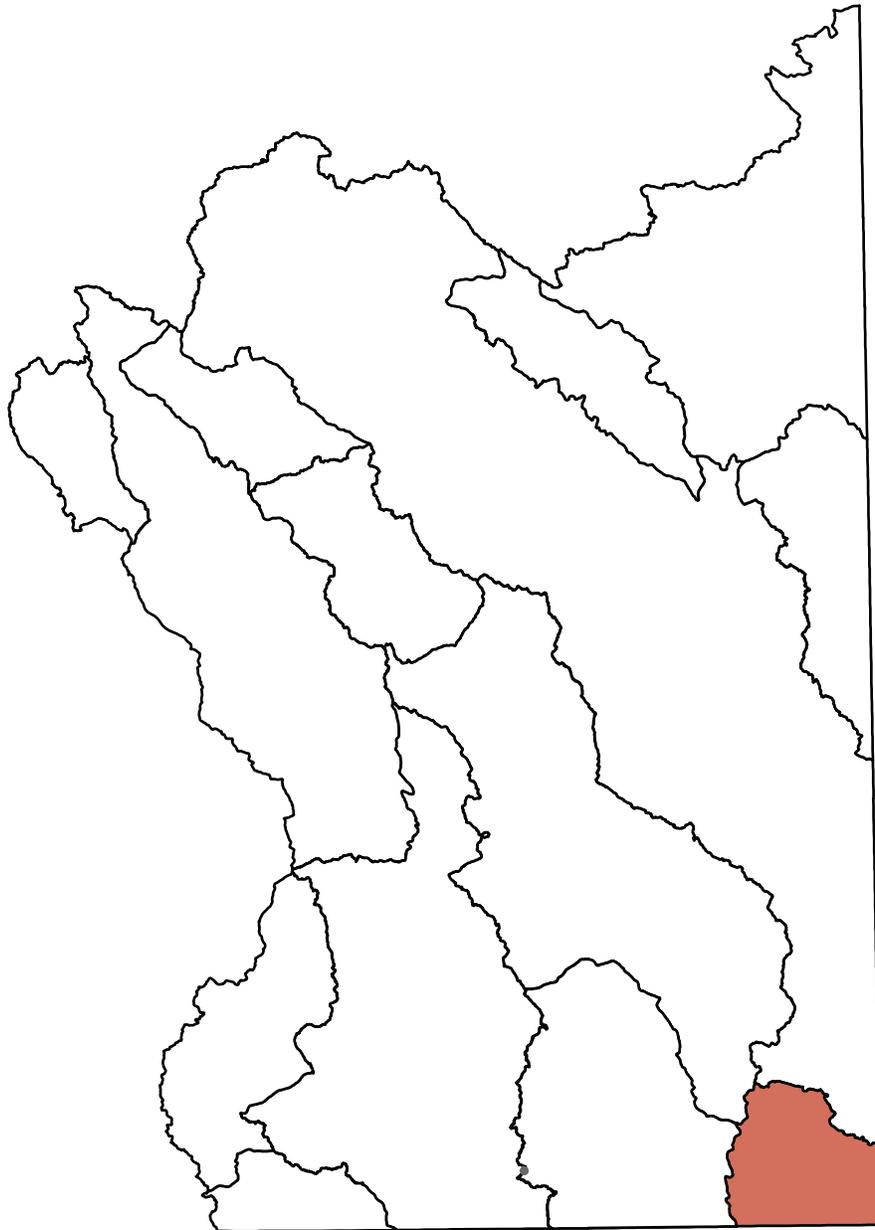


Section 3.11

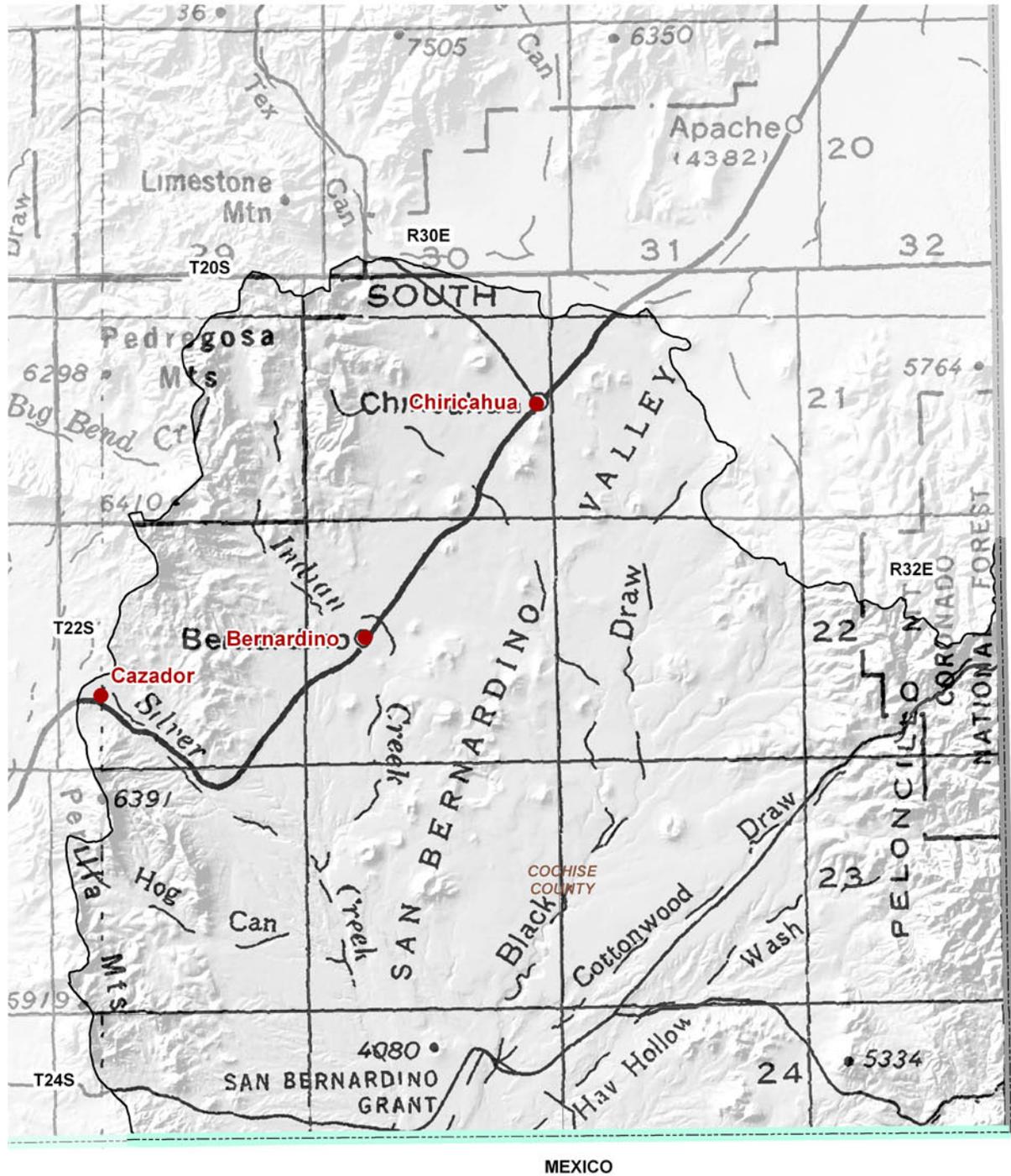
San Bernardino Valley Basin



3.11.1 Geography of the San Bernardino Valley Basin

The San Bernardino Valley Basin is a small, 387 square mile basin in the southeastern corner of the planning area. Geographic features and principal communities are shown on Figure 3.11-1. The basin is characterized by a valley flanked by two mountain ranges. Vegetation is primarily semi-desert grassland with smaller areas of madrean evergreen woodland and Chihuahuan desertscrub. (see Figure 3.0-10) Riparian vegetation includes mesquite and cottonwood/willow along Black Draw.

- Principal geographic features shown on Figure 3.11-1 are:
 - San Bernardino Valley east of Bernardino and Chiricahua
 - Black Draw east of Bernardino running north-south to the Mexico border
 - Peloncillo Mountains to the east
 - Pedregosa Mountains on the northwest basin boundary
 - Perilla Mountains to the west, which include the highest point in the basin at 6,391 feet
 - The lowest point at approximately 3,700 feet where Black Draw exits the basin.



Base Map: USGS 1:500,000, 1981



Figure 3.11-1
San Bernardino Basin
Geographic Features

- New Mexico State Boundary 
- International Boundary 
- COUNTY 
- City, Town or Place 

3.11.2 Land Ownership in the San Bernardino Valley Basin

Land ownership, including the percentage of ownership in each category, is shown for the San Bernardino Valley Basin in Figure 3.11-2. The principal feature of land ownership in this basin is the significant amount of State Trust Land, the largest of any basin in the planning area. 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.

State Trust

- 63.2% of land in this basin is held in trust for public schools and nine other beneficiaries under the State Trust Land system.
- Much of the state owned land in this basin is adjacent to other state owned lands but interspersed with parcels of privately owned and Bureau of Land Management lands.
- Primary land use is grazing.

Private

- 24.3% of land is private.
- Most private land is interspersed with state owned land.
- The largest portions of contiguous private land are near the communities of Cazador, Bernardino and Chiricahua.
- Primary land uses are domestic and grazing.

National Forest

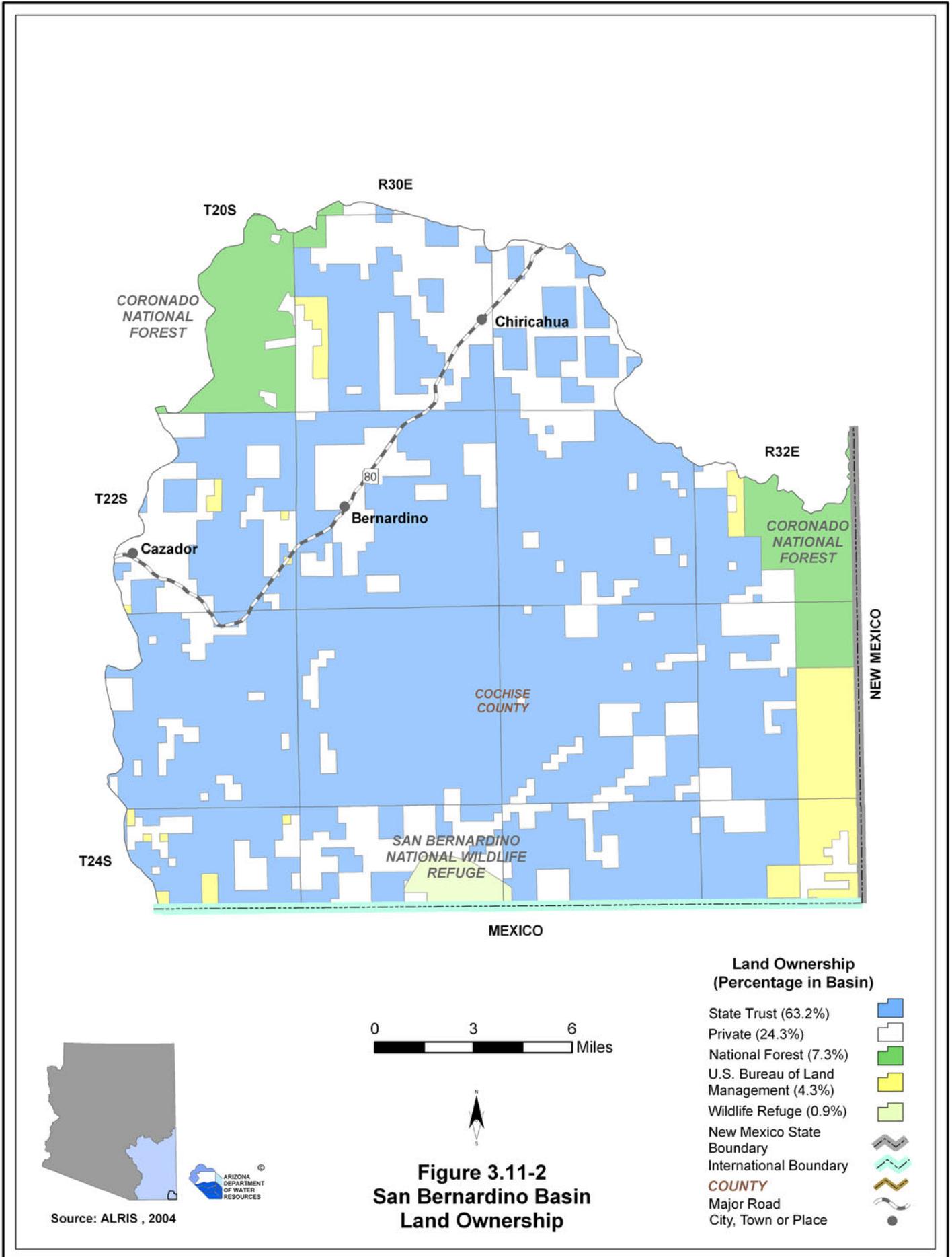
- 7.3% of land is federally owned and managed by the United States Forest Service (USFS).
- All forest land, although not contiguous, is in the Coronado National Forest, Douglas Ranger District.
- Primary land uses are grazing, recreation and timber production.

U.S. Bureau of Land Management (BLM)

- 4.3% of land is federally owned and managed by the Safford Field Office of the Bureau of Land Management.
- The majority of BLM land in this basin is in the east along the boundary with New Mexico.
- Primary land use is grazing.

Wildlife Refuge

- 0.9% of land is federally owned and managed by the U.S. Fish and Wildlife Service (USFWS).
- All USFWS land is in the San Bernardino National Wildlife Refuge.
- Primary land uses are wildlife protection and recreation.



3.11.3 Climate of the San Bernardino Valley Basin

The San Bernardino Valley Basin does not contain any NOAA/NWS Coop Network, Evaporation Pan, AZMET or SNOTEL/Snowcourse stations. Figure 3.11-3 shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. More detailed information on climate is found in Section 3.0.4. A description of this and other climate data sources and methods is found in Volume 1, Appendix A.

SCAS Precipitation Data

- See Figure 3.11-3
- Precipitation data shows average annual rainfall as as high as 22 inches at the Pedregosa Mountains in the northwest portion of the basin and as low as 10 inches at the San Bernardino Valley along the border with Mexico.

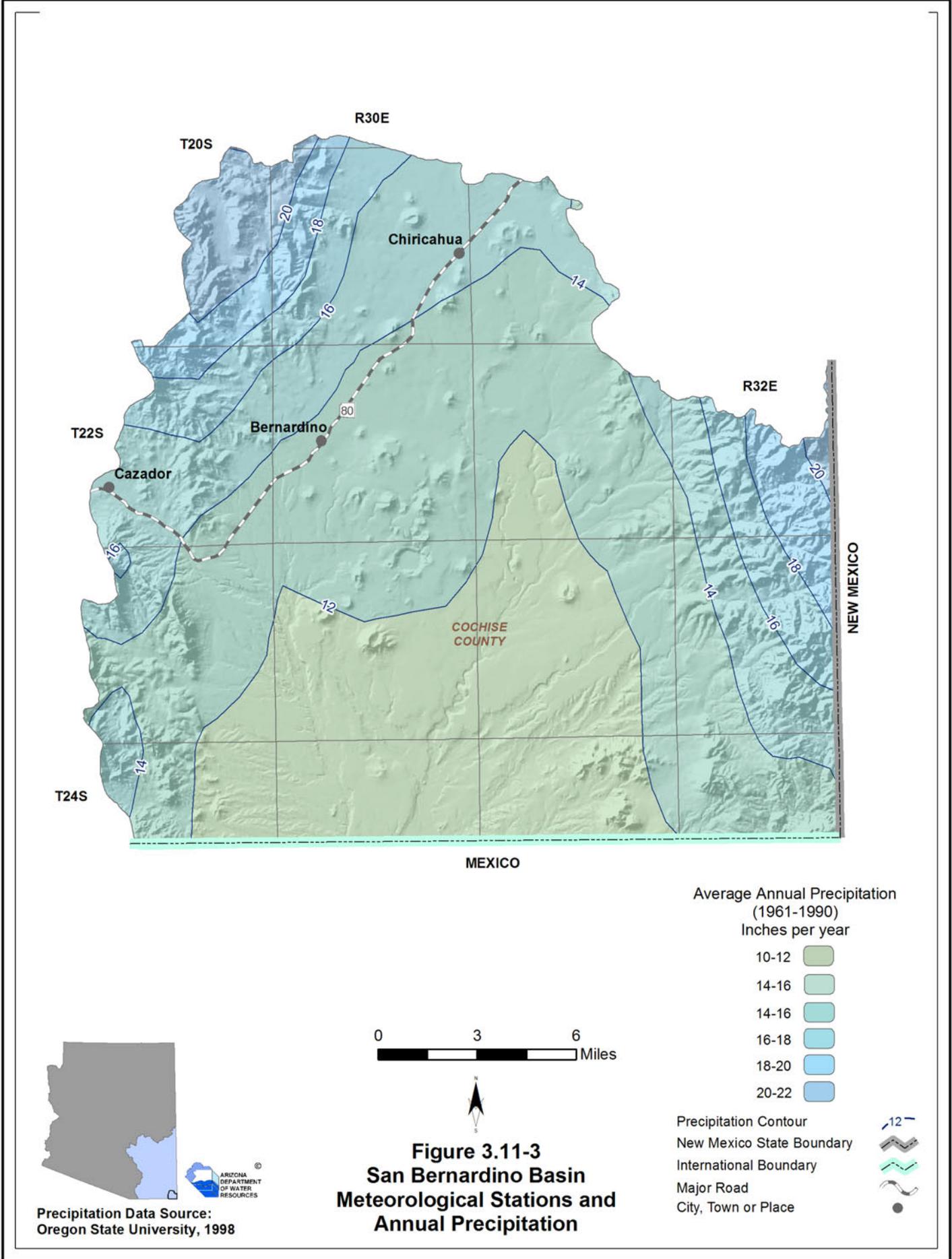


Figure 3.11-3
San Bernardino Basin
Meteorological Stations and
Annual Precipitation

3.11.4 Surface Water Conditions in the San Bernardino Valley Basin

There are no streamflow data or flood ALERT equipment in this basin. 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 3.11-1. The location of USGS runoff contours and large reservoirs are shown on Figure 3.11-4. The USGS annual runoff contours as well as stream channels are shown on Figure 3.11-4. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Reservoirs and Stockponds

- Refer to Table 3.11-1
- Surface water is stored or could be stored in one large and five small reservoirs in the basin.
- Total maximum surface area in the large reservoir is 401 acres. The use of this reservoir is unknown.
- There are an estimated 151 stockponds in this basin.

Runoff Contour

- Refer to Figure 3.11-4.
- Average annual runoff varies from 0.2 inches per year, or 10.6 acre-feet per square mile, in the middle half of the basin to 2 inches per year, or 106.6 acre-feet per square mile, at the northern boundary.

Table 3.11-1 Reservoirs and Stockponds in the San Bernardino Valley 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 ²	JURISDICTION
1	Dry ³	AZ Land Dept.	401	U	State

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: 45 acre-feet

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

Total number: 4

Total surface area: 22 acres

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

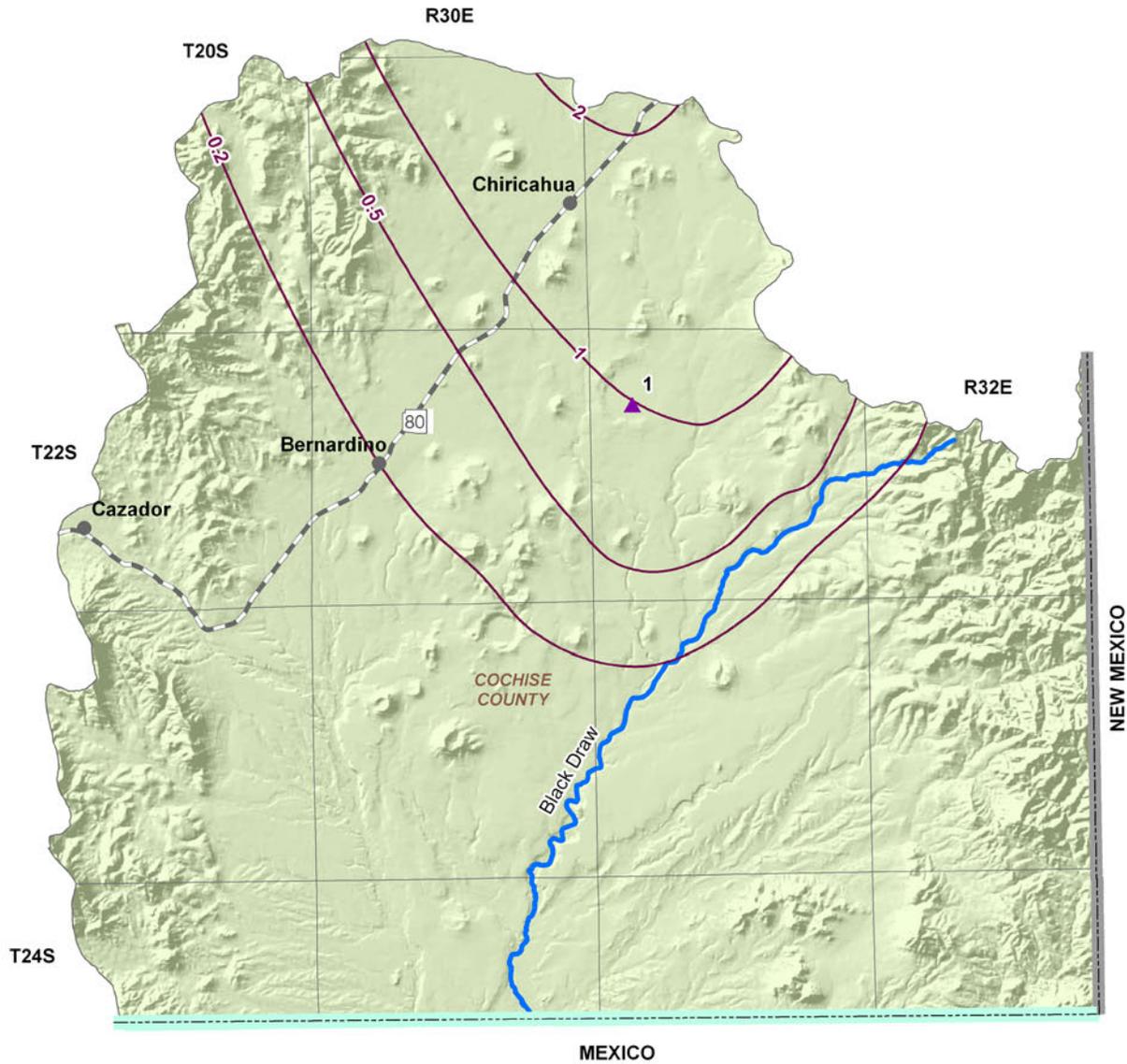
Total number: 151 (from water right filings)

Notes:

¹Capacity data not available to ADWR

²U=unknown

³Dry Lake



Stream Data Source: ALRIS, 2005

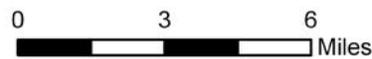


Figure 3.11-4
San Bernardino Valley Basin
Surface Water Conditions

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

Stream Channel (width of line reflects stream order)

Large Reservoir

New Mexico State Boundary

International Boundary

COUNTY

Major Road

City, Town or Place



3.11.5 Perennial/Intermittent Streams and Major Springs in the San Bernardino Valley Basin

Minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 3.11-2. There are no major springs identified in this basin. The locations of perennial and intermittent streams are shown on Figure 3.11-5. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- There is one perennial stream, Black Draw, located near the border with Mexico.
- A number of intermittent streams are located on the eastern boundary of the basin.
- There is one minor spring in the basin.
- Listed discharge rates may not be indicative of current conditions. The House Spring was last measured in 1985.
- The total number of springs identified by the USGS varies from 6 to 10, depending on the database reference.

Table 3.11-2 Springs in the San Bernardino Valley 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):

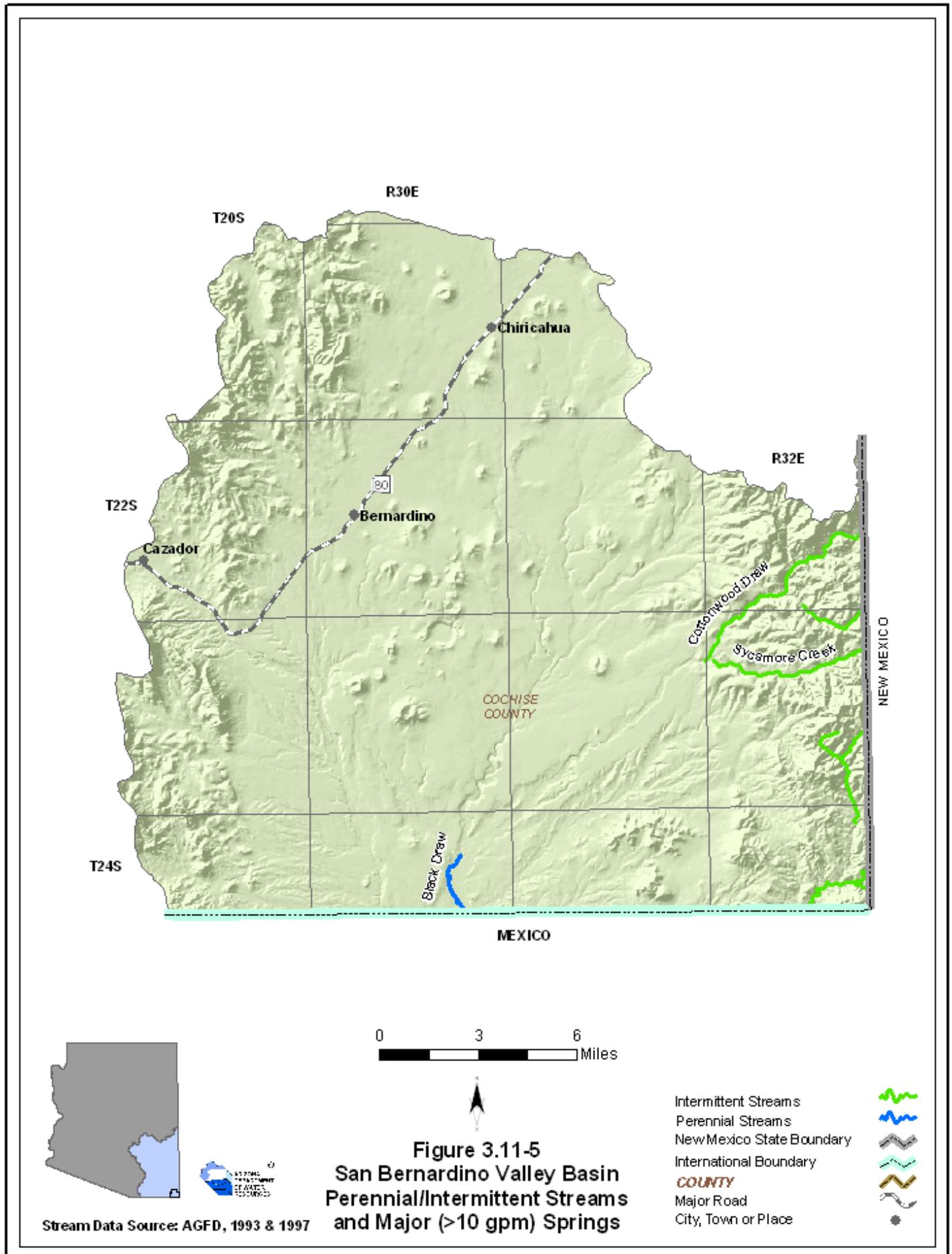
Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
House	312012	1091642	3	3/1/1985

Source: Compilation of databases from ADWR & others

C. Total number of springs, regardless of discharge, identified by USGS (see ALRIS, 2005a and USGS, 2006a): 6 to 10

Notes:

¹Most recent measurement identified by ADWR



3.11.6 Groundwater Conditions of the San Bernardino Valley 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 3.11-3. Figure 3.11-6 shows aquifer flow direction and water-level change between 1990-1991 and 2003-2004. Figure 3.11-7 contains hydrographs for selected wells shown on Figure 3.11-6. Figure 3.11-8 shows well yields in three 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 3.11-3 and Figure 3.11-6.
- The major aquifers in the basin are recent stream alluvium and volcanic rock.
- Artesian wells and springs support wetlands in this basin near the border with Mexico.
- Flow direction is generally from the north to the south.

Well Yields

- Refer to Table 3.11-3 and Figure 3.11-8.
- As shown on Figure 3.11-8 well yields in this basin range from less than 100 gallons per minute (gpm) to 1,000 gpm.
- One source of well yield information, based on three reported wells, indicates that the median well yield in this basin is 450 gpm, however the range is quite large, 22-600 gpm.

Natural Recharge

- Refer to Table 3.11-3.
- The natural recharge estimate for this basin is 9,000 acre-feet per year.

Water in Storage

- Refer to Table 3.11-3.
- Storage estimates for this basin range from 1.6 million acre-feet to two million acre-feet to a depth of 1,200 feet.

Water Level

- Refer to Figure 3.11-6. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures four index wells in this basin. Hydrographs for two of these wells are shown in Figure 3.11-7.
- Depth to water was measured for three wells in this basin in 2003-2004 and varies from 612 feet in the north central portion of the basin to 30 feet along the border with Mexico.

Table 3.11-3 Groundwater Data for the San Bernardino Valley Basin

Basin Area, in square miles:	387	
Major Aquifer(s):	Name and/or Geologic Units	
	Recent Stream Alluvium	
	Volcanic Rock	
Well Yields, in gal/min:	Range 22 - 600 Median 450 (3 wells reported)	Reported on registration forms for large (> 10-inch) diameter wells
	Range 0 - 2,500	Anning and Duet, USGS (1994)
Estimated Natural Recharge, in acre-feet/year:	9,000	Freethy and Anderson (1986)
Estimated Water Currently in Storage, in acre-feet:	1,600,000 (to 1,200 ft)	ADWR (1990)
	2,000,000 ¹ (to 1,200 ft)	Freethy and Anderson (1986)
Current Number of Index Wells:	4	
Date of Last Water-level Sweep:	1990 (50 wells measured)	

¹Predevelopment Estimate

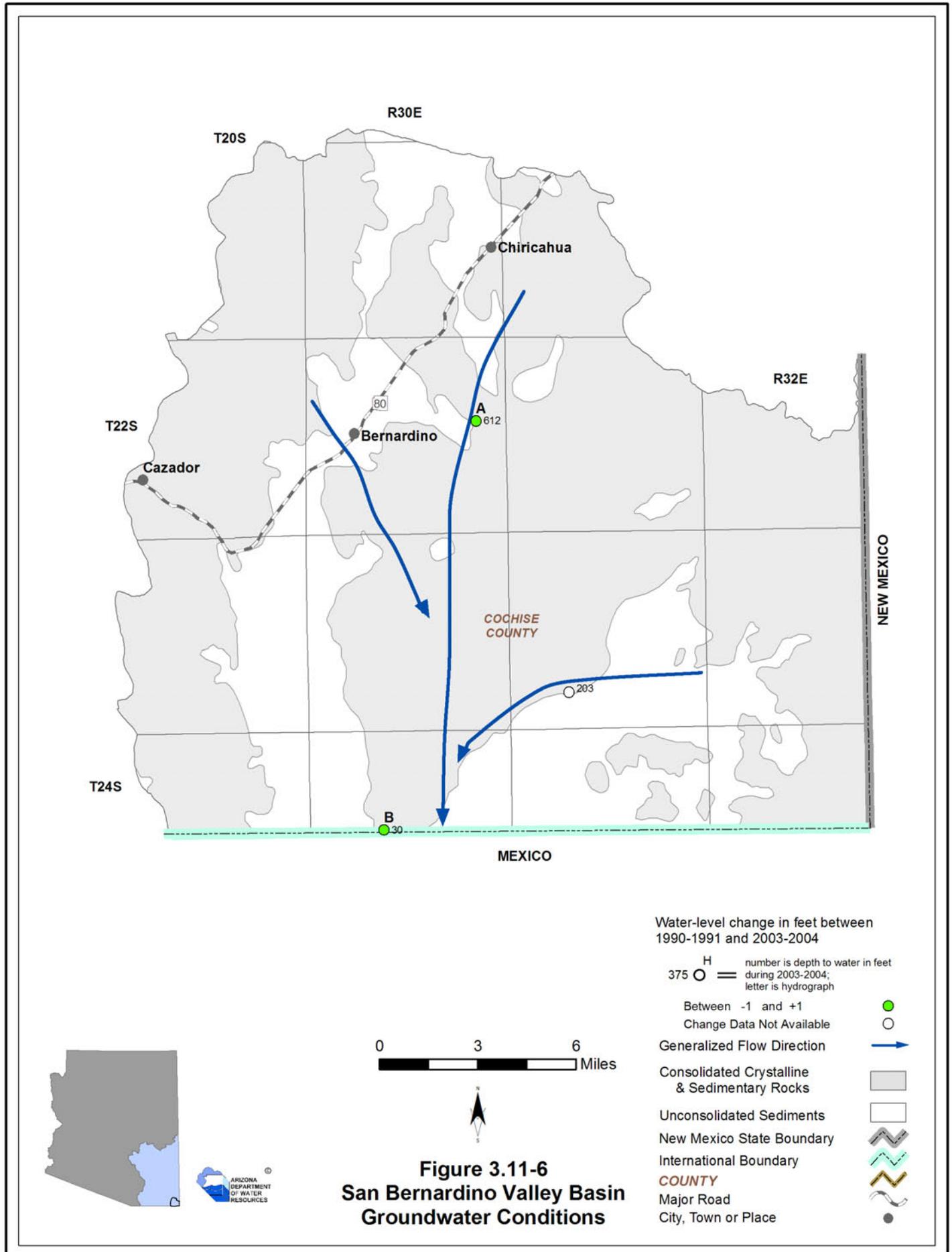
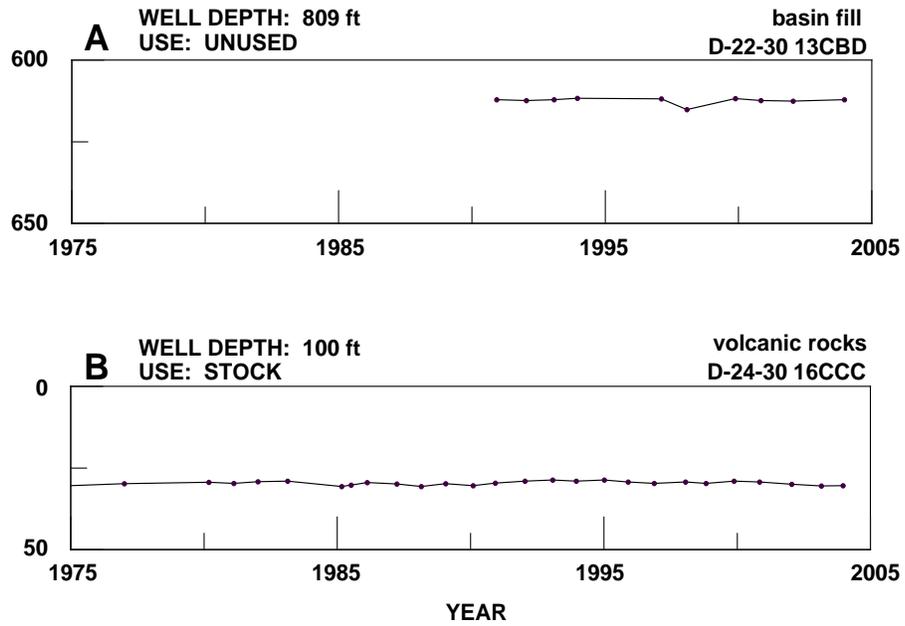
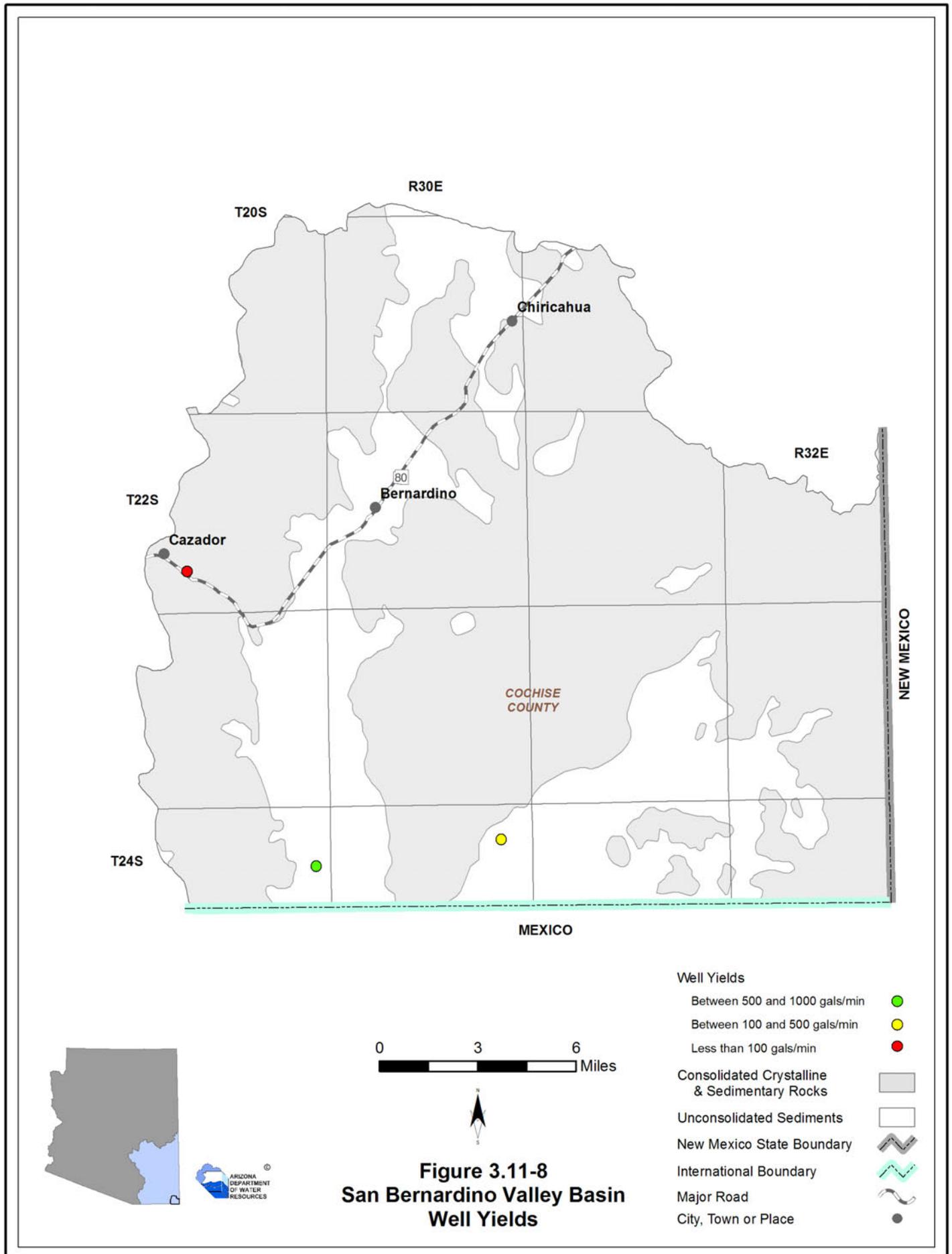


Figure 3.11-7
San Bernardino Valley Basin
Hydrographs Showing Depth to Water in Selected Wells

Depth To Water In Feet Below Land Surface





3.11.7 Water Quality of the San Bernardino Valley Basin

Sites with parameter concentrations that have equaled or exceeded drinking water standard(s) (DWS), including location and parameter(s) are shown in Table 3.11-4A. There are no data on impaired lakes and streams in this basin. Figure 3.11-9 shows the location of exceedences keyed to Table 3.11-4A. 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 3.11-4A.
- Two sites have nitrate concentrations that have equaled or exceeded DWS.

Table 3.11-4 Water Quality Exceedences in the San Bernardino Valley 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	24 South	29 East	11	NO3
2	Well	24 South	32 East	6	NO3

Source: Compilation of databases from ADWR & others

B. Lakes and Streams

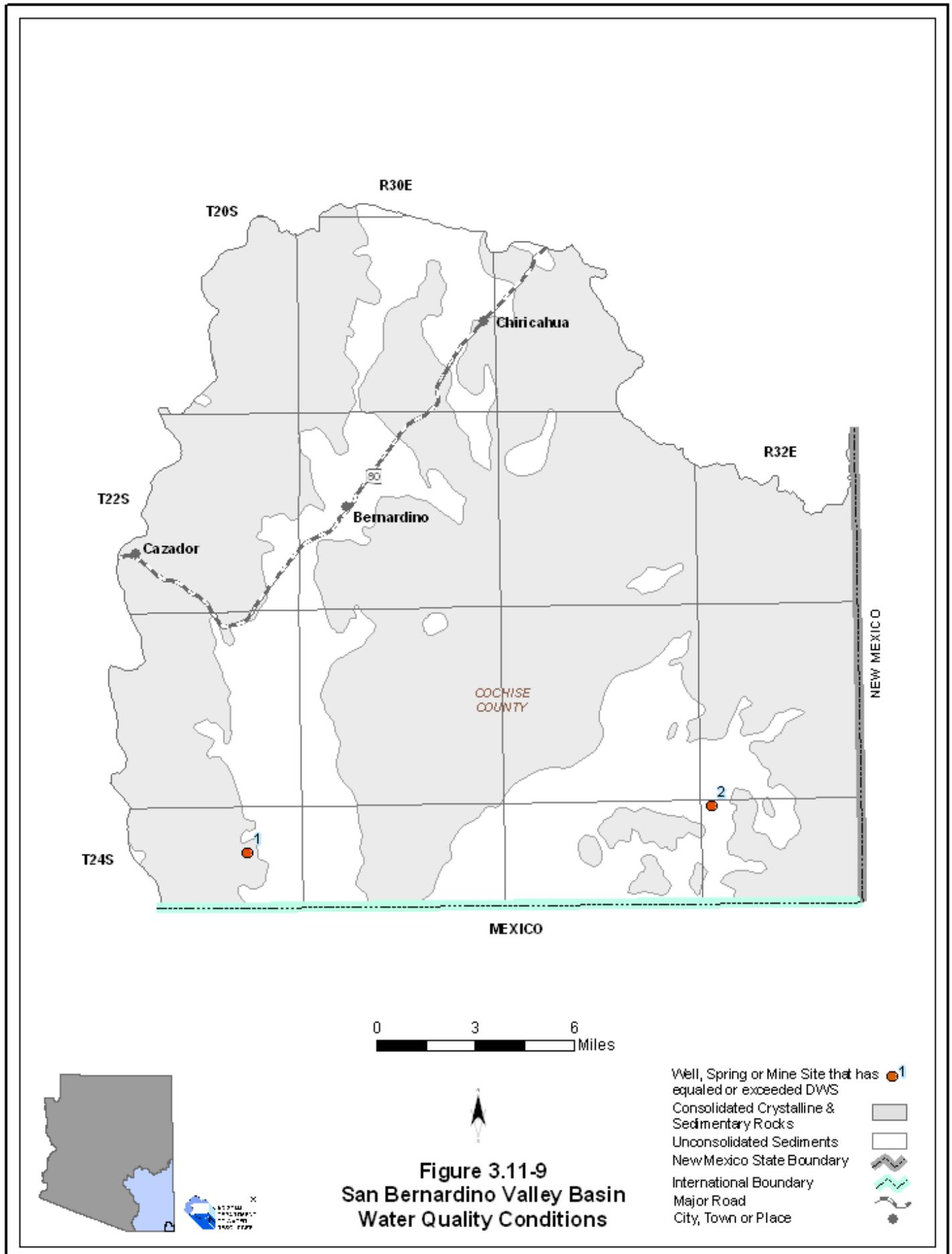
Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard	Parameter(s) Exceeding Use Standard
None identified by ADWR at this time						

Notes:

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

¹ Water quality samples collected between 1974 and 2002.

² NO3 = Nitrate



3.11.8 Cultural Water Demands in the San Bernardino Valley 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 3.11-5. There is no recorded effluent generation in this basin. The USGS National Gap Analysis Program, the source of cultural demand map data, showed no demand centers for this basin. 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 3.11-5.
- Population increased between 1980-1990 and decreased between 1990-2000 but there was an overall increase in population.
- All water use in this basin is groundwater; pumping has decreased from 1971- 2005 with less than 300 acre-feet pumped per year in the period from 1991 - 2005. All demand in this basin is for municipal use.
- As of 2005 there were 164 registered wells with a pumping capacity of less than or equal to 35 gallons per minute and 12 wells with a pumping capacity of more than 35 gallons per minute.

Table 3.11-5 Cultural Water Demands in the San Bernardino Valley 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		111 ²	7 ²	<500			NR			ADWR (1994a)
1972										
1973										
1974										
1975										
1976										
1977										
1978		<500			NR					
1979										
1980	20	11	0	<500			NR			
1981	26									
1982	33									
1983	39									
1984	45									
1985	51									
1986	58			<500			NR			
1987	64									
1988	70									
1989	76									
1990	83	7	2	<300	NR	NR	NR			USGS (2007)
1991	81									
1992	79									
1993	78									
1994	76									
1995	74									
1996	73			<300						
1997	71									
1998	69	8	0	<300	NR	NR	NR			
1999	68									
2000	66									
2001	68									
2002	69	6	2	<300	NR	NR	NR			
2003	71									
2004	72									
2005	74									
2010	82									
2020	95									
2030	105									
WELL TOTALS:		164	12							

Notes:

NR = Not reported

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

² Includes all wells through June 1980.

3.11.9 Water Adequacy Determinations in the San Bernardino Valley Basin

There are no water adequacy applications on file with the Department as of December 2008 for the San Bernardino Valley Basin. 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.

SAN BERNARDINO VALLEY BASIN

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