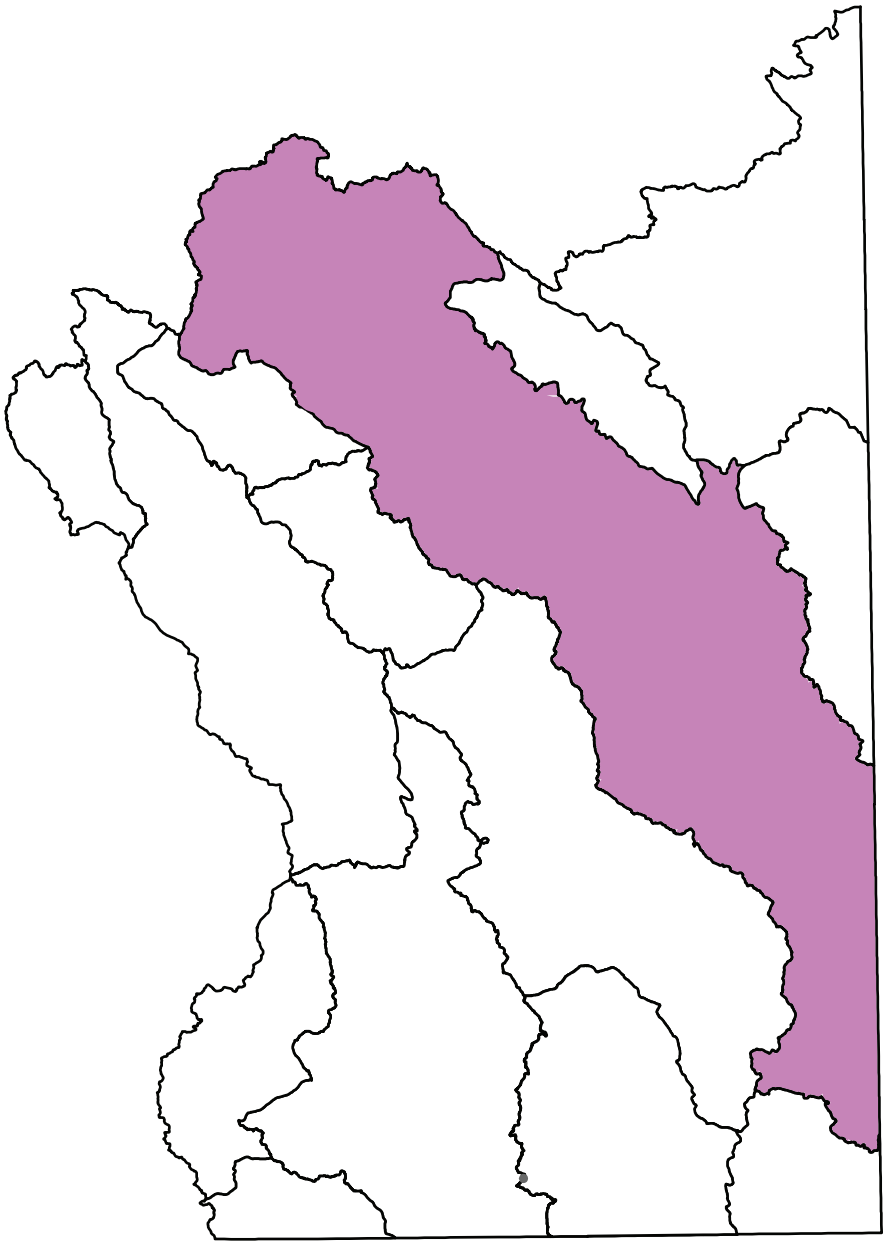
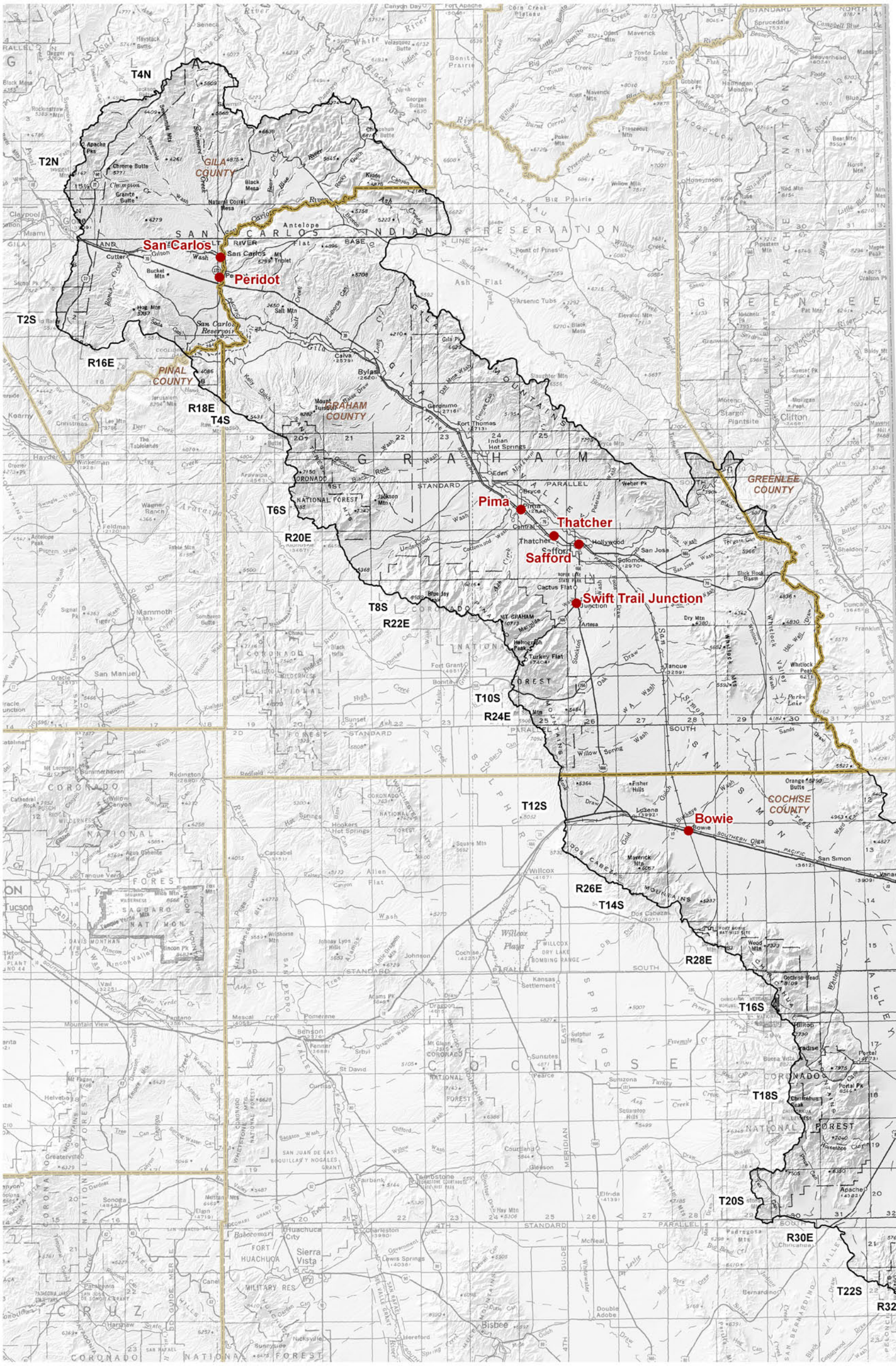
Section 3.10
Safford Basin



3.10.1 Geography of the Safford Basin

The Safford Basin is the largest basin in the planning area at 4,747 square miles. Geographic features and principal communities are shown on Figure 3.10-1. The basin is characterized by valleys, high-elevation mountain ranges and a variety of vegetation types including: Arizona uplands Sonoran and Chihuahuan desertscrub, semi-desert grassland, Rocky Mountain and montane conifer forest, Great Basin conifer woodland, madrean evergreen woodland and a small portion of Rocky Mountain subalpine forest atop Mt. Graham. (see Figure 3.0-10) Riparian vegetation includes: mesquite and tamarisk on the Gila River; conifer oak, mixed broadleaf and mesquite on Ash Creek; conifer oak and mesquite on Frye Canyon; and conifer oak and mixed broadleaf on Deadman Canyon and Cave Creek and its tributaries.

- Principal geographic features shown on Figure 3.10-1 are:
    - Gila River running northwest from Greenlee County through San Carlos
    - San Simon Creek flowing through the San Simon Valley south of Safford
    - Gila Mountains northeast of Pima
    - Dos Cabezas Mountains on the southeastern basin boundary
    - Chiricahua Mountains along the southeastern and southern basin boundary
    - Pinaleño Mountains west of Swift Trail Junction, which include the highest point in the basin and planning area, Mount Graham at 10,712 feet
    - The lowest point at approximately 2,500 feet where the Gila River exits the basin.



0 3 6 Miles

Base Map: USGS 1:500,000, 1981

ARIZONA DEPARTMENT OF WATER RESOURCES ©

Figure 3.10-1
Safford Basin
Geographic Features

New Mexico State Boundary
COUNTY
City, Town or Place

3.10.2 Land Ownership in the Safford Basin

Land ownership, including the percentage of ownership in each category, for the Safford Basin is shown in Figure 3.10-2. A principal feature of land ownership is the diversity of land ownership types, eight total. A description of land ownership data sources and methods is found in Volume 1, Appendix A. More detailed information on National Parks, Monuments, Riparian, Conservation, Wildlife and Wilderness Areas is found in Section 3.0.3. Land ownership categories are discussed below in the order of percentage from largest to smallest in the basin.

Indian Reservations

- 29.5% of land is under ownership of the San Carlos Apache Tribe.
- Tribal lands are located in the northern quarter of the basin.
- The basin contains the San Carlos Apache tribal headquarters in San Carlos and the San Carlos Apache cultural center in Peridot.
- Primary land uses are domestic, commercial, farming, grazing and mining.

U.S. Bureau of Land Management (BLM)

- 29.0% of land is federally owned and managed by the Safford Field Office of the U.S. Bureau of Land Management.
- Most of the BLM land occurs in a wide band along the eastern portion of the basin.
- The basin contains the entire Dos Cabezas Mountain Wilderness, North Santa Teresa, and Fishooks Wilderness areas.
- Portions of the Peloncillo Wilderness Area and Gila Box National Conservation Area in T12S, R32E and T6S, R28E, respectively, are also in the basin. (see Figure 3.0-13)
- Primary land uses are grazing and recreation.

State Trust Land

- 16.3% of land in this basin is held in trust for public schools and 13 other beneficiaries under the State Trust Lands system.
- Many of the state owned lands in this basin are fragmented, however, significant contiguous portions exist east of Swift Trail Junction, in a band surrounding the Coronado National Forest west of Safford, and north and south of Interstate 10.
- Primary land use is grazing.

National Forest

- 12.6% of land is federally owned and managed by the United States Forest Service (USFS).
- The basin includes two national forests and three ranger districts: the Tonto National Forest, Globe Ranger District in the north; and the Coronado National Forest, Safford Ranger District east of Safford, and the Douglas Ranger District in the south.
- Two wilderness areas are located within the basin. Most of the Santa Teresa Wilderness is located in the northern portion of the Safford Ranger District and a portion of the Chiricahua Wilderness is located in the Douglas Ranger District. (see Figure 3.0-13)
- Primary land uses are grazing, recreation and timber production.

Private

- 12.0% of land is private.
- Small parcels of private land are scattered throughout the basin.
- The largest continuous blocks of private land are along Highway 70 in the vicinity of Safford, along Interstate 10 and around Highway 80 in the southern portion of the basin.
- Primary land uses are farming, domestic, commercial and mining.

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

- 0.3% of land is state owned and managed by the Arizona Game and Fish Department.
- The basin contains two wildlife areas, the May Memorial Wildlife Area in T17S, R31E and the Cluff Ranch Wildlife Area T7S, R24E.
- Primary land uses are wildlife protection and recreation.

U.S. Military

- 0.2% of the land is federally owned and managed by the U.S. Military.
- A U.S. Military Reserve is located near Swift Trail Junction in T7S, R25E.
- Primary land use is military activities.

National Park Service (NPS)

- 0.1% of the land is federally owned and managed by the National Park Service (NPS).
- The basin contains two NPS units, the Fort Bowie National Historic Site in T15S, R28E and a very small portion of the Chiricahua National Monument in T16S, R30E.
- Primary land use is recreation.

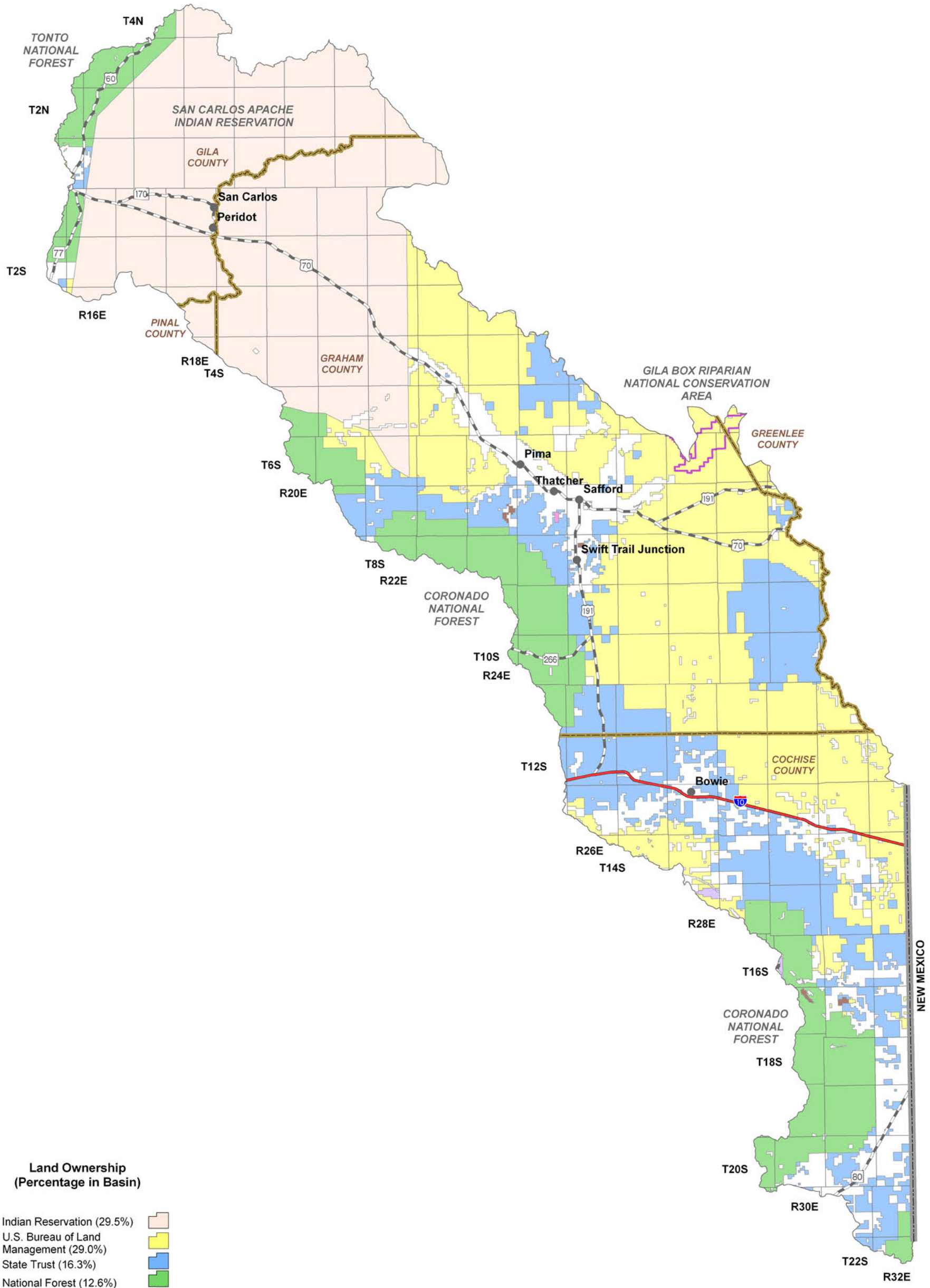


Figure 3.10-2
Safford Basin
Land Ownership

Source: ALRIS , 2004
Bureau of Land Management, 1999

3.10.3 Climate of the Safford Basin

Climate data from NOAA/NWS Coop Network, Evaporation Pan and AZMET stations are complied in Table 3.10-1 and the locations are shown on Figure 3.10-3. Figure 3.10-3 also shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. The Safford Basin does not contain SNOTEL/Snowcourse stations. More detailed information on climate is found in Section 3.0.4. A description of the climate data sources and methods is found in Volume 1, Appendix A.

NOAA/NWS Coop Network

- Refer to Table 3.10-1A.
- There are nine NOAA/NWS Coop Network climate stations in the basin. The average monthly maximum temperature occurs in July at all stations and ranges between 70.4°F at Portal 4 SW to 84.4°F at San Carlos. The average monthly minimum temperature occurs in December or January and ranges between 37.8°F at Paradise to 46.0°F at Bowie.
- Highest average seasonal rainfall occurs in the summer (July – September). For the period of record used, the highest annual rainfall is 21.56 inches at Portal 4 SW and the lowest is 9.34 inches at San Carlos.

Evaporation Pan

- Refer to Table 3.10-1B.
- There is one site at the Safford Agricultural Center.
- This site, at 2,950 feet, has an annual pan evaporation rate of 98.05 inches.

AZMET

- Refer to Table 3.10-1C.
- There are two AZMET stations in the basin at Safford and Bowie.
- Average annual evaporation at the Bowie site, located at 4,416 feet, is 60.64 inches.
- Average annual evaporation at the Safford site, located at 2,956 feet, is 76.50 inches.

SCAS Precipitation Data

- Additional precipitation data shows rainfall as high as 44 inches near Chiricahua Peak, elevation 9,760 feet, and as low as 8 inches in the areas surrounding San Simon and Safford.
- This basin contains the second largest range of average annual rainfall in the planning area with 36 inches separating areas of lowest and highest precipitation.

Table 3.10-1 Climate Data for the Safford 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
Bowie	3,770	1971-2000	82.6/Jul	46.0/Dec	2.52	1.17	5.28	3.37	12.34
Paradise	5,430	1906-1937	72.6/Jul	37.8/Dec	3.59	1.58	9.88	3.97	19.04
Portal	5,000	1914-1955	75.1/Jul	41.2/Jan	3.08	1.57	9.08	3.64	17.38
Portal 4 SW	5,390	1971-2000	70.4/Jul	38.2/Jan	3.64	2.14	10.43	5.35	21.56
Safford	2,900	1898-1973[1]	84.2/Jul	45.0/Jan	1.34	0.65	4.75	3.23	9.95
Safford Ag. Ctr.	2,950	1971-2000	83.2/Jul	44.4/Dec	2.13	0.80	4.29	2.57	9.79
San Carlos	2,640	1948-1977[1]	84.4/Jul	44.2/Jan	1.98	0.79	3.63	2.95	9.34
San Simon	3,610	1971-2000	80.5/Jul	42.7/Jan	1.94	0.65	4.98	3.09	10.66
San Simon 9 ESE	3,880	1962-1986[1]	81.9/Jul	44.4/Jan	1.96	0.81	5.59	2.50	10.85

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)
Safford Agricultural Center	2,950	1948 - 2002	98.05

Source: WRCC, 2005

C. AZMET:

Station Name	Elevation (in feet)	Period of Record	Average Annual Reference Evaportranspiration, in inches (*Number of years to calculate averages*)
Bowie	4,416	2004 - current	60.64 *(4)*
Safford	2,956	1999 - current	76.50 *(9)*

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
None								

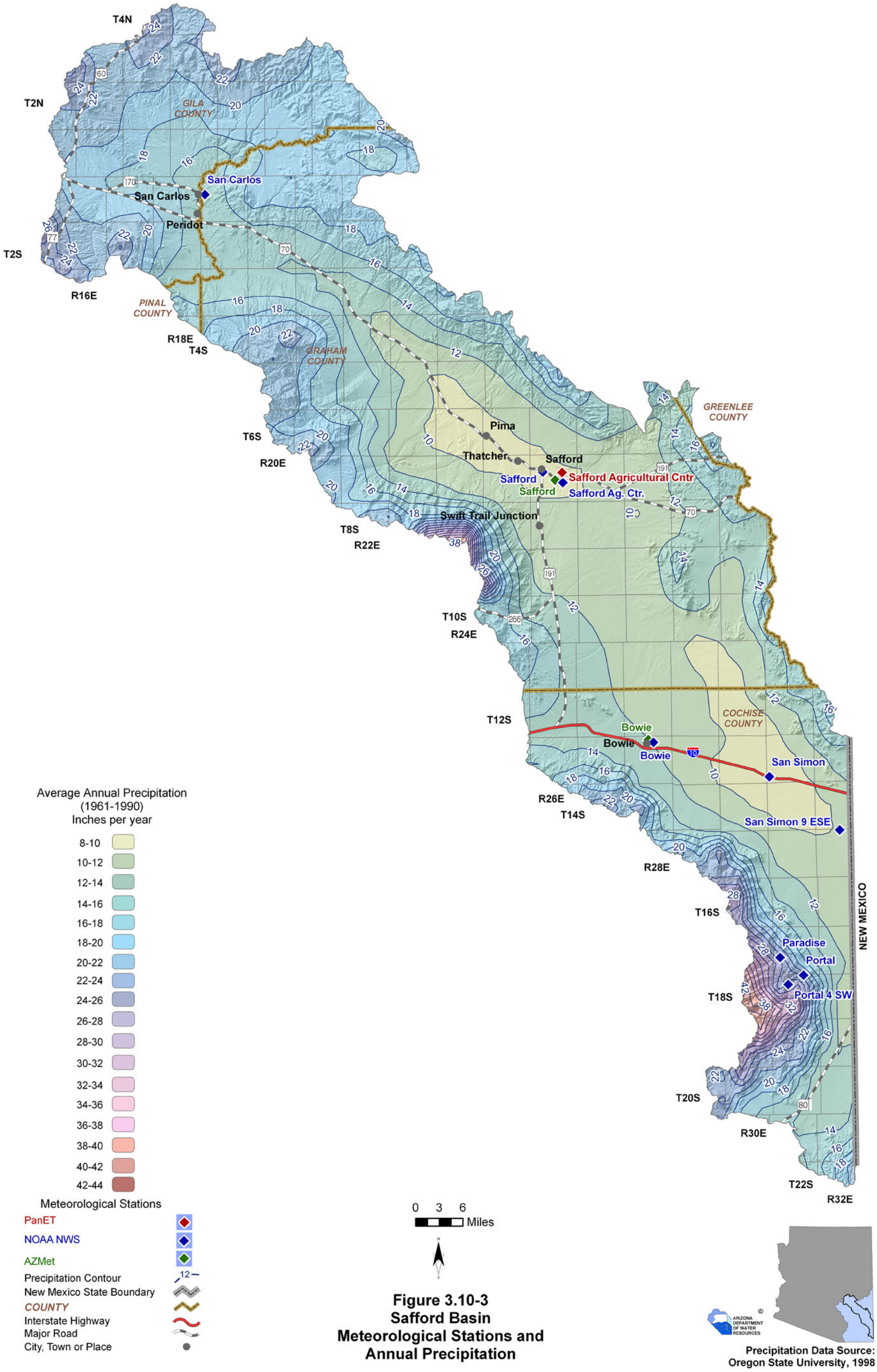


Figure 3.10-3
Safford Basin
Meteorological Stations and Annual Precipitation

Precipitation Data Source:
Oregon State University, 1998

3.10.4 Surface Water Conditions in the Safford Basin

Streamflow data, including average seasonal flow, average annual flow and other information is shown in Table 3.10-2. Flood ALERT equipment in the basin is shown on Table 3.10-3. Reservoir and stockpond data, including maximum storage or maximum surface area of large reservoirs and type of use of the stored water, are shown in Table 3.10-4. The location of streamflow gages identified by USGS number, flood ALERT equipment, USGS runoff contours and large reservoirs are shown on Figure 3.10-5. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Streamflow Data

- Refer to Table 3.10-2.
- Data from 18 stations on eight water courses are shown on the table and on Figure 3.10-4. Fourteen stations have been discontinued and the remaining four are real-time stations.
- The average seasonal flow for many of the stations is highest in the Winter (January-March) and lowest in the Spring (April-June).
- Maximum annual flow in this basin was 1,732,915 acre-feet in 1993 on the Gila River at Calva, see Figure 3.10-4, and minimum annual flow was 56 acre-feet in 1969 on Frye Creek.

Flood ALERT Equipment

- Refer to Table 3.10-3.
- There are eight stations in the basin as of October 2005.

Reservoirs and Stockponds

- Refer to Table 3.10-4
- Surface water is stored or could be stored in 12 large and 57 small reservoirs in this basin.
- The largest reservoir, San Carlos Lake, has a maximum storage capacity of 1,073,000 acre-feet. San Carlos Lake is created by Coolidge Dam, built in 1929. This is the largest reservoir in the planning area and the only large storage dam on the Gila River. Its uses are for hydroelectric generation, irrigation and recreation.
- Other uses include irrigation, water supply, flood control and recreation.
- There are an estimated 1,429 stockponds in this basin.

Runoff Contour

- Refer to Figure 3.10-5
- Average annual runoff increases from 0.2 inches, or 10.6 acre-feet per square mile, in the vicinity of Safford and Thatcher along the Gila River and in the southeastern part of the basin, to five inches, or 266.6 acre-feet per square mile, in the Chiricahua Mountains along the southwestern boundary.

Figure 3.10-4 Annual Flows (in acre-feet) at Gila River River at Calva (Station # 9466500) Water Years 1930-2007

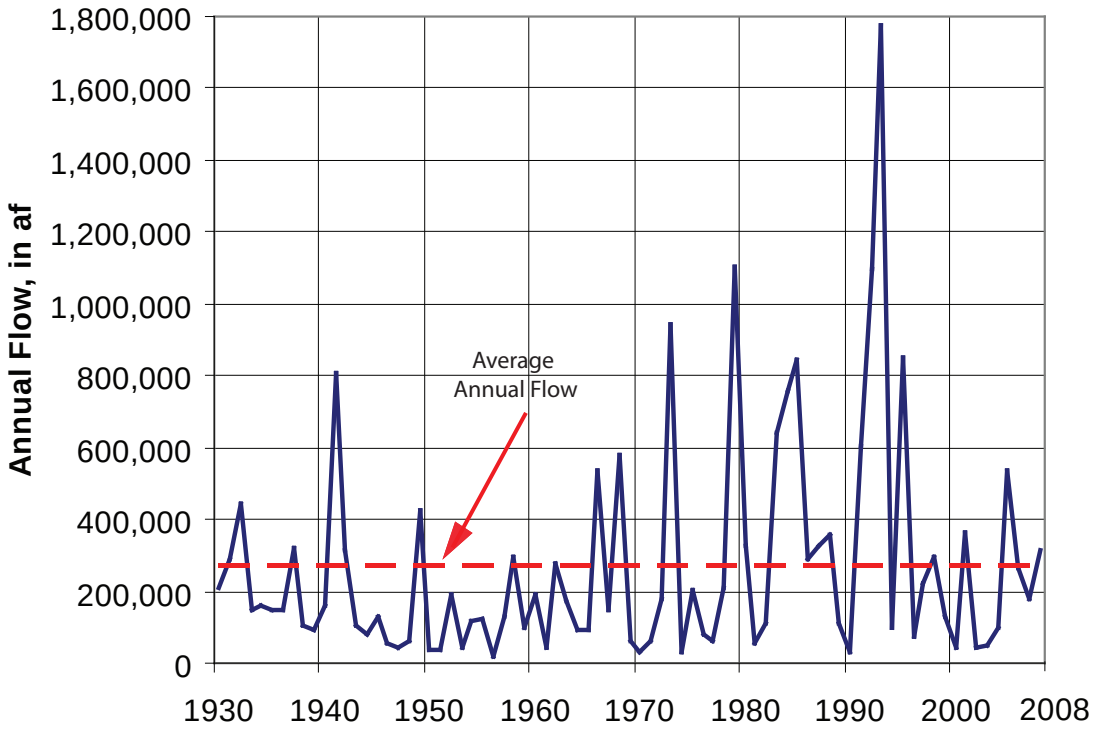


Table 3.10-2 Streamflow Data for the Safford Basin

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	
9448500	Gila River at head of Safford Valley near Solomon	7,896	3,060	10/1920-current (real time)	41	18	20	22	48,953 (1956)	273,008	337,069	1,559,116 (1993)	77
9451000	Gila River near Solomon	7,950	NA	4/1914-9/1951 (discontinued)	40	18	23	18	18,461 (1956)	162,170	198,406	58,780 (1941)	34
9454500	Cave Creek near Paradise	39	4,950	8/1919-9/1925 (discontinued)	17	11	32	40	1,028 (1922)	4,720	4,842	9,122 (1923)	5
9455000	Cave Creek near Paradise	39	NA	10/1919-9/1925 (discontinued)	17	35	26	23	586 (1922)	767	898	1,361 (1923)	5
9455500	East Turkey Creek at Paradise	8	NA	8/1919-9/1925 (discontinued)	22	13	42	23	80 (1922)	1,071	835	1,433 (1921)	5
9456000	San Simon River near San Simon	814	NA	8/1919-6/1941 (discontinued)	1	6	86	8	335 (1937)	2,621	3,943	14,842 (1921)	13
9456200	San Simon River below Fandrop Detention Dam near Bowie	1,400	NA	11/1955-6/1959 (discontinued)	1	2	96	1	710 (1956)	13,104	9,214	13,828 (1957)	3
9456800	San Simon River near Tanque	1,953	NA	7/1957-6/1959 (discontinued)	No ststistics run, less than 3 years of data								2
9457000	San Simon River near Solomon	2,192	2,960	6/1931-9/1982 (discontinued)	1	2	90	7	1,275 (1980)	5,648	8,411	27,953 (1954)	46
9458050	Marijilda Wash near Safford	11	NA	5/1971-9/1978 (discontinued)	35	40	10	16	586 (1977)	1,951	2,687	6,610 (1973)	6
9458200	Deadman Creek near Safford	5	NA	11/1966-4/1995 (discontinued)	36	40	9	15	232 (1989)	800	1,124	2,730 (1991)	14
9458500	Gila River at Safford	10,459	2,880	6/1940-9/1965 (discontinued)	45	14	24	17	69,719 (1946)	133,574	206,504	847,778 (1941)	14
9460150	Frye Creek near Thatcher	4	5,850	10/1989-current (real time)	26	44	14	16	59 (2002)	927	1,031	1,890 (1991)	8
9460200	Frye Creek at Thatcher	24	NA	2/1963-2/1973 (discontinued)	2	3	81	14	56 (1969)	159	286	1,231 (1967)	10
9466300	Gila River near Bylas	11,380	NA	10/1965-9/1970 (discontinued)	53	13	14	20	54,733 (1969)	284,161	288,433	53,068 (1968)	4
9466500	Gila River at Calva	11,470	2,517	10/1929-current (real time)	48	15	14	23	7,386 (1956)	165,833	271,929	1,732,915 (1993)	73
9467100	Gila River near Calva	11,550	NA	10/1964-9/1970 (discontinued)	33	5	43	19	28,163 (1970)	86,877	98,244	179,691 (1967)	3
9468500	San Carlos River near Peridot	1,026	2,542	4/1914-current (real time)	61	5	13	21	4,070 (2002)	28,677	43,480	296,181 (1993)	73

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 retreived in 2005
NA=Not available

Table 3.10-3 Flood ALERT Equipment in the Safford Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
591	Heliograph Peak Repeater	Repeater/Precipitation	10/1/2001	ADWR
620	Portal Fire/Rescue Station	Precipitation	10/1/2001	ADWR
630	Jacobson Canyon	Precipitation	10/1/2001	ADWR
631	Emerald Park	Precipitation	7/29/2004	ADWR
632	Pinaleno Park	Precipitation	7/29/2004	ADWR
640	Marijilda Canyon	Precipitation/Stage	7/25/2004	ADWR
647	Noon Creek	Precipitation/Stage	7/30/2004	ADWR
900	Upstream Coolidge Dam, Gila River	Precipitation/Stage	NA	Gila County FCD

Source: ADWR 2005c

Notes:
ADWR = Arizona Department of Water Resources
FCD = Flood Control District
NA = Not available

Table 3.10-4 Reservoirs and Stockponds in the Safford 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	San Carlos (Coolidge Dam)	Bureau of Reclamation	1,073,000	H,I,R	Federal
2	Talkalai (Elgo)	San Carlos Apache Tribe	13,000	R,S	Tribal
3	Foote Wash	Graham County	5,500	C	State
4	Graveyard Wash	City of Safford	2,360	C	State
5	Billingsley	Graham Canal Co.	2,175	C	State
6	Cheslkey-Wamslee	Graham Canal Co.	2,160	C	State
7	San Jose	Private	1,734	C	Landowner
8	Freeman Wash	Graham County	960[2]	C	State
9	Tufa Stone	San Carlos Apache Tribe	850[2]	I	Tribal
10	No Name Wash	Graham County	646	C	State

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[1]	JURISDICTION
11	Parks	Private	426	U	Landowner
12	Dry[4]	Private	75	P	Landowner

Source: Compilation of databases from ADWR & others

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

Total number: 25
Total maximum storage: 3,862 acre-feet

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

Total number: 32
Total surface area: 328 acres

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

Total number: 1429 (from water right filings)

Notes:

[1]C=flood control; H=hydroelectric; I=irrigation; P=fire protection, stock or farm pond
R=recreation; S=water supply; U=unknown

[2]Normal capacity < 500acre-feet

[3]Capacity data not available to ADWR

[4]Dry Lake

Figure 3.10-5
Safford Basin
Surface Water Conditions

3.10.5 Perennial/Intermittent Streams and Major Springs in the Safford 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 3.10-5. The locations of major springs as well as perennial and intermittent streams are shown on Figure 3.10-6. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- There are numerous perennial stream reaches located primarily along the western boundary of the basin. Including the San Carlos River and the Blue River in the northern part of the basin.
- Numerous intermittent streams are also located primarily along the western boundary of the basin.
- The Gila River is predominantly an intermittent stream through the basin, with perennial reaches near the Greenlee and Graham County boundary and in the vicinity of Highway 70 in T4S, R22E.
- There are 24 major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time. The largest discharge rate is 3,398 gpm at Warm Spring. This is the largest recorded discharge in the planning area.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 3.10-5. There are 30 minor springs identified in this basin.
- Listed discharge rates may not be indicative of current conditions. Most of the measurements were taken prior to 1990 and many measurements date from the 1940's and 1950's. Three major and two minor spring measurements post-date 1990.
- The total number of springs identified by the USGS varies from 379 to 387, depending on the database reference.

Table 3.10-5 Springs in the Safford Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
		Latitude	Longitude		
1	Warm	332623	1101244	3,398	During or prior to 1982
2	Cold #1	330024	1095409	449	5/10/1940
3	Cold #2	330024	1095409	449	5/10/1940
4	Indian Hot	325954	1095351	150	5/10/1940
5	Unnamed	330007	1095359	75	5/10/1940
6	Unnamed[2]	325432	1094910	50	9/1/1941
7	Unnamed[2]	330116	1095534	44	09/1941
8	Unnamed[2]	325631	1095350	40	NA
9	Unnamed[2]	315916	1091543	35	8/1/1946
10	Cassadore	333043	1102400	35	3/13/1951
11	Cold #3	330023	1095409	30	5/10/1940
12	Unnamed[2]	325625	1094833	30	9/15/1960
13	Unnamed[2]	325205	1094525	30	NA
14	Ash Creek	324910	1095024	20	During or prior to 1982
15	Unnamed[2]	324747	1094709	20	3/10/1940
16	Spring Canyon[2,3]	325046	1093120	15[4]	07/2000
17	Simon Springs	325515	1095332	13	04/2002
18	Upper Fishook	331341	1095817	11	04/2002
19	Unnamed[2]	325654	1095353	10	09/1941
20	Unnamed[2]	325526	1095107	10	9/12/1941
21	Unnamed[2]	325110	1095739	10	1/8/1941
22	Unnamed[2]	324625	1094510	10	7/31/1940
23	Unnamed[2]	323535	1092031	10	7/31/1940
24	Unnamed	330420	1095914	10	During or prior to 1982

Table 3.10-5 Springs in the Safford Basin (Cont)

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
	Latitude	Longitude		
Unnamed[2,3]	331349	1100225	6	05/1980
Unnamed[2]	325546	1095107	5	9/12/1941
Tom Niece	330410	1095840	5	During or prior to 1982
Big	325619	1094818	5	07/1981
Lower Sam Canyon[2,3]	331523	1100233	3	05/1981
Apache	320843	1092624	3	11/20/2002
Indian Hot	325954	1095352	3	4/20/1942
Bigler[2]	330017	1095312	2	04/1995
Unnamed[2]	330226	1095659	2	9/12/1941
Eden	325832	1095237	2	NA
Unnamed[2]	325226	1094828	2	11/15/1940
Unnamed[2]	325222	1094828	2	11/15/1940
George Hill[2,3]	325525	1092550	2	12/1981
Delia[2,3]	325258	1092902	2	09/1982
Bill[2,3]	325607	1092654	2	08/1984
Ward[2]	322138	1090633	2	04/1990
Spring Branch-Ranch Creek[2,3]	331539	1104123	2	5/8/1951
Cold at Warm Springs[2,3]	332625	1101241	2	3/2/1951
Unnamed[2]	325945	1095352	2	4/20/1942
#13[2,3]	320839	1092328	2	04/1989
Fisher[2,3]	325601	1101343	1	09/1981
Unnamed	330009	1095401	1	05/1940

Table 3.10-5 Springs in the Safford Basin (Cont)

B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm)[1]	Date Discharge Measured
	Latitude	Longitude		
Turkey	321238	1093418	1	05/1984
Unnamed[2]	325425	1095109	1	11/1940
Unnamed[2]	324711	1094605	1	7/20/1941
Upper Bear	321510	1093250	1	11/1989
Elefante	321437	1093019	1	07/1985
Indian	321337	1092954	1	07/1985
Alamo	321312	1093034	1	07/1985
Cowboy Swimming Hole	321631	1093242	1	04/1990

Source: Compilation of databases from ADWR & others

C. Total number of springs, regardless of discharge, identified by USGS (see ALRIS, 2005a and USGS, 2006a): 379 to 387

Notes:
NA = Not Available
[1]Most recent measurement identified by ADWR
[2]Spring not displayed on current USGS topo map
[3]Location approximated by ADWR
[4]Most recent measurement < 10 gpm

Stream Data Source: AGFD, 1993 & 1997
Brown and Carmony, 1981

Figure 3.10-6
Safford Basin
Perennial/Intermittent Streams and Major (>10 gpm) Springs

3.10.6 Groundwater Conditions of the Safford 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 3.10-6. Figure 3.10-7 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 3.10-8 contains hydrographs for selected wells shown on Figure 3.10-7. Figure 3.10-9 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 3.10-6 and Figure 3.10-7.
- The basin is composed of three sub-basins
- The southernmost sub-basin, the San Simon Valley sub-basin, consists of recent stream alluvium and contains artesian conditions in the lower aquifer.
- The middle sub-basin, the Gila Valley sub-basin, contains older and younger basin fill. The principal aquifer is the younger basin fill.
- The northern sub-basin, the San Carlos Valley sub-basin, consists of younger stream alluvium and basin fill. The principal water-bearing unit is the younger stream alluvium.
- Flow direction is generally from south to north, however, the flow is from north to south in the vicinity of San Carlos. Flow directions have been altered due to pumping south of Interstate 10.

Well Yields

- Refer to Table 3.10-6 and Figure 3.10-9.
- As shown on Figure 3.10-9, well yields in this basin range from less than 100 gallons per minute (gpm) to more than 2,000 gpm.
- One source of well yield information, based on 1,494 reported wells, indicates that the median well yield in this basin is 600 gpm.

Natural Recharge

- Refer to Table 3.10-6.
- The only estimate for natural recharge in this basin is 105,000 acre-feet per year.

Water in Storage

- Refer to Table 3.10-6.
- Storage estimates for this basin range from more than 27 million acre-feet to 69 million acre-feet to a depth of 1,200 feet.

Water Level

- Refer to Figure 3.10-7. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures 50 index wells in this basin. Hydrographs for thirteen wells are shown in Figure 3.10-8.
- Water levels are as deep as 517 feet in the vicinity of Interstate 10 and as shallow as 21 feet in the Safford, Pima and Thatcher area.

Table 3.10-6 Groundwater Data for the Safford Basin

Basin Area, in square miles:	4,747	
Major Aquifer(s):	**Name and/or Geologic Units**	
	Recent Stream Alluvium	
	Basin Fill	
Well Yields, in gal/min:	Range 70 - 1,683 Median 771.5 (52 wells measured)	Measured by ADWR and/or USGS
	Range 1 - 7,000 Median 600 (1,494 wells reported)	Reported on registration forms for large (> 10-inch) diameter wells
	Range 50 - 2,500	ADWR (1990 and 1994b)
	Range 0 - 2,500	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	105,000	Freethey and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	66,000,000 (to 1,200 ft)	ADWR (1990)
	69,000,000[1] (to 1,200 ft)	Freethey and Anderson (1986)
	>27,000,000	Arizona Water Commission (1975)
Current Number of Index Wells:	50	
Date of Last Water-level Sweep:	1997 (559 wells measured)[2]	

[1] Predevelopment Estimate

[2] 1,093 wells were meaured in a water-level sweep in 1987

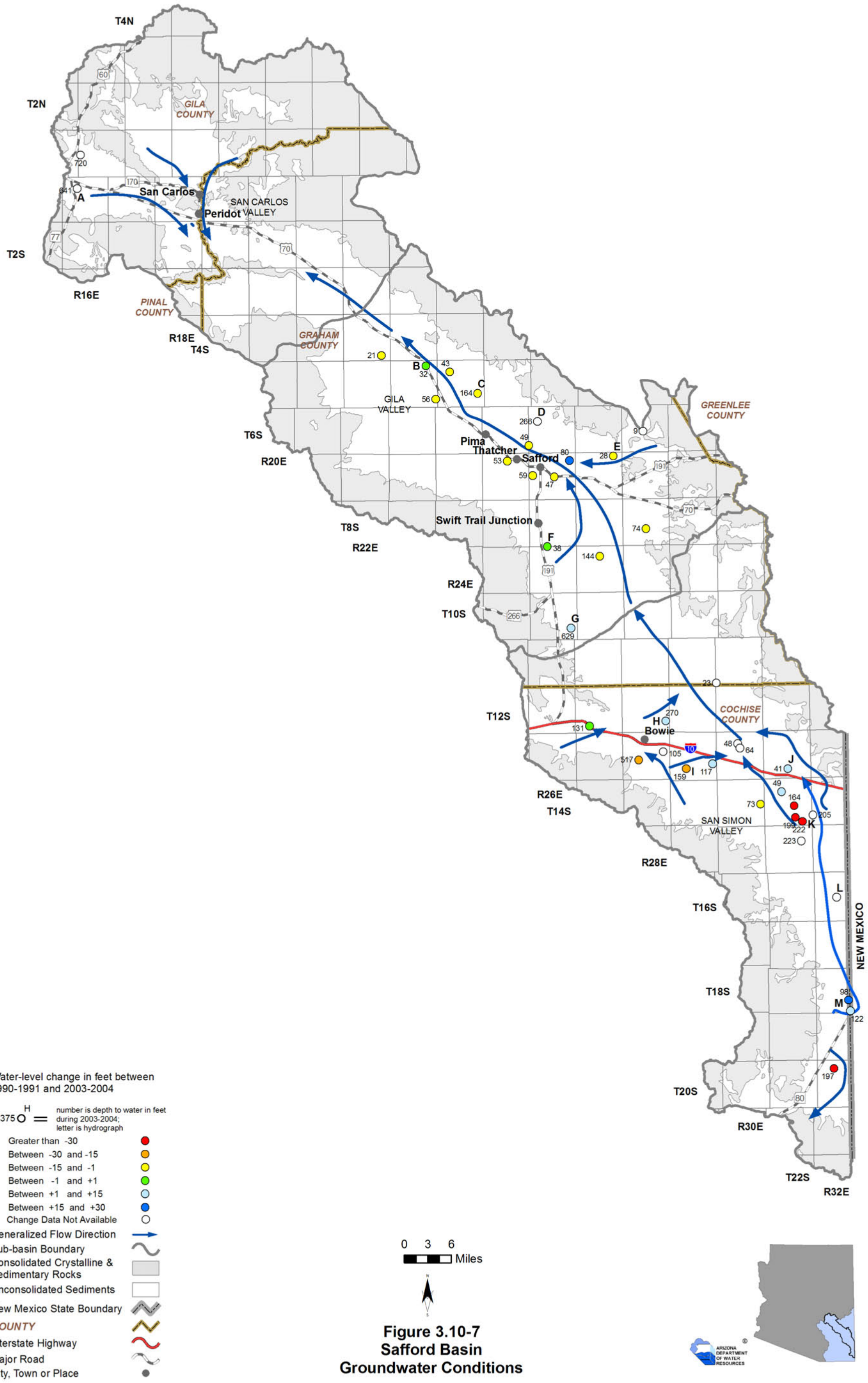
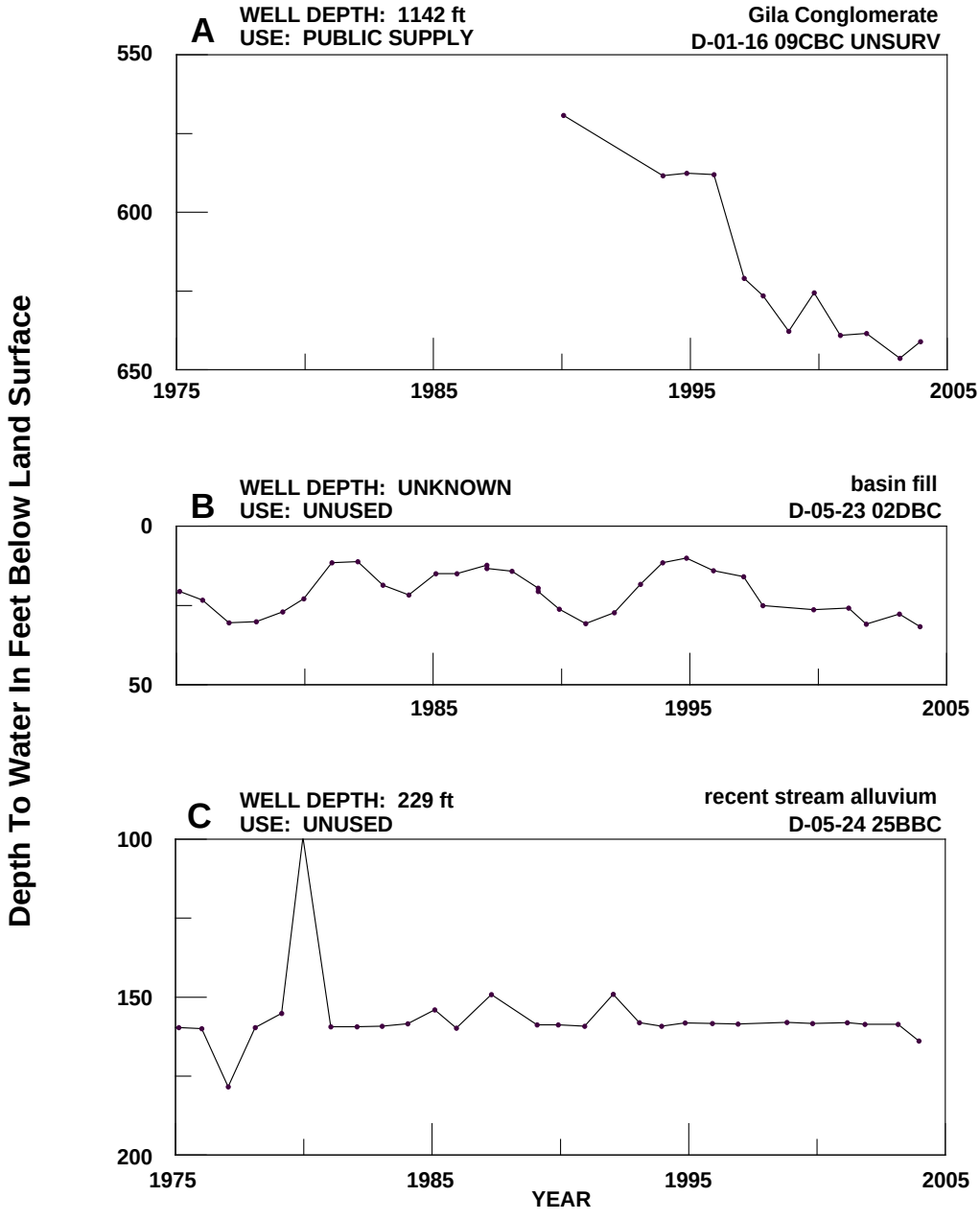


Figure 3.10-7
Safford Basin
Groundwater Conditions

Figure 3.10-8
Safford Basin
Hydrographs Showing Depth to Water in Selected Wells



In Hydrograph A UNSURV indicates there is no land survey for the area the well is in, and the coordinates are projected based on latitude and longitude.

Figure 3.10-8 (Cont)
Safford Basin
Hydrographs Showing Depth to Water in Selected Wells

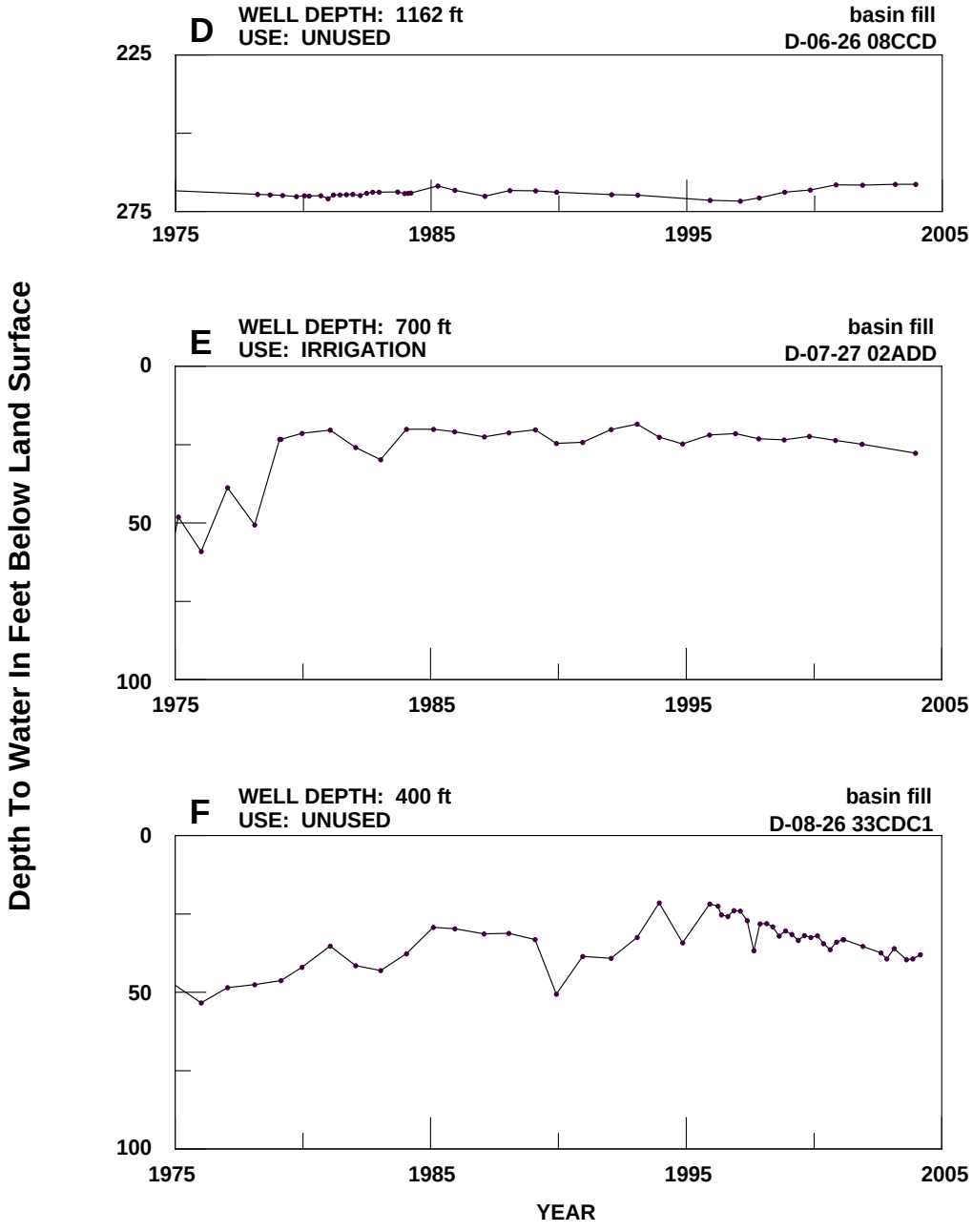


Figure 3.10-8 (Cont)
Safford Basin
Hydrographs Showing Depth to Water in Selected Wells

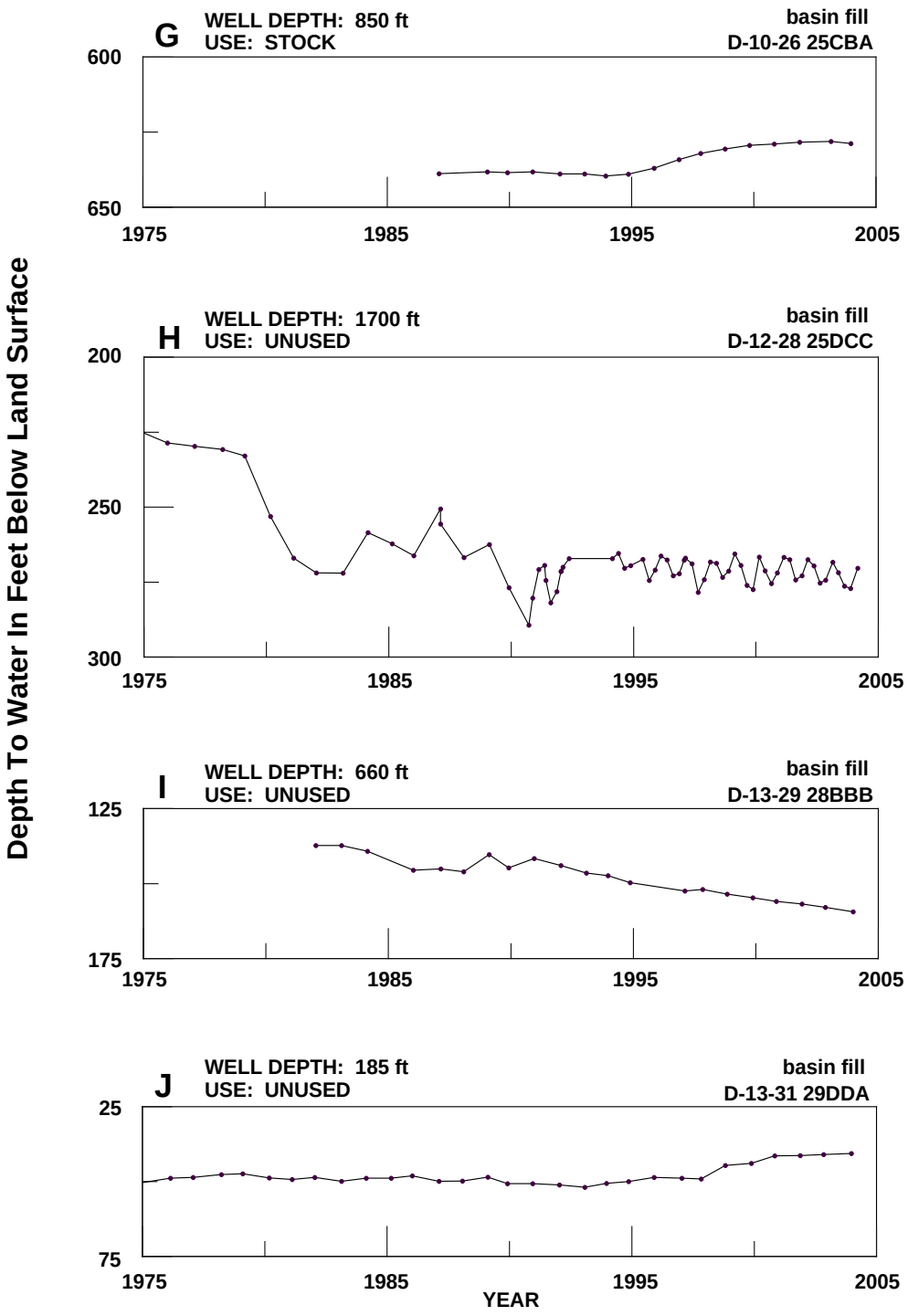
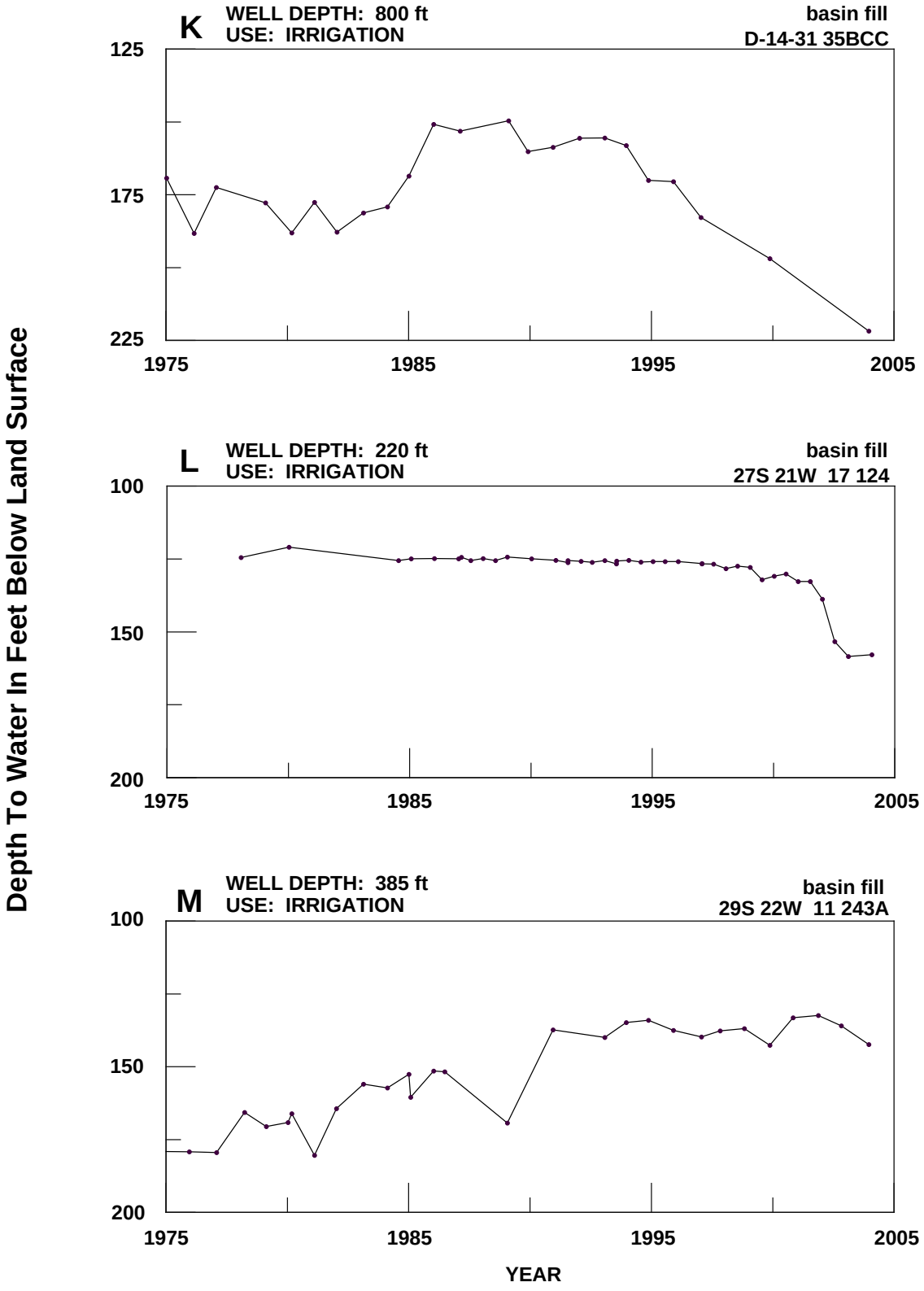


Figure 3.10-8 (Cont)
Safford Basin
Hydrographs Showing Depth to Water in Selected Wells



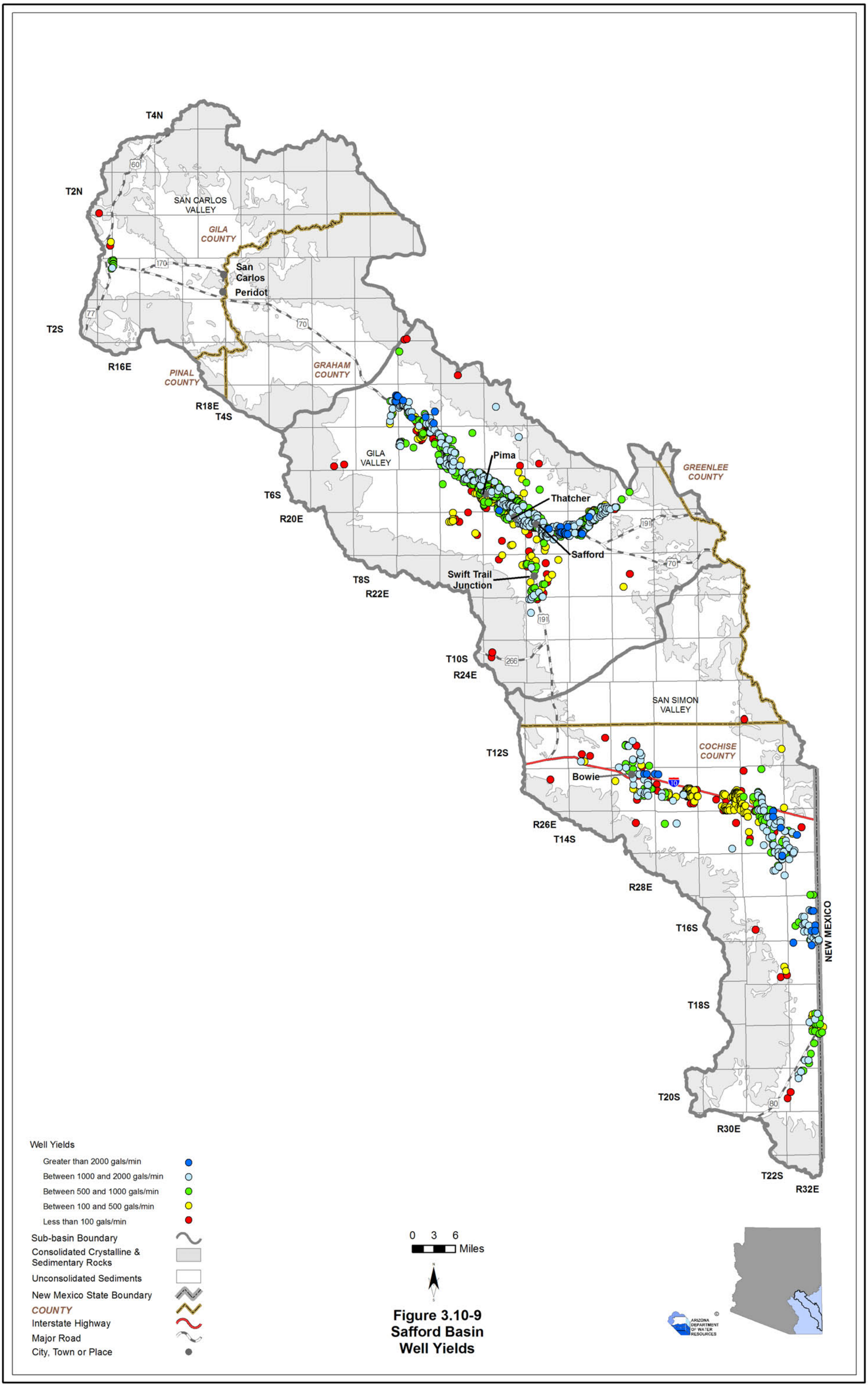


Figure 3.10-9
Safford Basin
Well Yields

3.10.7 Water Quality of the Safford Basin

Sites with parameter concentrations that have equaled or exceeded drinking water standard(s) (DWS), including location and parameter(s) are shown in Table 3.10-7A. Impaired lakes and streams with site type, name, length of impaired stream reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 3.10-7B. Figure 3.10-10 shows the location of exceedences and impairment keyed to Table 3.10-7. 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 3.10-7A.
- One hundred and fourteen sites have parameter concentrations that have equaled or exceeded DWS.
- Frequently equaled or exceeded parameters include fluoride and arsenic.
- Other parameters commonly equaled or exceeded in the sites measured in this basin were total dissolved solids, nitrates and lead.

Lakes and Streams with impaired waters

- Refer to Table 3.10-7B.
- Water quality standards were exceeded in one reach of Cave Creek and one reach of the Gila River.
- The parameter exceeded at Cave Creek was selenium.
- The parameters exceeded at the Gila River included E. coli and sediment load.
- The impaired portion of the Gila River in this basin is part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) program. A draft TMDL report is underway.

Effluent Dependent Reaches

- Refer to Figure 3.10-10.
- This basin contains two effluent dependent reaches, Bennett Wash in the vicinity of Safford and an unnamed wash in the vicinity of Highway 60. Bennett Wash receives effluent from the Arizona Department of Corrections Safford WWTF and the unnamed wash near Highway 60 receives effluent from the Arizona Department of Corrections Globe WWTF.

Table 3.10-7 Water Quality Exceedences in the Safford Basin[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		
1	Well	1 North	18 East	17	1	As
2	Well	1 South	18 East	12	1	As
3	Well	3 South	19 East	11	1	As
4	Well	3 South	22 East	18	1	TDS
5	Well	3 South	22 East	30	1	TDS
6	Spring	4 South	23 East	7	1	TDS
7	Well	4 South	23 East	18	1	As
8	Well	4 South	23 East	20	1	NO3
9	Spring	4 South	23 East	36	1	As, F
10	Well	5 South	21 East	36	1	F
11	Spring	5 South	24 East	17	2	F
	Spring	5 South	24 East	17	1	As, Cd, F, TDS
12	Well	5 South	24 East	29	2	NO3
13	Well	5 South	24 East	31	1	As, Pb, TDS
14	Well	6 South	23 East	3	2	As, F
15	Well	6 South	24 East	5	1	Pb
16	Well	6 South	24 East	12	1	NO3, TDS
17	Spring	6 South	25 East	5	1	F
18	Well	6 South	25 East	16	1	F
19	Well	6 South	25 East	17	1	As, F, TDS
20	Well	6 South	25 East	19	1	As, F
21	Well	6 South	25 East	23	1	As, F, TDS
22	Well	6 South	25 East	26	2	As, F
	Well	6 South	25 East	26	1	F
23	Well	6 South	25 East	28	1	NO3
24	Well	6 South	25 East	30	2	As
25	Well	6 South	25 East	33	1	NO3
26	Well	6 South	25 East	34	1	NO3
27	Well	6 South	25 East	35	1	NO3
28	Well	6 South	25 East	36	1	As, F, TDS
29	Well	6 South	26 East	35	1	F
30	Well	6 South	27 East	34	2	As
31	Well	7 South	23 East	1	1	As
	Well	7 South	23 East	1	1	F, Pb
	Well	7 South	23 East	1	9	F
32	Well	7 South	23 East	5	1	As
33	Well	7 South	24 East	8	1	As, F
	Well	7 South	24 East	8	3	As
34	Well	7 South	24 East	14	2	As
35	Well	7 South	25 East	2	1	As
	Well	7 South	25 East	2	2	NO3
36	Well	7 South	25 East	7	1	As, Cd, F, Pb, TDS
37	Well	7 South	25 East	11	1	NO3
38	Well	7 South	25 East	27	1	As, F, TDS
39	Well	7 South	26 East	4	1	As, F, TDS
40	Well	7 South	26 East	15	1	As, F, TDS
41	Well	7 South	26 East	21	1	As
42	Well	7 South	26 East	23	1	As
43	Well	7 South	26 East	24	4	As
44	Well	7 South	26 East	28	1	TDS
45	Well	7 South	27 East	2	3	As, F
	Well	7 South	27 East	2	2	F
	Well	7 South	27 East	2	1	As
46	Well	7 South	27 East	3	1	As, F

Table 3.10-7 Water Quality Exceedences in the Safford 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		
47	Well	7 South	27 East	8	1	As
48	Well	7 South	27 East	11	1	As, F
49	Well	7 South	27 East	16	2	F
	Well	7 South	27 East	16	1	As
50	Well	7 South	27 East	18	1	As
51	Well	7 South	27 East	20	1	As
	Well	7 South	27 East	20	1	As, F
52	Well	8 South	26 East	6	1	As, F
53	Well	8 South	26 East	7	1	As, F, TDS
	Well	8 South	26 East	7	1	Pb
	Well	8 South	26 East	7	1	As
	Well	8 South	26 East	7	2	F
54	Well	8 South	26 East	8	2	F
55	Well	8 South	26 East	15	1	F
56	Well	8 South	26 East	17	2	F
57	Well	8 South	26 East	18	4	F
58	Well	8 South	26 East	20	1	F
59	Well	8 South	26 East	28	1	As, F
60	Well	8 South	26 East	32	1	F
61	Well	8 South	27 East	23	1	As, F
62	Well	8 South	28 East	22	1	F
63	Well	8 South	28 East	29	1	As, F
64	Well	8 South	29 East	22	1	Pb
65	Well	9 South	26 East	5	1	F
66	Well	9 South	26 East	6	1	As
66	Well	9 South	26 East	6	1	As, F
67	Well	9 South	28 East	31	1	As, F
68	Well	9 South	30 East	33	1	As
69	Well	10 South	27 East	28	1	F
70	Well	10 South	28 East	7	1	Se
71	Well	10 South	28 East	36	1	As, F
72	Well	11 South	26 East	23	1	F
73	Well	11 South	28 East	28	1	As, NO3
74	Well	11 South	28 East	31	1	NO3
75	Well	11 South	29 East	1	2	F
	Well	11 South	29 East	1	1	As, F
76	Well	11 South	29 East	10	1	F
77	Well	11 South	29 East	14	1	As, F
78	Well	11 South	29 East	36	2	F
79	Well	11 South	30 East	1	1	F
80	Well	11 South	30 East	31	1	As, F
81	Well	12 South	28 East	14	1	NO3
82	Well	12 South	28 East	34	1	NO3
83	Well	12 South	29 East	1	1	F
84	Well	12 South	29 East	16	1	As, F
85	Well	12 South	30 East	28	1	F
86	Well	13 South	26 East	10	1	Rad
87	Well	13 South	29 East	18	1	F
88	Well	13 South	29 East	21	1	F
89	Well	13 South	29 East	25	2	As
	Well	13 South	29 East	25	1	NO3
90	Well	13 South	30 East	3	1	F

Table 3.10-7 Water Quality Exceedences in the Safford 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		
91	Well	13 South	30 East	15	1	F
	Well	13 South	30 East	15	1	As
92	Well	13 South	30 East	24	1	F
93	Well	13 South	30 East	25	2	F
94	Well	13 South	31 East	6	2	F
95	Well	13 South	31 East	17	1	F
96	Well	13 South	31 East	18	1	F
97	Well	13 South	31 East	20	1	F
98	Well	13 South	31 East	22	1	F
99	Well	13 South	31 East	28	1	F
100	Well	13 South	31 East	30	1	F
101	Well	13 South	31 East	31	1	F
102	Well	13 South	31 East	34	1	F
103	Well	14 South	31 East	3	1	NO3,TDS
104	Well	14 South	31 East	6	1	F
105	Well	14 South	31 East	9	1	Pb, NO3
	Well	14 South	31 East	9	1	F, NO3, TDS
	Well	14 South	31 East	9	1	NO3, TDS
	Well	14 South	31 East	9	2	F
106	Well	14 South	31 East	10	2	F, NO3
106	Well	14 South	31 East	10	1	NO3, TDS
107	Well	14 South	31 East	16	1	As, F
108	Well	14 South	31 East	19	1	As, F
109	Well	14 South	31 East	23	1	Pb
110	Well	14 South	31 East	35	1	F
111	Well	14 South	32 East	20	1	NO3
112	Well	15 South	29 East	4	1	F
113	Well	15 South	32 East	34	1	Pb
114	Well	18 South	32 East	26	1	F

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	Cave Creek (headwaters to South Fork of Cave Creek)	8	NA	A&W	Se
b	Stream	Gila River (Bonita Creek to Yuma Wash)	6	NA	A&W, FBC	E-coli, sediment

Source: ADEQ 2005f

Notes:

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

NA = Not applicable

[1] Water quality samples collected between 1975 and 2004.

[2] As = Arsenic
Cd = Cadmium
F= Fluoride
Pb = Lead
NO3 = Nitrate
Se = Selenium
Rad = One or more of the following radionuclides - Gross Alpha, Gross Beta, Radium, and Uranium
TDS = Total Dissolved Solids

[3] A&W = Aquatic and Wildlife
FBC = Full Body Contact

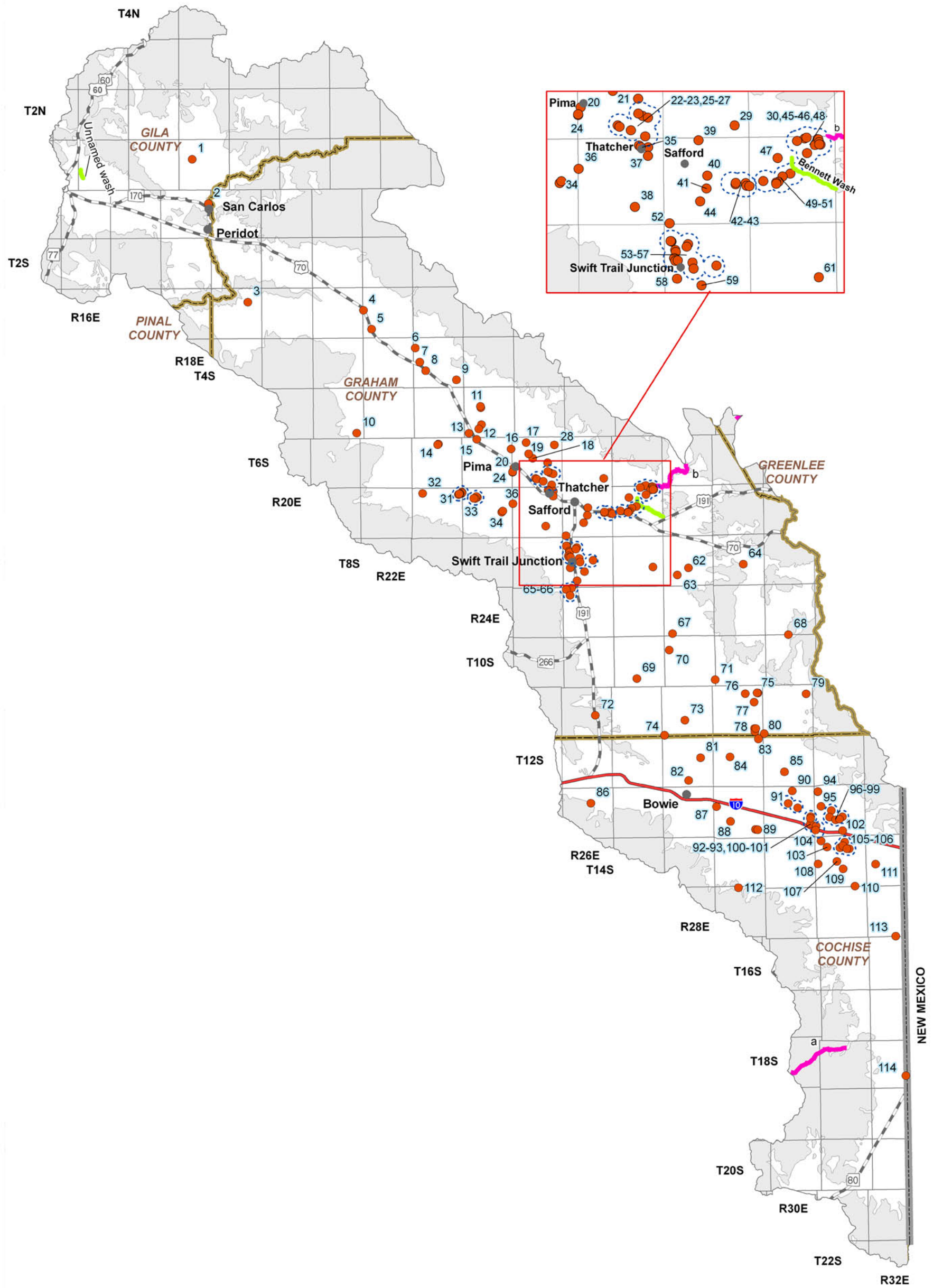


Figure 3.10-10
Safford Basin
Water Quality Conditions

3.10.8 Cultural Water Demands in the Safford 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 3.10-8. Effluent generation including facility ownership, location, population served and not served, volume treated, disposal method and treatment level is shown on Table 3.10-9. Figure 3.10-11 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 demands is found in Section 3.0.7.

Cultural Water Demands

- Refer to Table 3.10-8 and Figure 3.10-11.
- Population has increased by about 600 people a year on average from 1980 to 2000.
- Total groundwater use decreased from 1971 to 1990 and then increased again from 1991 to 2005. An average of 124,500 acre-feet was pumped per year in the period from 2001-2005.
- Surface water diversions increased from 1971 to 1985 and have decreased from 1986 to 2005, with 61,300 acre-feet diverted per year on average in the period from 1991 – 2005. All surface water diversions between 1991 and 2003 were for agriculture.
- Approximately 98% of the total water demand in this basin is for agriculture.
- Large tracks of agricultural lands are located along Highway 70 and the Gila River in the vicinity of Pima, Thatcher and Safford and in Cochise County south of Interstate 10.
- Current municipal and industrial demand is comparable to historic use with 3,300 acre-feet of municipal water demand per year and 800 acre-feet of industrial water demand per year in the period from 2000-2005.
- As of 2005 there were 2,698 registered wells with a pumping capacity of less than or equal to 35 gallons per minute and 2,278 wells with a pumping capacity of more than 35 gallons per minute.

Effluent Generation

- Refer to Table 3.10-9.
- There are 13 wastewater treatment facilities in the basin.
- Almost 29,000 people are served by these facilities.
- More than 2,000 acre-feet of effluent per year are generated in this basin.
- Three facilities discharge wastewater for irrigation.
- Discharge from one facility, the Peridot Heights Wastewater Treatment Facility, recharges the aquifer through an unlined impoundment. This facility is not permitted by the Department as an Underground Storage Facility.
- One facility, the Safford Wastewater Treatment Facility, discharges water for golf course irrigation.

Table 3.10-8 Cultural Water Demands in the Safford Basin[1]

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		1,473[2]	1,854[2]	180,000			84,000			ADWR (1994a) Gila Water Commis - sioner (2006)
1972										
1973										
1974										
1975										
1976				184,000			86,000			
1977										
1978										
1979										
1980	27,638									
1981	27,969	244	111	113,000			125,000			
1982	28,300									
1983	28,631									
1984	28,962									
1985	29,293									
1986	29,624	222	99	71,500			117,000			
1987	29,955									
1988	30,286									
1989	30,617									
1990	30,948									
1991	32,081	192	64	3,200	700	86,000	NR	NR	117,000	USGS (2007) Gila Water Commis - sioner (2006) ADWR (2008b)
1992	33,214									
1993	34,348									
1994	35,481									
1995	36,614									
1996	37,748	299	60	3,400	700	91,500	NR	NR	99,500	
1997	38,881									
1998	40,014									
1999	41,148									
2000	42,281									
2001	42,847	268	90	3,300	800	120,400	NR	NR	61,300	
2002	43,412									
2003	43,978									
2004	44,544									
2005	45,110									
2010	47,938									
2020	52,282									
2030	56,570									
	WELL TOTALS:	**2,698**	**2,278**							

Notes:
NR=Not reported
[1] Does not include evaporation losses from stockponds and reservoir, or effluent
[2] Includes all wells through June 1980.
Note: Groundwater withdrawn in the Bonita Creek Basin is delivered to the Safford Basin for municipal use. These withdrawals are not included in the table

Table 3.10-9 Effluent Generation in the Safford 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	Industrial Use	Discharge to Another Facility	Infiltration Basins			
AZ St. Industrial School	Arizona Department of Corrections	Prison	673	90	NA								Secondary	NA	2001
Bylas	San Carlos Apache Tribe	Bylas	1,480	79	NA										2001
Daley Estates	Private	Thatcher	NA												
Gilson Wash	San Carlos Apache Tribe	San Carlos	3,002	258	NA								Secondary	NA	2001
Peridot Heights	San Carlos Apache Tribe	Peridot Heights	625	22								X	Secondary	700	2000
Pima WWTF	Town of Pima	Pima	1,918	119		X							Secondary	NA	2000
Safford WWTF	Gila Resources	Safford	10,500	846			X	Mt. Graham					Secondary	NA	2000
Safford WWTF #1	Arizona Department of Corrections	Ft. Grant	286	34	Bennett Wash		X						Secondary	NA	2001
San Carlos Regional Sewer	San Carlos Apache Tribe	San Carlos	5,500	560		X							Secondary	NA	2000
Skill Center	San Carlos Apache Tribe	NA	111	10	NA								Secondary	NA	1996
Soda Canyon	San Carlos Apache Tribe	Soda Canyon	106	10	NA								Secondary	NA	1996
Thatcher WWTF	Town of Thatcher	Thatcher	4,429	411			X						Adv. Trt. I	400	2000
Upper Seven Mile	San Carlos Apache Tribe	San Carlos	254	11	NA								Secondary	NA	2000
Total			**28,884**	**2,450**											

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: Wastewater Treatment Facility
Adv. Tr. I: Advance treatment level I

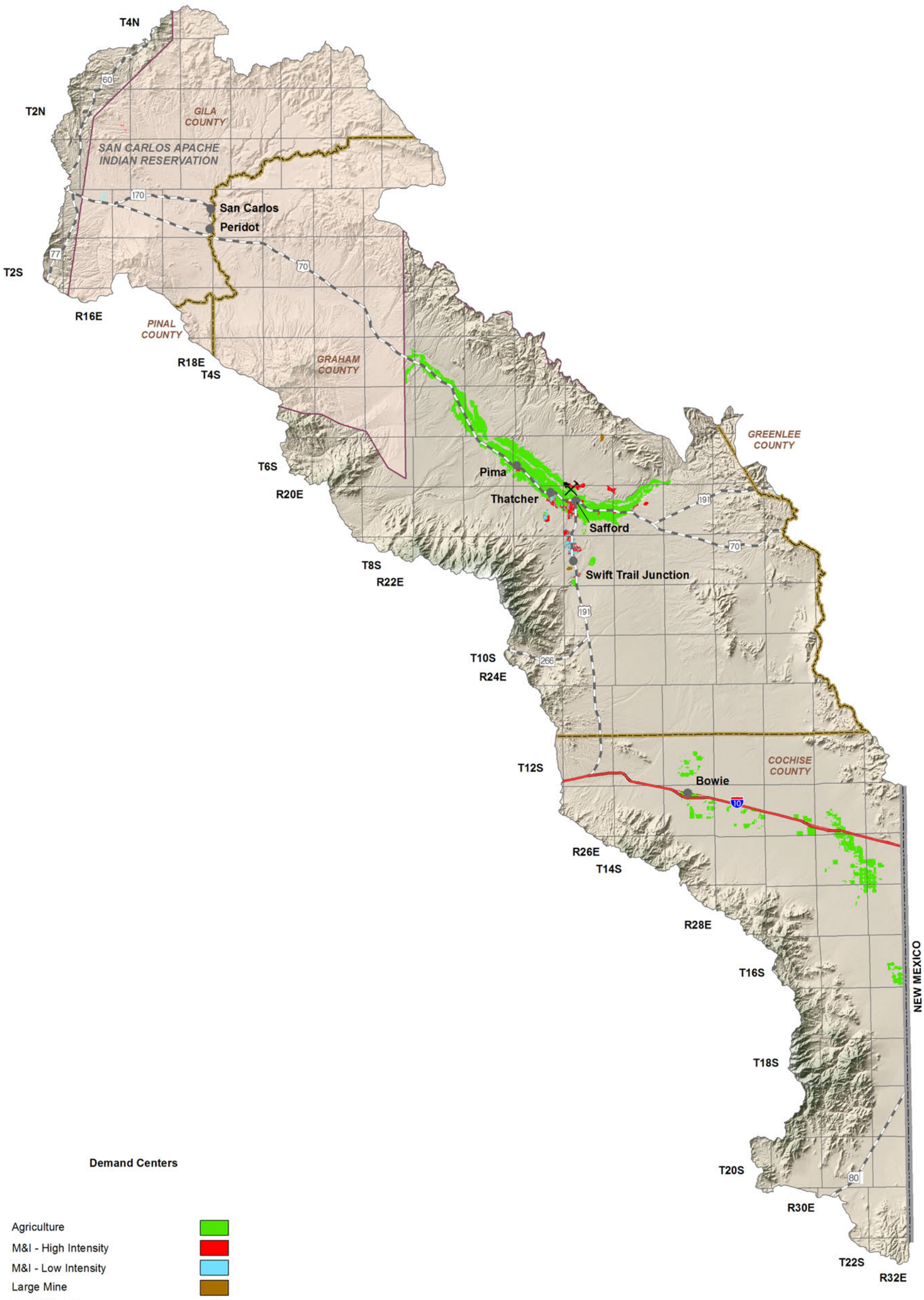


Figure 3.10-11
Safford Basin
Cultural Water Demand

Primary Data Source: USGS National Gap Analysis Program, 2004

3.10.9 Water Adequacy Determinations in the Safford 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 3.10-10. Figure 3.10-12 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.

- Twenty-three water adequacy determinations have been made in this basin through December 2008.
- Seventeen determinations of inadequacy have been made; the most common reason for an inadequacy determination was because the applicant chose not to submit necessary information and/or available hydrologic data was insufficient to make a determination.
- 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
Cochise	80	0	0
Gila	>154	38	~25
Graham	>671	76	~11
Greenlee	0	0	NA
Pinal	0	0	NA

Table 3.10-10 Adequacy Determinations in the Safford Basin[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						
1	Alder Heights	Graham	6 South	25 East	29, 32	63	53-700407	Inadequate	A1	9/17/2007	Graham Co. Utilities Cooperative
2	Apache Peaks Dev., Plat A	Gila	1 North	16 East	13, 14	38	53-500275	Adequate		4/20/1981	Apache Peaks Utilities
3	Arizona Sky Village	Cochise	17 South	32 East	19	80	53-400785	Inadequate	A1	10/28/2002	Dry Lot Subdivision
4	Buena Vista Ranches	Graham	8 South	26 East	29	25	53-300236	Adequate		12/17/1996	Dry Lot Subdivision
5	Copper Canyon Ranches #1B	Gila	1 North	15.5 East	29	NA	NA	Inadequate	A1	10/16/1990	Dry Lot Subdivision
6	Copper Canyon Ranches #2	Gila	1 North	16 East	10, 14, 15	65	53-500505	Inadequate	A1, A2, C	2/2/1995	Dry Lot Subdivision
7	Copper Canyon Ranches Unit III	Gila	1 North	15 East	10	51	53-400246	Inadequate	A1	1/20/1998	Dry Lot Subdivision
8	Desert Hills Ranchettes	Graham	8 South	26 East	6	49	53-500563	Inadequate	C	4/6/1976	Dry Lot Subdivision
9	Desert Hills Ranchettes #3	Graham	7 South	26 East	31	66	53-500564	Inadequate	A1, C	4/11/1983	Dry Lot Subdivision
10	Desert Hills Ranchettes #4	Graham	7 South 8 South	25 East 25 East	1 36	NA	53-500565	Inadequate	A1, C	5/21/1985	Dry Lot Subdivision
11	Fred Webb Park	Graham	5 South	24 East	20	92	53-700236	Inadequate	A1	3/15/2007	Dry Lot Subdivision
12	Galeyville Subdivision	Cochise	17 South	31 East	18	71	53-400763	Inadequate	A2	8/5/2002	Dry Lot Subdivision
13	High Mesa Air Park	Graham	8 South	26 East	2	NA	53-500788	Inadequate	D	6/21/1988	Dry Lot Subdivision
14	Los Alamos Hills #1	Graham	7 South	24 East	4	24	53-500916	Inadequate	A1	6/19/1985	Dry Lot Subdivision
15	Maloy High Chaparral Estates	Graham	8 South	26 East	2	64	53-400078	Inadequate	A1, C	5/21/1999	Dry Lot Subdivision
16	Mountain Air Estates	Graham	8 South	26 East	9	28	53-501017	Inadequate	C	3/6/1974	Dry Lot Subdivision
17	Mountain Breeze	Graham	8 South	26 East	7	4	53-501018	Inadequate	C	6/16/1976	Dry Lot Subdivision
18	Orchard Park	Graham	6 South	26 East	23	19	53-500099	Inadequate	A1	3/6/2007	Dry Lot Subdivision
19	Pima South Estates	Graham	6 South	25 East	30	27	53-501146	Adequate		11/30/1976	City Utilities Co
20	Pima South Estates #1	Graham	6 South	25 East	30	24	53-501147	Adequate		5/17/1994	General Utilities
21	Pima South Estates #2	Graham	6 South	25 East	30	6	53-501148	Adequate		10/18/1979	Graham County Utilities
22	Siesta Hot Springs	Graham	6 South	24 East	6	90	53-300003	Inadequate	A1,C	4/21/1998	Dry Lot Subdivision
23	Sundown	Graham	5 South	23 East	3	19	53-501495	Adequate		7/16/1979	Dry Lot Subdivision

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 unavaible;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 currently not available to ADWR

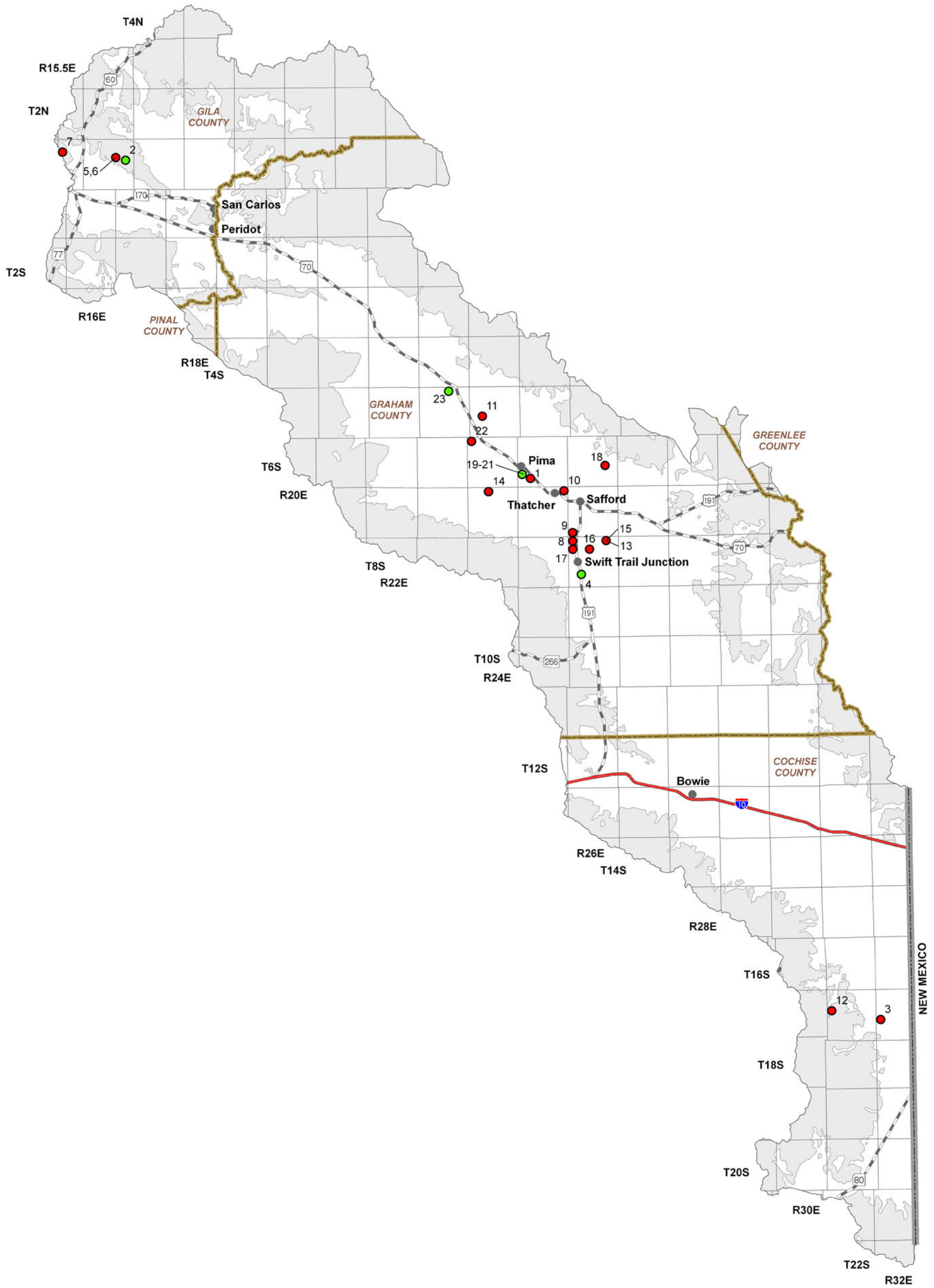


Figure 3.10-12
Safford Basin
Adequacy Determinations

SAFFORD BASIN
References and Supplemental Reading

References

A

Anning, D.W. and N.R. Duet, 1994, Summary of ground-water conditions in Arizona, 1987-90, USGS Open-file Report 94-476.

Arizona Department of Economic Security, 2005, Workforce Informer: Data file, accessed August 2005, http://www.workforce.az.gov.

Arizona Department of Environmental Quality (ADEQ), 2005a, ADEQSWI: Data file, received September 2005.

_____, 2005b, ADEQWWTP: Data file, received August 2005.

_____, 2005c, Azurite: Data file, received September 2005.

_____, 2005d, Effluent dependent waters: GIS cover, received December 2005.

_____, 2005e, Impaired lakes and reaches: GIS cover, received January 2006.

_____, 2005f, WWTP and permit files: Miscellaneous working files, received July 2005.

_____, 2004, Water quality exceedences for drinking water providers in Arizona: Data file, received September 2004.

Arizona Department of Mines and Mineral Resources (ADMMR), 2005, Active mines in Arizona: Database, accessed at http://www.admmr.state.az.us.

Arizona Department of Water Resources (ADWR), 2008a, Assured and adequate water supply applications: Project files, ADWR Hydrology Division.

_____, 2008b, Industrial demand outside of the Active Management Areas 1991-2007: Unpublished analysis by ADWR Office of Resource Assessment Planning.

_____, 2006, Statement of claimants filed by the Indian tribes or the United States on their behalf in the Gila and Little Colorado River adjudications: Data files, ADWR Office of Planning and Adjudications Support.

_____, 2005a, Automated recorder sites: Data files, ADWR Basic Data Unit.

_____, 2005b, 2004 rural water provider questionnaire: Data files, ADWR Office of Resource Assessment Planning.

_____, 2005c, Flood warning gages: Database, ADWR Office of Water Engineering.

_____, 2005d, Inspected dams: Database, ADWR Office of Dam Safety.

_____, 2005e, Non-jurisdictional dams: Database, ADWR Office of Dam Safety.

_____, 2005f, Groundwater Site Inventory (GWSI): Database, ADWR Hydrology Division.

_____, 2005g, Registry of surface water rights: ADWR Office of Water Management.

_____, 2005h, Wells55: Database.

_____, 2004, Rural Water Resources 2003 Questionnaire Report: Rural water resources study, ADWR Office of Regional Strategic Planning.

_____, 1994a, Arizona Water Resources Assessment, Vol. I, Inventory and Analysis.

_____, 1994b, Arizona Water Resources Assessment, Vol. II, Hydrologic Summary.

_____, 1990, Draft outline of basin profiles for the state water assessment: ADWR Statewide Planning Division, Memorandum to L. Linser, January 16, 1990.

Arizona Game and Fish Department (AGFD), 2005, Arizona Waterways: Data file, received April 2005.

_____, 1997 & 1993, Statewide riparian inventory and mapping project: GIS cover.

Arizona Land Resource Information System (ALRIS), 2005a, Springs: GIS cover, accessed January 2006 at http://www.land.state.az. us/alris/index.html.

_____, 2005b, Streams: GIS cover, accessed 2005 at http://www.land.state. az.us/alris/index.html.

_____, 2004, Land ownership: GIS cover, accessed in 2004 at http://www.land.state.az.us /alris/index.html.

Arizona Meteorological Network (AZMET), 2007, Arizona climate stations: Pan evaporation date, accessed December 2008 at http://www.ag.arizona.edu/azmet/locate.html.

Arizona Water Commission, 1975, Summary, Phase I, Arizona State Water Plan, Inventory of resource and uses.

B

Bureau of Land Management (BLM), 2005, Springs in the Safford region: Data file received January 2005.

D

Dickens, C. M., 2002, Hydrologic Study, Galeyville Subdivision, Cochise County, Arizona.

Diroll, M., and D. Marsh, 2006, Status of water quality in Arizona-2004 integrated 305(b) assessment and 303(d) listing report: ADEQ report.

F

Fisk, G.G., D.W, Duet, C.E. Evans, N.K. Angernoth, and S.A Longsworth, 2004, Water Resources Data, Arizona Water Year 2003: USGS Water-Data Report AZ-03-1.

Freethey, G.W. and T.W. Anderson, 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: USGS Hydrologic Investigations Atlas-HA664.

G

Gebert, W.A., D.J. Graczyk and W.R. Krug, 1987, Average annual runoff in the United States, 1951-1980: GIS Cover, accessed March 2006 at http://aa179.cr.usgs.gov/metadata/wrdmeta/runoff.htm.

Gila Water Commissioner, 2006, Distribution of Waters of the Gila River, Annual Report No. 70 (year 2005), prepared for the U.S. District Court.

H

Harris, R.C.A, 1999, Bibliography and review of water quality studies in the upper Gila watershed, Arizona: AZGS Open File Report 99-25.

O

Oregon State University, Spatial Climate Analysis Service (SCAS), 2006, Average annual precipitation in Arizona for 1961-1990: PRISM GIS cover, accessed in 2006 at www.ocs.orst.edu/prism.

P

Pope, G.L., P.D. Rigas and C.F. Smith, 1998, Statistical summaries of streamflow data and characteristics of drainage basins for selected streamflow-gaging stations in Arizona through water year 1996: USGS Water Resources Investigations Report 98-4225.

T

Tadayon, S., 2004, Water withdrawals for irrigation, municipal, mining, thermoelectric-power, and drainage uses in Arizona outside of the active management areas, 1991-2000: USGS Scientific Investigations Report 2004-5293, 27 pp.

Towne, D., 2004, Ambient groundwater quality of the San Simon sub basin: a 2002 baseline study: ADEQ Open File Report 04-02.

U

United States Army Corps of Engineers, 2004 and 2005, National Inventory of Dams: Arizona Dataset, accessed November 2004 to April 2005 at http://crunch.tec.army.mil/nid/wepages/nid.cfm

United States Geological Survey (USGS), 2008, National Water Information System (NWIS) data for Arizona: Accessed October 2008 at http://waterdata.usgs.gov/nwis.

_____, 2007, Water withdrawals for irrigation, municipal, mining, thermoelectric-power, and drainage uses in Arizona outside of the active management areas, 1991-2005: Data file, received November 2007.

_____, 2006a, National Hydrography Dataset: Arizona dataset, accessed at http://nhd.usgs.gov/.

_____, 2006b, Springs and spring discharges: Dataset, received November 2004 and January 2006 from USGS office in Tucson, AZ.

_____, 2004, Southwest Regional Gap analysis study- land cover descriptions: Electronic file, accessed January 2005 at http://earth.gis.usu.edu /swgap.

_____, 1981, Geographic digital data for 1:500,000 scale maps: USGS National Mapping Program Data Users Guide.

W

Wahl, C.R., S.R. Boe, R.A.Wennerlund, R.A. Winstead, L.J. Allison and D.M. Kubly, 1997, Remote sensing mapping of Arizona intermittent stream riparian areas: Arizona Game and Fish Technical Report 112.

Western Regional Climate Center (WRCC), 2005, Pan evaporation stations: Data file accessed December 2005 at http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwDI~GetCity~USA.

_____, 2005, Precipitation and temperature stations: Data file, accessed December 2005 at http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwDI~GetCity~USA.

Supplemental Reading

Ajami, H., D. P Guertin, L.R. Levick and K. Uhlman, 2005, NEMO Watershed Based Plan Upper Gila Watershed, University of Arizona.

Anderson, T.W., and Freethey, G.W., 1995, Simulation of groundwater flow in alluvial basins in south central Arizona and parts of adjacent states: USGS Professional Paper

1406-D.

Anning, D.W., 1999, Concentrations and stream loads of nitrogen and phosphorus in surface water resources of central Arizona: in Water Issues and Partnerships for Rural Arizona: Proceedings from 12th annual Arizona Hydrological Society Symposium, September 1999, Pinetop, Arizona.

_____, 1998, Sources of nitrogen and phosphorus in drainage basins of central Arizona: in Water at the Confluence of Science, Law, and Public Policy: Proceedings from the 11th annual Arizona Hydrological Society Symposium, September 1998, Tucson, Arizona, p. 8.

Arizona Department of Environmental Quality, 2007, Upper Gila River Total Maximum Daily Load, ADEQ Fact Sheet 07-01.

_____, 2004, Ambient Groundwatr of the San Simon Sub-Basin: An ADEQ 2002 Baseline Study, October 2004, ADEQ Fact Sheet 04-06.

Baker, D. L., and K.A. King, 1994, Environmental contaminant investigation of water quality, sediment and biota of the upper Gila River basin, Arizona: US Fish and Wildlife service, Project No. 22410-1130-90-2-053, 53 p.

Baldys, S., L.K. Ham, and K.D. Fossum, 1995, Summary statistics and trend analysis of water quality data at sites in the Gila River Basin, New Mexico and Arizona: USGS Water Resources Investigations Report 95-4083 86 p.

Baldys, S. and J.A. Bayles, J.A., 1990, Flow characteristics of streams that drain the Ft.Apache and San Carlos Indian Reservations, east central Arizona: USGS Water Resources Investigation Report 90-4053.

Brown, S. L., Yu, S.K., and Munson, B. E.,,1996, The impact of agricultural runoff on the pesticide contamination of a river- a case study on the middle Gila River: ADEQ Open File Report 96-1.

Bureau of Reclamation, 1990, Upper Gila water supply analyses and sizing studies: Arizona Projects Office, draft report, April 1990.

City of Safford, General Plan Water Resources Element, adopted November 2003.

Cordy, G.E., D.J. Gellenbeck, J.B. Gebler, D.W. Anning, A.L. Coes, R.J. Edmonds, J.A. Rees, and H.W. Sanger, 2000, Water quality in the central Arizona basins, Arizona, 1995-1998: USGS Circular 1213.

Gebler, J. B., 1998, Water quality of selected effluent dependent stream reaches in southern Arizona as indicated by concentrations of periphytic chlorophyll *a* and aquatic invertebrate communities: USGS Water Resources Investigations Report 98-4199,

12 p

Gookin, T.A., 2005, The Turner study in Safford Valley: in Conservation and Innovation in Water Management: Proceedings of the 18th annual Arizona Hydrological Society Symposium, Flagstaff, Arizona, September, 2005.

Halpenney, L.C. and P.C. Halpenny, 1994, Beyond adjudication: de facto conjunction of surface and ground water: in Approaching the Millennium-Evolving Perspectives in Water Resources: Proceedings from the 7th annual Arizona Hydrological Society Symposium, September 1994, Scottsdale, Arizona, 149-158.

Haney, J., 2005, Evaluation of the ecological implications of altered flows on the Upper Gila River: in Conservation and Innovation in Water Management: Proceedings of the 18th annual Arizona Hydrological Society Symposium, Flagstaff, Arizona, September, 2005.

Harris, R.C., 2000, Tritium as a tracer of groundwater sources and movement in the Safford basin, Graham County Arizona: AZGS Open File Report 00-10, 9 p.

_____, 1997, Distribution of evaporates and implications for water quality in the San Carlos-Safford-Duncan non point source management zone: AZGS Open-File Report 97-3, 56 p.

_____, 1996, Distribution of uranium in rocks and radon levels in water in the San Carlos-Safford-Duncan non point source management zone: AZGS Open-File Report 96-28, 10 p.

Huckleberry, G., 1996, Historical geomorphology of the Gila River: AZGS Open – File Report 96-14, 31 p.

Konieczki, A.D. amd S.R. Anderson, 1990, Evaluation of recharge along the Gila River as a result of the October 1983 flood: USGS Water Resources Investigations Report 89-4148, 30 pp.

Matlock, G.W., 1995, Management conflicts involving surface and ground water law: a Gila River example: in Water Use in Arizona: Cooperation or Conflict?: Proceedings from the 8th annual Arizona Hydrological Society Symposium, September 1995, Tucson, Arizona, p. 81-82.

Richard, S.M., 1998, Map showing the orientation of layering and faults in the San Carlos – Safford - Duncan non point source management areas: AZGS Open – File Report 98-8 4 p.

Robertson, F.N., 1991, Geochemistry of groundwater in alluvial basins in Arizona, and adjacent parts of Nevada, New Mexico and California: USGS Professional Paper 1406-C, 90 p.

Santec Consulting and JE Fuller/ Hydrology & Geomorphology, Inc., 2000, Small and minor watercourses analysis for Cochise County, Arizona: Arizona State Land Department, Final Report.

Tellman, B., R. Yarde, and M. Wallace, 1997, Arizona's changing rivers: How people have affected rivers: Water Resources Research Center, University of Arizona, Tucson, Arizona

Trapp, R.A., and R.C. Harris, 1996, Bibliography of the San Carlos-Safford-Duncan Non point source management zone: AZGS Open-File Report 96-20, 58 p.

United States Geological Survey, 1997, Stage discharge rating curve for the Gila River, at the head of Safford Valley, near Solomon, AZ: USGS Water Resources unpublished report, Tucson, AZ.

Webb, R.H., S.A. Leake, and R.M. Turner, 2007, The Ribbon of Green: Change in Riparian Vegetation in the Southwestern United States, University of Arizona Press.

Wittler, R. J., Klawon, J.E., and Collins, K.L., 2004, Upper Gila River fluvial geomorphology study: Bureau of Reclamation final report.