# Warren Valley Groundwater Basin

- Groundwater Basin Number: 7-12
- County: San Bernardino
- Surface Area: 17,200 acres (26.9 square miles)

## Basin Boundaries and Hydrology

The Warren Valley Basin is located in the northwestern portion of the Colorado Desert Hydrologic Study Area. This basin includes the water-bearing sediments beneath the town of Yucca Valley and the surrounding area. The northern boundary of the basin is the Pinto Mountain fault and the southern boundary is the bedrock outcrop of the Little San Bernardino Mountains. The Warren Valley Basin is bounded on the east by a bedrock constriction called the "Yucca barrier" and on the west by a bedrock constriction and a topographic divide between Warren Valley and Morongo Valley. Precipitation in this basin ranges from 8 to 12 inches per year, with an average rainfall across the basin of about 10 inches (USDA 1999).

## Hydrogeologic Information

### *Water Bearing Formations*

The productive water-bearing materials in this basin consist of unconsolidated to partly consolidated Miocene to Quaternary continental deposits (Mendez and Christensen 1997). The continental deposits regionally are interpreted to range up to 10,000 feet in thickness (Moyle 1984); however, wells in Warren Valley Basin reach as deep as 1,610 feet without encountering bedrock. Geophysical studies suggest that the Warren Valley Basin may exceed a depth of 2,000 feet (Whitt and Jonker 1998).

The main productive water-bearing deposits are unconfined interbedded gravels, conglomerates, and silts deposited in alluvial fan systems (Schaefer 1978, BEE 1994). These deposits have an average of about 11 percent specific yield (Lewis 1972) and well yields up to 4,000 gpm.

### *Restrictive Structures*

The Pinto Mountain fault zone juxtaposes alluvial valley fill material against consolidated bedrock. Data to evaluate whether this fault is a barrier to water at the boundary of the Warren Valley Basin is sparse, but the Pinto Mountain fault is a barrier to groundwater flow toward the east at the Copper Mountain Valley Basin - Joshua Tree Basin boundary (Mendez and Christensen 1997). A north-trending basement high causes a sharp change in water level between the towns of Yucca Valley and Joshua Tree, showing a drop of about 400 feet to the east ("Yucca barrier" of Lewis 1972).

### *Recharge Areas*

Natural recharge to the basin is mainly from direct percolation of precipitation and percolation of ephemeral streamflow from Water Canyon in the north and Covington Canyon in the south (BEE 1994; Mendez and Christensen 1997; Whitt and Jonker 1998). Lewis (1972) suggests that annual recharge may not exceed 200 af, but actual recharge amounts are poorly constrained and quite variable from year to year. Some minor inflow may come from groundwater moving through fractures in the adjacent

bedrock. Percolation of septic tank effluent also contributes to recharge of groundwater. State Water Project water delivered via the Morongo Basin Pipeline provides recharge through spreading grounds near the Yucca Valley Airport (Hanson 1999).

### *Groundwater Level Trends*

Hydrographs of wells in the Warren Valley Basin show water levels in 1998 above the 1986 levels (Hanson 1999). Most hydrographs show a general lowering of water levels from 1986 through about 1992 and then recovery of water levels through 1998. The range in elevation of water levels is up to 220 feet since 1986 (Hanson 1999). Groundwater in the Warren Valley Basin appears to flow northward from the Little San Bernardino Mountains to the Pinto Mountain fault and then east toward Twentynine Palms (Lewis 1972; Mendez and Christensen 1997). Groundwater flows eastward across the "Yucca barrier," a subsurface structure associated with an eastward lowering of groundwater water levels into the Joshua Tree Basin (Lewis 1972).

### *Groundwater Storage*

**Groundwater Storage Capacity.** Lewis (1972) calculated 106,000 af of groundwater in storage in 1958 using a saturated thickness of 150 feet, a specific yield of 11percent, and an area of 6,400 acres. Lewis (1972) assumed that prior to 1948, groundwater levels were probably static. If so, then this storage value would represent a steady-state basin under natural conditions. According to Lewis' maps, additional storage space is available above the water levels of 1958. A total storage capacity of about 568,000 af for the Warren Groundwater Basin can be estimated using an area of 17,200 acres, an average specific yield of 11 percent, and an average total thickness of 300 feet.

**Groundwater in Storage.** Lewis (1972) calculated 106,000 af of groundwater in storage in 1958 using 150 feet saturated thickness, 11percent specific yield, and 6,400 acres. The annual report of the Warren Valley Basin Watermaster (Hanson 1999) does not determine available storage.

### *Groundwater Budget (Type-A)*

Not enough data exist to compile a detailed groundwater budget for this basin. For the 1998-1999 water year, total extraction amounted to 2,201 af which includes 312 af pumped by the Blue Skies Country Club mainly for irrigation of a golf course (Hanson 1999). HDWD recharges State Water Project water, which amounted to 2,237 af for water year 1998-1999 (Hanson 1999). An estimate of natural recharge rate for this area was determined to be about 2.8 percent of precipitation by Whitt and Jonker (1998). Using the area of the watersheds for the basin, the reported precipitation, and a 2.8 percent recharge rate, the natural recharge for water year 1998-1999 is estimated to be about 330 af.

### *Groundwater Quality*

**Characterization.** Water quality data for 1999 from the Hi-Desert Water District (HDWD 2000) indicates that the average water has calcium-sodium bicarbonate character. Total dissolved solids concentration ranges from 129

to 269 mg/L, with an average of 196 mg/L (HDWD 2000). Electrical conductivity ranges from 290 to 450 μmhos/cm and averages about 360 μmhos/cm (HDWD 1999).

**Impairments.** Fluoride concentration of groundwater exceeds 1.4 mg/l in some wells in the Warren Valley Basin (BEE 1994).

## Water Quality in Public Supply Wells

| Constituent Group[1] | Number of wells sampled[2] | Number of wells with a concentration above an MCL[3] |
|---|---|---|
| Inorganics – Primary | 18 | 1 |
| Radiological | 18 | 1 |
| Nitrates | 18 | 5 |
| Pesticides | 16 | 0 |
| VOCs and SVOCs | 16 | 0 |
| Inorganics – Secondary | 18 | 3 |

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

## Well Production characteristics

| | Well yields (gal/min) | |
|---|---|---|
| Municipal/Irrigation | Range: 10 - 4,000 | Average: 350 (25 wells) |
| | **Total depths (ft)** | |
| Domestic | | |
| Municipal/Irrigation | | |

## Active Monitoring Data

| Agency | Parameter | Number of wells /measurement frequency |
|---|---|---|
| Hi Desert WD | Groundwater levels. | 17 wells/monthly (Brown 2000). |
| Hi Desert WD | Minerals, organic and inorganic chemicals. | 11 wells/quarterly (Schwab 2000). |
| Hi Desert WD | Coliform. | 11 wells/weekly (Schwab 2000). |
| U.S. Geological Survey | Quality | 7 |
| U.S. Geological Survey | Groundwater levels. | 10 |

## Basin Management

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|---|---|
| Groundwater management: | The Hi Desert WD is the court appointed watermaster for this adjudicated basin. The Warren Valley Basin Management Plan was adopted in 1991 (Hanson 1999). |
| Water agencies | |
| Public | Hi Desert WD, Mojave Water Agency. |
| Private | |

## Selected Bibliography

Akers, J.P. 1986. Geohydrology and Potential for Artificial Recharge in the Western Part of the U.S. Marine Corps Base, Twentynine Palms, California, 1982-83. U.S. Geological Survey Water-Resources Investigations Report 84-4119. 18 p.

Bader, J.S. 1963. Effect of Faulting in Alluvium on the Occurrence, Movement, and Quality of Ground Water in the Twentynine Palms Area, California (abstract). Geological Society of America Special Paper 73. 22 p.

_____. 1966. Records of Water Level and Pumpage in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report. 3 p.

Bookman-Edmonston Engineering Inc. (BEE). 1994. Regional Water Management Plan. Mojave Water Agency, Apple Valley, California. 135 p.

Brown, J. 2000. Hi Desert Water District. Telephone conversation with R.R. Davis (Department of Water Resources), August 22, 2000.

California Department of Water Resources (CDWR). 1960. Data on Water Wells and Springs in the Yucca Valley-Twentynine Palms Area, San Bernardino and Riverside Counties, California. Bulletin 91-2. 163 p.

_____. 1984. Twentynine Palms Ground Water Study. Southern District Report. 109 p.

Downing, D.J. 1974. Records of Water Level and Pumpage for 1973 in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report. 15 p.

_____. 1977. Ground-Water Data for 1974-75 in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report 77-80. 34 p.

_____. 1978. Ground-Water Data for 1976-77 in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report 78-854. 34 p.

Freckleton, J.R. 1982. Ground Water in the Twenty-Nine Palms Indian Reservation and Vicinity, San Bernardino County, California. U.S. Geological Survey Water-Resources Investigations Report 82-4060. 46 p.

Hanson, J.C. 1999. Annual Report of the Warren Valley Basin Watermaster for Water Year 1998-99. Yucca Valley, California: Hi Desert Water District.

Hi Desert Water District (HDWD). 1999. 1998 Annual Water Quality Report. April 1999. Yucca Valley. 2 p.

Hi Desert Water District (HDWD). 2000. WaterNotes: Annual Water Quality Report. June 2000. Yucca Valley. 4 p.

Lewis, R.E. 1972. Ground-Water Resources of the Yucca Valley-Joshua Tree Area, San Bernardino County, California. U.S. Geological Survey Open-File Report. 51 p.

Mendez, G.O. and A.H. Christensen. 1997. Regional Water Table (1996) and Water-Level Changes in the Mojave River, the Morongo, and the Fort Irwin Ground-Water Basins, San Bernardino County, California. U.S. Geological Survey Water-Resources Investigations Report 97-4160. 34 p.

Miller, G.A. 1968. Test-Drilling and Pumping-Test Data, Joshua Tree National Monument, California, 1968. U.S. Geological Survey Open-File Report. 13 p.

_____. 1970. Records of Water Level and Pumpage for 1969 in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report. 17 p.

_____. 1971. Records of Water Level and Pumpage for 1970 in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report. 16 p.

_____. 1972. Records of Water Level and Pumpage for 1971 in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report. 17 p.

_____. 1973. Records of Water Level and Pumpage for 1972 in Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report. 17 p.

Moyle, W.R., Jr. 1974. Geohydrologic Map of Southern California. U.S. Geological Survey Water-Resources Investigations Report 48-73.

_____. 1984. Bouguer Gravity Anomaly Map of the Twentynine Palms Marine Corps Base and Vicinity, California. U.S. Geological Survey Water-Resources Investigations Report 84-4005.

Schaefer, D.H. 1978. Ground-Water Resources of the Marine Corps Base, Twentynine Palms, San Bernardino County, California. U.S. Geological Survey Water-Resources Investigations Report 77-37. 29 p.

Schwab, S. 2000. Hi Desert Water District. Telephone conversation with R.R. Davis (Department of Water Resources), August 22, 2000.

United States Department of Agriculture (USDA). 1999. *California Annual Precipitation*, scale 1:850,000, 1 sheet.

Weir, J.E., Jr., and J.S. Bader. 1963. Ground Water and Related Geology of Joshua Tree National Monument, California. U.S. Geological Survey Open-File Report. 123 p.

Whitt, A. and K. Jonker. 1998. Groundwater Survey of the Joshua Tree and Copper Mountain Subbasins, Joshua Tree, California. Consultant's report prepared by Western Water Surveys for Joshua Basin Water District.

## Errata

Changes made to the basin description will be noted here.