558 (1993)	38
9508000	Verde River below East Verde River near Childs	5,606	2,400	6/1934-5/1941 (discontinued)	67	13	9	11	258,525 (1939)	395,733	444,220	733,574 (1937)	6
9508300	Wet Bottom Creek near Childs	36	2,320	10/1967-current (real time)	71	6	5	18	87 (2002)	8,471	10,182	37,864 (1978)	35
9508500	Verde River below Tangle Creek above Horseshoe Dam	5,858	2,029	8/1945-current (real time)	51	17	11	20	131,073 (2002)	294,733	409,875	1,583,014 (1993)	57
9509000	Verde River at Bartlett Reservoir near Cave Creek	6,065	NA	10/1938-12/1945 (discontinued)	48	25	11	16	245,428 (1942)	381,536	434,387	1,036,012 (1941)	7
9510070	West Fork Sycamore Creek above McFar Canyon near Sunflower	5	4,380	10/1966-5/1986 (discontinued)	60	12	4	24	27 (1971)	623	816	2,121 (1983)	10
9510080	West Fork Sycamore Creek near Sunflower	10	4,000	10/1961-9/1974 (discontinued)	54	13	6	26	50 (1971)	923	1,573	4,503 (1973)	12
9510100	East Fork Sycamore Creek near Sunflower	4	4,140	10/1961-5/1986 (discontinued)	69	13	4	14	7 (1964)	308	678	2,302 (1980)	22
9510150	Sycamore Creek near Sunflower	52	3,308	10/1961-9/1976 (discontinued)	47	14	6	34	297 (1964)	2,881	5,476	18,244 (1965)	14
9510170	Camp Creek near Sunflower	3	1,309	8/1963-9/1966 (discontinued)	No statistics run; less than 3 years of data							2	



Table 5.5-2 Streamflow Data for Verde River Basin (Cont)

Station Number	USGS Station Name	Drainage Area (in mi ²)	Gage Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow (in acre-feet/year)				Years of Annual Flow Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
9510180	Rock Creek near Sunflower	15	2,052	3/1963-9/1972 (discontinued)	44	7	12	38	109 (1971)	999	1,227	4,474 (1965)	8
9510200	Sycamore Creek near Fort McDowell	164	1,759	12/1960-current (real time)	70	11	3	17	41 (2002)	8,290	19,584	111,493 (1993)	42

Source: USGS (NWIS) 2005 & 2008

Notes:

Statistics based on Calendar Year

Annual Flow statistics based on monthly values

Summation of Average Annual Flows may not equal 100 due to rounding

Period of record may not equal Year of Record used for annual Flow/Year statistics due to only using years with a 12 month record

In Period of Record, current equals November 2008

Seasonal and annual flow data used for the statistics was retrieved in 2005

NA = Not available

Table 5.5-3 Flood ALERT Equipment in the Verde River Basin

A. ALERT gages

Station ID	Station Name	Station Type	Install Date	Responsibility
105	Metz Mountain	Precipitation	7/14/1994	Yavapai County FCD
110	Woody Mountain	Precipitation	7/12/1993	Yavapai County FCD
115	Kelly Pocket	Precipitation	7/13/1993	Yavapai County FCD
120	Red Hill	Precipitation	7/3/1993	Yavapai County FCD
125	Small Tank	Precipitation	7/2/1993	Yavapai County FCD
130	Coyote Park	Precipitation	7/11/1993	Yavapai County FCD
135	Bear Seep	Precipitation	7/14/1993	Yavapai County FCD
140	Munds Park	Precipitation/Stage	7/9/1993	Yavapai County FCD
145	Pumphouse Wash	Precipitation/Stage	11/12/1997	Yavapai County FCD
150	Sedona Airport	Weather Station	7/2/1993	Yavapai County FCD
155	West Fork Oak Creek	Precipitation/Stage	11/12/1997	Yavapai County FCD
160	Oak Creek @ Tlaquepaque	Precipitation/Stage	11/12/1997	Yavapai County FCD
165	ADOT Rim Camp	Precipitation	7/9/1993	Yavapai County FCD
175	Dry Creek Levee	Precipitation/Stage	8/28/2001	Yavapai County FCD
180	Merry-Go-Round	Precipitation	3/23/2005	Yavapai County FCD
185	Chick Road Detention Pond	Precipitation/Stage	12/15/2000	Yavapai County FCD
193	Mingus Mountain Repeater	Repeater/Weather Station	8/22/1997	Yavapai County FCD
240	Jacks Point	Precipitation	7/27/2004	Yavapai County FCD
250	Jacks Canyon	Precipitation	7/19/2004	Yavapai County FCD
260	House Mountain	Precipitation	7/14/2004	Yavapai County FCD
370	Summit Mountain	Precipitation	5/6/1997	Yavapai County FCD
375	Happy Jack	Precipitation	5/6/1997	Yavapai County FCD
410	Walnut Creek @ Williamson Valley Rd	Precipitation/Stage	8/27/2001	Yavapai County FCD
415	Sycamore Point	Precipitation	8/28/2001	Yavapai County FCD
420	White Hills	Precipitation	7/15/2004	Yavapai County FCD
425	Yavapai County Verde Roads Yard	Precipitation	11/19/1997	Yavapai County FCD
430	Cottonwood Public Works Yard	Weather Station	8/21/2001	Yavapai County FCD
460	Apache Maid	Precipitation	4/17/2000	Yavapai County FCD
465	Buck Mountain	Precipitation	7/13/2000	Yavapai County FCD
470	Lee Butte	Precipitation	12/4/2000	Yavapai County FCD
485	Cedar Flat	Precipitation	8/1/2001	Yavapai County FCD
490	Calloway Butte	Precipitation	4/28/2000	Yavapai County FCD

Table 5.5-3 Flood ALERT Equipment in the Verde River Basin (Cont)

A. ALERT gages

Station ID	Station Name	Station Type	Install Date	Responsibility
495	Baker Butte	Precipitation	8/29/2001	Yavapai County FCD
3800	Hyde Mountain Repeater	Repeater/Precipitation	4/13/2005	Yavapai County FCD
3805	Williamson Valley Fire Department	Precipitation	6/16/2005	Yavapai County FCD
3825	Big Chino Wash @ SR 89	Precipitation/Stage	4/1/2005	Yavapai County FCD
3850	Bill Williams Repeater	Repeater/Precipitation	9/20/2005	ADWR
4940	Humboldt Mountain Repeater	Repeater/Weather Station	7/14/1981	Maricopa County FCD
4950	Seven Springs	Precipitation	11/12/1981	Maricopa County FCD
5890	Horseshoe Lake	Weather Station	9/11/2000	Maricopa County FCD
5910	Bartlett Lake	Weather Station	8/31/2000	Maricopa County FCD

Source: ADWR 2005c

Notes:

FCD = Flood Control District

ADWR = Arizona Department of Water Resources

B. SRP Low Flow Gages

Map Key	Station Name	GaugeType	Install Date	Upper Flow Limit (cfs)
a	Verde Headwaters/Campbell Ranch	Critical Depth Flume	4/2004	100
b	Verde at Black Bridge	Radar based level sensor	9/2001	150
c	Verde Falls	Low Flow Gage	6/2001 (destroyed spring 2004 and reinstalled summer 2006)	150
d	Bubbling Ponds	Low Flow Gage	NA	NA

Source: SRP, 2008

Notes:

NA = Not available at this time

Table 5.5-4 Reservoirs and Stockponds in the Verde Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE ¹	JURISDICTION
1	Barlett	Bureau of Reclamation	178,186	R,S	Federal
2	Horseshoe	Bureau of Reclamation	131,500	I,S	Federal
3	Hells Canyon Tank (Hell Canyon)	AZ Dept. of Transportation	1,545	P	State
4	Wineglass Ranch	AZ Land Dept	1,226	P	State
5	Railroad Embankment	Atchison, Topeka, & Santa Fe RR	1,000	C	State
6	Padre Reservoir (Pan Dam)	Atchison, Topeka, & Santa Fe RR	760	O	State
7	Canyon Mouth	Atchison, Topeka, & Santa Fe RR	600	O	State

B. Other Large Reservoirs (50 acre surface area or greater)²

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE ¹	JURISDICTION
8	Rogers ³	Coconino NF	1,134	P	Federal
9	Stoneman	Coconino NF	220	P	Federal
10	Unnamed ⁴	AZ Land Dept.	94	P	State
11	Little Red Lake ⁴	Private	85	P	Landowner
12	Horse ⁴	Kaibab NF	83	P	Federal
13	Duck	Kaibab NF	50	P	Federal

Source: Compilation of databases from ADWR & others

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total number: 27

Total maximum storage: 3,592 acre-feet

D. Other Small Reservoirs (between 5 and 50 acres surface area)²

Total number: 32

Total surface area: 496 acres

E. Stockponds (up to 15 acre-feet capacity)

Total number: 2,328 (from water right flings)

Notes:

NA = Not applicable

¹C=flood control; F=fish & wildlife pond; I=irrigation; O=other; P=fire protection, stock or farm pond

R=recreation; S=water supply

²Capacity data not available to ADWR

³Intermittent Lake

⁴Dry Lake



- USGS Annual Runoff Contour for 1951-1980 (in inches)
- Stream Channel (width of line reflects stream order)
- Large Reservoir
- USGS Gage & Station ID
- Flood ALERT Equip. & Station ID
- SRP Low Flow Gage
- County
- Interstate Highway
- Major Road
- City, Town or Place

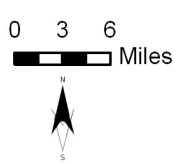


Figure 5.5-4
Verde River Basin
Surface Water Conditions



Stream Data Source: ALRIS, 2005



5.5.5 Perennial/Intermittent Streams and Major Springs in the Verde River Basin

Major and minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 5.5-5. The locations of major springs and perennial and intermittent streams are shown on Figure 5.5-5. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- Perennial streams are located throughout most of the basin and include the Verde River, Oak Creek, Fossil Creek, East Verde Creek, West Clear Creek, Wet Beaver Creek, Deadman Creek and Sycamore Creek. These streams are perennial for all or most of their length.
- Intermittent streams are found throughout the basin except for the northwestern portion of the basin.
- There are 102 major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time, the largest number reported in any groundwater basin in Arizona. The largest discharge rate of 21,647 gpm was measured at Fossil Creek spring.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 5.2-5B. There are 83 minor springs in this basin.
- Listed discharge rates may not be indicative of current conditions. Many of the measurements were taken during or prior to 1981.
- The total number of springs, regardless of discharge, identified by the USGS varies from 493 to 571, depending on the database reference.

Table 5.5-5 Springs in the Verde River Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
1	Fossil Creek (multiple)	342523	1113423	21,647	During or prior to 2001
2	Big Chino	345107	1122546	8,941	During or prior to 1997
3	Bubbling Pond	344625	1115403	3,879	5/20/1968
4	Buckhorn	343340	1113108	1,000- 3,750 ²	5/28/1959
5	Unnamed	345327	1120815	2,917	7/4/1991
6	Page	344542	1115318	2,693	1/20/1975
7	Summers	345250	1120358	2,100	10/12/2003
8	Wet Beaver	344116	1113433	850-1,350 ²	10/28/1999
9	Parson	345410	1120349	1,600	11/27/1999
10	Webber Canyon	341923	1112003	996	During or prior to 2002
11	Montezuma Well	343856	1114503	916	During or prior to 1990
12	Cold	342058	1111547	830	11/11/1952
13	Unnamed	345838	1114507	749	During or prior to 1949
14	Haskell	344407	1120357	600	10/24/1958
15	Lower Newell ³	344438	1115332	520	2/4/1959
16	Duff	345234	1121727	449	During or prior to 1997
17	Sullivan Lake	345148	1122636	448	During or prior to 1997
18	Grotto	341859	1112026	340	5/15/1952
19	Bonito ³	342410	1111238	330	11/19/1999
20	Lolo-Mai	344631	1115403	300	7/10/1974
21	Sterling # 1	350130	1114420	300	10/12/2003
22	Tree Root	344627	1115405	264	7/9/1952
23	Dude	342925	1111351	250	11/18/1999
24	Blue	343125	1114959	230	6/11/1981
25	Upper Parsnip ³	342616	1112543	230	11/9/1999
26	Unnamed ³	341935	1114515	220	4/21/1976
27	Unnamed ³	343135	1115015	220	11/6/1980
28	Spring Creek	344633	1115511	207	10/12/2003
29	Pieper Hatchery	342602	1111527	200	10/12/2003
30	Chase ³	342557	1111740	200	11/11/1999
31	Unnamed ³	343138	1115035	190	6/9/1981
32	Spider John	345300	1120422	15-180 ²	10/27/1999
33	Thompson Pasture	345436	1114335	177	2/14/1952
34	Big	341854	1112037	175	5/15/1952
35	Turtle Pond	344627	1115404	160	12/10/1952
36	Clover	343021	1112145	123 ⁵	4/26/2003
37	Indian Gardens	345439	1114336	115	2/14/1952

Table 5.5-5 Springs in the Verde River Basin (Cont)

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
38	Sheepshead Canyon	344448	1115557	111	3/1/1974
39	Bear	343259	1112548	100	5/27/1959
40	Tonto Bridge	341918	1112716	100	10/12/2003
41	Burned house ^{3,4}	342257	1111700	100	10/18/1952
42	Unnamed	343122	1114959	90	11/6/1980
43	Beaverhead	344251	1114701	85	6/4/1974
44	Unnamed	342221	1111709	75	10/18/1952
45	Unnamed	345316	1120734	75	6/8/1977
46	Walker Creek ³	343847	1114111	75	7/10/1959
47	Banjo Bill	345739	1114509	75 ⁵	3/6/1974
48	Unnamed	351313	1114958	64	8/2/1978
49	Unnamed	351320	1115033	60	8/9/1949
50	Page area # 1	344634	1115405	60	7/10/1974
51	Ellison Headwater	342333	1110913	60	12/1/1999
52	Gravel Plant ³	344605	1120235	60	10/29/1958
53	Landon	350726	1114238	60	8/29/1979
54	Walnut	344423	1120801	52	5/10/1978
55	Unnamed	345106	1129358	50	During or prior to 1965
56	Unnamed	345832	1114546	50	8/18/1949
57	Unnamed	351324	1115045	50	8/9/1949
58	Brown	342439	1114721	50	2/3/1959
59	Pine Flat	350040	1114411	50	10/4/2002
60	Sherwood	345908	1114450	50	1/20/2000
61	Unnamed	340735	1115116	45	5/12/1976
62	Big	350929	1120448	40	6/11/1997
63	Ellison	342330	110959	40	12/1/1999
64	Twin (multiple)	344132	1120619	40	5/10/1978
65	Clear Creek # 1	343138	1113925	30	11/17/1999
66	Lelani	345905	1114443	30	During or prior to 1949
67	Geronimo	350440	1115649	10-30 ^{2,5}	During or prior to 2001
68	North Sycamore ³	342521	1111908	30	1/12/1999
69	Sheep Bridge Hot (multiple)	340441	1114223	26	6/13/2002
70	Cave	345955	1114423	25	1/20/2000
71	Lolami	345937	1114437	25	8/17/1949
72	Woods	345211	1113723	25	12/13/1960
73	Hummingbird	345903	1114450	25	8/18/1949
74	Lo	350913	1115857	24	7/24/2002

Table 5.5-5 Springs in the Verde River Basin (Cont)

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
75	Catfish	343112	1115003	22	6/11/1981
76	Sterling # 2	350130	1114423	21 ⁵	8/13/1949
77	Sterling # 3	350130	1114421	20	8/13/1949
78	Hutch # 1	341232	1115311	20	6/12/2002
79	Hutch # 2	341229	1115306	20	6/12/2002
80	LX	341005	1115005	20	6/13/2002
81	Stone Camp	340704	1115105	20	7/6/2002
82	Zig Zag # 1	341040	1114734	20	6/13/2002
83	Mine	342903	1115107	20	1/27/1982
84	Poison	350802	1115828	20 ⁵	8/31/1949
85	Pivot Rock	342927	1112351	20 ⁵	12/2/1999
86	Parsnip	342600	1112553	20 ⁵	11/9/1999
87	Clear Creek # 3	343222	1113730	20	11/17/1999
88	Clear Creek # 2	343141	1113919	15	11/17/1989
89	Unnamed	345745	1114604	15	During or prior to 1951
90	Pyle Ranch	342215	1111009	15	12/1/1999
91	Soda	343845	1114429	15	2/6/1959
92	Unnamed ³	343120	1115001	13	11/6/1980
93	Little	351812	1115724	12	6/6/1979
94	Verde Hot	342119	1114233	12	6/20/2002
95	Unnamed	341126	1114730	10	7/7/1976
96	Bunker Hill	345900	1115524	10	9/20/1962
97	Frey Ranch	344635	1115413	10	7/10/1974
98	Lindberg/Fulton	350629	1114313	10	7/8/1952
99	Washington Park	342526	1111600	10	10/18/1952
100	Washington	342603	1111619	10 ⁵	10/1/1999
101	Gray	350736	1115743	10 ⁵	9/20/1962

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Unnamed	343131	1115002	9	11/6/1980
Babe's Hole	350421	1115623	8	8/10/2002
Bull Pen	343214	1114145	7	10/10/1959
Lower Lo	350906	1115854	6	10/24/2001
Cottontail	344337	1115538	5	6/9/1977

Table 5.5-5 Springs in the Verde River Basin (Cont)

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Maxwell	351657	1114746	5	6/5/1978
Unnamed	345202	1122523	5	5/2/1977
Storm Seep	350107	1123053	5	4/19/2001
Hackberry # 2	342558	1114122	5	5/31/2002
Wet Prong	342431	1114350	5	6/21/2002
Big	343228	1113724	5	11/19/1999
Unnamed	352017	1114328	5	8/17/1978
Lockwood	350248	1115147	5 ⁶	9/20/1960
Irving High	342426	1113611	5 ⁶	11/15/1999
Irving Low	342417	1113640	5 ⁶	5/24/1978
Hance	343336	1114420	4	5/27/1981
Frizell Ranch	344443	1115511	4	2/6/1959
Picnic	340941	1114957	4	6/13/2002
Turkey	322436	1112307	4	7/27/2002
North Pasture	340750	1115127	3	6/14/2002
Red rock	342214	1112402	3	7/22/1946
Dripping (multiple)	342327	1112603	3	7/20/1946
Unnamed	351354	1115136	3	8/2/1978
Spitz	351537	1115823	3	6/1/1978
Oak	342102	1112822	3	08/1946
Sycamore #1B	342825	1114232	3	6/7/2002
Cottonwood	343102	1115215	3	12/13/1977
Lee	345605	1125506	2	4/20/2001
Russell	343709	1114536	2	10/12/2003
Quail	344015	1120258	2	7/11/2002
Phroney	342631	1114134	2	6/10/2000
Sycamore #1A	342830	1114230	2	6/7/2002
Sycamore # 2	342754	1114249	2	6/7/2002
Zig Zag # 2	341041	1114733	2	6/13/2002
Pine	345759	1125413	2	4/20/2001
Ash	340459	1115214	2	5/12/1976
Beaver Creek ³	344044	1114108	2	4/20/1978
Buzzard	350026	1114943	2	9/20/1962
West Twin	351006	1121326	2	9/30/1976
Little Hutch # 1	341232	1115316	2	6/12/2002
Little Hutch # 2	341231	1115317	2	6/12/2002
Sheep	345458	1113214	2	6/24/2002
Unnamed ³	343030	1115410	2	7/10/1959

Table 5.5-5 Springs in the Verde River Basin (Cont)

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Powell	343454	1120445	2	4/20/1978
Goat Camp	343748	1120141	2	4/18/1978
Hogpen	344552	1120603	2	5/4/1978
Unnamed	345606	1124002	2	7/15/1969
Surprise	343614	1123242	2	4/19/2001
Log	343606	1120420	2	6/29/2002
Rosalida	351030	1120341	2	6/11/1997
Cherry 361b	343625	1120038	2	7/11/2002
Tappen	351057	1114655	2	9/6/1949
McGee	342522	1111601	2	10/18/1952
Unnamed	344208	1120530	2	5/10/1978
Mud	350654	1121111	1	4/30/2003
Black	350802	1114117	1	8/1/1949
Baker	350115	1141729	1	12/2/1999
Railroad	350807	1115734	1	11/2/2001
Pine	342242	1112323	1	8/11/2002
Pfau	343622	1120012	1	7/11/2002
Trail Jct.	335838	1114021	1	7/18/2002
Kelsey	350432	1115605	1	8/6/2002
Hackberry # 1	342603	1114117	1	10/12/2003
Fuller/Strawberry	342436	1112833	1	7/24/1946
Dripping (multiple)	342328	1112306	1	10/11/2002
Unnamed	343154	1115035	1	10/28/1981
North Mine	342916	1115113	1	1/27/1982
Fourty Four	342905	1112217	1	1/19/2000
Unnamed	343425	1114352	1	5/27/1981
Holly	344501	1115502	1	3/1/1974
Bell Rock	344752	1114552	1	4/25/1974
Dorsey	350316	1115640	1	8/11/1949
Grassy Meadow	350014	1114402	1	8/17/1949
Aspen	350738	1114707	1	6/22/1978
Buck	351120	1120240	1	During or prior to 11/2004
Garland	351116	1115949	1	During or prior to 11/2004
Huffer	342756	1112315	1	12/2/1999
Strawberry Hollow	342346	1112814	1	7/24/1946
Chasm	342643	1114942	1	7/1/2002
Rock Top	345109	1113253	1	6/27/2002
Cottonwood ^{3,4}	342248	1112840	1	7/24/1946
Unnamed ^{3,4}	350633	1114929	1	During or prior to 1946

Table 5.5-5 Springs in the Verde River Basin (Cont)

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Fisher (tank)	351022	1114531	1	8/18/1949

Source: Compilation of databases from ADWR & others

**C. Total number of springs, regardless of discharge, identified by USGS
(see ALRIS, 2005a and USGS, 2006a): 493 to 571**

Notes:

¹Most recent measurement identified by ADWR

²Discharge is expressed as a range

³Spring is not displayed on current USGS topo maps

⁴Location approximated by ADWR

⁵Discharge measurements vary. Shown is greatest measured discharge;
most recent measurement < 10 gpm

⁶Discharge measurements vary. Shown is greatest measured discharge;
most recent measurement < 1 gpm

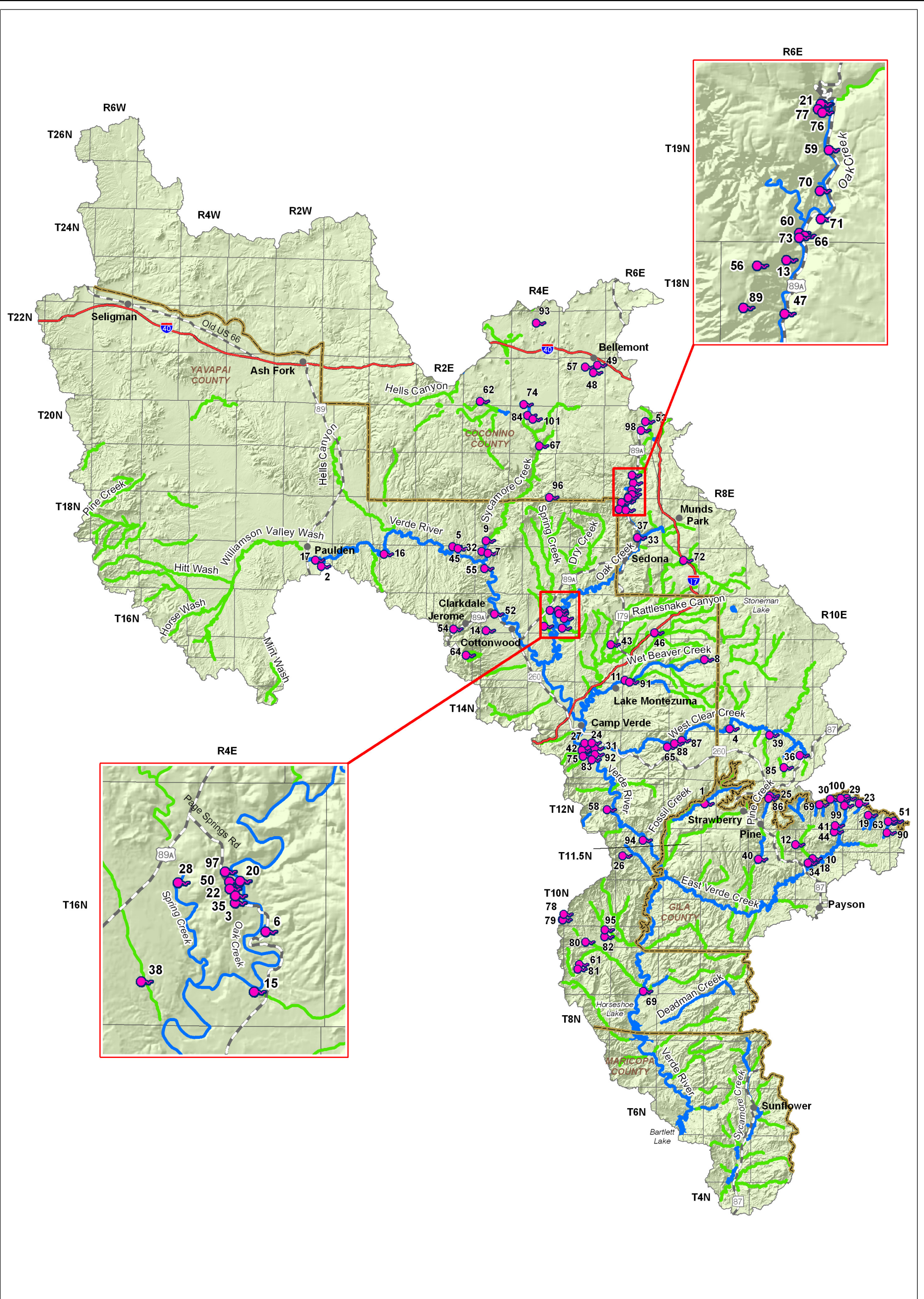










Figure 5.5-5
Verde River Basin
Perennial/Intermittent Streams
and Major (>10 gpm) Springs

Stream Data Source: AGFD, 1993 & 1997



- Springs 
- Intermittent Streams 
- Perennial Streams 
- COUNTY 
- Interstate Highway 
- Major Road 
- City, Town or Place 

5.5.6 Groundwater Conditions of the Verde River Basin

Major aquifers, well yields, estimated natural recharge, estimated water in storage, number of index wells and date of last water-level sweep are shown in Table 5.5-6. Figure 5.5-6 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. In the Verde Valley and Big Chino sub-basins few wells were measured in 1990-1991. Figures 5.5-6A and 5.5-6B show water level changes in these sub-basins measured in other years. Figure 5.5-7 contains hydrographs for selected wells shown on Figure 5.5-6. Figure 5.5-8 shows well yields in five yield categories. A description of aquifer data sources and methods as well as well data sources and methods, including water-level changes and well yields are found in Volume 1, Appendix A.

Major Aquifers

- Refer to Table 5.5-6 and Figures 5.5-6 and 5.5-6 A and B.
- Major aquifers in the basin include the Verde formation, the C and R aquifers, recent stream alluvium, basin fill and igneous and metamorphic rock.
- The basin contains three sub-basins, Big Chino, Verde Valley and Verde Canyon.
- Flow direction is generally from the north to the south following the Verde River.

Well Yields

- Refer to Table 5.5-6 and Figure 5.5-8.
- As shown on Figure 5.5-8, well yields in this basin range from less than 100 gallons per minute (gpm) to greater than 2,000 gpm.
- One source of well yield information, based on 262 reported wells, indicates that the median well yield in this basin is 260 gpm.

Natural Recharge

- Refer to Table 5.5-6.
- Natural recharge estimates range from 107,000 acre-feet per year (AFA) to more than 138,000 AFA.
- Natural recharge in the Big Chino Sub-basin is from runoff along the mountain fronts and the major washes. Recharge estimates for the sub-basin range from 30,300 to 31,770 AFA. Recharge in the Verde Valley Sub-basin is principally from infiltration of precipitation in the higher elevations and is estimated at 167,470 acre-feet per year (Blausch et al., 2006).

Water in Storage

- Refer to Table 5.5-6.
- Storage estimates for this basin range from 13 million acre-feet (maf) to 28 maf to a depth of 1,200 feet. Estimates for portions of the basin are shown in Table 5.5-6.

Water Level

- Refer to Figures 5.5-6 and 5.5-6A and B. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures 130 index wells in this basin. Hydrographs for 20 index wells, one automated well (P) and three other wells are shown in Figure 5.5-7. Index well hydrographs are: B-J, L-N and Q-X.

- There are eight ADWR automated groundwater level monitoring devices in this basin.
- These data show the deepest recorded water level in the basin is 1,375 feet in the vicinity of Strawberry. There are two wells in the basin where the depth to water is only one foot, located southwest of Paulden and south and east of Bellemont.

Table 5.5-6 Groundwater Data for the Verde River Basin

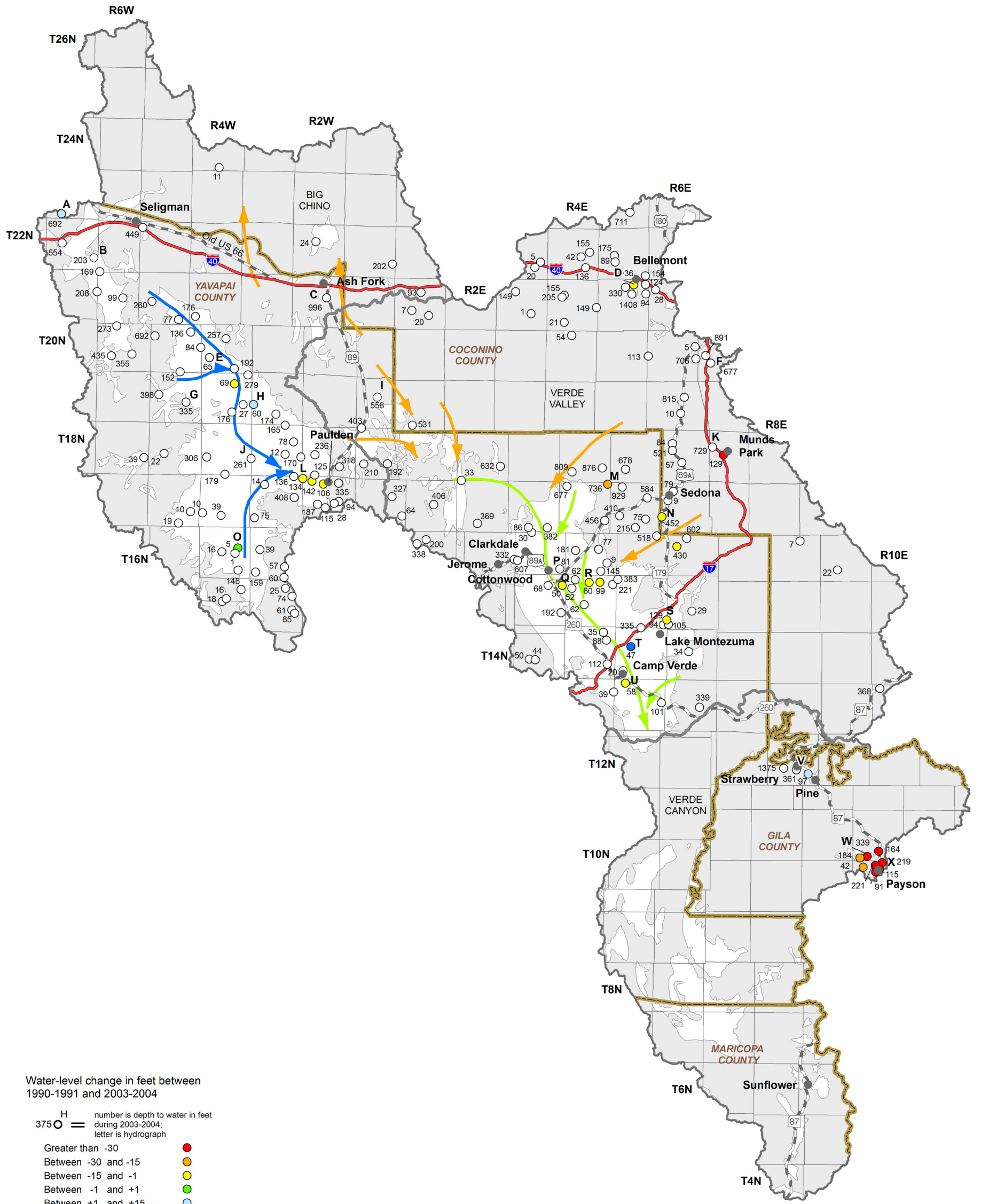
Basin Area, in square miles: 5,661		
Major Aquifer(s):	Name and/or Geologic Units	
	Recent Stream Alluvium	
	Basin Fill with Interbedded Volcanic Rock	
	Sedimentary Rock (Verde Formation)	
	Sedimentary Rock (C and R Aquifers)	
	Igneous and Metamorphic Rock	
Well Yields, in gal/min:	Range 10-2,908 Median 102 (55 wells measured)	Measured by ADWR (GWSI) and/or USGS
	Range 1-5,500 Median 260 (262 wells reported)	Reported on registration forms for large (>10-inch) diameter wells (Wells55)
	10-1000	ADWR (1994b)
	Range 0-2,500	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	167,470 (average for Verde Valley Sub-basin during 1990 - 2003) ¹	Blasch and others (2006)
	30,300 (average for Big Chino Sub-basin during 1990 - 2003) ²	Blasch and others (2006)
	31,770 (Big Chino Sub-basin during 1996 and 1997) ³	ADWR (2000)
	1,826 (Town of Payson only)	Southwest Groundwater Consultants (1998)
	>138,000	ADWR (1994b)
	107,000	Freethey and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	6,800,000 (portion of Upper Big Chino Sub-basin)	Southwest Groundwater Consultants (2005)
	10,000,000 (Big Chino Sub-basin to 1,200 feet)	McGavock (2003)
	9,230 (Pine/Strawberry area) ⁴	ADWR (1996)
	28,000,000 (to 1,200 feet)	ADWR (1990)
	13,000,000 (to 1,200 feet)	Freethey and Anderson (1986)
	>22,000,000	Arizona Water Commission (1975)
Current Number of Index Wells: 130		
Date of Last Water-level Sweep: 2009 (269 wells measured)		

¹ Includes 19,300 AF of incidental and artificial recharge.

² Includes 4,300 AF of incidental and artificial recharge.

³ Includes 8,010 AF of incidental recharge.

⁴ This figure has been refuted as an overestimation by Morrison Maierle (2003).



Water-level change in feet between 1990-1991 and 2003-2004

- H number is depth to water in feet during 2003-2004; letter is hydrograph
- 375 ○ =
- Greater than -30 ●
- Between -30 and -15 ●
- Between -15 and -1 ●
- Between -1 and +1 ●
- Between +1 and +15 ●
- Between +15 and +30 ●
- Greater than +30 ●
- Change Data Not Available ○

- Generalized Flow Direction
- Verde Formation and Quaternary Alluvial Aquifers →
 - "Basin Fill" Aquifer →
 - "Carbonate" Aquifer →

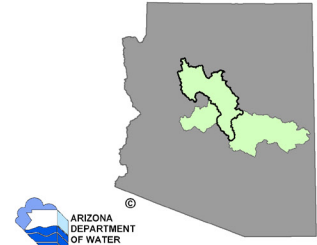
- Sub-Basin Boundary ~~~~~
- Consolidated Crystalline & Sedimentary Rocks [shaded box]
- Unconsolidated Sediments [white box]
- COUNTY [dashed line]
- Interstate Highway [thick red line]
- Major Road [thin red line]
- City, Town or Place ●

Note: Quaternary alluvial aquifer is immediately adjacent to the Verde River and generally less than 1 mile wide (Blasch and others, 2005)

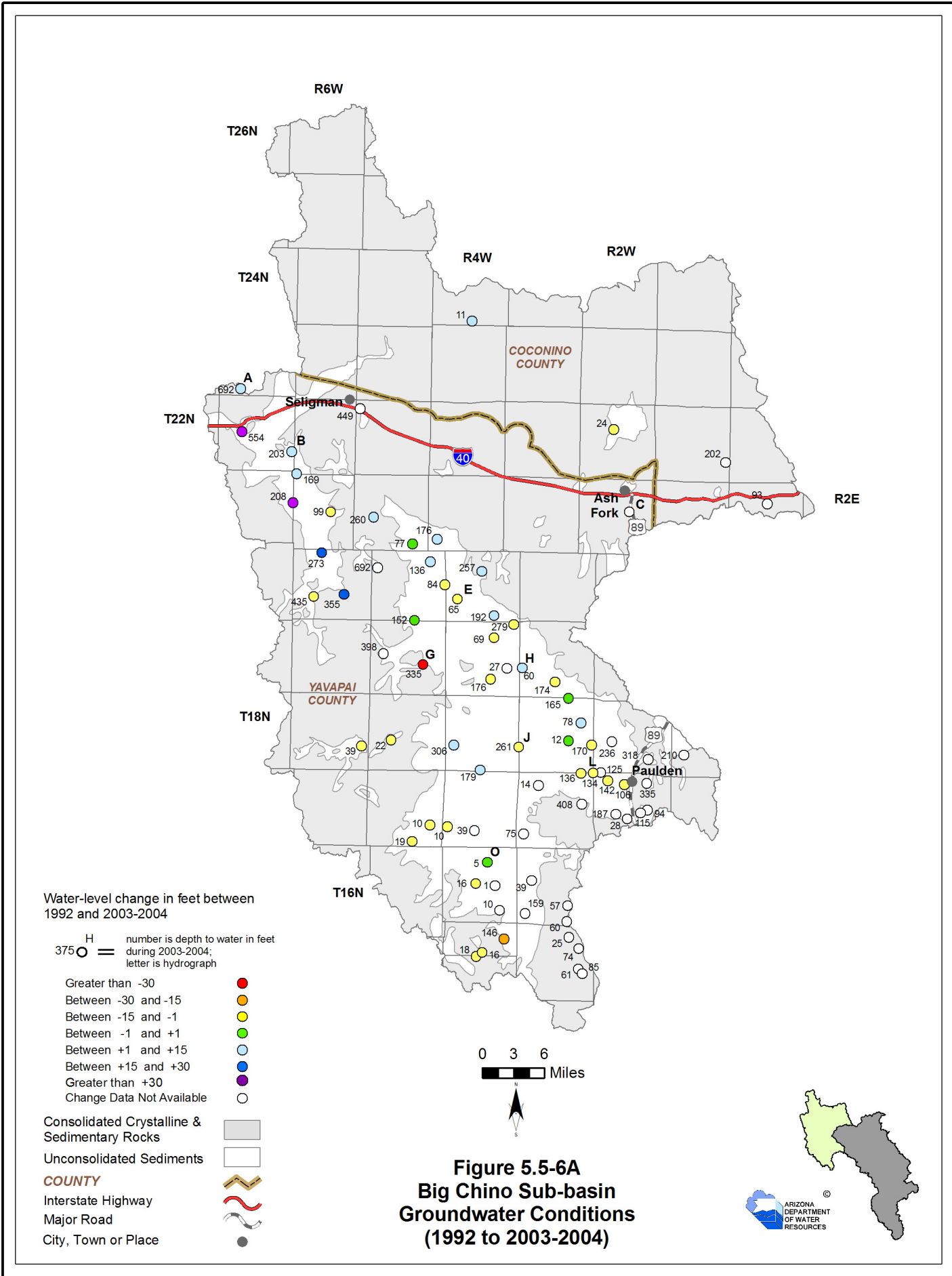
0 3 6 Miles

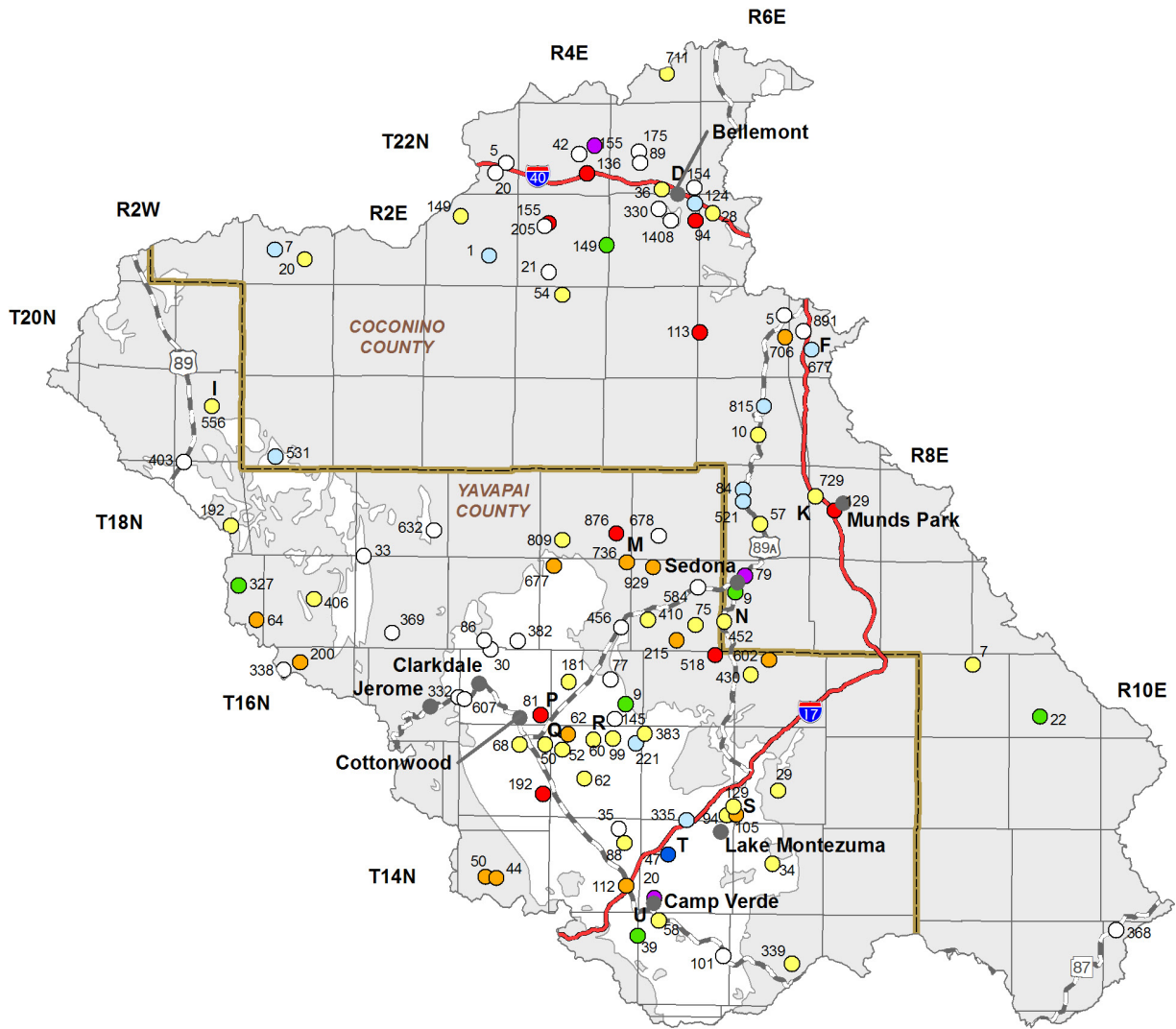


Figure 5.5-6
Verde River Basin
Groundwater Conditions



ARIZONA DEPARTMENT OF WATER RESOURCES





Water-level change in feet between
1994 and 2003-2004

H = number is depth to water in feet
during 2003-2004;
letter is hydrograph

- Greater than -30 ●
- Between -30 and -15 ●
- Between -15 and -1 ●
- Between -1 and +1 ●
- Between +1 and +15 ●
- Between +15 and +30 ●
- Greater than +30 ●
- Change Data Not Available ○

Consolidated Crystalline &
Sedimentary Rocks

Unconsolidated Sediments

COUNTY

Interstate Highway

Major Road

City, Town or Place

0 3 6
Miles



Figure 5.5-6B
Verde Valley Sub-basin
Groundwater Conditions
(1994 to 2003-2004)



Figure 5.5-7
Verde River Basin
Hydrographs Showing Depth to Water in Selected Wells

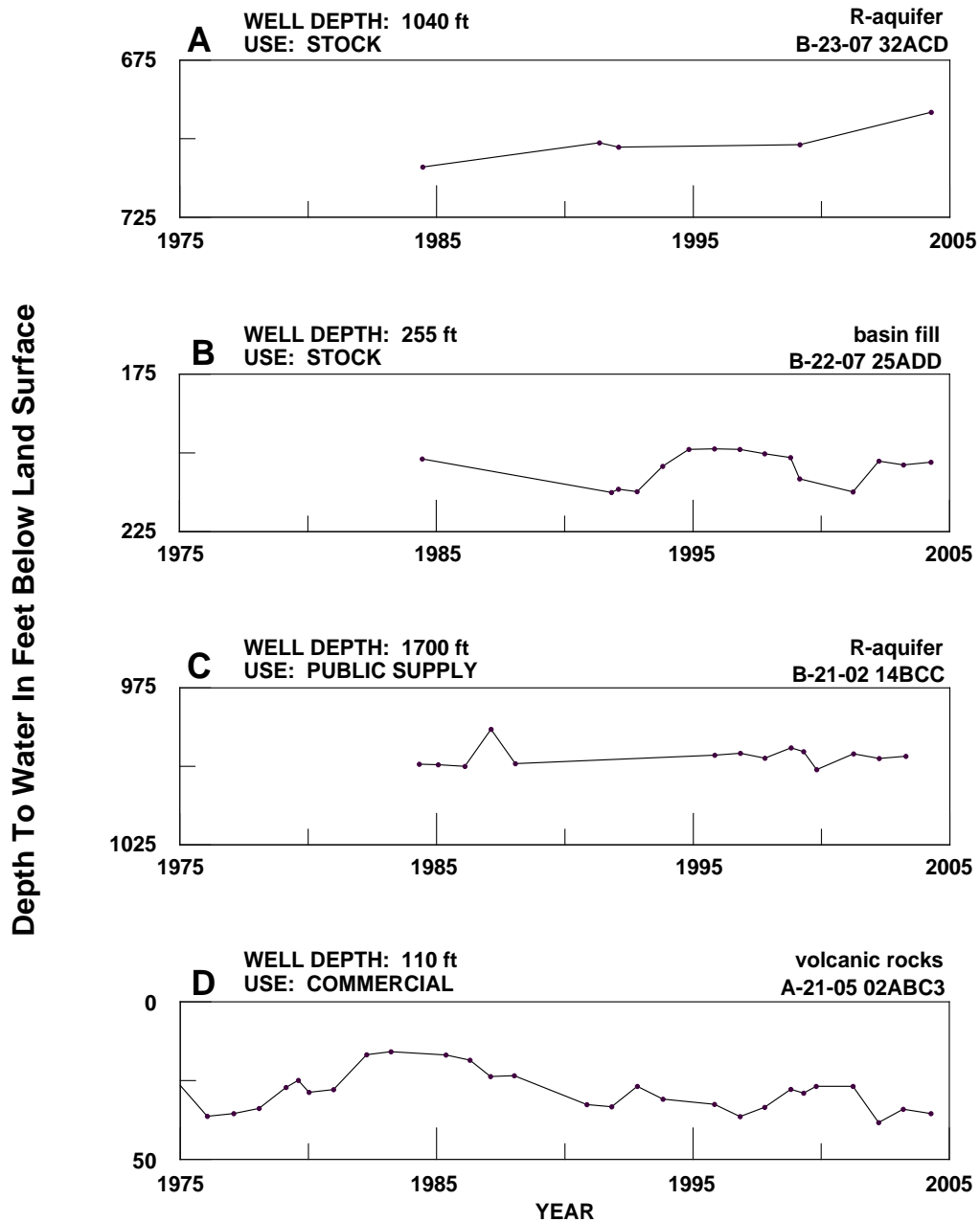


Figure 5.5-7 (Cont)
Verde River Basin
Hydrographs Showing Depth to Water in Selected Wells

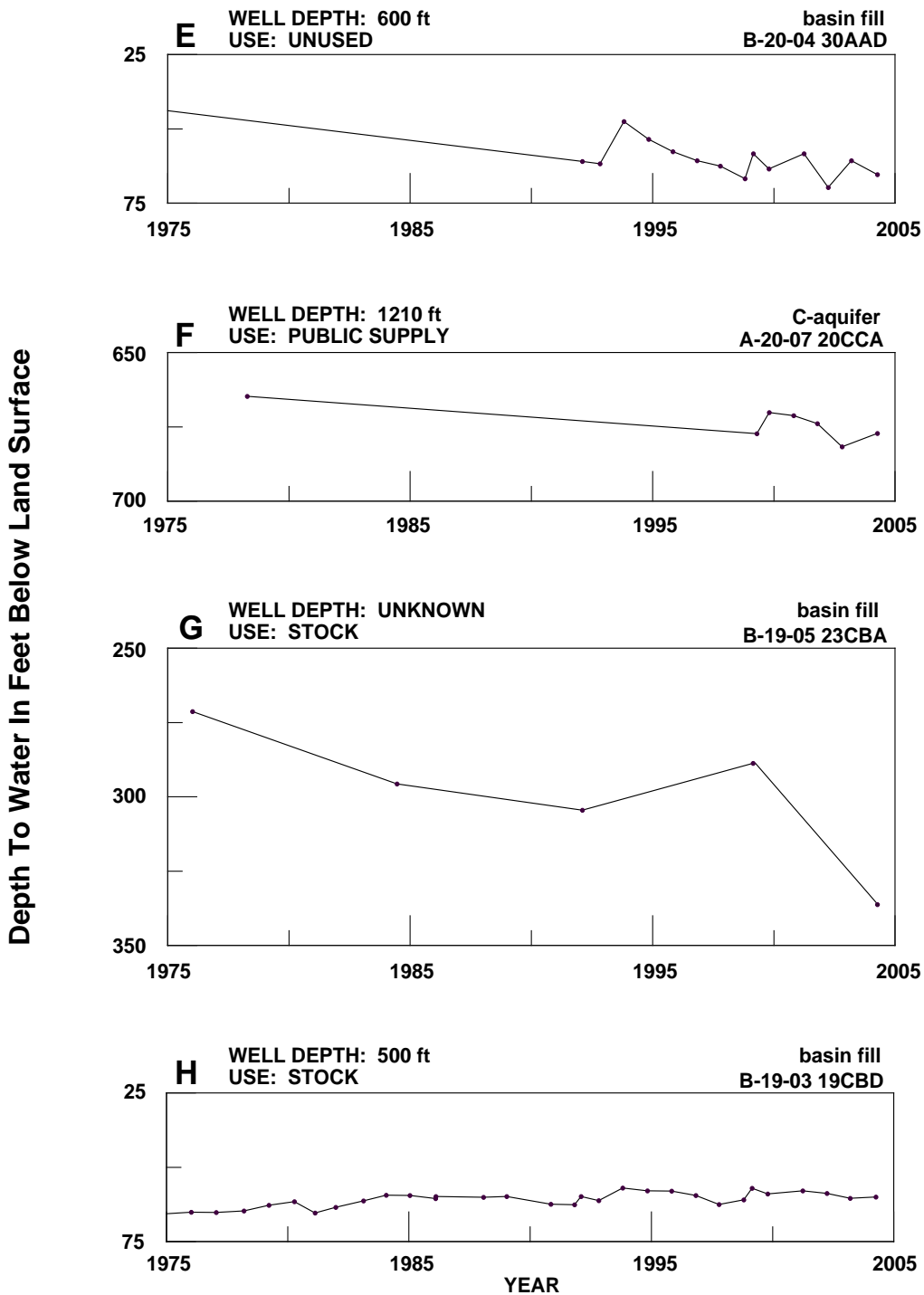


Figure 5.5-7 (Cont)
Verde River Basin
Hydrographs Showing Depth to Water in Selected Wells

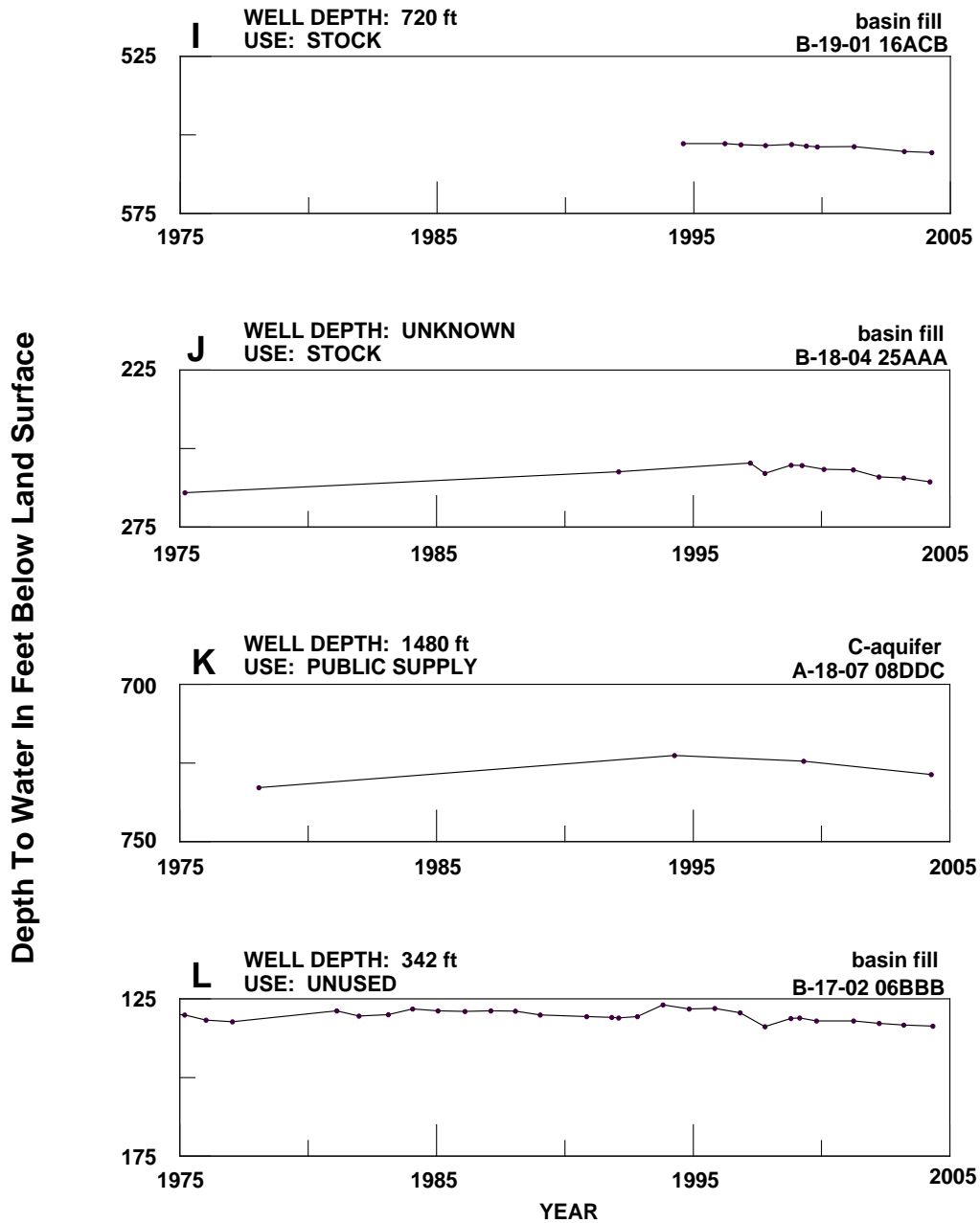


Figure 5.5-7 (Cont)
Verde River Basin
Hydrographs Showing Depth to Water in Selected Wells

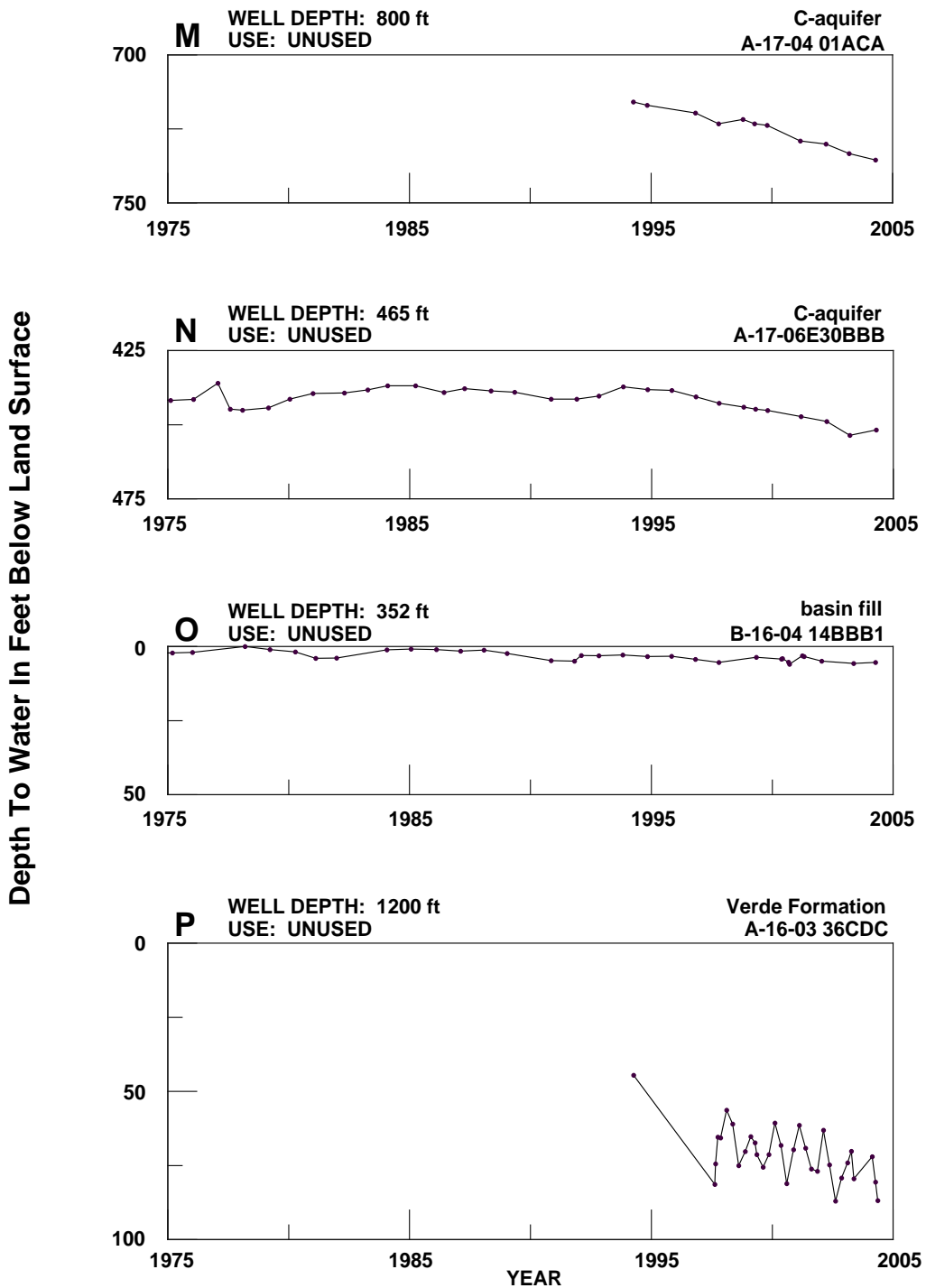


Figure 5.5-7 (Cont)
Verde River Basin
Hydrographs Showing Depth to Water in Selected Wells

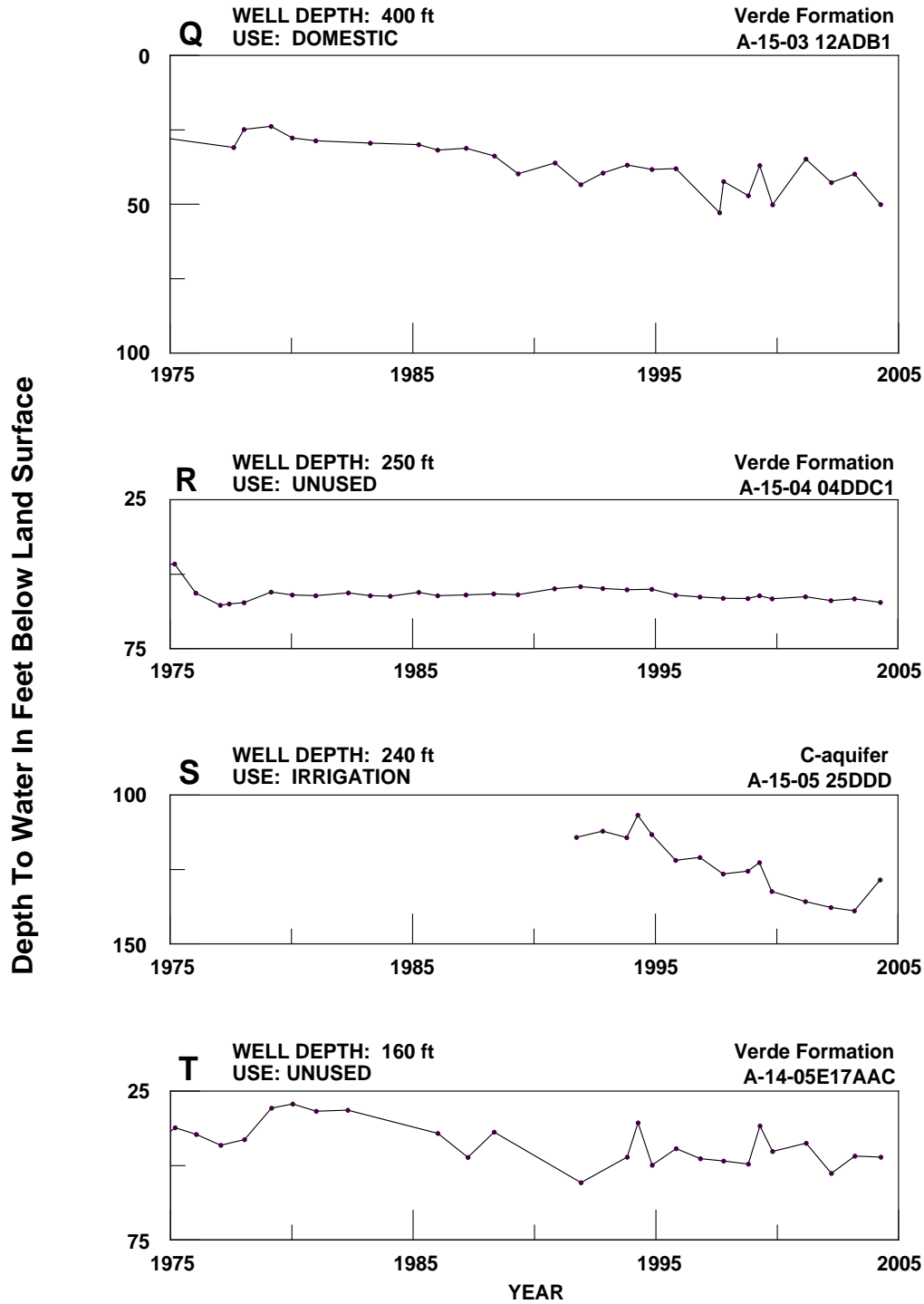


Figure 5.5-7 (Cont)
Verde River Basin
Hydrographs Showing Depth to Water in Selected Wells

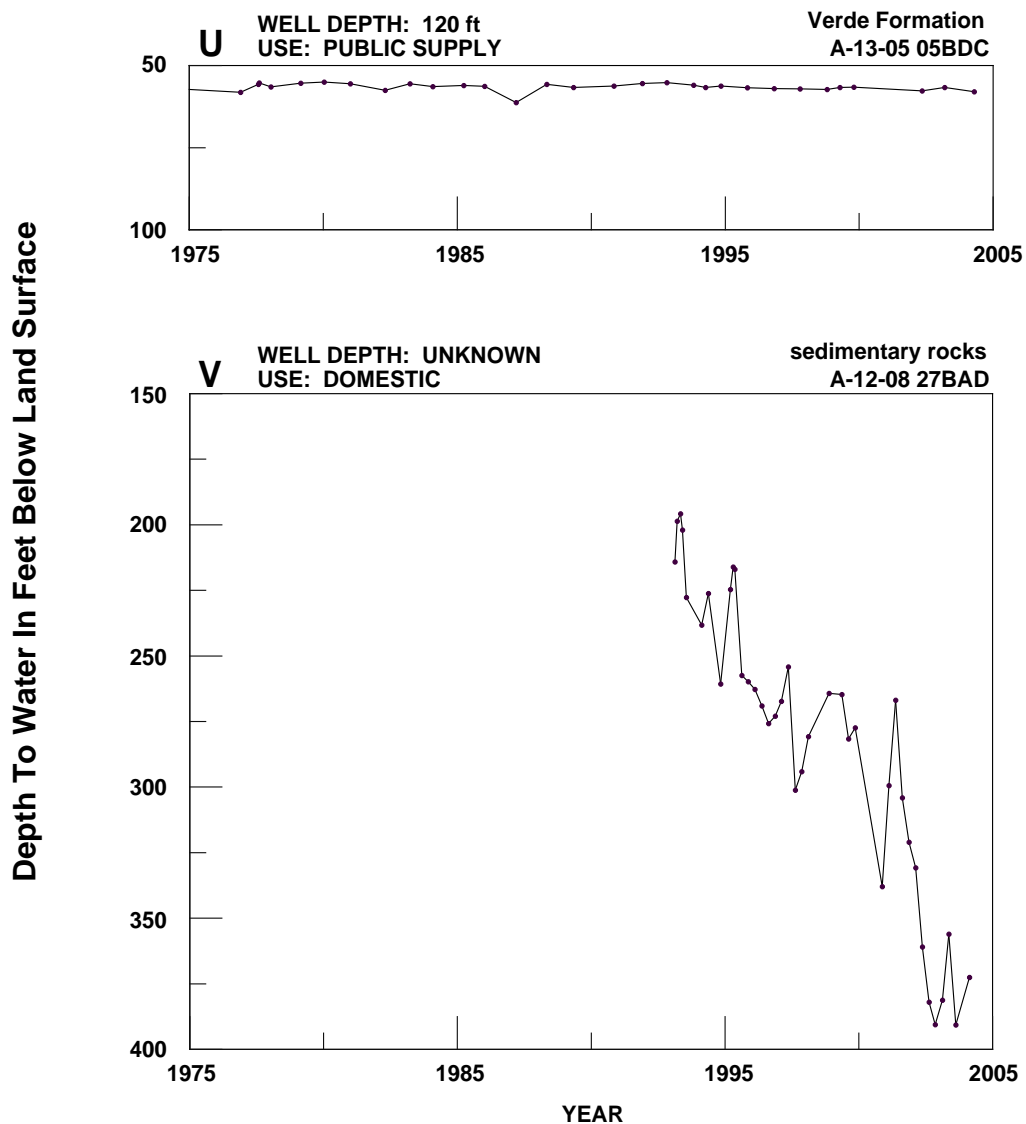
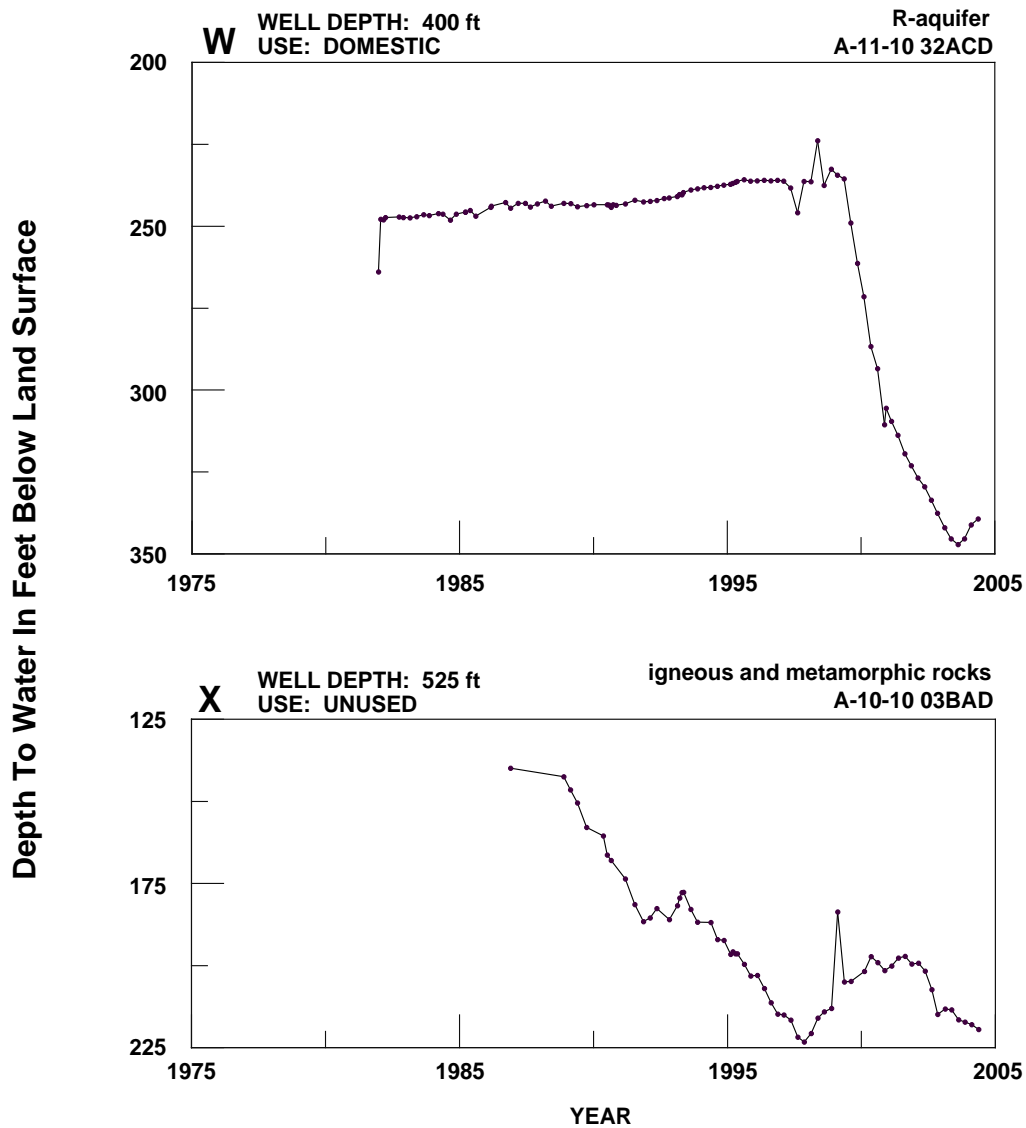
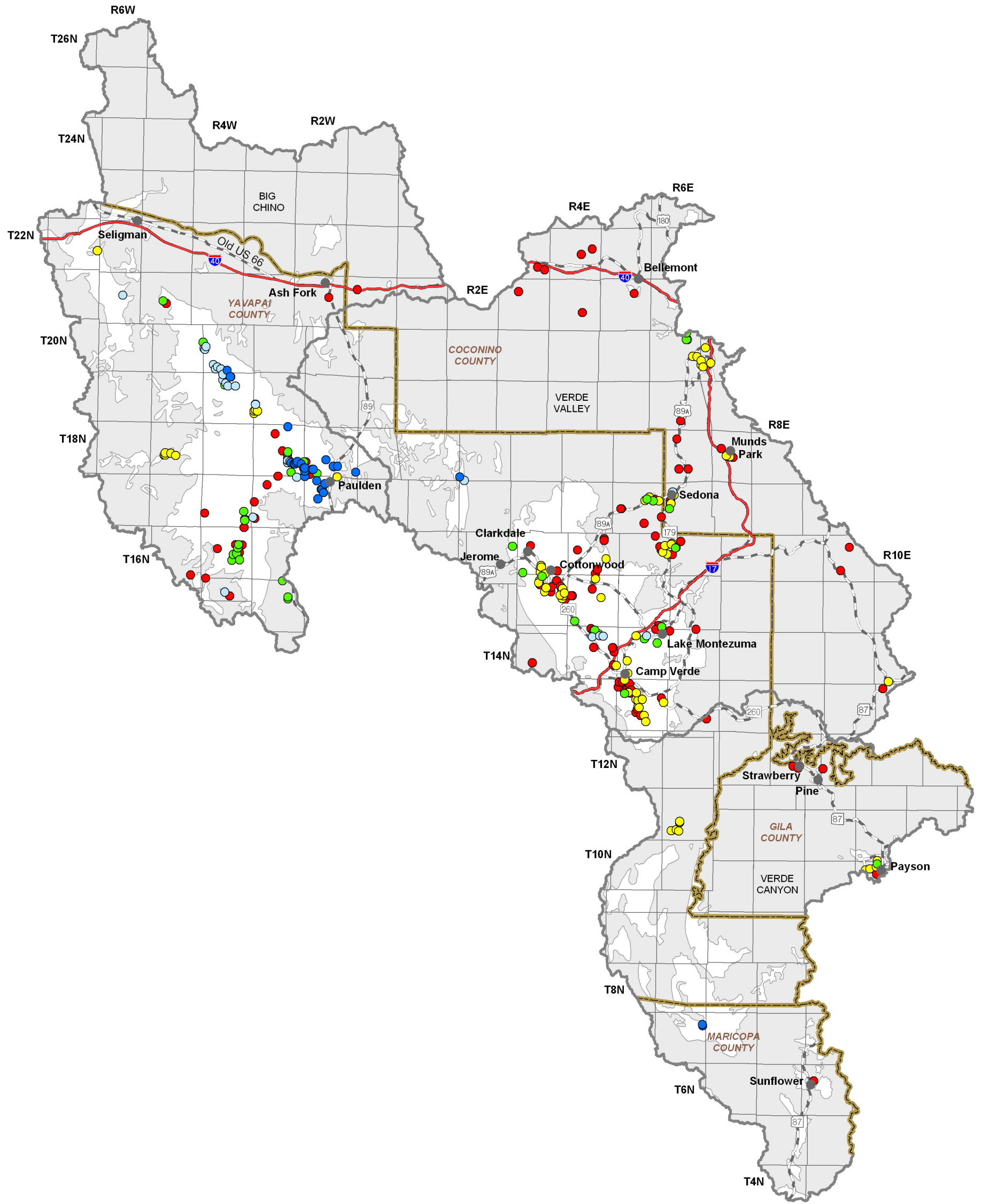


Figure 5.5-7 (Cont)
Verde River Basin
Hydrographs Showing Depth to Water in Selected Wells





Well Yields

- Greater than 2000 gals/min ●
- Between 1000 and 2000 gals/min ●
- Between 500 and 1000 gals/min ●
- Between 100 and 500 gals/min ●
- Less than 100 gals/min ●

Sub-Basin

- Consolidated Crystalline & Sedimentary Rocks
- Unconsolidated Sediments

COUNTY

- Interstate Highway —
- Major Road —
- City, Town or Place ●

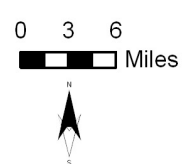
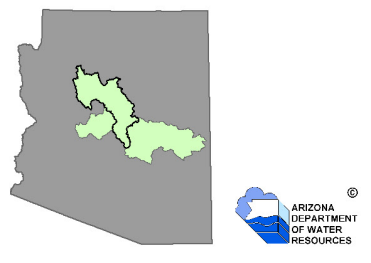


Figure 5.5-8
Verde River Basin
Well Yields



5.5.7 Water Quality of the Verde River Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 5.5-7A. Impaired lakes and streams with site type, name, length of impaired reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 5.5-7B. Figure 5.5-9 shows the location of water quality occurrences keyed to Table 5.5-7. All community water systems are regulated under the Safe Drinking Water Act and treat water supplies to meet drinking water standards. Not all parameters were measured at all sites; selective sampling for particular constituents is common. A description of water quality data sources and methods is found in Volume 1, Appendix A.

Well, Mine or Spring sites that have equaled or exceeded drinking water standards (DWS)

- Refer to Table 5.5-7A.
- Four hundred and twenty-nine sites have parameter concentrations that have equaled or exceeded drinking water standards
- The parameter most frequently equaled or exceeded in the sites measured was arsenic.
- Many of the wells in the Payson area equaled or exceeded the standards for arsenic, beryllium, cadmium, lead, semi-volatile organic compounds and selenium.
- Other parameters equaled or exceeded in this basin include fluoride, nitrates and total dissolved solids.

Lakes and Streams with impaired waters

- Refer to Table 5.5-7B.
- Water quality standards were exceeded in three lakes in the basin and five stream reaches on three streams.
- Three stream reaches, totaling 37.5 miles, on the Verde River exceeded the water quality standard for turbidity.
- Whitehorse Lake and Pecks Lake exceeded the standard for dissolved oxygen and Stoneman Lake exceeded the and pH standard.
- East Verde River, Oak Creek, Verde River, Pecks Lake and Stoneman Lake are part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) program. Final TMDL reports have been completed for the lakes and all impaired reaches except for East Verde River which is under investigation.
- Whitehorse Lake is not part of the TMDL program at this time.

Effluent Dependent Reaches

- Refer to Figure 5.5-9
- There are three effluent dependent reaches. American Gulch near Payson, Bitter Creek near Jerome and Jacks Canyon Wash south of Sedona.

Table 5.5-7 Water Quality Exceedences in the Verde River Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Number of Sampling Sites	Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section		
1	Well	21 North	4 East	5	1	NO3
2	Well	19 North	1 East	33	1	As
3	Well	18 North	1 East	36	1	As
4	Spring	18 North	3 East	8	1	Cd
5	Spring	17 North	1 East	7	1	As
6	Spring	17 North	3 East	5	1	As
7	Well	17 North	3 East	33	1	As
8	Well	17 North	4 East	15	2	NO3
9	Well	17 North	5 East	11	1	As, Pb
	Well	17 North	5 East	11	1	Cd
10	Well	17 North	5 East	12	1	As
11	Well	17 North	5 East	13	1	As
12	Well	17 North	5 East	15	1	As, Cd
13	Well	17 North	5 East	19	1	As
14	Well	17 North	5 East	25	1	As, Cd, Pb
15	Well	17 North	5 East	26	2	Pb
16	Well	17 North	5 East	29	1	As
17	Well	17 North	5 East	35	1	As
18	Well	17 North	6 East	8	1	Cu
19	Well	17 North	6 East	19	1	As
20	Well	16 North	2 East	24	1	As
21	Spring	16 North	2 East	34	1	As
22	Well	16 North	3 East	21	1	As
23	Spring	16 North	3 East	22	1	As
	Well	16 North	3 East	22	1	As
24	Well	16 North	3 East	27	1	As
25	Well	16 North	3 East	28	2	As
26	Well	16 North	3 East	29	1	As
27	Well	16 North	3 East	30	1	As
28	Well	16 North	3 East	33	3	As
	Well	16 North	3 East	33	1	As, Be
29	Well	16 North	3 East	34	4	As
	Well	16 North	3 East	34	1	As, Cd
30	Well	16 North	3 East	35	1	As
31	Well	16 North	4 East	11	1	As
32	Spring	16 North	4 East	23	1	As
33	Well	16 North	4 East	27	2	As
34	Well	16 North	4 East	34	1	As
35	Well	16 North	4 East	35	1	As
36	Well	16 North	5 East	11	1	As
37	Well	16 North	5 East	13	1	As
38	Well	16 North	5 East	14	1	As
39	Well	16 North	6 East	8	1	As
40	Well	16 North	6 East	9	1	As
41	Well	16 North	6 East	13	1	As
42	Well	16 North	6 East	17	1	As
43	Well	16 North	6 East	18	3	As
44	Spring	15 North	2.5 East	13	1	As
45	Well	15 North	3 East	4	2	As
46	Well	15 North	3 East	5	2	As
47	Well	15 North	3 East	11	2	As
48	Well	15 North	3 East	12	6	As
49	Well	15 North	3 East	13	7	As
50	Well	15 North	4 East	2	2	As
51	Well	15 North	4 East	3	6	As
	Well	15 North	4 East	3	1	Pb
52	Well	15 North	4 East	4	2	As
53	Well	15 North	4 East	6	1	As
54	Well	15 North	4 East	9	1	As
55	Well	15 North	4 East	10	1	As

Table 5.5-7 Water Quality Exceedences in the Verde River Basin (Cont)¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Number of Sampling Sites	Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section		
56	Well	15 North	4 East	15	1	As
	Well	15 North	4 East	15	1	Pb
57	Well	15 North	4 East	18	4	As
58	Well	15 North	4 East	19	2	As
59	Well	15 North	4 East	21	1	As, Pb
60	Well	15 North	4 East	22	1	As
61	Well	15 North	4 East	31	1	As
62	Well	15 North	4 East	33	1	As
63	Well	15 North	5 East	20	1	As
64	Well	15 North	5 East	24	1	Pb
65	Well	15 North	5 East	34	1	As
66	Well	15 North	5 East	35	1	As
67	Well	15 North	5 East	36	8	As
68	Well	15 North	6 East	29	1	As
69	Spring	15 North	6 East	31	1	As, Pb
	Well	15 North	6 East	31	1	As
70	Spring	14 North	3 East	5	1	As
71	Spring	14 North	3 East	14	1	As
72	Well	14 North	3 East	21	1	NO3
73	Well	14 North	4 East	2	1	As
74	Well	14 North	4 East	3	4	As
	Well	14 North	4 East	3	1	As, Se
75	Well	14 North	4 East	11	1	As, Pb
	Well	14 North	4 East	11	2	As
76	Well	14 North	4 East	12	1	As
77	Well	14 North	4 East	13	10	As
78	Well	14 North	4 East	14	1	As, TDS
	Well	14 North	4 East	14	3	As
79	Well	14 North	4 East	24	1	As
	Well	14 North	4 East	24	1	As, Cd
80	Well	14 North	5 East	1	5	As
81	Well	14 North	5 East	2	9	As
82	Well	14 North	5 East	4	2	As
83	Well	14 North	5 East	17	1	As, Pb
84	Well	14 North	5 East	18	2	As
85	Well	14 North	5 East	19	7	As
	Well	14 North	5 East	19	1	As, Se
86	Well	14 North	5 East	31	3	As
87	Well	14 North	5 East	32	6	As
	Well	14 North	5 East	32	1	As, Pb
88	Well	13 North	4 East	12	1	As
89	Well	13 North	5 East	4	1	As, NO3
90	Well	13 North	5 East	5	8	As
91	Well	13 North	5 East	6	20	As
	Well	13 North	5 East	6	1	As, Pb
	Well	13 North	5 East	6	1	As, TDS
92	Well	13 North	5 East	7	28	As
	Well	13 North	5 East	7	2	As, Pb
	Well	13 North	5 East	7	1	As, TDS
	Well	13 North	5 East	7	1	F
93	Well	13 North	5 East	8	17	As
	Well	13 North	5 East	8	1	As, Pb
94	Well	13 North	5 East	9	3	As
	Well	13 North	5 East	9	1	As, Pb
95	Well	13 North	5 East	12	1	As
96	Well	13 North	5 East	13	1	As
97	Well	13 North	5 East	15	2	As
	Well	13 North	5 East	15	1	TDS

Table 5.5-7 Water Quality Exceedences in the Verde River Basin (Cont)¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Number of Sampling Sites	Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section		
98	Well	13 North	5 East	16	4	As
	Spring	13 North	5 East	16	1	As, Pb
99	Well	13 North	5 East	17	7	As
100	Well	13 North	5 East	20	1	As
101	Well	13 North	5 East	21	1	TDS
	Well	13 North	5 East	21	3	As
102	Well	13 North	5 East	27	4	As
103	Well	13 North	5 East	28	8	As
	Well	13 North	5 East	28	1	As, Pb
	Well	13 North	5 East	28	1	TDS
104	Well	13 North	5 East	34	3	As
105	Well	13 North	6 East	29	1	As
106	Spring	12 North	6 East	11	2	As
107	Well	12 North	8 East	26	4	As
108	Well	11.5 North	10 East	35	1	As
109	Spring	11 North	6 East	10	1	As, TDS
110	Well	10 North	10 East	3	1	As, Be, Cd, Pb, Organics, Se
111	Well	10 North	10 East	4	5	As, Be, Cd, Pb, Organics, Se
	Well	10 North	10 East	4	4	Organics
	Well	10 North	10 East	4	1	NO3
	Well	10 North	10 East	4	1	As
112	Well	10 North	10 East	8	1	As
	Well	10 North	10 East	8	1	Pb
113	Well	10 North	10 East	9	1	As, Organics
	Well	10 North	10 East	9	1	Pb
	Well	10 North	10 East	9	1	As, NO3
	Well	10 North	10 East	9	3	As, Be, Cd, Pb, Se
	Well	10 North	10 East	9	43	As, Be, Cd, Pb, Organics, Se
	Well	10 North	10 East	9	1	As, Be, Cd, Pb, Organics, NO3, Se
	Well	10 North	10 East	9	16	Organics
	Well	10 North	10 East	9	3	As
114	Well	10 North	10 East	10	3	As, Be, Cd, Pb, Organics, Se
	Well	10 North	10 East	10	1	As
	Well	10 North	10 East	10	1	As, NO3
	Well	10 North	10 East	10	1	As, Be, Cd, Pb, Se
115	Well	6 North	7 East	28	1	F
116	Well	22 North	7 West	8	1	As
117	Well	22 North	7 West	25	1	NO3
118	Well	19 North	4 West	4	1	As
119	Well	19 North	4 West	10	1	As
120	Well	18 North	1 West	6	2	NO3
121	Well	18 North	2 West	27	2	As
122	Well	18 North	3 West	11	1	As
123	Well	18 North	3 West	25	1	As
124	Spring	18 North	6 West	27	1	As
125	Well	17 North	2 West	2	1	As
126	Well	17 North	2 West	3	2	As
127	Well	17 North	2 West	4	1	As
128	Well	17 North	2 West	9	1	As
129	Well	17 North	2 West	15	1	As
130	Well	17 North	2 West	22	1	As
131	Spring	17 North	4 West	8	1	As

Source: Compilation of databases from ADWR & others

Table 5.5-7 Water Quality Exceedences in the Verde River Basin (Cont)¹

B. Lakes and Streams

Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard ³	Parameter(s) Exceeding Use Standard ²
a	Stream	East Verde River - Ellison Creek to American Gulch	20	NA	A&W	Se
b	Stream	Oak Creek - Slide Rock State Park	1	NA	FBC	E. coli
c	Lake	Pecks Lake	NA	95	A&W	DO
d	Lake	Stoneman Lake ⁴	NA	14	A&W	pH
e	Stream	Verde River - Beaver Creek to HUC boundary	0.5	NA	A&W	Turbidity/Suspended sediment concentration
f	Stream	Verde River - Oak Creek to Beaver Creek	13	NA	A&W	Turbidity/Suspended sediment concentration
g	Stream	Verde River - West Clear Creek to Fossil Creek	24	NA	A&W	Turbidity/Suspended sediment concentration
h	Lake	Whitehorse Lake	NA	41	A&W	DO

Source: ADEQ 2005e

Notes:

¹ Water quality samples collected between 1975 and 2004.

²As = Arsenic

Be = Beryllium

Cd = Cadmium

DO = Dissolved oxygen

F= Fluoride

Pb = Lead

NO₃ = Nitrate

Organics = One or more of several volatile and semi-volatile organic compounds and pesticides

pH = Measurement of acidity or alkalinity

Se = Selenium

TDS = Total Dissolved Solids

³A&W = Aquatic and Wildlife

FBC = Full Body Contact

⁴Lake has been dry or nearly dry since 2002

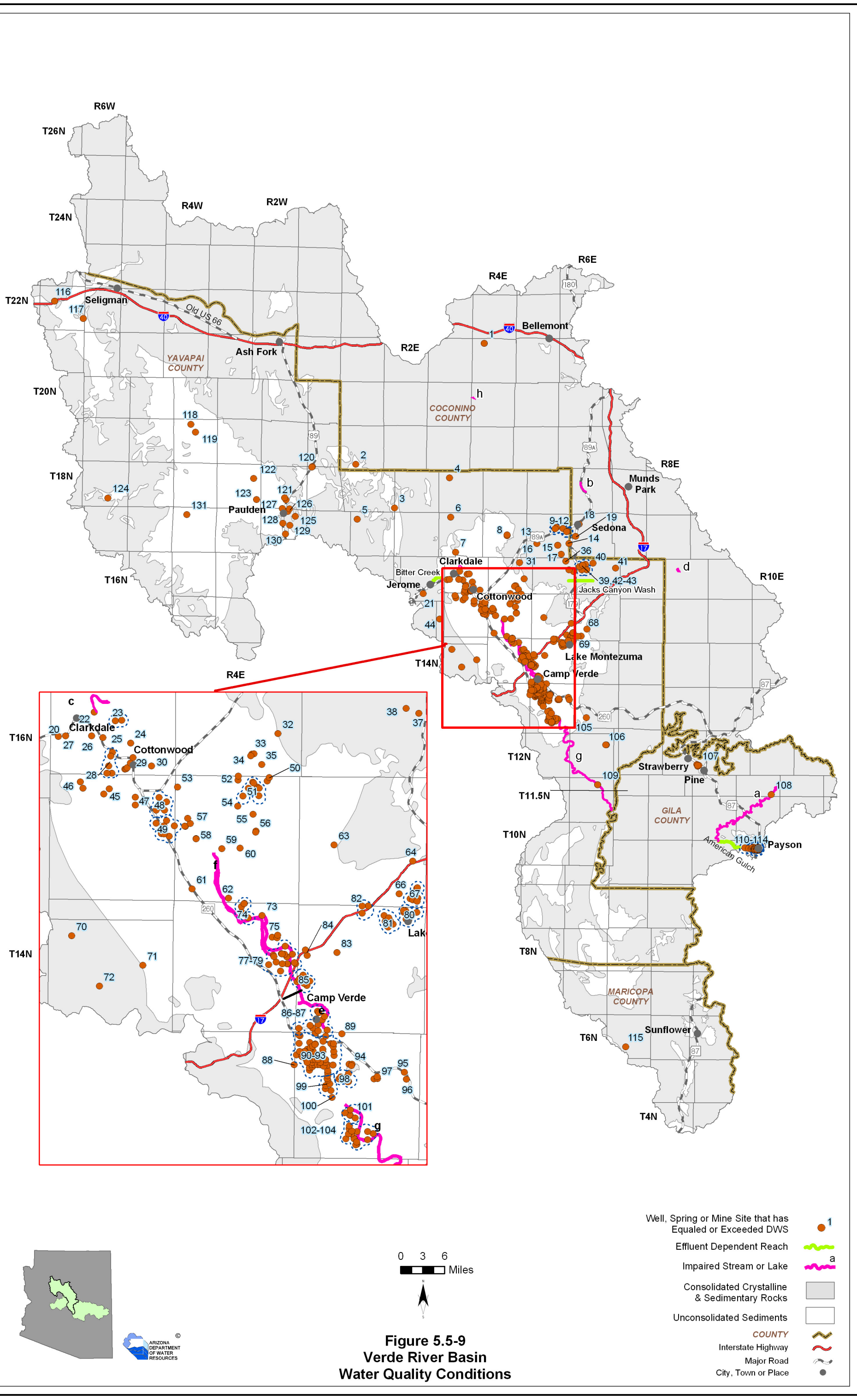


Figure 5.5-9
Verde River Basin
Water Quality Conditions



5.5.8 Cultural Water Demand in the Verde River Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 5.5-8. Effluent generation including facility ownership, location, population served and not served, volume treated, disposal method and treatment level is shown in Table 5.5-9. Figure 5.5-10 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Appendix A. More detailed information on cultural water demand is found in Section 5.0.7.

Cultural Water Demand

- Refer to Table 5.5-8 and Figure 5.5-10.
- Population in this basin has more than doubled from 36,049 in 1980 to 89,309 in 2000.
- In general, groundwater use has increased since 1971, from an average of 16,000 AFA in 1971-1975 to an average of 29,500 AFA in 2001-2005.
- Total surface water diversions in this basin have decreased slightly from 18,000 AFA in 1971-1990 to 17,400 AFA in 2001-2005.
- Municipal groundwater demand has increased from an average of 7,200 AFA in 1991-1995 to 15,200 AFA in 2001-2005. Municipal surface water demand is about 600 AFA.
- Industrial groundwater use has increased slightly from 3,100 AFA in 1991-1995 to 3,200 AFA in 2001-2005. Industrial surface water use has remained a constant 800 AFA during this time.
- Groundwater use for irrigation has increased from 8,100 AFA in 1991-1995 to 11,100 AFA in 2001-2005. Most of the surface water use in the basin is for irrigation with 11,500 AFA in 1991-1995 and 16,000 AFA in 2001-2005. The majority of the agricultural use is found along the Verde River.
- Municipal and industrial demand centers are found primarily in the central portion of the basin.
- There are two large mines, Clarkdale Cement and the closed United Verde copper mine, and two small mines or quarries located in the vicinity of Clarkdale and Jerome. An additional small mine or quarry is located north of Sunflower.
- As of 2005 there were 11,093 registered wells with a pumping capacity of less than or equal to 35 gpm and 1,659 wells with a pumping capacity of more than 35 gpm.

Effluent Generation

- Refer to Table 5.5-9.
- There are 27 wastewater treatment facilities in this basin.
- Information on population served was available for 16 facilities and information on effluent generation was available for 17 facilities. These facilities serve over 44,000 full-time residents and generate almost 6,200 acre-feet of effluent per year.
- Of the 13 facilities with information on the effluent disposal method: five discharge to evaporation ponds; five discharge for golf or turf irrigation; six discharge to a watercourse; five discharge for irrigation; and two use other forms of effluent disposal. In Payson, treated effluent is delivered to a 10.5 acre recreational lake where it is stored to irrigate turf and recharges the aquifer. The Kachina Village WWTP discharges effluent to a wetland that is a wildlife area open to the public.

Table 5.5-8 Cultural Water Demand in the Verde Basin¹

Year	Estimated and Projected Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						Data Source						
				Well Pumpage			Surface-Water Diversions									
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Agricultural	Municipal	Industrial	Agricultural							
1971		3,746 ²	704 ²							ADWR (1994a)						
1972																
1973				16,000			18,000									
1974																
1975																
1976																
1977																
1978		16,000			18,000											
1979																
1980	36,049															
1981	38,093															
1982	40,137	1,437	265													
1983	42,181			19,000			18,000									
1984	44,225															
1985	46,269															
1986	48,313															
1987	50,357	1,009	168													
1988	52,401			33,000			18,000									
1989	54,445															
1990	56,489															
1991	59,771	1,188	170	10,000	3,100	8,100	600	800	11,500	USGS (2007) ADWR (2008b) ADWR (2008c) ADWR (2005a)						
1992	63,053															
1993	66,335															
1994	69,617															
1995	72,899															
1996	76,181															
1997	79,463	1,830	170	12,000	3,200	8,400	600	800	12,500							
1998	82,745															
1999	86,027															
2000	89,309															
2001	91,827	1,883	182	15,200	3,200	11,100	600	800	16,000							
2002	94,345															
2003	96,862															
2004	99,380															
2005	101,898															
2010	114,487															
2020	138,296															
2030	155,456															
WELL TOTALS:		11,093	1,659													

Notes:

¹ Does not include effluent or evaporation losses from stockponds and reservoirs.

² Includes all wells through 1980.

Table 5.5-9 Effluent Generation in the Verde River Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet/year)	Disposal Method								Current Treatment Level	Population Not Served	Year of Record	
					Water-course	Evaporation Pond	Irrigation	Golf Course/Turf/Landscape	Wildlife Area	Discharged to Another Facility	Infiltration Basins	Other				
American Gulch	Northern Gila County SD	Payson	8,000	2,240	X		X	Payson, Chaparral & Rim				X		Adv. Trt II & Nutrient Removal	200	2004
American Ranch WWTF	NA	Prescott	NA													
Big Park ID	Yavapai County	Sedona	2,500	224			X							Secondary	NA	1999
Camp Verde WWTF	Camp Verde SD	Camp Verde	2,500	195		X								Secondary	7,400	2000
Camp Navajo	National Guard	Bellemont	NA													
Clarkdale WWTF	Clarkdale	Clarkdale	1,920	291		X	X							Secondary	1,600	2004
Cottonwood WWTF	Cottonwood	Cottonwood	8,500	1,008			X							Adv. Trt. I	1,000	2002
Crimson View WWTP	NA	Sedona	NA													
Cross Creek Ranch WWTF	NA	Sedona	NA													
Flagstaff Meadows	Private	Bellemont	365	64	X									Secondary	NA	2007
Forest Highlands Wastewater Reclamation Co.	Private	Forest Highlands	NA	48				Forest Highlands						NA		2002
Inscription Canyon Ranch	Private	Prescott	NA													
Jerome WWTF	Jerome	Jerome	400	56	Bitter Creek									Secondary	40	2004
Kachina Village WWTP	Kachina Village ID	Kachina Village	5,000	426		X			X					Secondary	NA	2001
Lolo Mai Springs	Private	NA	420	34	X								X	Secondary	NA	2001
Lost Canyon WWTF	Private	Resort	NA													
Munds Park/Kay Blackman WWTP	Pinewood SD	Munds Park	1,500-5,000	147	Munds Creek			Pinewood						Adv. Trt. I & Nutrient Removal	2,000	2007
Oak Creek Property Owners	Private	Oak Creek	29	1									X	NA		2007
Pine Creek Domestic WWTF	Private	Pine	NA													
Portal Pine Creek WWTP	NA	Strawberry/Pine	NA													

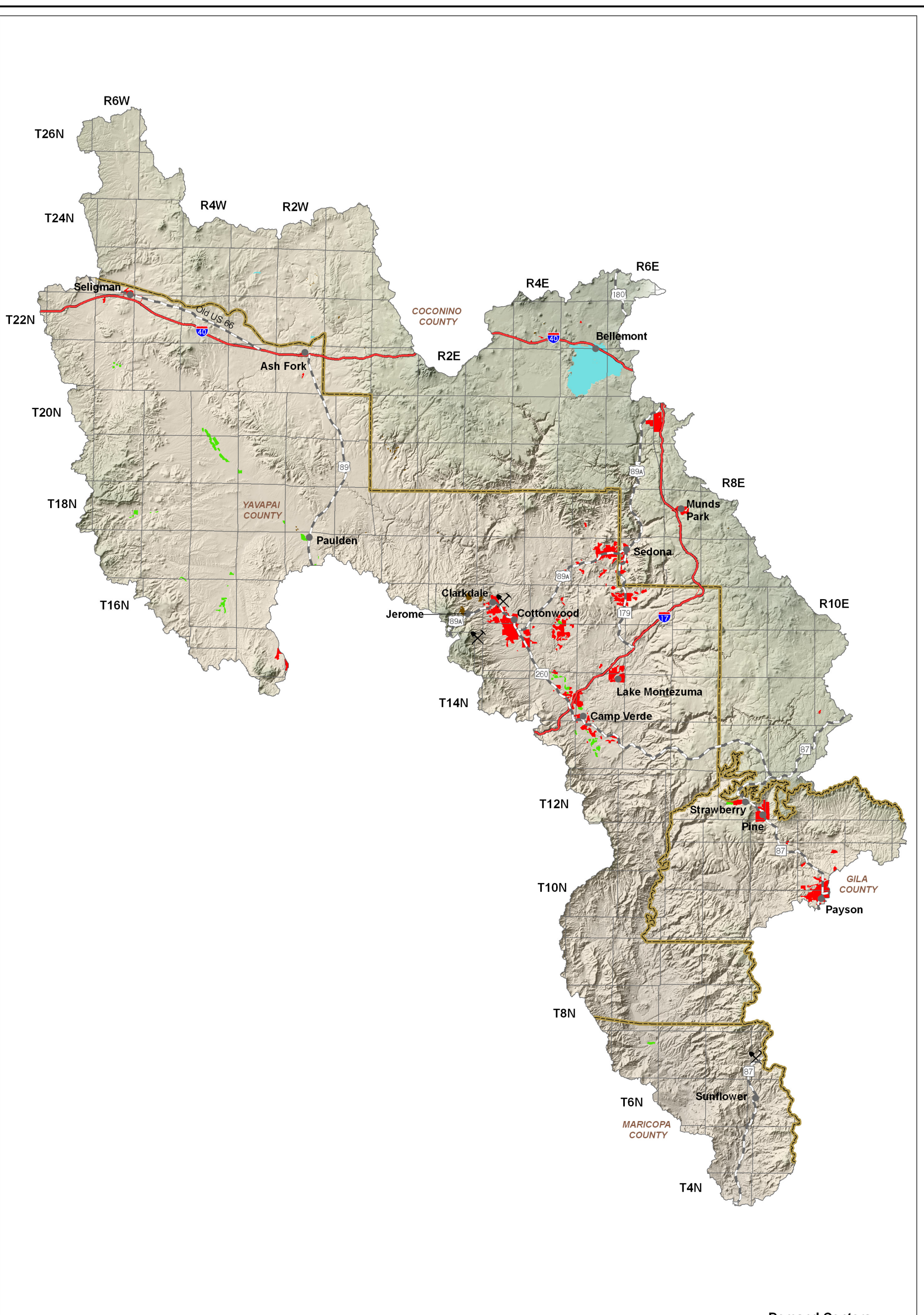


Table 5.5-9 Effluent Generation in the Verde River Basin (Cont)

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet/year)	Disposal Method								Current Treatment Level	Population Not Served	Year of Record	
					Water-course	Evaporation Pond	Irrigation	Golf Course/Turf Irrigation	Wildlife Area	Discharged to Another Facility	Infiltration Basins	Other				
Sedona Venture WWTF	Private	Sedona	272	50	Unnamed tributary to Oak Cr.									NA	NA	2007
Sedona WWTF	Sedona	Sedona	12,420	1,344		X	X		X					Adv. Trt. II & Nutrient Removal	2,500	2001
Seligman WWTF	Yavapai County SD	Seligman	84	9		X								Secondary	324	2004
Seven Canyons of Sedona	Private	Sedona	37	10				Seven Canyons						Secondary	NA	2007
Thunder Mountain Ranch WWTP	Private	Sedona	NA		NA											
Valley Vista Estates WWTP	Private	Oak Creek	NA		NA											
Verde Santa Fe	Private	Cornville	928	70				X						Secondary	NA	2006
Total			44,875 to 48,375	6,217												

Source: Compilation of databases from ADWR & others

Notes:
 Year of Record is for the volume of effluent treated/generated
 NA: Data not currently available to ADWR
 WWTF: Waste Water Treatment Facility
 WWTP: Waste Water Treatment Plant
 WRP: Water Reclamation Plant
 SD: Sanitation District
 ID: Improvement District



Demand Centers

- Agriculture
- M&I - High Intensity
- M&I - Low Intensity
- Large Mine
- Small Mine \ Quarry
- COUNTY
- Interstate Highway
- Major Road
- City, Town or Place

0 3 6
Miles



Figure 5.5-10
Verde River Basin
Cultural Water Demand



Primary Data Source: USGS National Gap Analysis Program, 2004



5.5.9 Water Adequacy Determinations in the Verde River Basin

Water adequacy determination information including the subdivision name, location, number of lots, adequacy determination, reason for the inadequacy determination, date of determination and subdivision water provider are shown in Table 5.5-10A and B for water reports and analysis of adequate water supply. Designated water provider information is shown in Table 5.5-10C with date of application, date the designation was issued and projected or annual estimated demand. Figure 5.5-11 shows the general locations of subdivisions and designated providers for the entire basin. Figures 5.5-11A-C show the location of subdivisions and designated providers in each sub-basin keyed to the Table. A description of the Water Adequacy Program is found in Volume 1, Appendix C. Adequacy determination data sources and methods are found in Volume 1, Appendix A.

- Four hundred and thirty-one water adequacy determinations have been made in this basin through December 2008.
- One hundred and thirty-three determinations of inadequacy have been made.
- The most common reason for an inadequacy was because the applicant did not submit the necessary information and/or the available hydrologic data were insufficient to make a determination.
- There are 11 Analysis of Adequate Water Supply applications for a total of 10,000 lots.
- There are five designated water providers with a total projected or annual estimated demand of 2,281 acre-feet.
- The number of lots receiving a water adequacy determination, by county, are:

County	Number of Subdivision Lots	Number of Lots Determined to be Adequate	Percent Adequate
Coconino County	5,600	4,828	86%
Gila County	>5,743	>1,294	~24%
Maricopa County	20	20	100%
Yavapai County	>20,996	>18,419	~88%

Table 5.5-10 Adequacy Determinations in the Verde River Basin¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
1	Verde Valley	540 Jordan Road	Coconino	17 North	6 East	8	8	53-500828	Adequate		11/15/1982	Arizona Water Company - Sedona
2	Verde Valley	Aerie I and Aerie II	Yavapai	17 North	5 East	5, 8	74	53-401588	Adequate		7/6/2005	Aerie Conservancy
3	Verde Canyon	Alpine Ridge	Gila	11 North	10 East	34	7	53-500260	Inadequate	A1, A2	1/12/1982	Town of Payson
4	Verde Canyon	Alpine Village #1	Gila	11 North	10 East	33	312	53-500261	Inadequate	A1, A2	7/16/1985	Town of Payson
5	Verde Valley	Amigos Rancheros	Yavapai	17 North	5 East	29	105	53-500267	Inadequate	B	8/20/1987	NA
6	Verde Valley	Anasazi	Coconino	17 North	6 East	7	11	53-500269	Adequate		5/1/1981	Arizona Water Company - Sedona
7	Big Chino	Antelope Lakes #1	Yavapai	18 North	2 West	27	22	53-300068	Adequate		11/6/1995	co-op water system
8	Big Chino	Antelope Lakes #2	Yavapai	18 North	2 West	27	655	53-500271	Adequate		2/19/1997	Antelope Lakes Water Company, Inc.
9	Big Chino	Antelope Lakes #3	Yavapai	18 North	2 West	28	44	53-500273	Adequate		3/14/1988	Dry Lot Subdivision
10	Verde Valley	Arena del Loma Estates	Yavapai	14 North	5 East	19	11	53-300031	Adequate		7/28/1995	Dry Lot Subdivision
11	Big Chino	Arizona Homes # 3	Coconino	22 North	1 East	22	NA	NA	Adequate		6/7/1973	Northwest Water Company
12	Big Chino	Arizona Homes # 4	Coconino	22 North	1 East	22	NA	NA	Adequate		4/8/1977	Northwest Water Company
13	Verde Valley	Arnold Terrace	Yavapai	14 North	5 East	31	18	53-500297	Adequate		7/9/1974	Camp Verde Water System
14	Verde Valley	Arroyo Roble Resort	Coconino	17 North	6 East	8	92	53-500299	Adequate		5/18/1983	Arizona Water Company - Sedona
15	Verde Valley	Arroyo Seco (1991)	Yavapai	17 North	5 East	10	46	53-500300	Adequate		7/12/1991	Arizona Water Company - Sedona
16	Verde Valley	Arroyo Sienna	Yavapai	17 North	6 East	18	12	53-400647	Adequate		2/12/2002	Arizona Water Company - Sedona
17	Verde Valley	Aspen Shadows	Yavapai	16 North	3 East	34	36	53-300478	Adequate		7/22/1998	City of Cottonwood
18	Verde Valley	Back'O Beyond Ranch	Coconino	17 North	6 East	30	80	53-300211	Adequate		10/23/1996	Arizona Water Company - Sedona
19	Verde Valley	Beaver Creek Acres	Yavapai	14 North	5 East	11	36	53-401502	Adequate		1/20/2005	Dry Lot Subdivision
20	Verde Valley	Beaver Creek Golf Club	Yavapai	14 North	5 East	1, 2	137	53-401848	Adequate		10/18/2005	Arizona Water Company - Rimrock
22	Verde Valley	Beaver Creek Preserve	Yavapai	15 North	5 East	26	101	53-402203	Adequate		8/4/2006	Arizona Water Company - Rimrock
23	Verde Valley	Beaver Creek Villas	Yavapai	14 North	5 East	1	25	53-402205	Adequate		7/27/2006	Arizona Water Company - Rimrock
24	Verde Canyon	Beaver Valley Estates	Gila	12 North	10 East	35	8	53-500312	Inadequate	A1, A2	3/5/1986	Beaver Valley Water Company
25	Verde Valley	Bell Rock Vista	Yavapai	16 North	6 East	18	6	53-500315	Adequate		6/15/1989	Big Park Water Company
26	Verde Valley	Bella Terra on Oak Creek	Yavapai	17 North	5 East	26, 27	106	53-401631	Adequate		3/1/2005	Arizona Water Company - Sedona
27	Verde Valley	Bella Vista	Yavapai	17 North	5 East	13	7	53-401746	Adequate		6/21/2005	Oak Creek Water Company
28	Verde Valley	Bent River Village	Yavapai	16 North	3 East	28	12	53-700476	Adequate		5/7/2008	Bent River Village HOA
29	Verde Canyon	Bison Cove Condominiums	Gila	10 North	10 East	3	46	53-700296	Inadequate	A1	5/21/2007	Town of Payson
30	Verde Canyon	Bison Cove Condominiums - Phase 2	Gila	10 North	10 East	3	162	53-700355	Inadequate	A1	6/26/2007	Town of Payson
31	Verde Valley	Black Hill Industrial Park	Yavapai	16 North	3 East	33	24	53-500337	Adequate		5/13/1987	City of Cottonwood
32	Verde Valley	Black Hills Estates	Yavapai	16 North	3 East	32	66	53-500338	Adequate		6/20/1974	City of Cottonwood
33	Verde Valley	Black Hills Estates #2	Yavapai	16 North	3 East	32	80	53-500339	Adequate		10/31/1981	City of Cottonwood
34	Verde Valley	Black Hills Terrace	Yavapai	16 North	3 East	32, 33	18	53-500341	Adequate		5/8/1980	City of Cottonwood
35	Verde Canyon	Bonita Creek	Gila	12 North	11 East	32	38	53-500348	Inadequate	A1	6/6/1975	Dry Lot Subdivision
36	Verde Canyon	Bonita Pines Condominiums	Gila	10 North	10 East	3	26	53-500039	Inadequate	A1	11/20/2006	Town of Payson
37	Verde Valley	Boynton Canyon Ranch	Yavapai	18 North	5 East	20, 29	12	53-500350	Adequate		6/27/1980	Homeowners Association Wells
38	Verde Valley	Butler Subdivision	Yavapai	14 North	5 East	30	9	53-500372	Inadequate	C	3/25/1980	Dry Lot Subdivision
39	Verde Valley	Butterfield Plaza	Yavapai	16 North	5 East	13	46	53-500374	Adequate		6/6/1983	Big Park Water Company

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
40	Verde Valley	Camp Verde Acres	Yavapai	13 North	5 East	34	53	53-500386	Adequate		6/24/1981	Dry Lot Subdivision
41	Verde Valley	Camp Verde Townsite, Block 7	Yavapai	14 North	5 East	31	5	53-500387	Adequate		10/4/1993	Camp Verde Water System
42	Verde Valley	Canyon Mesa Country Club	Yavapai	16 North	6 East	18	109	53-500390	Adequate		8/27/1984	Big Park Water Company
43	Verde Valley	Canyon Mesa Country Club #2	Yavapai	16 North	6 East	18	44	53-500391	Adequate		12/12/1985	Big Park Water Company
44	Verde Valley	Canyon Mesa Country Club #3	Yavapai	16 North	6 East	18	20	53-400072	Adequate		5/21/1999	Big Park Water Company
45	Verde Canyon	Canyon River Ranch Subdivision	Gila	10 North	9 East	17	116	53-700322	Inadequate	A1	5/23/2007	Dry Lot Subdivision
46	Verde Valley	Canyon Shadows	Yavapai	17 North	5 East	1	21	53-500393	Adequate		7/7/1980	Arizona Water Company - Sedona
47	Verde Valley	Casa Bonita	Yavapai	17 North	5 East	12	22	53-500402	Adequate		4/17/1981	Arizona Water Company - Sedona
48	Verde Valley	Casa Del Sol Condominiums	Yavapai	16 North	3 East	34	28	53-400548	Adequate		8/14/2001	City of Cottonwood
49	Verde Valley	Casa Del Sol Condominiums - South	Yavapai	16 North	3 East	34	52	53-401223	Adequate		4/7/2004	City of Cottonwood
50	Verde Valley	Castle Rock Plaza	Yavapai	16 North	5 East	13	4	53-500423	Adequate		12/18/1985	Big Park Water Company
51	Verde Valley	Castle Rock Plaza #2	Yavapai	16 North	5 East	13	6	53-500424	Adequate		9/20/1982	Big Park Water Company
52	Verde Valley	Cathedral Rock Ranchos	Yavapai	17 North	5 East	35, 36	99	53-500425	Adequate		9/1/1981	Dry Lot Subdivision
53	Verde Valley	Cathedral View #2	Yavapai	16 North	6 East	18	15	53-500426	Adequate		7/19/1991	Big Park Water Company
54	Verde Valley	Cave View Estates	Yavapai	13 North	5 East	11	13	53-400595	Adequate		11/1/2001	Verde Lake Water Corp.
55	Verde Valley	Cedar Ridge	Yavapai	17 North	5 East	11	49	53-500428	Adequate		12/26/1978	Arizona Water Company - Sedona
56	Verde Canyon	Cedar Ridge Phase 1	Gila	11 North	10 East	32	8	53-401441	Inadequate	A1	10/21/2004	Town of Payson
57	Verde Canyon	Cedar Ridge Phase 2	Gila	11 North	10 East	32	14	53-401615	Inadequate	A1	1/18/2005	Town of Payson
58	Verde Canyon	Cedar Ridge Phase 3	Gila	11 North	10 East	32	6	53-401918	Inadequate	A1	1/3/2006	Town of Payson
59	Verde Valley	Chapel View	Yavapai	17 North	6 East	30	17	53-500447	Adequate		8/21/1973	Arizona Water Company - Sedona
61	Verde Canyon	Cimmaron Pines	Gila	12 North	9 East	30	64	53-500456	Inadequate	A1	7/6/1982	E & R Water Company
62	Verde Valley	Circle C Ranch	Yavapai	14 North	4 East	24	6	53-700321	Inadequate	A1	6/5/2007	Dry Lot Subdivision
63	Verde Valley	Clarkdale Palisades	Yavapai	16 North	3 East	29	53	53-500463	Adequate		4/17/1975	City of Cottonwood
64	Verde Valley	Clarkdale Palisades #3	Yavapai	16 North	3 East	29	84	53-500464	Adequate		9/26/1975	City of Cottonwood
65	Verde Valley	Clarkdale Palisades #4	Yavapai	16 North	3 East	29	112	53-500465	Adequate		8/25/1975	City of Cottonwood
66	Verde Valley	Cliffs Unit 2 South, The	Yavapai	14 North	5 East	31	30	53-400433	Adequate		12/5/2000	Camp Verde Water System
67	Verde Valley	Cliffs Unit Two North, The	Yavapai	14 North	5 East	31	29	53-300164	Adequate		7/23/1996	Camp Verde Water System
68	Verde Valley	Cliffs, The	Yavapai	14 North	5 East	31	42	53-500474	Adequate		9/2/1994	Camp Verde Water System
69	Verde Valley	Coffee Pot Lodge	Yavapai	17 North	5 East	1	27	53-500480	Adequate		2/10/1984	Arizona Water Company - Sedona
70	Verde Valley	Copper Gate Business Park	Yavapai	16 North	3 East	33	32	53-700477	Adequate		5/27/2008	City of Cottonwood
71	Verde Valley	Copper Vista Estates	Yavapai	17 North	5 East	13	42	53-500506	Adequate		7/6/1979	Oak Creek Water Company
72	Verde Valley	Cor D'Amor	Yavapai	17 North	5 East	15	43	53-402003	Adequate		4/25/2006	Arizona Water Company - Sedona
73	Verde Canyon	Cottage Creek Subdivision	Gila	10 North	10 East	3	11	53-402191	Inadequate	A1	8/3/2006	Town of Payson
74	Verde Valley	Cottages at Coffee Pot, The	Yavapai	17 North	5 East	1	37	53-500515	Adequate		6/27/1986	Arizona Water Company - Sedona
75	Verde Valley	Cottonwood Airpark	Yavapai	16 North	3 East	33	18	53-500516	Adequate		7/19/1985	City of Cottonwood
76	Verde Valley	Cottonwood Business Park	Yavapai	16 North	3 East	34	10	53-500517	Adequate		10/9/1981	City of Cottonwood
77	Verde Valley	Cottonwood Commons/Cottonwood Square	Yavapai	15 North	3 East	2	178	53-400318	Adequate		6/1/2000	City of Cottonwood

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
78	Verde Valley	Cottonwood Highlands Condominiums	Yavapai	15 North	3 East	3	12	53-700335	Adequate		6/25/2007	City of Cottonwood
79	Verde Valley	Cottonwood Ranch	Yavapai	16 North	3 East	32, 33	627	53-300096	Adequate		5/13/1996	City of Cottonwood
80	Verde Valley	Cottonwood Springs	Yavapai	15 North	3 East	17, 20	420	53-500519	Adequate		8/4/1980	Quail Springs Ranch Water Company
81	Verde Valley	Country Estates #3	Yavapai	13 North	5 East	7	19	53-500525	Inadequate	C	12/4/1973	Dry Lot Subdivision
82	Verde Valley	Country Estates #4	Yavapai	13 North	5 East	7	14	53-500526	Inadequate	C	3/14/1984	Dry Lot Subdivision
83	Verde Valley	Courthouse Butte Estates	Yavapai	17 North	5 East	27	16	53-500530	Adequate		6/15/1979	Community well
84	Verde Valley	Crestview	Yavapai	15 North	3 East	3	91	53-300022	Adequate		6/16/1995	City of Cottonwood
85	Verde Valley	Crestview Phase 3	Yavapai	15 North	3 East	3	40	53-400345	Adequate		7/19/2000	City of Cottonwood
86	Verde Valley	Crimson View	Yavapai	17 North	5 East	11	91	53-300088	Adequate		2/29/1996	Arizona Water Company - Sedona
87	Verde Valley	Cross Creek Ranch	Yavapai	17 North	5 East	33	84	53-400694	Adequate		4/9/2003	Cross Creek Ranch Community Association
88	Verde Valley	Diamond Creek Ranch	Yavapai	13 North	5 East	8	27	53-400199	Inadequate	C	11/2/1999	Dry Lot Subdivision
89	Verde Valley	Diamond Creek Ranch North	Yavapai	13 North	5 East	8	22	53-401353	Inadequate	C	6/10/2004	NA
90	Verde Valley	Distant Drums	Yavapai	17 North	5 East	9	6	53-500592	Adequate		2/6/1976	Arizona Water Company - Sedona
91	Verde Valley	Doodlebug #2	Coconino	17 North	6 East	19	42	53-500593	Adequate		4/15/1974	Arizona Water Company - Sedona
92	Verde Canyon	Eagle Glen Townhouses	Gila	12 North	8 East	36	57	53-500594	Inadequate	A1	2/16/1984	E & R Water Company
93	Verde Valley	Eagle Rock Subdivision	Yavapai	17 North	5 East	11	26	53-401545	Adequate		2/2/2005	Arizona Water Company - Sedona
94	Verde Canyon	East Tyler Condominiums	Gila	11 North	10 East	27	18	53-500043	Inadequate	A1	1/17/2007	Town of Payson
95	Verde Valley	Edgewater Condominiums	Yavapai	16 North	3 East	34	13	53-700521	Adequate		9/2/2008	City of Cottonwood
96	Verde Valley	Elk Creek at Simonton Ranch	Yavapai	14 North	4 East	36	87	53-500056	Adequate		5/18/2007	Camp Verde Water System
97	Verde Valley	Elk Creek at Simonton Ranch	Yavapai	14 North	5 East	31	87	53-500056	Adequate		5/18/2007	Camp Verde Water System
98	Verde Canyon	Elusive Acres	Gila	12 North	10 East	20	30	53-500611	Inadequate	A1, A2	3/22/1988	United Utilities Company
99	Verde Valley	Equestrian Estates	Yavapai	14 North	4 East	14	44	53-401613	Adequate		4/20/2005	Camp Verde Water System
100	Verde Valley	Estrella Noche Ranch (1999)	Yavapai	17 North	4 East	1, 36	10	53-300591	Adequate		1/14/1999	Homeowners Association Wells
101	Verde Valley	Fairfield Sedona	Yavapai	17 North	5 East	11, 14	114	53-400109	Adequate		8/2/1999	Arizona Water Company - Sedona
102	Verde Valley	Fairway Oaks	Yavapai	16 North	5 East	13	8	53-500634	Adequate		1/7/1987	Big Park Water Company
103	Verde Canyon	Fairway Oaks Estates replat	Gila	10 North	10 East	5, 6	23	53-500635	Inadequate	A1, A2	3/10/1983	Town of Payson
104	Verde Canyon	Falcon Lookout Phase One	Gila	11 North	10 East	33	19	53-402271	Inadequate	A1	10/27/2006	Town of Payson
105	Verde Canyon	Falcon View	Gila	11 North	10 East	33	57	53-300027	Inadequate	A2	10/3/1995	Town of Payson
106	Verde Valley	Flagstaff Meadows I	Coconino	21 North	5 East	1	220	53-401478	Inadequate	A1	8/17/2004	Homeowners Association Wells
107	Verde Valley	Flagstaff Meadows Townhomes	Coconino	21 North	5 East	1	105	53-401477	Inadequate	A1	8/17/2004	Undetermined
108	Verde Valley	Flagstaff Meadows Unit II	Coconino	21 North	5 East	1	87	53-401174	Inadequate	A1	2/4/2004	Utility Source LLC
109	Verde Valley	Flagstaff Meadows Unit III	Coconino	21 North	5 East	1	274	53-700301	Adequate		6/21/2007	Utility Source LLC
110	Verde Valley	Foothill Terrace	Yavapai	16 North	3 East	29	140	53-500638	Adequate		5/5/1983	City of Cottonwood
111	Verde Valley	Foothills North	Yavapai	17 North	5 East	3, 7	21	53-500661	Adequate		2/20/1979	Arizona Water Company - Sedona
112	Verde Valley	Foothills South	Yavapai	17 North	5 East	10	64	53-500667	Adequate		6/18/1974	Arizona Water Company - Sedona
113	Verde Valley	Foothills South #2 Amended	Yavapai	17 North	5 East	15	100	53-500668	Adequate		12/22/1982	Arizona Water Company - Sedona

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
114	Verde Valley	Foothills South Unit 4	Yavapai	17 North	5 East	15	8	53-401826	Adequate		9/8/2005	Arizona Water Company - Sedona
115	Verde Valley	Foothills South, Phase 3	Yavapai	17 North	5 East	15	25	53-401029	Adequate		9/18/2003	Arizona Water Company - Sedona
116	Verde Valley	Forest Highlands Unit Five	Coconino	20 North	7 East	18	170	53-300321	Adequate		8/22/1997	Forest Highlands Water Company
117	Verde Canyon	Forest Park	Gila	10 North	10 East	4	10	53-500670	Inadequate	A1, A2	8/11/1988	Town of Payson
118	Verde Canyon	Forest Park #1-3	Gila	10 North	10 East	4	28	53-500672	Inadequate	A1, A2	5/20/1980	United Utilities Company
119	Verde Valley	Forrest Ranch #1	Coconino	22 North	4 East	13, 24	10	53-500676	Inadequate	A1, A2	1/13/1987	Dry Lot Subdivision
120	Verde Canyon	Four Seasons North	Gila	11 North	10 East	34	48	53-500687	Inadequate	A2, A3	5/18/1983	Town of Payson
121	Verde Valley	FoxBoro Ranch Estates	Coconino	17 North	7 East	10	57	53-401577	Adequate		2/10/2005	Water Improvement District
122	Verde Canyon	Frontier Condominiums	Gila	10 North	10 East	4	42	53-300091	Inadequate	A1, A2	11/16/1996	Town of Payson
123	Verde Canyon	Frontier Cove	Gila	10 North	10 East	4	9	53-700367	Inadequate	A1	7/11/2007	Town of Payson
125	Verde Canyon	Frontier Townhouses	Gila	10 North	10 East	9	8	53-500690	Inadequate	A2	6/17/1980	United Utilities Company
126	Verde Valley	Gateway Commercial Complex Unit 1	Yavapai	14 North	4 East	23, 24	8	53-401794	Adequate		8/4/2005	Camp Verde Water System
127	Verde Valley	Golden Heights	Yavapai	14 North	4 East	12, 13	44	53-500717	Adequate		7/17/1980	Camp Verde Water System
128	Verde Canyon	Green Valley Estates	Gila	10 North	10 East	8	14	53-400849	Inadequate	A1, A2	11/25/2002	Town of Payson
129	Verde Canyon	Greenfaire	Gila	10 North	10 East	8	11	53-500761	Inadequate	A1, A2, C	10/27/1994	Town of Payson
130	Verde Canyon	Greenfaire Unit Two	Gila	10 North	10 East	8	8	53-300216	Inadequate	A1	10/30/1996	Town of Payson
131	Verde Valley	Grey Fox Ridge	Yavapai	16 North	3 East	28	99	53-401907	Adequate		2/2/2006	City of Cottonwood
133	Verde Canyon	Guevremont	Gila	12 North	8 East	21	10	53-500767	Inadequate	A1	7/17/1984	E & R Water Company
134	Verde Valley	Harmony Heights North	Yavapai	17 North	5 East	11	45	53-500775	Adequate		1/18/1978	Arizona Water Company - Sedona
135	Verde Valley	Haskell Springs	Yavapai	16 North	3 East	32	150	53-300011	Adequate		5/24/1995	City of Cottonwood
136	Big Chino	Headwaters Ranch Country Club	Yavapai	17 North	2 West	2	1,385	53-500778	Adequate		6/18/1993	E & R Water Company
137	Verde Canyon	Hidden Pines Phase II	Gila	12 North	8 East	25	18	53-500784	Inadequate	A1	8/8/1996	Williamson Waterworks, Inc.
138	Verde Canyon	Hidden Pines	Gila	12 North	8 East	25	49	53-500786	Inadequate	A1, A2	10/19/1995	Williamson Waterworks, Inc.
139	Verde Valley	Hidden Springs	Yavapai	16 North	3 East	31	10	53-402120	Adequate		7/7/2006	Clarkdale Municipal Water Utility
140	Verde Valley	Highland Estates #2	Yavapai	16 North	5 East	11	47	53-500790	Adequate		11/1/1979	Little Park Water Company
141	Verde Valley	Hillcrest Villa	Yavapai	15 North	3 East	2	10	53-500794	Adequate		3/22/1994	City of Cottonwood
142	Verde Valley	Hinch Springs Estates	Yavapai	13 North	5 East	11	33	53-401737	Adequate		6/28/2005	Verde Lake Water Corp.
143	Big Chino	Holiday Lake Estates	Yavapai	18 North	2 West	33, 34	1,543	53-300240	Inadequate	A1,B	2/7/1997	Abra Water Company, Inc.
145	Verde Valley	Homestead at Camp Verde, The (2000)	Yavapai	14 North	4 East	25, 30, 31, 36	165	53-400441	Adequate		12/18/2000	Camp Verde Water System
146	Verde Valley	Homestead at Simonton Ranch	Yavapai	14 North	4 East	25, 30	52	53-402060	Adequate		5/29/2007	Camp Verde Water System
147	Verde Canyon	Homestead, The	Gila	12 North	8 East	30	25	53-500803	Inadequate	A1	1/18/1984	E & R Water Company
148	Verde Canyon	Hunt Ranch #01	Gila	12 North	8 East	20	8	53-500810	Inadequate	A1	7/21/1993	E & R Water Company
149	Verde Valley	Hyatt Pinon Point/The Y Project	Coconino	17 North	6 East	7	109	53-400946	Adequate		5/16/2003	Arizona Water Company - Sedona
150	Verde Valley	Indian Cliffs	Coconino	17 North	6 East	30	41	53-500813	Adequate		9/15/1992	Arizona Water Company - Sedona
151	Verde Valley	Indian Lakes #2	Yavapai	14 North	5 East	11	46	53-700282	Inadequate	A1	9/25/2007	Dry Lot Subdivision
152	Big Chino	Inscription Canyon Ranch	Yavapai	16 North	3 West	27, 28	323	53-300021	Adequate		11/15/1995	ICR Water Users Association
153	Big Chino	Inscription Canyon Ranch Unit Five	Yavapai	16 North	3 West	27, 28	46	53-400551	Adequate		9/14/2001	ICR Water Users Association
154	Verde Valley	J.D. Stump Subdivision	Yavapai	14 North	5 East	2	8	53-500818	Adequate		9/27/1988	Dry Lot Subdivision

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
155	Verde Valley	John Gardiner's Enchantment Resort (2000)	Yavapai	18 North	5 East	20, 29	19	53-400266	Adequate		2/28/2000	Boynton Canyon Enchantment Homeowners Association
156	Verde Valley	Jordan Meadows #2	Yavapai	13 North	5 East	7	10	53-500823	Inadequate	A1	2/24/1976	Dry Lot Subdivision
157	Verde Valley	Jordan Meadows #3	Yavapai	13 North	5 East	7	6	53-500824	Inadequate	A1	3/26/1979	Dry Lot Subdivision
158	Verde Valley	Jordan Park Glen	Coconino	17 North	6 East	6	20	53-500825	Adequate		12/6/1991	Arizona Water Company
159	Verde Valley	Jordan Park Ridge	Coconino	17 North	6 East	5	39	53-500826	Adequate		12/29/1993	Arizona Water Company - Sedona
160	Verde Valley	Jordan Road Condominiums	Coconino	17 North	6 East	5	4	53-500827	Adequate		4/30/1981	Arizona Water Company - Sedona
161	Verde Valley	Jordan Road Condominiums B	Coconino	17 North	6 East	8	9		Adequate		6/14/2002	Arizona Water Company - Sedona
162	Verde Valley	Juniper Meadows	Yavapai	17 North	5 East	29	42	53-500830	Adequate		5/7/1992	Juniper Meadows Water Users'
163	Verde Valley	Junipine Oak Creek (1986)	Coconino	18 North	6 East	5, 8	18	53-500833	Adequate		3/21/1986	Junipine Community Property Owners Association
164	Verde Valley	Kachina Village	Coconino	20 North	7 East	20	3,000	53-500834	Adequate		8/25/1975	Flagstaff, City of
165	Big Chino	Kaibab Knolls Estates Unit 17	Coconino	22 North	2 West	17	12	53-500073	Inadequate	A1	1/30/2007	Dry Lot Subdivision
166	Verde Valley	Kindra Heights	Yavapai	16 North	3 East	28	21	53-401150	Adequate		1/28/2004	City of Cottonwood
167	Verde Valley	Kinsey Estates Two at Western Hills	Yavapai	17 North	5 East	11	9	53-401603	Adequate		3/30/2005	Arizona Water Company - Sedona
168	Verde Valley	Kinsey Estates at Western Hills	Yavapai	17 North	5 East	11	9	53-401397	Adequate		9/15/2004	Arizona Water Company - Sedona
169	Verde Valley	Koch Ranch Estates (2005)	Yavapai	15 North	4 East	15	35	53-401913	Adequate		12/1/2005	Dry Lot Subdivision
170	Verde Valley	La Barranca	Yavapai	16 North	6 East	17, 18	76	53-300502	Adequate		9/8/1998	Big Park Water Company
171	Verde Valley	Lakeside Townhouses	Yavapai	14 North	5 East	2	10	53-500891	Adequate		5/27/1983	Arizona Water Company - Rimrock
172	Verde Valley	Las Estancias	Yavapai	14 North	4 East	14	26	53-400398	Adequate		10/25/2000	Camp Verde Water System
173	Verde Valley	Las Oficinas Office Building	Yavapai	17 North	5 East	12	6	53-500896	Adequate		10/22/1984	Arizona Water Company - Sedona
174	Verde Valley	Las Piedras	Yavapai	16 North	5 East	24	152	53-300413	Adequate		5/18/1998	Big Park Water Company
				16 North	6 East	19						
175	Verde Valley	Les Springs	Coconino	17 North	6 East	7, 18	106	53-500904	Adequate		8/28/1985	Arizona Water Company - Sedona
176	Verde Valley	Loma Sinagua Townhomes	Yavapai	15 North	3 East	2	195	53-300084	Adequate		1/10/1996	City of Cottonwood
177	Big Chino	Long Meadow Ranch - Unit 3	Yavapai	16 North	3 West	19	6	53-401596	Inadequate	A1	12/29/2004	Dry Lot Subdivision
179	Verde Canyon	Longhorn Condominiums	Gila	10 North	10 East	4	14	53-700234	Inadequate	A1	6/15/2007	Town of Payson
180	Verde Valley	Los Abridados Timeshare	Coconino	17 North	6 East	18	175	NA	Adequate		12/9/1988	Arizona Water Company
181	Verde Valley	Los Lomas	Yavapai	17 North	5 East	15	32	53-500920	Adequate		11/9/1982	Arizona Water Company - Sedona
182	Verde Canyon	Lovett Place	Gila	11 North	10 East	28	18	53-300113	Inadequate	A2	3/15/1996	Town of Payson
183	Verde Valley	Lucky Canyon Estates	Yavapai	13 North	4 East	1	6	53-401490	Inadequate	A1	12/8/2004	Dry Lot Subdivision
184	Verde Valley	Maine Townsite	Coconino	22 North	4 East	26	9	53-500931	Inadequate	A2, A3	7/29/1977	Dry Lot Subdivision
185	Big Chino	Malapai Ridge Estates	Yavapai	17 North	2 West	9	25	53-500932	Adequate		1/15/1988	Dry Lot Subdivision
186	Verde Canyon	Manzanita Hills Phase 4	Gila	10 North	10 East	5	19	53-400739	Inadequate	A1	6/18/2002	Town of Payson
187	Verde Canyon	Manzanita Hills #1	Gila	10 North	10 East	5	11	53-500934	Inadequate	A1, A2, C	1/17/1995	Town of Payson
188	Verde Canyon	Manzanita Hills #2	Gila	11 North	10 East	5	22	53-500935	Inadequate	A1, A2, C	1/18/1995	Town of Payson
189	Verde Valley	Manzanita Hills #2	Coconino	17 North	6 East	5	16	53-500936	Adequate		4/15/1974	Arizona Water Company - Sedona
190	Verde Canyon	Manzanita Hills #3	Gila	10 North	10 East	5	7	53-300461	Inadequate	A1	5/15/1998	Town of Payson
191	Verde Canyon	Manzanita Hills Phase Five	Gila	11 North	10 East	32	8	53-400905	Inadequate	A1	3/31/2003	Town of Payson

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
192	Verde Canyon	Manzanita Hills Phase Six	Gila	10 North	10 East	5	14	53-500007	Inadequate	A1	10/24/2006	Town of Payson
193	Verde Canyon	Manzanita Woods	Gila	11 North	10 East	32	6	53-300462	Inadequate	A1	5/15/1998	Town of Payson
194	Verde Valley	Maybelle Estates	Yavapai	13 North	5 East	6	5	53-500939	Adequate		10/11/1974	Camp Verde Water System
195	Verde Canyon	Mazatzal Mountain Air Park, Unit 4	Gila	11 North	10 East	31, 32	41	53-700436	Inadequate	A1	11/1/2007	Town of Payson
196	Verde Canyon	Mazatzal Mountain Air Park, Unit3 Phase 1	Gila	11 North	10 East	32	12	53-401032	Inadequate	A1	9/3/2003	Town of Payson
197	Verde Canyon	Mazatzal Mountain Airpark #01	Gila	11 North	10 East	32	26	53-300173	Inadequate	A1, A2	8/23/1996	Town of Payson
198	Verde Canyon	Mazatzal Moutain Air Park, Unit 2, Phase 2	Gila	11 North	10 East	32	14	53-400805	Inadequate	A1	9/17/2002	Town of Payson Water Department
199	Verde Valley	Mel Glo Estates #2	Yavapai	15 North	4 East	3	8	53-500951	Inadequate	C	2/25/1976	Dry Lot Subdivision
200	Verde Canyon	Mesa Del Caballo Tracts, plats 3, 5 & 6	Gila	11 North	10 East	23, 24	12	53-400038	Inadequate	A1, C	3/26/1999	Brooke Utilities
201	Verde Valley	Mesa Verde Estates	Yavapai	14 North	5 East	19, 30	16	53-500968	Inadequate	C	4/15/1980	Dry Lot Subdivision
202	Verde Valley	Mesquite Hills	Yavapai	15 North	3 East	4, 5	425	53-402009	Adequate		1/11/2007	City of Cottonwood
203	Verde Valley	Mesquite Springs	Yavapai	15 North	3 East	3	64	53-401689	Adequate		7/14/2005	City of Cottonwood
204	Verde Valley	Millwood Estates	Yavapai	13 North	5 East	8	30	53-401948	Inadequate	A1	2/1/2006	Dry Lot Subdivision
206	Verde Valley	Mingus Panorama Estates	Yavapai	16 North	4 East	35	69	53-700263	Adequate		3/9/2007	Mingus Panorama Estates HOA
207	Verde Valley	Mingus Shadows	Yavapai	16 North	3 East	29	122	53-500978	Adequate		5/21/1982	City of Cottonwood
208	Verde Valley	Mingus View Estates	Yavapai	16 North	3 East	32	70	53-500979	Adequate		1/13/1994	City of Cottonwood
209	Big Chino	Mint Creek Ranch	Yavapai	15 North	3 West	2, 11	74	53-500981	Adequate		11/29/1993	Dry Lot Subdivision
210	Verde Valley	Mission Hills	Yavapai	17 North	5 East	12	81	53-500989	Adequate		9/26/1980	Arizona Water Company - Sedona
211	Verde Canyon	Mogollon Village	Gila	10 North	10 East	4	42	53-401668	Inadequate	A1	3/29/2005	Town of Payson
212	Verde Valley	Morning Sun Condominiums	Yavapai	17 North	5 East	13	74	53-501016	Adequate		12/31/1987	Oak Creek Water Company
213	Verde Valley	Mountain Estates	Yavapai	13 North	4 East	1	15	53-401186	Adequate		2/2/2004	Camp Verde Water System
214	Verde Valley	Mountain Gate	Yavapai	16 North	3 East	19, 20	606	53-401660	Adequate		6/3/2005	City of Cottonwood
215	Verde Valley	Mountain Rose Ranch	Coconino	21 North	3 East	3	32	53-400914	Inadequate	A1, A2, A3	4/17/2003	Individual Wells
216	Verde Valley	Mountain View Ranchos	Yavapai	15 North	4 East	11	47	53-501034	Adequate		3/26/1979	Dry Lot Subdivision
217	Verde Canyon	Mountain-Aire Condominiums	Gila	11 North	10 East	34	4	53-501041	Inadequate	A1, A2	6/14/1982	Ponderosa Utility Corporation
218	Verde Canyon	Mountain-Aire Condominiums #3	Gila	11 North	10 East	34	8	53-501042	Inadequate	A1, A2	9/10/1985	Town of Payson
219	Verde Valley	Mountainaire #5	Coconino	20 North	7 East	28	22	53-501040	Adequate		7/29/1983	Town of Payson
220	Verde Valley	Mountainaire Meadows	Coconino	20 North	7 East	28	20	53-501043	Adequate		5/5/1983	Ponderosa Utility Corporation
221	Verde Valley	Mystic Hills	Coconino	17 North	6 East	19	144	53-501045	Adequate		9/15/1992	Arizona Water Company
222	Verde Valley	Nepenthe	Yavapai	17 North	5 East	14	182	53-300083	Adequate		1/16/1996	Arizona Water Company
223	Big Chino	Nighthawk Ridge	Yavapai	17 North	2 West	29	188	53-700463	Adequate		4/29/2008	Town of Chino Valley
224	Verde Valley	Nizhoni Village	Yavapai	16 North	5 East	13	40	53-501049	Adequate		11/7/1980	Big Park Water Company
225	Big Chino	North Arrow Ranch	Yavapai	15 North	3 West	2	25	53-401930	Adequate		1/25/2006	Dry Lot Subdivision
226	Verde Valley	North Slopes #3, Lots 33-55	Yavapai	17 North	5 East	3	23	53-300258	Adequate		7/3/1997	Arizona Water Company - Sedona
227	Verde Valley	Northeast Industries Commercial Complex	Yavapai	14 North	5 East	5	28	53-402092	Inadequate	A1	9/11/2006	Camp Verde Water System
228	Verde Valley	Northern Shadows	Yavapai	17 North	5 East	12	36	53-501054	Adequate		7/18/1983	Arizona Water Company - Sedona
229	Verde Valley	Northview	Yavapai	17 North	5 East	13	121	53-501058	Adequate		11/29/1973	Oak Creek Water Company
230	Verde Canyon	Northwoods	Gila	11 North	10 East	34	72	53-300199	Inadequate	A1, A2	11/8/1996	Town of Payson

A. Water Adequacy Reports

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont¹)

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
231	Verde Valley	Oak Bend #2	Yavapai	15 North	4 East	10, 15	12	53-501059	Adequate		2/4/1988	Dry Lot Subdivision
232	Verde Valley	Oak Creek Country Club Est #2	Yavapai	16 North	5 East	13	40	53-501060	Adequate		11/23/1981	Arizona Water Company - Sedona
233	Verde Valley	Oak Creek Country Club Est #3	Yavapai	16 North	5 East	23, 24	58	53-501061	Adequate		11/23/1981	Arizona Water Company - Sedona
234	Verde Valley	Oak Creek Country Club Estates	Yavapai	16 North	5 East	13	63	53-501062	Adequate		2/6/1980	Arizona Water Company - Sedona
235	Verde Valley	Oak Creek Estates	Yavapai	16 North	5 East	13	136	53-501063	Adequate		6/3/1981	Big Park Water Company
236	Verde Valley	Oak Creek Palisades	Yavapai	16 North	4 East	35	15	53-501064	Inadequate	A1	8/26/1973	Dry Lot Subdivision
237	Verde Valley	Oak Creek Valley #1, 3	Yavapai	16 North	4 East	34	135	53-501065	Adequate		6/21/1977	Oak Creek Water Company
238	Verde Valley	Oak Creek Valley #2	Yavapai	16 North	4 East	34	50	53-501066	Adequate		8/8/1979	Oak Creek Water Company
239	Big Chino	Old Highway 89 Estates	Yavapai	17 North	2 West	22	8	53-700422	Inadequate		10/18/2007	Dry Lot Subdivision
240	Verde Valley	Orchards #2	Cocoonino	17 North	6 East	6	34	53-501066	Adequate		8/30/1974	Arizona Water Company - Sedona
241	Verde Valley	Palisades	Cocoonino	17 North	6 East	18	86	53-501092	Adequate		10/17/1978	Arizona Water Company - Sedona
242	Verde Valley	Panorama	Yavapai	16 North	3 East	19, 30	22	53-501098	Adequate		10/30/1975	City of Cottonwood
243	Verde Valley	Papago Highlands (1974)	Yavapai	17 North	5 East	10, 15	192	53-501103	Adequate		9/23/1974	Arizona Water Company - Sedona
244	Verde Canyon	Paradise Heights	Gila	10 North	10 East	8, 9	16	53-401022	Inadequate	A1	9/3/2003	Town of Payson
245	Verde Canyon	Paradise Heights Phase Two	Gila	10 North	10 East	9	20	53-401547	Inadequate	A1	11/16/2004	Town of Payson
246	Verde Valley	Park Place Condominium	Yavapai	17 North	5 East	15	88	53-401834	Adequate		11/14/2005	Arizona Water Company - Sedona
247	Verde Valley	Parks Pile	Cocoonino	22 North	4 East	26	26	53-501125	Inadequate	A2, A3	9/20/1973	Dry Lot Subdivision
248	Big Chino	Paullen Farms	Yavapai	17 North	2 West	4	15	53-501128	Adequate		3/4/1992	Dry Lot Subdivision
249	Verde Canyon	Payson Industrial Park	Gila	10 North	10 East	4	13	53-501129	Inadequate	D	11/8/1988	Town of Payson
250	Verde Canyon	Payson Meadows	Gila	11 North	10 East	27, 28	32	53-501130	Inadequate	A1, A2	8/7/1986	Town of Payson
251	Verde Canyon	Payson Pines	Gila	11 North	10 East	28	127	53-300364	Inadequate	A1	9/30/1997	Town of Payson
252	Verde Canyon	Payson Pines Unit Two	Gila	11 North	10 East	28	22	53-400740	Inadequate	A1	6/29/2002	Town of Payson
253	Verde Canyon	Payson Townsite (Map 64 GCR); ROS 3121 - Parcels A - E and ROS 3235 - Parcels A1 -D1	Gila	10 North	10 East	4	9	53-700363	Inadequate	A1	6/26/2007	Town of Payson
254	Verde Valley	Pebble Rock	Yavapai	13 North	5 East	5	10	53-401538	Adequate		3/7/2005	NA
255	Verde Valley	Pecan Acres	Yavapai	16 North	3 East	35	28	53-501134	Adequate		5/9/1979	City of Cottonwood
256	Verde Valley	Penny Acres #2	Yavapai	15 North	3 East	1, 2	8	53-501141	Adequate		7/27/1978	Dry Lot Subdivision
257	Verde Valley	Piedras Del Rojo Condominiums	Yavapai	17 North	5 East	15	18	53-401864	Adequate		11/14/2005	Arizona Water Company - Sedona
258	Verde Canyon	Pine Aite	Gila	10 North	10 East	3	12	53-501149	Inadequate	A1, A2	3/18/1980	United Utilities Company
259	Verde Canyon	Pine Mountain Acres	Gila	12 North	9 East	30	32	53-501151	Inadequate	A1, A2, B	11/26/1974	Dry Lot Subdivision
260	Verde Valley	Pinewood Fairway Condos #1	Cocoonino	18 North	7 East	15	44	53-501168	Inadequate	A1	1/29/1979	Arizona Water Company
261	Verde Valley	Pinewood Fairway Condos #2	Cocoonino	18 North	7 East	15	18	53-501169	Inadequate	A1	4/26/1979	Arizona Water Company
262	Verde Valley	Pinewood Fairway Condos #2	Cocoonino	18 North	7 East	15	20	53-501170	Inadequate	A1	5/14/1981	Arizona Water Company
263	Verde Valley	Pinewood Fairway Condos #3	Cocoonino	18 North	7 East	15	8	53-501171	Inadequate	A1	6/8/1981	Arizona Water Company
264	Verde Valley	Pinewood Fairway Condos #4	Cocoonino	18 North	7 East	15	18	53-501172	Inadequate	A1	11/25/1981	Arizona Water Company
265	Verde Valley	Pinewood Fairway Condos #5	Cocoonino	18 North	7 East	15	20	53-501173	Inadequate	A1	12/9/1981	Arizona Water Company
266	Verde Valley	Pinon Valley Estates	Yavapai	16 North	6 East	18	8	53-501190	Adequate		8/9/1983	Big Park Water Company
267	Verde Valley	Pinon Woods	Yavapai	16 North	6 East	18	129	53-501191	Adequate		8/15/1983	Big Park Water Company
268	Verde Valley	Pinon Woods #2	Yavapai	16 North	6 East	18	28	53-501192	Adequate		4/5/1993	Big Park Water Company

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
269	Verde Valley	Pinon Woods Unit III	Yavapai	16 North	6 East	18	70	53-300005	Adequate		3/30/1995	Big Park Water Company
270	Verde Valley	Playa del Rio	Yavapai	14 North	4 East	13, 14	183	53-501200	Adequate		5/13/1987	Camp Verde Water System
271	Verde Valley	Plaza West, The	Yavapai	17 North	5 East	11	33	53-501201	Adequate		11/8/1984	Arizona Water Company - Sedona
272	Verde Valley	Poco Diablo Villas	Coconino	17 North	6 East	19	18	53-501202	Adequate		10/11/1974	Arizona Water Company - Sedona
273	Verde Valley	Poco Diablo Villas #2	Coconino	17 North	6 East	19	33	53-501203	Adequate		9/28/1978	Arizona Water Company - Sedona
274	Verde Canyon	Ponderosa Heights - Phase 1	Gila	11 North	10 East	27	20	53-700454	Inadequate	A1	1/3/2008	Town of Payson
275	Verde Valley	Ponderosa Paradise #2	Coconino	16 North	8 East	16	6	53-501204	Inadequate	D	8/21/1989	Stoneman Lake Water Company
276	Verde Valley	Ponderosa Shadows	Coconino	22 North	4 East	28	13	53-700386	Inadequate	A1	8/9/2007	Dry Lot Subdivision
277	Verde Canyon	Portal #3, Pine Canyon	Gila	12 North	8 East	24	192	53-501206	Adequate		10/23/81	Myers Water Company
278	Verde Canyon	Portal (Canyon Shadows)	Gila	12 North	8 East	25	NA	53-501207	Adequate		7/17/1973	developer-supplied
279	Verde Canyon	Portal Pine Creek Canyon #2	Gila	12 North	8 East	25	208	53-501208	Adequate		8/12/1976	Myers Water Company
280	Verde Canyon	Portal Pine Creek Canyon #3	Gila	12 North	8 East	24	198	53-501209	Adequate		10/23/1981	Myers Water Company
281	Verde Canyon	Portal Pine Creek Canyon #4, Phase 1	Gila	12 North	8 East	25	73	53-501210	Inadequate	A1,A2	7/19/1994	Williamson Water Works
282	Verde Canyon	Portal at Pine Creek Canyon #4, Phase 2	Gila	12 North	8 East	25	7	53-400396	Inadequate	A1	9/22/2000	Pine Creek Canyon Domestic Water Improvement Dist.
283	Verde Valley	Quail Canyon	Yavapai	15 North	3 East	15, 22	59	53-401819	Adequate		9/8/2005	Quail Canyon Domestic Water Improvement District
284	Verde Valley	Quail Springs Ranches	Yavapai	15 North	2 East	15	16	53-501238	Inadequate	A2	3/25/1975	Dry Lot Subdivision
285	Verde Valley	Rainbow Subdivision	Yavapai	16 North	3 East	34	5	53-501245	Adequate		1/6/1988	Cottonwood Water Works, Inc.
286	Verde Valley	Ranch Acres	Yavapai	14 North	5 East	30, 31	75	53-501246	Adequate		10/26/1973	Camp Verde Water System
287	Big Chino	Ranch at Hidden Valley, The	Yavapai	17 North	2 West	29	56	53-400349	Inadequate	A2	8/21/2000	Dry Lot Subdivision
288	Verde Valley	Rancho Shangri La	Coconino	18 North	5 East	21	20	53-501271	Adequate		8/19/1981	Rancho del Oro
289	Verde Valley	Rancho del Oro	Yavapai	18 North	6 East	27	437	53-501256	Adequate		4/1/1981	Shangri La Property Owners Association
290	Big Chino	Ravencrest	Yavapai	18 North	2 West	19, 30	29	53-400573	Adequate		9/11/2001	Dry Lot Subdivision
291	Verde Valley	Red Rock Cove	Yavapai	17 North	5 East	13	6	NA	Adequate		1/22/1982	Big Park Water Company
292	Verde Valley	Red Rock Vista	Yavapai	16 North	5 East	23	6	53-501291	Adequate		3/21/1994	Arizona Water Company - Sedona
294	Verde Valley	Retreat on Oak Creek	Yavapai	17 North	5 East	27, 34	38	53-700261	Adequate		4/23/2007	Oak Creek Domestic Water Improvement District
295	Verde Valley	Ridge at Sedona, The (1985)	Yavapai	16 North	5 East	24	19	53-501294	Adequate		2/28/1985	Arizona Water Company - Sedona
296	Verde Valley	Ridge at Sedona, The (1997)	Yavapai	16 North	5 East	24	8	53-300360	Adequate		10/10/1997	Arizona Water Company - Sedona
297	Verde Valley	Ridge on Sedona Golf Resort, The	Yavapai	16 North	5 East	24	106	53-300330	Adequate		7/5/1997	Arizona Water Company - Sedona
298	Verde Canyon	Rim Golf Club, The	Gila	11 North	10 East	1, 36	317	53-300426	Adequate		4/21/1998	Town of Payson
299	Verde Canyon	Rim Ranch	Gila	11 North	10 East	32	20	53-300547	Inadequate	A1	10/19/1998	Town of Payson
300	Verde Canyon	Rim Ridge Estates Phase I	Gila	10 North	10 East	3	14	53-700560	Inadequate	A1	8/27/2008	Town of Payson
301	Verde Valley	Rim Rock Heights	Yavapai	15 North	5 East	36	36	53-400653	Adequate		2/26/2002	Dry Lot Subdivision
302	Verde Valley	Rim Shadows	Yavapai	17 North	5 East	1	32	53-501298	Adequate		7/7/1980	Arizona Water Company - Sedona
303	Big Chino	Rimrock #1	Yavapai	17 North	2 West	14, 15, 23	35	53-300008	Adequate		5/26/1995	Dry Lot Subdivision
304	Big Chino	Rimrock #2	Yavapai	17 North	2 West	23	52	53-300079	Adequate		12/8/1995	Dry Lot Subdivision



Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
305	Big Chino	Rimrock North	Yavapai	17 North	2 West	15	35	53-300329	Adequate		7/30/1997	Dry Lot Subdivision
306	Verde Valley	Rio Bonito Ranch	Yavapai	16 North	4 East	34	33	53-401892	Adequate		7/13/2006	Dry Lot Subdivision
307	Verde Valley	Rio Verde Condominiums	Yavapai	16 North	3 East	34	12	53-501319	Adequate		11/17/1981	City of Cottonwood
308	Verde Valley	Rio Verde Ranchos	Yavapai	13 North	5 East	6	34	53-501321	Inadequate	C	3/17/1989	Dry Lot Subdivision
309	Verde Valley	River Ranch Estates	Yavapai	14 North	4 East	3	18	53-300144	Adequate		6/28/1996	Dry Lot Subdivision
310	Verde Valley	Rivers View Estates	Yavapai	14 North	5 East	30, 31	15	53-402077	Adequate		3/22/2007	Camp Verde Water System
311	Verde Valley	Rylie Heights	Yavapai	16 North	3 East	28	16	53-401990	Adequate		6/21/2006	City of Cottonwood
312	Verde Valley	Saddlerock Homes	Yavapai	17 North	5 East	13	116	53-501351	Adequate		9/11/1978	Oak Creek Water Company
313	Verde Valley	San Carlos Condominiums	Yavapai	17 North	5 East	12	40	53-501357	Adequate		7/24/1980	Oak Creek Water Company
314	Verde Valley	San Patricio Estates	Yavapai	17 North	5 East	12	40	53-501364	Adequate		9/26/1975	Arizona Water Company - Sedona
315	Big Chino	Santa Fe Industrial Sites	Yavapai	18 North	2 West	34	200	53-501371	Adequate		4/11/1994	Abra Water Co.
316	Verde Valley	Sawmill Cove	Yavapai	15 North	3 East	2	36	53-501375	Adequate		1/18/1994	City of Cottonwood
317	Verde Valley	Sawmill Gardens Patio Homes	Yavapai	15 North	3 East	2	59	53-501376	Adequate		11/13/1985	City of Cottonwood
318	Verde Valley	Schuerman Estates	Yavapai	17 North	5 East	26	2	53-501377	Adequate		1/27/1976	Dry Lot Subdivision
319	Verde Canyon	Secluded Homesites	Gila	12 North	9 East	31	19	53-501380	Inadequate	A1	3/28/1980	Dry Lot Subdivision
320	Verde Valley	Sedona At Seven Canyons, Unit II	Yavapai	18 North	5 East	27	20	53-401110	Adequate		10/17/2003	Arizona Water Company - Sedona
321	Verde Valley	Sedona Gardens	Yavapai	17 North	5 East	15	18	53-501381	Adequate		11/23/1981	Arizona Water Company - Sedona
322	Verde Valley	Sedona Golf Resort 1	Yavapai	16 North	5 East	24	19	53-300071	Adequate		12/4/1995	Arizona Water Company - Sedona
323	Verde Valley	Sedona Golf Resort 2	Yavapai	16 North	5 East	24	94	53-300148	Adequate		6/11/1995	Arizona Water Company - Sedona
324	Verde Valley	Sedona Golf Resort, Phase 2	Yavapai	16 North	5 East	23, 24	192	53-300401	Adequate		3/31/1998	Arizona Water Company - Sedona
325	Verde Valley	Sedona Golf Resort, Rst Hotel	Yavapai	16 North	5 East	24	225	53-300340	Adequate		8/25/1997	Arizona Water Company - Sedona
326	Verde Valley	Sedona Heights	Yavapai	17 North	5 East	12	16	53-300273	Adequate		3/25/1997	Arizona Water Company - Sedona
327	Verde Valley	Sedona National Golf Club	Yavapai	18 North	5 East	29, 30, 31	20	53-400606	Adequate		11/1/2001	Arizona Water Company - Sedona
328	Verde Valley	Sedona San Carlos	Yavapai	17 North	5 East	12	40	53-501382	Adequate		9/24/1990	Oak Creek Water Company
329	Verde Valley	Sedona Seven Canyons Units I, II, and III	Yavapai	18 North	5 East	27	118	53-400907	Adequate		8/28/2003	Seven Canyons Water Company
330	Verde Valley	Sedona Summit II, Phase 3	Yavapai	17 North	5 East	15	39	53-400124	Adequate		8/24/1999	Arizona Water Company - Sedona
331	Verde Valley	Sedona Vista Estates	Coconino	17 North	6 East	7	12	53-501383	Adequate		8/21/1980	Arizona Water Company - Sedona
332	Verde Valley	Seven Canyons of Sedona	Yavapai	18 North	5 East	27	300	53-300262	Adequate		10/29/1997	NA
333	Verde Valley	Seven Vistas	Coconino	17 North	6 East	30	9	53-700221	Adequate		9/24/2007	Arizona Water Company - Sedona
334	Verde Valley	Shadow Rock	Yavapai	17 North	5 East	1	34	53-501386	Adequate		3/21/1980	Arizona Water Company - Sedona
335	Verde Valley	Shadowbrook Condominium	Yavapai	17 North	5 East	11	54	53-501387	Adequate		2/22/1988	Arizona Water Company - Sedona
336	Verde Valley	Sierra Verde Estates	Yavapai	13 North	5 East	15, 16	30	53-501404	Inadequate	C	4/12/1982	Dry Lot Subdivision
337	Verde Valley	Silver Springs #1	Yavapai	15 North	3 East	3	8	53-501412	Adequate		11/12/1980	City of Cottonwood
338	Verde Valley	Silver Springs Development	Yavapai	15 North	3 East	3	48	53-501413	Adequate		10/29/1986	City of Cottonwood
339	Verde Valley	Silver Springs Garden Homes	Yavapai	15 North	3 East	3	26	53-501414	Adequate		7/11/1994	City of Cottonwood
340	Verde Valley	Silver Springs Terrace #1	Yavapai	15 North	3 East	3	22	53-501415	Adequate		4/7/1981	City of Cottonwood

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
341	Verde Valley	Silverado at Simonton Ranch	Yavapai	14 North	4 East	25, 36	252	53-401916	Adequate		11/14/2005	Camp Verde Water System
342	Verde Valley	Sky Line Estates	Coconino	17 North	6 East	17	11	53-501418	Adequate		6/21/1991	Arizona Water Company - Sedona
343	Verde Canyon	Sky Park Industrial	Gila	11 North	10 East	32	64	53-501419	Inadequate	A1,A2	12/29/1983	Town of Payson
344	Verde Valley	Skyline Estates	Yavapai	15 North	3 East	3	34	53-401481	Adequate		12/13/2004	City of Cottonwood
345	Verde Valley	Sleepy Hollow Townhomes	Yavapai	14 North	5 East	32	20	53-700284	Inadequate	A1	4/25/2007	Camp Verde Water System
346	Verde Valley	Solair Estates	Yavapai	15 North	4 East	11	42	53-501429	Adequate		10/23/1979	Dry Lot Subdivision
347	Verde Valley	Solair Estates #1	Yavapai	15 North	4 East	11	12	53-501430	Adequate		4/28/1983	E & R Water Company
348	Verde Canyon	Solitude Pines #1,2,5	Gila	12 North	9 East	31	255	53-501431	Inadequate	A1	9/11/1985	E & R Water Company
349	Verde Canyon	Solitude Trails	Gila	12 North	9 East	31	73	53-501432	Inadequate	A1	9/28/1994	E & R Water Company
350	Verde Canyon	Solitude Trails Unit Four	Gila	12 North	9 East	31	10	53-300580	Adequate		8/16/1999	Solitude Trails Domestic Water Improvement District
351	Verde Canyon	Spirit Ridge Equestrian Estates	Gila	11 North	10 East	27	5	53-401614	Inadequate	NA	1/12/2005	Town of Payson
353	Verde Valley	Spring Creek Ranch Phase 1	Yavapai	16 South	4 East	22	15	53-500024	Adequate		11/6/2006	Spring Creek Ranch Domestic Water Improvement District
354	Verde Valley	Spring Creek Ranch Phase 1	Yavapai	16 North	4 East	21	15	53-500024	Adequate		11/6/2006	Spring Creek Ranch Domestic Water Improvement District
355	Verde Valley	Spring Creek Ranch Phases 2, 3, 4	Yavapai	16 North	4 East	15, 21, 22	83	53-700248	Adequate		2/21/2007	Spring Creek Ranch Domestic Water Improvement District
356	Verde Valley	Starlight Village #2	Yavapai	15 North	3 East	3	32	53-501456	Adequate		1/16/1981	City of Cottonwood
357	Verde Canyon	Stone Creek at Payson	Gila	10 North	10 East	4, 5	130	53-400061	Inadequate	A1	4/21/1999	Town of Payson
358	Verde Valley	Stoneridge	Yavapai	14 North	5 East	31	54	53-400904	Adequate		7/21/2003	Camp Verde Water System
359	Verde Canyon	Strawberry Creek Foothills	Gila	12 North	8 East	20	96	53-501461	Adequate		3/13/1980	Myers Water Company
360	Verde Canyon	Strawberry Hollow	Gila	12 North	8 East	26	72	53-401908	Adequate		3/17/2006	Strawberry Hollow DWID
361	Verde Canyon	Strawberry Mountain Shadows #2,3	Gila	12 North	8 East	35	134	53-501462	Adequate		3/31/1977	E & R Water Company
362	Verde Canyon	Strawberry Mountain Shadows #4	Gila	12 North	9 East	35	264	53-501463	Inadequate	A1	2/11/1981	E & R Water Company
363	Verde Canyon	Strawknolls #4 amended	Gila	12 North	8 East	22	8	53-501464	Inadequate	C	11/12/1982	Arizona Water Company
364	Verde Canyon	Streams at Payson, The #1	Gila	10 North	10 East	4	72	53-501465	Inadequate	A1,A2	9/6/1985	Town of Payson
365	Verde Valley	Sun Dance Townhouses	Yavapai	16 North	5 East	13	58	53-501478	Adequate		2/28/1980	Big Park Water Company
366	Big Chino	Sundown Acres unit 2	Yavapai	15 North	3 West	24	8	53-501496	Adequate		12/16/1974	Dry Lot Subdivision
367	Verde Valley	Sunrise Cliffs	Yavapai	17 North	5 East	1	6	53-501506	Adequate		8/21/1986	Arizona Water Company - Sedona
368	Verde Valley	Sunset Hills	Yavapai	17 North	5 East	19	76	53-501516	Adequate		3/21/1974	Big Park Water Company
369	Verde Valley	Sunset Plaza	Yavapai	17 North	5 East	11	8	53-501519	Adequate		5/14/1976	Arizona Water Company - Sedona
370	Verde Valley	Sunup Ranch	Yavapai	16 North	5 East	14	16	53-401418	Adequate		9/15/2004	Arizona Water Company - Sedona
371	Verde Valley	Swinging Bridge Estates	Yavapai	16 North	4 East	34	8	53-501530	Adequate		6/12/1979	Dry Lot Subdivision
372	Verde Valley	Sycamore Farms	Yavapai	16 North	3 East	35	17	53-501531	Adequate		1/1/1979	Cottonwood Water Works, Inc.
373	Verde Valley	Sycamores II, The	Yavapai	14 North	5 East	1	6	53-501532	Adequate		8/26/1983	Arizona Water Company
374	Big Chino	Talking Rock Ranch	Yavapai	16 North	3 West	15, 16, 22	198	53-400519	Adequate		8/17/2001	ICR Water Users Association
375	Big Chino	Talking Rock Ranch Phase 26	Yavapai	16 North	3 West	33, 34	38	53-401355	Adequate		9/8/2004	ICR Water Users Association, Inc.

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
376	Big Chino	Talking Rock Ranch Phase 27	Yavapai	16 North	3 West	22	38	53-401175	Adequate		2/18/2004	ICR Water Users Associations, Inc.
377	Big Chino	Talking Rock Ranch Phase 8	Yavapai	16 North	3 West	22	80	53-401206	Adequate		2/18/2004	ICR Water Users Association, Inc.
378	Big Chino	Talking Rock Ranch Phase 9	Yavapai	16 North	3 West	15, 22	107	53-401417	Adequate		9/8/2004	ICR Water Users Association
379	Big Chino	Talking Rock Ranch Phase IV a	Yavapai	16 North	3 West	19	10	53-400758	Adequate		7/30/2002	ICR Water Users Association
380	Big Chino	Talking Rock Ranch Phase Va&Vb& Phase VI	Yavapai	16 North	3 West	15, 22	73	53-400831	Adequate		10/8/2002	ICR Water Users Association
381	Big Chino	Talking Rock Ranch Phases 10, 12, & 13	Yavapai	16 North	3 West	15, 16	235	53-401870	Adequate		12/1/2005	ICR Water Users Association
383	Big Chino	Talking Rock Ranch Phases II and III	Yavapai	16 North	3 West	15, 22	127	53-400675	Adequate		3/7/2002	ICR Water Users Association
384	Verde Canyon	Terra Pine	Gila	12 North	8 East	36	30	53-501540	Adequate		1/2/1980	E & R Water Company
385	Verde Valley	The Condos at Jordan Road	Coconino	17 North	6 East	8	9	53-400722	Adequate		6/14/2002	Arizona Water Company - Sedona
387	Verde Valley	The Highlands	Yavapai	16 North	3 East	29, 32	240	53-402110	Adequate		6/16/2006	Clarkdale Municipal Water Utility
388	Verde Valley	The Preserve at Oak Creek	Coconino	17 North	6 East	8	158	53-500009	Adequate		4/18/2007	Arizona Water Company - Sedona
389	Verde Valley	The Villas on Elm	Yavapai	15 North	3 East	2	110	53-401483	Adequate		12/1/2004	City of Cottonwood
390	Verde Valley	Thunder Mountain Ranch	Yavapai	17 North	5 East	10, 11	100	53-300070	Adequate		11/21/1995	Arizona Water Company - Sedona
391	Verde Valley	Thunder Mountain Ranch 2	Yavapai	17 North	5 East	10	43	53-300509	Adequate		9/1/1998	Arizona Water Company - Sedona
392	Verde Valley	Thunder Ridge	Yavapai	15 North	5 East	25	230	53-300118	Adequate		7/12/1996	Dry Lot Subdivision
393	Verde Valley	Thunderbird Hills South #2	Yavapai	17 North	5 East	14	16	53-501543	Adequate		10/15/1975	Arizona Water Company - Sedona
394	Verde Valley	Tierra Sienna Condominiums	Yavapai	17 North	5 East	13	32	53-501556	Adequate		11/25/1987	Oak Creek Water Company
395	Verde Valley	Tierra Verde	Yavapai	17 North	5 East	14	9	53-401976	Adequate		4/24/2006	Arizona Water Company - Sedona
396	Verde Valley	Tierra Verde Estates II	Yavapai	15 North	3 East	4	10	53-402222	Adequate		9/1/2006	City of Cottonwood
397	Verde Valley	Tierra Verde Subdivision	Yavapai	15 North	3 East	3	39	53-300586	Adequate		12/22/1998	City of Cottonwood
398	Verde Valley	Tierra del Arte	Yavapai	17 North	5 East	14	6	53-401985	Adequate		5/17/2006	Arizona Water Company - Sedona
399	Verde Canyon	Timber Ridge Estates II	Gila	10 North	10 East	4	22	53-300147	Inadequate	A2	5/22/1996	Town of Payson
400	Verde Canyon	Town & Country Estates	Gila	10 North	10 East	3	19	53-400231	Inadequate	A1, C	1/26/2000	Town of Payson
401	Verde Valley	Town Homes at Flagstaff Meadows	Coconino	21 North	5 East	1	105	53-401224	Inadequate	A1	3/15/2004	Utility Source, LLC
402	Verde Canyon	Trailwood #1	Gila	10 North	10 East	4	104	53-501578	Inadequate	A1, A2	4/14/1994	Town of Payson
403	Verde Canyon	Trailwood #2	Gila	10 North	10 East	4	86	53-501579	Inadequate	A1, A2, C	12/7/1994	Town of Payson
404	Verde Canyon	Trailwood #3	Gila	10 North	10 East	4	123	53-300028	Inadequate	A2	7/26/1995	Town of Payson
405	Verde Valley	Two Ponds Estates	Yavapai	14 North	4 East	12	4	53-501588	Adequate		7/24/1980	Dry Lot Subdivision
406	Verde Valley	Valley Shadows	Yavapai	17 North	5 East	14	158	53-501600	Adequate		3/21/1974	Arizona Water Company - Sedona
407	Verde Valley	Valley View Estates	Yavapai	16 North	3 East	17	28	53-300469	Inadequate	A1	6/17/1998	Dry Lot Subdivision
408	Big Chino	Valley View Ranch	Yavapai	16 North	3 West	20, 29, 32	126	53-700220	Adequate		6/26/2007	Tipeji Domestic Water Improvement District
409	Verde Valley	Ventana Vista	Yavapai	15 North	3 East	15	69	53-501608	Inadequate	B, C	1/18/1994	Cordes Lakes Water Company
410	Verde Valley	Verde Cliffs	Yavapai	14 North	5 East	31	208	53-401354	Inadequate	D	7/21/2004	Camp Verde Water System
411	Verde Valley	Verde Monterey	Yavapai	15 North	3 East	11	14	53-501609	Adequate		10/1/1984	Cordes Lakes Water Company
412	Verde Valley	Verde Outpost	Yavapai	14 North	5 East	31	28	53-501610	Adequate		3/12/1980	Camp Verde Water System

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

A. Water Adequacy Reports

Map Key	Sub-Basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination ³	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section						
413	Verde Valley	Verde Park	Yavapai	13 North	5 East	9, 16	59	53-501611	Inadequate	C	1/26/1982	Dry Lot Subdivision
414	Verde Valley	Verde Ranchettes	Yavapai	15 North	4 East	17	17	53-501612	Adequate		2/4/1985	Dry Lot Subdivision
415	Verde Valley	Verde Santa Fe (1997)	Yavapai	15 North	4 East	6	103	53-300257	Adequate		2/21/1997	Verde Santa Fe Water Company
416	Verde Valley	Verde Valley Business Park	Yavapai	14 North	4 East	15	23	53-401142	Adequate		1/12/2004	Camp Verde Water System
417	Verde Valley	Verde Village #6	Yavapai	15 North	3 East	10, 11	19	53-300170	Adequate		9/6/1996	Cordes Lakes Water Company
418	Verde Valley	Verde West Acres #2	Yavapai	14 North	4 East	14	16	53-501613	Inadequate	C	6/9/1975	Dry Lot Subdivision
419	Verde Valley	Village Park	Yavapai	16 North	6 East	18	25	53-501634	Adequate		9/10/1980	Big Park Water Company
420	Verde Valley	Villages Estates	Yavapai	16 North	5 East	13, 14	25	53-401469	Adequate		12/3/2004	Arizona Water Company - Sedona
421	Verde Valley	Vista Grande Ranch	Yavapai	15 North	3 East	3	48	53-300488	Adequate		7/22/1998	City of Cottonwood
422	Verde Valley	Vista Montana	Yavapai	17 North	5 East	12	60	53-501650	Adequate		4/8/1981	Arizona Water Company - Sedona
423	Verde Canyon	Walnut Glen	Gila	12 North	8 East	29	29	53-501663	Adequate		12/12/1974	E & R Water Company
424	Verde Valley	Water's Edge At Simonton Ranch	Yavapai	14 North	5 East	30, 31	10	53-700347	Adequate		7/13/2007	Camp Verde Water System
425	Verde Valley	Western Hills	Yavapai	17 North	5 East	2, 11	79	53-501668	Adequate		8/15/1977	Arizona Water Company - Sedona
426	Verde Valley	Western Hills #2	Yavapai	17 North	5 East	11	63	53-501669	Adequate		6/12/1979	Arizona Water Company - Sedona
427	Verde Canyon	Western Manor	Gila	11 North	10 East	33, 34	26	53-501671	Inadequate	A1, A2	12/27/1974	United Utilities Company
428	Verde Valley	Westward	Yavapai	17 North	5 East	2, 11	25	53-501673	Adequate		3/25/1980	Arizona Water Company - Sedona
429	Big Chino	Whispering Canyon	Yavapai	16 North	3 West	33, 34	400	53-400580	Adequate		3/7/2002	ICR Water Users Association
430	Verde Canyon	Whitney Ranch Estates	Maricopa	6 North	9 East	7	20	53-300033	Adequate		8/19/1997	Whitney Ranch Estates Property Owners' Association
431	Verde Valley	Wild Turkey Townhouses #2	Yavapai	16 North	5 East	13	82	53-501683	Adequate		12/26/1978	Big Park Water Company
432	Verde Canyon	Wildwood	Gila	10 North	10 East	5	99	53-501687	Inadequate	A1, A2	7/20/1983	Town of Payson
433	Verde Valley	Wilma Overal Property	Yavapai	17 North	5 East	27	5	53-501691	Adequate		8/10/1989	Dry Lot Subdivision
434	Big Chino	Wineglass Estates	Yavapai	18 North	2 West	19	67	53-700374	Adequate		9/11/2007	Dry Lot Subdivision
435	Big Chino	Wineglass Lake Estates	Yavapai	18 North	3 West	13	117	53-501696	Inadequate	A1	10/15/1993	Dry Lot Subdivision
436	Verde Canyon	Wonder Valley	Gila	11 North	10 East	11	8	53-501700	Adequate		8/22/1975	Co-op water system
437	Verde Canyon	Woodhill #1-8	Gila	11 North	10 East	33	396	53-501701	Inadequate	A2, C	5/31/1995	Town of Payson
438	Verde Canyon	Woodland Meadows #1 (amended)	Gila	10 North	10 East	4, 5	102	53-501702	Inadequate	A1, A2	1/6/1981	Town of Payson
439	Verde Canyon	Woodland Meadows #2	Gila	10 North	10 East	4, 5	91	53-501703	Inadequate	A1, A2	11/9/1982	Town of Payson
440	Verde Canyon	Woodland Meadows #3	Gila	10 North	10 East	4	84	53-501704	Inadequate	A1, A2	6/20/1984	Town of Payson
441	Verde Canyon	Woodland Meadows #4	Gila	10 North	10 East	4, 5	24	53-501705	Inadequate	A1, A2	4/12/1988	Town of Payson

B. Analysis of Adequate Water Supply

Map Key	Sub-basin	Subdivision Name	County	Location			No. of Lots	ADWR File No. ²	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section				
21	Verde Valley	Beaver Creek Preserve	Yavapai	15 North	5 East	26	101	43-401859	11/7/2005	Arizona Water Company - Rimrock
60	Big Chino	Chino Grande	Yavapai	19 North	3 West	18	6,016	43-402044	3/11/2008	NA
				19 North	4 West	1, 3, 4, 10, 11, 13, 14, 15				
				20 North	4 West	3, 5, 7, 8, 9, 15, 17, 18, 19, 21, 23, 25, 27, 29, 30, 33, 35				

Table 5.5-10 Adequacy Determinations in the Verde River Basin (Cont)¹

B. Analysis of Adequate Water Supply

Map Key	Sub-basin	Subdivision Name	County	Location			No. of Lots	ADWR File No.	Date of Determination	Water Provider at the Time of Application
				Township	Range	Section				
124	Big Chino	Frontier Ranch	Yavapai	17 North	2 West	19	450	43-700433	3/19/2008	NA
132	Verde Valley	Groves Property	Yavapai	16 North	4 East	23	40	43-700352	8/10/2007	NA
144	Verde Valley	Homestead at Camp Verde, The (1999)	Yavapai	14 North	4 East	25, 36	393	43-400183	12/22/1999	Camp Verde Water System
				14 North	5 East	30, 31				
178	Big Chino	Long Meadow Ranch	Yavapai	16 North	3 West	19	994	43-700418	11/24/2008	Undetermined
				16 North	4 West	14, 23, 24, 26				
205	Verde Valley	Mingus Panorama Estates	Yavapai	16 North	4 East	35	69	43-402259	9/11/2006	Undetermined
293	Verde Valley	Retreat on Oak Creek	Yavapai	17 North	5 East	27, 34	42	43-700209	4/19/2007	Undetermined
352	Verde Valley	Spring Creek Ranch	Yavapai	16 North	4 East	15, 21, 22	98	43-402086	8/11/2006	Undetermined
382	Big Chino	Talking Rock Ranch Phases 2-8	Yavapai	16 North	3 West	11, 15, 16, 17, 21, 22, 28, 33	1,557	43-400556	12/20/2001	ICR Water Users Association
386	Verde Valley	The Highlands	Yavapai	16 North	3 East	29, 32	240	43-401910	1/20/2006	Undetermined

C. Designated Adequate Water Supply

Map Key	Basin	County	Designation No.	Projected or Annual Estimated Demand (af/yr)	Date Application Received	Date Application Issued	Year of Projected or Annual Demand
a	American Ranch DWID	Yavapai	40-400437.0000	108	1/11/2000	3/14/2002	2010
b	Big Park Water Company	Yavapai	40-400325.0000	1,005	1/2/2000	6/30/2000	2010
c	Camp Verde Water System	Yavapai	40-700446.0000	622.2	11/6/2007	4/15/2008	2017
d	Little Park Water Company	Yavapai	40-400324.0000	42.8	4/21/2000	10/30/2000	2010
e	Verde Santa Fe Water Company	Yavapai	40-400876.0000	503	1/17/2003	5/23/2003	2010

Source: ADWR 2008a

Notes:

¹Each determination of the adequacy of water supplies available to a subdivision is based on the information available to ADWR and the standards of review and policies in effect at the time the determination was made.

In some cases, ADWR might make a different determination if a similar application were submitted today, based on the hydrologic data and other information currently available, as well as current rules and policies.

² Prior to February 1995, ADWR did not assign file numbers to applications for adequacy. Between 1995-2006 all applications for adequacy were given a file number with a 22 prefix.

In 2006 a 53 prefix was assigned to all water adequacy reports and applications regardless of their issue date.

³ A. Physical/Continuous

1) Insufficient Data (applicant chose not to submit necessary information, and/or available hydrologic data insufficient to make determination)

2) Insufficient Supply (existing water supply unreliable or physically unavailable; for groundwater, depth-to-water exceeds criteria)

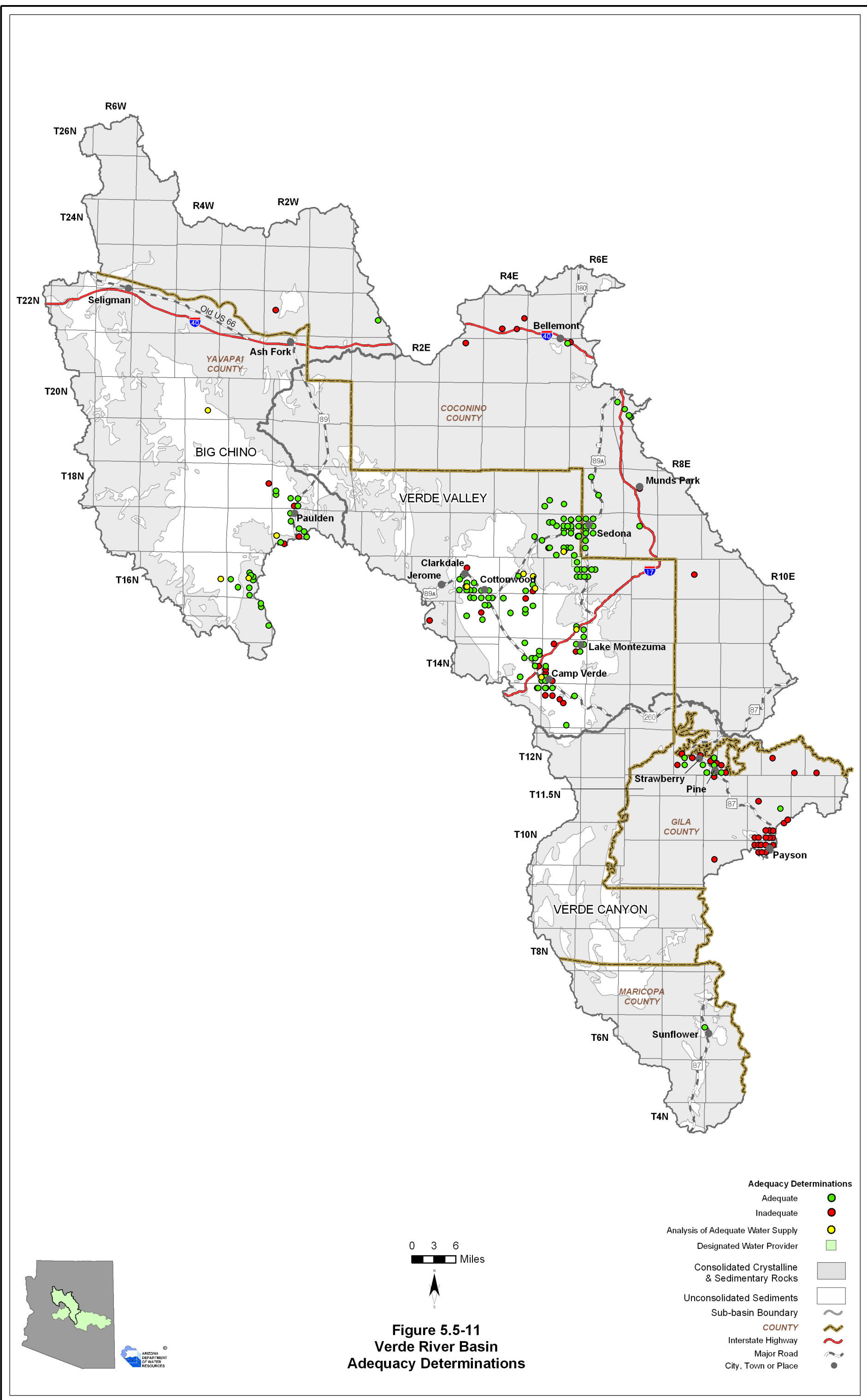
3) Insufficient Infrastructure (distribution system is insufficient to meet demands or applicant proposed water hauling)

B. Legal (applicant failed to demonstrate a legal right to use the water or failed to demonstrate the provider's legal authority to serve the subdivision)

C. Water Quality

D. Unable to locate records

NA = Data not available to ADWR



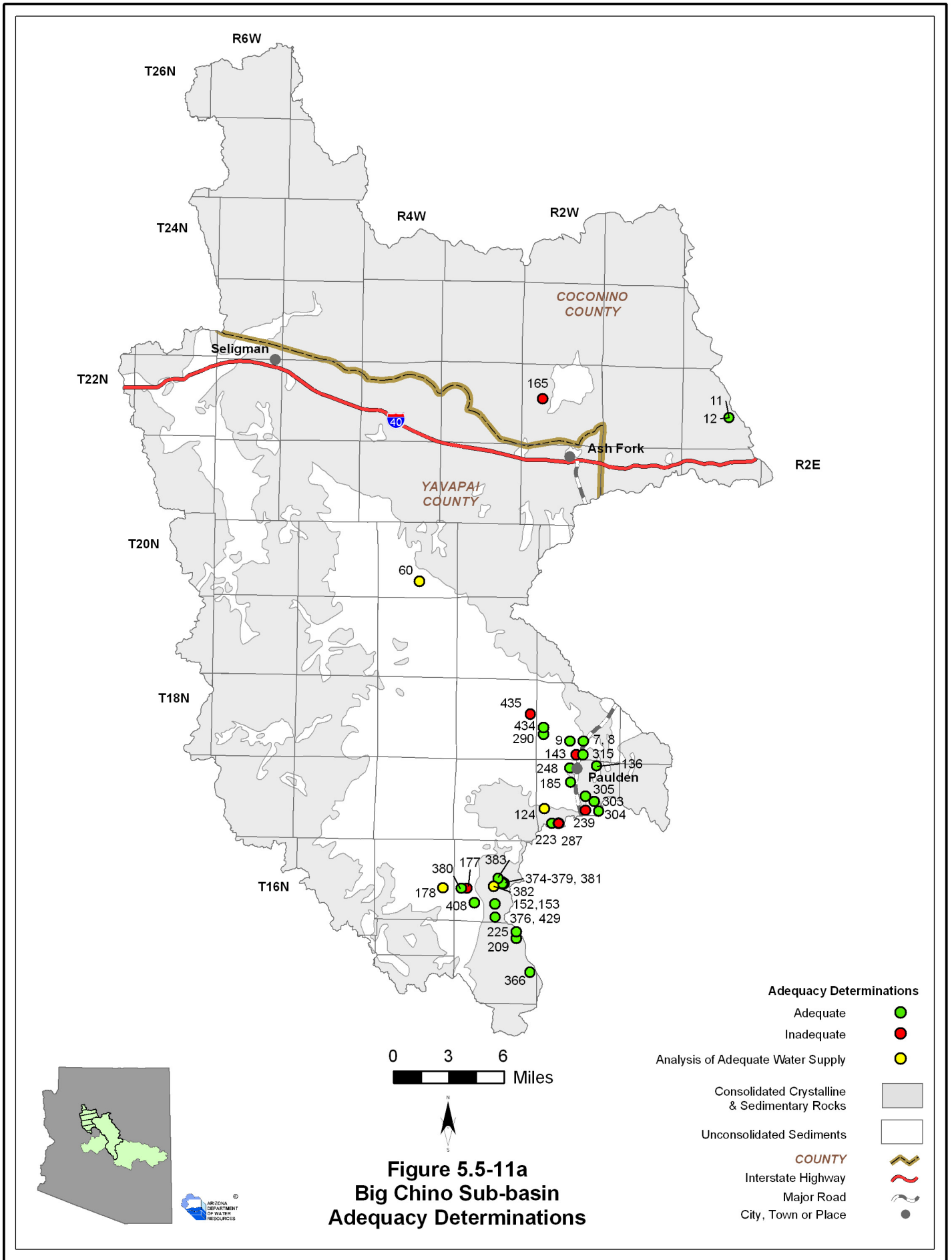


Figure 5.5-11a
Big Chino Sub-basin
Adequacy Determinations

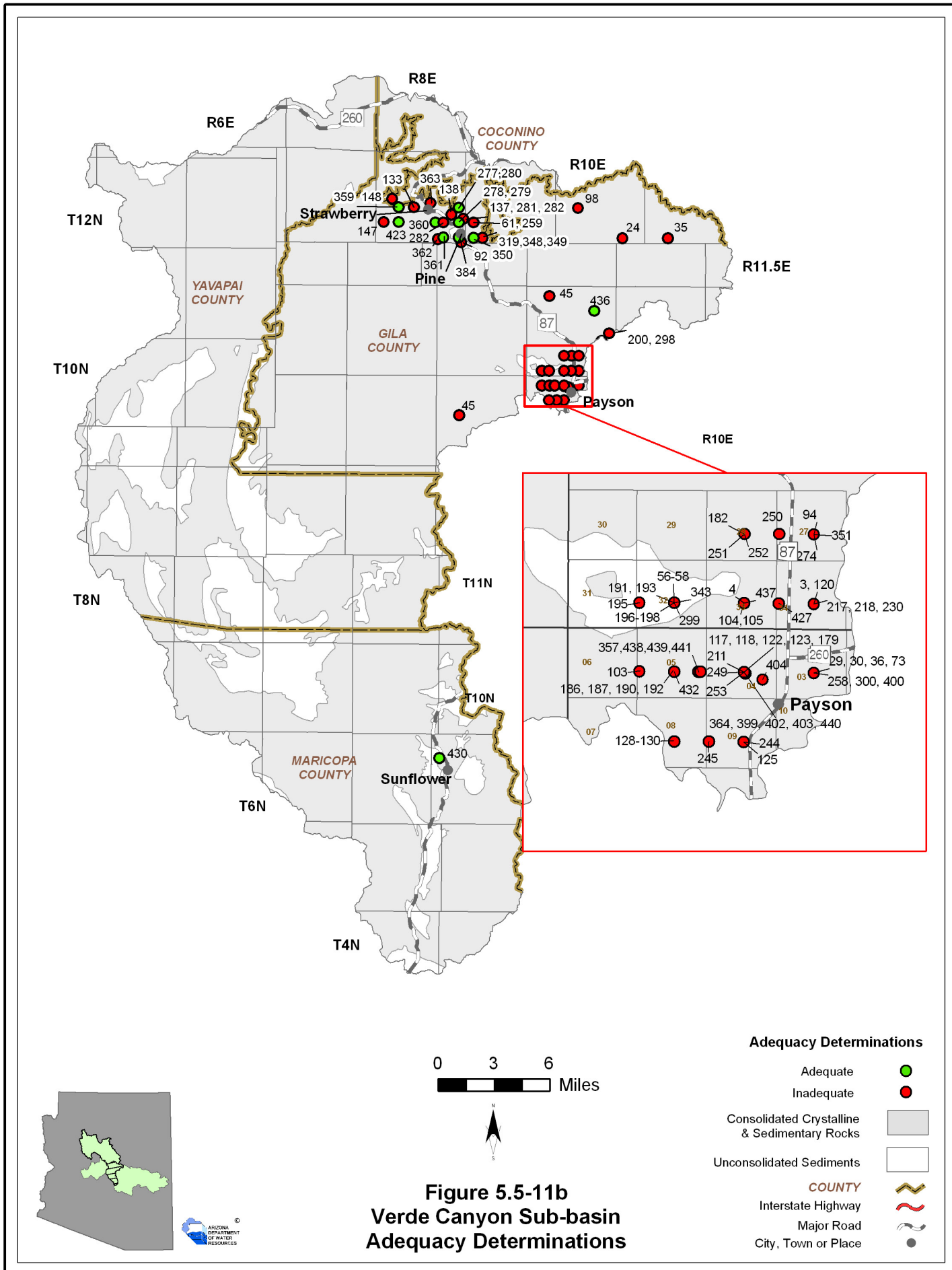


Figure 5.5-11b
Verde Canyon Sub-basin
Adequacy Determinations

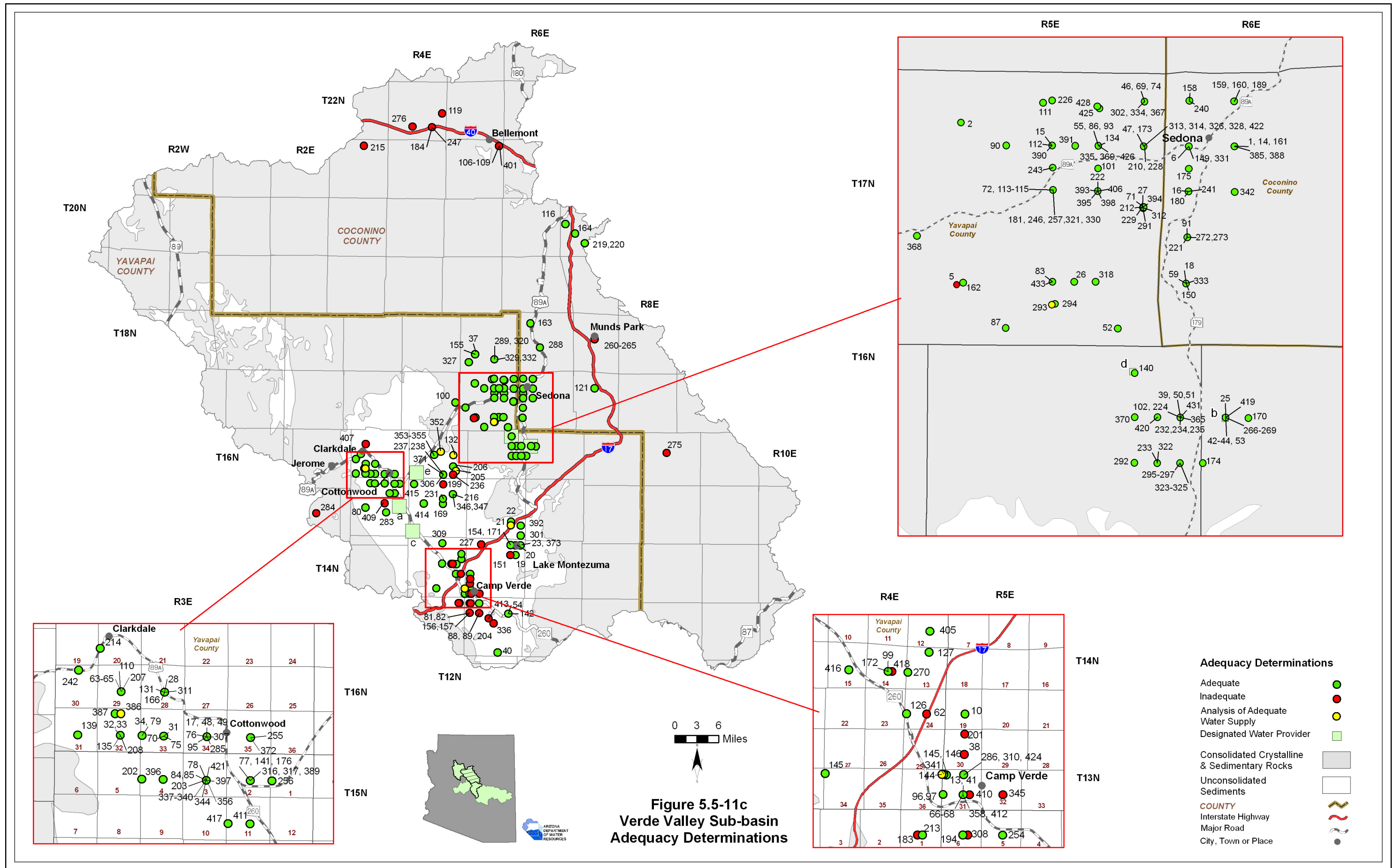


Figure 5.5-11c
Verde Valley Sub-basin
Adequacy Determinations

Verde River Basin

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ACRONYMS AND ABBREVIATIONS

AAWS	Analysis of Adequate Water Supply
ACC	Arizona Corporation Commission
ADMMR	Arizona Department of Mines and Mineral Resources
ADWR	Arizona Department of Water Resources
ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
ALERT	Automated Local Evaluation in Real Time
ALRIS	Arizona Land Resource Information System
AMA	Active Management Area
AWPF	Arizona Water Protection Fund
AZMET	Arizona Meteorological Network
BIA	United States Bureau of Indian Affairs
BLM	United States Bureau of Land Management
CAP	Central Arizona Project
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLIMAS	Climate Assessment for the Southwest
CPC	Center for Plant Conservation
DES	Arizona Department of Economic Security
DOD	United States Department of Defense
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCD	Flood Control District
GIS	Geographic Information System
gpcd	Gallons per capita per day
gpm	Gallons per minute
GWSI	Groundwater Site Inventory System
HIA	Historically Irrigated Acres
HSR	Hydrographic Survey Report
HUC	Hydrologic Unit Code
ITCA	Intertribal Council of Arizona
LUST	Leaking Underground Storage Tank
maf	Million acre-feet
M&I	Municipal and Industrial
NEMO	Non-point Education for Municipal Officials
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Administration
NPS	United States National Park Service
NRCD	Natural Resources Conservation District
NRCS	Natural Resources Conservation Service
NWIS	National Water Information System
NWS	National Weather Service
Pan ET	Pan Evapotranspiration
PCE	tetrachloroethene

PDO	Pacific Decadal Oscillation
SNOTEL	SNOpack TELelemetry
SRP	Salt River Project
TDS	Total Dissolved Solids
USBOR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VRP	Voluntary Remediation Program
WAC	Yavapai County Water Advisory Committee
WIFA	Water Infrastructure Finance Authority
WQARF	Water Quality Assurance Revolving Fund
WRCC	Western Regional Climate Center
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant



Appendix A

APPENDIX A
AWPF Funded Projects
In the Central Highlands Planning Area through FY 2008

CENTRAL HIGHLANDS PLANNING AREA			
Groundwater Basin	AWPF Grant #	Project Title	Project Category
Agua Fria	96-0007	Ash Creek Riparian Protection Project	Stream Restoration
Agua Fria	03-117	Lynx Creek Restoration at Sediment Trap #2	Stream Restoration
Salt River	95-021	Lofer Cienega Restoration Project	Fencing & Habitat Protection
Salt River	95-022	Gooseberry Watershed Restoration Project	Stream Restoration
Salt River	99-083	Cherry Creek Enhancement Demonstration Project	Stream Restoration
Salt River	05-128	Canyon Creek Riparian Restoration Project, Reach 4-5	Fencing & Habitat Protection
Tonto Creek	95-019	Quantifying Anti-Erosion Traits of Streambank Graminoids	Research
Tonto Creek	99-097	Dakini Valley Riparian Project	Fencing & Revegetation
Upper Hassayampa	99-088	Wickenburg High School Stream Habitat Creation	Constructed Wetland Restoration
Verde River	95-001	Stable Isotope Assessment of Groundwater and Surface Water Interaction – Application to the Verde River Headwaters	Research
Verde River	95-003	Sycamore Creek Riparian Management Area	Fencing
Verde River	95-004	Road Reclamation to Improve Riparian Habitat Along the Hassayampa and Verde Rivers	Revegetation
Verde River	95-006	Critical Riparian Habitat Restoration Along a Perennial Reach of a Verde River Tributary	Stream Restoration
Verde River	95-017	Restoration of Fossil Creek Riparian Ecosystem	Research
Verde River	97-030	Walnut Creek Center for Education and Research – Biological Inventory	Research

Groundwater Basin	AWPF Grant #	Project Title	Project Category
Verde River	98-047	Upper Verde Adaptive Management Unit	Fencing
Verde River	98-050	Watershed Restoration of a High Elevation Riparian Community	Watershed & Stream Restoration
Verde River	98-055	Horseshoe Allotment: Verde Riparian Project II	Fencing & Upland Water Developments
Verde River	98-057	Upper Verde Valley Riparian Area Historical Analysis	Research
Verde River	98-058	Effects of Removal of Livestock Grazing on Riparian Vegetation and Channel Conditions of Selected Reaches of the Upper Verde River	Research
Verde River	98-059	Verde River Headwaters Riparian Restoration Demonstration Project	Channel Restoration
Verde River	99-078	Aquifer Framework and Ground-Water Flow Paths in Big and Little Chino Basins	Research
Verde River	99-091	Effects of Livestock Use Levels on Riparian Trees on the Verde River	Research
Verde River	03-118	Verde River Riparian Area Partnership Project	Exotic Species Control
Verde River	04-120	Verde River Headwaters 3-D Hydrogeological Model Framework and Visualization	Research
Verde River	05-133	Verde Wild and Scenic River Fence Enclosure	Fencing
Verde River	07-149	Control of Tamarisk on 12 Miles of the Upper Verde River	Habitat Protection
Verde River	08-161	Montezuma Well Riparian Pasture Restoration Project	Habitat Restoration



Appendix B

APPENDIX B: Community Water System Annual Report Data 2006-2007 and Submitted Plans

PCC	FACILITY	Basin	2006 Withdrawn	2006 Diverted	2006 Received	2006 Total Demand	2006 Delivered	2006 Delivered to	2007 Withdrawn	2007 Diverted	2007 Received	2007 Total Demand	2007 Delivered	2007 Delivered to	
91-000692	ARCOSANTI CAMP	AGF	NR							12			12	12	CUSTOMER
91-000638	BLACK CANYON CITY WID	AGF	266			266	247	CUSTOMER	246			246	247	CUSTOMER	
91-000646	BRADSHAW MT VIEW WATER	AGF	184			184	148	CUSTOMER	181			181	145	CUSTOMER	
91-000678	COLDWATER CANYON	AGF	36			36	37	CUSTOMER	NR						
91-000614	COLDWATER CANYON WC	AGF	73			73	73	CUSTOMER	NR						
91-000616	CORDES LAKE WATER COMPANY	AGF	290			290	253	CUSTOMER	283			283	255	CUSTOMER	
91-000645	CORDES LAKES I	AGF	63			63	250	CUSTOMER	55			55	55	CUSTOMER	
91-000657	CORDES LAKES II	AGF	327			327	250	CUSTOMER	355			355	355	CUSTOMER	
91-000658	CORDES LAKES III	AGF	165			165	250	CUSTOMER	171			171	171	CUSTOMER	
91-000659	CORDES LAKES VI, VII, VIII	AGF	621			621	250	CUSTOMER	592			592	592	CUSTOMER	
91-000679	GAMBEL QUAIL MH & RV PARK	AGF	11			11	11	CUSTOMER	11			11	11	CUSTOMER	
91-000628	MAYER DOMESTIC WATER IMPR	AGF	114			114	123	CUSTOMER	108			108	124	CUSTOMER	
91-000655	ORME RANCH SCHOOL	AGF	NR							NR					
91-000662	PHILADELPHIA WATER SYSTEM	AGF	9			9	9	CUSTOMER	9	9		18	9	CUSTOMER	
91-000689	QUARTER CIRCLE V BAR RANCH	AGF	NR							NR					
91-000288	APACHE LAKE MARINA-RESORT	SRB		26		26	26	CUSTOMER		29		29	29	CUSTOMER	
91-000155	APACHE TRAIL MHP	SRB	9			9	8	CUSTOMER	NR						
91-000151	ARROYO WATER CO INC	SRB	8,458			8,458	8458	CUSTOMER	2,686			2,686	2686	CUSTOMER	
91-000160	AUGUST HILLS MHP	SRB	NR							3			3	4	CUSTOMER
91-000117	AZ WATER CO - MIAMI/CLAYPOOL	SRB	968			968	896	CUSTOMER	1,024			1,024	939	CUSTOMER	
91-000374	AZ WATER CO - PINETOP LAKES	SRB	208			208	166	CUSTOMER	228			228	184	CUSTOMER	
91-000527	AZ WATER CO - SAN MANUEL	SRB			646	646	582	CUSTOMER			661	661	582	CUSTOMER	
91-000528	AZ WATER CO - SUPERIOR SYS	SRB	NR							NR					
91-000165	DEROSE TRAILER PARK	SRB	8			8	8	CUSTOMER	8			8	8	CUSTOMER	
91-000122	GLOBE, CITY OF	SRB	1,603			1,603	1441	CUSTOMER	1,642			1,642	1480	CUSTOMER	
91-000162	HOLIDAY HILLS MHP	SRB	4			4	4	CUSTOMER	3			3	3	CUSTOMER	
91-000156	PUEBLO HEIGHTS MHP	SRB	NR							NR					
91-000137	ROOSEVELT LAKE ESTATES	SRB	37			37	32	CUSTOMER	NR						
91-000126	ROOSEVELT LAKE RESORT INC	SRB	NR							NR					
91-000546	THE OAKS MOBILE HOME PARK	SRB	NR							7			7	7	CUSTOMER
91-000120	CHRISTOPHER CREEK HAVEN	TON	11			11	11	CUSTOMER	15			15	13	CUSTOMER	

APPENDIX B: Community Water System Annual Report Data 2006-2007 and Submitted Plans (Cont)

PCC	FACILITY	Basin	2006 Withdrawn	2006 Diverted	2006 Received	2006 Total Demand	2006 Delivered	2006 Delivered to	2007 Withdrawn	2007 Diverted	2007 Received	2007 Total Demand	2007 Delivered	2007 Delivered to	
91-000163	CHRISTOPHER CREEK MHP	TON	3			3	3	CUSTOMER	4			4	4	CUSTOMER	
91-000130	EAST VERDE WATER	TON	16			16	15	CUSTOMER	NR						
91-000150	STAR VALLEY MOTEL MH & RV	TON	NR							NR					
91-000138	STAR VALLEY WATER	TON	77			77	72	CUSTOMER	NR						
91-000127	TONTO CREEK UTILITY CO	TON	7			7	7	CUSTOMER	8			8	7	CUSTOMER	
91-000212	TONTO HILLS UTILITY COMPANY	TON	NR							NR					
91-000129	TONTO VILLAGE WATER CO	TON	24			24	20	CUSTOMER	NR						
91-000148	UNITED UTILITIES - DEER CREEK	TON	27			27	26	CUSTOMER	NR						
91-000184	CABALLEROS WATER CO	UHA	96			96	96	CUSTOMER	NR						
91-000615	CONGRESS DWID	UHA	270			270	270	CUSTOMER	259			259	259	CUSTOMER	
91-000189	COUNTRY CLUB ACRES WATER INC	UHA	NR							78			78	78	CUSTOMER
91-000672	ESCAPEES AT NORTH RANCH	UHA	39			39	39	CUSTOMER	47			47	47	CUSTOMER	
91-000267	G LAZY B MOBILE HOME PARK	UHA	NR							NR					
91-000256	STONEHEDGE ESTATES	UHA	5			5	5	CUSTOMER	18			18	18	CUSTOMER	
91-000198	WICKENBURG, TOWN OF	UHA	1,944			1,944	1,944/464	CUSTOMER/OTHER	1,729			1,729	1,729/444	CUSTOMER/OTHER	
91-000642	YARNELL WATER IMPROVEMENT ASSN	UHA	6			6	6	CUSTOMER	9			9	9	CUSTOMER	
91-000643	YAVAPAI COUNTRY CLUB WATER	UHA			5	5					5	5			
91-000605	ABRA WC	VRB	163			163	149	CUSTOMER	169			169	169	CUSTOMER	
91-000606	ASH FORK WATER SERVICE	VRB	125			125	119	CUSTOMER	138			138	126	CUSTOMER	
91-000607	AUBREY WATER CO-SELIGMAN	VRB	176			176	114	CUSTOMER	155			155	126	CUSTOMER	
91-000082	AZ WATER CO - PINWOOD	VRB	342			342	262	CUSTOMER	390			390	286	CUSTOMER	
91-000635	AZ WATER CO - RIMROCK	VRB	326			326	288	CUSTOMER	337			337	301	CUSTOMER	
91-000083	AZ WATER CO - SEDONA WATER SYSTEM	VRB	3,332			3,332	3073	CUSTOMER	3,396			3,396	3131	CUSTOMER	
91-000663	AZ WATER CO - VALLEY VISTA	VRB	420			420	406	CUSTOMER	432			432	413	CUSTOMER	
91-000694	BEAVER CREEK STORE	VRB	8			8	7	CUSTOMER	8			8	7	CUSTOMER	
91-000119	BEAVER VALLEY WC	VRB	7	24		31	31	CUSTOMER	NR						
91-000609	BIG PARK WATER CO	VRB	880			880	833	CUSTOMER	925			925	886	CUSTOMER	
91-000693	BUFFALO RUN MHP	VRB	NR							NR					
91-000649	CAMP VERDE WATER SYS-VER	VRB	12			12	8	CUSTOMER	15			15	15	CUSTOMER	



APPENDIX B: Community Water System Annual Report Data 2006-2007 and Submitted Plans (Cont)

PCC	FACILITY	Basin	2006 Withdrawn	2006 Diverted	2006 Received	2006 Total Demand	2006 Delivered	2006 Delivered to	2007 Withdrawn	2007 Diverted	2007 Received	2007 Total Demand	2007 Delivered	2007 Delivered to	
91-000610	CAMP VERDE WTR SYSTEM	VRB	460			460	458	CUSTOMER	517			517	517	CUSTOMER	
91-000664	CATHEDRAL ROCK ESTATES WATER COOP	VRB	2			2	2	CUSTOMER	NR						
91-000611	CATHEDRAL VISTA WC	VRB	19			19	19	CUSTOMER	20			20	20	CUSTOMER	
91-000617	CLARKDALE PUBLIC WATER SYSTEM	VRB	405			405	430	CUSTOMER	487			487	435	CUSTOMER	
91-000700	CLEAR CREEK MOBILE HOME	VRB	NR							4			4	4	CUSTOMER
91-000613	CLEMENCEAU WATER CO	VRB	266			266	276	CUSTOMER	254			254	254	CUSTOMER	
91-000702	C-OASIS PARK	VRB	3			3			3			3	3	CUSTOMER	
91-000618	COTTONWOOD WATER WORKS	VRB	1,514			1,514	95/46	CUSTOMER/ OTHER	1,359			1,359	1359	CUSTOMER	
91-000621	CUP OF GOLD WATER CO	VRB	NR							20			20	20	CUSTOMER
91-000698	DELLS VIEW WC	VRB	NR							NR					
91-000121	ER WATER CO-STRAWBERRY	VRB	145			145	107 25	CUSTOMER/ SYSTEM	NR						
91-000131	FLOWING SPRINGS	VRB	NR							NR					
91-000104	FOREST HIGHLANDS WATER CO	VRB	569		4	573	391/4	CUSTOMER/ OTHER	656		4	660	443/4	CUSTOMER/ OTHER	
91-000705	GILPINS TRAILER PARK	VRB	11			11	11	CUSTOMER	NR						
91-000164	GISELA	VRB	55			55	46	CUSTOMER	NR						
91-000152	JAKE'S CORNER	VRB	NR							NR					
91-000626	JEROME, TOWN OF	VRB					90	CUSTOMER	NR						
91-000090	KACHINA VILLAGE UTILITIES	LCR	235			235	196	CUSTOMER	229			229	192	CUSTOMER	
91-000128	LAKE ROOSEVELT GARDENS EAST	VRB	6			6	5	CUSTOMER	NR						
91-000627	LAKE VERDE WATER COMPANY	VRB	19			19	29	CUSTOMER	NR						
91-000158	LAMPLIGHTER RV RESORT	VRB	NR							27			27	27	CUSTOMER
91-000159	LAZY D RANCH MOTEL	VRB	NR							NR					
91-000651	LITTLE PARK WATER CO	VRB	45			45	43	CUSTOMER	44			44	44	CUSTOMER	
91-000124	MEADS RANCH	VRB	2			2	2	CUSTOMER	NR						
91-000133	MESA DEL CABALLO	VRB	NR							NR					
91-000661	MICHAELS RANCH	VRB	13			13	12	CUSTOMER	13			13	12	CUSTOMER	
91-000677	MONTEZUMA HEIGHTS WATER	VRB	24			24	24	CUSTOMER	22			22	22	CUSTOMER	
91-000648	MONTEZUMA RIMROCK WC, LLC	VRB	42			42	38	CUSTOMER	46			46	46	CUSTOMER	
91-000631	OAK CREEK PUBLIC SERVICE, LLC	VRB	66			66	66	CUSTOMER	66			66	66	CUSTOMER	

APPENDIX B: Community Water System Annual Report Data 2006-2007 and Submitted Plans (Cont)

PCC	FACILITY	Basin	2006 Withdrawn	2006 Diverted	2006 Received	2006 Total Demand	2006 Delivered	2006 Delivered to	2007 Withdrawn	2007 Diverted	2007 Received	2007 Total Demand	2007 Delivered	2007 Delivered to
91-000665	OAK CREEK VALLEY	VRB	479			479	479	CUSTOMER	568			568	567	CUSTOMER
91-000630	OAK CREEK WATER CO #1	VRB	309			309	280	CUSTOMER	317			317	290	CUSTOMER
91-000134	PAYSON, TOWN OF	VRB	1,815			1,815	1,689/31	CUSTOMER/SYSTEM	1,837			1,837	1732/31	CUSTOMER/SYSTEM
91-000143	PINE CREEK CANYON DWID	VRB	8			8	5	CUSTOMER	NR					
91-000656	PINE VALLEY WATER CO	VRB	47			47	44	CUSTOMER	47			47	45	CUSTOMER
91-000125	PINE WATER ASSN DWID	VRB		8		8	6	CUSTOMER		10		10	10	CUSTOMER
91-000135	PINE WC	VRB	145		27	172	152	CUSTOMER	NR					
91-000392	PINEDALE DOMESTIC WATER	VRB	61			61	59	CUSTOMER	46			46	46	CUSTOMER
91-000153	PONDEROSA GLEN MHP	VRB	NR						NR					
91-000094	PONDEROSA UTILITY CORPORATION	VRB	82			82	77	CUSTOMER	108			108	88	CUSTOMER
91-000110	RAINBOW TP	VRB	NR						NR					
91-000650	RED ROCK CROSSING MOBILE	VRB	6			6	6	CUSTOMER	5			5	5	CUSTOMER
91-000136	RIM TRAIL DWID	VRB	NR						NR					
91-000660	SEDONA VENTURE WATER SYST	VRB	111			111	111	CUSTOMER	112			112	112	CUSTOMER
91-000685	SIERRA VERDE RANCH	VRB	NR						NR					
91-000154	SOLITUDE TRAILS DWID	VRB	NR						34			34	34	CUSTOMER
91-000149	STAR VALE MHP	VRB	NR						NR					
91-000695	SUNSET VILLAGE MOBILE HOME PARK	VRB	NR						10			10	10	CUSTOMER
91-000342	SUNSHINERS MOBILE HOME PK	VRB	NR						5			5	5	CUSTOMER
91-000144	UNITED UTILITIES - GARDENS WEST	VRB	63			63	58	CUSTOMER	NR					
91-000132	UNITED UTILITIES - GERONIMO ESTATES	VRB	5			5	5	CUSTOMER	NR					
91-000706	VERDE LAKES WTR-STILL WTR	VRB	78			78	60	CUSTOMER	48			48	52	CUSTOMER
91-000668	VERDE LKS WATER-CLEAR CK	VRB	75			75	57	CUSTOMER	123			123	56	CUSTOMER
91-000644	VERDE LKS WATER-VERDE LKS	VRB	88			88	74	CUSTOMER	95			95	75	CUSTOMER
91-000812	VERDE SANTA FE	VRB	189			189	176	CUSTOMER	177			177	177	CUSTOMER
91-000667	VERDE VALLEY MANOR	VRB	37			37	37	CUSTOMER	36			36	36	CUSTOMER
91-000140	WHISPERING PINES	VRB	15			15	14	CUSTOMER	NR					
91-000696	WHITE HILLS TRAILER PARK	VRB	41			41	41	CUSTOMER	47			47	47	CUSTOMER
91-000670	WILLOWS MOBILE HOME PARK	VRB	NR						NR					

PCC = Program Certificate Conveyance (used as the community water system ID number)



**Community Water Systems that have submitted a plan to the
Department as of 12/2008**

PCC	NAME	Basin
91-000614	COLDWATER CANYON WC	AGF
91-000616	CORDES LAKE WATER COMPANY	AGF
91-000628	MAYER DOMESTIC WATER IMPR	AGF
91-000638	BLACK CANYON CITY WID	AGF
91-000645	CORDES LAKES I	AGF
91-000646	BRADSHAW MT VIEW WATER	AGF
91-000657	CORDES LAKES II	AGF
91-000658	CORDES LAKES III	AGF
91-000659	CORDES LAKES VI, VII, VIII	AGF
91-000662	PHILADELPHIA WATER SYSTEM	AGF
91-000692	ARCOSANTI CAMP	AGF
91-000117	AZ WATER CO - MIAMI/CLAYPOOL	SRB
91-000122	GLOBE, CITY OF	SRB
91-000126	ROOSEVELT LAKE RESORT INC	SRB
91-000137	ROOSEVELT LAKE ESTATES	SRB
91-000151	ARROYO WATER CO INC	SRB
91-000155	APACHE TRAIL MHP	SRB
91-000160	AUGUST HILLS MHP	SRB
91-000162	HOLIDAY HILLS MHP	SRB
91-000165	DEROSE TRAILER PARK	SRB
91-000288	APACHE LAKE MARINA-RESORT	SRB
91-000374	AZ WATER CO - PINETOP LAKES	SRB
91-000527	AZ WATER CO - SAN MANUEL	SRB
91-000546	THE OAKS MOBILE HOME PARK	SRB
91-000120	CHRISTOPHER CREEK HAVEN	TON
91-000127	TONTO CREEK UTILITY CO	TON
91-000130	EAST VERDE WATER	TON
91-000138	STAR VALLEY WATER	TON
91-000148	UNITED UTILITIES - DEER CREEK	TON
91-000189	COUNTRY CLUB ACRES WATER INC	UHA
91-000198	WICKENBURG, TOWN OF	UHA
91-000256	STONEHEDGE ESTATES	UHA
91-000615	CONGRESS DWID	UHA
91-000642	YARNELL WATER IMPROVEMENT ASSN	UHA
91-000643	YAVAPAI COUNTRY CLUB WATER	UHA
91-000672	ESCAPEES AT NORTH RANCH	UHA
91-000082	AZ WATER CO - PINWOOD	VRB
91-000083	AZ WATER CO - SEDONA WATER SYSTEM	VRB
91-000094	PONDEROSA UTILITY CORPOR	VRB
91-000104	FOREST HIGHLANDS WATER CO	VRB
91-000121	ER WATER CO-STRAWBERRY	VRB
91-000124	MEADS RANCH	VRB
91-000125	PINE WATER ASSN DWID	VRB
91-000128	LAKE ROOSEVELT GARDENS EAST	VRB
91-000131	FLOWING SPRINGS	VRB
91-000132	UNITED UTILITIES - GERONIMO ESTATES	VRB
91-000133	MESA DEL CABALLO	VRB
91-000134	PAYSON, TOWN OF	VRB
91-000135	PINE WC	VRB
91-000140	WHISPERING PINES	VRB
91-000143	PINE CREEK CANYON DWID	VRB

**Community Water Systems that have submitted a plan to the
Department as of 12/2008 (Cont)**

PCC	NAME	Basin
91-000144	UNITED UTILITIES - GARDENS WEST	VRB
91-000145	NORTH BAY ESTATES WATER	VRB
91-000154	SOLITUDE TRAILS DWID	VRB
91-000164	GISELA	VRB
91-000342	SUNSHINERS MOBILE HOME PK	VRB
91-000392	PINEDALE DOMESTIC WATER	VRB
91-000605	ABRA WC	VRB
91-000606	ASH FORK WATER SERVICE	VRB
91-000607	AUBREY WATER CO-SELIGMAN	VRB
91-000609	BIG PARK WATER CO	VRB
91-000610	CAMP VERDE WTR SYSTEM	VRB
91-000611	CATHEDRAL VISTA WC	VRB
91-000613	CLEMENCEAU WATER CO	VRB
91-000617	CLARKDALE PUBLIC WATER SYSTEM	VRB
91-000618	COTTONWOOD WATER WORKS	VRB
91-000621	CUP OF GOLD WATER CO	VRB
91-000626	JEROME, TOWN OF	VRB
91-000627	LAKE VERDE WATER COMPANY	VRB
91-000630	OAK CREEK WATER CO #1	VRB
91-000631	OAK CREEK PUBLIC SERVICE, LLC	VRB
91-000635	AZ WATER CO - RIMROCK	VRB
91-000644	VERDE LKS WATER-VERDE LKS	VRB
91-000648	MONTEZUMA RIMROCK WC, LLC	VRB
91-000649	CAMP VERDE WATER SYS-VER	VRB
91-000650	RED ROCK CROSSING MOBILE	VRB
91-000651	LITTLE PARK WATER CO	VRB
91-000656	PINE VALLEY WATER CO	VRB
91-000660	SEDONA VENTURE WATER SYST	VRB
91-000661	MICHAELS RANCH	VRB
91-000663	AZ WATER CO - VALLEY VISTA	VRB
91-000665	OAK CREEK VALLEY	VRB
91-000667	VERDE VALLEY MANOR	VRB
91-000668	VERDE LKS WATER-CLEAR CK	VRB
91-000670	WILLOWS MOBILE HOME PARK	VRB
91-000677	MONTEZUMA HEIGHTS WATER	VRB
91-000685	SIERRA VERDE RANCH	VRB
91-000694	BEAVER CREEK STORE	VRB
91-000695	SUNSET VILLAGE MOBILE HOME PARK	VRB
91-000696	WHITE HILLS TRAILER PARK	VRB
91-000700	CLEAR CREEK MOBILE HOME	VRB
91-000702	C-OASIS PARK	VRB
91-000706	VERDE LAKES WTR-STILL WTR	VRB
91-000810	RINCON COUNTRY EAST RV	VRB

PCC = Program Certificate Conveyance (used as the community water system ID number)



Appendix C

APPENDIX C

SURFACE WATER RIGHT AND ADJUDICATION FILINGS

Surface water is defined in Arizona as “waters of all sources, flowing in streams, canyons, ravines or other natural channels, or in definite underground channels, whether perennial or intermittent, floodwaters, wastewaters, or surplus water, and of lakes, ponds and springs on the surface” (A.R.S. § 45-101).

In 1864, the first territorial legislature of Arizona adopted the doctrine of prior appropriation to govern the use of surface water. The doctrine is based on the tenet of “first in time, first in right” which means that the person who first puts the water to beneficial use acquires a right that is superior to later appropriators of the water. Since the population and water use were both relatively small at that time, no method was initially specified by the legislature for filing surface water right claims or granting rights. By the late 1800s, rapid development of irrigated agriculture combined with drought years had resulted in severe water shortages along the Salt and Gila Rivers. The territorial legislature responded in 1893 with a requirement that new water appropriations be posted at the point of diversion. However, until 1919, a person could acquire a surface water right simply by applying the water to beneficial use and recording a notice of appropriation at the state and country recorder’s office. There still was not a mechanism for granting surface water rights (ADWR, 1992).

On June 12, 1919, the state legislature enacted a surface water code. Now known as the Public Water Code, the law generally requires that a person apply for and obtain a permit in order to appropriate surface water. There is an exception for water use from the mainstem of the Colorado River, which requires a contract with the Secretary of the Interior. In addition, most persons claiming surface water rights prior to the code have been required to file a statement of claim under the Water Rights Registration Act of 1974, although the act did not provide a process for determining the validity of these claims. The legislature also enacted the Stockpond Registration Act in 1977 to recognize certain unpermitted stockponds constructed after 1919 that had not gone through the application process.

The Public Water Code provides that beneficial use shall be the basis, measure and limit to the use of water within the state. Beneficial uses are domestic (which includes the watering of gardens and lawns not exceeding one-half acre), municipal, irrigation, stockwatering, water power, recreation, wildlife including fish, nonrecoverable water storage, and mining uses (A.R.S. § 45-151(A)). The quantity of water that is reasonable for a particular beneficial use depends on a number of factors, including the location of the use.

The Department maintains a registry of surface water right applications and claims filed in Arizona since the Public Water Code was enacted. Each filing is assigned a unique number with one of the following prefixes

- “3R” – application to construct a reservoir filed before 1972;
- “4A” – application to appropriate surface water filed before 1972;
- “33” – application for permit to appropriate public water or construct a reservoir filed after 1972. In addition to surface water diversions and reservoirs, instream flow maintenance

can be applied for and is defined as a surface water right that remains in-situ or “in-stream”, is not physically diverted or consumptively used, and is for maintaining the flow of water necessary to preserve wildlife, including fish, and/or recreation;

- “36” – statement of claim of rights to use public waters of the state. To make this claim, an applicant or predecessor-in-interest must have initiated a water use based on state law before March 17, 1995;
- “38” – claim of water right for a stockpond and application for certification filed for stockponds constructed after June 12, 1919 and before August 27, 1977. To file this claim and application, the stockpond should have been used exclusively for watering of livestock and/or wildlife, have a maximum capacity of 15 acre-feet, and not be subject to water rights litigation or protests prior to August 27, 1977;
- “39” – statement of claimant filed in *The General Adjudication of the Gila River System and Source* (Gila Adjudication) and *The General Adjudication of the Little Colorado River System and Source* (LCR Adjudication). As explained further below, the Department maintains a separate registry of these filings on behalf of the Superior Court of Arizona; and,
- “BB” – decreed water rights determined through judicial action in state or federal court.

These filings specify the source of water, its point of diversion (POD) and place of use (POU), the type and quantity of water use, and date of first use or priority.

If, after moving through a number of administrative steps, an application to appropriate surface water or construct a reservoir (3R, 4A, or 33) is determined to be for beneficial use and not conflict with vested rights or be a menace to public safety or against the interests and welfare of the public, it may be approved and the applicant issued a permit to appropriate. The permit allows the permit holder to construct diversion works, as needed, and put the water to beneficial use. If the terms of the permit are met, the applicant can submit proof of appropriation through an application of certification and may be issued a Certificate of Water Right (CWR). The CWR has a priority date that relates back to the date of application and is evidence of a perfected surface water right that is superior to all other surface water rights with a later priority date, but junior to all rights with an earlier (older) priority date. The CWR also specifies the extent and purpose of the right and may be subject to abandonment and forfeiture if not beneficially used. There are currently approximately 850 applications to appropriate pending with ADWR, and approximately 420 permits and over 7,000 certificates have been issued by ADWR or its predecessors.

A CWR may also be issued based on a stockpond claim (38) if it is found that the facts stated in the claim are true and entitle the claimant to a water right for the stockpond. The priority date depends on the date that the owner of the stockpond filed the claim. If filed prior to March 17, 1996, the priority date is the date of construction. Otherwise, the priority date is the date of filing the claim. Regardless of the date, the CWR for a stockpond claim is junior to (a) Colorado River and other court decreed rights; (b) other rights acquired prior to June 12, 1919 and registered as a statement of claim; and (c) any other CWR issued pursuant to an application filed before August 27, 1977. To date, nearly 20,000 stockpond claims have been filed of which over 3,000 stockpond certificates have been issued by ADWR or its predecessors.

Unlike a CWR, the act of filing a statement of claim (36) does not in itself create a water right, nor does it constitute a judicial determination of the claim. Statements of claim are subject to

challenge, but can be admitted “in evidence as a rebuttal presumption of the truth and accuracy of the information contained in the claim” (A.R.S. § 45-185). To date, nearly 30,000 statements of claim have been filed in Arizona.

In addition to the applications and claims described above, ADWR’s registry of surface water right filings includes several rights determined through judicial action in state or federal court. These ‘adjudications’, in which a water right is determined by court action, may be initiated when one or more water users seek to know how their rights compare to the rights of other water users and/or seek judicial relief from alleged interference with their rights by other water users. The court process establishes or confirms the validity of surface water rights and claims, determines whether these have been properly maintained over the years, and ranks them according to their priority. The result is a decree that may, in addition to establishing and confirming rights, specifies terms under which the decreed rights may be exercised if water shortages occur. Court decreed rights are considered the most valued or certain surface water rights because in the absence of abandonment or forfeiture, they are normally accepted as to their validity. More than 1,000 court-decreed rights are listed in ADWR’s registry and given the prefix “BB”. Further discussion of the major court decrees is provided in Volume 1.

Although several surface water uses have been decreed, many claims and rights established before and after statehood have still not been examined to see if they remain valid. In addition, many water rights established under federal law and claimed by Indian tribes and the United States have not been quantified or prioritized. To better manage water resources in the state, these diverse rights and claims have been joined into large, comprehensive determinations.

Arizona currently has two general stream adjudications – the Gila Adjudication and the LCR Adjudication. The purpose of these judicial proceedings is to determine the nature, extent, and priority of water rights across the entire river systems. In addition to confirming existing state-based surface water rights, the adjudications will quantify and prioritize reserved water rights for Indian and non-Indian federal lands. The latter include military bases, national parks and monuments, and national forests. The adjudications will also determine which wells are pumping appropriable underground water (subflow) and therefore are subject to the jurisdiction of the court. The Gila and LCR Adjudications are being conducted in the Superior Court of Arizona in Maricopa and Apache Counties, respectively. ADWR provides technical, legal and administrative support to the adjudication court, as described in A.R.S. § 45-256.

The Gila Adjudication was initiated in 1974 when SRP filed a petition to determine the water rights in the Salt River Watershed above the Granite Reef Diversion. Since that time, the adjudication area has grown and now covers over 53,000 square miles. It is divided into 7 watersheds and includes 12 Indian reservations and over 24,000 parties. The LCR Adjudication was initiated by a petition filed by Phelps Dodge in 1978. This adjudication now covers 27,000 square miles and includes 3 watersheds, 5 Indian reservations, and over 3,000 parties. A party is a person or entity that has filed one or more statement of claimant (SOC) in the adjudication.

All parties who claim to have a water right within the river systems are required to file an SOC or risk the loss of their right. Well owners are also encouraged to file an SOC since the adjudication process may include water use from a well depending on the well’s location relative to streams and

other factors. However, a person does not obtain a right to use water by filing an SOC nor is an SOC a legal permit to use water. Rights to use water must be acquired in accordance with state or federal law.

Each year, ADWR sends summons to new surface water appropriators and well owners in the adjudication areas that direct them to file an SOC. In response, the number of SOCs filed in the adjudications continues to increase as new water uses are initiated. To date, nearly 81,000 SOCs have been filed in the Gila Adjudication and over 14,000 SOCs have been filed in the LCR Adjudication. ADWR maintains a separate registry of these adjudication filings on behalf of the Superior Court and assigns each a unique number with the prefix “39”.

Figure C-1 General Stream Adjudications in Arizona

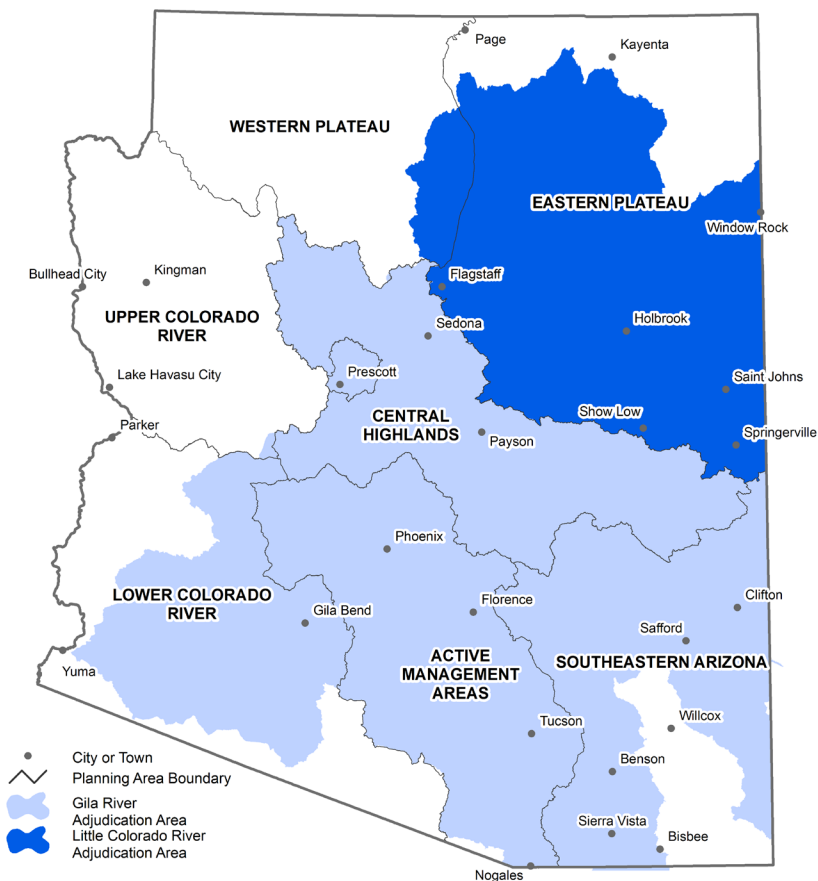


Table C-1 summarizes the number of surface water right and adjudication filings for each planning area. The table was generated by querying ADWR’s surface water right and SOC registries in February 2009. Files are only counted in the table if they include sufficient locational information (Township, Range, and Section) to allow a POD and/or POU to be mapped within the planning area. If a file lists more than one POD or POU in a planning area, it is only counted once in the table for that planning area. However, no attempt was made to avoid counting multiple filings for the same POD/POU which can result if a landowner or lessee has two or more filings or if different applicants each have at least one filing. Since many SOCs list surface water right filings as their basis of claim, multiple filings are common and account, in part, for the large number of filings. Sorting through multiple filings is one of the challenges facing the Department and the adjudication courts. Results from the Department’s investigation of surface water right and adjudication filings are presented in Hydrographic Survey Reports (HSRs).

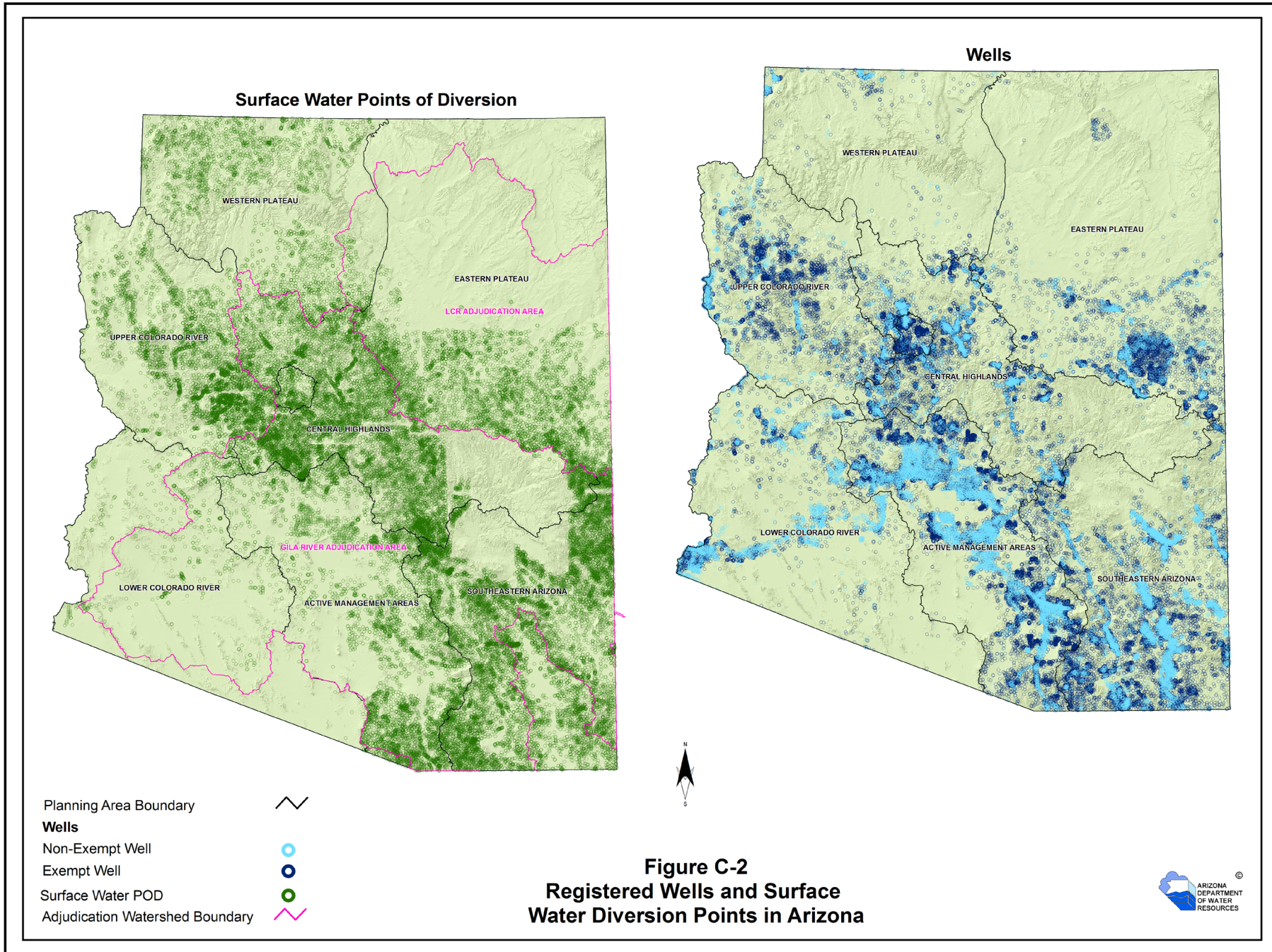
Figure C-2 shows the location of surface water diversion points listed in the Department’s surface water rights registry. The numerous points mapped reflect the relatively large number of stockpounds and reservoirs that have been constructed across the state as well as diversions from streams and springs. Locations for registered wells, many of which are referenced as the basis of claim in SOCs, are also shown in Figure C-2. Instream flow filings are not shown as these filings do not have points of diversion.

Table C-1 Count of Surface Water Right and Adjudication Filings by Planning Area¹

PLANNING AREA	TYPE OF FILING							TOTAL
	BB ²	3R ³	4A ³	33 ³	36 ⁴	38 ⁵	39 ⁶	
Eastern Plateau	134	163	196	373	3,289	3,275	12,099	19,529
Southeastern	483	395	716	898	8,288	6,415	19,288	36,483
Upper Colorado River	0	224	329	469	2,858	2,084	0	5,964
Central Highlands	1	287	625	897	8,517	3,928	25,443	39,698
Western Plateau	0	415	207	554	1,177	1,270	324	3,947
Lower Colorado River	0	26	48	86	355	304	2,323	3,142
Active Management Areas	1	269	341	687	4,072	2,913	27,134	35,417
Total	619	1,779	2,462	3,964	28,556	20,189	86,611	144,180

Notes:

- ¹ Based on a query of ADWR's surface water right and adjudication registries in February 2009. A file is only counted in this table if it provides sufficient information to allow a Point of Diversion (POD) and/or Place of Use (POU) to be mapped within the planning area. If a file lists more than one POD or POU in a given planning area, it is only counted once in the table for that planning area. Several surface water right and adjudication filings are not counted here due to insufficient locational information. However, multiple filings for the same POD/POU are counted.
- ² Court decreed rights; not all of these rights have been identified and/or entered into ADWR's surface water rights registry.
- ³ Application to construct a reservoir, filed before 1972 (3R); application to appropriate surface water, filed before 1972 (4A); and application for permit to appropriate public water or construct a reservoir, filed after 1972 (33).
- ⁴ Statement of claimant of rights to use public waters of the state, filed pursuant to the Water Rights Registration Act of 1974.
- ⁵ Claim of water right for a stockpond and application for certification, filed pursuant to the Stockpond Registration Act of 1977.
- ⁶ Statement of claimant, filed in the Gila or LCR General Stream Adjudications.





Appendix D

APPENDIX D: RURAL WATERSHED PARTNERSHIPS ISSUE SUMMARY (2008)

MULTI-PLANNING AREA - Eastern Plateau, Western Plateau and Central Highlands			
Watershed Partnership	Primary Participants	Projects & Accomplishments	Issues
Coconino Plateau Water Advisory Council	Flagstaff Coconino County Williams Sedona Page Tusayan TNC Grand Canyon Trust Navajo Nation Hopi Tribe Havasupai Tribe Hualapai Tribe ADWR ADEQ State Land NRCD NAU USGS USBoR USFS National Parks US Fish and Wildlife Grand Canyon National Park AZ Game and Fish Doney Park Water Co.	<ul style="list-style-type: none"> • 4 categories of potential water augmentation projects have been identified along with their associated costs. • Groundwater study and conceptual model completed • Phase I Water Demand Study for Coconino Plateau • Growth Impacts Study • Western Navajo Pipeline Study • Development of study for importing C aquifer groundwater east of Flagstaff has been completed. • Flagstaff, Hopi and Navajo are exploring cooperative opportunities for developing C aquifer groundwater. • Flagstaff purchased Red Gap Ranch for possible future development of groundwater. • Hopi HSR initiated. • Water Supply Appraisal Study Completed, which identifies current & future demands and alternatives for meeting projected demands. • Numeric Groundwater Model completed • Strategic Plan has been 	<ul style="list-style-type: none"> • Continued growth throughout entire plateau region • Limited and deep groundwater supplies. • Drought sensitive surface water supplies of Williams, Flagstaff and others • Groundwater salinity issues in northeastern part of plateau • Numerous water haulers with few hauling stations that are sometimes cutoff during drought • Unable to get adequate water supply designation under current definition • Growth in Page with no current means of additional supply • ESA issues with groundwater usage and impacts on perennial streams • Potential limitation of groundwater usage resulting from reserved groundwater rights of Indians • Uncertainty of Indian water right settlements (LCR & Colorado River) • Proposed San Juan Paiute reservation west of Flagstaff • Potential impacts on springs in Grand Canyon and also on supplies to Havasupai and Hualapai reservations • Access to water development on public lands • Limited groundwater data for entire region • Minor Arsenic issues in Woody Mtn. Well field (9-14 ppb) • Unregulated lot splits

MULTI-PLANNING AREA - Eastern Plateau, Western Plateau and Central Highlands			
Watershed Partnership	Primary Participants	Projects & Accomplishments	Issues
		<p>completed to address water conservation and management on the Plateau</p> <ul style="list-style-type: none"> • Attempting to obtain Congressional Authority to complete a Feasibility Study of the water alternatives identified 	<ul style="list-style-type: none"> • Limited funding resources for planning, projects, infrastructure and studies • Extremely high cost of water augmentation projects • Competition from Phoenix/Tucson for CAP reallocation water and other Colorado River supplies • Congressional Support for completion of a Feasibility Study • Modifications to the current definition of an adequate water supply resulting from the passage of SB1575
Northern Arizona Municipal Water Users Association (NAMWUA)	<p>Prescott Flagstaff Cottonwood Sedona Chino Valley</p> <p>Prescott Valley Williams Clarkdale Payson</p>	<ul style="list-style-type: none"> • Projected water demands through 2040 have been identified • A request for 70,000 acre-feet of CAP reallocation water has been submitted to ADWR for consideration. • Completed Colorado River Supply Study 	<ul style="list-style-type: none"> • Limited supplies to meet projected demands • ESA issues impacting potential ground and surface water supplies • Limited funding resources for planning, projects, infrastructure and studies • Competition from Phoenix/Tucson for CAP reallocation water and other Colorado River supplies • Funding for Colorado River infrastructure • Water quality issues in Verde Valley and Flagstaff • Upper Basin/Lower Basin issues with Colorado River affect potential for use • Modifications to the current definition of an adequate water supply resulting from the passage of SB1575



CENTRAL HIGHLANDS PLANNING AREA

Watershed Partnership	Primary Participants	Projects & Accomplishments	Issues
Mogollon Highlands Partnership	<p>Payson Pine Strawberry Gila County</p> <p>Brooks Utilities Rim Trails WID Pine Strawberry WID Local citizens and special interests</p> <p>Tonto Apache Nation</p> <p>ADWR SRP</p> <p>USFS USBoR USGS</p>	<ul style="list-style-type: none"> • Comprehensive groundwater study and conceptual model completed. • Completed Water Supply Appraisal Study to identify current & future demands and alternatives for meeting projected demands. • Strategic Plan completed • Feasibility study and cost estimates for Blue Ridge Reservoir pipeline completed • Obtained approximately 3,500 ac-ft of surface water from Craigen Reservoir. • Numeric groundwater model completed. 	<ul style="list-style-type: none"> • Limited water resources to meet current demands. • Environmental, supply, treatment, transportation and financing costs associated with augmentation from Blue Ridge reservoir • Numerous private water companies, Arizona Corporation Commission and Domestic Water Improvement District conflicts • Interbasin transfer conflicts resulting from Payson's ability to pump from two different basins • Seasonal demand issues; peaking problems • County encouragement of growth in Pine and Strawberry • Unresolved Indian water rights settlements • Environmental issues pertaining to Fossil Creek • Limited groundwater data for entire region • Costs associated with hauling water • Access to water development on public lands • Infrastructure needs for private water companies • Limited funding resources for planning, projects, infrastructure and studies
Upper Agua Fria Watershed Partnership	<p>Mayer Black Canyon City</p> <p>Cordes Lakes Yavapai County Spring Valley</p> <p>Local Citizens</p> <p>ADWR ADEQ Cooperative Extension State Lands</p>	<ul style="list-style-type: none"> • Watershed Reconnaissance studies • Active recharge site identification study. • Corp of Engineers watershed appraisal study completed • Corp of Engineers watershed feasibility study initiated • Completed wet dry mapping of Agua Fria R. 	<ul style="list-style-type: none"> • Proposed growth in the Mayer, Bensch Ranch and Spring Valley areas • Limited groundwater supplies • Little or no groundwater data • Groundwater and surface water supplies are very drought sensitive • Potential water quality attributed to local septic systems and discharges from Prescott Valley • Poorly constructed and maintained infrastructure in some areas

CENTRAL HIGHLANDS PLANNING AREA			
Watershed Partnership	Primary Participants	Projects & Accomplishments	Issues
	BLM/Agua Fria Nat. Monument USFS	<ul style="list-style-type: none"> Groundwater quality study completed 	<ul style="list-style-type: none"> Limited funding resources for planning, projects, infrastructure and studies
Yavapai Water Advisory Committee	<p>Prescott Valley Chino Valley Yavapai County Camp Verde Cottonwood</p> <p>24 local special interest groups TNC</p> <p>Yavapai Apache Prescott</p> <p>ADWR SRP Cooperative Extension NAU</p> <p>USFS USBoR</p> <p>Prescott Paulden Sedona Clarkdale Jerome</p> <p>Yavapai</p> <p>ADEQ NRCD</p> <p>USGS USF&W</p>	<ul style="list-style-type: none"> Comprehensive groundwater study and conceptual model Study of geologic framework of aquifer units and groundwater flow paths of Verde River headwaters using aeromagnetic and gravity data. Verde River Watershed Study. Water educational forum conducted for WAC and public with ultimate goal of developing water management plan for Verde watershed area. Big Chino Subbasin Historical and Current Water Uses and Water Use Projections study. Riparian demand study of Middle Verde Numeric groundwater model completed. Prescott AMA groundwater model. Study of groundwater flow paths for upper and middle Verde using stable isotopes. Prescott purchased JWK Ranch in Big Chino to import 8,717 ac-ft annually to Prescott and 	<ul style="list-style-type: none"> Potential impacts resulting from the transfer of 8,717 ac-ft from Big Chino to Prescott and Prescott Valley 25,000 to 30,000 approved lots still outstanding in Prescott AMA Multiple developments currently under construction in the tri-city region of the AMA ESA issues associated with the Verde Proposed critical habitat area in Verde Valley for Willow Fly Catcher New Arsenic standards Pending Subflow decision Political and philosophical differences between AMA and Verde Valley Countywide growth and unregulated lot splits Indian water rights Thousands of private domestic wells already permitted and more being requested daily Potential water quality impacts on groundwater system from the thousands of septic systems Potential development rumors of the CVCF Ranch in the Big Chino Limited funding resources for planning, projects, infrastructure and studies



CENTRAL HIGHLANDS PLANNING AREA			
Watershed Partnership	Primary Participants	Projects & Accomplishments	Issues
		Prescott Valley <ul style="list-style-type: none"> • Groundwater monitoring program in Big Chino initiated. • Developed water demand scenarios to run on groundwater model • Initiated Water Supply Appraisal Study with BOR/ADWR 	