

Upper Klamath Basin, Lower Klamath Lake Subbasin

- Groundwater Basin Number: 1-2.02
- County: Siskiyou
- Surface Area: 75,330 acres (118 square miles)

Basin Boundaries and Hydrology

The Lower Klamath Lake Subbasin is a portion of Upper Klamath River Groundwater Basin located in California and Oregon. The subbasin is bounded on the west by the Mahogany Mountains, on the south by Pliocene to Pleistocene volcanics, and on the east by Miocene to Pliocene volcanic rocks of Sheepy Ridge (Gay 1958). The northern boundary is the state boundary between Oregon and California. Annual precipitation ranges from 11- to 17-inches, increasing to the west.

Hydrogeologic Information

Water-Bearing Formations

The principal water-bearing formations in the subbasin include Quaternary alluvium, Tertiary sediments, Tertiary deposits of diatomite, and Tertiary to Quaternary lake deposits and volcanics. The following geologic descriptions are from Hotchkiss (1968), unless otherwise noted.

Quaternary Alluvium. Alluvial deposits in the subbasin consist of Pleistocene to Holocene deposits of gravel, sand, clay, soil, and loess up to a thickness of 30 feet. These moderately permeable deposits are generally above the saturated zone and likely serve as minor, localized recharge areas. The deposits occupy approximately 20- to 25-percent of the subbasin surface area to the northwest.

Holocene Upper Basalt. This unit is a series of unweathered, vesicular, olivine basalt flows that is generally highly permeable due to extensive fracturing and readily yields water to wells. In upland areas these flows may be above the saturated zone but serve as extensive recharge areas. Some areas have exposures of massive unfractured flows. Outcrops of the upper basalt occur in the area of 48N R3E, Sections 33 and 34. Subsurface extents are unknown.

Pleistocene Intermediate Basalt. This unit is a series of reddish brown to black, thin-bedded flows of Pleistocene diabasic olivine basalt. These flows border the subbasin to the south and interfinger with lakebed deposits to the north. These rocks are generally highly permeable due to well-developed columnar jointing and the abundance of bedding planes. Wells developed in the unconfined portion of this volcanic aquifer will often yield moderate to large quantities of water ranging from 2,000- to 4,000-gpm with specific capacities of 50- to 250-gpm per foot of drawdown if sufficient fractures, fracture interconnections, and saturated depths are encountered. Thickness of this series of flows is unknown.

Pliocene to Holocene Lake Deposits. The lake deposits consist of sand, silt, clay, ash, lenses of diatomaceous earth, and semi-consolidated shale. Poorly

sorted zones have very low permeability and may act as confining layers where interfingering with basalts. Thickness of the lake deposits is unknown. Well yields are generally low.

Upper Pliocene Diatomite. Deposits of diatomite are prominently exposed at the surface in the southwestern portion of the subbasin. These gray to white deposits often include interbedded sand, tuff breccia, and volcanic ash. The diatomite is essentially non-water-bearing and commonly serves as a confining layer; however, some yields may be obtained from wells developed in the interbedded deposits.

Pliocene Continental Sediments. These sediments consist of clay, diatomaceous earth and interbedded fluvial deposits of unknown thickness that overlap volcanic rocks of Miocene and Pliocene age but their exact relation in the subsurface is unknown. These sediments may locally include the Upper Pliocene diatomite deposits. They are probably of low to moderate permeability and may locally act as a confining layer. These sediments are located along the eastern boundary of the subbasin.

Pliocene to Miocene Lower Basalt. The older basalt ranges from dark green-black ophitic olivine basalt to a gray-black porphyritic basalt. It often exhibits weak columnar jointing and fracturing in surface exposures. This is typically a highly permeable aquifer that is commonly confined beneath the alluvial deposits within the subbasin. Surface exposures of the basalt flows are found south of the subbasin boundary and outcrop at Big Tableland and Little Tableland. In the surrounding uplands these rocks are important recharge areas for the subbasin.

Restrictive Structures.

The western boundary of the subbasin is formed by the northwest trending ridges of Mahogany Mountain. These ridges are composed of Pliocene basalts and are the upthrown side of normal faults. Additional north and northwest trending faults occur within the subbasin east of Big Tableland and along the eastern boundary. The water-transmitting properties of these faults are not understood.

Recharge Areas

Infiltration of surface water from the channels, lakes and sumps of the Lower Klamath along with underflow from volcanic rocks are the principal sources of recharge in this basin.

Groundwater Level Trends

Long-term trend data is not available. Monitoring wells have been recently established by DWR and USGS.

Groundwater Storage

Groundwater Storage Capacity. The basin boundary has been delineated by the contact of the alluvial fill with the surrounding hard rock. Although some wells produce water from the alluvium, many wells also produce water from underlying volcanic rock. All units in the valley are hydrologically interconnected. The volcanic units provide storage and recharge to the basin

and also serve as recharge and storage to areas outside of the basin. Due to the complexity of the region with respect to the extensive network of volcanic recharge/storage areas, the amount of groundwater in storage has not been estimated.

Groundwater Budget (Type B)

A survey of groundwater extraction for the Tulelake and Lower Klamath Lake subbasins was conducted in 1997. The survey included land use and sources of water. Combined results of the survey for both subbasins are included in the Tule Lake Subbasin summary.

Groundwater Quality

Characterization. As reported by Wescorp (2001), the character of water in the northwest part of the basin varies from sodium bicarbonate to sodium sulfate type waters. In the vicinity of Sheepy Creek Island, samples taken from two wells were characterized as sodium bicarbonate type water with total dissolved solids (TDS) ranging from 150- to 175-mg/L. Boron concentrations were 0.17- and 0.12-mg/L. North of that location north of Otey Island, water samples were characterized as sodium sulfate type water with TDS concentrations ranging from 1,560- to 1,930-mg/L. Boron concentrations were measured at 0.17- and 0.5-mg/L. In the southeast portion of the basin near Chalk Bluffs, geothermal conditions were encountered in the older basalt at a depth of 446 feet. The temperature of water at that depth was measured at 180°F.

Hotchkiss (1968) reports that the TDS content of groundwater generally increases in proportion to the thickness or proximity of the lake deposits. Waters from wells in volcanic rocks several miles from the lake deposits or from deep wells developed beneath the confining lake deposits typically contain a low to moderate TDS.

The water quality of groundwater in the basin ranges widely in response to its source and proximity to sources of surface and subsurface impairment. Water from wells in the unconfined volcanic rocks within and adjacent to the subbasin is good with a sodium-bicarbonate character and a total dissolved solids range of 150- to 270-mg/L. A shift in water quality is observed with the unconfined volcanics that are proximate to lake sediments. The character shifts to a sodium/calcium/magnesium-bicarbonate/sulfate water that is much higher in total dissolved solids (600- to 800-mg/L), which generally increases in proportion to the thickness of interfingering lake deposits penetrated.

Impairments. Localized high boron, TDS, and water temperature may be an issue.

Well Production characteristics

Well yields (gal/min)		
Irrigation	Range: 200 – 2,600	Average: 1,550 (5 Well Completion Reports)
Total depths (ft)		
Domestic	Range: 70 - 1030	Average: 277 (13 Well Completion Reports)
Irrigation	Range: 95 – 1890	Average: 700 (15 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR, USGS	Groundwater levels	4 wells semi-annually
	Miscellaneous Water Quality	NKD

NKD – No known data

Basin Management

Groundwater management: Siskiyou County adopted a groundwater management ordinance in 1998.

Water agencies

Public

Private

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Errata

Changes made to the basin description will be noted here.