Upper Lake Basin

- Groundwater Basin Number: 5-13
- County: Lake
- Surface Area: 7,260 acres (11 square miles)

Basin Boundaries and Hydrology

The Upper Lake Basin is an irregularly shaped basin at the north end of Clear Lake that includes Middle Creek Valley, Clover Valley, and Bachelor Valley, all of which extend to a main central valley opening to the south to Clear Lake. Middle Creek Valley and Clover Valley are bounded by Middle Mountain to the west and Pitney and Hogback Ridges to the east (Jennings 1969).

Middle Mountain is a fault-bounded block underlain by sandstone and shale of the Great Valley Sequence. Pitney and Hogback Ridges consist mainly of graywacke sandstone and shale with minor interbedded basalt and chert of the Jurassic-Cretaceous Franciscan Formation. Similar rock types also underlie the mountain ridge south of Tule Lake located west of the basin. The contact between the bedrock materials bounding the unconsolidated alluvium generally defines the basin boundary. Bedrock units in the area include the Franciscan Formation and the Great Valley Sequence (Earth Sciences Associates 1978). Precipitation in the basin ranges from 35- to 43-inches annually, increasing to the north.

Hydrogeologic Information

Water-Bearing Formations

The aquifer system in the Upper Lake Basin is composed primarily of Quaternary alluvial deposits and Pliestocene terrace, lake, and floodplain deposits. The alluvium, lake, and floodplain deposits fill the valleys and contain nearly all water yielded to wells. The older Cretaceous and Jurassic formations generally form the uplands surrounding the alluvial basin. Groundwater within bedrock mainly occurs in near surface fractures along the lower hills. Generally, groundwater in bedrock has not been developed. Bedrock units and terrace deposits yield very little water to wells (DWR 1957).

Quaternary Alluvium. The Quaternary alluvial deposits include channel alluvium, fan deposits, and older alluvium consisting of gravel, sand, and fines (ESA 1978). The active channels of Middle Creek, Alley Creek, and Clover Creek, and all other smaller creeks that drain the area around the Upper Lake Basin are underlain by uncemented gravel and sand, with silt and clay lenses. Fan and older alluvial deposits occur at the mouths of some ravines and small canyons that enter into the valley. These deposits consist of a mixture of gravel, sand, and fines and reach a thickness of 40- to 50-feet (DWR 1957). The thickness of the deposits decrease downstream to just a few feet.

Pleistocene Terrace Deposits. The Pleistocene terrace deposits border the west and northwest sides of Middle Creek Valley and exist as isolated

remnants above the valley floor. The deposits consist of poorly consolidated clay, silt, and sand with some gravel lenses. The deposits generally have a low permeability due to their high clay content and are less important as a groundwater source (DWR 1957).

Pleistocene Lake and Floodplain Deposits. Fine grained lacustrine sediments and coarser grained floodplain deposits underlie the valley floors of Middle, Clover, and Alley creeks. These deposits overlie bedrock and older unconsolidated sediments. These sediments generally range in thickness from about 60- to 110-feet and, in the Middle Creek Valley area, form a confining layer for an underlying artesian aquifer system (DWR 1957). The fine grained lake deposits also contain numerous sand and gravel lenses representing portions of former stream channels. Permeability of the fine-grained lake deposits is low with specific yields ranging from about 3- to 5-percent. Sand and gravel lenses yield an average of 230 gpm (DWR 1957).

Plio-Pleistocene Cache Creek Formation. The Cache Creek formation is a pre-terrace alluvial deposit consisting of lacustrine clays, sands, and gravels that overly bedrock in some places along the borders of the valley. The permeability of the formation is generally low (DWR 1957).

Recharge Areas

Recharge of the principal aquifer is from Middle Creek (upstream of Section 25, T16N, R10W), Clover Creek, and Alley Creek (upsteam of Section 5, T15N, R9W) (DWR 1957). ESA (1978) identifies the recharge area as from Middle Creek upstream of Section 31, T16N, R10W.

Groundwater Level Trends

Analysis Incomplete.

Groundwater Storage

The average specific yield for the depth interval of 0- to 100-feet is estimated to be 8 percent based on review and analysis of well logs for the Upper Lake Basin (DWR 1957). The storage capacity for the basin is 10,900 acre-feet (DWR 1957). DWR (1975) estimates the useable storage capacity to be 5,000 acre-feet.

Groundwater Budget (Type B)

Estimates of groundwater extraction for the Upper Lake Basin are based on a survey conducted by the California Department of Water Resources in 1995. The survey included land-use and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 4,100 and 190 acre-feet respectively. Deep percolation from applied water is estimated to be 2,100 acre-feet.

Groundwater Quality

Characterization. Magnesium bicarbonate and calcium bicarbonate water are the predominant groundwater types in the basin. Total dissolved solids (TDS) range from 180- to 615-mg/L, averaging 500 mg/L (DWR unpublished).

Impairments. Boron has been detected is some wells in the basin; however, high boron is not a prevalent condition (DWR 1957). Water quality analyses show high iron, manganese, EC, calcium, ASAR, and TDS.

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	6	0
Radiological	4	0
Nitrates	7	0
Pesticides	4	0
VOCs and SVOCs	4	0
Inorganics – Secondary	6	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 Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 15 – 900	Average: 302 (8 Well Completion Reports)
	Total depths (ft)	
Domestic	Range: 20 – 390	Average: 89 (302 Well Completion Reports)
Municipal/Irrigation	Range: 50 – 308	Average: 129 (96 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	1 well monitored semi-annually
Lake County	Groundwater levels	12 wells monitored semi-annually
DWR	Miscellaneous water quality	3 wells biennially
Department of Health Services and cooperators	Title 22 water quality	6

Basin Management

Groundwater management:	Lake County adopted a groundwater management ordinance in 1999.
Water agencies	
Public	County of Lake
Private	

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Errata

Changes made to the basin description will be noted here.