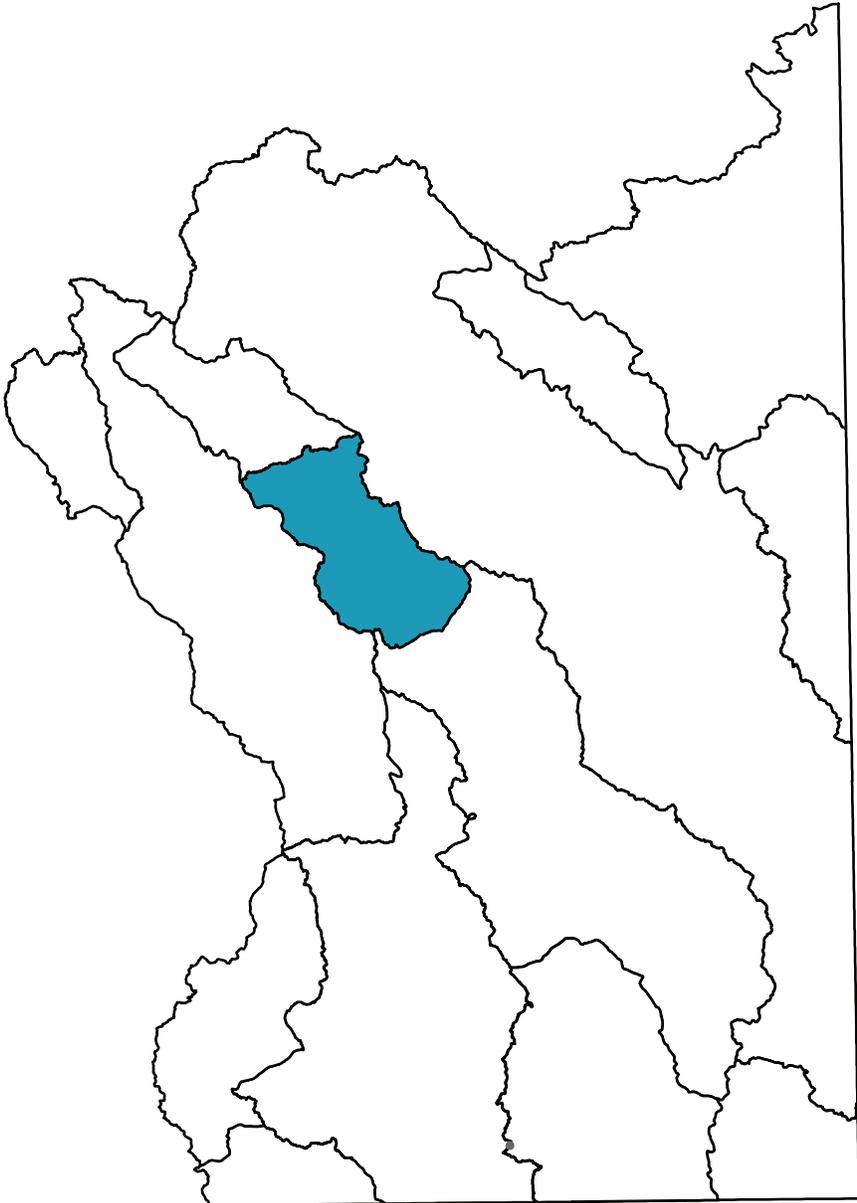


Section 3.1 Aravaipa Canyon Basin



3.1.1 Geography of the Aravaipa Canyon Basin

The Aravaipa Canyon Basin is a relatively small, 517 square mile basin in the center of the planning area. Geographic features and principal communities are shown on Figure 3.1-1. The sparsely populated basin is characterized by medium-elevation mountain ranges, canyons, valleys and grasslands.

- Principal geographic features shown on Figure 3.1-1 are:
 - Principal basin communities of Klondyke and Aravaipa
 - Aravaipa Creek, which runs north-south through Klondyke and turns west north of Klondyke where it enters Aravaipa Canyon
 - Galiuro Mountains southwest of Klondyke, which contain the highest point in the basin at 7,540 feet
 - Black Hills south of Klondyke
 - Aravaipa Valley south of Klondyke

- Not well shown on Figure 3.1-1 are the Santa Teresa Mountains west of Aravaipa and Klondyke on the western boundary of the basin.

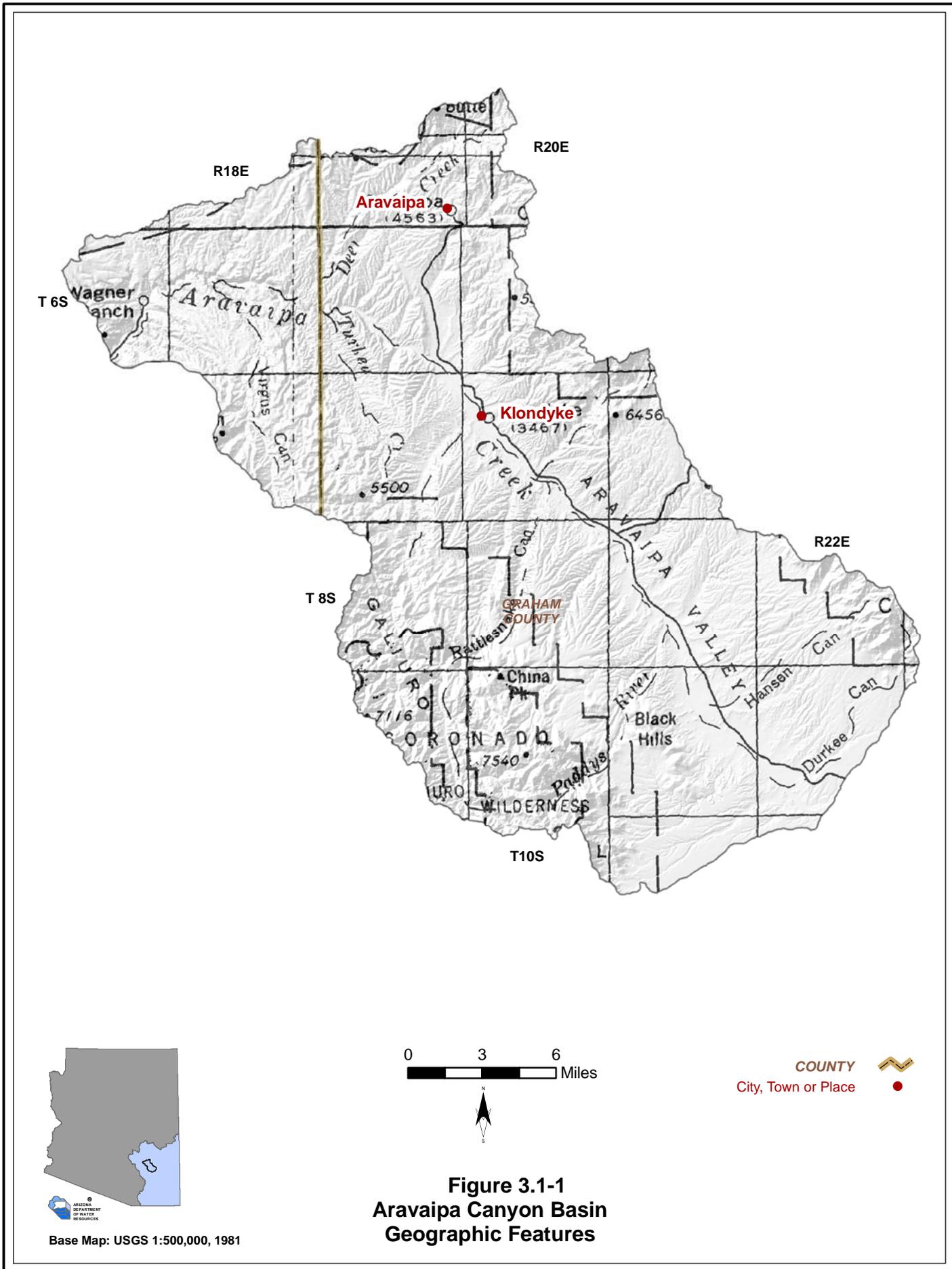


Figure 3.1-1
Aravaipa Canyon Basin
Geographic Features

3.1.2 Land Ownership in the Aravaipa Canyon Basin

Land ownership, including the percentage of ownership by category, for the Aravaipa Canyon Basin is shown in Figure 3.1-2. Principal features of land ownership in this basin are the large amount of federal land holdings and a relative abundance of state trust lands. A description of land ownership data sources and methods is found in Volume 1, Section 1.3.8. Land ownership categories are discussed below in the order of percentage from largest to smallest in the basin.

State Trust Land

- 38.3% of the land in this basin is held in trust for the public schools and 10 other beneficiaries under the State Trust Land system.
- Most state trust land is in two bands flanking the Klondyke and Klondyke-Bonita Roads and extending to national forest boundaries.
- Primary land use is for livestock grazing.

National Forest and Wilderness

- 25.6% of the land is federally owned and managed as national forest and wilderness.
- All forest lands in the basin, although they are not contiguous, are in the Safford Ranger District of the Coronado National Forest.
- The western most national forest land contains a portion of the Galiuro Wilderness Area.
- Land uses include grazing, recreation and timber production.

U.S. Bureau of Land Management (BLM)

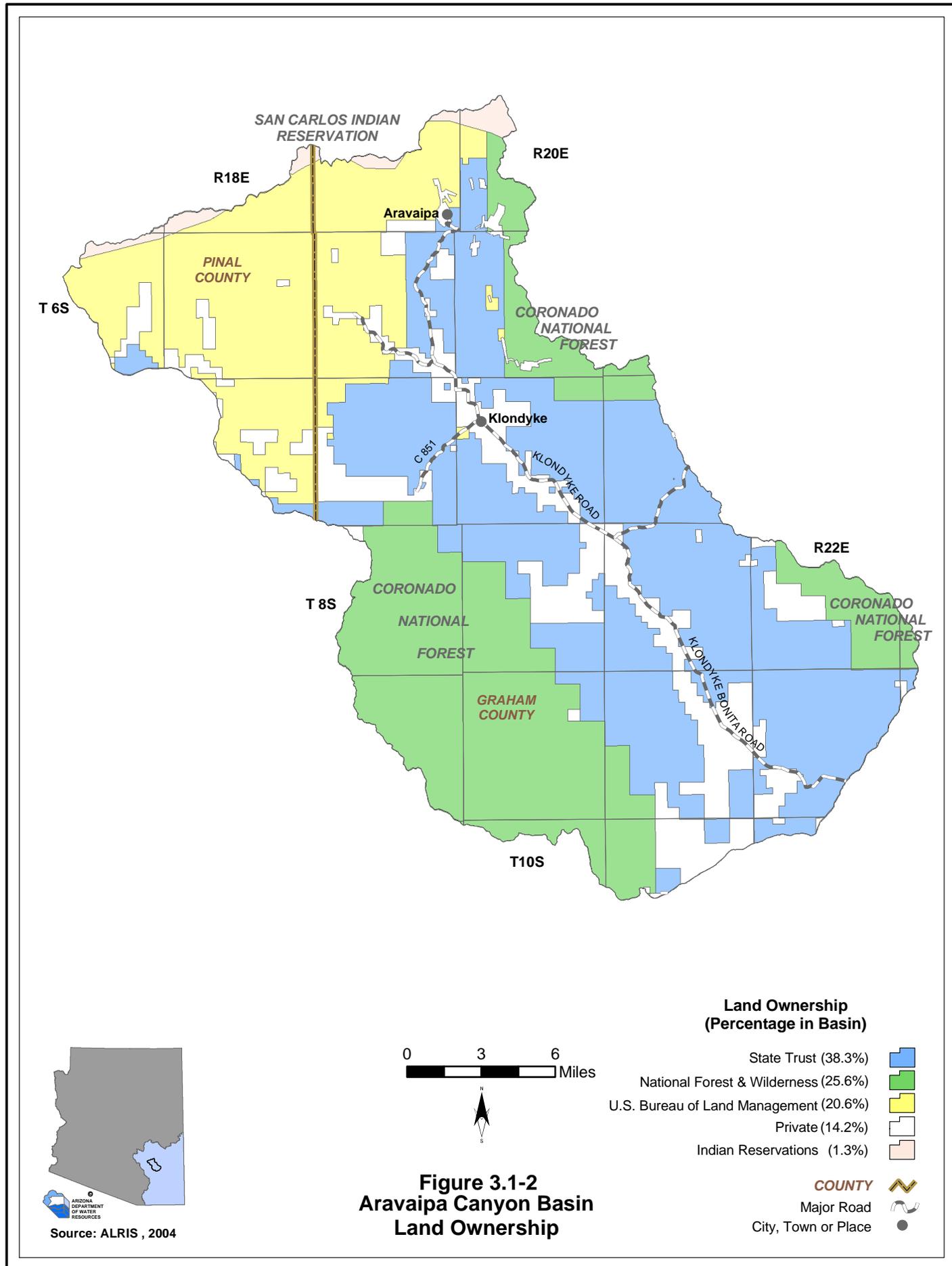
- 20.6% of the land is federally owned and managed by the Safford Field Office of the Bureau of Land Management.
- All BLM lands are in a block in the northwestern portion of the basin.
- Just over a quarter of the BLM land in the basin, 18,970 acres, is managed as the Aravaipa Canyon Wilderness located in T6S and T7S, R18E.
- Land uses include recreation and grazing.

Private

- 14.2% of the land is private.
- Private land is interspersed throughout state trust, national forest and BLM lands.
- Most of the private land is along the major roads.
- There are a number of private land in-holdings in the BLM land and one in the national forest land on the northeastern boundary of the basin.
- Primary land uses are domestic, ranching and farming.

Indian Reservations

- 1.3% of the land is under ownership of the San Carlos Apache Tribe.
- Tribal lands are located in a small strip along the northern boundary of the basin.
- Primary land uses are grazing.



3.1.3 Climate of the Aravaipa Canyon Basin

The Aravaipa Canyon Basin does not contain any NOAA/NWS Coop Network, Evaporation Pan, AZMET or SNOTEL/Snowcourse stations. The precipitation figures shown in Figure 3.1-3 are from the Spatial Climatic Analysis Service at Oregon State University. A description of this and other climate data sources and methods is found in Volume 1, Section 1.3.3.

Average Annual Precipitation

- Average annual precipitation is as high as 26 inches in the Galiuro Mountains in the southwestern portion of the basin.
- Average annual precipitation is as low as 16 inches in the Aravaipa Canyon area in the northwestern portion of the basin.
- In general, precipitation increases as the elevation increases in this basin.
- The range of 14 inches between areas of highest and lowest precipitation recorded is common for the planning area.

Table 3.1-1. Climate Data for the Aravaipa Canyon 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
None									

Source: WRCC, 2003.

B. Evaporation Pan:

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

Source: WRCC, 2003.

C. AZMET:

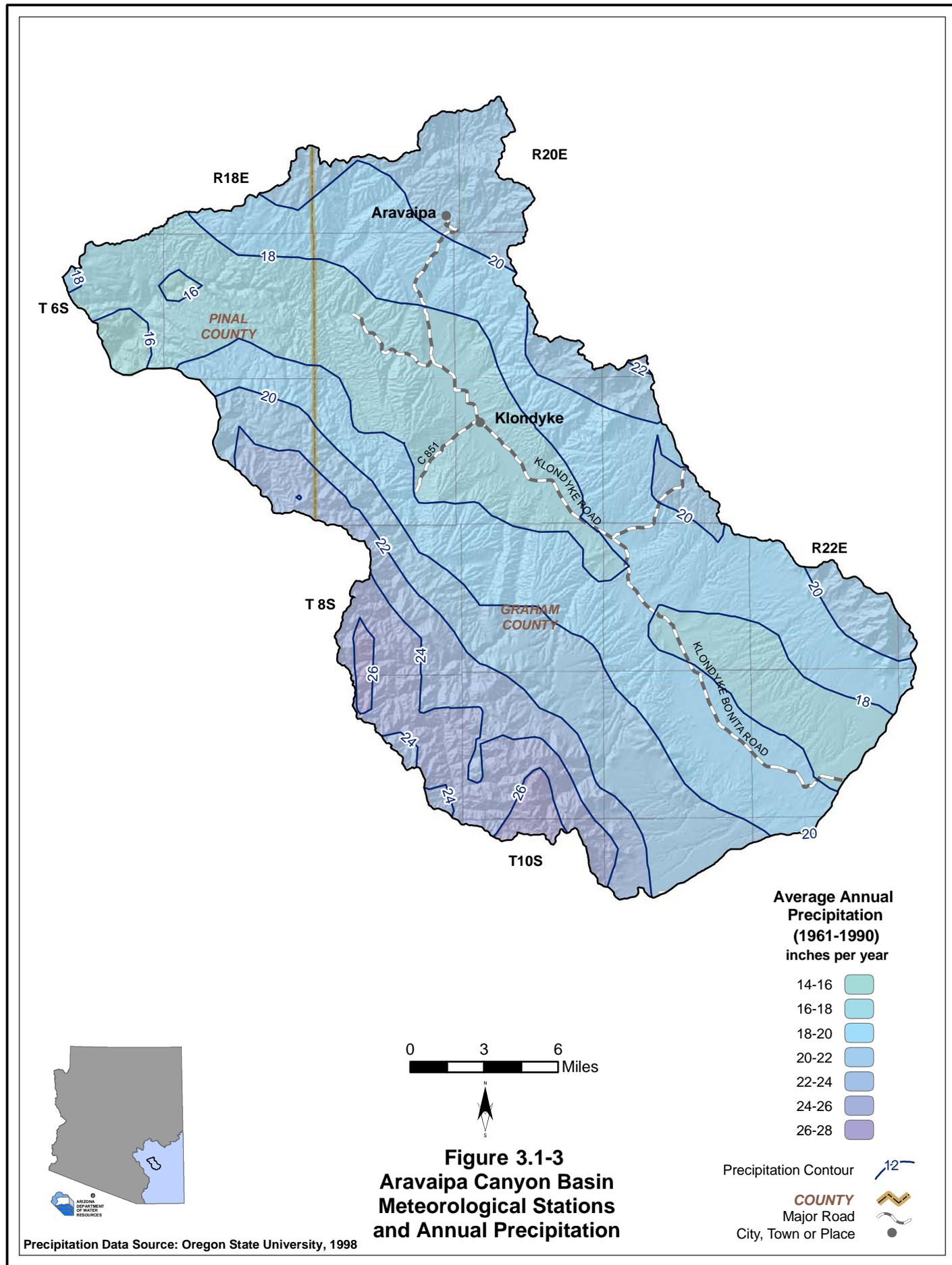
Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Annual Reference Evapotranspiration, in inches (number of years to calculate averages)
None			

Source: Arizona Meteorological Network, 2005

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record Used for Averages	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								

Source: Natural Resources Conservation Service, 2005



3.1.4 Surface Water Conditions in the Aravaipa Canyon Basin

There are no streamflow data or flood ALERT equipment in this basin. Reservoir and stockpond data, including maximum storage or maximum surface area, are shown in Table 3.1-4. The USGS annual runoff contours as well as stream channels are shown on Figure 3.1-4. A description of stream data sources and methods is found in Volume 1, Section 1.3.16. A description of reservoir data sources and methods is found in Volume 1, Section 1.3.11. A description of stockpond data sources and methods is found in Volume 1, Section 1.3.15.

Reservoirs and Stockponds

- Refer to Table 3.1-4.
- Surface water is stored or could be stored in four small reservoirs in the basin.
- Total maximum storage for two of the small reservoirs is 117 acre-feet. Total surface area for the other two small reservoirs is 38 acres.
- There are an estimated 349 stockponds in this basin.

Runoff Contour

- Refer to Figure 3.1-4.
- Average annual runoff varies from 0.5 inches per year along Aravaipa Creek to one inch per year in the southwestern portion of the basin.

Table 3.1-2 Streamflow Data for the Aravaipa Canyon Basin

Station Number	USGS Station Name	Contributing Drainage Area (in sq. miles)	Mean Basin 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	
None													

Table 3.1-3 Flood ALERT Equipment in the Aravaipa Canyon Basin

Station Name	Station ID	Station Type	Install Date	Responsibility
None				

Table 3.1-4 Reservoirs and Stockponds in the Aravaipa Canyon 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)¹

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					

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

Total number: 2
 Total maximum storage: 117 acre-feet

D. Other Small Reservoirs (between 5 and 50 acres surface area)¹

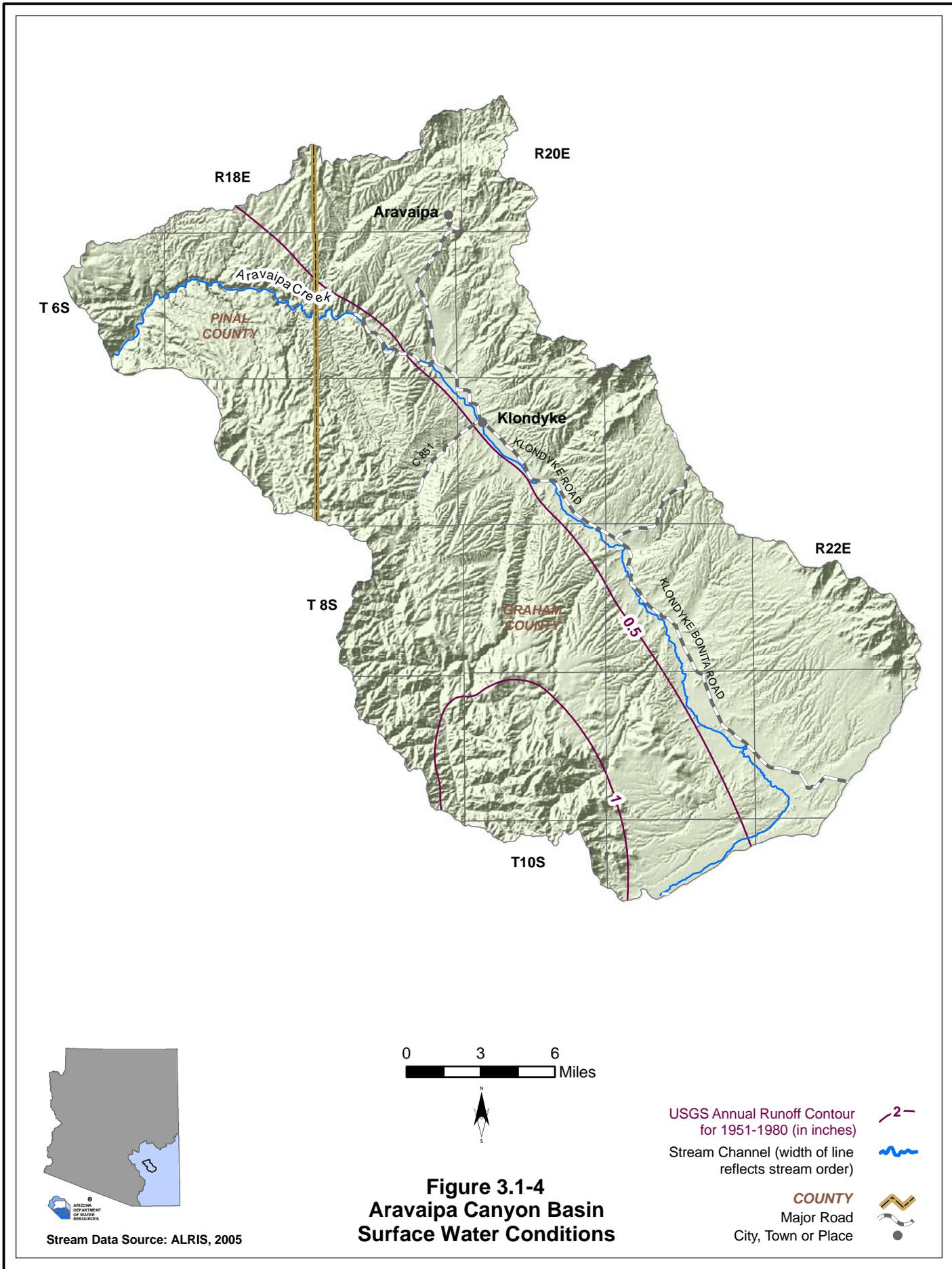
Total number: 2
 Total surface area: 38 acres

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

Total number: 349 (from water right filings)

Notes:

¹Capacity data not available to ADWR



3.1.5 Perennial/Intermittent Streams and Major Springs in the Aravaipa Canyon 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 3.1-5. The locations of major springs as well as perennial and intermittent streams are shown on Figure 3.1-5. A description of data sources and methods for intermittent and perennial reaches is found in Volume 1, 1.3.16. A description of spring data sources and methods is found in Volume 1, Section 1.3.14.

- There are four perennial streams including, Aravaipa Canyon, Parsons Creek, Turkey Creek and Virgus Canyon. All perennial streams are located in the northeastern portion of the basin.
- A number of intermittent streams are located in the Galiuro Mountains along the southern boundary and on the eastern boundary.
- There are six major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time.
- Listed discharge rates may not be indicative of current conditions. Some of the measurements were taken prior to 1990. For example, the most recent measurements for two major springs, Jackson and Saltuna, were less than 10 gpm. Three major and 10 minor spring measurements post-date 1990.
- All but one major spring is located in the vicinity of Aravaipa Canyon. The greatest discharge rate was measured at Hanging Spring, 100 gpm.
- All but one of the major springs discharges 30 gpm or less.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 3.1-5. There are 15 minor springs identified in this basin.
- The total number of springs identified by the USGS varies from 87 to 116, depending on the database reference.

Table 3.1-5 Springs in the Aravaipa Canyon Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
1	Hanging	325507	1102620	100	04/1987
2	Goat	325250	1102743	30	11/2002
3	Jackson	325121	1102618	30 ³	11/1999
4	Saltuna ²	325439	1102715	15 ³	04/1987
5	Warm	325901	1102224	15	11/1/2002
6	McRae	325230	1102704	10	11/1/1999

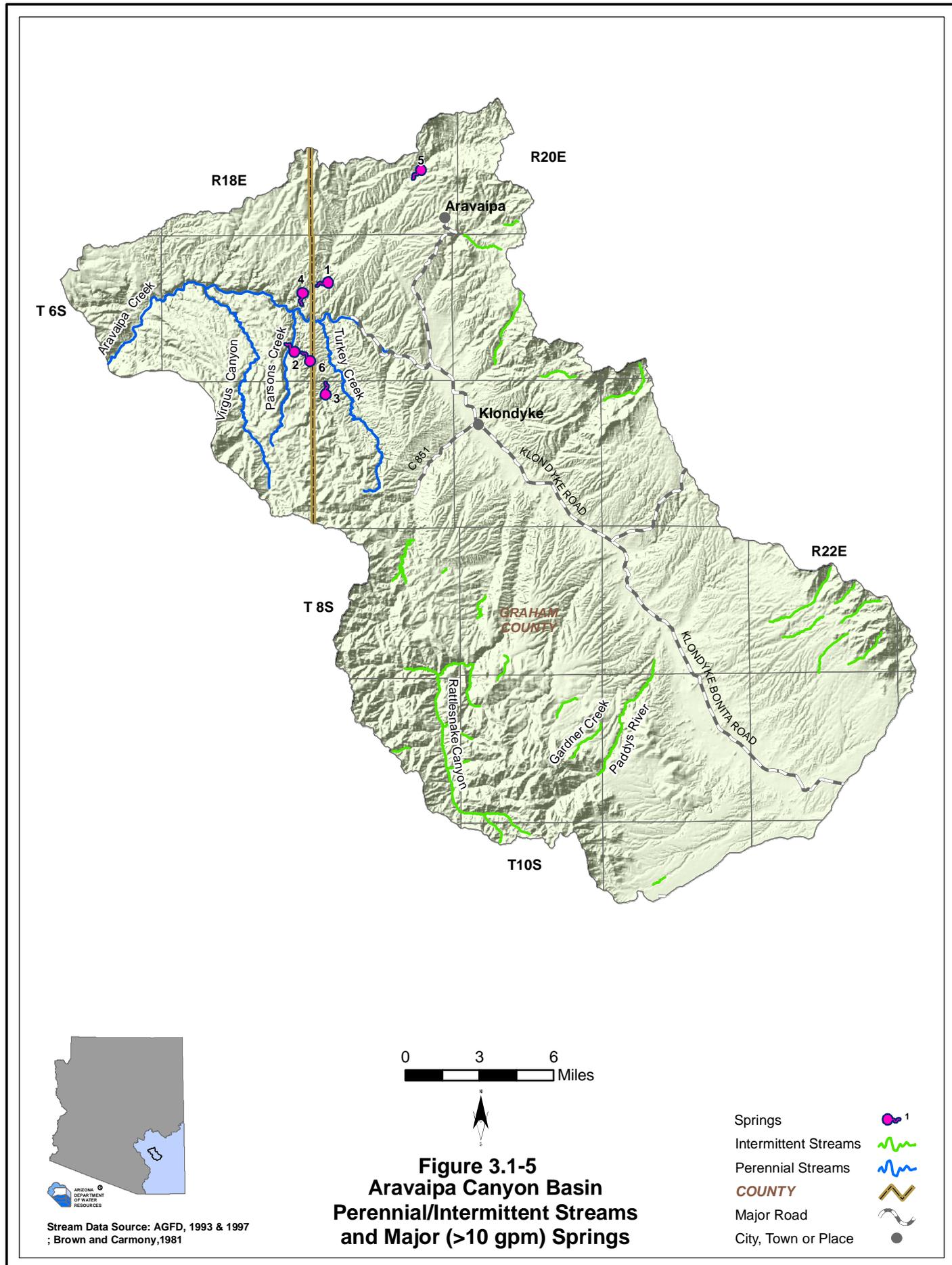
B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Brandi ^{2,4}	325052	1102624	6	02/2004
Natural Boundary ^{2,4}	325512	1102648	6	04/1987
East Booger ^{2,4}	325524	1102918	5	07/1986
Red Basalt ^{2,4}	324859	1102734	4	06/1986
Janette ^{2,4}	325540	1102627	4	04/1991
#2 ^{2,4}	325833	1102511	3	11/2002
Wait a Minute Bush ^{2,4}	324839	1102714	3	03/2000
Oak Grove ^{2,4}	325053	1102624	3	02/2004
Willow ^{2,4}	325940	1102047	2	04/1996
Walnut ^{2,4}	324736	1102730	2	11/1951
Cammie ^{2,4}	330009	1102100	2	04/1996
Upper Boulder ^{2,4}	325856	1102524	1 ⁵	12/1979
Jed ^{2,4}	324805	1102657	1	04/2001
Parsons Grove ^{2,4}	324926	1102832	1	01/2001
Turkey Creek ^{2,4}	325253	1102610	1	06/2001

C. Total number of springs, regardless of discharge, identified by USGS (see ALRIS, 2005 and NHD, 2006): 87 to 116

Notes:

- ¹Most recent measurement identified by ADWR
- ²Spring not displayed on current USGS topo map
- ³Most recent measurement < 10 gpm
- ⁴Location approximated by ADWR
- ⁵Most recent measurement < 1 gpm



3.1.6 Groundwater Conditions of the Aravaipa Canyon 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 3.1-6. Figure 3.1-6 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 3.1-7 contains hydrographs for selected wells shown on Figure 3.1-6. Figure 3.1-8 shows well yields in four yield categories. A description of aquifer data sources and methods is found in Volume 1, Section 1.3.2. A description of well data sources and methods, including water-level changes and well yields is found in Volume 1, Section 1.3.19.

Major Aquifers

- Refer to Table 3.1-6 and Figure 3.1-6.
- Major aquifers in the basin include recent stream alluvium and basin fill.
- The recent stream alluvium is the primary source of water in the basin.
- Flow direction is generally from southeast to northwest.

Well Yields

- Refer to Table 3.1-6 and Figure 3.1-8.
- As shown on Figure 3.1-8 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 36 reported wells, indicates that the median well yield in this basin is 350 gpm.
- The highest reported well yields in the basin are located in unconsolidated sediments in the vicinity of the Klondyke and Klondyke-Bonita Roads.

Natural Recharge

- Refer to Table 3.1-6.
- Principal sources of recharge are mountain-front recharge, streambed infiltration of runoff and direct infiltration of rainfall.
- Natural recharge estimates range from 7,000 acre-feet per year to 16,700 acre-feet per year. The most recent estimate is from a 1994 ADWR study.

Water in Storage

- Refer to Table 3.1-6.
- Storage estimates for this basin range from five million to 5.1 million acre-feet to a depth of 1,200 feet.
- The predevelopment storage estimate is five million acre-feet.

Water Level

- Refer to Figure 3.1-6. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures three index wells in this basin.
- In 1996, the year of the last water level sweep, 60 wells were measured.

- There are two wells with water depth reported in 2003-2004. The wells are along the Klondyke and Klondyke-Bonita Roads and measure 39 feet and 64 feet to water.
- Hydrographs corresponding to selected wells shown on Figure 3.1-6 but covering a longer time period are shown in Figure 3.1-7.

Table 3.1-6 Groundwater Data for the Aravaipa Canyon Basin

Basin Area, in square miles:	517	
Major Aquifer(s):	Name and/or Geologic Units	
	Recent Stream Alluvium	
	Basin Fill	
Well Yields, in gal/min:	NA	Measured by ADWR and/or USGS
	Range 2-1,500 Median 350 (36 wells reported)	Reported on registration forms for large (> 10-inch) diameter wells
	1500	ADWR (1994)
	Range 0 - 2,500	Anning and Duet, USGS (1994)
Estimated Natural Recharge, in acre-feet/year:	7,000 - 16,700	ADWR (1994)
	7,000	Freethy and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	5,000,000 - 5,100,000 (to 1,200 ft)	ADWR (1990 and 1994)
	5,000,000 ¹ (to 1,200 ft)	Freethy and Anderson (1986)
	NA	Arizona Water Commission (1975)
Current Number of Index Wells:	3	
Date of Last Water-level Sweep:	1996 (60 wells measured)	

Notes:

NA = Not Available

¹Predevelopment Estimate

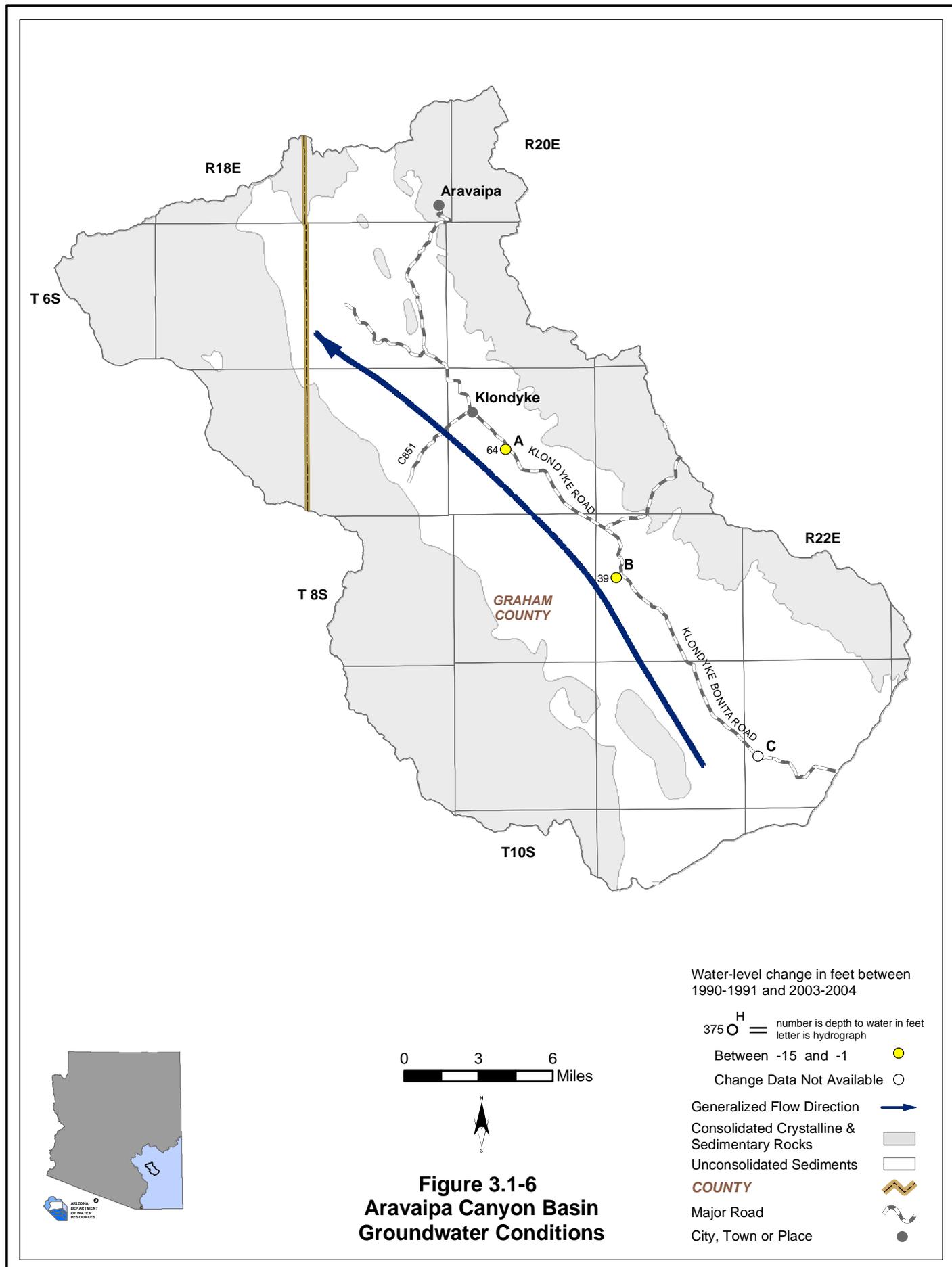
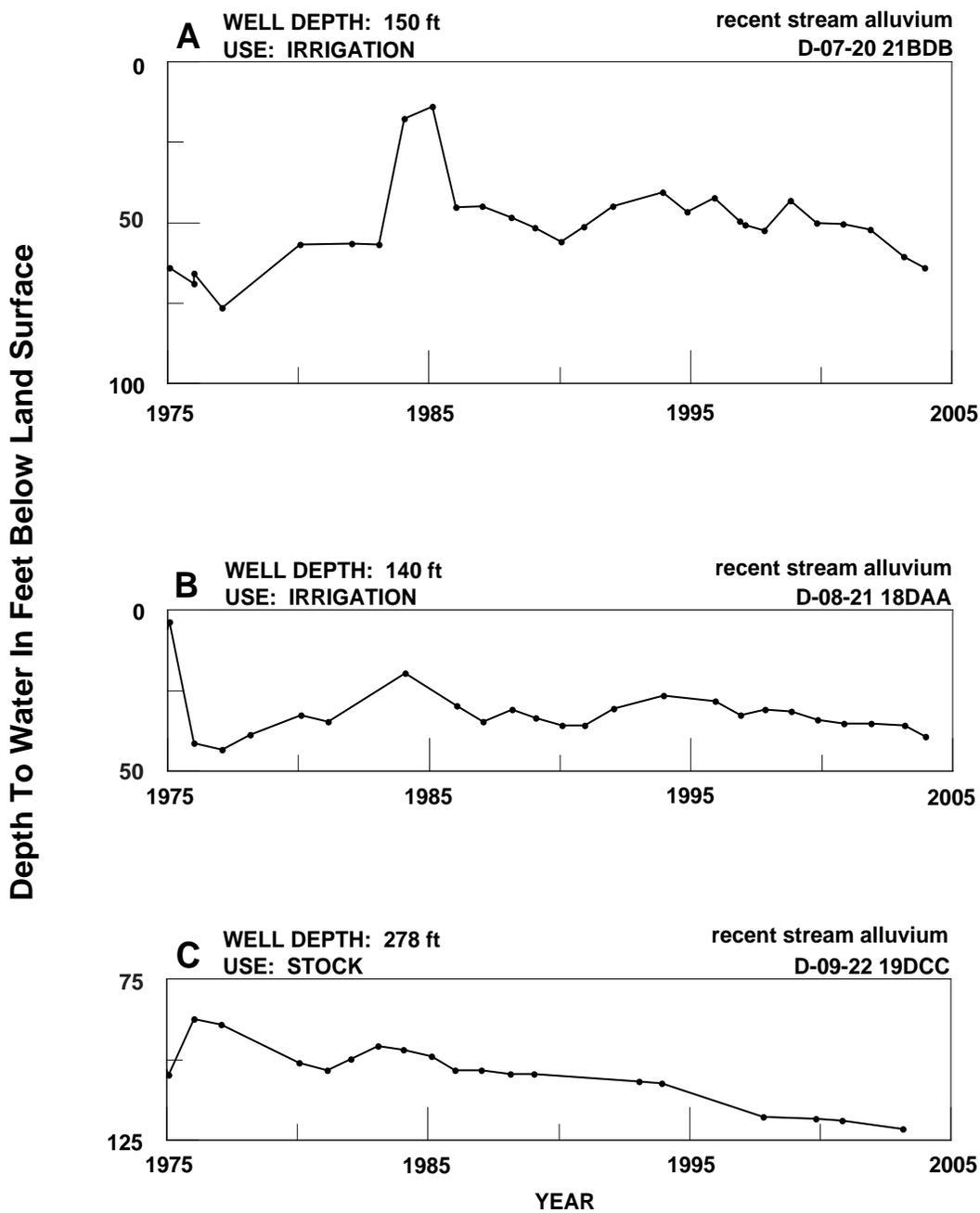
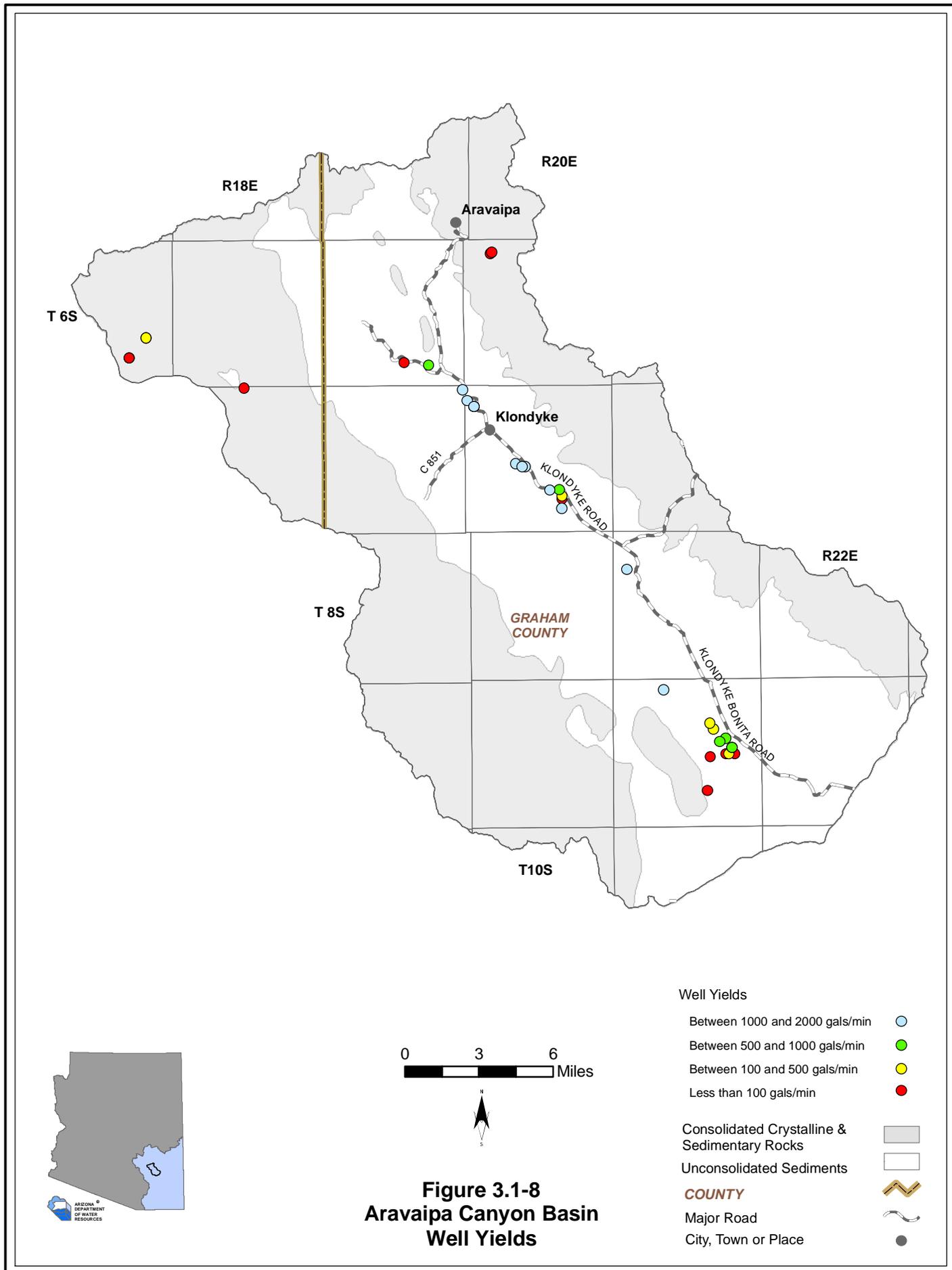


Figure 3.1-7
Aravaipa Canyon Basin
Hydrographs Showing Depth to Water in Selected Wells





3.1.7 Water Quality of the Aravaipa Canyon Basin

Drinking water standard exceedences in wells, springs and mine sites including location and parameter(s) exceeded are shown in Table 3.1-7. There are no data on impaired lakes and streams in this basin. Figure 3.1-9 shows the location of exceedences keyed to Table 3.1-7A. A description of water quality data sources and methods is found in Volume 1, Section 1.3.18. Not all parameters were measured at all sites; selective sampling for particular constituents is common.

Wells, Springs and Mines

- Refer to Table 3.1-7A.
- Drinking water standard exceedences have been reported for eight wells in the basin.
- The parameter most frequently exceeded in the sites measured in this basin was arsenic. Other parameters exceeded included nitrates, beryllium, cadmium, copper, lead and fluoride.
- All areas where the parameter for arsenic was exceeded are along the Klondyke and Klondyke-Bonita Roads.

Table 3.1-7 Water Quality Exceedences in the Aravaipa Canyon Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Section	Parameter(s) Exceeding Drinking Water Standard ²
		Township	Range			
1	Well	6 South	17 East		26	NO3
2	Well	6 South	17 East		26	NO3
3	Well	7 South	20 East		6	As, Be, Cd, Cu, Pb
4	Well	7 South	20 East		6	As, Be, Cd, Pb
5	Well	9 South	20 East		33	F
6	Well	9 South	21 East		10	As
7	Well	9 South	22 East		21	As
8	Well	9 South	22 East		21	As

B. Lakes and Streams

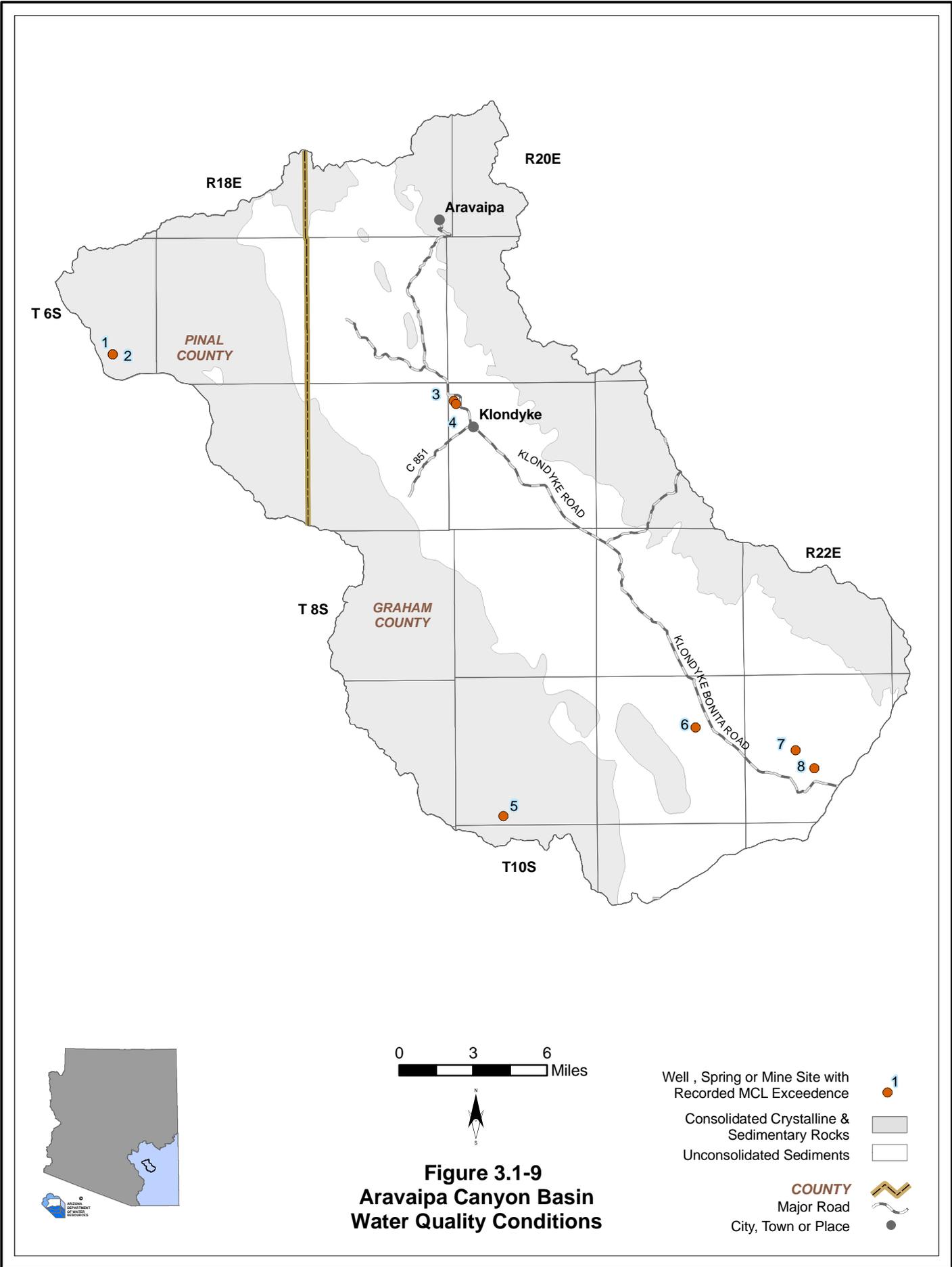
Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard ³	Parameter(s) Exceeding Use Standard ²
			None identified at this time			

Notes:

Because of map scale feature locations may appear different than the location indicated on the table

¹ Water quality samples collected between 1989 and 2004.

² As = Arsenic
Be = Beryllium
Cd = Cadmium
Cu = Copper
F = Fluoride
NO3 = Nitrates
Pb = Lead



3.1.8 Cultural Water Demands in the Aravaipa Canyon 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 3.1-8. There is no recorded effluent generation in this basin. Figure 3.1-10 shows the location of demand centers. A description of cultural water demand data sources and methods is found in Volume 1, Section 1.3.5. More detailed information on cultural water demands is found in Section 3.0.7.

Cultural Water Demands

- Refer to Table 3.1-8 and Figure 3.1-10.
- Population remained virtually unchanged from 1980 to 2000. Projections suggest a slight increase in growth rate through 2050.
- Overall groundwater pumping is decreasing with an average of less than 1,300 acre-feet pumped per year in the period from 2001 – 2003.
- Information on surface water diversions is only available for the period of 1991 – 2003. During this period all surface water diversions have been for agriculture and were less than 1,000 acre-feet per year.
- Municipal and industrial demand is minimal in this basin, less than 300 acre-feet per year.
- Total agricultural demand in the basin is less than 2,000 acre-feet per year.
- The only agricultural lands shown on the map are located along the Klondyke Bonita Road in T9S, R21E. Agricultural lands also historically existed in small pastures scattered along Aravaipa Creek.
- As of 2003 there were about 205 registered wells with a pumping capacity of less than or equal to 35 gallons per minute and 32 wells with a pumping capacity of more than 35 gallons per minute.

Table 3.1-8 Cultural Water Demands in the Aravaipa Canyon Basin¹

Year	Recent (Census) and Projected (DES) Population	Number of Registered Water Supply Wells Drilled		Annual Demand (in acre-feet)						Data Source
				Well Pumpage			Surface-Water Diversions			
				Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Irrigation	Municipal	
1971										
1972										
1973						3,000			NR	
1974										
1975		171 ²	29 ²							
1976										
1977						3,000			NR	
1978										
1979										
1980	74									ADWR (1994)
1981	79									
1982	85									
1983	90	1	1			2,000			NR	
1984	96									
1985	101									
1986	107									
1987	112									
1988	118	5	1			2,000			NR	
1989	123									
1990	129									
1991	129									USGS (2005) ADWR (2005)
1992	130									
1993	131	5	0	<300	NR	<1,000	NR	NR	<1,000	
1994	131									
1995	132									
1996	133									
1997	133									
1998	134	15	1	<300	NR	<1,000	NR	NR	<1,000	
1999	134									
2000	135									
2001	141									
2002	146	5	0	<300	NR	<1,000	NR	NR	<1,000	
2003	152									
2010	191									
2020	214									
2030	240									
2040	269									
2050	302									

ADDITIONAL WELLS:³ 3
TOTALS: 205 32

Notes:

NR - Not reported

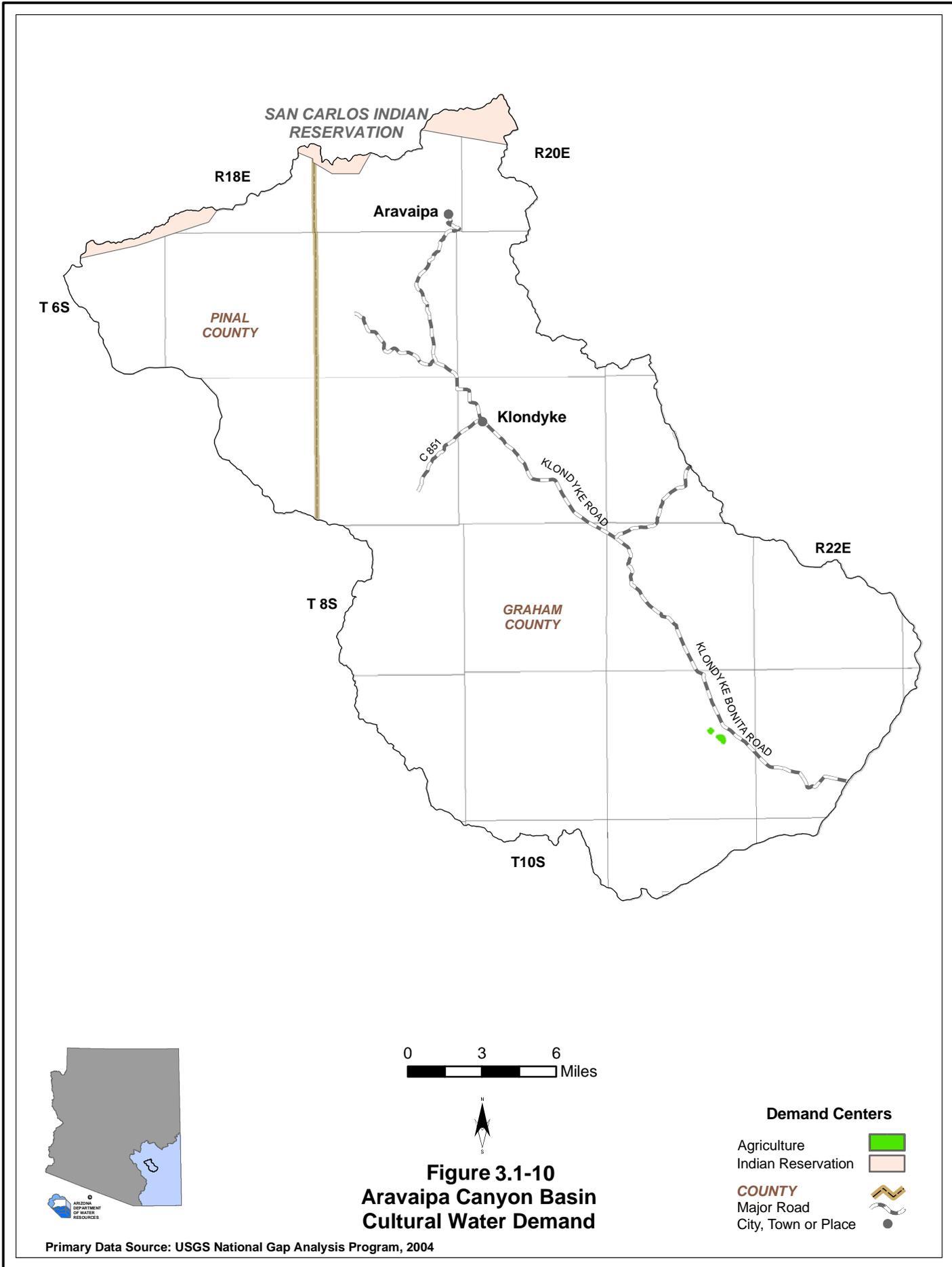
¹ Does not include evaporation losses from stockponds and reservoirs.

² Includes all wells through 1980.

³ Other water-supply wells are listed in the ADWR Well Registry for this basin, but they do not have completion dates. These wells are summed here.

Table 3.1-9 Effluent Generation in the Aravaipa Canyon 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 Irrigation	Wildlife Area			
No Wastewater Treatment Facilities Identified by ADWR in this Basin												



3.1.9 Water Adequacy Determinations in the Aravaipa Canyon Basin

There are no water adequacy applications on file with the Department as of May, 2005 for the Aravaipa Canyon Basin. A description of the Water Adequacy Program is found in Volume 1, Appendix A. Adequacy determination data sources and methods are found in Volume 1, Section 1.3.1.

Table 3.1-10 Adequacy Determinations in the Aravaipa Canyon Basin

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No.	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section						
No subdivisions on file with ADWR at this time											



ARAVAIPA CANYON

References and Supplemental Reading

References

A

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