

Bear Valley Groundwater Basin

- Groundwater Basin Number: 8-9
- County: San Bernardino
- Surface Area: 19,600 acres (30.6 square miles)

Basin Boundaries and Hydrology

This groundwater basin underlies Bear Valley and is bound by crystalline rocks of the San Bernardino Mountains in southern San Bernardino County. Big Bear Lake, which lies in the western portion of the valley, receives runoff from Grout Creek to the northwest, Van Dusen Canyon to the northeast, Sawmill Canyon to the southeast, Sand Canyon to the southeast, Knickerbocker and Metcalf Creek to the south and North Creek to the southwest. Baldwin Lake, typically dry, lies the northeast portion of the valley, and receives occasional runoff from Van Dusen Canyon to the northwest and Shay Creek to the south (Geoscience 2001). Average annual precipitation to the valley ranges from 23 to 29 inches.

Hydrogeologic Information

Water Bearing Formations

Groundwater in the Bear Valley Groundwater Basin is found primarily in the unconsolidated alluvial deposits. The water-bearing deposits in the valley have been separated into upper, middle, and lower aquifers (Geoscience 1999). The upper and middle aquifers are the primary water producers. In addition, wells completed in underlying bedrock produce as much as 300 gpm (Geoscience 1999).

Upper Aquifer. The upper aquifer is composed of Holocene alluvium, which typically consists of sand and gravel deposits that transmit water readily. This aquifer extends through the eastern part of the basin where it reaches more than 200 feet thick, but is thin and unsaturated in the western part of the basin (Geoscience 2001). Groundwater found in this aquifer is generally unconfined to semi-confined (Geoscience 1999).

Middle Aquifer. The middle aquifer is primarily composed of older alluvium and older fan deposits containing various amounts of sand, silt, gravel, and clay. This aquifer, which ranges from 150 to more than 800 feet thick, is found throughout the basin (Geoscience 2001). Groundwater found in older fan sediments are generally unconfined to semi-confined in this aquifer; whereas, groundwater in the older alluvial sediments is generally confined under fine sediments (Geoscience 1999).

Lower Aquifer. Data are scarce concerning the lower aquifer. The unit consists of gravel, coarse sand, pebbles, and sandy clay and is likely restricted to the eastern part of the basin (Geoscience 2001). One well near Baldwin Lake encountered these deposits about 120 feet thick.

Restrictive Structures

A groundwater divide exists between Big Bear Lake and Baldwin Lake in the vicinity of the Big Bear Airport (Geoscience 1999). Faults are mapped cutting Pleistocene alluvium, but it is not known if these are barriers to groundwater movement.

Recharge Areas

Recharge of this basin is likely from percolation of precipitation and runoff and underflow from fractured crystalline rocks.

Groundwater Level Trends

Groundwater levels within the basin generally correlate with annual fluctuation of precipitation, with peak water levels occurring during winter months and the highest peaks occurring during years with increased annual precipitation. At higher elevations within the basin, seasonal levels fluctuate more so than at lower elevations. Water levels in the basin declined as much as 45 feet between 1984 and 1991 because of reduced precipitation. Water levels returned to their 1983 levels by 1999 (Geoscience 1999). In 1992, groundwater levels dropped 30-feet in response to the Big Bear earthquake, but recovered by 1998 (Geoscience 1999).

Groundwater Storage

Groundwater Storage Capacity. The total storage capacity is estimated at 42,000 af (DWR 1975).

Groundwater in Storage. No information is available.

Groundwater Budget (Type A)

Average inflow of 6,240 af/yr includes percolation of water from precipitation and surface flow minus the affects of evapotranspiration and average outflow of 4,212 af/yr is chiefly from pumping (Geoscience 1999; 2001). Annual groundwater production from 1982 through 1998 ranged from 1,352 to 1,697 af with an average of 1,485 af/yr (GeoScience 1999). Pumping in 2000 was about 2,946 af (Big Bear City DWP 2002).

Groundwater Quality

Characterization. Groundwater within this basin is mainly calcium bicarbonate in character, except for water in the middle aquifer between Baldwin Lake and Big Bear Lake, which tends to have higher concentrations of sodium (Geoscience 2001). TDS content in the eastern portion of the basin ranges from 210 to 360 mg/L without any significant differences between the upper and middle aquifers (Geoscience 1999). In the western part of the basin, TDS concentrations range from 94 to 458 mg/L (Geoscience 2001). Water sampled from 31 public supply wells has an average TDS content of approximately 250 mg/L and a range from 112 to 384 mg/L.

Impairments. Water from wells in the eastern part of the basin have had elevated fluoride content, and one well that is screened in all aquifers has

fluoride concentration that has ranged from 6.3 to 9.0 mg/L (Geoscience 2001).

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	33	7
Radiological	37	0
Nitrates	32	0
Pesticides	20	0
VOCs and SVOCs	31	0
Inorganics – Secondary	33	5

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 Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: to 1,000 gal/min	Average: 500 gal/min (DWR 1975)
	Total depths (ft)	
Domestic	Range:	Average:
Municipal/Irrigation	Range:	Average:

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
City of Big Bear DWP	Groundwater levels	57
City of Big Bear DWP	Miscellaneous water quality	57
Department of Health Services and cooperators	Title 22 water quality	52

Basin Management

Groundwater management: City of Big Bear Department of Water and Power manages the basin under a master plan (Wilson 2002).

Water agencies

Public Big Bear City Community Services District,
City of Big Bear Department of Water and Power

Private

References Cited

- Big Bear City, Department of Water and Power. 2002. Internet site: www.citybigbearlake.com/dwp. 26 June, 2002.
- California Department of Water Resources (DWR). 1975. *California's Ground Water*. Bulletin 118. 135 p.
- GeoScience Support Services, Inc. (Geoscience). 1999. *Re-Evaluation of the Maximum Perennial Yield in the Baldwin Lake Watershed*. 56 p.
- _____. 2001. *Re-Evaluation of Maximum Perennial Yield – Big Bear Lake Watershed and a Portion of Baldwin Lake Watershed*. 84 p.
- Wilson, Steve. 2002. City of Big Bear Department of Water and Power. Telephone communication with Tim Ross, Department of Water Resources. 26 June, 2002.

Additional References

- Brown, G.A. and Fox, R. 1978. *Hydrogeologic Studies, Big Bear Lake – Baldwin Lake Area*. Prepared for the Big Bear City Community Services District and Southern California Water Company.
- California Department of Public Works, Division of Water Resources (DPW). 1934. *South Coastal Basin Investigation: Geology and Ground Water Storage Capacity of Valley Fill*. Bulletin No. 45. 279 p.
- California Department of Conservation, Division of Mines and Geology. 1954. *Geology of Southern California*. Bulletin 170. Volume 1.
- _____. 1982. *Geology of the NE San Bernardino Mountains, San Bernardino County, California*.
- Crippen, J.R. 1965. *Natural Water Loss and Recoverable Water in Mountain Basin of Southern California*. United States Geological Survey Professional Paper 417-E.
- Dibblee, T.W. Jr. 1964. *Geologic Map of the Lucerne Valley Quadrangle, San Bernardino, CA*. United States Geological Survey Map I-426.
- Dowdy, D.R., and O'Donnel, T. 1965. *Mathematical Models of Catchment Behavior*. American Society of Civil Engineers. Journal of Hydraulics Division. Volume 91.
- Geoscience. 1991. *Geohydrologic Characteristics and Artificial Recharge Potential of the Sand Canyon Area*. Consultant's Report.
- _____. 1992. *Re-Evaluation of Maximum Perennial Yields, Big Bear Ground Water Basin, San Bernardino County, California*. Prepared for Big Bear Lake Department of Water and Power. Consultant's Report.
- _____. 2000. *Geohydrologic Investigation of the Moon Camp Area, Big Bear Valley, California*. Prepared for Big Bear Lake Department of Water and Power. Consultant's Report.
- Law Environmental. 1988. *Hydrologic Evaluation of the Shay Meadows Area, Erwin Subarea, Big Bear City, San Bernardino County, California*. Prepared for the Big Bear City Community Services District. Consultant's Report.

- _____. 1989. *Exploration Drilling for New Well Sites and an Evaluation of Fluoride Occurrence*. Prepared for the Big Bear City Community Services District. Consultant's Report.
- LeRoy Crandall and Associates. 1987a. *Re-evaluation of Sustained Ground Water Yield, Big Bear Lake Watershed, San Bernardino County, California*. Prepared for Big Bear Lake Department of Water and Power. Consultant's Report.
- LeRoy Crandall and Associates. 1987b. *Re-evaluation of Sustained Ground Water Yield, Baldwin Lake Watershed, San Bernardino County, California*. Prepared for Big Bear Lake Department of Water and Power. Consultant's Report.
- Rogers, T. H. 1967. *Geologic Map of California, San Bernardino Sheet*. Single Map Sheet, Scale 1:250,000.

Errata

Substantive changes made to the basin description will be noted here.