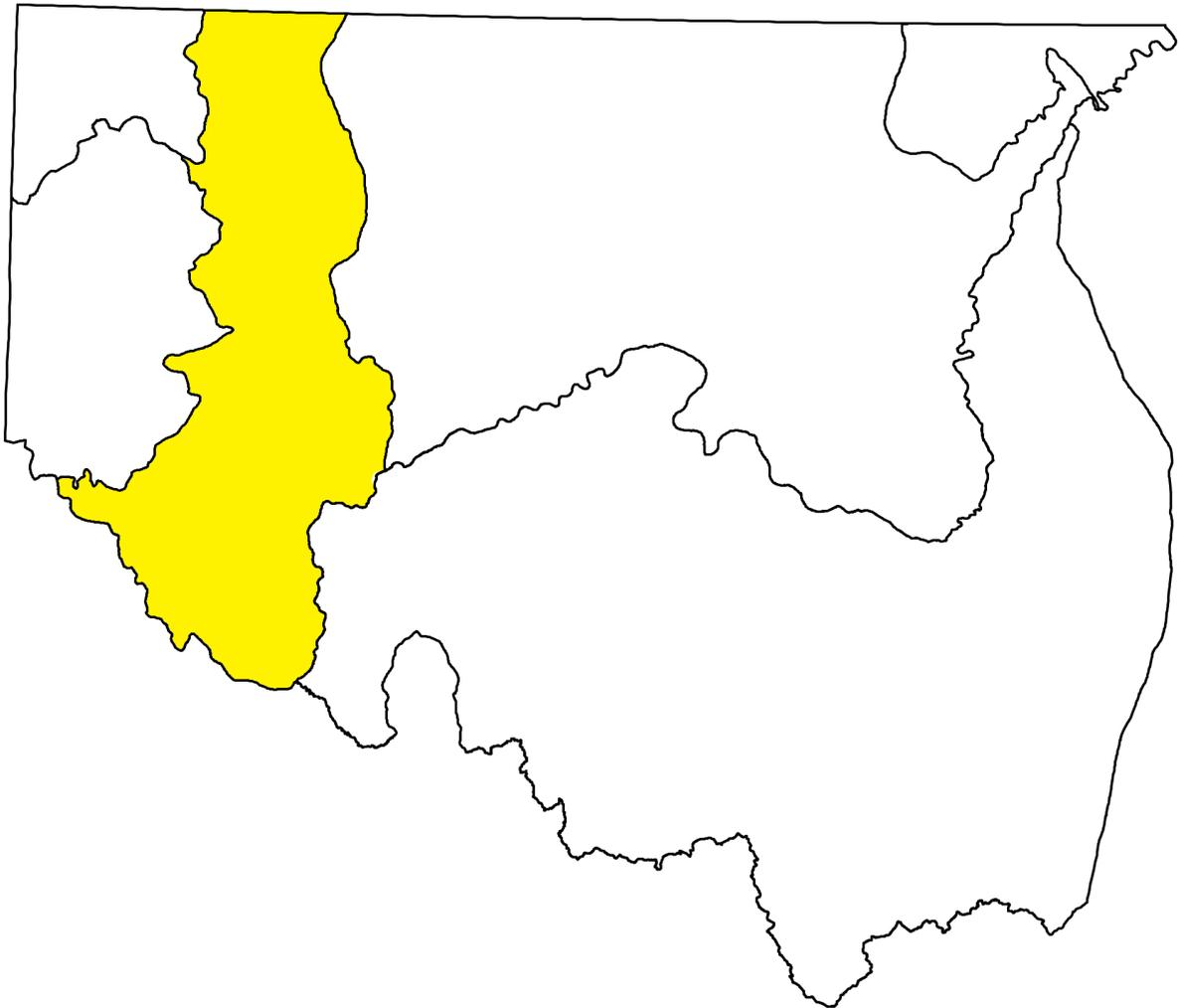


Section 6.5

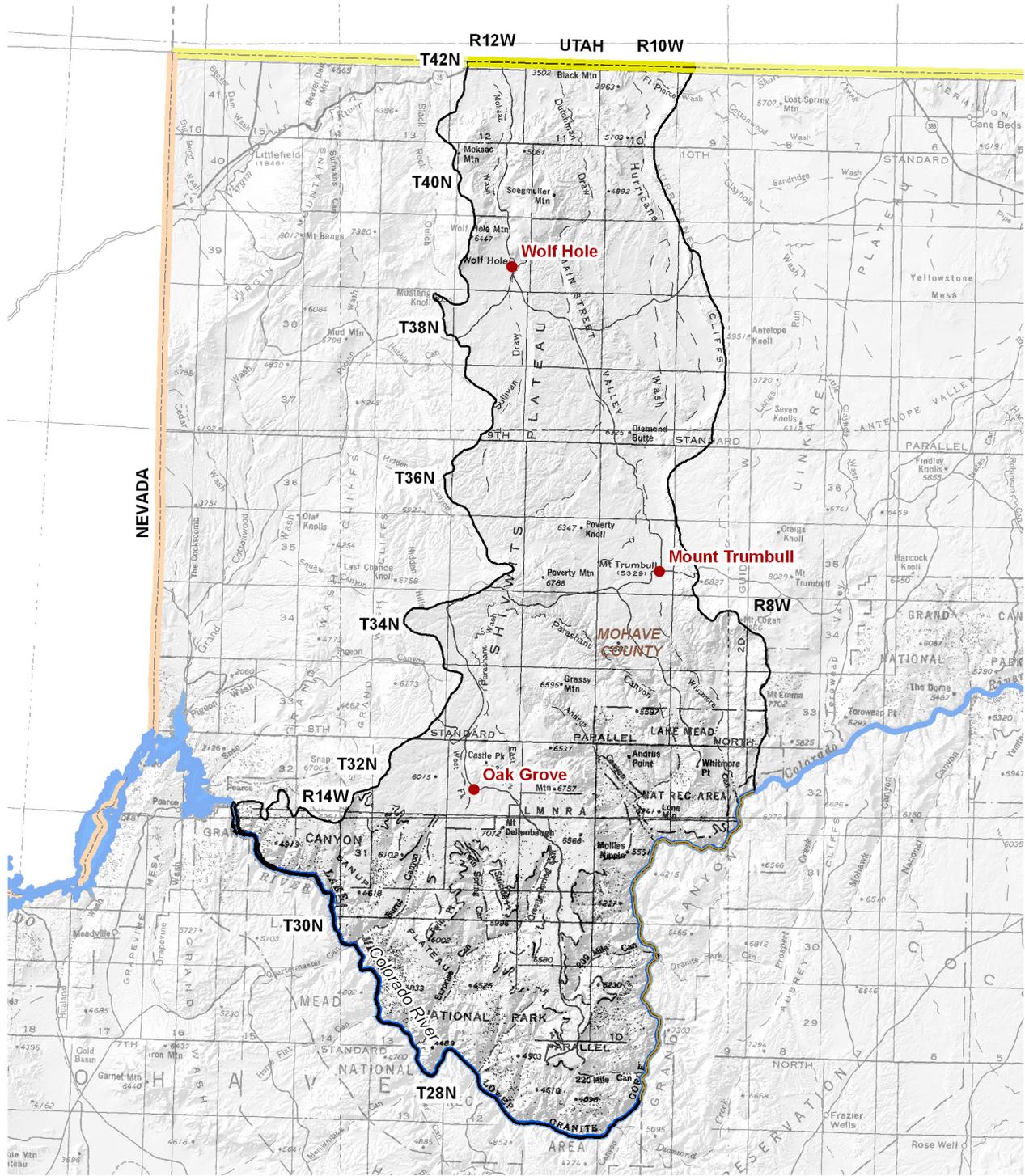
Shivwits Plateau Basin



6.5.1 Geography of the Shivwits Plateau Basin

The Shivwits Plateau Basin, located in the western 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 and Great Basin grassland with small areas of Rocky Mountain and madrean montane forest and interior chaparral. (See Figure 6.0-11)

- Principal geographic features shown on Figure 6.5-1 are:
 - The Colorado River and 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 northeastern basin boundary
 - Mt. Dellenbaugh, located south of Oak Grove, the highest point in the basin at 7,072 feet
 - The lowest point at approximately 1,200 feet where the Colorado River exits the basin.



Base Map: USGS 1:500,000, 1981

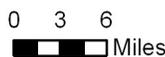


Figure 6.5-1
Shivwits Plateau Basin
Geographic Features

- Nevada State Boundary
- Utah State Boundary
- COUNTY
- City, Town or Place

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, Appendix A. More detailed information on protected areas is found in Section 6.0.4. 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. (see Figure 6.0-14)
- Land use includes grazing, recreation and resource conservation.

National Park Service (NPS)

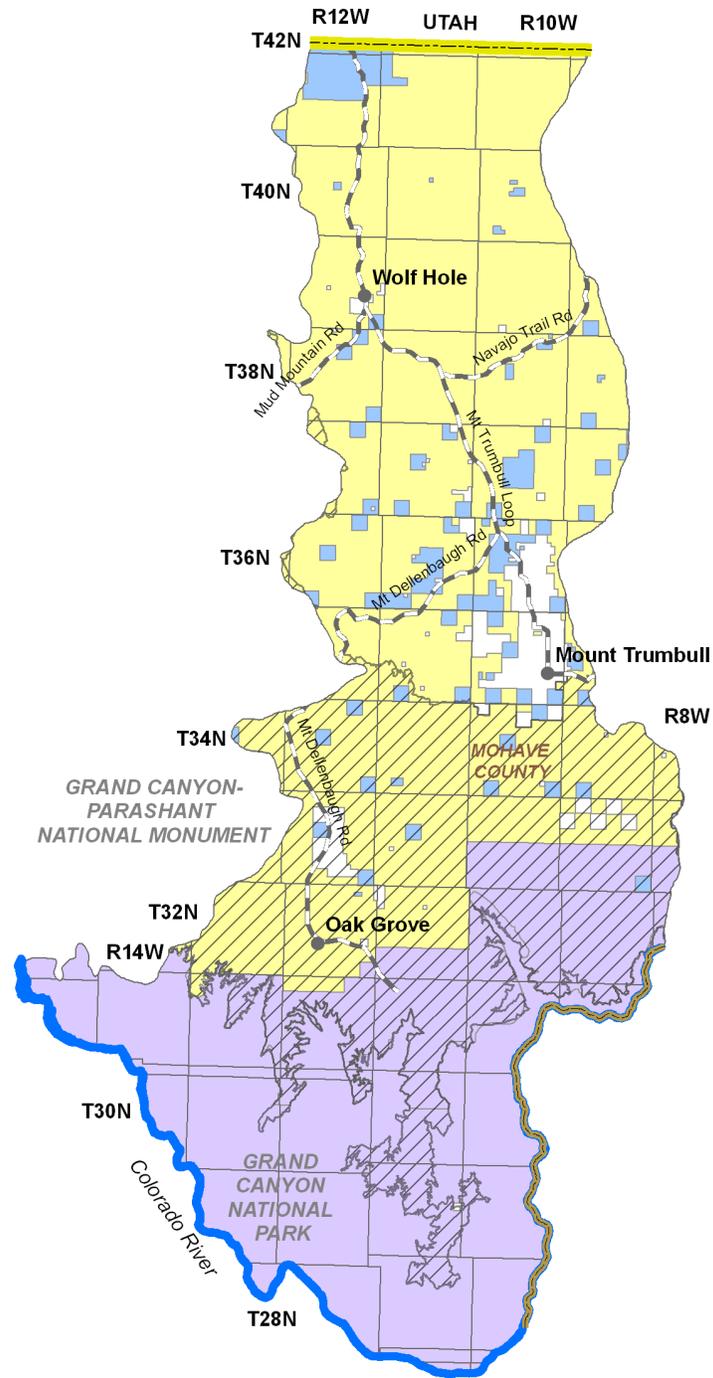
- 38.1% of the land is federally owned and managed by the National Park Service as the Grand Canyon National Park and the Grand Canyon-Parashant National Monument.
- Land use includes resource conservation and recreation.

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. More detailed information on climate in the planning area is found in Section 6.0.3. A description of the climate data sources and methods is found in Volume 1, Appendix A.

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.

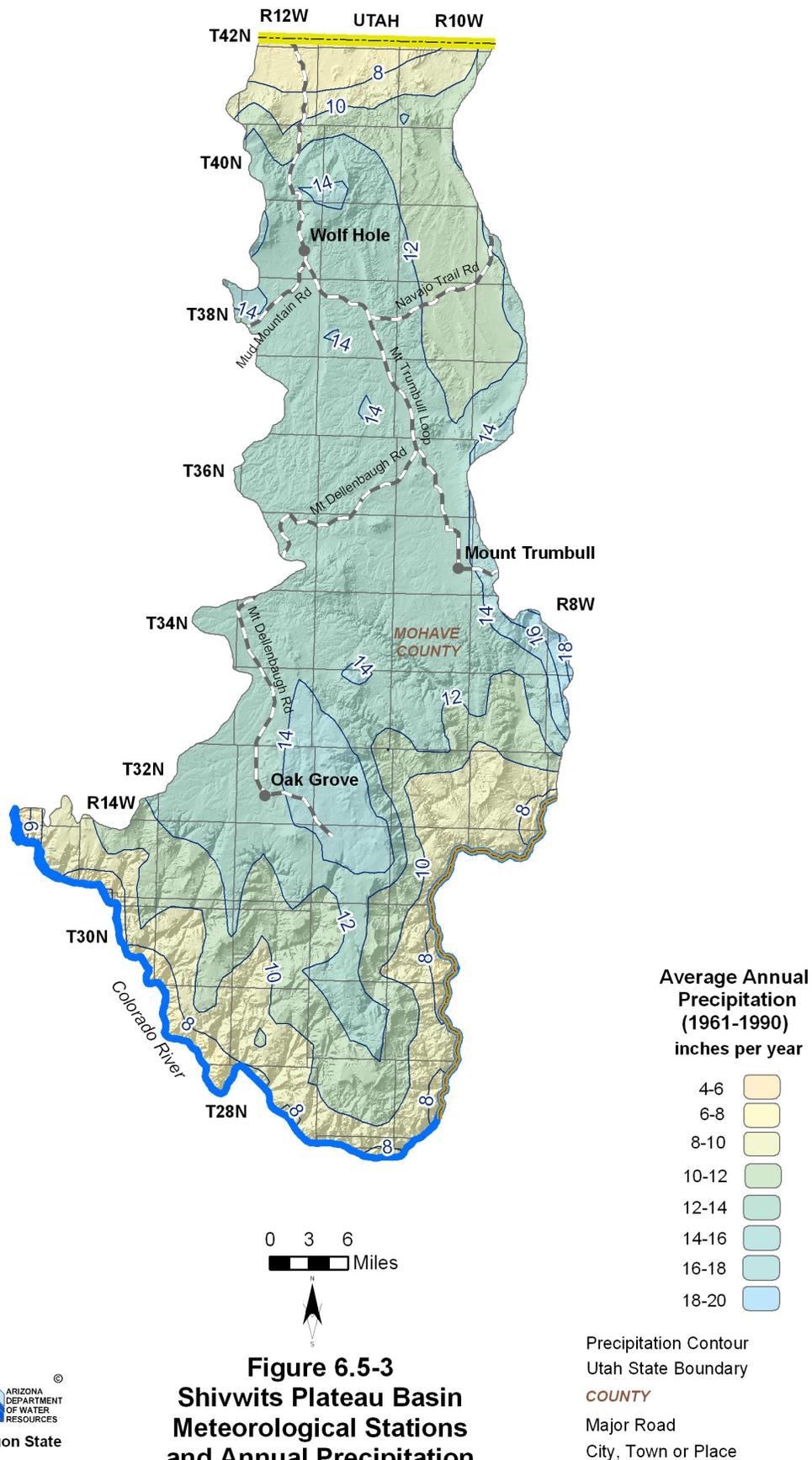


Figure 6.5-3
Shivwits Plateau Basin
Meteorological Stations
and Annual Precipitation

ARIZONA DEPARTMENT OF WATER RESOURCES
 Precipitation Data Source: Oregon State University, 1998

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 6.5-1. The USGS runoff contours and large reservoirs are shown on Figure 6.5-4. Descriptions of stream, reservoir and stockpond data sources and methods are found in Volume 1, Appendix A.

Reservoirs and Stockponds

- Refer to Table 6.5-1.
- 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 26.65 acre-feet per square mile, in the northwestern portion of the basin near Mud Mountain Road and decreases to 0.1 inches, or 5.33 acre-feet per square mile, in the southernmost and central portions of the basin.

Table 6.5-1 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

Source: Compilation of databases from ADWR & others

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

Total number: 1

Total maximum storage: 20 acre-feet

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

Total number: 1

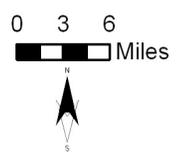
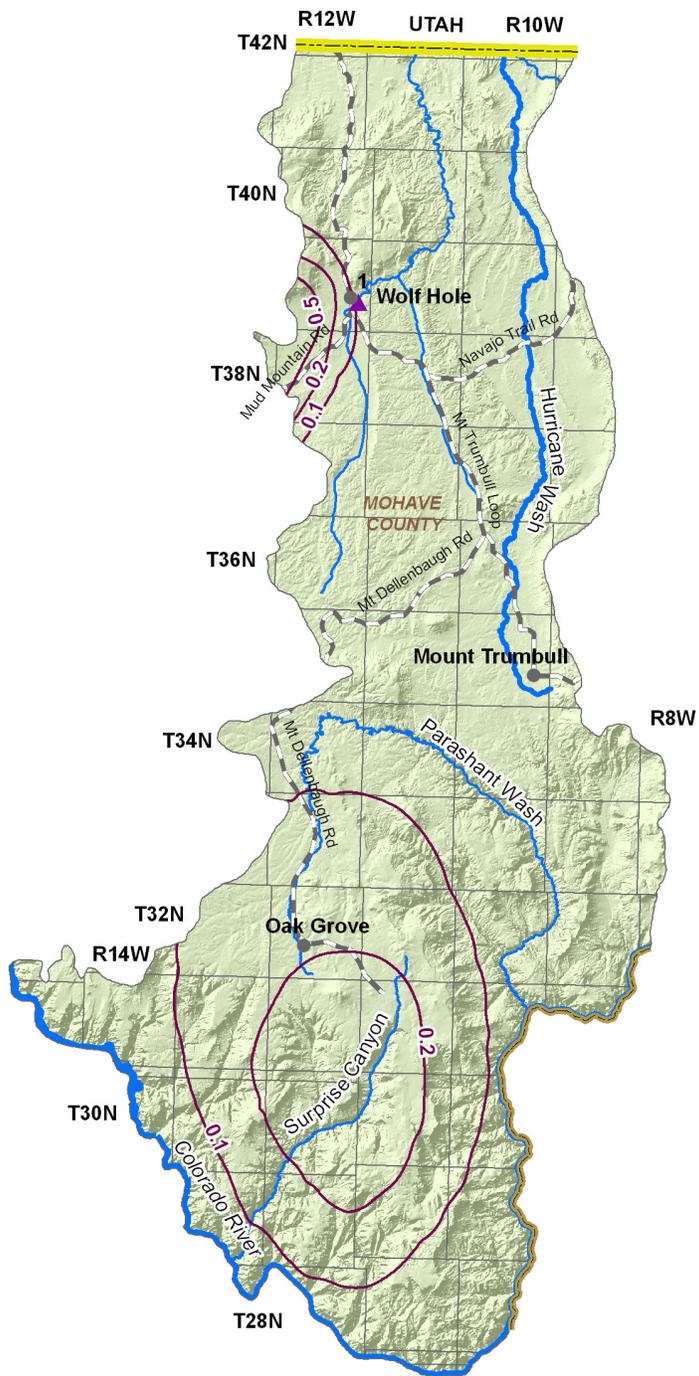
Total surface area: 10 acres

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



- 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

Figure 6.5-4
Shivwits Plateau Basin
Surface Water Conditions

Stream Data Source: ALRIS, 2005

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 6.5-2. The location of a major spring and perennial stream are shown on Figure 6.5-5. Descriptions of data sources and methods for intermittent and perennial reaches and springs are found in Volume 1, Appendix A.

- There are no intermittent streams. Perennial streams include the Colorado River and Boulder Wash.
- 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 6.5-2B. 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 6.5-2 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

Source: Compilation of databases from ADWR & others

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

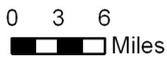


Figure 6.5-5
Shivwits Plateau Basin
Perennial/Intermittent Streams
and Major (>10 gpm) Springs

- 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 6.5-3. Figure 6.5-6 shows water-level change between 1990-1991 and 2003-2004. Figure 6.5-7 contains the hydrograph for the selected well shown on Figure 6.5-6. 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 6.5-3 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 natural recharge, groundwater in storage and groundwater flow direction is not available for this basin.

Well Yields

- Refer to Table 6.5-3
- 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.

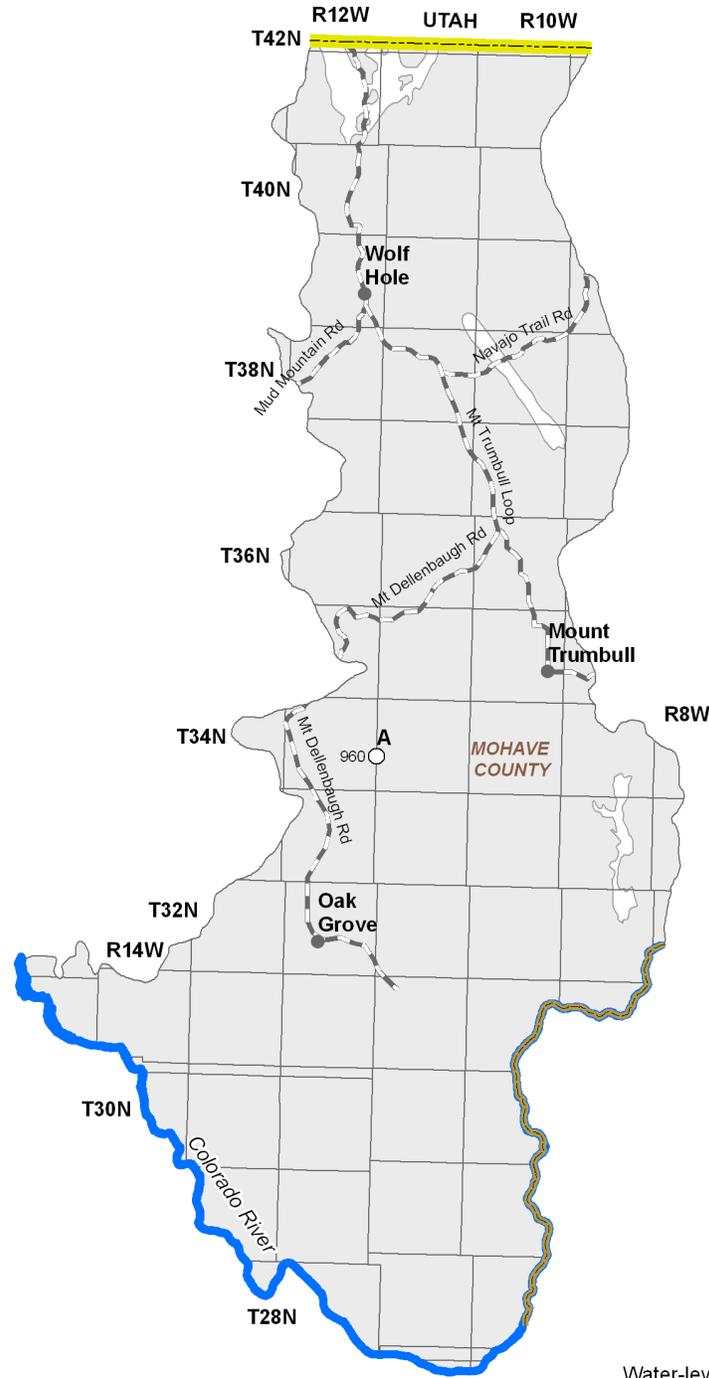
Water Level

- 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, with a depth to water of 960 feet. A hydrograph for this well is shown in Figure 6.5-7.

Table 6.5-3 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:	Range 2-35 Median 5 (17 wells reported)	Reported on registration forms for all wells (Wells55)
	Range 0-45	ADWR (1990 and 1994b)
	Range 0-10	Anning and Duet (1994)
Estimated Natural Recharge, in acre-feet/year:	N/A	
Estimated Water Currently in Storage, in acre-feet:	N/A	
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 $\overset{H}{\circ}$ = number is depth to water in feet
during 2003-2004;
letter is hydrograph

Change Data Not Available \circ

Consolidated Crystalline
& Sedimentary Rocks

Unconsolidated Sediments

Utah State Boundary

Major Road

City, Town or Place



0 3 6
Miles

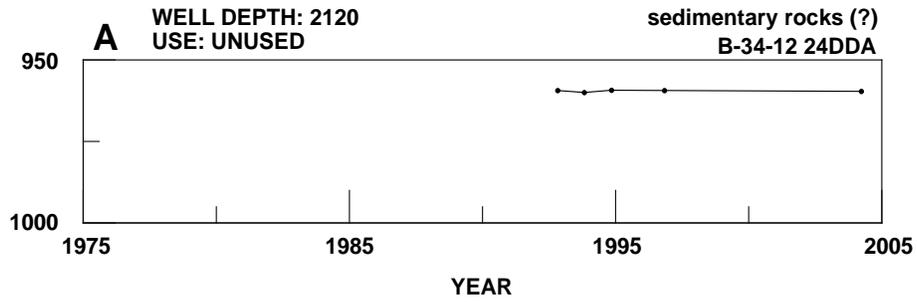


Figure 6.5-6
Shivwits Plateau Basin
Groundwater Conditions



Figure 6.5-7
Shivwits Plateau Basin
Hydrograph Showing Depth to Water

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 6.5-4A. 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 6.5-4B. Figure 6.5-8 shows the location of water quality occurrences keyed to Table 6.5-4. 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 6.5-4A.
- One spring has a parameter concentration that has equaled or exceeded the drinking water standard for arsenic.

Lakes and Streams with impaired waters

- Refer to Table 6.5-4B.
- 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 is located along 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 6.5-4 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

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	Colorado River (Parashant Canyon to Diamond Creek)	28 ⁴	NA	A&W	Se, suspended sediment concentration

Source: ADEQ 2005

Notes:

NA = Not Applicable

¹ Water quality samples collected between 1976 and 2001.

² As = Arsenic

Se = Selenium

³ A&W = Aquatic and Wildlife

⁴ Total length of the impaired reach. This reach is located along part of the border with the Coconino Plateau Basin.

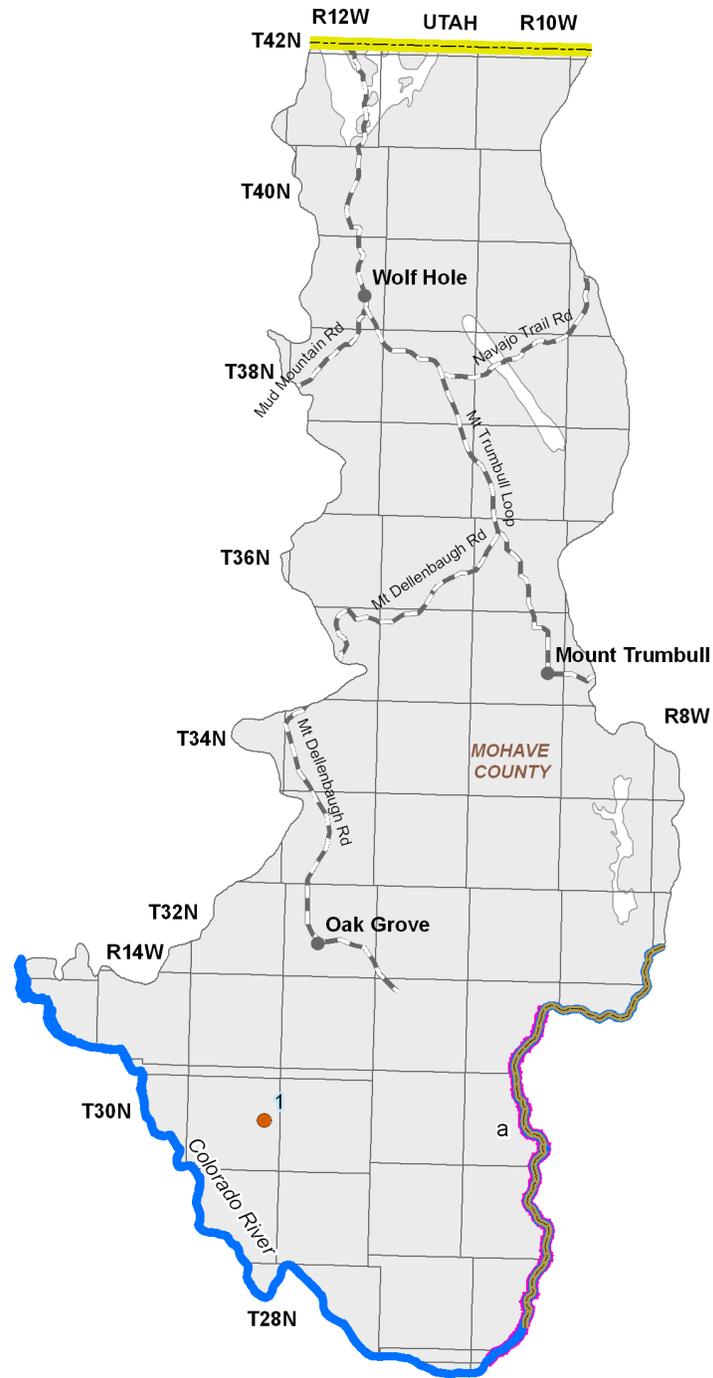


Figure 6.5-8
Shivwits Plateau Basin
Water Quality Conditions

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



6.5.8 Cultural Water Demand 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 6.5-5. 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, Appendix A. More detailed information on cultural water demand is found in Section 6.0.7.

Cultural Water Demand

- Refer to Table 6.5-5
- Population in this basin is very small, with 12 residents in 2000.
- There are no recorded surface water uses in this basin. All groundwater use is for municipal (domestic) demand and has remained relatively constant since 1971.
- As of 2005 there were 17 registered wells with a pumping capacity of less than or equal to 35 gallons per minute (gpm) and two wells with a pumping capacity of more than 35 gpm.

Table 6.5-5 Cultural Water Demand in the Shivwits Plateau 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		14 ²	0 ²	<500			NR			ADWR (1994a)
1972										
1973										
1974										
1975										
1976										
1977										
1978				<500			NR			
1979										
1980	4	0	0	<500			NR			
1981	4									
1982	5									
1983	5									
1984	6									
1985	6									
1986	6									
1987	7			<500			NR			
1988	7									
1989	8	3	0	<300	NR	NR	NR			USGS (2007)
1990	8									
1991	8									
1992	9									
1993	9									
1994	10									
1995	10									
1996	10			<300			NR			
1997	11									
1998	11									
1999	12									
2000	12	0	2	<300	NR	NR	NR			
2001	12									
2002	12									
2003	12									
2004	12									
2005	12									
2010	12									
2020	12									
2030	12									
TOTALS:		17	2							

¹ Does not include evaporation losses from stockponds and reservoirs.

² Includes all wells through 1980.

NR - Not reported

6.5.9 Water Adequacy Determinations in the Shivwits Plateau Basin

There are no water adequacy applications on file with the Department as of December 2008 for the Shivwits Plateau 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.

Shivwits Plateau Basin

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