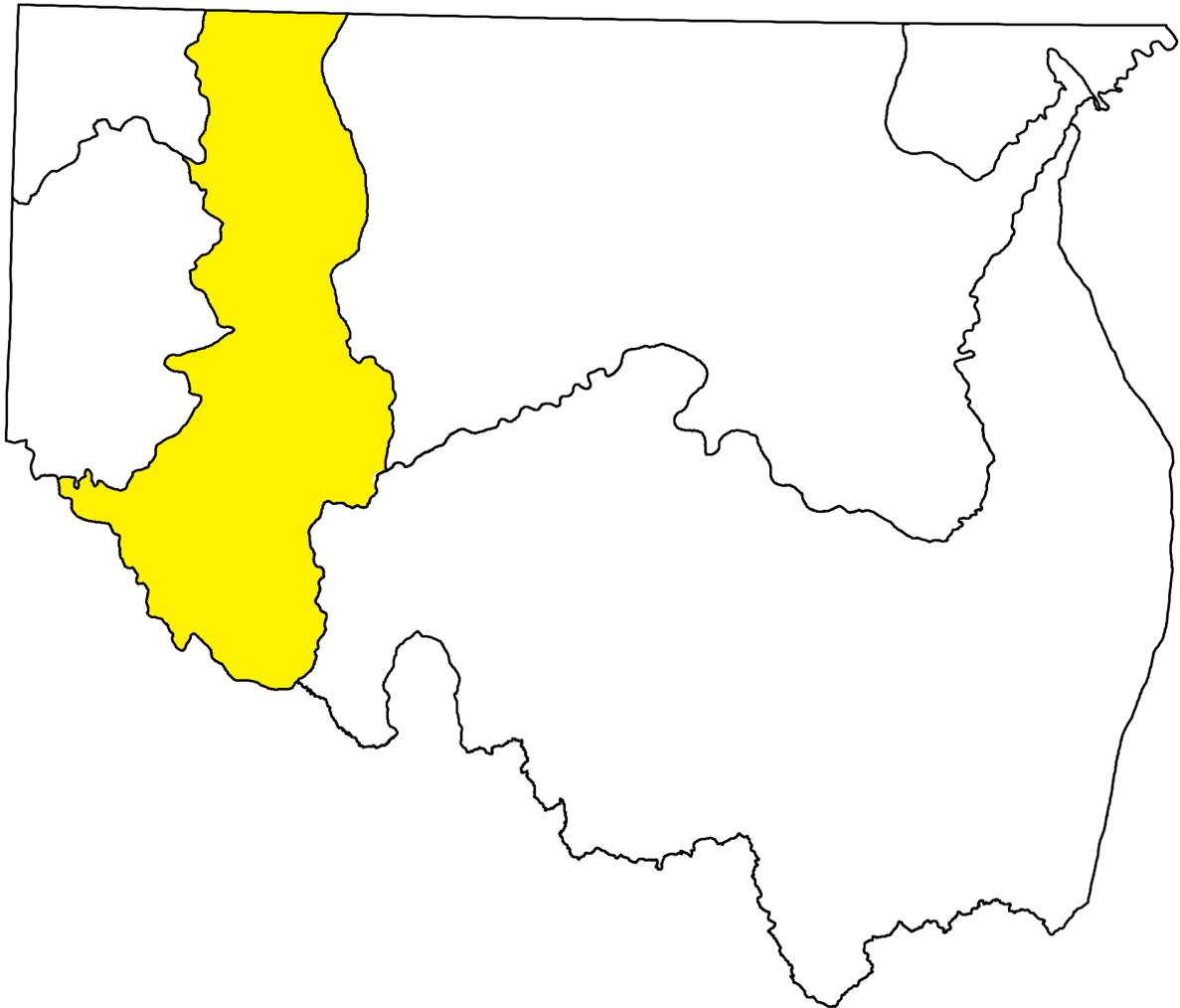


Section 6.5

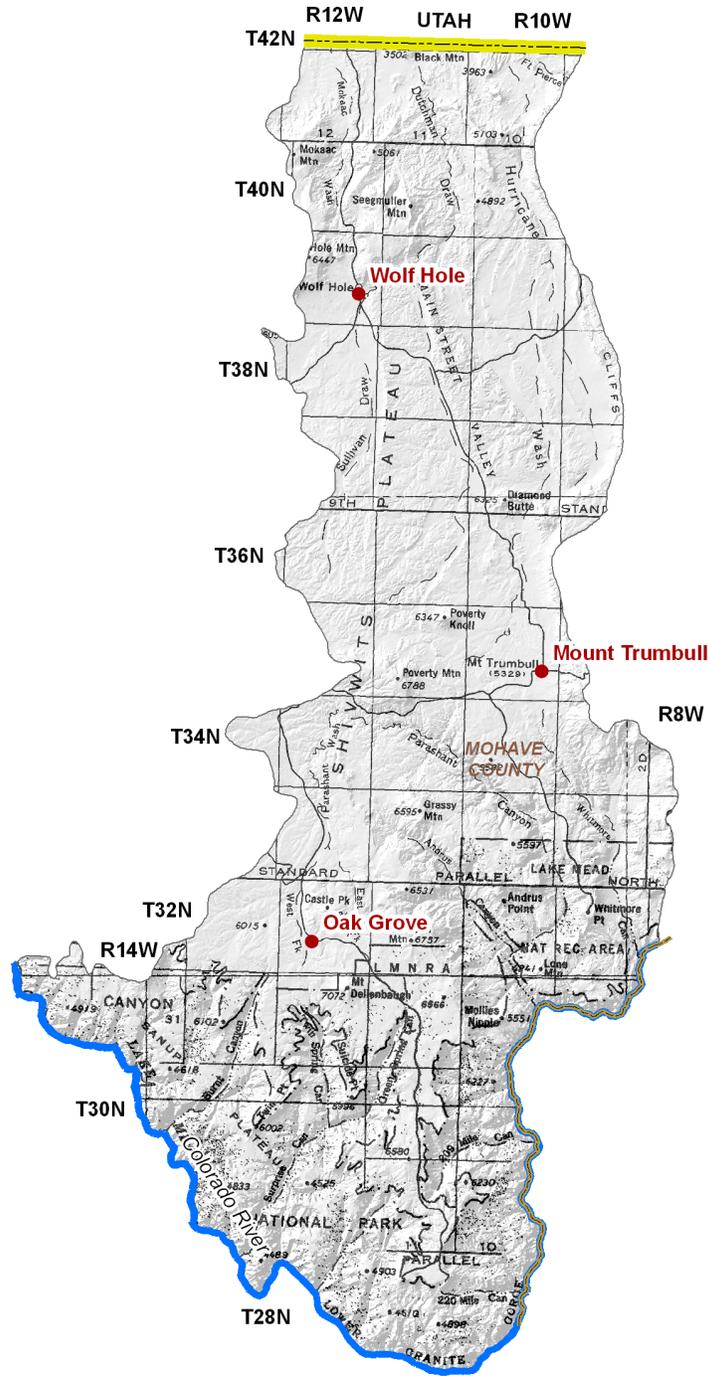
Shivwits Plateau Basin



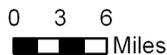
6.5.1 Geography of the Shivwits Plateau Basin

The Shivwits Plateau Basin, located in the central part of the planning area is 1,821 square miles in area. Geographic features and principal communities are shown on Figure 6.5-1. The basin is characterized by plateaus, canyons and cliffs. Vegetation is primarily Great Basin conifer woodland, Great Basin and Mohave desertscrub and plains grassland with small areas of Rocky Mountain montane forest and interior chaparral. (See Figure 6.0-9)

- Principal geographic features shown on Figure 6.5-1 are:
 - Basin places of Wolf Hole, Mount Trumbull and Oak Grove
 - The Colorado River and the Lower Granite Gorge of the Grand Canyon forming the southern basin boundary
 - Shivwits Plateau running north south throughout most of the basin and the Sanup Plateau in the southwest
 - Hurricane Cliffs on the eastern basin boundary
 - Mt. Dellenbaugh, located south of Oak Grove, the highest point in the basin at 7,072 feet



Base Map: USGS 1:500,000, 1981



Utah State Boundary
 COUNTY
 City, Town or Place



Figure 6.5-1
Shivwits Plateau Basin
Geographic Features

6.5.2 Land Ownership in the Shivwits Plateau Basin

Land ownership, including the percentage of ownership by category, for the Shivwits Plateau Basin is shown in Figure 6.5-2. Principal features of land ownership in this basin are the large parcels of land managed by the U.S. Bureau of Land Management (BLM) and National Park Service (NPS). Thirty-four percent of the basin is managed jointly by the BLM and NPS as the Grand Canyon-Parashant National Monument. 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.

U.S. Bureau of Land Management (BLM)

- 53.7% of the land is federally owned and managed by the Arizona Strip Field Office of the Bureau of Land Management.
- BLM land in the basin includes a portion of the Grand Canyon-Parashant National Monument and the 14,650 acre Mt. Logan Wilderness, located south of Mount Trumbull.
- Land use includes grazing, recreation and resource conservation.

National Park Service (NPS)

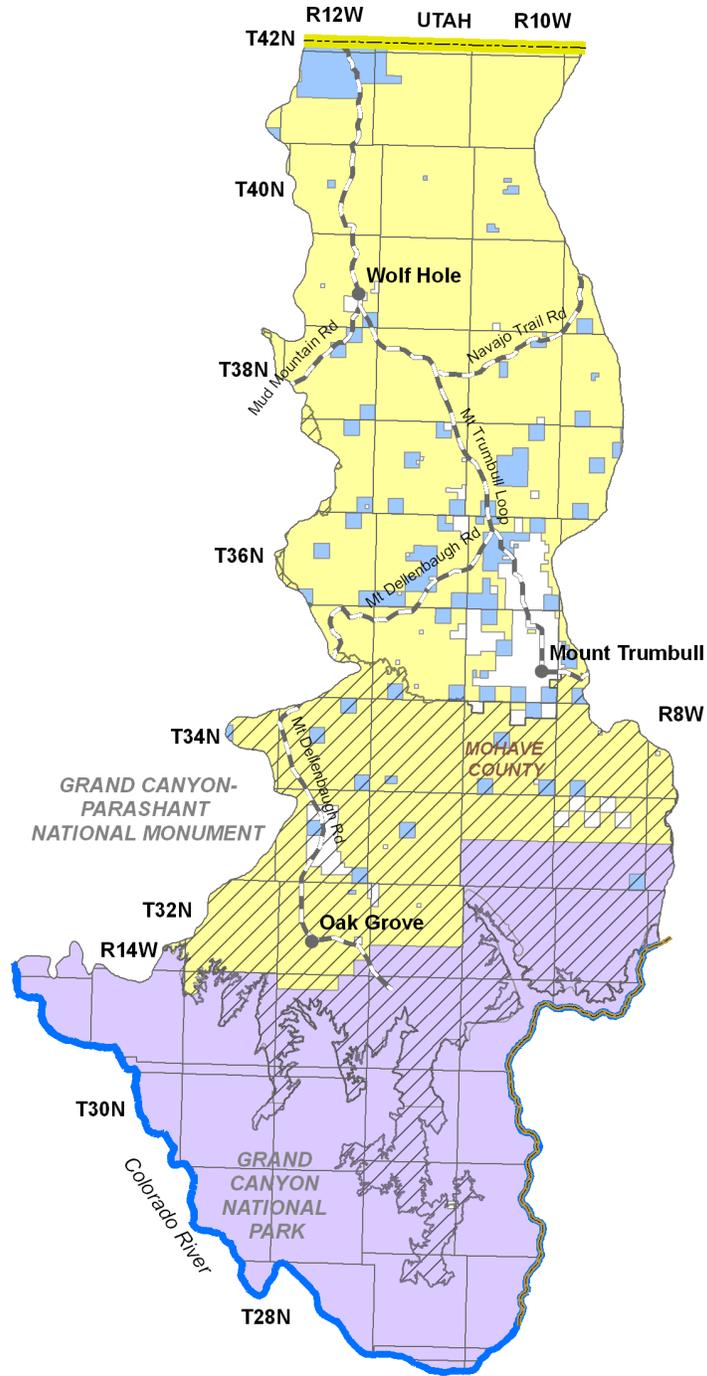
- 38.1% of the land is federally owned and managed by the National Park Service as the Grand Canyon National Park and the Grand Canyon-Parashant National Monument.
- Land use includes resource conservation and recreation.

State Trust Land

- 4.9% of the land is held in trust for the public schools under the State Trust Land system.
- State land is located throughout most of the basin and is interspersed with BLM and private lands.
- Primary land use is grazing.

Private

- 3.3% of the land is private.
- The majority of the private land is in the vicinity of Mt. Trumbull and north of Oak Grove.
- Land uses include domestic and ranching.



**Land Ownership
(Percentage in Basin)**

- U.S. Bureau of Land Management (53.7%) 
- National Park Service (38.1%) 
- State Trust (4.9%) 
- Private (3.3%) 
- National Monument 
- Utah State Boundary 
- COUNTY 
- Major Road 
- City, Town or Place 

0 3 6
Miles



**Figure 6.5-2
Shivwits Plateau Basin
Land Ownership**



Source: ALRIS, 2004
Bureau of Land management, 1999 & 2000

6.5.3 Climate of the Shivwits Plateau Basin

The Shivwits Plateau Basin does not contain NOAA/NWS, Evaporation Pan, AZMET or SNOTEL/Snowcourse stations. Figure 6.5-3 shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. A description of the climate data sources and methods is found in Volume 1, Section 1.3.3.

SCAS Precipitation Data

- See Figure 6.5-3
- Average annual rainfall is as high as 20 inches along the central eastern basin boundary and as low as four inches at the Colorado River on the basin's western boundary.

Table 6.5-1 Climate Data for the Shivwits Plateau Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average 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:

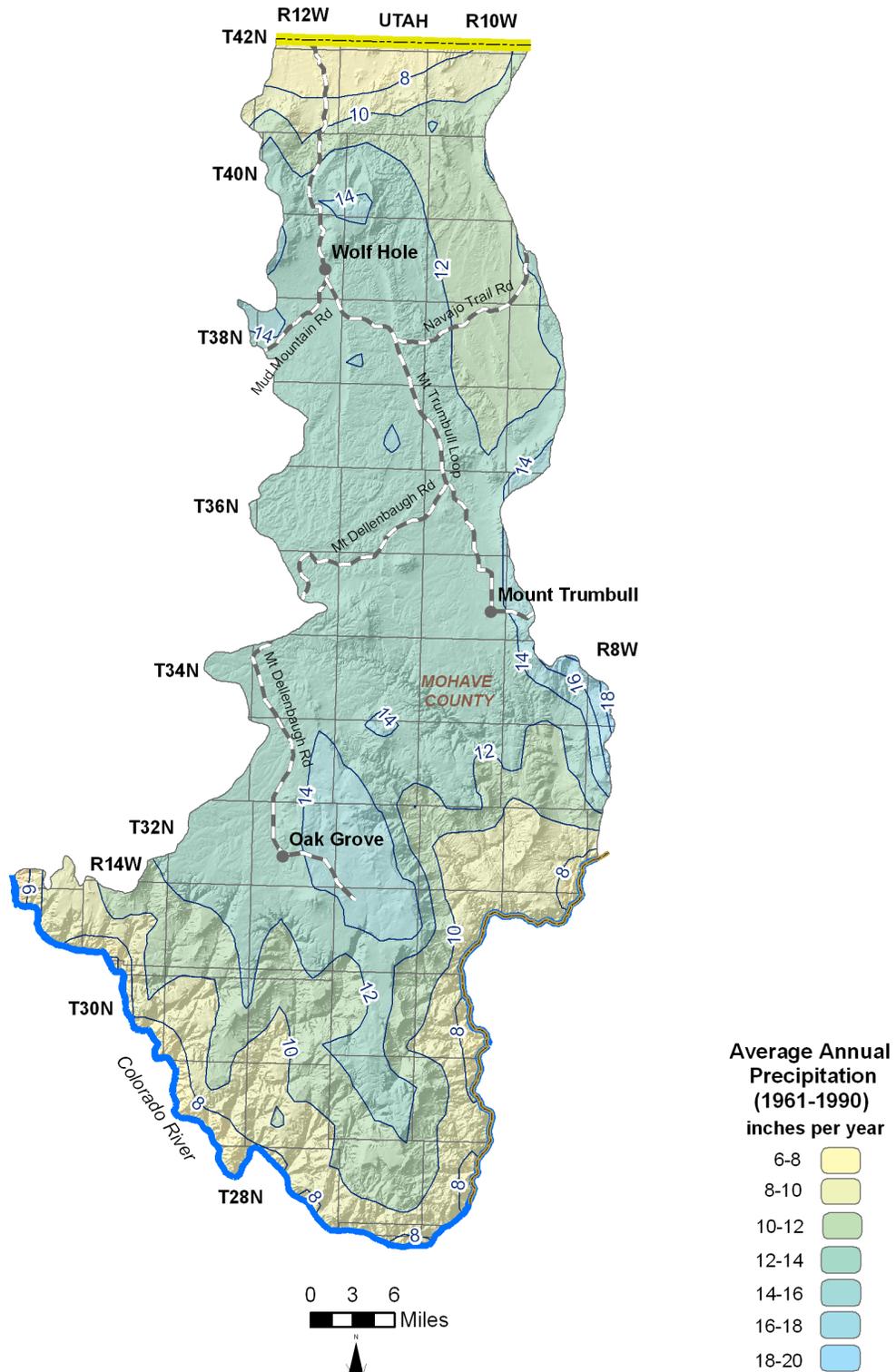
Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Annual Reference Evapotranspiration, in inches (Number of years to calculate averages)
None			

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: NRCS, 2005



Precipitation Data Source: Oregon State University, 1998

Figure 6.5-3
Shivwits Plateau Basin
Meteorological Stations
and Annual Precipitation

- Precipitation Contour
- Utah State Boundary
- COUNTY
- Major Road
- City, Town or Place

6.5.4 Surface Water Conditions in the Shivwits Plateau 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 6.5-4. The USGS runoff contours and large reservoirs are shown on Figure 6.5-4. 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 6.5-4.
- The only large reservoir in the basin is Wolf Hole with a maximum surface area of 58 acres. This reservoir is used for fire protection or as a stock or farm pond.
- Surface water is stored or could be stored in two small reservoirs.
- There are 369 registered stockponds in this basin.

Runoff Contour

- Refer to Figure 6.5-4.
- Average annual runoff is highest, 0.5 inches per year or 26 acre-feet per square mile, in the northwestern portion of the basin near Mud Mountain Road and decreases to 0.1 inches, or five acre-feet per square mile, in the southernmost and central portions of the basin.

Table 6.5-2 Streamflow Data for the Shivwits Plateau Basin

Station Number	USGS Station Name	Drainage Area (in mi ²)	Mean Basin Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow/Year (in acre-feet)				Years of Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
None													

Sources: USGS NWIS, USGS 1998 and USGS 2003.

Table 6.5-3 Flood ALERT Equipment in the Shivwits Plateau Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
None				

Table 6.5-4 Reservoirs and Stockponds in the Shivwits Plateau Basin

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

MAP KEY	RESERVOIR/LAKE NAME <i>(Name of dam, if different)</i>	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 <i>(Name of dam, if different)</i>	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE ²	JURISDICTION
1	Wolf Hole	Private	58	P	NA

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

Total number: 1

Total maximum storage: 20 acre-feet

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

Total number: 1

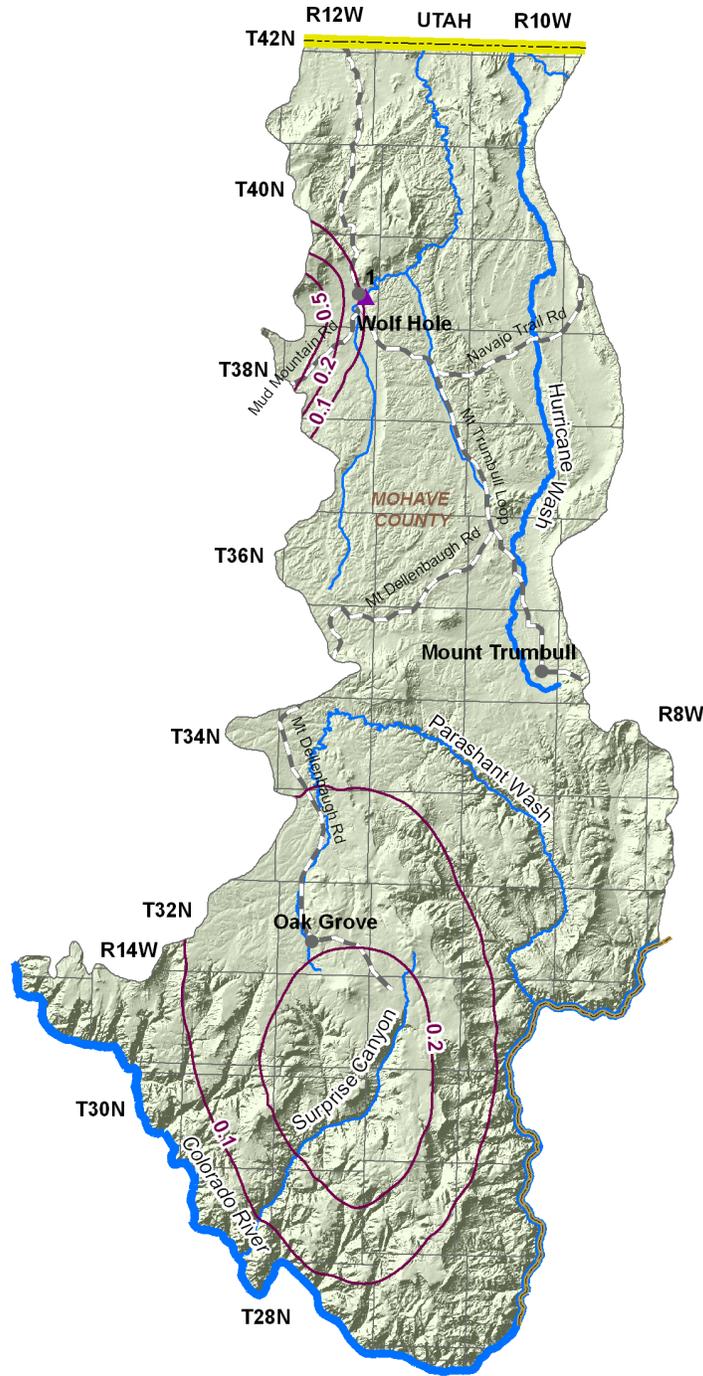
Total surface area: 10 acres

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

Total number: 369

¹ Capacity data not available to ADWR

² P=fire protection, stock or farm pond



Stream Data Source: ALRIS, 2005

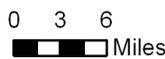


Figure 6.5-4
Shivwits Plateau Basin
Surface Water Conditions

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

Stream Channel (width of line reflects stream order)

Large Reservoir

Utah State Boundary

COUNTY

Major Road

City, Town or Place



6.5.5 Perennial/Intermittent Streams and Major Springs in the Shivwits Plateau Basin

Major springs with discharge rates and date of measurement and the total number of springs in the basin are shown in Table 6.5-5. The locations a major spring and perennial stream are shown on Figure 6.5-5. A description of data sources and methods for intermittent and perennial reaches is found in Volume 1, Section 1.3.16. A description of spring data sources and methods is found in Volume 1, Section 1.3.14.

- There are no intermittent streams and the only perennial stream is the Colorado River.
- There is one major spring in the basin, Spring Canyon located at the Colorado River, with a discharge rate of 331 gallons per minute (gpm).
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 6.5-5B. There are five minor springs in this basin.
- The total number of springs, regardless of discharge, identified by the USGS varies from 51 to 56, depending on the database reference.

Table 6.5-5 Springs in the Shivwits Plateau Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
1	Spring Canyon ²	360107	1132106	331	3/20/2004

B. Minor Springs (1 to 10 gpm):

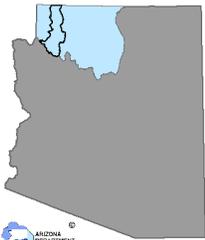
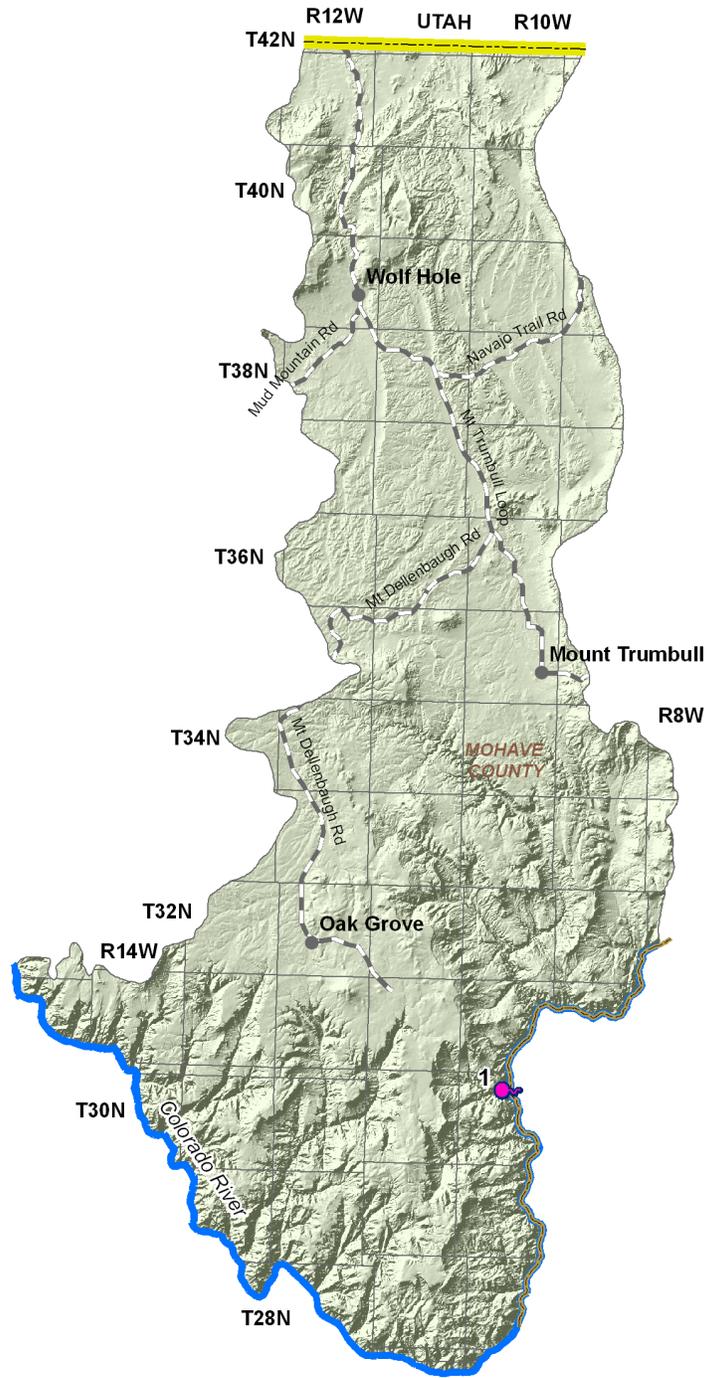
Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Ivanpatch	362340	1132823	3	7/20/1951
Big	362014	1131125	2	8/10/1976
Green	360538	1132825	1	6/18/2000
Poverty	362355	1133251	1	9/8/1976
Russell	363120	1131930	1	7/21/1951

C. Total number of springs, regardless of discharge, identified by USGS (see ALRIS, 2005 and NHD, 2006): 51 to 56

Notes:

¹ Most recent measurement identified by ADWR

² Spring is not displayed on current USGS topo maps



Stream Data Source: AGFD, 1993 & 1997

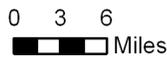


Figure 6.5-5
Shivwits Plateau Basin
Perennial/Intermittent Streams
and Major (>10 gpm) Springs

- Spring 
- Perennial Stream 
- Utah State Boundary 
- COUNTY 
- Major Road 
- City, Town or Place 

6.5.6 Groundwater Conditions of the Shivwits Plateau Basin

Major aquifers, well yields, number of index wells and date of last water-level sweep are shown in Table 6.5-6. Figure 6.5-6 shows water-level change between 1990-1991 and 2003-2004. Figure 6.5-7 contains hydrographs for selected wells shown on Figure 6.5-6. 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 6.5-6 and Figure 6.5-6.
- The major aquifer in the basin is the recent stream alluvium.
- Almost all of the basin geology consists of consolidated crystalline and sedimentary rock.
- Data on groundwater flow direction is not available for this basin.

Well Yields

- Refer to Table 6.5-6
- One source of well yield information, based on 17 reported wells, indicates that the median well yield in this basin is five gallons per minute.

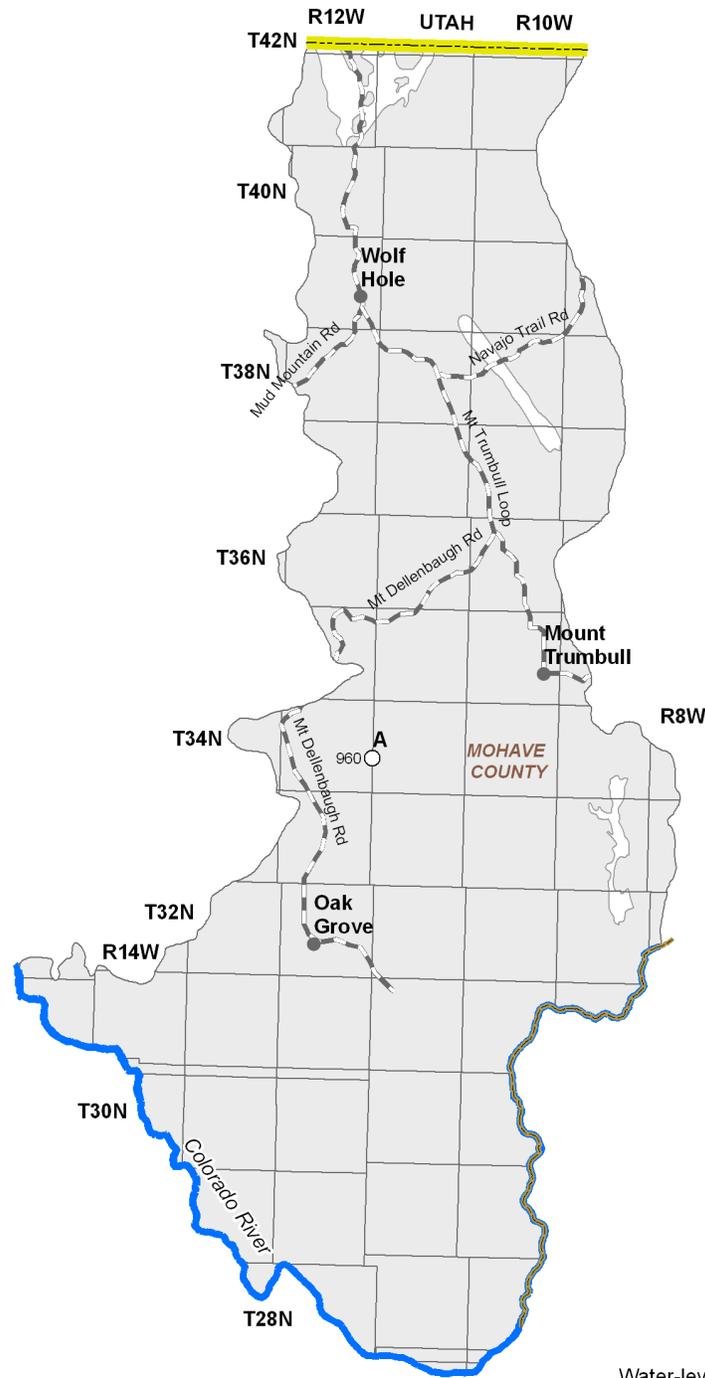
Water Level

- Refer to Figure 6.5-6. Water levels are shown for wells measured in 2003-2004.
- There are no index wells in this basin.
- Water level information is available for one well in this basin, with a depth to water of 960 feet.
- A hydrograph corresponding to the well shown on Figure 6.5-6 is shown in Figure 6.5-7.

Table 6.5-6 Groundwater Data for the Shivwits Plateau Basin

Basin Area, in square miles:	1,821	
	Name and/or Geologic Units	
Major Aquifer(s):	Recent Stream Alluvium	
Well Yields, in gpm:	N/A	Measured by ADWR and/or USGS
	Range 2-35 Median 5 (17 wells reported)	Reported on registration forms for all wells
	Range 0-45	ADWR (1990 and 1994)
	Range 0-10	USGS (1994)
Estimated Natural Recharge, in acre-feet/year:	N/A	
Estimated Water Currently in Storage, in acre-feet:	N/A	
	ADWR (1990 and/or 1994)	
	N/A	
	Arizona Water Commission (1975)	
Current Number of Index Wells:	0	
Date of Last Water-level Sweep:	1976 (9 wells measured)	

N/A=Not Available



Water-level change in feet between
1990-1991 and 2003-2004

375 ^H ○ = number is depth to water in feet
during 2003-2004;
letter is hydrograph

Change Data Not Available ○

Consolidated Crystalline
& Sedimentary Rocks

Unconsolidated Sediments

Utah State Boundary

Major Road

City, Town or Place

0 3 6
Miles



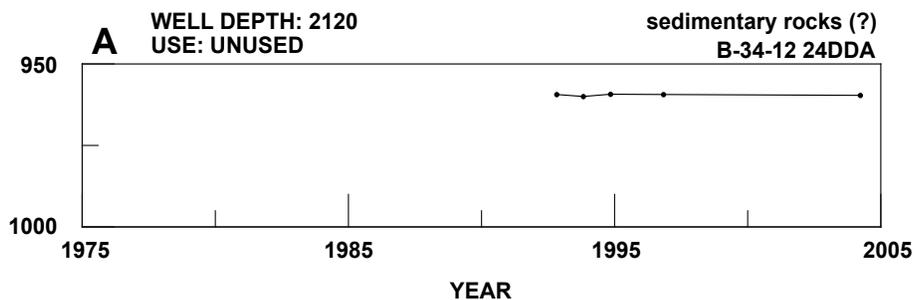
Figure 6.5-6
Shivwits Plateau Basin
Groundwater Conditions



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Figure 6.5-7
Shivwits Plateau Basin
Hydrographs Showing Depth to Water in Selected Wells

Depth To Water In Feet Below Land Surface



6.5.7 Water Quality of the Shivwits Plateau Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 6.5-7A. Impaired lakes and streams with site type, name, length of impaired reach, area of impaired lake, designated use standard and parameter(s) exceeded is shown in Table 6.5-7B. Figure 6.5-8 shows the location of water quality occurrences keyed to Table 6.5-7. 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 6.5-7A.
- One spring has a parameter concentration that has equaled or exceeded the drinking water standard for arsenic.

Lakes and Streams

- Refer to Table 6.5-7B.
- The water quality standard for suspended sediment concentration was exceeded in one 28-mile stream reach, the Colorado River from Parashant Canyon to Diamond Creek. This impaired reach also forms part of the border with the Coconino Plateau Basin.
- This reach is not part of the ADEQ water quality improvement effort called the Total Maximum Daily Load (TMDL) Program at this time.

Table 6.5-7 Water Quality Exceedences in the Shivwits Plateau Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section	
1	Spring	30 North	13 West	24	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
a	Stream	Colorado River (Parashant Canyon to Diamond Creek)	28 ⁴	NA	A&W	SSC

Notes:

NA = Not Applicable

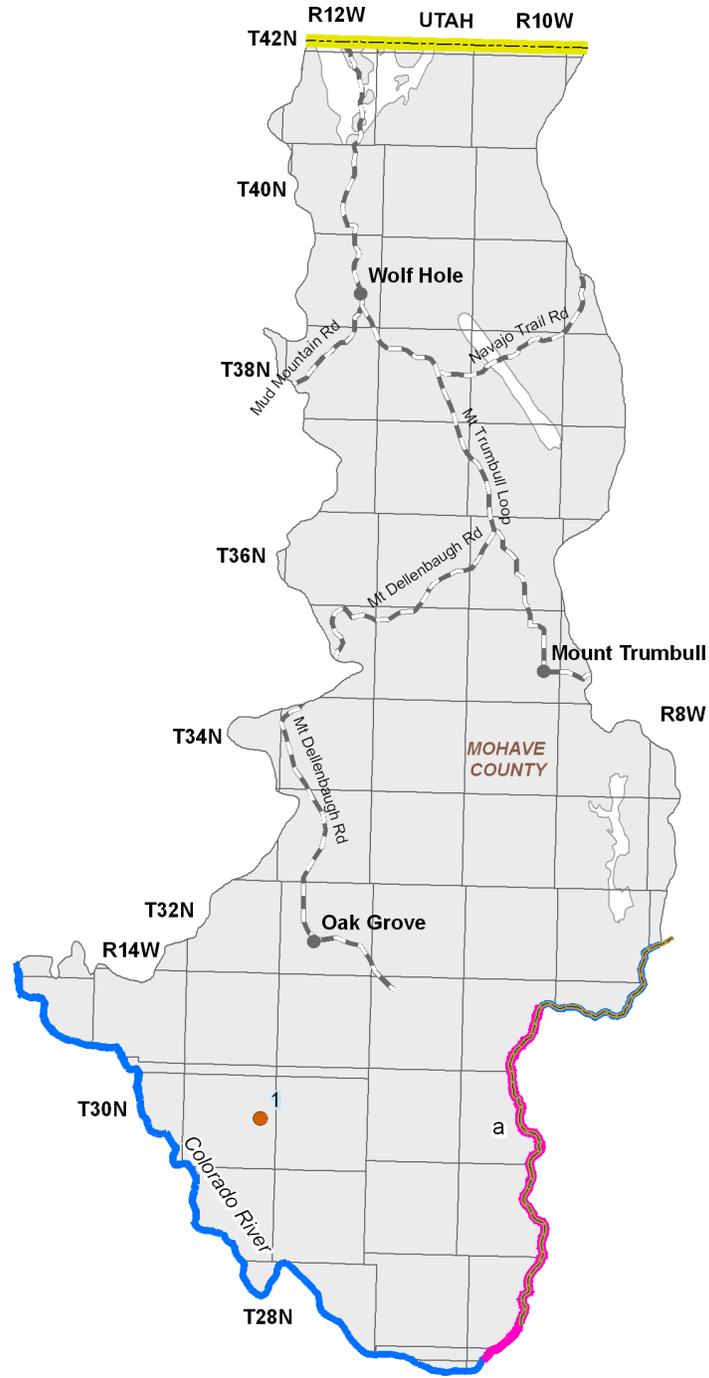
¹ Water quality samples collected between 1976 and 2001.

² As = Arsenic

SSC = Suspended sediment concentration

³ A&W = Aquatic and Wildlife

⁴ Total length of the impaired reach. This reach forms a portion of the border with the Coconino Plateau Basin.



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RESOURCES

0 3 6
Miles



Figure 6.5-8
Shivwits Plateau Basin
Water Quality Conditions

- Well, Spring or Mine Site that has Equaled or Exceeded DWS
- Impaired Stream or Lake
- Consolidated Crystalline & Sedimentary Rocks
- Unconsolidated Sediments
- Utah State Boundary
- COUNTY
- Major Road
- City, Town or Place



6.5.8 Cultural Water Demands in the Shivwits Plateau 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 6.5-8. There is no recorded effluent generation in this basin. The USGS National Gap Analysis Program, the primary 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, Section 1.3.5. More detailed information on cultural water demands is found in Section 6.0.7.

Cultural Water Demands

- Refer to Table 6.5-8
- Population in this basin is very small, with 12 residents in 2000. Projections suggest a small increase in population through 2050.
- There are no recorded surface water uses in this basin. All groundwater use is for municipal demand and has remained relatively constant since 1971.
- As of 2003 there were 18 registered wells with a pumping capacity of less than or equal to 35 gallons per minute and no wells with a pumping capacity of more than 35 gallons per minute.

Table 6.5-8 Cultural Water Demands in the Shivwits Plateau Basin¹

Year	Recent (Census) and Projected (DES) 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	Irrigation	Municipal	Industrial	Irrigation	
1971										
1972										
1973										
1974										
1975										
1976		16 ²	0 ²							
1977										
1978										
1979										
1980	4									
1981	4									
1982	5									
1983	5	0	0							
1984	6									
1985	6									
1986	6									
1987	7									
1988	7	0	0							
1989	8									
1990	8									
1991	8									
1992	9									
1993	9	1	0	<300	NR	NR				
1994	10									
1995	10									
1996	10									
1997	11									
1998	11	0	0	<300	NR	NR				
1999	12									
2000	12									
2001	13									
2002	13	0	0	<300	NR	NR				
2003	14									
2010	18									
2020	27									
2030	40									
2040	61									
2050	91									

ADDITIONAL WELLS:³

1

TOTALS:

18

0

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.
NR - Not reported

Table 6.5-9 Effluent Generation in the Shivwits Plateau Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet)	Disposal Method							Current Treatment Level	Population Not Served	Year of Record
					Water-course	Evaporation Pond	Irrigation	Golf Course	Municipal Reuse	Wildlife Area	Discharged to Another Facility			
No Wastewater Treatment Facilities Identified by ADWR in this Basin														

6.5.9 Water Adequacy Determinations in the Shivwits Plateau Basin

There are no water adequacy applications on file with the Department as of May, 2005 for the Shivwits Plateau 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 6.5-10. Adequacy Determinations in the Shivwits Plateau Basin

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No.	ADWR Adequacy	Reason(s) for Inadequacy	Date of Determination	Water Provider at the Time of
			Township	Range	Section						
None identified by ADWR at this time											

Shivwits Plateau Basin

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