

Suisun-Fairfield Valley Groundwater Basin

- Groundwater Basin Number: 2-3
- County: Solano
- Surface Area: 133,600 acres (208 square miles)

Basin Boundaries and Hydrology

The Suisun-Fairfield Valley Groundwater Basin is composed of low alluvial plains, surrounding foothills and mountains located immediately north of Suisun Bay. The basin is bounded on the west by the foothills of the Coast Ranges located west of Green Valley. The southern extent of the Vaca Mountains forms the basin boundary to the north and its eastern extent is marked by low ridges of consolidated rock that appear near Vacaville and extend southeast to the Montezuma Hills (Thomasson and others 1960). The basin drains to Suisun Bay in the south. Suisun Creek and Ledgewood Creek drain the Suisun-Fairfield Valley. Green Valley Creek and Laurel Creek, respectively drain the area west and east of the Suisun-Fairfield Valley (Thomasson and others 1960). Precipitation ranges from less than 16 inches in the southeast to more than 24 inches in the northwest portion of the basin.

Hydrogeologic Information

Water-Bearing Formations

The Suisun-Fairfield Valley Groundwater Basin is comprised of late Tertiary to Quaternary age volcanic rocks and continental sedimentary deposits. The water-bearing units within the basin include the Sonoma Volcanics, Pleistocene Alluvium, and Recent Alluvium. The Pleistocene Alluvium constitutes the primary aquifer. However, the Recent Alluvium yields some water to wells in the north and many of the deeper wells in the western part of the basin obtain water from the Sonoma Volcanics (Thomasson and others 1960).

Recent Alluvium. The Recent Alluvium consists of fine-grained silt, clay, and sand of fluvial origin (Thomasson and others 1960). It is difficult to distinguish from the Pleistocene Alluvium, which it overlies in most of the basin and it has a maximum thickness of approximately 60 feet. The Recent Alluvium is generally of low to moderate permeability, but does yield sufficient water for limited stock and domestic uses in the northern part of the Suisun-Fairfield Valley and in areas north and east of Fairfield (Thomasson and others 1960).

Pleistocene Alluvium. The Pleistocene Alluvium is composed of loose to moderately compacted silt, clay, gravel, and sand of fluvial origin (Thomasson and others 1960). Generally it underlies the recent alluvium and unconformably overlies the Sonoma Volcanics. The Pleistocene Alluvium has a maximum thickness of more than 200 feet at the southern extent of the valley (Thomasson and others 1960). This aquifer provides most of the water pumped from wells in the Suisun-Fairfield Valley. The permeability varies widely depending on the thickness of gravel and sand lenses intersected by wells. Yields range from 20 to 460 gallons per minute (gpm) and average approximately 200 gpm (Thomasson and others 1960).

Pliocene Sonoma Volcanics. The Sonoma Volcanics, of Pliocene age, are comprised of interbedded tuff, tuff breccia, agglomerate, and flow rock that in aggregate has a thickness of more than 1,500 feet (Thomasson and others 1960). The Sonoma Volcanics outcrop between the Suisun-Fairfield Valley and Green Valley. They are also exposed on the western slope of the Green Valley and the alluvial plain to the south. Tuff beds form the predominant lithologic layer of this unit and contain most of the useable groundwater (Thomasson and others 1960). The flow rocks are dense and relatively impermeable, but can yield significant amounts of water to wells where fractured. Generally, the average permeability of the Sonoma Volcanics is substantially less than the overlying alluvium. Limited data on wells drilled in the Sonoma Volcanics indicate yields in excess of 500 gpm have been obtained, but only from wells that penetrate several hundred feet of saturated material (Thomasson and others 1960).

Recharge Areas

Natural recharge is principally from infiltration of precipitation that falls on the valley floor and the surrounding hills within the drainage basin. Some limited infiltration occurs from streams in areas where the water table is lower than the stream channels (Thomasson and others 1960).

Groundwater Level Trends

A comprehensive basin-wide monitoring program was initiated for the Suisun-Fairfield Valley Groundwater Basin in the early 1950's. By 1950, groundwater extraction had created a groundwater depression in the region to the west and southwest of Fairfield. Static water levels within this depression were 10 to 20 feet below sea level. Water levels averaged 10 to 15 feet above sea level in the remainder of the Basin (DWR 1994). Alternative surface water supplies including Solano Project water provided from Putah Creek for municipal and irrigation use served to supplement groundwater needs. This ultimately eliminated the groundwater depression and groundwater levels stabilized (DWR 1994). Groundwater levels have generally remained stable since 1970 (Solano Water Authority 1995).

Groundwater Storage

Groundwater Storage Capacity. Total groundwater storage capacity for the depth range of 10 to 200 feet was estimated to be 226,000 acre-feet in a study conducted by the USGS (Thomasson and others 1960). The study area encompassed an area of 42,000 acres. Of this, 21,000 acres east of Fairfield, was not estimated because of the near surface proximity of impermeable rock and the presence of water of degraded quality. The average specific yield was determined to be 7 percent. Additionally, in the area roughly south of U.S. Highway 40 possible intrusion of brackish water from the tidal marsh poses a threat should drawdown create an inland gradient. Hence, usable storage capacity is estimated to be in the range of 25,000 to 40,000 acre-feet (Thomasson and others 1960). The Department of Water Resources currently defines the Suisun-Fairfield Valley Groundwater Basin to include 133,600 acres. This larger area will result in a larger total storage capacity for this basin than provided in the USGS estimate.

Groundwater Budget (Type C)

Insufficient published data was found to provide either an estimate of the Suisun-Fairfield Valley Groundwater Basin's present groundwater budget or groundwater extraction. From 1941 to 1951, USGS estimates of groundwater extraction, principally for irrigation ranged from 1,500 to 7,900 acre-feet per year. The portion of the basin west of Fairfield was estimated to support a sustainable yield of 6,000 acre-feet with natural reservoir capacity (Thomasson and others 1960). The basin as defined by DWR includes 133,600 acres as contrasted with 42,000 acres in the USGS estimates.

Groundwater Quality

Characterization. The usable groundwater in this area is of the bicarbonate type. The water is slightly alkaline, with pH values commonly ranging from 7.1 to 7.6 (Thomasson and others 1960). Water, although scarce, in the area east of Fairfield has boron present in amounts that would be toxic to most plants. In the area south of Fairfield, the near proximity of the tidal marsh poses the threat of intrusion by brackish water if subjected to heavy groundwater draft (Thomasson and others 1960).

Well Characteristics

Well yields (gal/min)		
Municipal/Irrigation	Range: 2 – 865	Average: 164 (based on 51 well completion reports [WCRs])
Total depths (ft)		
Domestic	Range: 19 – 690	Average: 162 (based on 329 WCRs)
Municipal/Irrigation	Range: 20 – 1,010	Average: 225 (based on 108 WCRs)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	5 wells/semiannually
Solano Irrigation District	Groundwater levels	6 wells/semiannually
DWR	Miscellaneous water quality	11 wells/biennially
Department of Health Services and cooperators	Title 22 water quality	10 wells/annually

Basin Management

Groundwater management:	No known water management agency
Water agencies	
Public	City of Fairfield WSA, Solano Irrigation District, Solano Water Authority, Solano County Water Agency, Maine Prairie Water District
Private	Unknown

References Cited

- California Department of Water Resources (DWR). 1995. Historical Ground Water Levels in the Napa Valley.
- Thomasson, HG Jr., Olmsted, FH, and LeRoux, EF. 1960. Geology, Water Resources and usable Ground-Water Storage Capacity of part of Solano County, California. US Geological Survey Water Supply Paper 1464.
- Solano Water Authority. 1995. Annual Report Groundwater Conditions in Solano County.

Errata

Changes made to the basin description will be noted here.