Ukiah Valley Groundwater Basin

- Groundwater Basin Number: 1-52
- County: Mendocino
- Surface Area: 37,500 acres (59 square miles)

Basin Boundaries and Hydrology

The Ukiah Valley groundwater basin, located in southeastern Mendocino County, is approximately 22 miles long and 5 miles wide at the widest point, and is the largest of several groundwater basins along the Russian River. The basin is part of the Ukiah and the Redwood Valleys to the north, and their tributary valleys. The low-lying regions of the Ukiah and Redwood Valleys as well as those sloping areas along the valley edges that include Quaternary- and Tertiary-age sediments define the areal extent of this north-south trending basin. The basin surface elevation varies from approximately 1,000 feet in the upper portions of the Redwood Valley, to approximately 500 feet in the lower, southern areas of the Ukiah Valley.

The Russian River traverses the entire length of the Ukiah Valley groundwater basin and is met by many tributaries from both the east and west sides of Redwood and Ukiah Valleys. The main tributaries include Forsythe Creek, which joins with the Russian River north of the city of Calpella, and the East Fork of the Russian River, which joins the main branch of the Russian River north of Ukiah. Lake Mendocino, a reservoir created from the East Fork of the Russian River located between Redwood Valley and Ukiah Valley, is also an important feature of the surface hydrology of the region. Precipitation in the basin ranges from approximately 45 inches in the north to about 35 inches in the south.

Ukiah is the largest city within the valley and is located on its southwest side. Other cities include Talmage, east of Ukiah, and Calpella on the south end of Redwood Valley. Highway 101 travels the length of the Ukiah Valley from the south and veers west away from Redwood Valley, paralleling Forsythe Creek. Highway 20 enters the valley from the east and intersects with Highway 101 at Calpella.

Hydrogeologic Information

Water Bearing Formations

Groundwater-bearing units of primary importance within the Ukiah Valley Groundwater Basin include Recent alluvium, as well as alluvium of Pliocene and Pleistocene age. The terrace deposits and dissected alluvium of Pleistocene age are of lesser importance with regard to groundwater production. Underlying these deposits is moderately to highly fractured basement rock consisting of the Franciscan and Knoxville Formations. Even when highly fractured these formations have limited permeability, and are considered to yield only small quantities of water locally (Cardwell 1965). Information on water-bearing formations, hydrogeology, and storage capacity is available from Cardwell (1965), DWR, (1965), and Farrar (1986).

Recent Alluvium. Alluvium within the basin is considered a principal source of groundwater and consists of unconsolidated gravel, sand, silt, and minor amounts of clay deposited in channels and on floodplains of the Russian River and its tributaries, on alluvial fans, and as colluvium on interfan slopes. A subdivision of Recent alluvium includes river-channel deposits defined by those areas where gravely stream channel deposits are currently being deposited. River-channel deposits are generally very high yielding loose gravels and sands; in some cases these deposits contain boulders. Recent alluvium is thickest in the central portion of the basin and extends from the surface to depths of 50 to 80 feet (Cardwell 1965). An average specific yield of 20 percent was used for the alluvium in two separate studies (Cardwell 1965, DWR 1965). Groundwater in the alluvium generally occurs under unconfined conditions.

Pleistocene Terrace Deposits. Terrace deposits are characterized as alluvial deposits of primarily Pleistocene age, ranging from a thin veneer of red gravelly clay soil, to deposits of sandy or silty gravel up to 200 feet thick. Terrace deposits generally overly the Pliocene- and Pleistocene-age alluvium and occur discontinuously along the flanks of the Ukiah Valley and more continuously within the Redwood Valley on both sides of the Russian River. Groundwater in the terrace deposits is unconfined to locally confined (Cardwell 1965).

Production from the terrace deposits is variable based on sediment thickness, depth to water, and percentage of fine grained material; however, these deposits generally yield enough water for domestic purposes if an appreciable thickness of the deposit occurs below the water table (Cardwell 1965).

Pliocene/Pleistocene Alluvium. These deposits are described as continental deposits comprised of poorly consolidated and poorly sorted clayey and sandy gravel, clayey sand, and sandy clay. In general, thick lenses of moderately indurated gravel interfinger with large bodies of blue sandy silt and clay (Cardwell 1965). Overall, this alluvium has low permeability due to the relatively high percentage of fine sediments; however, wells can produce moderate amounts of water from these sediments if long sections of perforated (or screened) intervals are used. Bed thickness is variable, with the maximum thickness considered to be about 2,000 feet. Outcrops of this formation can be seen along the entire east side of the Ukiah Valley, as well as the southeast side of the Redwood Valley (Cardwell 1965). It is possible that current groundwater use relies more heavily on Pleistocene- and Pliocene-age alluvium than reflected in this basin description due to ongoing trends in improved well construction techniques and deeper well seal requirements. Groundwater in the older alluvium deposits is generally confined (Cardwell 1965).

Dissected Alluvium. Dissected alluvium is gravelly sediment cemented by carbonate precipitation located along Sulfur Creek below Vichy Springs and along McNab Creek. These sediments yield only very limited quantities of water (Cardwell 1965).

Groundwater Level Trends

Based on hydrographs from DWR monitored wells, groundwater levels in the past 30 years have remained relatively stable. During drought conditions there is increased drawdown during summer months and less recovery in winter months. Post-drought conditions rebound to approximately the same levels as pre-drought conditions.

Groundwater Storage

Groundwater Storage Capacity. It is estimated that approximately 324,000 af of storage exists in the older continental deposits; however, it is probably not usable for short-term storage purposes due to the low-permeability nature of these deposits (DWR 1965).

Groundwater in Storage. Groundwater in storage within the alluvium and younger terrace deposits is estimated to be about 75,000 to 100,000 af (Cardwell 1965). Groundwater in storage within the river-channel deposits between 10 and 50 foot depths is estimated to be 35,000 af based on an average specific yield of 20 percent (Cardwell 1965, DWR 1965). Farrar (1986) estimated that the quantity of groundwater stored in the upper 100 feet of the most productive area of valley fill (Type I) to be about 90,000 af using an average specific yield of 8 percent and an area of 20 square miles. Farrar (1986) also estimated the quantity of groundwater stored along the margins of the valley (Type II area) and underlain by terrace deposits or thin alluvium at 45,000 af. This estimate is based on the upper 100 feet of Type II aquifer materials, an area of 19 square miles, and an average specific yield of 5 percent.

Groundwater Budget (Type C)

There is not enough data available to provide an estimate of the basin's water budget.

Groundwater Quality

Characterization. Water quality is good in general, especially water derived from Recent alluvium deposits; however, locally the content of chemical constituents varies widely. Overall, water is moderately hard to hard bicarbonate. Based on limited data, calcium-bicarbonate groundwater occurs in the southern portion of the basin and magnesium-bicarbonate water occurs in the east-central portion of the basin (Cardwell 1965). Quality in the Recent formations is similar to Russian River water, with slightly higher TDS and chloride levels. Pliocene- and Pleistocene-age formations yield water with higher TDS and sodium than Recent-age formations. Water from springs ranges from highly mineralized to good in quality (Cardwell 1965). TDS values range from 108 to 401 mg/L and average 224 mg/L based on four wells (Cardwell 1965). Electrical conductivity ranges from 450 to 759 μmhos/cm and average 605 μmhos/cm based on two wells (Cardwell 1965). Based on analyses of 22 water supply wells in the Ukiah Valley, TDS ranges from 87 to 301 mg/L and averages about 166 mg/L.

Impairments. Wells with high boron concentrations are located in several areas along the Ukiah Valley edges and in the north end of the Redwood

Valley. Verbal reports indicate that (in general) poor quality water occurs on the west side of the basin. Flammable gas was reported in at least one well. Pressurized carbon dioxide gas was detected in two wells which probably penetrate bedrock (Cardwell 1965). Most poor quality water is believed to migrate into basin sediments from basement rock through fractures or faults.

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	23	0
Radiological	21	0
Nitrates	28	0
Pesticides	23	0
VOCs and SVOCs	22	0
Inorganics – Secondary	23	6

[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)

Up to 1,200 gal/min from Recent Alluvium and less than 50 gal/min from undifferentiated older formations (DWR 1965)

Total depths (ft)

Domestic	Range: 15 - 600	Average: 220 (155 Well Completion Reports)
Municipal/Irrigation	Range: 36 - 115	Average: 115 (36 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	5 wells/semi-annually
Mendocino County Water Agency	Groundwater levels	23 well/annually
DWR	Mineral, nutrient, & minor element.	7 wells/ biennially
Department of Health Services	Coliform, nitrates, mineral, organic chemicals, and radiological.	25 wells as required in Title 22, Calif. Code of Regulations

Basin Management

Groundwater management:	No groundwater management plans were identified
Water agencies	
Public	Mendocino County Water Agency, Hopland PUD, Millview County WD, Redwood County WD, Willow County WD.
Private	

References Cited

California Department of Water Resources (DWR). 1965. Water Resources and Future Water Requirements – North Coastal Hydrographic Area, Volume 1: Southern Portion (Preliminary Edition) – Bulletin No. 142-1.

Cardwell, G.T. 1965. Geology and Ground Water in Russian River Valley Areas and in Round, Laytonville and Little Lake Valleys, Sonoma and Mendocino Counties, California. USGS Water Supply Paper 1548.

Farrar, C.D. 1986. Ground-Water Resources in Mendocino County, California. USGS Water-Resources Investigations Report 85-4258.

Errata

Changes made to the basin description will be noted here.