Sierra Valley Groundwater Basin, Sierra Valley Groundwater Subbasin

- Groundwater Basin Number: 5-12.01
- County: Plumas, Sierra
- Surface Area: 117,700 acres (184 square miles)

Basin Boundaries and Hydrology

Sierra Valley is an irregularly shaped, complexly faulted valley in eastern Plumas and Sierra Counties. The basin is bounded to the north by Miocene pyroclastic rocks of Reconnaissance Peak, to the west by Miocene andesite of Beckwourth Peak, to the south and east by Tertiary andesite, and to the east by Mesozoic granitic rocks (Saucedo 1992).

The Middle Fork Feather River heads in Sierra Valley and is formed by the confluence of several streams draining the surrounding mountains. Most of the smaller tributaries flow north and northwest to join the Middle Fork Feather before it exits the valley at the northwest corner of the basin. Annual precipitation ranges from 13 inches in the valley to 29 inches in the upland areas to the south and west.

Hydrogeologic Information

Water-Bearing Formations

The primary water-bearing formations in Sierra Valley are Holocene sedimentary deposits, Pleistocene lake deposits, and Pleistocene lava flows. The aquifers of the valley are mainly alluvial fan and lake deposits. The alluvial fans grade laterally from the basin boundaries into course lake and stream deposits. The deposits of silt and clay act as aquitards or aquicludes in the formation. Aquiclude materials are predominantly fine-grained lake deposits. In the central part of the basin, alluvial, lake and basin deposits comprise the upper 30- to 200-feet of aquitard material that overlies a thick sequence of interstratified aquifers and aquicludes. The following summary of water-bearing formations is from DWR (1963) and DWR (1983).

Holocene Sedimentary Deposits. Holocene sedimentary deposits include alluvial fans and intermediate alluvium. Alluvial fans consist of unconsolidated gravel, sand, and silt with minor clay lenses. These deposits are located at the perimeter of the valley to a thickness of 200 feet. The fan deposits coalesce or interfinger with basin, lake, and alluvial deposits. Specific yield ranges from 8- to 17-percent. The fans are a major source of confined and unconfined groundwater and also serve as important recharge areas.

Intermediate alluvium consists of unconsolidated silt and sand with lenses of clay and gravel. Specific yield is estimated to range between 5- to 25-percent. This unit is limited in extent and is found along streams and centrally in the basin. The deposits are up to 50 feet in thickness and yield moderate amounts of groundwater to shallow wells.

Pleistocene Lake Deposits. Lake deposits underlie the majority of the valley and range in thickness to 2000 feet. These provide most of the

groundwater developed in the valley. The deposits consist of slightly consolidated, bedded sand, silt, and diatomaceous clay with the sand beds yielding large amounts of groundwater to wells. Specific yield ranges from 1- to 25-percent. Well production reportedly ranges up to 3,200 gpm.

Pleistocene Volcanic Rocks. Pleistocene volcanic rocks consist of jointed and fractured basalt flows ranging in thickness from 50- to 300-feet. These rocks are moderately to highly permeable and yield large amounts of groundwater to wells. They also serve as a recharge area and, where buried by lake deposits, form confined zones with significant artesian pressures.

Recharge Areas

Most of the upland recharge areas are composed of permeable materials occurring along the upper portions of the alluvial fans that border the valley. Recharge to groundwater is primarily by way of infiltration of surface water from the streams that drain the mountains and flow across the fans.

Groundwater Level Trends

Increases in groundwater development in the mid-late 1970s resulted in the cessation of flow in many artesian wells and large pumping depressions formed over the areas where heavy pumping occurred. Water levels in a flowing artesian well in the northeast portion of the basin declined to more than 50 feet below ground surface by the early 1990s, when reductions in groundwater pumpage occurred. Through the 1990's groundwater levels in the basin have recovered to mid 1970's levels.

Groundwater Storage

Groundwater Storage Capacity. The estimated groundwater storage in the basin is 7,500,000 acre-feet to a depth of 1000 feet (DWR 1963). DWR (1963) notes that the quantity of water that is useable is unknown. DWR (1973) estimates storage capacity to be between 1,000,000 to 1,800,000 acre-feet for the top 200 feet of sediments based on an estimated specific yield ranging from 5 to 8 percent. These estimates include the Chilcoot Subbasin.

Groundwater Budget (Type B)

Estimates of groundwater extraction are based on a survey conducted by the California Department of Water Resources during 1997. The survey included land use and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 3,400 and 110 acre-feet respectively. Deep percolation from applied water is estimated to be 2,100 acre-feet.

Groundwater Quality

Characterization. A wide range of mineral type waters exist throughout the basin. Sodium chloride and sodium bicarbonate type waters occur south of Highway 49 and north and west of Loyalton along fault lines. Two well waters are sodium sulfate in character. In other parts of the valley the water is bicarbonate with mixed cationic character. Calcium bicarbonate type water is found around the rim of the basin and originates from surface water runoff (DWR 1973). Total dissolved solids in the basin range in

concentration from 110- to 1620-mg/L, averaging 312 mg/L (DWR unpublished data).

Impairments. The poorest quality groundwater is found in the central west side of the valley where fault-associated thermal waters and hot springs yield water with high concentrations of boron, fluoride, iron, and sodium. Several wells in this area also have high arsenic and manganese concentrations. Boron concentrations in thermal waters have been measured in excess of 8 mg/L. At the basin fringes, boron concentrations are usually less than 0.3 mg/L (DWR 1983). There's also a sodium hazard associated with thermal waters and some potential for problems in the central portion of the basin (DWR 1983).

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	9	0
Radiological	3	0
Nitrates	10	0
Pesticides	9	0
VOCs and SVOCs	9	0
Inorganics – Secondary	9	1

[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)	
Irrigation	Range: 75 – 1500	Average: 640 (5 Well Completion Reports)
	Total depths (ft)	
Domestic	Range: 43 - 719	Average: 192 (178 Well Completion Reports)
Irrigation	Range: 80 - 1000	Average: 602 (31 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	34 wells semi-annually
DWR	Miscellaneous Water Quality	15 wells biennially(includes Subbasin 5-12.02)
Department of Health Services and cooperators	Miscellaneous Water Quality	9

Basin Management

Groundwater management:	Sierra Valley Groundwater Management District (authorized by Senate Bill 1391, enacted in 1980)
Water agencies	
Public	Loyalton Water District, Sierra Valley PUD
Private	Sierra Brooks Subdivision

Selected References

California Department of Water Resources (DWR). 1963. Northeastern Counties Groundwater Investigation, Volume 1, Text. California Department of Water Resources. Bulletin 98. 224 p.

California Department of Water Resources (DWR). 1963. Northeastern Counties Investigation, Volume 2, Plates. California Department of Water Resources. Bulletin 98.

California Department of Water Resources (DWR). 1973. An Ineragency-Multidisciplinary Investigation of the Natural Resources of the Sierra Valley Study Area, Sierra and Plumas Counties.

California Department of Water Resources. June 1983. Sierra Valley Ground Water Study. Northern District Memorandum Report

Saucedo, G. J. and D. L. Wagner (1992). Geologic Map of the Chico Quadrangle, California, California Division of Mines and Geology.

Bibliography

California Department of Water Resources. 1960. Northeastern Counties Investigation. California Department of Water Resources. Bulletin 58.

California Department of Water Resources. 1965. Northeastern Counties Ground Water Investigation, Appendix C, Geology. California Department of Water Resources, Northern District. Bulletin 98.

California Department of Water Resources. 1975. California's Ground Water. California Department of Water Resources. Bulletin 118.

California Department of Water Resources. 1980. Ground Water Basins in California. California Department of Water Resources. Bulletin 118-80.

California Department of Water Resources. 1986. Sierra Valley Ground Water Study Update-1986. California Department of Water Resources, Northern District. Memorandum Report.

California Department of Water Resources. 1990. Sierra Valley Ground Water Study Update-1990. California Department of Water Resources, Northern District. Memorandum Report.

California Department of Water Resources. 1991. 1990-91 Sierra Valley Ground Water Study Update. California Department of Water Resources, Northern District. Memorandum Report.

California Department of Water Resources. 1992. Lassen County Water Resources Assessment Study. California Department of Water Resources, Northern District. Memorandum Report.

Schmidt. May 1999. 1994 – 1998 Sierra Valley Groundwater Update.

Errata

Changes made to the basin description will be noted here.