Sacramento Valley Groundwater Basin, Corning Subbasin

- Groundwater Basin Number: 5-21.51
- County: Tehama, Glenn
- Surface Area: 205,640 acres (321 square miles)

Boundaries and Hydrology

The Corning Subbasin comprises the portion of the Sacramento Valley Groundwater Basin bounded on the west by the Coast Ranges, on the north by Thomes Creek, on the east by the Sacramento River, and on the south by Stony Creek. Stony Creek is believed to be a hydrologic boundary throughout the year. The Corning Subbasin is likely contiguous with the Red Bluff Subbasin at depth. Annual precipitation ranges from 19- to 25-inches, increasing to the north.

Hydrogeologic Information

Water-Bearing Formations

The Corning Subbasin aquifer system west is comprised of deposits of late Tertiary to Quaternary age. The Quaternary deposits include Holocene alluvium and the Pleistocene terrace deposits of the Modesto and Riverbank Formations. The Tertiary deposits consist of the Pliocene Tehama and Tuscan Formations.

Holocene Stream Channel Deposits. These deposits consist of unconsolidated gravel, sand, silt and clay derived from the erosion, reworking, and deposition of adjacent Tehama Formation and Quaternary stream terrace deposits. The thickness varies from 1- to 80-feet (Helley and Harwood 1985). The unit represents the upper part of the unconfined zone of the aquifer and is moderately-to-highly permeable; however, the thickness and areal extent of the deposits limit the water-bearing capability.

Pleistocene Modesto Formation. The Modesto Formation (deposited between 14,000 to 42,000 years ago) consists of poorly indurated gravel and cobbles with sand, silt, and clay derived from reworking and deposition of the Tehama and the Riverbank formations. The deposit ranges from less than 10 feet to nearly 200 feet across the valley floor (Helley and Harwood 1985). These terrace deposits are observed along Thomes Creek, Burch Creek, and Stony Creek.

Pleistocene Riverbank Formation. The Riverbank Formation (deposited between 130,000 to 450,000 years ago) consists of poorly-to-highly permeable pebble and small cobble gravels interlensed with reddish clay sands and silt. The formation ranges from less than one foot to over 200 feet thick depending on location (Helley and Harwood 1985). Surficial deposits are observed over the eastern third of the subbasin and along Burch Creek and its tributaries.

Pliocene Tehama Formation. The Tehama Formation consists of sediments originating from the coastal mountains and is the primary source of groundwater for the subbasin. The formation ranges in thickness up to 2,000 feet, increasing in thickness from west to east, dipping 4 degrees to the east (DWR 1982). The majority of the formation consists of fine-grained sediments indicative of deposition under floodplain conditions (McManus 1993). The majority of both coarse and fine-grained sediments are unconsolidated or moderately consolidated.

Pliocene Tuscan Formation. The Tuscan Formation is located within the eastern third of the subbasin. The formation occurs at a depth of approximately 200 feet from the surface and is composed of a series of volcanic mudflows, tuff breccia, tuffaceous sandstone, and volcanic ash layers. The formation is described as four separate but lithologically similar units, A through D, (with Unit A being the oldest), which in some areas are separated by layers of thin tuff or ash units (Helly and Harwood 1985). Units A, B, and C are believed to extend as far west as the Corning Canal.
Unit A is the oldest water-bearing unit of the formation and is characterized by the presence of metamorphic clasts within interbedded lahars, volcanic conglomerate, volcanic sandstone, and siltstone. Unit B is composed of fairly equal distribution of lahars, tuffaceous sandstone, and conglomerate. Unit C consists of massive mudflow or lahar deposits with some interbedded volcanic conglomerate and sandstone. In the subsurface, these low permeability lahars form thick, confining layers for groundwater contained in the more permeable sediments of Unit B.

Subareas of the Corning Subbasin

Sacramento Valley Floodplain. Pleistocene and Holocene silt, sand, and gravel deposits in the vicinity of the City of Corning extend to depths of 50 to 185 feet. The proportion of sand and gravel in the unconsolidated alluvium overlying the Tehama Formation averages 20, 18, and 25 percent for depth intervals of 20- to 50-feet, 50- to 100-feet, and 100- to 200-feet respectively (Olmsted and Davis 1961). The Tehama Formation near the City of Corning consists of yellow clay, poorly consolidated sandstone, and conglomerate.

Dissected Uplands. The surface of the upland area within the central third of the subbasin between Thomes Creek and Stony Creek includes a coarse-grained gravelly conglomerate locally capping the Tehama Formation. Wells drilled in this area encounter up to 60 feet of coarse deposits before reaching fine-grained Tehama deposits. The deposits are believed to be formed as a response to a fixed base level by impeded or enclosed drainages and have been referred to as the Red Bluff Formation. (Helley and Harwood 1985). The shallow gravel is not a significant contributor to groundwater storage due to its position above the saturated zone.

Thomes Creek Floodplain. Bounding the northern extents of the subbasin, the Thomes Creek floodplain includes Holocene alluvium underlain by deposits of both the Modesto and Riverbank Formations. The floodplain averages about 1 mile in width and extends from the Coast Ranges to the Sacramento River floodplain.

Stony Creek Floodplain. The southern part of the subbasin, including the Capay plain, is alluviated by older floodplain deposits and channel deposits of Stony Creek. This area includes a moderately well-defined, highly productive, shallow water-bearing zone reaching a thickness of 150 feet along Stony Creek and 110 feet along the Sacramento River. Domestic and shallow irrigation wells along the west side of Capay plain and south of the Tehama County line provide moderate-to-high yields from confined groundwater in 10- to 50-foot thicknesses of highly pervious pebble and cobble gravels. In the northwest part of Capay plain, older alluvium of the Riverbank Formation extends from the surface to 150 feet. Wells in this zone have low-to-moderate yields. This zone is underlain by a highly productive confined gravel averaging 40 feet in thickness (USBR 1960).

Groundwater Level Trends

Review of hydrographs for long-term comparison of spring-spring groundwater levels indicates a decline of 5- to 12-feet associated with the 1976-77 and 1987-94 droughts, followed by a recovery to pre-drought conditions of the early 1970's and 1980's. Groundwater level data show seasonal fluctuations of approximately 3- to 15-feet for unconfined wells (5-feet near the Sacramento River), up to 30-feet for semi-confined wells away from the river, 5- to 20-feet for composite wells, and 10- to 30-feet for confined wells. Overall, there does not appear to be any increasing or decreasing trends in the groundwater levels.

Groundwater Budget (Type B)

Estimates of groundwater extraction for the Corning Subbasin are based on surveys conducted during the years of 1993, 1994, and 1997. Surveys included landuse and sources of water. Groundwater extraction for agricultural use is estimated to be 152,000 acre-feet. Groundwater extraction for municipal and industrial uses is estimated to be 6,600 acre-feet. Deep percolation of applied water is estimated to be 54,000 acre-feet.

Groundwater Storage

The storage capacity of the subbasin was estimated based on estimates of specific yield for the Sacramento Valley as developed in DWR (1978). Estimates of specific yield, determined on a regional basis, were used to obtain a weighted specific yield conforming to the subbasin boundary. The estimated specific yield for the subbasin is 6.7 percent. The estimated storage capacity to a depth of 200 feet is approximately 2,752,950 acre-feet.

Groundwater Quality

Characterization. Calcium-magnesium bicarbonate and magnesium-calcium bicarbonate are the predominant groundwater types in the subbasin. The subbasin has localized areas of calcium bicarbonate waters near Stony Creek. Total dissolved solids concentrations range from 130-to 490-mg/L, averaging 286 mg/L (DWR unpublished data).

Impairments. The Corning Subbasin has locally high calcium.

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	20	0
Radiological	19	0
Nitrates	20	0
Pesticides	18	0
VOCs and SVOCs	16	0
Inorganics – Secondary	20	0

[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 50 – 3,500	Average: 977 (63 Well Completion Reports)
	Total depths (ft)	
Domestic	Range 24 – 633	Average: 135 (1,667 Well Completion Reports)
Municipal/Irrigation	Range 27 –780	Average: 246 (822 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels.	29 wells semi-annually
DWR	Miscellaneous water quality	7 wells biiennially
Department of Health Services	Miscellaneous water quality	30

Basin Management

Groundwater management:	Tehama County adopted a groundwater management ordinance in 1994. Tehama County adopted a countywide AB3030 plan in 1996.
Water agencies	
Public	Tehama County Flood Control and Water Conservation District adopted a Coordinated AB 3030 Plan, Orland Unit Water Users' Association, Capay Rancho WD, City of Corning, Corning WD, Kirkwood WD, Richfield WD, Tehama WD, O'Connell MWD, City of Orland, Glenn Colusa ID, Thomes Creek WD
Private	

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Errata

Updated groundwater management information and added hotlinks to applicable websites. (1/20/06)