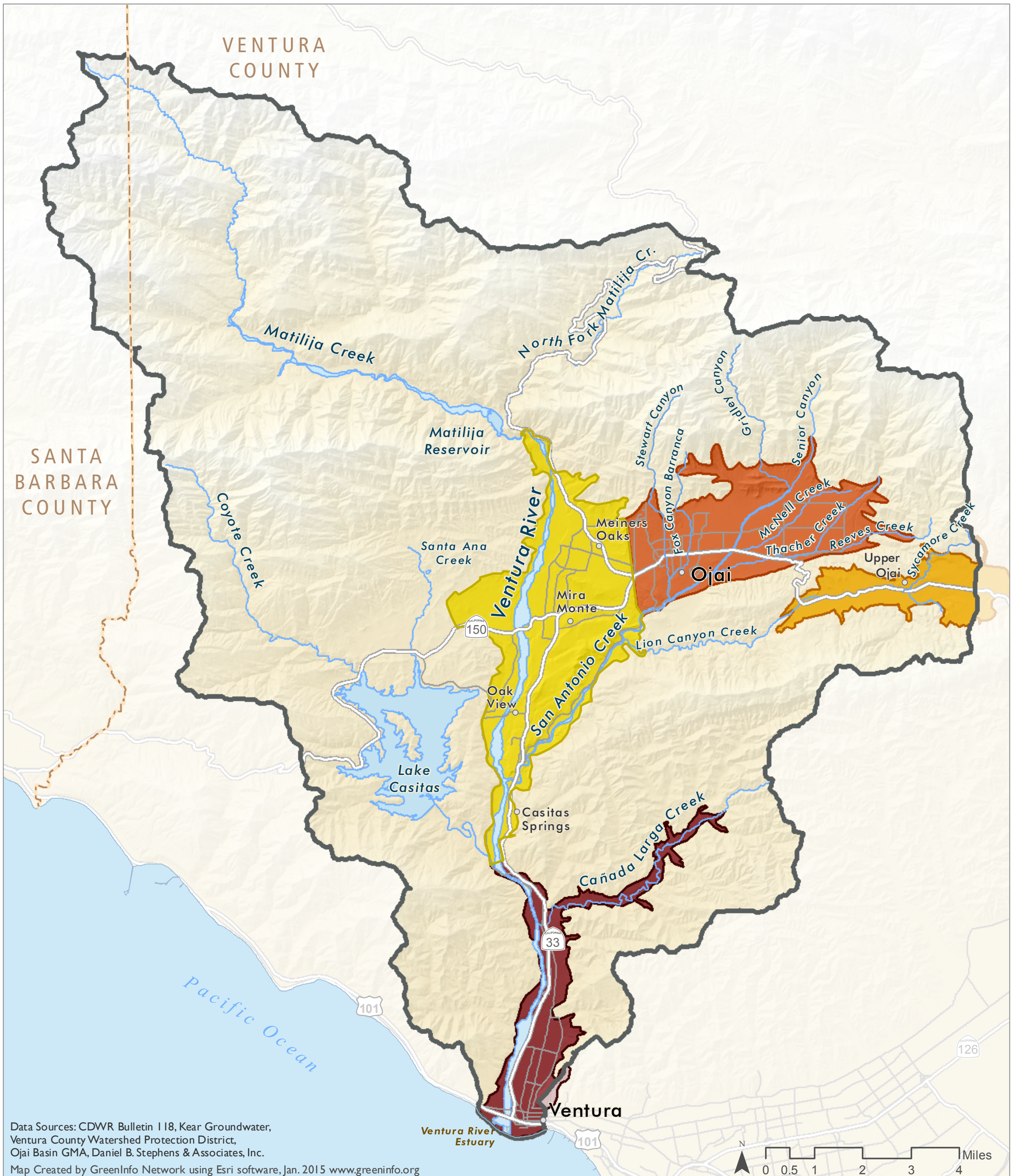


Groundwater Basins

Ventura River Watershed

Groundwater Basin	Acres	Sq. Mi.	Shallow Depth to Water (ft.)	Max. Capacity	Avg. Well Yield	Active Wells	Approx. Safe Yield
Upper Ojai	2,840	4.4	0-40	5,681 AF	50 gpm	95	Unavail.
Ojai Valley	6,471	10.1	0-80	85,000 AF	383 gpm	149	5,026 AF
Upper Ventura River	9,360	14.6	0-5	35,118 AF	600 gpm	160	9,482 AF
Lower Ventura River	6,090	9.5	3-13	8,743 AF [a]	20 gpm	16	2,130 AF [b]

a - Represents unconsolidated alluvium
b - Preliminary estimate, based on groundwater balance for water years 1997-2007

Source: Daniel B. Stephens & Associates, Inc. 2010 & 2013

Figure 3.3.3.2 Groundwater Basins Map

Data sources: See Table 3.4.2.1.3 Groundwater Basins Map Data Sources in "3.4.2 Water Supplies" for an explanation of the various data in the table.

The Ojai Valley Basin, which lies under the City of Ojai and the Ojai Valley's East End, has the largest capacity of the four groundwater basins. It is a relatively deep, bowl-shaped basin and is heavily relied upon for serving municipal and agricultural water users. It is the only basin in the watershed that has a formal management oversight entity—the Ojai Basin Groundwater Management Agency (OBGMA)—with specific authority to manage the supply and demand of the groundwater resource (Senate 1991).

The Upper Ventura River Basin supplies the greatest volume of groundwater in the watershed, even though its water holding capacity at any one time is not the largest.

The Upper Ventura River Basin, which lies under and adjacent to the Ventura River from the upper end at the Matilija Creek–North Fork Matilija Creek junction down to Foster Park, supplies the greatest volume of groundwater in the watershed, even though its water holding capacity at any one time is not the largest. This basin is tilted at a slight southward gradient, unconfined (see "Unconfined and Confined Aquifers" later in this section), and much shallower than the Ojai Valley Basin (SWRCB 1956; Entrix 2001).

The Lower Ventura River Basin is similar to the Upper Ventura Basin in that it primarily underlies the river. The basin begins at Foster Park and extends to the coast (deep layers of this basin extend offshore as submerged alluvial delta deposits). This basin has water quality limitations (VCFCD 1971) and is used minimally for industrial or agricultural needs.

The Upper Ojai Valley Basin is a fairly deep, bowl-shaped basin. It is an important source of water for residential users in Upper Ojai, as well as some agricultural users. Less hydrologic information is known about this basin than the others.

Each of these basins is described in more detail in "Groundwater Basins" later in this section.

3.3.3.1 Unconfined and Confined Aquifers

Aquifers can be confined, unconfined, or semi-confined. A confined aquifer lies between two confining layers, such as impermeable or low-permeable clay or rock. An unconfined aquifer has no upper confining layer—its upper boundary is the water table (i.e., the boundary between water-saturated ground and unsaturated ground) (Barlow & Leake 2012). Unconfined aquifers are sometimes called "leaky aquifers," aquifers that lose or gain water through adjacent less permeable layers (USGS 2014a). A semi-confined aquifer has some characteristics of both a confined and an unconfined aquifer.

Unconfined aquifers are typically located closer to the ground surface and are permeable, so they can be directly recharged by rain, irrigation water, septic tank effluent, or infiltration from lakes and streams. Confined aquifers tend to be located deeper beneath the ground surface; they can be recharged by rain or surface water infiltrating the ground at considerable distance away from the aquifer (Barlow & Leake 2012). Often aquifers are unconfined along their highest elevation reaches where they "crop out" (intersect with the ground), and may become confined at lower elevations (Schnaar 2013).

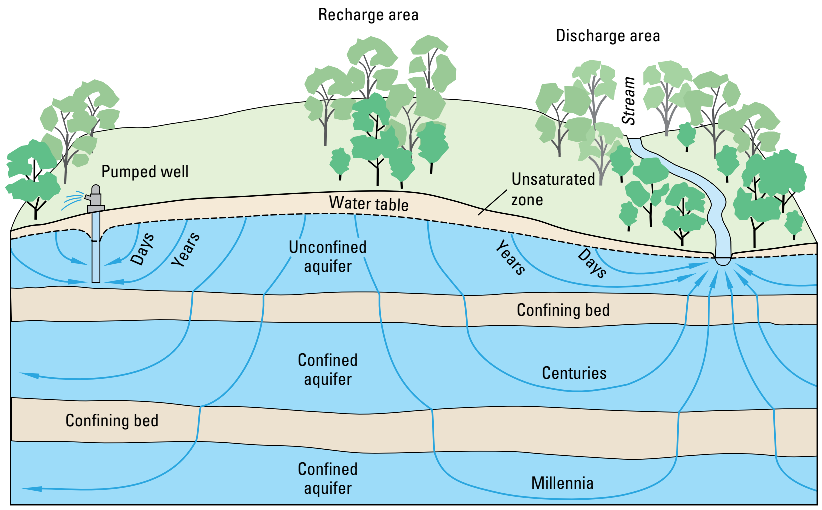


Figure 3.3.3.1.1 Unconfined and Confined Groundwater Aquifers. The image shows how groundwater systems can be composed of a vertical sequence of aquifers, with an upper, unconfined aquifer underlain by one or more confined aquifers. Groundwater systems can also be composed of a single, unconfined aquifer underlain by largely impermeable bedrock.

Image Source: Streamflow Depletion by Wells (Barlow & Leake 2012)

Unconfined aquifers are usually recharged by rain or irrigation water infiltrating directly through the overlying soil, and by infiltration from lakes and streams. The water table of unconfined aquifers is free to fluctuate up and down in response to recharge and discharge rates. Groundwater in these aquifers tends to be young (Barlow & Leake 2012), so surface conditions can directly affect water quality.

Except for the Ojai Valley Basin, current understanding is that the watershed's usable aquifers are unconfined. The Ojai Valley Basin has areas of confined, semi-confined, and unconfined groundwater (Kear 2005).

3.3.3.2 Recharge and Discharge

The concepts of groundwater recharge and discharge are introduced in this section. See also the surface water/groundwater interaction discussion in "3.3.1 Surface Water Hydrology."

Recharge

Groundwater recharge occurs when surface water percolates to groundwater and adds to the total volume in storage.

Surface water makes its way into groundwater basins by percolation of:

1) Streamflow in established drainages (such as the Ventura River, San Antonio Creek, and other streams). Stream reaches that lose water to the underlying aquifer are called "losing reaches."
2) Rain falling directly on wetlands and valley floors.
3) Reservoir leakage.
4) Irrigation water (in excess of plant use).
5) Septic system effluent seepage.
6) Enhanced recharge systems designed to increase the amount of water stored in aquifers.

In addition, water finds its way into groundwater basins by inflow from bedrock and neighboring groundwater basins (DBS&A 2010; CDWR 2003). Table 3.3.3.2.1 shows the relative amount of recharge from different sources in the Ojai Valley Basin.

Table 3.3.3.2.1 Ojai Valley Basin Groundwater Model - Annual Inflows and Outflows by Source

	Entire Calibration Period (1970–2013)		**End of Calibration Period (2009–2013)**	
Source	**AF[1]/Year**	**%**	**AF/Year**	**%**
Groundwater Inflows				
Precipitation Recharge (Basin Floor)	4,743	65%	2,639	64%
Precipitation Recharge (Upgradient Alluvial Channels)	2,032	28%	1,114	27%
Irrigation Recharge	364	5%	341	8%
Recharge from Septic Systems, Wastewater, & Former San Antonio Creek Spreading Grounds	173	2%	13	0%
Total Inflows:	7,312	—	4,107	—
Groundwater Outflows				
Pumping from Private Wells	2,606	35%	3,457	52%
Pumping for Ojai City Use (Golden State Water Co.)	1,673	23%	1,710	26%
Discharge to San Antonio Creek	2,744	37%	1,157	17%
Riparian Evapotranspiration	265	4%	190	3%
Groundwater Flow Exiting Basin	135	2%	124	2%
Total Outflows:	7,423	—	6,638	—
Net Change in Storage	**–111**	**—**	**–2532**	**—**

1: AF – acre-feet

Data Source: Update to the 2010 Ojai Basin Groundwater Model (DBS&A 2014)

Enhanced Recharge

Enhanced, or artificial, recharge refers to systems specifically designed to introduce and store water in aquifers. Enhanced recharge is used to stabilize or raise groundwater levels, smooth out supply/demand fluctuations, reduce losses from evaporation and runoff, and store water in aquifers for future use. Common methods include surface infiltration, percolation of recharge water at some depth below the ground surface, and direct injection of recharge water into the aquifer (Reddy 2008). The San Antonio Creek Spreading Grounds (see "3.4.2 Water Supplies") on Ojai's East End is an example of enhanced recharge using passive percolation recharge wells.

Recharge from Irrigation

Irrigation—primarily for crops, but also for watering large residential landscapes, golf courses, schools, and parks—comprises a significant use of water in the watershed. Agriculture alone comprises about 40% of water demand (see "3.4.3 Water Demands"). Irrigation water applied in excess of plant needs is recharged to groundwater. A 2010 study estimated that crop and landscape irrigation water contributes an average of 2,891 acre-feet (AF) per year to the Upper Ventura River Basin and 655 AF per year to the Lower Ventura River Basin (DBS&A 2010). A 2014 study estimated that crop and landscape irrigation water contributes 364 AF per year (5% of total recharge) to the Ojai Valley Basin (see Table 3.3.3.2.1) (DBS&A 2014).

The source of irrigation water is both groundwater and Lake Casitas water. During extended dry periods when groundwater is less available, much more Casitas water is used for irrigation. The water from Lake Casitas then becomes an input into the system, indirectly recharging groundwater basins.

Recharge from Septic Systems

Large areas of the watershed rely on septic systems for wastewater treatment; one of the largest populated areas is Ojai's East End (see Figure 3.5.3.1.1 Sewer Lines and Septic Systems Map in "3.5.3 Wastewater Quality"). This area sits over the Ojai Valley Basin. Some of the consumed water from households using septic systems is eventually recharged to groundwater. Like irrigation water, water used by households with septic systems can come from groundwater or Lake Casitas water.

Since the watershed's unconfined aquifers are permeable and open to infiltration from the surface, they can recharge quite rapidly during wet periods.

Since unconfined aquifers are permeable and open to infiltration from the surface, they can recharge quite rapidly during wet periods. This is especially the case in the Ventura River watershed, where groundwater basins are for the most part surrounded by mountains of impermeable bedrock that essentially funnel water into the alluvial basins. The sediments in the watershed's stream channels tend to be loose and unconsolidated deposits of gravel and sand—very permeable materials that water readily infiltrates. Underlying faults and folds are also found in these streambeds and may facilitate downward flow into aquifers. By inhibiting subsurface underground flows, these faults and folds can also delay or retain available water, enhance percolation time, and cause springs (Entrix 2001).

The following study excerpt describes the importance of the inflow of San Antonio Creek to the recharge of the Upper Ventura River Basin where the City of Ventura has their well field, and how quickly the basin can recharge:

> We conclude that the inflow from San Antonio Creek is a direct and significant influence on flow in this reach of the River system during the low-flow conditions observed by the study. We also conclude that high streambed infiltration rates and high

aquifer hydraulic conductivity values result in a very rapid rate of groundwater recharge. These conditions result in a quick groundwater level response to changes in City production. Based on data provided from the controlled shutdown period when the wells were turned off, we conclude that when the surface flow entering the Foster Park reach from the live reach of the River is 5 cfs or greater, the alluvial aquifer affected by City wellfield diversions is completely refilled within a week (or sooner) after cessation of City pumping.

—*Preliminary Hydrogeological Study, Surface Water/Groundwater Interaction Study, Foster Park* (Hopkins 2013)

An example of rapid groundwater recharge occurred in 1952, when the heavy winter rainfall was sufficient to return the groundwater in the Ojai Valley Basin to near maximum levels, even though the basin was at historic low levels following five years of deficient rainfall (Kear 2005). More recently, the groundwater level in one of Ventura River Water District's (non-pumping) wells in the Ventura River floodplain (located just above the Highway 150 Bridge) was raised 15 feet within 20 days and 22 feet within 40 days following a four-day, 7.3-inch storm in the spring of 2014 (Rapp 2014).

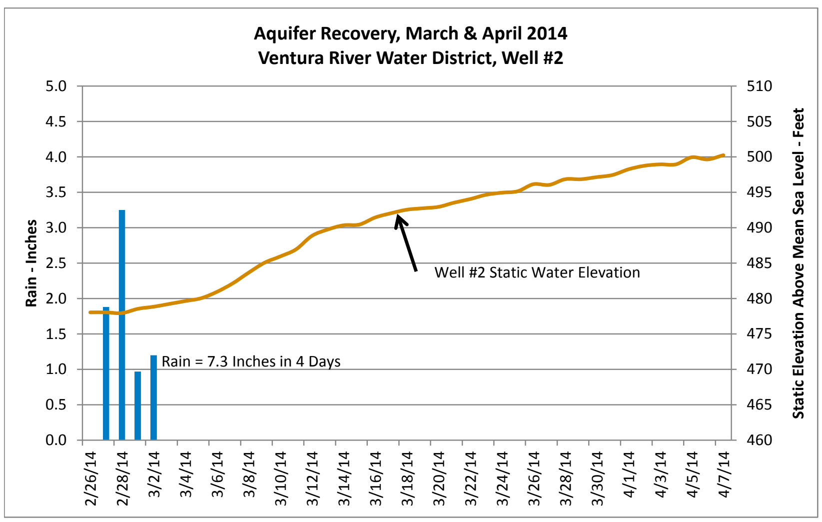


Figure 3.3.3.2.1 Aquifer Recovery, March–April 2014, Ventura River Water District Well #2. Following a four-day, 7.3-inch storm in the spring of 2014, the groundwater levels in one of Ventura River Water District's (static/non-pumping) wells in the Ventura River floodplain (located just above the Highway 150 Bridge) was raised 15 feet within 20 days and 22 feet within 40 days.

Source: Ventura River Water District

Discharge

Discharge of water from groundwater basins in the watershed occurs via groundwater pumping for municipal, industrial, domestic, and agricultural purposes; consumption by riparian and other natural vegetation; outflow to the ocean or neighboring groundwater basins; and discharge into open channels or drainages (DBS&A 2010). During wet periods, artesian conditions or springs can occur when the elevation to which groundwater will naturally rise exceeds the ground surface elevation.

For much of the year—and almost all of the dry-season—nearly all of the water in the Ventura River and its tributaries is from groundwater and springs (excluding the lower stretch of the river that is partially fed by treated wastewater).

This is not uncommon in the southwestern part of Ojai Valley Basin (Kear 2005; DBS&A 2011).

Groundwater rising above the level of a stream bottom results in what is called a "gaining stream," where groundwater seeps out of the surface and flows downstream. For much of the year—and almost all of the dry-season—nearly *all* of the water in the Ventura River and its tributaries is from groundwater and springs (excluding the lower stretch of the river that is partially fed by treated wastewater).

> It is not unusual for streams in Southern California that are rain fed and lack groundwater support to dry up in summer months, in both average and below average precipitation years. In the Ventura River watershed, however, several of the small tributaries and even the mainstem have short perennial reaches that are fed by springs and/or the perched groundwater over shallow bedrock.
>
> —*Surface Water–Groundwater Interaction Report for the Ventura River Habitat Conservation Plan* (Entrix 2001)

Only during storms, and for a relatively short period of time afterwards, do surface runoff and flows from soil water (water diffused in the soil) add to the base flow.

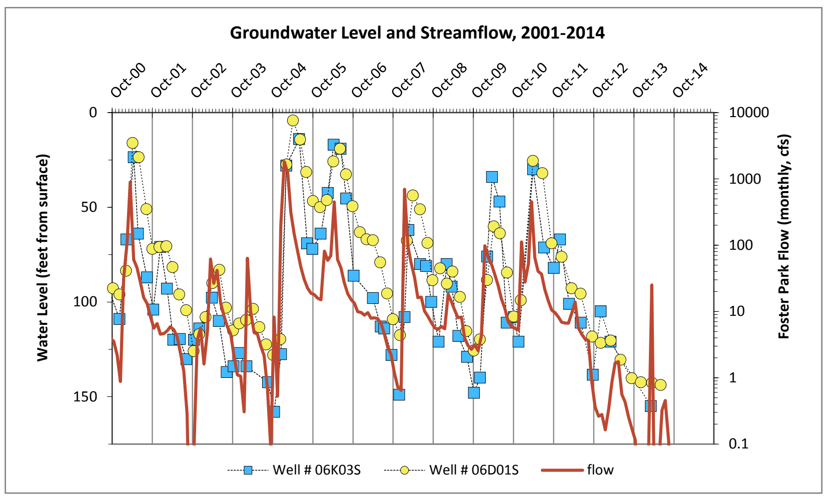


Figure 3.3.3.2.2 Groundwater Level and Streamflow, Water Years 2001–2014. The graph shows the depth-to-water measurements for two wells (indicated by green circles and blue squares) in the upper San Antonio Creek subwatershed—one to the east and the other to the west of San Antonio Creek about two miles above the San Antonio/Stewart Canyon Creek confluence. Also shown are average monthly Ventura River flows measured at Foster Park (monthly flows were used to remove the multiple spikes in the hydrograph caused by individual storms). The graph indicates that the elevation of the water table in the Ojai Valley Basin and flow of the Ventura River at Foster Park are extremely well correlated.

Data Source: Nitrate in the Ventura River Watershed (Leydecker 2013a)

The Upper Ventura River Basin, has been referred to by locals as a series of "tea cups" rather than a "basin," because of its relatively small capacity and the tendency for groundwater to collect more in some areas than others.

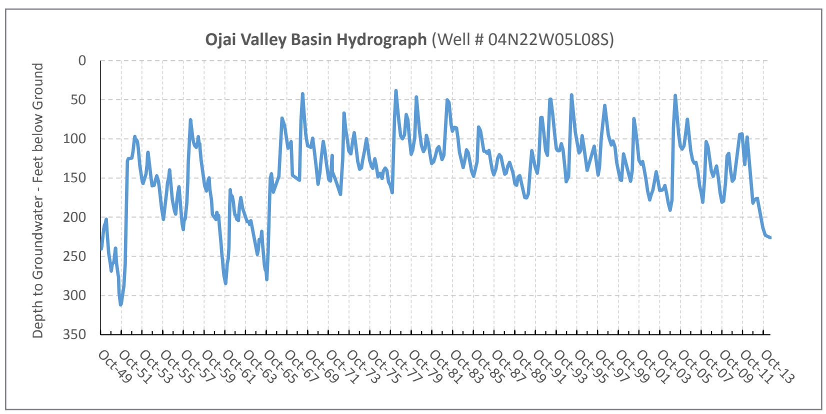
Because the watershed and its basins follow the topography and slope toward the coast (SWRCB 1956; Entrix 2001), some groundwater also drains downward into other basins or is lost to the ocean. The Upper Ventura River Basin drains into the Lower Ventura River Basin, and the Lower Ventura River Basin loses water to the ocean; the Ojai Valley Basin drains indirectly into the Upper Ventura River Basin by way of its discharge to San Antonio Creek. Coastal basins in the region are prone to seawater intrusion (CDWR 2003) because of the hydraulic connection between groundwater and seawater.

The basins along the Ventura River can be drawn down relatively quickly during dry periods by well extractions, evapotranspiration, and other discharge mechanisms. This may be especially true for the Upper Ventura River Basin, which has been referred to by locals as a series of "tea cups" rather than a "basin," because of its relatively small capacity and the tendency for groundwater to collect more in some areas than others.

Because of the relatively rapid discharge and recharge that occurs in the watershed's groundwater basins, groundwater levels and storage volumes can fluctuate dramatically from one year to the next. For example, in just seven months, between March 2012 and October 2012, water levels in the Ojai Valley Basin dropped 84 feet (VCWPD 2014). However, historical analysis (on the Ojai Valley Basin) and the experience of pumpers indicate that the long-term average amount of groundwater in storage has been fairly stable (DBS&A 2011; CDWR 2003).

Figure 3.3.3.2.3 Ojai Valley Basin Monitoring Well Hydrograph, 1949 to 2013

Source: Ventura County Watershed Protection District



Seasonal Groundwater Levels

The following excerpt describes typical variations in seasonal groundwater levels in the two most developed basins in the watershed:

> Groundwater levels in the Upper Ventura River Basin, the Ojai Basin, and the Lower San Antonio Creek Basin [now considered part of the Upper Ventura River Basin] fluctuate seasonally with the highest water levels occurring in the winter and early spring and the lowest levels occurring in the late summer and early fall.

> In general, groundwater levels in these basins recover rapidly following periods of precipitation and decline slowly under natural conditions, which is characteristic of unconfined groundwater basins. In the Upper Ventura River basin, groundwater levels in the vicinity of Meiners Oaks appear to fluctuate less than groundwater levels in the vicinity of Casitas Springs, which may be related to differences in groundwater extraction and/or potentially related to a threshold-response relationship for groundwater flow across the Santa Ana/Arroyo Parida fault.
>
> —*Surface Water-Groundwater Interaction Report for the Ventura River Habitat Conservation Plan* (Entrix 2001)

3.3.3.3 Groundwater Basins

Ojai Valley Basin

The Ojai Valley Basin is one of the most important basins in the watershed in terms of serving a large number of people and agricultural acres. It also contributes regular annual flow volumes to San Antonio Creek (DBS&A 2011), providing critical base flow and supporting its riparian habitat, which serves many important ecological functions, including supporting endangered steelhead.

The Ojai Valley Basin is one of the most important basins in the watershed in terms of serving a large number of people and agricultural acres.

Below is an excerpt from a 2011 report on the development of a groundwater model for this basin.

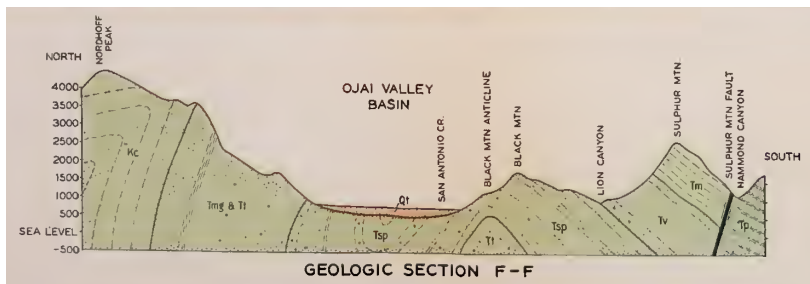
> In the lower elevations of the Basin, below the confluence of Thacher Creek and San Antonio Creek, it has generally been understood that gaining reaches are present in San Antonio Creek, with nearly perennial flow as the creek exits the Basin. This observation is supported by data collected from the nearest streamflow gage on San Antonio Creek, which is located 4 miles downstream of the Basin at the confluence of San Antonio Creek and the Ventura River. Flow was present in that location of San Antonio Creek 88 percent of the time during the model calibration period.
>
> The model-simulated results are consistent with these observations. Groundwater discharge rates to the streamflow channels (represented by Drain boundary conditions) vary based on model-wide recharge rates; however, discharge is maintained at minor levels during dry periods (Figure 19). Additionally, groundwater discharge zones simulated by the model are limited to the lower-elevation areas of the domain, consistent with the general understanding of the Basin hydrogeology.
>
> —*Groundwater Model Development – Ojai Basin* (DBS&A 2011)

The Ojai Valley Basin is bounded on the west and east by non-water-bearing Tertiary age rocks, on the south by the Santa Ana Fault and Black Mountain, and on the north by the Topatopa Mountains (CDWR 2003).

Major surface drainages that contribute influx or recharge to this basin include San Antonio Creek and the various tributary streams that drain the East End of the Ojai Valley and flow into San Antonio Creek. Steep slopes in these creeks—especially those flowing out of Senior Canyon, Horn Canyon/Thacher Creek, and Horn Canyon (VCWPD 2009)—are responsible for forming extensive alluvial fan deposits as the fast-moving, debris-laden water coming out of the mountains slows, spreads out, and deposits suspended sediment. These deposits of sand and gravel, thickest closest to the mountains in the northeastern portion of the basin, are largely responsible for filling the Ojai Valley Basin over time and forming the water-bearing aquifers of the basin (VCFCD 1971; Kear 2005).

1933 Ojai Valley Basin Geologic Cross Section

Source: Bulletin 46, Ventura County Investigation (CDWR 1933)



Unconfined conditions exist in the northern and eastern portions of the basin, in the areas of the alluvial fan heads. Groundwater in the rest of the aquifer system is, depending on the amount of water in storage and groundwater level position, mostly confined to semi-confined in the central, southern, and western portions of the basin (Kear 2005).

> With respect to aquifer confinement conditions, it appears that water levels are imperative to the status of confined versus unconfined conditions observed in the basin…
>
> —*Hydrogeology of the Ojai Groundwater Basin: Storativity and Confinement, Ventura County, CA* (Kear 2005)

Groundwater generally flows in a southwesterly direction; however, it also flows towards the municipal wells in the central portion of the basin (DBS&A 2011).

Bowl-like in shape, the basin is deepest in the center and southern areas where sediments have built up against the boundary defined by the Santa Ana Fault. The thickness of the water-bearing alluvium is as much as 715 feet (DBS&A 2011). The primary storage areas are approximately four sand and gravel units that are each on the order of up to 100 feet thick (Kear 2005).

Ojai Basin Groundwater Model

The Ojai Basin Groundwater Management Agency commissioned the development of an advanced, linked distributed-parameter groundwater model. Completed in 2011 and updated in 2014, the model provides a quantitative method for understanding the impacts of rainfall cycles and droughts on groundwater levels in the Ojai Valley Basin, including the basin's safe yield and associated impacts to flow in San Antonio Creek (DBS&A 2011).

Depth to water can be on the order of 300 feet in the eastern and northern alluvial fan-head portions of the basin (with seasonal variations between 50 and 90 feet). In the southern and western portions of the basin, depth to water is typically less than 50 feet (with seasonal variations on the order of 15 feet). The southwestern wells sometimes exhibit flowing artesian conditions when the basin reaches its storage limit during periods of high water levels (Kear 2005).

The maximum water-holding capacity of the basin is about 85,000 AF (CDWR 2003), the largest capacity of the watershed's four basins.

Upper Ventura River Basin

The Upper Ventura River Basin plays a major role in providing municipal and agricultural water. Of the four watershed basins, it has the largest surface area extent—9,360 acres. With less depth than the Ojai Valley Basin, the Upper Ventura River Basin has the second largest water storage capacity at 35,118 AF (CDWR 2003). This storage capacity is small relative to annual surface water runoff (Entrix 2001).

The basin is bounded on the south by the Lower Ventura River Basin, on the east by the Ojai Valley Basin, and on the north and west by impermeable rocks of the Santa Ynez Mountains. The boundary between the Ojai Valley Basin and the Upper Ventura River Basin is roughly Camp Comfort to the south and the Arbolada to the north (Entrix 2001). Shallow bedrock and near surface faults in some places cause water levels to remain or rise near the surface (Entrix & Woodward Clyde 1997). The east-west trending Santa Ana Fault crosses the basin just below the Highway 150 Bridge.

Major surface drainages that contribute water to this basin include San Antonio and Matilija creeks and the Ventura River (CDWR 2003). Another indirect contributor of surface water is Lake Casitas. Drainage around and under Lake Casitas flows towards the bottom of Upper Ventura River Basin. It is estimated that about 2,003 AF of water a year are contributed from the lake to recharge of this basin (DBS&A 2010).

The basin is unconfined, with generally thin water-bearing alluvial deposits. In some areas (e.g., near San Antonio and Coyote creeks), alluvium thickness is only 5 to 30 feet (CDWR 2003); below the point where the Santa Ana Fault crosses the Ventura River, alluvium attains a thickness of about 65 feet, whereas alluvium thickness is greater than 200 feet just north of the fault the (VCFCD 1971). This location is a good example of how faults can create enhanced groundwater deposits on the upstream side of a natural barrier to underflow.

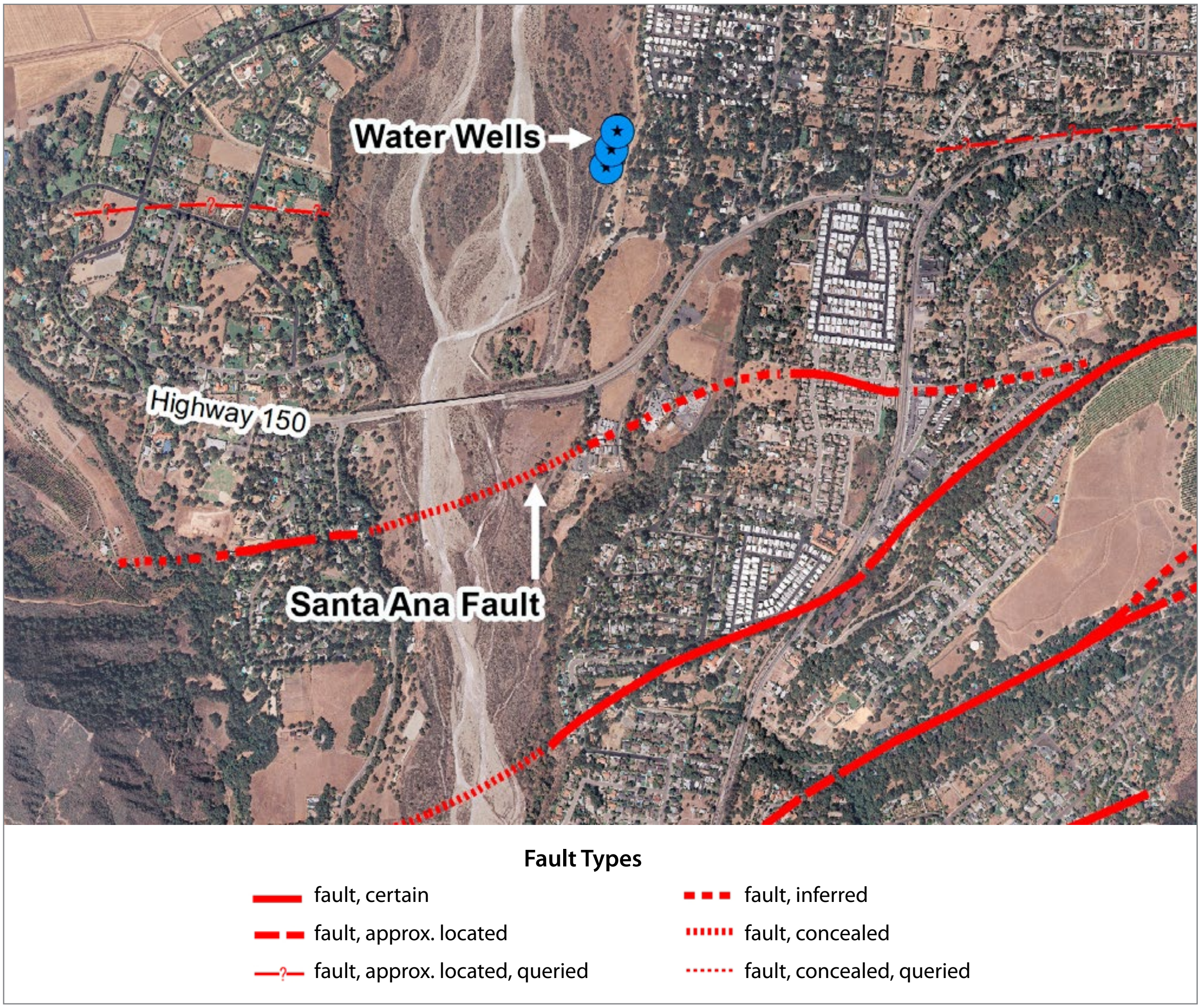


Figure 3.3.3.3.1 Map of Santa Ana Fault Crossing Ventura River

Fault Data Source: Gutierrez, C.I., Tan, S.S., and Clahan, K.B, 2008, Geologic map of the east half Santa Barbara 30' x 60' quadrangle, California: California Geological Survey, Preliminary Geologic Map, scale 1:100,000

The unconfined Upper Ventura River Basin has an open and direct relationship with the surface water of the Ventura River.

This unconfined groundwater basin has an open and direct relationship with the surface water of the Ventura River (EDAW 1978; VCFCD 1971; Entrix 2001; DBS&A 2006; Tetra Tech 2009a; Hopkins 2010; DBS&A 2010). Much of the river bottom overlying the Upper Ventura River Basin is known locally as "the dry reach," where, in low to moderate rainfall years, the surface water quickly disappears underground once storm flows have passed—even when the river is still flowing above and below this reach.

The boundaries of the dry reach depend on the magnitude of the previous rainy season and the state of groundwater storage, but they generally extend from somewhere below the Robles Diversion to just above the river's confluence with San Antonio Creek (just below Oak View). See "3.3.1 Surface Water Hydrology" for a more in-depth discussion on the dry reach.

Ventura River Dry Reach above Highway 150 Bridge

Photo courtesy of Rick Wilborn

Geographically, this dry reach is where boulders, cobbles, and sediments that have been eroded from the tallest mountains in the watershed are deposited as the gradient flattens and storm flows spread out. Water rapidly filters down through this coarse material to the groundwater basin below.

Groundwater flows through the alluvium from north to south, following the surface drainage and the slight but relatively consistent gradient of the basin (SWRCB 1956). Well logs and historic accounts of rising water above the Highway 150 bridge and above where the Santa Ana Fault crosses the river suggest that the fault slows the flow of underground water (VCFCD 1971); however, this phenomena remains to be studied. The Ventura River Water District's wells are located in this area to take advantage of this potential effect.

Groundwater is known to upwell via in-river springs in the area just above Foster Park. The community in this area is aptly named "Casitas Springs."

Upstream of the San Antonio Creek confluence, a groundwater constriction forces water in the Upper Ventura River Basin to the surface (USBR 2007).

Groundwater is known to upwell via in-river springs in the area just above Foster Park (EDAW 1978). The community in this area is aptly named "Casitas Springs." Farther downstream at Foster Park, groundwater becomes indistinguishable from surface water where the shallow, 33-foot-deep (DBS&A 2010), water-holding alluvium runs into a natural bedrock barrier that forces subsurface flow to the surface (USACE 2004). Faults often block groundwater flow and cause springs to emerge upstream. The bedrock in this area could be associated with the Red Mountain fault, which is inclined (dips) to the north, so at depth is closer to Foster Park (Keller 2014). This natural bedrock barrier was enhanced by the Ventura County Power Company in 1906 through the construction of a subsurface diversion structure to increase water retention in that area for extraction purposes (CDWR 2003).

City of Ventura's Subsurface Diversion Structure at Foster Park. The diversion dam slows the flow of subsurface water downstream. The City of Ventura extracts water at the structure and also has a number of wells just upstream.

The subsurface diversion structure at Foster Park marks the border between the Upper and Lower Ventura River Basins. A 1956 assessment of groundwater resources in Ventura County considered the Upper and Lower Ventura River Basins one groundwater basin until the subsurface diversion was installed:

> Under natural conditions, this basin was undifferentiated from the Upper Ventura River Basin, but it has been treated separately herein because of the impedance to ground water movement effected by the artificial subsurface barrier at Foster Park.
>
> —*Bulletin 12, Ventura County Investigation* (SWRCB 1956)

A 2010 groundwater budget study estimated that the groundwater flux into the Lower Ventura River Basin from the Upper Ventura River Basin is 535 AF per year (DBS&A 2010).

> The largely unconfined [Upper Ventura River] aquifer is aligned along a moderately sloping valley profile and has a persistent downvalley flow direction. However, the rate of downvalley flow is not uniform through the various river reaches and groundwater nodes. Differential depths to bedrock and bedrock controls on valley width along the river reaches create varied aquifer storage

> and transmission rates that affect groundwater and surface water interactions. The Santa Ana fault configuration has a fundamental influence on downvalley movement of groundwater. North of the fault, on the down-dropped side, the thicker aquifer has a relatively large storage capacity while the south side of the fault has a much thinner alluvial veneer over bedrock. When groundwater levels on the upvalley (north) side of the fault fall below certain elevations, downvalley movement of groundwater can be reduced or eliminated. This situation is likely to have a fundamental effect on groundwater support to surface water flows downstream of the fault.
>
> —*Surface Water-Groundwater Interaction Report* (Entrix 2001)

The Ventura River Water District, one of two water districts that have water wells in the river in the upper part of the Upper Ventura River Basin, has found that the section of the basin where it pumps tends to hold about an 18 month supply of water (estimated from pumping during an extended dry spell following a good rainfall winter). Conversely, the basin can go from empty to full with just three months of average winder (Rapp 2013).

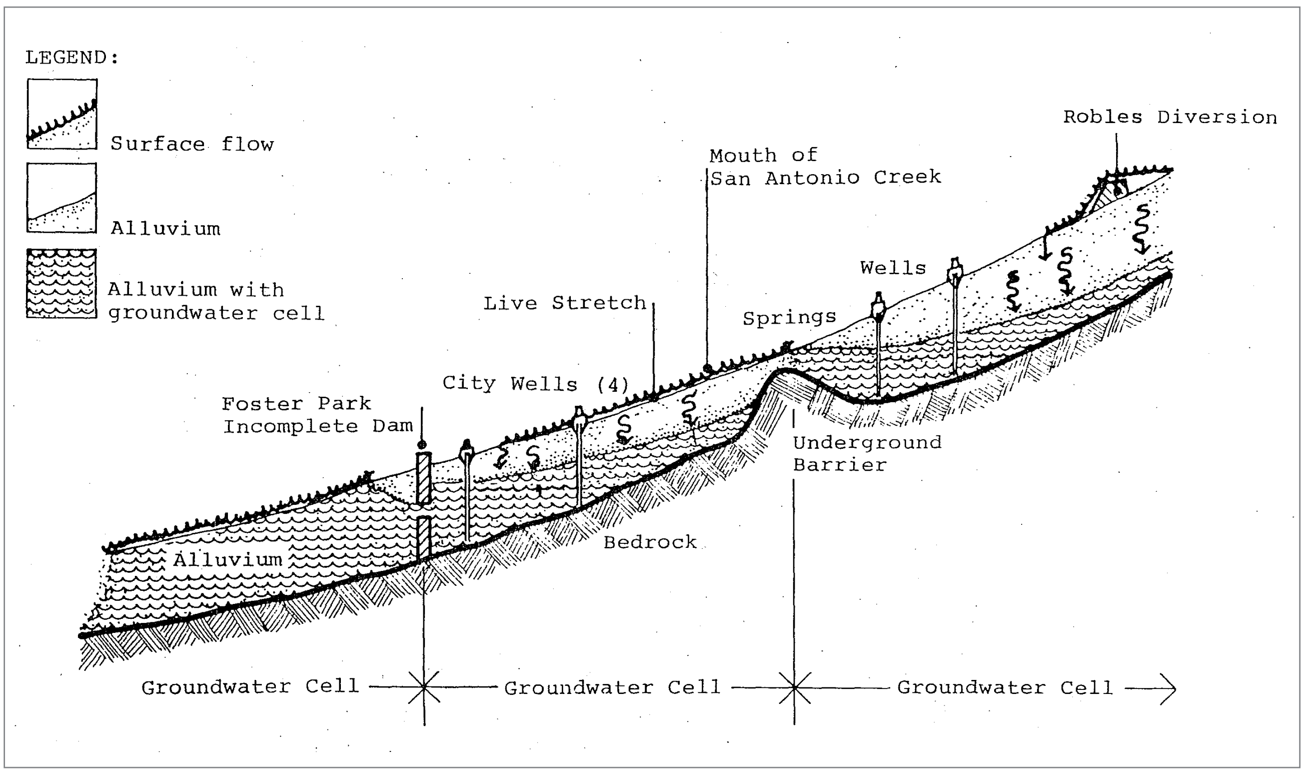
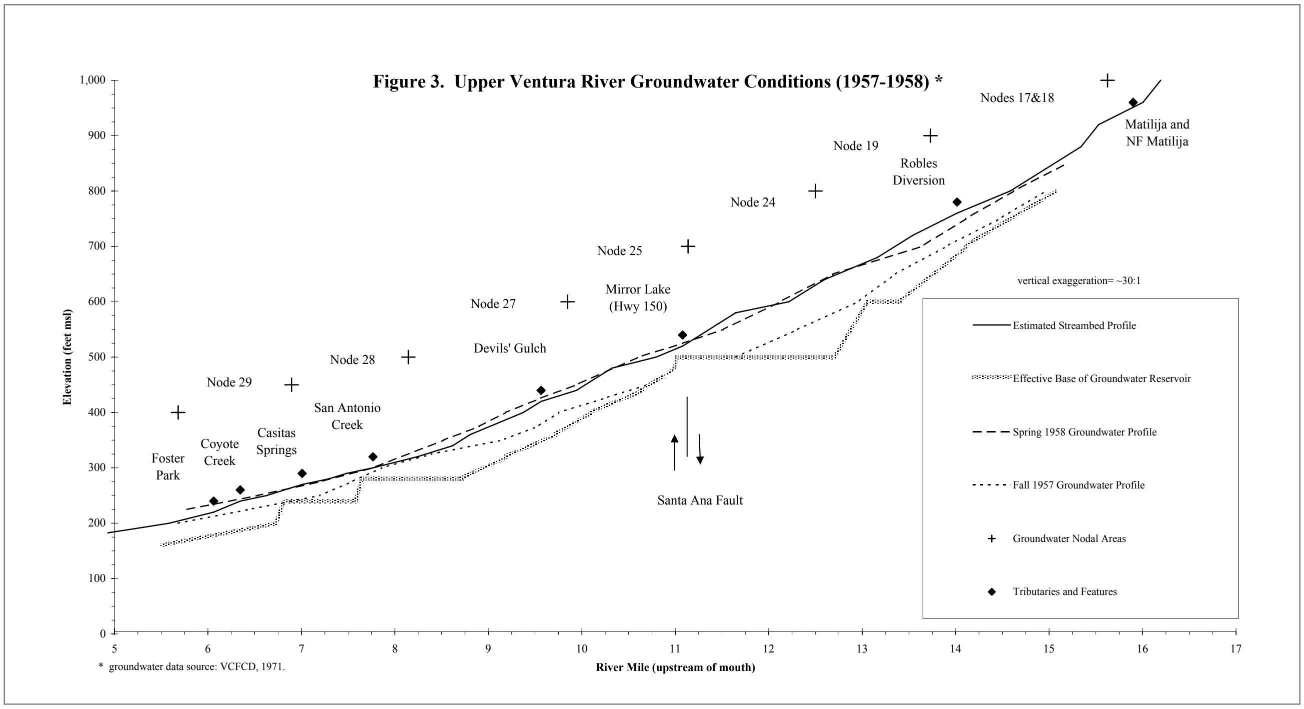


Figure 3.3.3.3.2 Ventura River, Robles Diversion to Foster Park, Summer Conditions. "There is usually no continuous surface flow in the Ventura River during the summer. However, two important local areas of surface flow do occur as a result of rising groundwater springs in the river. These are shown above as the 'live stretch' that occurs at and below the mouth of San Antonio Creek and the stretch below the Foster Park area. Flow in these stretches is stimulated by the presence of groundwater in the river alluvium, which depends on recharge from releases and spills at Robles Dam and flow from San Antonio Creek."

Note: Illustration not to scale. Source: EDAW 1978



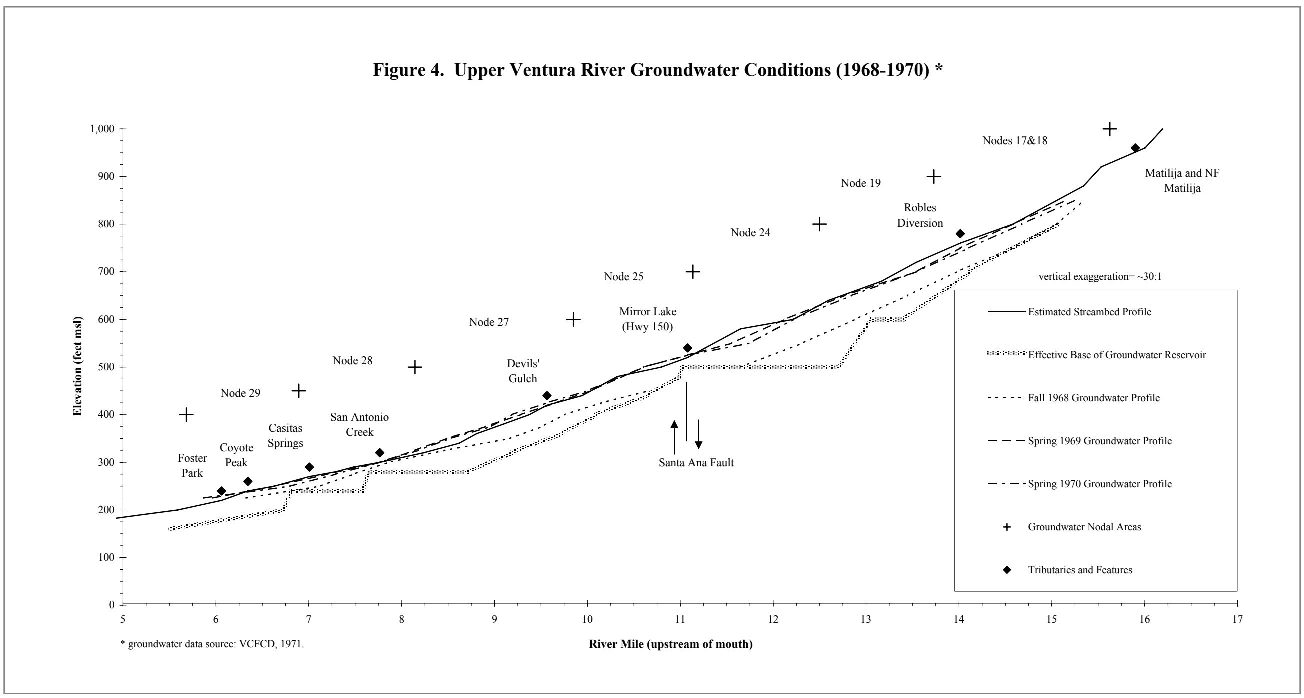


Figure 3.3.3.3.3 Comparison of Upper Ventura River Groundwater Conditions 1957–1958 (upper) and 1968–1970 (lower). "The consistency of the two fall groundwater profiles (1957 and 1968), despite different antecedent water year conditions, suggests that when high groundwater levels occur, they do not have long duration."

"The seasonal profiles presented in Figures 3 and 4 [1957–1958 and 1968–1970 figures respectfully] demonstrate the impacts of the Santa Ana/Arroyo Parida fault zone on the groundwater profile for the Upper Ventura River groundwater basin. Groundwater levels downstream of the Highway 150 crossing may be impacted when the groundwater elevations north of the fault fall below the base of the downstream aquifer (approximately 495 feet msl [above mean sea level]) which results in a disconnection in groundwater flow across the fault."

Source: Surface Water–Groundwater Interaction Report (Entrix 2001)

Lower Ventura River Basin

The Lower Ventura River Valley Basin has the lowest water supply withdrawals in the watershed.

The Lower Ventura River Valley Basin has the lowest water supply withdrawals in the watershed. Its storage capacity is estimated at 8,743 AF—assuming a basin area of 3,192 acres and an estimated average saturated thickness of 33 feet (DBS&A 2010). The California Department of Water Resources' Bulletin 118 lists its capacity as 243,000 AF (CDWR 2003); this very large figure may be due to inclusion of storage in very deep geologic formations underlying the basin as well as offshore components of those formations. The 8,743 AF estimate is based on the onshore, unconsolidated alluvium layer of the basin and not any deep or offshore layers.

The basin is bounded on the north by the Upper Ventura River Basin, on the south by the Pacific Ocean, to the southeast by the Mound Basin, and to the west and northwest by near-surface impermeable rocks of the Santa Ynez Mountains (CDWR 2003).

Major surface drainages that contribute water to this basin include the Ventura River, Coyote Creek, and Canada Larga. The flow of the Ventura River in this area is consistently enhanced by the addition of treated wastewater from the Ojai Valley Sanitary District. Unlike some other parts of the river, the stretch from the wastewater treatment plant to the coast rarely goes dry.

The basin is unconfined; the depth to groundwater is about 3 to 13 feet below ground surface in the floodplain and deeper as elevation increases towards the edge of the basin (VCWPD 2012). The alluvium continues offshore and may be in hydraulic continuity with the ocean (CDWR 1975).

As in the Upper Ventura River Basin, water flows through the alluvium from north to south, following the surface drainage and the slight gradient of the basin. A significant amount of groundwater, up to an estimated 2,412 AF a year, is discharged to the Pacific Ocean from the basin (DBS&A 2010).

Upper Ojai Basin

The Upper Ojai Basin, the third most important basin from a water supply perspective, serves residential and agricultural users in the Upper Ojai Valley. It is the smallest of the watershed's groundwater basins in aerial extent (2,840 acres) and storage capacity (5,681 AF) (CDWR 2003).

The Upper Ojai Valley Basin is narrowly elongated in an east-west direction, and is bounded by non-water-bearing Tertiary age rocks (Tan & Irvine 2005), including the Topatopa Mountains to the north, Black Mountain to the west, Sulphur Mountain to the south, and the convergence of the Topatopa Mountains and Sulphur Mountain to the east.

A surface and groundwater structural arch or divide is found in the eastern part of the basin (near Sisar Road); the divide separates groundwater flow westward toward Lion Canyon Creek and eastward toward Santa Paula Creek and into the Santa Clara River watershed (CDWR 2003).

Upper Ojai Basin:
Historical Changes to Overlying Drainages

The strata in the underground Saugus formation (between San Cayetano and Lion Canyon faults) tilts toward Santa Paula in the ancient Sisar Creek from the surface through at least 400 feet, which I have dowsed and seen dowsed. Most of the water follows ancient well-sorted stream channels, which gently curve toward the east in those levels. In the late 1800's, I was told by old residents (Hofmeister, Romp, Thompson) that during El Nino-type rainfall Sisar Creek occasionally flooded to the west until the mid-1890's. At those times, it ran down Sycamore Creek into Arnaz Creek, bypassing the Ojai Valley geologic structure.

I was told by the above-listed people that Tom McGuire's father was an early settler in the late 1800's and owned the property east of the current Black Mountain Ranch. He dryland farmed as my ancestors did. When the occasional flood happened, it littered his fields with rocks and flotsam that took a great amount of effort to remove for growing hay. Tom told my uncle that in the mid 1890's his father had hired local laborers to wall up and divert Sisar Creek water to the east. My uncle said that a few years later, a large slide slid down from the San Cayetano escarpment at the mouth of the creek, which built it up so the flow now always continues to the east (although it almost came over in 1969 and again in 2004/05.)

—Rod Thompson, Historian, 4th generation Upper Ojai resident, and Sisar Mutual Water Company board president

Lion Canyon Creek drains the Upper Ojai Valley to the west. Major tributaries to this creek include Sycamore Creek, draining the Topatopa Mountains, and Big Canyon Creek, draining Sulphur Mountain.

The Upper Ojai Valley Basin is a fairly deep, bowl-shaped unconfined basin filled primarily with alluvial fan deposits derived from erosion of the surrounding mountains. The average thickness of water-bearing deposits is approximately 60 feet, reaching a maximum of about 300 feet near Sisar Creek. Depth to groundwater is about 45 to 60 feet below ground surface (VCWPD 2012; CDWR 2003).

3.3.3.4 Key Data and Information Sources/ Further Reading

The most comprehensive evaluation of groundwater in the watershed was done by the California State Water Resources Control Board in the *Ventura County Investigation included in Bulletin 12, 1956*. The California Department of Water Resources' *Bulletin 118* is the state's current, comprehensive evaluation of groundwater basins in California; the bulletin is actually a series of bulletins that have been updated over the years.

In 1971, John Turner of the Ventura County Flood Control District (now the Ventura County Watershed Protection District) produced a detailed analysis of groundwater basins in the watershed, estimating their storage capacity and actual storage. This report, *Geohydrology of the Ventura River System: Groundwater Hydrology* (VCFCD 1971), is one of the most often cited analyses of the basins in the watershed (excluding the Lower Ventura River Basin).

Subsequent to the Turner report, a number of detailed studies have been prepared for the Ojai Valley Basin, which is now the watershed's most well studied groundwater basin. A graduate thesis published in 2005 documented the geology, degree of confinement, and hydraulic characteristics of the Ojai Valley Basin (Kear 2005). A comprehensive groundwater model prepared in 2010 estimated the basin's safe yield and provided additional information about the basin's subsurface structure (DBS&A 2011). An update to this model prepared in 2014 calibrated the original model using data through the end of 2013 and improved estimates of recharge from turf and crop irrigation (DBS&A 2014). The updated model is being used to evaluate how basin groundwater levels are expected to respond to various drought scenarios.

An important study conducted in 2010, *Groundwater Budget and Approach to a Groundwater Management Plan Upper and Lower Ventura River Basin*, provides estimates of water inputs and outputs for these basins, as well as a final groundwater budget (DBS&A 2010).

The Ventura County Watershed Protection District also produces an annual report summarizing well-monitoring data, well levels, and water quality (VCWPD 2012).

The OBGMA collects continuous groundwater level and temperature data in the Ojai Valley Basin via data loggers in five production wells and the San Antonio Creek Spreading Grounds depth discrete monitoring well.

Acronyms

AF—acre-feet

eWRIMS—electronic Water Rights Information Management System

msl—above mean sea level

OBGMA—Ojai Basin Groundwater Management Agency

Below is a list of some of the key documents that address groundwater hydrology in the watershed. See "4.3 References" for complete reference citations.

Bulletin 46: Ventura County Investigation (CDWR 1933)

Bulletin 12: Ventura County Investigation (SWRCB 1956)

Bulletin 118: California's Groundwater (CDWR 2003)

Groundwater Budget and Approach to a Groundwater Management Plan Upper and Lower Ventura River Basin (DBS&A 2010)

Groundwater Model Development – Ojai Basin (DBS&A 2011)

Update to Ojai Basin Groundwater Model Memo (DBS&A 2014)

Groundwater Section Annual Report, 2013 (VCWPD 2013g)

Hydrogeologic Investigation, Ojai Groundwater Basin, Section 602 and 603 Study Tasks (SGD 1992)

Hydrogeology of the Ojai Groundwater Basin: Storativity and Confinement (Kear 2005)

Hydrologic Assessment San Antonio Creek Sub-Watershed (DBS&A 2006)

Hydrology, Hydraulics and Sediment Studies of Alternatives for the Matilija Dam Ecosystem Restoration Project (USBR 2007)

Surface Water–Groundwater Interaction Report for the Ventura River Habitat Conservation Plan (Entrix 2001)

Status and Understanding of Groundwater Quality in the Santa Clara River Valley, 2007 – California GAMA Priority Basin Project: US Geological Survey Scientific Investigations Report (Burton et. al. 2011)

Ventura County Water Resources Management Study, Geohydrology of the Ventura River System: Ground Water Hydrology (VCFCD1971)

Gaps in Data/Information

A better understanding of groundwater, specifically its relationship with surface water, is considered one of the critical information gaps in the watershed. The extent to which groundwater pumping affects surface flows of water needs further investigation. With a better understanding of this relationship—including when pumping has the greatest effects and the location and extent of these effects—surface and groundwater supplies could be better managed to provide for both the instream water needs of the endangered steelhead at critical times of the year and the ongoing water supply needs of homes and businesses.

California's Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act, signed into law in September, 2014, created a framework for sustainable, local groundwater management for the first time in California history.

The Act established a definition of sustainable groundwater management and requires local agencies to adopt management plans for the state's most important groundwater basins. The legislation prioritizes groundwater basins and sets a timeline for implementation:

- By 2017, local groundwater management agencies must be identified;
- By 2020, overdrafted groundwater basins must have sustainability plans;
- By 2022, other high and medium priority basins not currently in overdraft must have sustainability plans; and
- By 2040, all high and medium priority groundwater basins must achieve sustainability.

For the purposes of this act, the Upper Ventura River and Ojai Valley Groundwater Basins are considered medium priority basins, and the Lower Ventura River Basin and the Upper Ojai Basin are low priority basins.

Implementation of the requirements in the Act will result in more groundwater management plans with additional data collection that should help address groundwater data gaps in the watershed.

Further investigation is warranted for many groundwater hydrology parameters throughout the Ventura River system including:

groundwater extraction[1]

groundwater elevation

accurate storage and safe-yield capacity

groundwater flow within and between the basins

definition of aquifer depth, barriers, and boundaries

enhanced groundwater recharge alternatives

groundwater–surface water interactions

detailed location and nature of faults, and how they affect groundwater hydrology

cross sections of subterranean geology

quantity of agricultural irrigation infiltration

recharge and discharge areas

1. At this time, groundwater extractions are only comprehensively reported and monitored in the Ojai Valley Basin; however, anyone with wells having aggregate extractions of more than 25 AF (or extractions of 10 AF or more from a single source) must file a report with the State Water Resources Control Board if there is no delegated local agency such as the OBGMA (Water Code §4999-5009). This has been a requirement in Ventura County since the 1950s. However, this requirement is not enforced, and the record of extractions in the State's electronic Water Rights Information Management System (eWRIMS) database is incomplete.

3.4 Water Supplies and Demands

Robles Canal
Photo courtesy of Michael McFadden

3.4 Water Supplies and Demands

3.4.1 Water Suppliers and Managers

3.4.1.1 Types of Suppliers

The watershed has several different types of water suppliers; the differences are mostly in the type of ownership, methods of payment or reimbursement for water, and the governing bodies. Different regulations and procedures may apply to different types of water suppliers. The following descriptions are taken from the Ventura County Watershed Protection District's *Inventory of Public & Private Water Purveyors in Ventura County* (VCWPD 2006).

Cities—Any charter or general law city is a public agency that can provide water service as a city function.

Special Districts—Special districts are public agencies formed pursuant to general or special laws, generally for the local performance of government or proprietary functions within limited boundaries.

Public or Special-Use Public Water Suppliers—These are public water suppliers other than cities or special districts. In the Ventura River watershed these are parks, campgrounds, and County facilities.

PUC-Regulated Private Water Companies—In a limited number of cases, the California Public Utilities Commission (PUC) licenses and regulates water companies. These private companies have rates and service areas established by the State PUC. They are not owned by any public agencies or by the affected customers, but usually by shareholders who purchase stock or ownership rights via bond issues, etc.

Mutual Water Districts or Companies—Similar to PUC-regulated water companies but with fewer restrictions, mutual water districts or companies are owned in common by the various shareholders or customers served by the company.

Privately Owned Water Companies—A popular and easily established form of water service is the private company. These include limited partnerships, private landowners, mobile home parks, and irrigation-only companies. Customers may or may not own shares in the company, depending on the size of the purveyor.

Private Well Owners—Many individuals and businesses in the watershed, especially farmers, have private wells and therefore serve as their own "supplier."

3.4.1.2 Major Urban Water Suppliers

There are five major urban water suppliers in the Ventura River watershed: Casitas Municipal Water District, Ventura Water, Golden State Water Company, Ventura River Water District, and Meiners Oaks Water District. These major urban water suppliers are described briefly below; more information on the suppliers is provided in "3.4.2 Water Supplies" (including a map of water supply key infrastructure) and "3.4.3 Water Demands."

Casitas Municipal Water District

Casitas Municipal Water District (CMWD) is the primary water supplier in the watershed, providing water to both water resale agencies and retail customers. The City of Ventura is Casitas' largest customer, and Lake Casitas water serves as one of the main sources of water for the City of Ventura. One of CMWD's important functions is to serve as the "backup" water supply for a number of their customers, including nine water suppliers, as well as farmers, when groundwater supplies become depleted.

Table 3.4.1.2.1 Major Urban Water Suppliers, Overview

Major Urban Water Supplier	Purveyor Type	Year Formed	Area Served	Est. Pop. Served	# of Connections
Casitas Municipal Water District (CMWD)	Special District	1952	Boundary include the City of Ojai, Upper Ojai, Ventura River Valley area, the City of Ventura to Mills Road, and the coastal Rincon area to the Santa Barbara County line. 137 sq. mi.	9,379 R 68,557 R+W	3,200
Ventura Water	City	1923	City of Ventura[1] In watershed: 1,798 acres within City + 944 acres within City's sphere of influence In CMWD service area: 4,112 acres Overall: 22 sq. mi. of City + 944 acres within City's sphere of influence	106,433 (entire city) 31,604[2] (Casitas's service area within city)	About 32,000 service connections; approximately 30% of those accounts (~9,600) are located within the CMWD service area.
Golden State Water Company	Investor-Owned Utility	1928	City of Ojai proper and some fringe County areas outside the City. 3,300 acres.	8,202	2,899
Ventura River Water District	Special District	1957	Part of Casitas Springs, Burnham Road area west of the Ventura River, and north half of Oak View up to Meiners Oaks and to the City of Ojai at the Vons shopping center. 2,220 acres.	5,988	2,150
Meiners Oaks Water District	Special District	1948	Meiners Oaks community on the east side of the Ventura River. 1,300 acres.	4,000	1,260

R = Retail, W=Wholesale. Because they are a wholesale provider, Casitas' service area encompasses that of the other districts; it also extends beyond the watershed's boundaries.

1. Ventura Water may use Casitas water within Casitas's service area, which extends to about Mills Road, but this restriction does not apply to use of Ventura River water from the City's Foster Park facilities.

2. Estimated with a GIS tool using Census Block Groups.

Sources: Kennedy/Jenks 2011, Rapp 2013, Hollebrands 2013, CDWR 2013, RBF 2013, USCB 2014

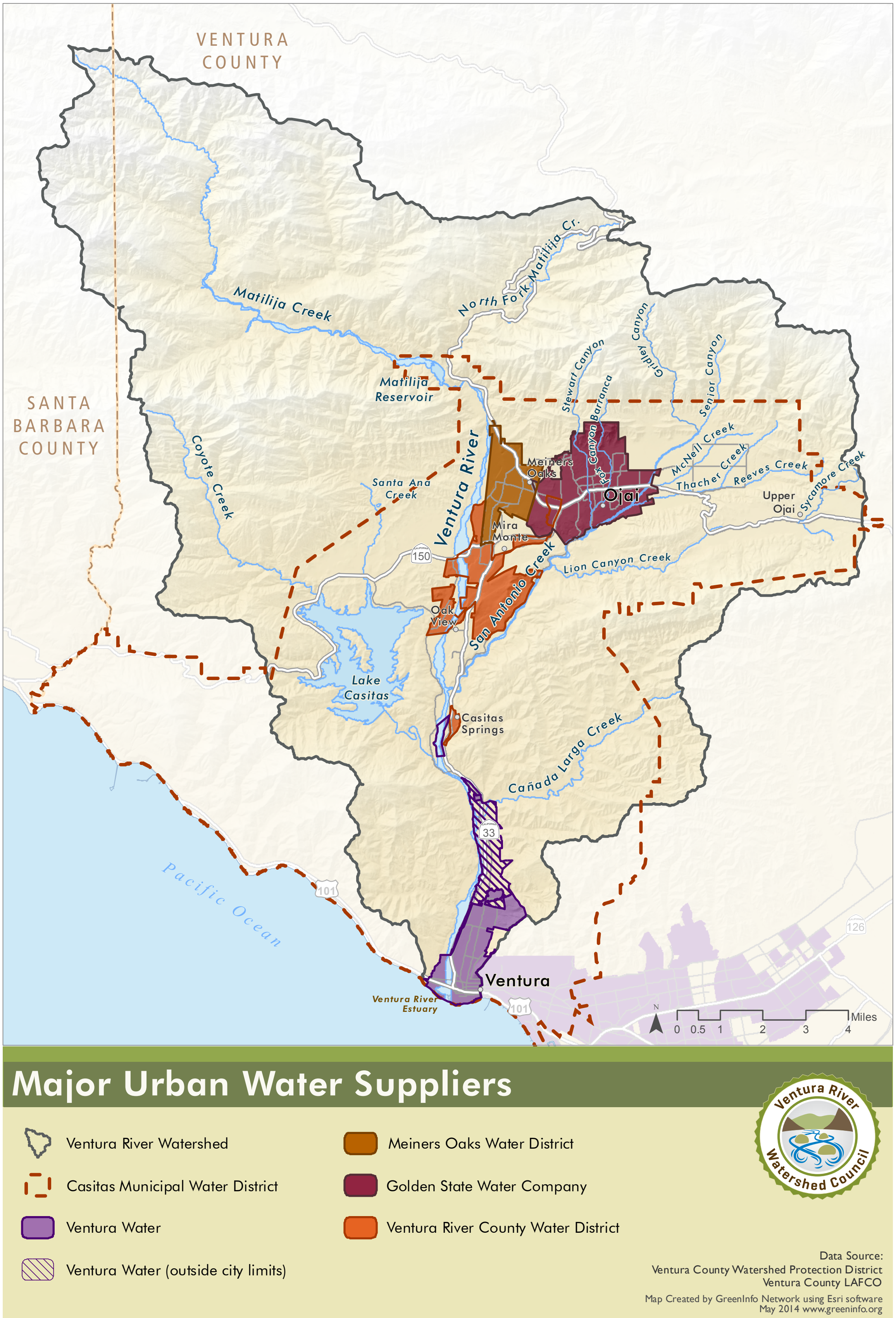


Figure 3.4.1.2.1 Major Urban Water Suppliers Map

CMWD's service area encompasses 137 square miles and includes the City of Ojai, Upper Ojai, the Ventura River Valley area, the City of Ventura south to about Mills Road, and the coastal Rincon area to the Santa Barbara County line.

CMWD gets its water from Lake Casitas, which is fed by both the reservoir's surrounding drainages and water diverted from the Ventura River. The district also operates one well in the Mira Monte area.

CMWD operates and maintains Lake Casitas and Casitas Dam, the Robles Diversion and Fish Passage Facility on the Ventura River, the Robles Canal, and the Marion Walker Pressure Filtration Plant. CMWD also maintains and operates one well in Mira Monte, which pulls from the Upper Ventura River Basin.

Ventura Water

Ventura Water is the name of the City of Ventura's department that supplies water and treats wastewater. Ventura Water's service area is within their city limits (22 sq. mi.), which comprises several watersheds, including the lower part of the Ventura River watershed east of the Ventura River (primarily the City's Westside). They also supply water to an area in the watershed of about 944 acres that is outside their city limits but within their sphere of influence.

Lake Casitas is one of Ventura Water's primary supply sources. The water received from CMWD may only be used in the part of the City within CMWD's service area (4,112 acres), which extends to about Mills Road. There is an exception to this in Casitas's 1995 contract with the City allowing them to "rent" water from Casitas (and return it later) for use outside of Casitas's service area (CMWD 1995); this contract is being reconsidered for relevance to current water supplies and demands.

Water from wells and diversions in the Foster Park area is another primary water source of Ventura Water. Water from this source may be used anywhere within Ventura Water's service area. Ventura Water also depends upon groundwater from sources in the Santa Clara River watershed.

In the Ventura River watershed, Ventura Water operates four groundwater wells at Foster Park (one of which is not currently operational because of damages sustained in the 2005 flood). These wells pull water from the downstream end of the Upper Ventura River Basin. Ventura Water also has both a surface and subsurface intake on the Ventura River at Foster Park (though the surface diversion has not been operational since 2000).

Ventura Water operates the Avenue Water Treatment Plant, which treats water from the Foster Park wells and diversions.

Golden State Water Company
A Subsidiary of American States Water Company

Golden State Water Company

Of the five major urban water suppliers in the watershed, Golden State Water Company is the only PUC-regulated private water company. Golden State also owns and operates several other water systems in California. In the Ventura River watershed their service area includes the City of Ojai proper, part of the unincorporated County east of the City of Ventura and part of the Meiners Oaks community to the west of Ojai. Golden State's main source of water is groundwater, which they supplement with water from CMWD.

Because of high water cost rates relative to other rates in the area, as well as complaints related to service, customers of Golden State in the City of Ojai initiated an effort in 2010 to have CMWD acquire the Ojai service area of Golden State and become the area's service provider. In 2013, voters approved a bond to fund the cost of acquiring the water system and making needed improvements. As of this writing, this issue is being litigated.

Golden State operates five wells in the Ojai Valley Groundwater Basin. They have two connections to CMWD (City of Ojai 2012).

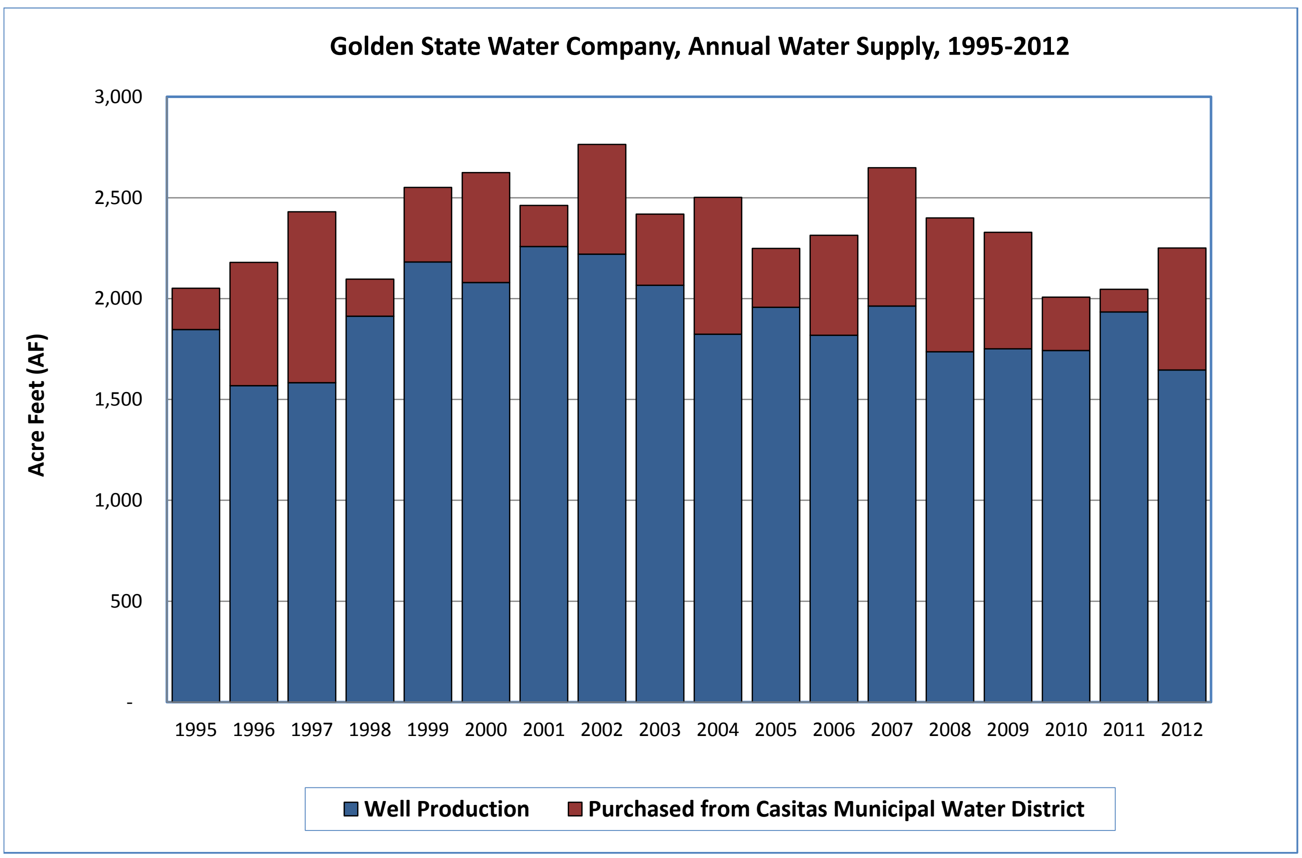


Figure 3.4.1.2.2 Golden State Water Company Annual Water Use by Source

Source: GSWC 2013

Ventura River Water District

Ventura River Water District (VRWD) is a small water district that supplies water to the area stretching from the southwestern edge of the City of Ojai down to the northern half of Oak View, and in the eastern half of Casitas Springs. Groundwater is VRWD's primary water supply source. CMWD water is also used, both as a backup source and as a regular source for customers in some locations.

> When full, our aquifer holds about a two year supply of water. If we do not receive sufficient rain after that we must rely upon water from Lake Casitas.
>
> —*Ventura River Water District website* (VRWD 2014)

VRWD operates four wells in the Upper Ventura River Groundwater Basin, and has five water system connections to receive water from Lake Casitas.

Meiners Oaks Water District

Meiners Oaks Water District (MOWD) is a small water district that supplies water to the community of Meiners Oaks on the east side of the Ventura River. Groundwater is MOWD's primary water supply source. Water from CMWD is infrequently used as backup, such as during extended drought periods.

MOWD operates five wells in the Upper Ventura River Groundwater Basin.

Table 3.4.1.2.2 Water Sources of Major Urban Water Suppliers

Major Urban Water Supplier	Water Sources
Casitas Municipal Water District	Lake Casitas, which is fed by both its surrounding drainages and water diverted from the Ventura River. The district also operates 1 well in the Mira Monte area, in the Upper Ventura River Basin.
Ventura Water	Sources from the Ventura River watershed include CMWD and Foster Park wells and diversions. Ventura Water operates 4 groundwater wells at Foster Park (one of which is not currently operational because of damages sustained in the 2005 flood), and both a surface and subsurface intake on the Ventura River at Foster Park (though the surface diversion has not been operational since 2000s). Groundwater is extracted from the Upper Ventura River Groundwater Basin. Ventura Water also has rights to reclaim water from the Ojai Valley Sanitary District treatment plant. Reclamation of this water source is currently under study.
Golden State Water Company	5 wells in the Ojai Valley Groundwater Basin, plus water from CMWD.
Ventura River Water District	4 wells in the Upper Ventura River Groundwater Basin, plus CMWD water as backup.
Meiners Oaks Water District	5 wells in the Upper Ventura River Groundwater Basin, plus CMWD water as backup.

3.4.1.3 Mutual Water Companies

There are 11 mutual water companies in the watershed as summarized in Table 3.4.1.3.1. They range from small companies serving 10 to 12 customers, to companies serving hundreds of customers. The majority of these mutual water companies were formed in the 1930s and 40s, before the construction of Lake Casitas. Antiquated infrastructure presents management challenges for some of these older water companies.

There are also eight private water companies that deliver water in the watershed along with three public water suppliers that supply water to locations, such as County parks and facilities.

Table 3.4.1.3.1 Small Water Suppliers, Overview

Water Supplier	Year Formed	Service Area	Est. Pop. Served	# of Connections	Water Sources
Casitas Mutual Water Company	1932	Serves residents in Casitas Springs, west of Highway 33.	250	81	Groundwater (Upper Ventura River Basin)
Gridley Road Water Group	1930	Serves primarily agriculture in the area of the Gridley Road and Grand Avenue intersection in the East End of the Ojai Valley.	44	20	Groundwater (Ojai Valley Basin), Golden State
Hermitage Mutual Water Company	1975	Serves primarily agriculture and several large residential estates located in the foothills between Gridley and Senior canyons north of the Ojai Valley.	35	22	Gridley Canyon Creek, Groundwater (Ojai Valley Basin), CMWD
North Fork Springs Mutual Water Company	1948	Serves residential users located up Highway 33, north of the City of Ojai, E. of the Matilija Reservoir, in the Los Padres National Forest.	10	11	Groundwater (Upper Ventura River Basin)
Old Creek Road Mutual Water Company	1975	Serves residential users along East Old Creek Road	12	5	CMWD
Rancho Matilija Mutual Water Company	Pre-1960	Serves agricultural parcels in the Rancho Matilija subdivision, north of Baldwin Road and west of Meiners Oaks	0	8	Groundwater (Upper Ventura River Basin), Ventura River surface water
Rancho del Cielo Mutual Water Company	1977	Serves residential and agricultural users along Creek Road (along San Antonio Creek)	18	7	CMWD
Senior Canyon Mutual Water Company	1929	Serves the northeast end of the Ojai Valley (north of Reeves Creek, east of Carne Road). Serves a mix of residential, large residential, and agricultural users.	800	247 domestic metered; 48 irrigation	Groundwater (Ojai Valley Basin), 2 spring/creek diversions, CMWD
Siete Robles Mutual Water Company	1940	Serves a housing tract located east of the City of Ojai.	245	98	Groundwater (Ojai Valley Basin), CMWD (minimal)
Sisar Mutual Water Company	1949	Serves the Summit area of the Upper Ojai Valley (partially within CMWD's service area boundary).	325	103	Groundwater (Upper Ojai Basin), CMWD
Tico Mutual Water Company	1949	Serves a small residential area in Mira Monte, west of Highway 33.	77	38	Groundwater (Upper Ventura River Basin), CMWD

Sources: CMWD 2011, VCWPD 2006, WCVC 2006, Thompson 2014

3.4.1.4 Private Wells and Diversions

Water is also supplied to many agricultural and domestic water users in the watershed by way of private wells and surface water diversions.

As of March 2014, 21 different entities were registered in the state's eWRIMS (Electronic Water Rights Information Management System) database as having rights to withdraw surface water or water from subterranean streams in the watershed (SWRCB 2014b).

As of May 2014, there were 442 active wells in the watershed, 203 of which were drilled prior to local permit requirements.

Table 3.4.1.4.1 Active Wells in 2014

Groundwater Basin	Active Wells (approx.)	Drilled Before Permits[1]
Upper Ventura River Basin	149	76
Lower Ventura River Basin	15	3
Ojai Valley Basin	182	98
Upper Ojai Basin	96	26
Total	442	203

Well records are approximate.

1. Drilling permits became required in 1999.

Source: VCWPD 2014a

3.4.1.5 Water Management Organizations

Ojai Basin Groundwater Management Agency

Ojai Basin Groundwater Management Agency (OBGMA) is a special-act district that manages the water of the Ojai Valley Groundwater Basin. Formed by state legislation in 1991, OBGMA is one of only 13 such districts with groundwater management authority in the State of California (CDWR 2003). The watershed's other three important water supply groundwater basins do not have similar management oversight. The OBGMA was established in the fifth year of a drought, amidst concerns of local water agencies, water users, and well owners about potential groundwater basin overdraft (OBGMA 2010).

The OBGMA was established in the fifth year of a drought, amidst concerns of local water agencies, water users, and well owners about potential groundwater basin overdraft.

OBGMA's mission is "To preserve the quantity and quality of groundwater in the Ojai Basin in order to protect and maintain the long-term water supply for the common benefit of the water users in the Basin."

There are five seats on the OBGMA board, which are filled by representatives from the City of Ojai, Casitas Municipal Water District, Golden State Water Company, Ojai Water Conservation District, and mutual water companies (one director is elected to represent three mutual water companies).

The OBGMA oversees the management of the Ojai Basin, and is required by law to have a groundwater management plan to guide its operations. Elements of OBGMA's Groundwater Management Plan are implemented in the form of policies, rules, regulations, and ordinances. Water drawn from the basin is used roughly equally between urban and agricultural users.

Ventura County Watershed Protection District

The Ventura County Watershed Protection District (VCWPD), originally named the Ventura County Flood Control District, was formed by state approval of the Ventura County Flood Control Act of 1944. This Act (as amended) includes five primary purposes of the VCWPD, including several related to water supplies:

- Provide for the control and conservation of flood and stormwaters
- Prevent waste or loss of water supply
- Import water into the district, retain and recycle storm and flood flows, and conserve all such water for beneficial uses.

Key programs and services that the district administers that support water supply management include:

- Lead role in monitoring and collection of precipitation, weather, and streamflows data
- Hydrologic modeling and forecasting
- Lead grant applicant/administrator in support of watershed partner projects, such as the San Antonio Creek Spreadings Grounds project
- Groundwater well permitting, groundwater data, and basin condition assessments
- Stormwater management programs that advance stormwater capture and infiltration.
- VCWPD implements Ventura County Well Ordinance No. 4184, which includes issuing permits for modification, construction, and destruction of all types of wells; inspecting well sealing and perforation work; and conducting an annual well usage survey. VCWPD hydrographers regularly perform water level measurements and water quality sampling of approximately 200 wells located throughout Ventura County and produce an annual report summarizing those findings. VCWPD maintains records on all known wells within the County, including a database of wells that helps track well status (active/inactive/destroyed).

Ojai Water Conservation District

The Ojai Water Conservation District (OWCD) is a special district formed in 1949. The district's focus is on reclaiming water in the San Antonio Creek area of the East End of the Ojai Valley for agricultural purposes. The district was formerly called the San Antonio Water Conservation District (VCWPD 2006). OWCD is authorized to monitor the use of groundwater, acquire water rights, store and spread water, and construct dams or other water facilities (VLAFCO 2004). The OWCD is within OBGMA's service area, and is represented on OBGMA's board.

3.4.1.6 Key Data and Information Sources/ Further Reading

Below are some of key documents that address water suppliers in the watershed. See "4.3 References" for complete reference citations.

2010 Urban Water Management Plan (CMWD 2011)

2013 Comprehensive Water Resources Report, Ventura Water (RBF 2013)

2014 Comprehensive Water Resources Report, Ventura Water (RBF 2014)

Inventory of Public & Private Water Purveyors in Ventura County (VCWPD 2006)

Public Water System Statistics (CDWR 2013)

Ojai Basin Groundwater Management Agency, Annual Report (OBGMA 2010)

Water and Wastewater Municipal Service Review Report (VLAFCO 2004)

3.4.2 Water Supplies

This section discusses the watershed's water supply sources. Other aspects of these water sources are discussed elsewhere in this document, including "3.3 Hydrology" and "3.5 Water Quality."

3.4.2.1 Current Supply Sources

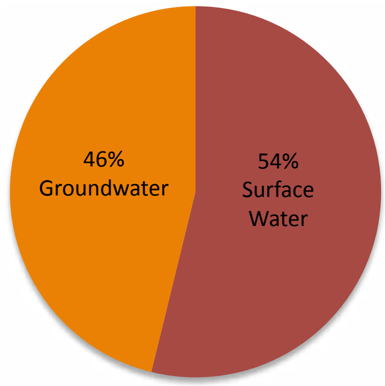


Figure 3.4.2.1.1 Average Annual Water Production by Source
Data source: See footnotes for Table 3.4.2.1.1.

The Ventura River watershed relies entirely on local water. No imported water is used in the watershed—truly remarkable given its location in coastal southern California. Local surface water and groundwater sources supply water demands within the watershed, and help meet demand in adjacent coastal watersheds. Reclaimed water, i.e., treated wastewater, is not currently used directly as a water supply source. Casitas Municipal Water District (CMWD) and the City of Ventura both hold entitlements to State Water Project water, however no pipeline, tunnel, or conveyance of any kind exists to deliver that water to the watershed.

Surface water is extracted for use directly from the Ventura River and some of the tributaries, but the primary source of surface water comes from Lake Casitas. Groundwater is extracted from the watershed's four groundwater basins by urban water suppliers, growers, and other private businesses and landowners.

Table 3.4.2.1.1 Average Annual Water Production, by Major Supply Source

Water Supply Source	Approx. Annual Average Use (acre-feet)	Total by Category	% by Category
Lake Casitas	17,493[1]		
Foster Park surface diversion	0[2]		
Surface Water Total:		17,493	54%
Ojai Valley Basin	5,113[3]		
Upper Ventura River Basin	9,300[4, 5]		
Lower Ventura River Basin	523		
Upper Ojai Basin	68.2[6]		
Groundwater Basins Total:		15,004	46%
Total:	**32,497**		

1. Average deliveries to the main conveyance system between 1975 and 2013 water years (CMWD 2009a).

2. City of Ventura's surface water diversion at Foster Park has been inactive since 2000 due to the natural channeling of the active river channel bypassing the structure. The City's subsurface diversion totals are included with groundwater.

3. Average groundwater production rate between 1985 and 2012 (OBGMA 2014).

4. Average municipal groundwater production rate between 2000 and 2007, plus estimated average annual domestic and agricultural extraction. These numbers are rough estimates due to data limitations and because extractions have changed over time (DBS&A 2010, Table 13). For example, the City of Ventura's 50-year average extraction rate between 1960 and 2009 was 6,000 AF (RBF 2013), whereas the 7-year average used in the report cited in the table above was 4,603 AF.

5. The City of Ventura's subsurface diversions are included in the groundwater category.

6. 10-year average provided by Sisar Mutual Water Co. Roughly half of Sisar's water is used in the Santa Clara River watershed. No other groundwater pumping data are available.

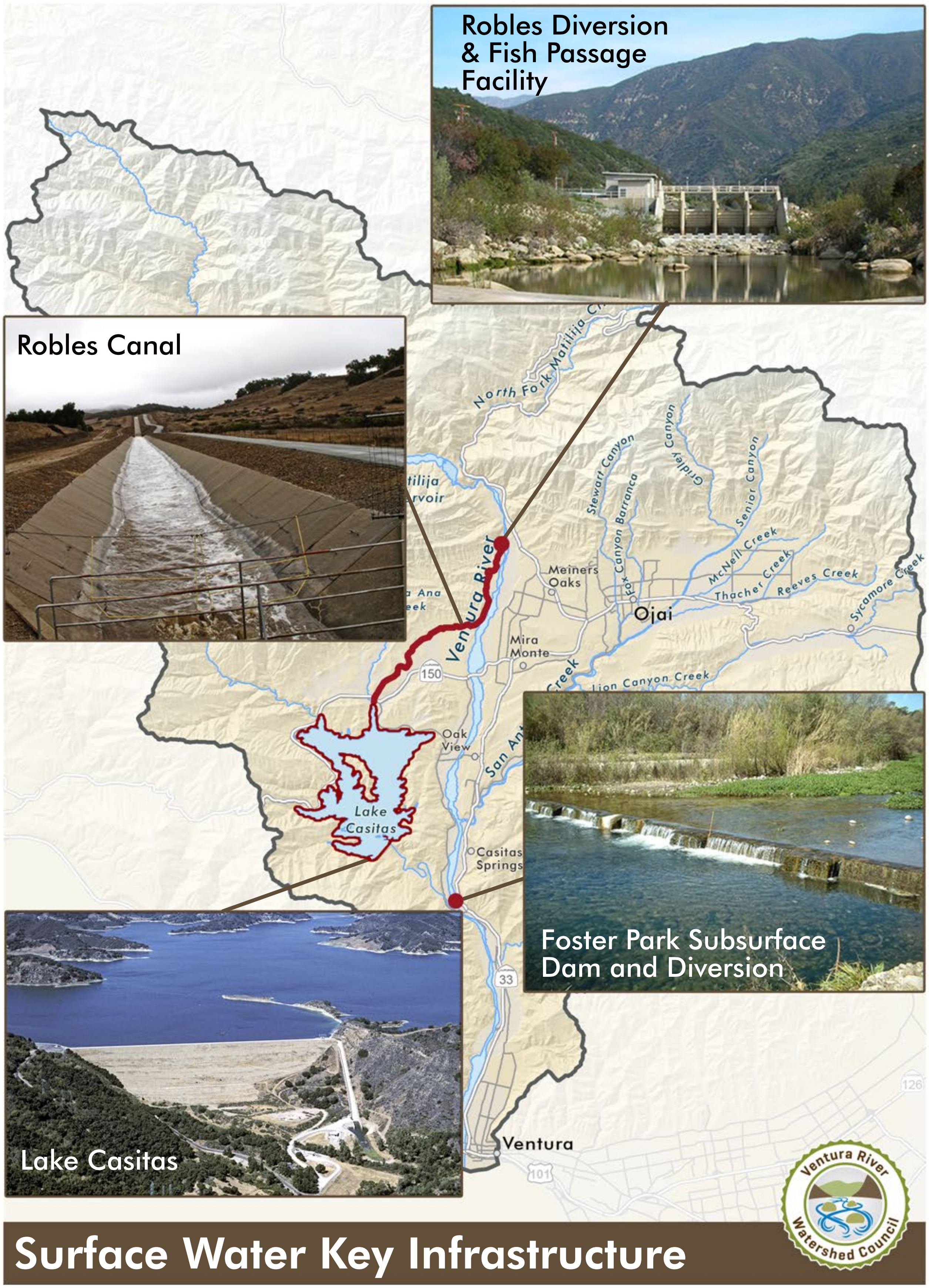


Figure 3.4.2.1.2 Surface Water Key Infrastructure Map

Lake Casitas

Lake Casitas is the cornerstone of the water supply infrastructure in the watershed, and its value cannot be overstated.

Lake Casitas is the cornerstone of the water supply infrastructure in the watershed, and its value cannot be overstated. This man-made lake was designed to hold 254,000 acre-feet (AF) of water, and it is carefully managed to maintain supplies during a repeat of the 21-year dry period from 1945 to 1965, the longest dry period on record. (See the "Safe Yield" section later in this section for more information on this concept.)

Although the lake has not yet been put to a 21-year dry period test, it has been a reliable source of water in many multi-year dry periods when numerous wells were dry and the river barely flowed.

Between 1975 and 2013, total annual deliveries from the reservoir averaged 17,493 AF. During this period, the highest annual delivery was 24,416 AF (1989) and the lowest was 11,694 AF (1993) (CMWD 2014).

Lake Casitas Dam and Reservoir
Photo courtesy of Rick Wilborn

CMWD's License for Diversion and Use of Water

Use of water from Lake Casitas is limited by CMWD's *License for Diversion and Use of Water* from the State of California, which authorizes Casitas to put to beneficial use up to 28,500 AF of water a year (SWRCB 1982).

Table 3.4.2.1.2 Lake Casitas Quick Facts

Maximum Storage Capacity	254,000 acre-feet
Safe Annual Yield	20,840 acre-feet per year (includes a small amount of water from one well)
Water Course Built On	Coyote Creek
Original Construction	1956 to 1959
Water Sources	Coyote Creek, Santa Ana Creek, Ventura River via Robles Diversion Canal
Surface Area (when full)	2,760 acres
Miles of Shoreline	32
Deepest Depth	200 feet
Maximum Diversion Rate at Robles Diversion	500 cubic feet per second

Source: Ventura River Project website (USBR 2014; Merckling 2014)

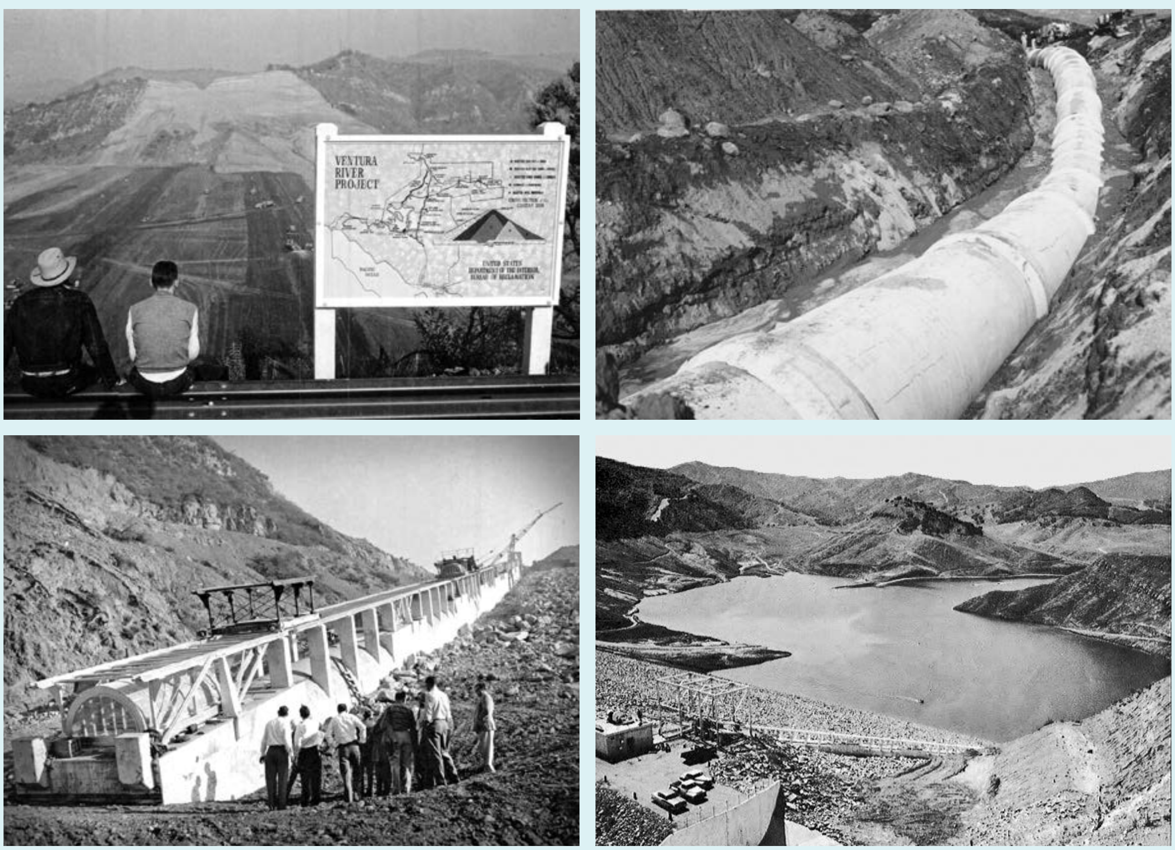
Water from the Lake Casitas reservoir is the primary water source for many users, and it is also a critical "backup" source for most groundwater users. Casitas's high-quality water is also blended with poorer quality groundwater by some water purveyors to improve water quality and extend supplies. The Casitas Municipal Water District (CMWD), originally called the Ventura River Municipal Water District, manages

The Ventura River Project

The Ventura River Project is the name given to the effort to build Lake Casitas and its associated infrastructure by its builder, the U.S. Bureau of Reclamation. The project included Casitas Dam, Robles Diversion, Robles Canal, and the main conveyance system, which includes 34 miles of pipeline, five pumping stations, and six balancing reservoirs located throughout the project area. A fish passage facility was added to the Robles Diversion in 2006 for the endangered southern California steelhead.

Construction of the Ventura River Project was notably fast—three years of construction, six years including planning:

> When the planned $27.5 million Ventura River project was officially authorized on March 1, 1956, construction began immediately. The entire process, from the formation of the VRMWD [Ventura River Municipal Water District] to initial water deliveries to project beneficiaries in 1959, took six years, causing The Reclamation Era to report, "It is believed that this is a record with respect to elapsed time for conception, design, and construction of a Federal reclamation project.
>
> —*The Ventura River Project* (USBR 1995)



The Ventura River Project Under Construction

Photos courtesy of United States Bureau of Reclamation

Robles Diversion in 2011 (wet year, above) vs. 2013 (dry year, below)

Photos courtesy of Casitas Municipal Water District

the lake and is a wholesale and retail water supplier (see "3.4.1 Water Suppliers and Managers" for more information on CMWD).

Lake Casitas was built in 1959 by the U.S. Bureau of Reclamation (USBR) under the title "The Ventura Project." The project was the last of three "seacoast" projects built by the USBR in southern California to capture floodwaters that would otherwise "waste to the sea" (USBR 1995). The USBR's other two seacoast projects were the Cachuma (Cachuma Lake) and Santa Maria (Twitchell Reservoir) projects.

The reservoir is filled by runoff from Coyote Creek and Santa Ana Creek, which drain directly into the lake, and by water diverted from the Ventura River by way of the 5.4-mile Robles Canal. The relative contributions from these sources vary depending on runoff conditions, but about 55% of inflow now comes from the surrounding drainages and 45% comes from the Ventura River.

Lake Casitas was built "offstream," meaning it is not built across the main river that supplies its water, as most water storage projects in the west were designed. One of the fortunate results of this design is that it minimizes the rate at which sediment enters the lake from the Ventura River.

> Sedimentation and seismicity have not caused the headaches for district officials at Ventura that they have caused other water project managers in Southern California. Sedimentation, an infamous villain at most regional reclamation developments, has robbed some reservoirs of over ten percent of their capacity (as is the case at Cachuma and Twitchell), but has not been particularly problematic at Casitas because of the project's make-up. Matilija Reservoir and Robles Diversion Dam, both upstream of Casitas, perennially hold most of the dropped silt in the river basin, leaving little to settle in and present problems at Casitas.
>
> —*The Ventura River Project* (USBR 1995)

Foster Park Surface/Subsurface Diversions

The Foster Park/Casitas Springs area is critical for both surface water and groundwater production in the Ventura River watershed. Figure 3.4.2.1.3 (Groundwater Basins Map) shows that a constriction of landforms in this area narrows both the riverbed and underlying groundwater basin. The basin alluvium is shallow here and groundwater upwells via in-river springs. In this part of the river, groundwater is near the surface, and rising groundwater contributes to surface flows. San Antonio Creek, which joins the Ventura River from the east just above Foster Park, contributes significant surface flow and groundwater recharge in this area (DBS&A 2010). These various factors cause the river environs just above and below Foster Park to be one of the most consistently wet parts of the river, which has earned it the name "live reach."

Residents of the City of Ventura have relied upon Foster Park area water since the late 1700s:

> When the City was founded in 1782, it used the Ventura River as its primary source of water. Streamflow was diverted near the present-day Foster Park and conveyed in an aqueduct built by the Chumash Indians, under the supervision of the Mission fathers, to a reservoir near the Mission. From 1869 to 1923, water facilities were developed and operated for the City by several companies. In 1923, the City acquired the water system from Southern California Edison and assumed responsibility for providing water to the City's residents.
>
> —*Draft Ventura River Habitat Conservation Plan* (Entrix & URS 2004)

Residents of the City of Ventura have relied upon Foster Park area water since the late 1700s.

In 1906, a subsurface diversion structure was constructed across the river to increase water retention for extraction purposes (CDWR 2003). The dam is 975 feet long and crosses the Ventura River, as well as the mouth of Coyote Creek (Entrix & Woodward Clyde 1997), and works in combination with subsurface collector pipes.

The City of Ventura also has a surface diversion in the Ventura River in the Foster Park area; however, because the river course tends to meander within the riverbed, the diversion intake is now located in a part of the river that has been dry since the year 2000, so no direct surface water diversions have occurred since then. In addition, the City has four wells located upstream of the subsurface dam. Water drawn from the City's diversions and wells is conducted downstream to the City's water treatment plant for processing prior to delivery to end-users.

City of Ventura's Subsurface Dam and Diversion at Foster Park. Originally built in 1906 as a subsurface diversion dam, the top of the diversion is now exposed in places due to scour, instream erosion, and the trapping of sediment behind Matilija Dam. An intake pipe runs along the back side of the dam, only partially buried by sediment when this photo was taken on June 17, 2014. This dam blocks migration of shallow subsurface underflow and thus raises groundwater levels in the area to produce enhanced surface flows (Entrix & URS 2004). The City of Ventura extracts water at the structure and also has a number of wells just upstream.

Between 2000 and 2012, the City produced an average of 1,556 AF a year from its subsurface diversion. The highest annual production was 2,025 AF (2006) and the lowest was 1,144 AF (2005). Diversions are generally lower in the winter when flows in the river are high, more turbid, and full of debris (Entrix & URS 2004). The last time the City's surface diversion produced water was in 2000, after which the active river channel migrated and bypassed the diversion structure (City of Ventura 2014). According to the City's *2013 Comprehensive Water Resources Report,* the City's current reliable water supply from the Ventura River at Foster Park is 4,200 AF a year, but the report states: "This number may further be drastically reduced by proposed regulatory and environmental constraints" (RBF 2013).

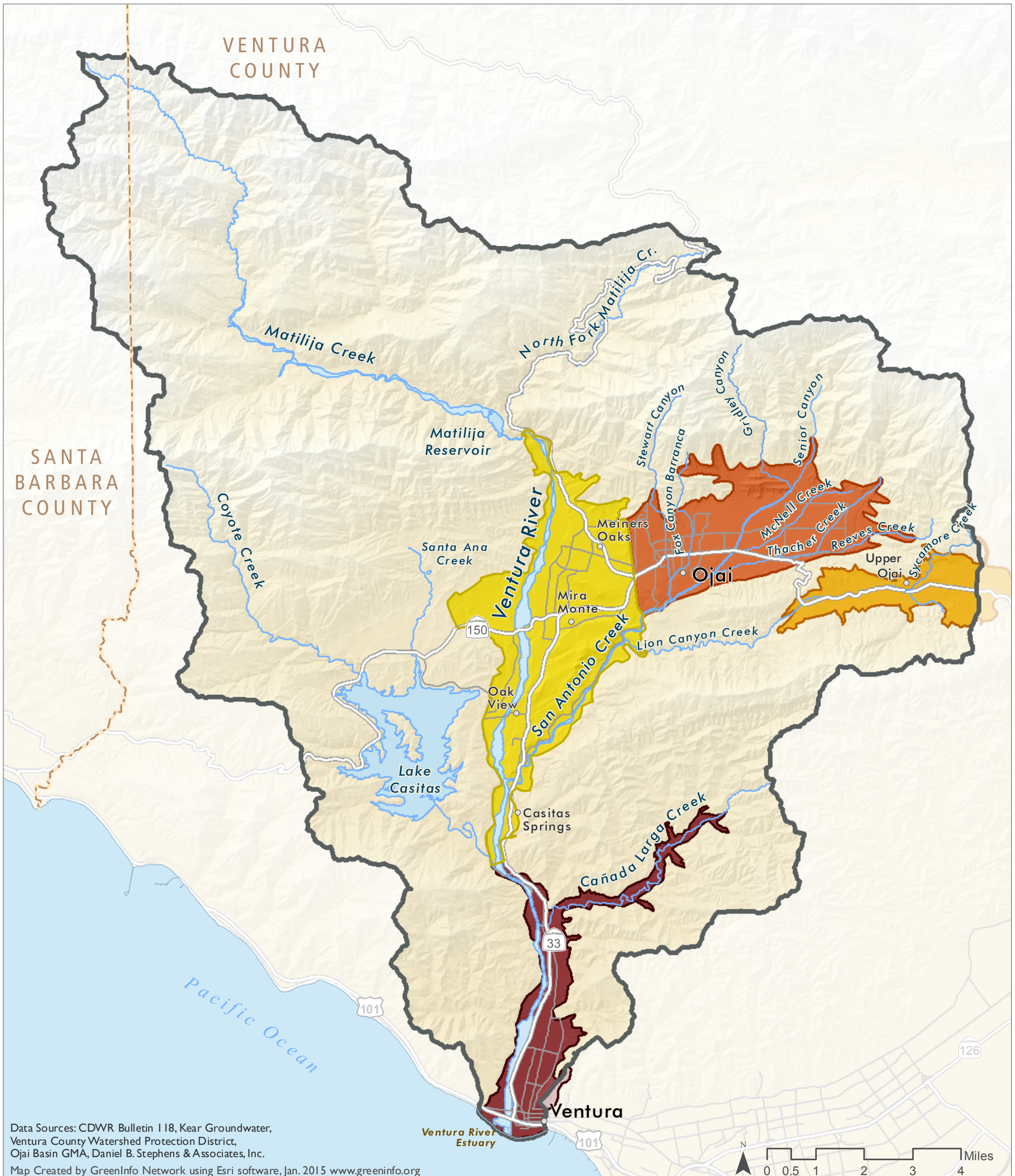
In 1981, the City submitted a pre-1914 water right claim (Statement of Diversion and Use) with the State Water Resources Control Board Division of Water Rights for 7,245 AF per year of surface water from the Ventura River in the Foster Park area; in 2011, the City submitted a water right claim for 72,397 AF per year of surface water from the river (SWRCB 2011).

Groundwater

The Ventura River watershed has four groundwater basins that are used as water supply sources: Ojai Valley Basin, Upper Ventura River Basin, Lower Ventura River Basin, and Upper Ojai Basin. The nature and hydrology of these basins are described in more detail in "3.3.3 Groundwater Hydrology."

Well Adjacent to Ventura River, Meiners Oaks

Photo courtesy of Smitty West



Groundwater Basins

Ventura River Watershed

Groundwater Basin	Acres	Sq. Mi.	Shallow Depth to Water (ft.)	Max. Capacity	Avg. Well Yield	Active Wells	Approx. Safe Yield
Upper Ojai	2,840	4.4	0-40	5,681 AF	50 gpm	95	Unavail.
Ojai Valley	6,471	10.1	0-80	85,000 AF	383 gpm	149	5,026 AF
Upper Ventura River	9,360	14.6	0-5	35,118 AF	600 gpm	160	9,482 AF
Lower Ventura River	6,090	9.5	3-13	8,743 AF [a]	20 gpm	16	2,130 AF [b]

a - Represents unconsolidated alluvium
b - Preliminary estimate, based on groundwater balance for water years 1997-2007

Source: Daniel B. Stephens & Associates, Inc. 2010 & 2013

Figure 3.4.2.1.3 Groundwater Basins Map

Data source: See Table 3.4.2.1.3 (Groundwater Basins Map Data Sources) on the next page.

Precise data on the quantity of groundwater produced in the watershed are not available because private well withdrawals are generally not reported. Production data are the most detailed in the Ojai Valley Basin, because the Ojai Basin Groundwater Management Agency collects data as part of its mandate to manage that basin. Preliminary estimates of pumping have been developed for the Upper and Lower Ventura River Basins in the report *Groundwater Budget and Approach to a Groundwater Management Plan, Upper and Lower Ventura River Basin* (DBS&A 2010). Least is known about extractions from the Upper Ojai Basin.

Table 3.4.2.1.3 Groundwater Basins Map Data Sources

Map Table Column	Data Source
Acres & Sq. Mi.	Ventura County Watershed Protection District (VCWPD) map (GIS shapefiles).
Shallow Depth to Water	Lower Ventura River Basin—*2012 Groundwater Section Annual Report* (VCWPD 2012). Other basins—Estimates provided by local groundwater consultants Jordan Kear (Kear Groundwater) & Greg Schnaar (DBS&A).
Max. Capacity	All basins except Lower Ventura River—*Bulletin 118: California's Groundwater* (CDWR 2003). Lower Ventura River Basin—The capacity provided in Bulletin 118 is exceedingly high, possibly because the number accounts for very deep aquifer layers, or parts of aquifers that historically extended offshore (SWRCB 1956). Greg Schnaar (DBS&A) prepared a calculation that estimated the capacity for only the unconsolidated, onshore alluvium basin.
Avg. Well Yield	*Bulletin 118: California's Groundwater* (CDWR 2003).
Active Wells	Watershed Protection District well database
Approx. Safe Yield	Upper & Lower Ventura River Basin—Estimate by Greg Schnaar (DBS&A) based on the report *Groundwater Budget and Approach to a Groundwater Management Plan Upper and Lower Ventura River Basin* (DBS&A 2010). Note: this report estimated the safe yield of the Upper Ventura River Basin as 12,732 AF, however this included the Coyote Creek drainage/Lake Casitas area as part of the basin. These areas are no longer considered by VCWPD to be part of the Upper Ventura River Basin, so Schnaar provided a revised estimate of 9,482 AF. Ojai Valley Basin—*Groundwater Model Development,* Ojai Basin (DBS&A 2011), median well yield.

Table 3.4.2.1.4 Water Suppliers by Groundwater Basin Use

Public or Mutual Water Company[1]		
Upper Ventura River Basin:	**Ojai Valley Basin:**	**Upper Ojai Basin:**
Casitas Municipal Water District	Gridley Road Water Group	Sisar Mutual Water Company[2]
Casitas Mutual Water Company	Golden State Water Company	
Meiners Oaks Water District	Hermitage Mutual Water Company	
North Fork Springs Mutual Water Company	Senior Canyon Mutual Water Company	
Rancho Matilija Mutual Water Company	Siete Robles Mutual Water Company	
Tico Mutual Water Company		
Ventura River Water District		
Ventura Water (City of Ventura)		

1 - Excluded from this table are private water pumpers.

2 – Sisar Mutual Water Company's wells pump from the Upper Ojai Basin, although they are located just over the border between the Ventura River and Santa Clara River watersheds, on the Santa Clara River watershed side.

Data Source: Ventura County Watershed Protection District Inventory of Public & Private Water Purveyors in Ventura County (VCWPD 2006)

Groundwater Basin Capacity

A groundwater basin reported to have a "maximum capacity" of 85,000 acre-feet (AF) in no way indicates that there is 85,000 AF of usable or recoverable fresh water, only that the basin has the capacity to hold a gross volume of 85,000 AF. Not all of the storage capacity contains economically recoverable water or water that is of acceptable quality for use.

Upper Ventura River Basin

The Upper Ventura River Basin supplies the greatest quantity of groundwater in the watershed. The most significant withdrawals occur in the Foster Park area (at the basin's downstream border) by the City of Ventura. Here, the City has the ability to withdraw both groundwater and subsurface water (discussed earlier in this section).

Because the City of Ventura's wells are in the river bottom, they have been subject to damage over the years:

The Upper Ventura River Basin supplies the greatest quantity of groundwater in the watershed.

> The Foster Park facilities produce groundwater throughout the year. However, due to storm flows, the wells are subject to inundation and erosion. The early 2005 winter storms destroyed Nye Well 1A and damaged Nye Wells 2, 7 and 8. The pipeline between Nye Wells 7 and 8 along the west bank of the river and the pipeline that crosses the river from Nye Well 8 to the intake pipeline for the Avenue Treatment Plant were also damaged during the storms. Nye Wells 7 and 8 were repaired in late 2006, the pipeline across the river was repaired in late 2007 and the pipeline repair between Nye Wells 7 & 8 was completed in early 2009. To date, Nye Well 2 has not been repaired.
>
> —*2013 Comprehensive Water Resources Report, Ventura Water* (RBF 2013)

Between 2000 and 2012, groundwater production (excluding subsurface production) from the City's Nye well field in Foster Park averaged 2,481 AF a year. This average reflects disruptions in production from flood-related well damage: very little groundwater was produced between 2005 and 2007. The City's highest annual groundwater production during this period was 5,080 AF (2000) and the lowest was 149 AF (2005). Since 2009, the City's groundwater production has been from two of their Nye wells.

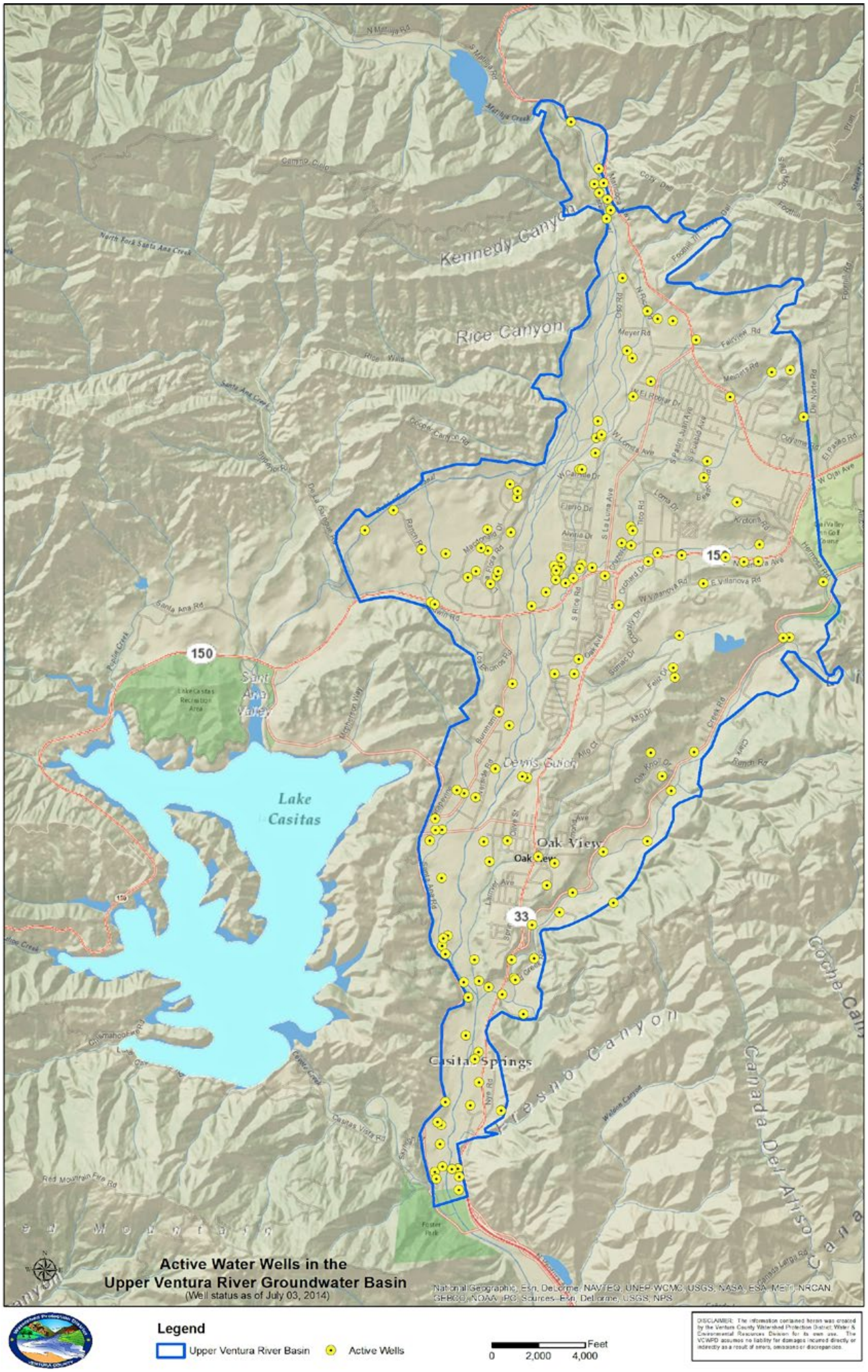


Figure 3.4.2.1.4 Wells in the Upper Ventura River Groundwater Basin Map

Source: Ventura County Watershed Protection District

Ventura River Water District (VRWD) and Meiners Oaks Water District (MOWD) are the next most significant (known) pumpers of groundwater in the Upper Ventura River Basin, with wells in the upper part of the basin between the Highway 150 Bridge and the Robles Diversion. This stretch of river is known as the "dry reach" because water percolates rapidly into the highly permeable riverbed and commonly disappears soon after storms. Both water districts have wells in the floodplain of the Ventura River; MOWD operates five wells and VRWD operates four wells. These water districts serve the communities of Meiners Oaks, Mira Monte, Oak View, and Casitas Springs.

Between 2005 and 2013, groundwater production from the MOWD's wells averaged 1,016 AF a year. During this period the highest annual production was 1,166 AF (2006) and the lowest was 821 AF (2011) (Hollebrands 2014).

The Ojai Valley Basin supplies the second largest quantity of groundwater in the watershed. Golden State Water Company depends upon wells in this basin, as do many of the agricultural growers in Ojai's East End.

Between 1995 and 2013, groundwater production from the VRWD's wells averaged 1,324 AF a year. During this period the highest annual production was 1,565 AF (2000) and the lowest was 1,068 AF (2013) (Rapp 2014).

Mutual water companies producing groundwater from the Upper Ventura River Basin include Casitas Mutual Water Company, North Fork Springs Mutual Water Company, Rancho Matilija Mutual Water Company, and Tico Mutual Water Company. Casitas Municipal Water District also operates one well in this basin.

As of 2014, there are 149 active wells in the Upper Ventura River Groundwater Basin, 44 of which have been drilled since 2000 (VCWPD 2014a).

Ojai Valley Basin

The Ojai Valley Basin supplies the second largest quantity of groundwater in the watershed. Golden State Water Company (GSWC) depends upon wells in this basin, as do many of the agricultural growers in Ojai's East End.

Between 1985 and 2012, annual groundwater production from the Ojai Valley Basin averaged 5,113 AF a year (approximately equal to its estimated safe yield of 5,026 AF), with an average of 1,858 AF produced by GSWC and 3,255 AF produced from private wells. During this period the highest production was 7,697 AF (1992: GSWC – 1,645 AF; private wells – 6,052 AF) and the lowest was 3,690 AF (1989: GSWC – 1,766 AF; private wells – 1,924 AF) (OBGMA 2014).

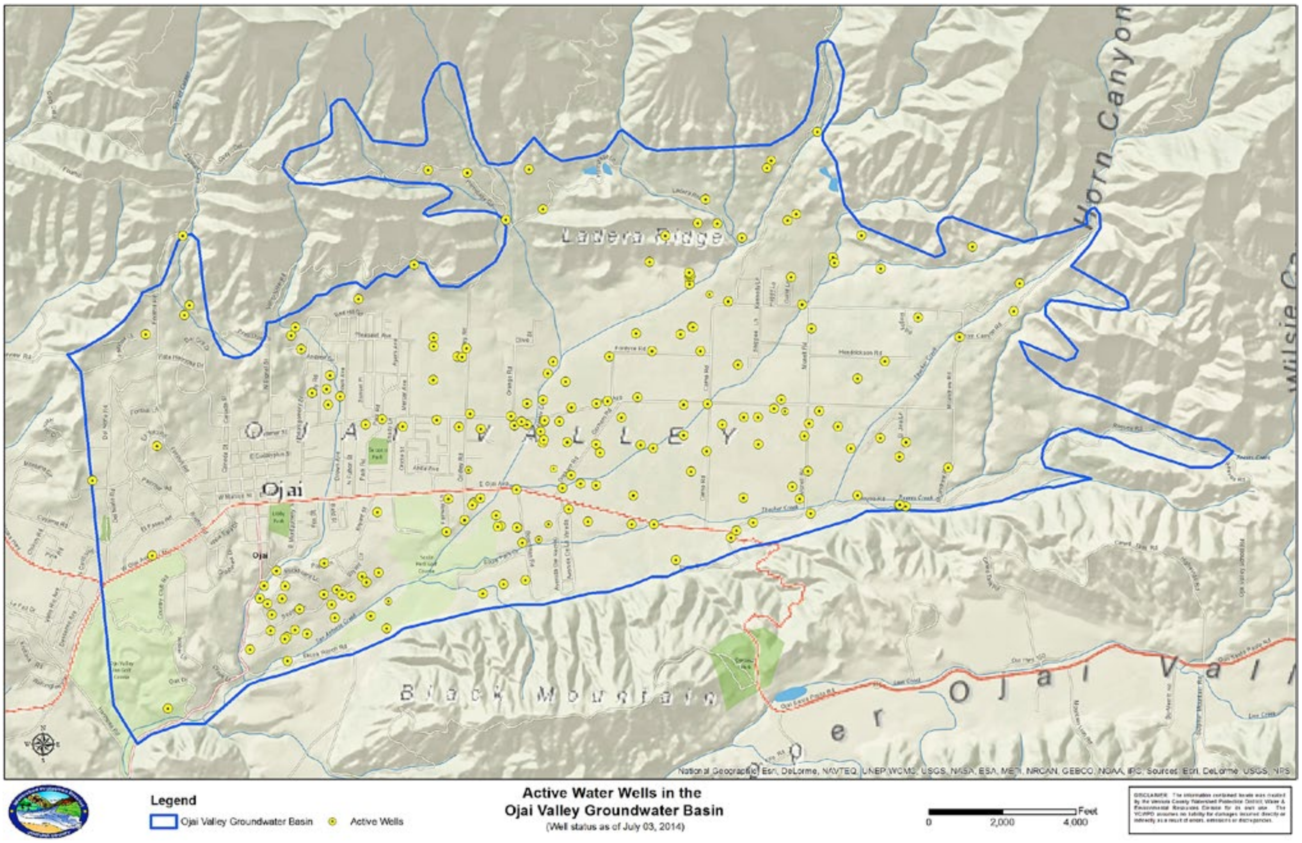


Figure 3.4.2.1.5 Wells in the Ojai Valley Groundwater Basin Map

Source: Ventura County Watershed Protection District

Mutual water companies that produce groundwater from the Ojai Valley Basin include Gridley Road Water Group, Hermitage Mutual Water Company, Senior Canyon Mutual Water Company, and Siete Robles Mutual Water Company.

As of 2014, there are 182 active wells in the Ojai Valley Groundwater basin, 64 of which have been drilled since 2000 (VCWPD 2014a).

Upper Ojai Basin

The divide between the Ventura River watershed and the Santa Clara River watershed runs through the Upper Ojai Basin near Sisar Road. Underground strata in this location separate groundwater flow either westward toward Lion Canyon Creek or eastward toward Santa Paula Creek and into the Santa Clara River watershed (CDWR 2003).

Residents and farmers in Upper Ojai rely upon the Upper Ojai Basin. There are limited data on the amount of withdrawals from that basin. The Sisar Mutual Water Company (SMWC) produces groundwater from the Upper Ojai Basin, although their wells sit just over the Ventura River watershed border, in the Santa Clara River watershed. Produced water is distributed to customers in both watersheds, in roughly equal amounts.

Between 2004 and 2013, SMWC's annual groundwater production from the Upper Ojai Basin averaged 67 AF a year. During this period the highest annual production was 74 AF (2013) and the lowest was 63 AF (2011) (Thompson 2014).

As of 2014, there are 96 active wells in the Upper Ojai Basin, 25 of which have been drilled since 2000 (VCWPD 2014a).

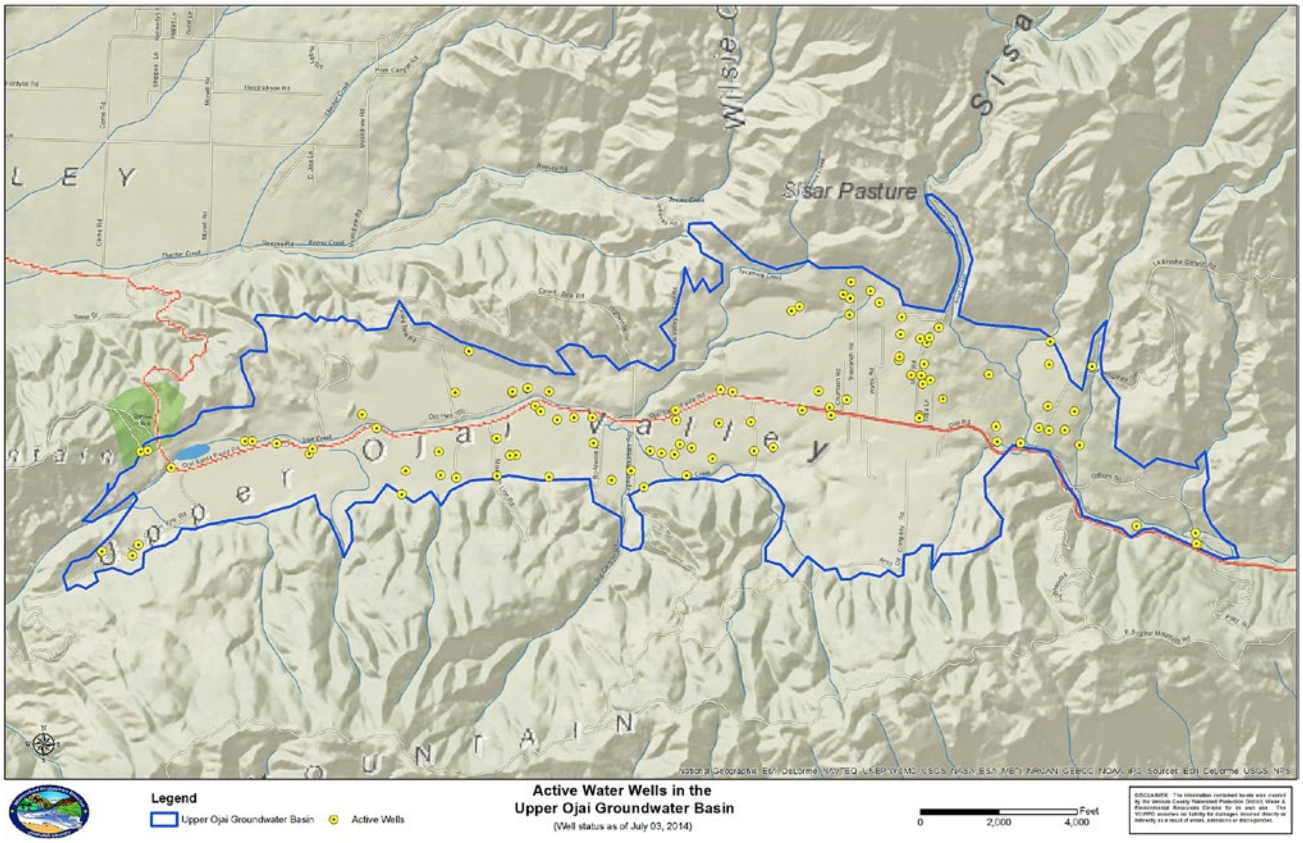


Figure 3.4.2.1.6 Wells in the Upper Ojai Groundwater Basin Map

Source: Ventura County Watershed Protection District

Lower Ventura River Basin

The Lower Ventura River Basin is minimally used and data are limited on the amount of water produced from the basin. Most of the wells are agricultural; no public water suppliers use the basin.

As of 2014, there are 18 active wells in the Lower Ventura River Groundwater Basin, 11 of which have been drilled since 2000 (VCWPD 2014a).

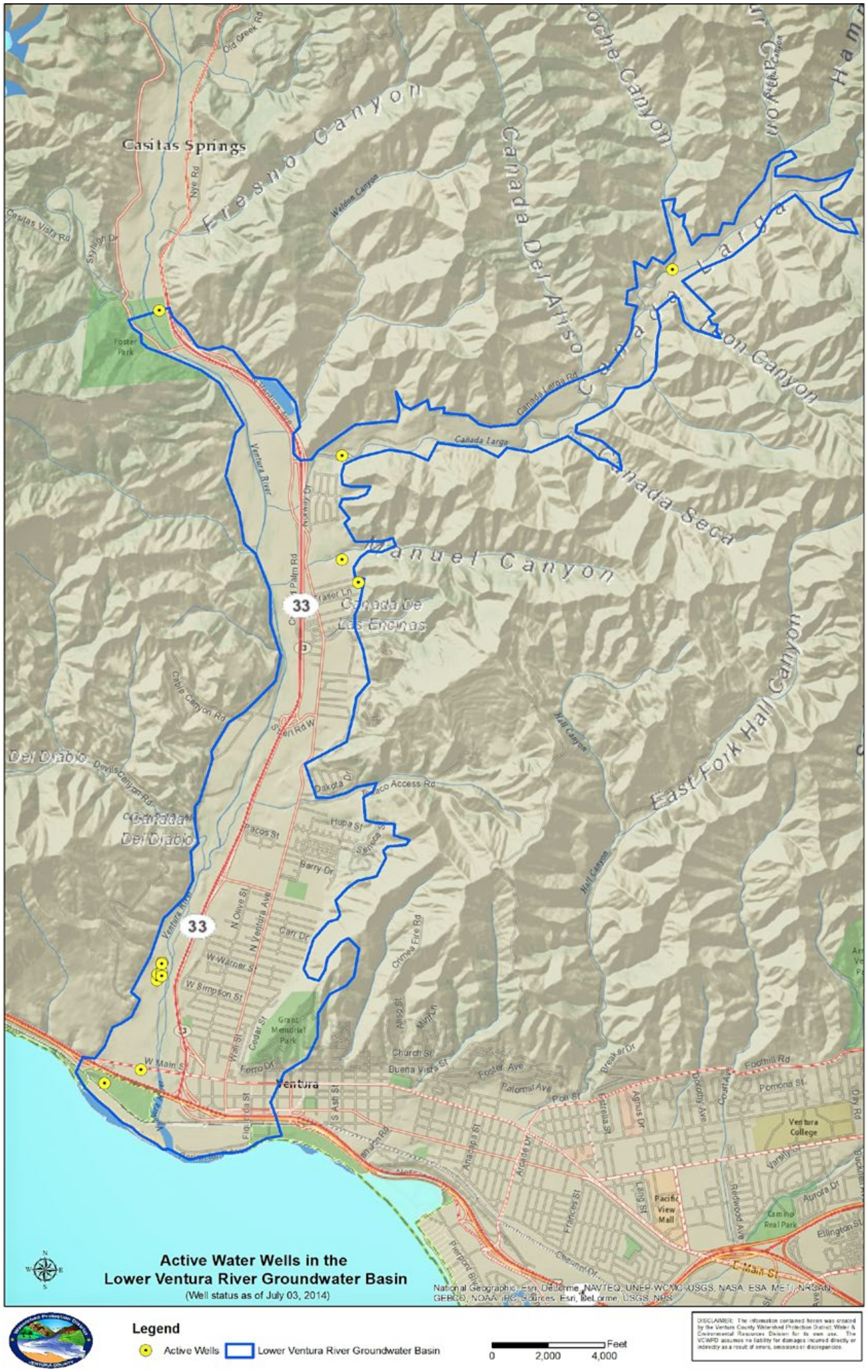


Figure 3.4.2.1.7 Wells in the Lower Ventura River Groundwater Basin Map

Source: Ventura County Watershed Protection District

Safe Yield

In the context of water reservoirs, safe yield, or "firm yield" is defined as "...a quantity of water from a project or program that is projected to be available on a reliable basis, given a specified level of risk, during a critically dry period." (Public Law 108-361)

In the context of groundwater basins, safe yield has commonly been defined as "the maximum quantity of water that can be continuously withdrawn from a groundwater basin without adverse effect" (CDWR 2003).

Some definitions of groundwater safe yield explicitly acknowledge the potential streamflow or environmental impacts of groundwater extraction:

> Safe yield is the amount of naturally occurring groundwater that can be withdrawn from an aquifer on a sustained basis, economically and legally, without impairing the native groundwater quality or creating an undesirable effect such as environmental damage.
>
> —*Applied Hydrogeology* (Fetter 2001)

> As human activities change the system, the components of the water budget (inflows, outflows, and changes in storage) also will change and must be accounted for in any management decision. Understanding water budgets and how they change in response to human activities is an important aspect of ground-water hydrology... a predevelopment water budget by itself is of limited value in determining the amount of ground water that can be withdrawn on a sustained basis.
>
> —*USGS Website: Ground-Water Development, Sustainability, and Water Budgets* (USGS 2014c)

Understanding water budgets and how they change in response to human activities is an important aspect of groundwater hydrology... a predevelopment water budget by itself is of limited value in determining the amount of ground water that can be withdrawn on a sustained basis.

In all cases, the concept of safe yield is complicated, and the factors that determine a water supply's safe yield are often changing, so the safe yield of a particular water supply often changes over time.

Safe Yield: Lake Casitas

> The calculation of safe yield for Casitas is based on the storage volume of Lake Casitas, the surface water and groundwater supply managed by Casitas, and the length of time that water supply needs to last (i.e., longest drought on record). The safe yield value is an interpolated value that is held constant over the period of the critical drought, bringing the level of storage to the desired minimum volume.
>
> —*Water Supply and Use Status Report, Casitas Municipal Water District* (CMWD 2004)

In 1954, the United States Bureau of Reclamation established 27,800 AF as the safe annual yield of Lake Casitas. This was based on the most critical dry period on record at that time (1918 to 1936), the ability to integrate operation of the Matilija Reservoir to maximize diversions through the Robles Canal, and other factors.

Safe Yield vs. As Available Supply Management

Lake Casitas reservoir has the capacity to hold almost 12 times its annual yield in storage, and operates on a "safe yield" basis. In contrast, many other water supply facilities are operated on an "as available" or "rule curve" basis. During wet years, customers can draw more water than would be allowed under a safe yield scenario. During dry spells however, deliveries to these customers are reduced, and they are left to seek other supplies. Delivering water on an "as available" basis allows greater deliveries on the average, but reduces reliability during droughts.

California's State Water Project (SWP) is an example of a water system operated beyond its safe yield. The SWP has 1.4 times its annual yield in storage (CDWR 2014). During very dry years, such as 2014, water deliveries were reduced to less than 5% of normal. If this system were operated within safe yield, annual deliveries would have to be substantially reduced to hold back water for dry spells. In August of 2014, when many state reservoirs were between 30 to 40% of capacity, Lake Casitas remained above 50%. The last time the lake was nearly full was in 2006, so it took nine years for the lake to drop to its August 2014 level.

See "3.4.3 Water Demands" for a discussion of the policies and management practices that have helped CMWD operate within the reservoir's safe yield.

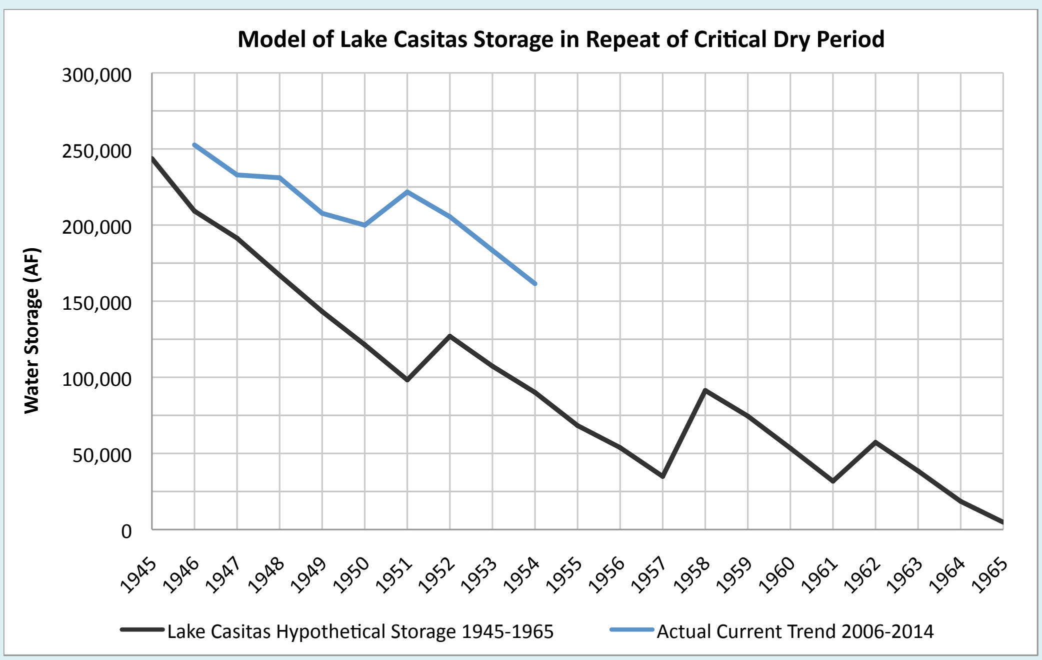


Figure 3.4.2.1.8 Model of Lake Casitas During Repeat of Critical Dry Period. The period of 1945 through 1965 is the longest dry period on record in the area. This dry period is used by CMWD to estimate how long supplies could last if a similar drought should occur in the future; this then is used to determine safe annual yield. Note that if the lake had existed in this long-term dry period (Lake Casitas was completed in 1959 and did not fill until 1978), there would have been some years when stored supplies increased.

Sources: CMWD 2010; CMWD 2004; Wickstrum 2014

As conditions changed and available data have become more refined, the operating annual safe yield has seen several adjustments. The current safe yield estimate for Lake Casitas is 20,840 AF. The current estimate factors in a new and longer critical drought period (1945 to 1965), greater levels of evaporation from the lake, the application of the Biological Opinion related to mandated flow requirements through the Robles Diversion to support fish passage, the discontinuation of releases of water from Matilija Reservoir, the use of water from a well in Mira Monte, and other factors (CMWD 1989; CMWD 2004; Merckling 2014).

Safe Yield: Foster Park Surface/Subsurface Diversions

A primary concern with regard to the amount of surface water or subsurface diversions that can be safely extracted in the Foster Park area is the effect this has on the endangered steelhead. Changes in the timing and magnitude of Ventura River flows and associated downstream hydrologic processes could negatively impact the spawning and migration of the steelhead, as well as the summer rearing of juveniles (NMFS 2007).

Adult Steelhead, Casitas Springs
Photo courtesy of Mark Allen/Normandeau

A draft Biological Opinion (BO) prepared in 2007 in response to the City of Ventura's request to repair its wells in Foster Park provided a comprehensive analysis of the correlation between the Foster Park facilities and the effect on streamflow. Because the City withdrew its application, this BO never became effective.

Since 2009, the City has been monitoring the effect of their Foster Park extractions on downstream flow and habitat suitability for steelhead. Their studies indicate that a flow threshold exists below which the steelhead habitat suitability declines significantly.

A 2013 report on the City's monitoring program concluded the following:

> Water balance calculations using upstream surface water flow rates, City groundwater diversions, and downstream flow rates indicate that groundwater production at Foster Park during the low-flow season is substantially supported by underflow through the alluvial sediments. Approximately 3 to 4 cubic feet per second can be produced by the City at Foster Park while the flow rate downstream at the Casitas Vista Road Bridge (flowing out of Foster Park) is virtually the same as the upstream flow rate at Casitas Springs where surface water enters the Foster Park reach of the River.
>
> The findings of this study indicate a flow threshold exists whereby when flows decrease below the threshold, the steelhead habitat

suitability declines significantly. During the 2012 low flow conditions when the City diversion was approximately 6.5 cubic feet per second (cfs) and there was 4 cfs or greater upstream (at Casitas Springs) and 2 cfs or greater downstream (at Casitas Vista Road Bridge), the HSI scores for adult steelhead remained fairly constant and the River pools maintained substantial depths. Study data indicate the upstream flow threshold was approximately 4 cfs (at the Casitas Springs live reach), while the downstream flow threshold was approximately 2 cfs (at the USGS gage *[at Casitas Vista Road Bridge – ed.]*). After surface flows declined below these rates, the HSI scores for steelhead and the habitat volume estimates declined rapidly.

—*Preliminary Hydrogeological Study, Surface Water/ Groundwater Interaction Study, Foster Park* (Hopkins 2013)

Safe Yield: Groundwater

There are no existing legal constraints that limit groundwater pumping and none of the watershed's groundwater basins are adjudicated (where the courts determine water rights). The only basin where legal authority exists to enforce safe yield extractions is the Ojai Valley Basin, through the Ojai Valley Groundwater Management Agency (OBGMA). (See "3.4.1 Water Suppliers and Managers" for information on OBGMA.)

A groundwater model developed for the Ojai Basin in 2011 determined that the safe yield of that basin is 5,026 AF per year, which is the median rate of natural basin recharge over the model calibration period (1970 to 2009). This is very close to average rate of groundwater production from the basin, which is 5,113 AF per year (between 1985 and 2012).

Estimated groundwater inputs and outputs for the Upper and Lower Ventura River Basins were analyzed in the 2010 report *Groundwater Budget and Approach to a Groundwater Management Plan Upper and Lower Ventura River Basin* (DBS&A 2010). Using the inputs from this analysis, the safe yield in the Upper Ventura River Basin is estimated at 9,482 AF per year. This is very close to the estimated average groundwater production from the basin, which is 9,300 AF per year (see Table 3.4.2.1.1). The safe yield in the Lower Ventura River Basin is estimated at 2,130 AF per year.[1]

Not enough information is available to estimate the safe yield of the Upper Ojai Valley Basin.

New Groundwater Regulations

In September of 2014, Governor Jerry Brown signed three groundwater bills that will create a groundwater management framework for the first time in California. These bills include a requirement that "groundwater sustainability plans" be developed for all high and medium priority basins. In the Ventura River watershed, the Upper Ventura River and Ojai Valley Groundwater Basins are considered medium priority basins, and so will be subject to the new requirements.

1 Note: the DBS&A report estimated inputs to the Upper Ventura River Basin as 12,732 AF per year; however this included the Coyote Creek drainage/Lake Casitas area as part of the basin. These areas are no longer considered to be part of the Upper Ventura River Basin, so the report's author provided the revised estimate of 9,482 AF. The estimate for the Lower Ventura River Basin is preliminary, and based on groundwater balance for water years 1997 to 2007.

Conjunctive Water Management

Conjunctive water use, or conjunctive water management, generally involves the coordinated use of ground and surface water supplies to use the overall water supply more efficiently. Conjunctive water management is a common recommendation for improved water use and protection.

> The purposes of conjunctive management are to coordinate water resource use in ways that reduce exposure to drought, to maximize water availability, to protect water quality, and to sustain ecological needs and aesthetic and recreational values. Other potential benefits are improved security of water supplies, reduced reliance on costly and environmentally disruptive surface water impoundment and distribution systems, and enhanced protection of aquatic life and habitat.
>
> Conjunctive management achieves these purposes by capturing surplus precipitation and streamflow, controlling releases from surface water storage facilities, and storing surface supplies underground in aquifers. The stored groundwater serves as a non-evaporating "bank" that can be tapped during subsequent dry periods to sustain consumptive uses or supplement stream flows. The aquifer thus provides a regulatory storage medium that helps to smooth out the greater variability of water demands and surface water supplies. Overall, surface water and aboveground storage facilities are operated together with groundwater supplies and underground storage as components of a single system (i.e., operated "conjunctively"). Multiple water needs are met by shifting mixes of surface and groundwater supplies determined by their relative availability.
>
> —*Institutions and Conjunctive Water Management among Three Western States* (Blomquist et al. 2001)

Conjunctive water management employs the coordinated use of ground and surface water supplies to use the overall water supply more efficiently.

In a recent example of conjunctive water management, Senior Canyon Mutual Water Company's water supply and distribution system was upgraded using grant funds secured by Casitas Municipal Water District to help Senior Canyon make better use of their groundwater supplies and reduce their demands on Lake Casitas. Another example, the San Antonio Creek Spreading Grounds refurbishing project, is described below.

The City of Ventura also practices conjunctive water management of its supplies from the Ventura River and Santa Clara watersheds. A portion of the City's allocation in the Oxnard Plain Groundwater Basin is not used during normal wet years when supply from the Ventura River is plentiful. During these years, the unused groundwater allocation is banked for future use. The City reserves the right to extract the banked water during droughts or emergencies (Entrix & URS 2004).

The Ventura River Conjunctive Use Agreement of 1983

The City of Ventura also practices conjunctive water management of its supplies from the Ventura River and Santa Clara watersheds. A portion of the City's allocation in the Oxnard Plain Groundwater Basin is not used during normal wet years when supply from the Ventura River is plentiful. During these years, the unused groundwater allocation is banked for future use. The City reserves the right to extract the banked water during droughts or emergencies (Entrix & URS 2004).

In 1978, Casitas Municipal Water District and the City of Ventura proposed a large-scale conjunctive water management project for the Ventura River watershed that would change how each agency diverted water from the Ventura River. The following description is from the Draft Environmental Impact Report (EIR) for the proposed conjunctive use agreement. Note that the southern California steelhead was not listed as an endangered species until 1997.

> The downstream bypass of the first 20 cfs of flow at Robles Diversion Dam would be discontinued, and all flows up to the 500-cfs capacity of the diversion canal would be diverted. The loss of water available to users downstream from the Robles dam (including the City, irrigators, and other public water purveyors) would be made up by CMWD with water from Casitas Reservoir.
>
> The conjunctive use operation would increase the average yield to the City and to the system as a whole and would significantly increase the reliability of the City's supply. In addition, the consummation of the agreement would settle the dispute between the City and CMWD over water rights in the river. The proposed project will make better use of the storage capacity of the Reservoir and will make more water available for use during periods of below normal rainfall. Casitas Reservoir will receive increased inflow but will have to meet increased demands, with little net effect on reservoir levels. The City and other water diverters will benefit from increased water supply reliability, as dry-year deficiencies will be made up by deliveries from Casitas Reservoir.
>
> —*Ventura River Conjunctive Use Agreement, Draft Environmental Impact Report* (EDAW 1978)

The draft proposal was strongly opposed by Friends of Ventura River and other stakeholders. The Final EIR, approved by Casitas and the City of Ventura in 1983, included an EIR Addendum requiring a five-year trial period to assess potential significant environment impacts. For various reasons, this conjunctive use effort did not progress. However, the initial implementation efforts of the project, beginning in 1983, marked the beginning of intense monitoring and reporting of well and river system hydrology on the river—a positive result of the effort.

San Antonio Creek Spreading Grounds

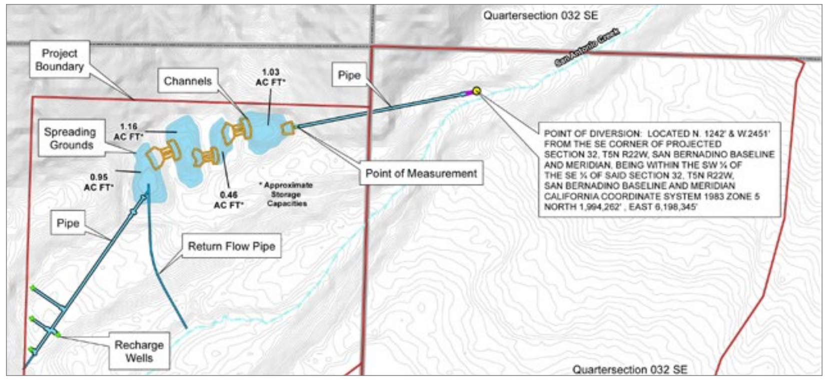
In 1949, growers in the east end of Ojai formed a water reclamation district called the San Antonio Water Conservation District, which has since been renamed the Ojai Water Conservation District. The district was formed primarily to divert water into settling ponds along San Antonio Creek for groundwater recharge of the Ojai Valley Groundwater Basin, although the district is also authorized to monitor the use of groundwater, acquire water rights, and construct dams or other water facilities. The district established a series of stair-stepped settling basins on private property adjacent to upper San Antonio Creek, designed so that one would overspill into the next. It is estimated that there were dozens of these basins, each 20 to 30 feet long, 50 to 60 feet wide, and 6 to 10 feet deep (Hawks & Associates 2005).

> Between 1951 and 1963, groundwater recharge was conducted using an estimated 10,000 acre-feet of surface water imported from Matilija Lake via pipeline. The pipeline was eventually abandoned and groundwater recharge was conducted by diverting surface water from San Antonio Creek from 1963 to 1985. Surface flow was diverted through a 24-inch-diameter pipe equipped with an iron gate to control flow rates, and was reportedly available on a seasonal basis.
>
> —*San Antonio Creek Spreading Grounds Rehabilitation Project: Project Description* (VCWPD 2010b)

Following the major "Wheeler Fire" of 1985, the Ventura County Flood Control District, now the Ventura County Watershed Protection District (VCWPD), was concerned that heavy rains could trigger a debris flow downstream and damage properties adjacent to San Antonio Creek. The VCWPD procured the 11.4-acre spreading grounds property and constructed a debris basin in the channel adjacent to the recharge basins. During basin construction, excavated material filled most of the spreading basins. In the early 1990's, VCWPD and the Ojai Water Conservation District collaborated in an effort to reconstruct the basins, but the reconstruction was only partially successful, and the project was eventually abandoned.

Rehabilitated San Antonio Creek Spreading Grounds, 2014

Photo courtesy of Ventura County Watershed Protection District



Engineer's drawing of the Rehabilitated San Antonio Creek Spreading Grounds.
Source: VCWPD

In 2006, VCWPD secured funding to rehabilitate the San Antonio Creek Spreading Grounds, and construction was completed in the summer of 2014. The new facility is designed to divert surface water from upper San Antonio Creek into holding basins where the water then recharges groundwater through passive injection wells. Annual groundwater recharge is projected to average 126 AF per year with a maximum of 914 AF per year. The project was a collaboration between the OBGMA and the VCWPD. Casitas Municipal Water District is also a project partner that will help with facility maintenance. (VCWPD 2010b; VCWPD 2014c)

3.4.2.2 Potential Future Supply Sources

Reclaimed Water

The watershed's sewer system wastewater is treated at one of two wastewater treatment facilities. Most of the wastewater is treated at the Ojai Valley Sanitary District's (OVSD) treatment plant located below Foster Park next to the Ventura River. Treated effluent from this facility is not reclaimed for reuse. The effluent is discharged into the Ventura River where it supports valuable habitat for the endangered southern California steelhead, and also recharges the shallow Lower Ventura River Groundwater Basin. The plant discharges an average of 2.1 million gallons per day (mgd), or 3.3 cubic feet per second, to the river. A discharge of 2.1 mgd is equivalent to approximately 2,354 AF per year.

Ojai Valley Sanitary District's treatment plant discharges an average of 2.1 million gallons per day, or 3.3 cubic feet per second, of treated wastewater to the Ventura River.

Exploring the feasibility of reusing treated wastewater for irrigation or groundwater recharge within the watershed is of interest to some stakeholders. Locating decentralized "scalping plants" in the upper watershed, such as near the City of Ojai, has been considered in this regard (Entrix & URS 2004). These facilities, sometimes called satellite plants, are small plants that withdraw wastewater from a sewer mainline to produce reclaimed water and return biosolids and non-reclaimable wastewater, such as brine, to the sewer mainline for treatment at the central treatment facility downstream (Byrne). Keeping treated wastewater higher in the watershed for reuse could be especially helpful during extended dry periods.

A number of studies have been conducted to investigate the potential to reclaim OVSD wastewater. ("Key Data and Information Sources/ Further Reading" at the end of this section lists these reports.) Over the years, water quality regulations have mandated the treatment plant to produce water of increasingly higher quality, requiring very expensive plant upgrades in some cases. In the past, these high costs have motivated OVSD to reassess effluent discharge options that could come at a lower cost.

Any efforts to reclaim wastewater for reuse in the watershed must address the environmental drawbacks of removing this flow from the river and estuary.

Any efforts to reclaim wastewater for reuse in the watershed must address the environmental drawbacks of removing this flow from the river and estuary. Since 1963, OVSD's effluent has been discharged to the Ventura River. The health of the lower river and the estuary, a very important ecosystem for many species, could be significantly impacted by the reduction in water from the treatment plant. The release of the effluent into the river is now integrated into the water quality permits that govern OVSD's operation.

The City of Ventura owns the land where OVSD's treatment plant is located, and holds first rights to any reclaimed water from that facility.

In 2007, the City of Ventura conducted an engineering and market analysis of using OVSD recycled water, which found:

> The engineering and market analysis identified a cost-effective combination of localized users that minimized the additional infrastructure necessary to supply the recycled water. The primary users identified were Aera Energy, and local growers, with Aera accounting for the bulk of the demand. These users, which are currently supplied with a combination of raw and potable water, could utilize approximately half of the current effluent discharge.
>
> —*Feasibility Study on the Reuse of Ojai Valley Sanitary District Effluent – Final Facilities Planning Report* (Nautilus 2007)

Much of the sewer system wastewater generated below OVSD's facility is treated by the Ventura Water Reclamation Facility located within Ventura city limits adjacent to the Santa Clara River estuary in the Santa Clara River watershed. Of the wastewater that enters the Ventura Water Reclamation Facility, 700 AF a year is reused for landscape irrigation within the City and the rest is discharged to the Santa Clara River estuary (RBF 2013).

Imported Water

The City of Ventura and CMWD both pay for an entitlement to water imported from the California State Water Project (SWP), but there are no pipelines or facilities in place to deliver SWP water into local distribution systems.

> In 1963, the Ventura County Flood Control District contracted with the State of California (State) for 20,000 acre-feet per year of water from the State Water Project (SWP). The SWP conveys water from Northern California to Southern California through a system of reservoirs, canals, pump stations and power generation facilities. In 1971, the administration of the State Water Contract with the State was assigned to the District. Of the 20,000 acre-feet per year contracted, the District [CMWD] is assigned 5,000 acre-feet per year, United Water Conservation District is assigned 5,000 acre-feet per year, and the City of Ventura is assigned 10,000 acre-feet per year. Currently, only United Water Conservation District is receiving water from the SWP.
>
> —*Casitas Municipal Water District, Comprehensive Financial Annual Report* (CMWD 2012)

> CMWD's service area, while holding 5,000 acre-feet of annual State Water entitlement, is not able to receive those annual entitlements due to the lack of any physical connection (pipeline or canal) to the State Water Project to bring State Water into the service area. Due to the cost of the physical connection, estimated in 1990 at over $100 million, and cost of State Water, the service area has not proceeded with the physical connection to the State Water system.
>
> —*Casitas Municipal Water District, Urban Water Management Plan, 2010* (CMWD 2011)

The City of Ventura and CMWD both pay for an entitlement to water imported from the California State Water Project (SWP), but there are no pipelines or facilities in place to deliver SWP water into local distribution systems.

In the drought of 1990, water agencies in the watershed participated in plans for an emergency transfer of SWP water to the City of Carpinteria in Santa Barbara County via "water wheeling"—the practice of using facilities owned by others to deliver transferred water. The plan involved transferring SWP to the City of Ventura from the City of Oxnard by way of a temporary, on-the-ground pipeline adjacent to various highways and lesser roads, then the City of Ventura would reduce its use of water from Lake Casitas by an equal amount, and that Casitas water would then be transferred to the City of Carpinteria via an emergency pipeline. Although the Oxnard-to-Ventura temporary pipeline connection was completed, and some water was conveyed, the big rains of 1991 came before the entire plan could be fully carried out.

Such wheeling arrangements are very expensive.

> Recent information provided to the City estimates the wheeling costs that would be required to pay Metropolitan Water District in order for the City to wheel water through their facilities would be over $1,300/AF, not including the wheeling charges assessed by local agencies.
>
> —*2013 Comprehensive Water Resources Report, Ventura Water* (RBF 2013)

Desalinated Water

In 1992, voters in the City of Ventura approved "Measure 0," an advisory ballot measure seeking direction on whether the City should pursue seawater desalination or the State Water Project for additional water supply.

> VENTURA — City Council members decided Monday to abide by the voters' wishes and move forward with building a seawater desalination plant. Residents voted last week 55% to 45% in favor of constructing a plant to desalt 7,000 acre-feet of water a year. An acre-foot is enough water to serve two families of four for a year.
>
> A city-ordered engineering study has estimated that it would cost $30.4 million a year for 30 years to build and maintain the facility.
>
> There are only five desalination plants in California, and two are temporarily shut down, said Shelley Jones, the city's director of public works. The active plants are at Gaviota, Diablo Canyon and Santa Catalina Island. The others are in Santa Barbara and Morro Bay.
>
> —*LA Times, November 11, 1992*

The per acre-foot cost of desalting ocean water is significantly higher than traditional local sources.

Constructing the desalination facilities did not go forward at the time, but remains an option. The per acre-foot cost of desalting ocean water is significantly higher than traditional local sources.

> …the citizens of Ventura voted November 3, 1993 [*correction: 1992 - ed*] in favor of desalinating seawater over importing water through the SWP, as the preferred supplemental water supply option. Current information on desalination of seawater presented by The Pacific Institute recently completed a report entitled, "Desalination, With a Grain of Salt – A California Perspective". The report indicates that the potential benefits of ocean desalination are great, but the economic, cultural and environmental costs of wide commercialization remain high. Alternatives such as treating low-quality local water sources, regional water transfers, improving conservation and efficiency and accelerating wastewater recycling and reuse can provide the same freshwater benefits of ocean desalination at far lower economic and environmental costs. The Pacific Institute analysis found that the cost to produce water from a desalination plant is high but subject to significant variability with recent estimates for plants proposed in the state ranging from $1,900 to more than $3,000 an acre-foot. City staff has been engaged in discussions with other local water agencies in regard to potential regional desalination projects and will continue to do so.
>
> —*2013 Comprehensive Water Resources Report, Ventura Water* (RBF 2013)

3.4.2.3 Supply Variability

Seasonal Variability

The majority of the watershed's rainfall occurs during a few winter months. Rainfall typically occurs in just a few significant storms each year, which can come any time between October 15 and April 1, with 90% of the rainfall occurring between November and April (VCWPD 2010). Figure 3.4.2.3.1 shows the fluctuation in rainfall over a typical year in downtown Ojai.

Although most of the rainfall occurs in winter and early spring, most water is used in the summer and fall. This highlights the need for significant water storage.

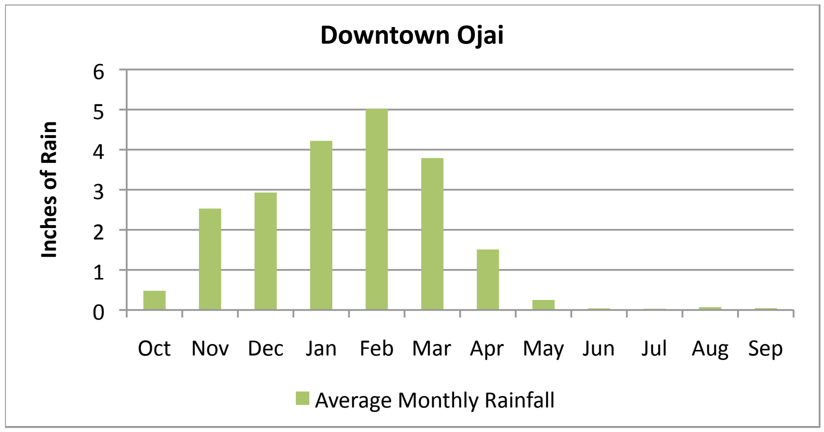


Figure 3.4.2.3.1 Average Monthly Rainfall, Ojai

Data source: VCWPD Hydrologic Data Server (VCWPD 2013)

Seasonal Variability = Big Storage Needs

Some water enhancement strategies, such as the use of cisterns and rain barrels, are made less cost-effective because seasonal rainfall variability creates such large storage needs. In climates where it rains throughout the year, cisterns can be filled and emptied many times, necessitating less overall storage. However, when most of the rainfall comes in only a few major storms each year, storage capacity needs to be quite substantial in order to hold a meaningful amount of water.

Annual Variability

Rainfall and runoff in the Ventura River watershed vary greatly from year to year, and this variability affects annual water supplies. Typically, conditions in the watershed cycle between very wet years that bring more water than drainage networks can hold, and multi-year dry periods that strain available water supplies. This variability in supply poses significant challenges to long-term water supply management.

Since 1930, total annual runoff in the watershed (as measured at Foster Park) has ranged from a low of 0.18 AF in water year (WY) 1951 to a high of 277,096 AF in WY 1995. The median annual total runoff during this period, 12,867 AF, is much lower than the average, 47,329 AF, because of a small number of extremely large runoff years. In the year of greatest runoff (1995), rainfall in Ojai was over 220% of the median (1995: 42.36 inches/median: 19.17 inches).

Figure 3.4.2.3.2 illustrates average annual runoff by water year types since 1930. As the chart shows, runoff conditions can range from very dry to very wet over just a few years. See "4.4 Appendices" for the "Table of Water Year Types Based on Annual Average Runoff," which lists runoff totals by water year and water year types.

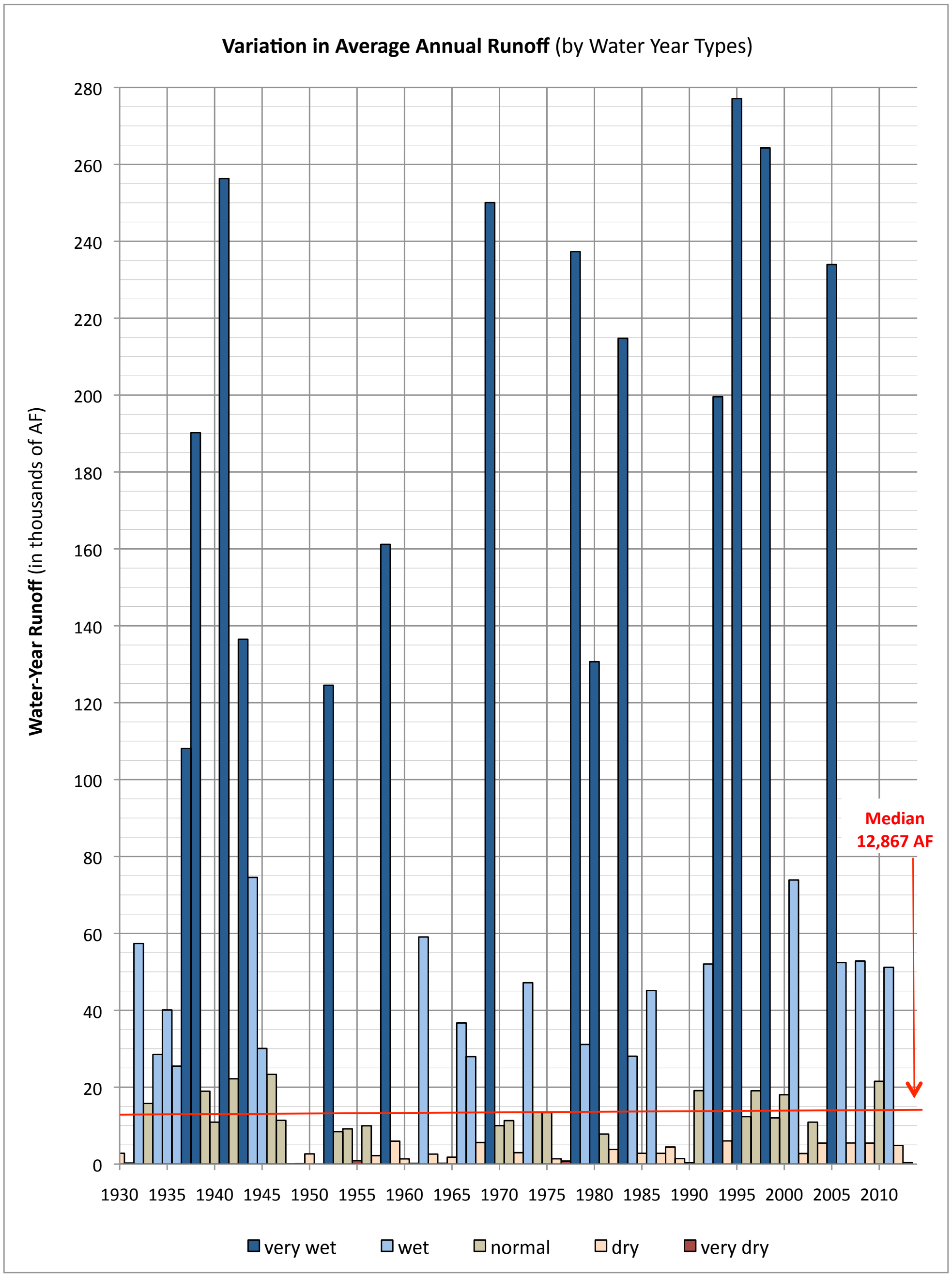


Figure 3.4.2.3.2 Variation in Average Annual Runoff (by Water Year Types). Average annual runoff from each water year between 1930–2013 (as measured at Foster Park) was used to assign one of five water year categories—very wet, wet, normal, dry, and very dry—to each year. Half of the years are above the median and half below. See "4.4 Appendices" for the "Table of Water Year Types Based on Annual Average Runoff," for the list of years by water year type, and an explanation of the category divisions.

Data Source: USGS National Water Information System Website (USGS 2014b)

Rainfall and runoff variability affect not only the water supply in the year it occurs, but also in subsequent years. For example, consecutive dry years reduce the amount of "backup" water in storage in Lake Casitas and groundwater basins. Water managers depend upon the cumulative "carryover storage" from wet and especially very wet years to meet demands during the multi-year dry cycles in the watershed.

Figure 3.4.2.3.3 illustrates the annual volume of water diverted from the Ventura River for storage since Lake Casitas was constructed in 1959. Water from Ventura River comprises about 45% of inflow into the reservoir; drainage from the reservoir's surrounding watersheds comprises the rest. The chart makes clear how important wet and very wet runoff years are in terms of their contribution of water to storage.

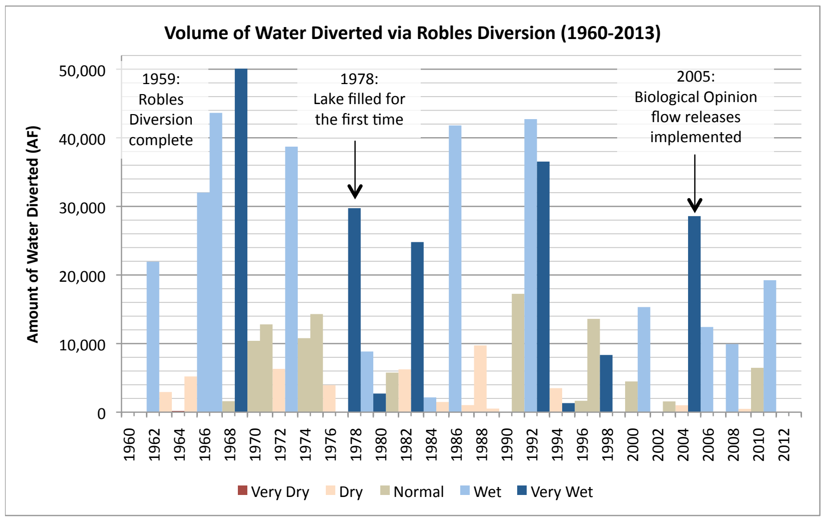


Figure 3.4.2.3.3 Volume of Water Diverted via Robles Diversion, Water Years 1960–2013. Bar chart colors indicate water year runoff types. Water from Ventura River comprises about 45% of inflow into Lake Casitas. Average annual water use from Lake Casitas is 17,500 AF.

Source: Casitas Municipal Water District, 2014

Figure 3.4.2.3.4 illustrates each year's minimum and maximum storage volumes in Lake Casitas since the reservoir's construction in 1959.

Figures 3.4.2.3.5 to 3.4.2.3.7 illustrate annual groundwater levels in three of watershed's four groundwater basins. (No graph of the Lower Ventura River Basin is available because of limited data availability.)

Figure 3.4.2.3.9 shows the findings of an update to the Ojai Basin Groundwater Model developed in 2014, three years into a drought. The model was used to project groundwater levels to the end of 2015 under three scenarios: 1) continued drought, assuming that precipitation in 2014 and 2015 is similar to that in 2012 and 2013, which is approximately 50% of median precipitation; 2) precipitation similar to the median conditions; and 3) precipitation 150% of median conditions.

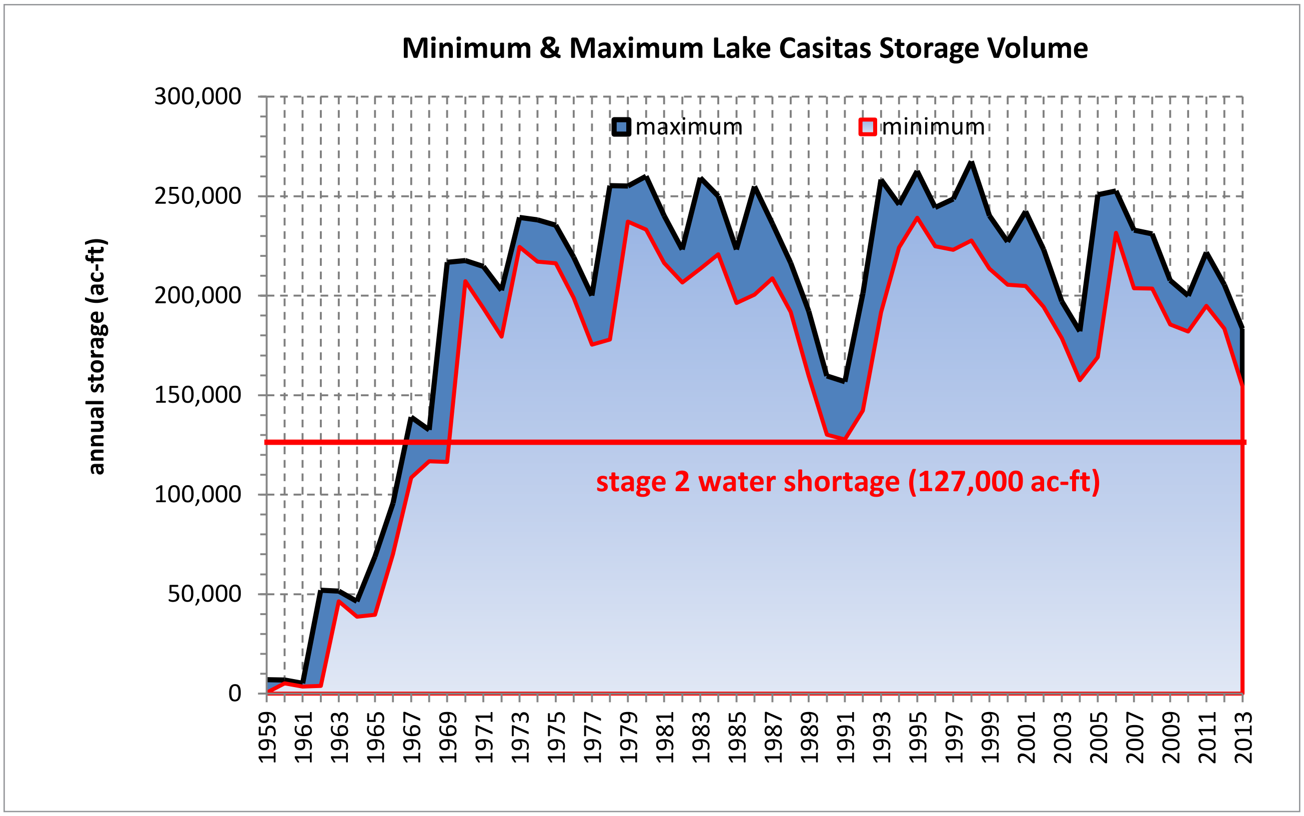


Figure 3.4.2.3.4 Minimum and Maximum Lake Casitas Storage Volume. When the reservoir reaches 50% capacity, a "Stage 2 Water Shortage" per CMWD's Water Efficiency and Allocation Program is indicated, which can be the trigger for stricter water conservation requirements.

Data source: Casitas Municipal Water District

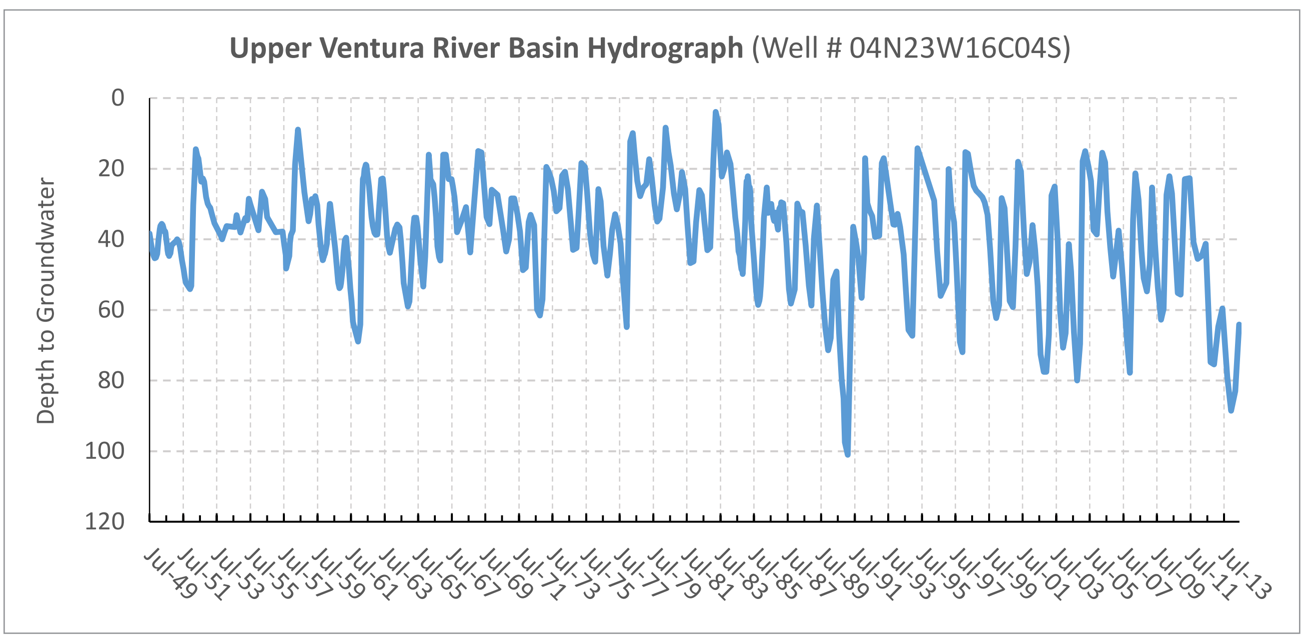


Figure 3.4.2.3.5 Upper Ventura River Basin Monitoring Well Hydrograph, 1949–2013. See Figure 3.4.2.3.8 (Monitoring Well Locations Map) below for location.

Source: Ventura County Watershed Protection District (VCWPD 2014b)

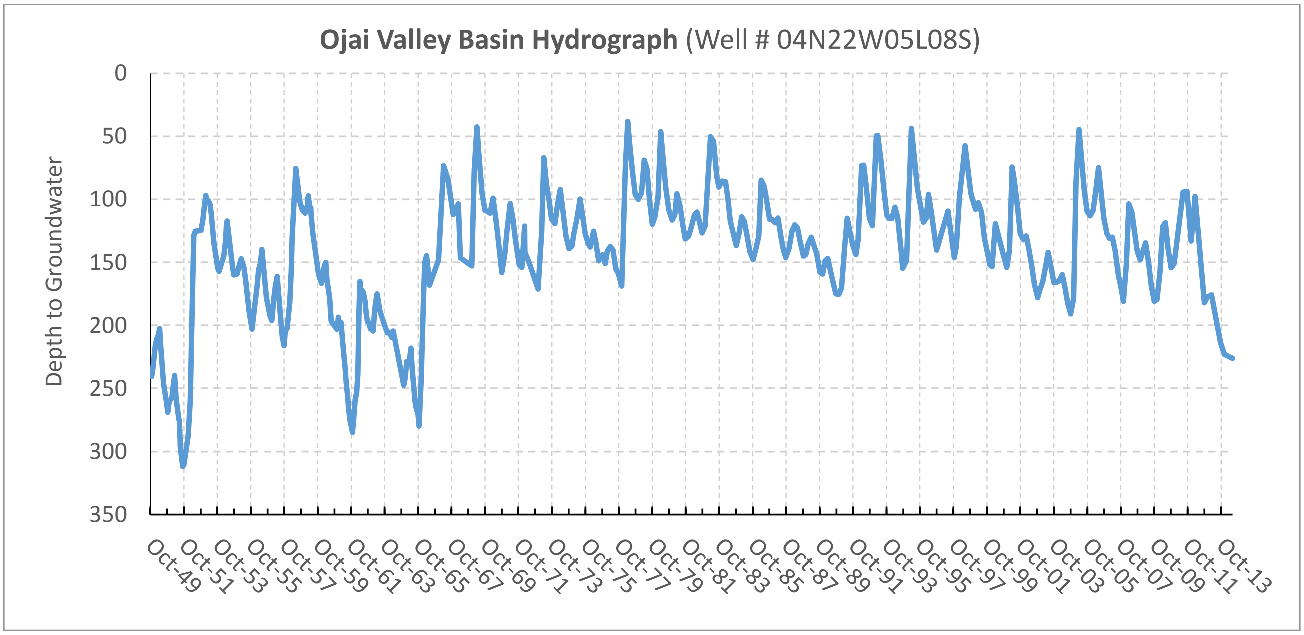


Figure 3.4.2.3.6 Ojai Valley Basin Monitoring Well Hydrograph, 1949–2013. See Figure 3.4.2.3.8 (Monitoring Well Locations Map) below for location.

Source: Ventura County Watershed Protection District (VCWPD 2014b)

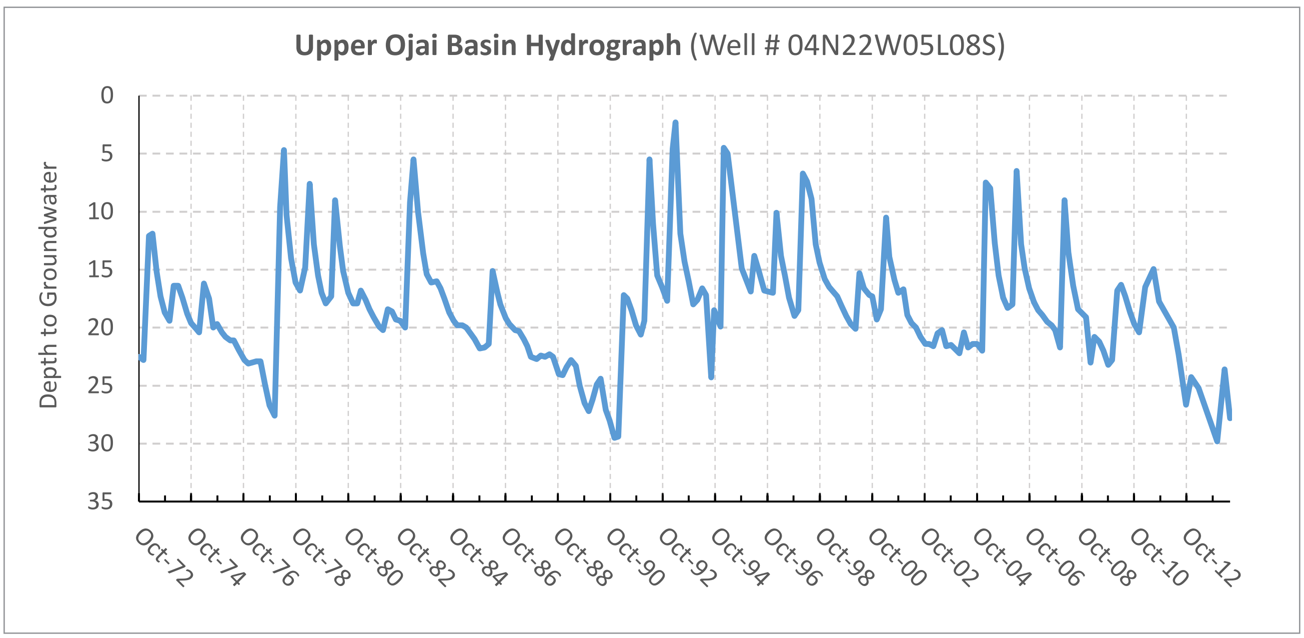
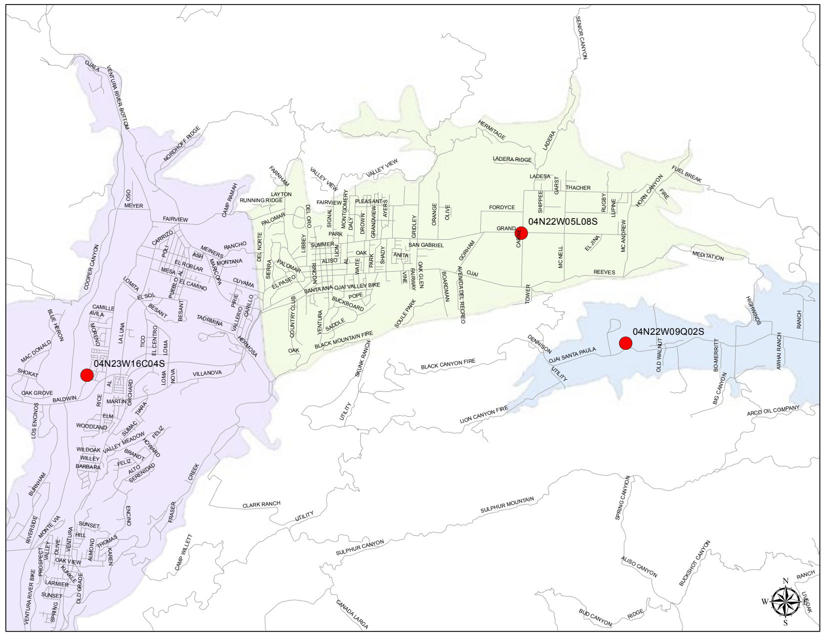


Figure 3.4.2.3.7 Upper Ojai Basin Monitoring Well Hydrograph, 1972–2013. See Figure 3.4.2.3.8 (Monitoring Well Locations Map) below for location.

Source: Ventura County Watershed Protection District (VCWPD 2014b)

Figure 3.4.2.3.8 Monitoring Well Locations Map

Source: Ventura County Watershed Protection District



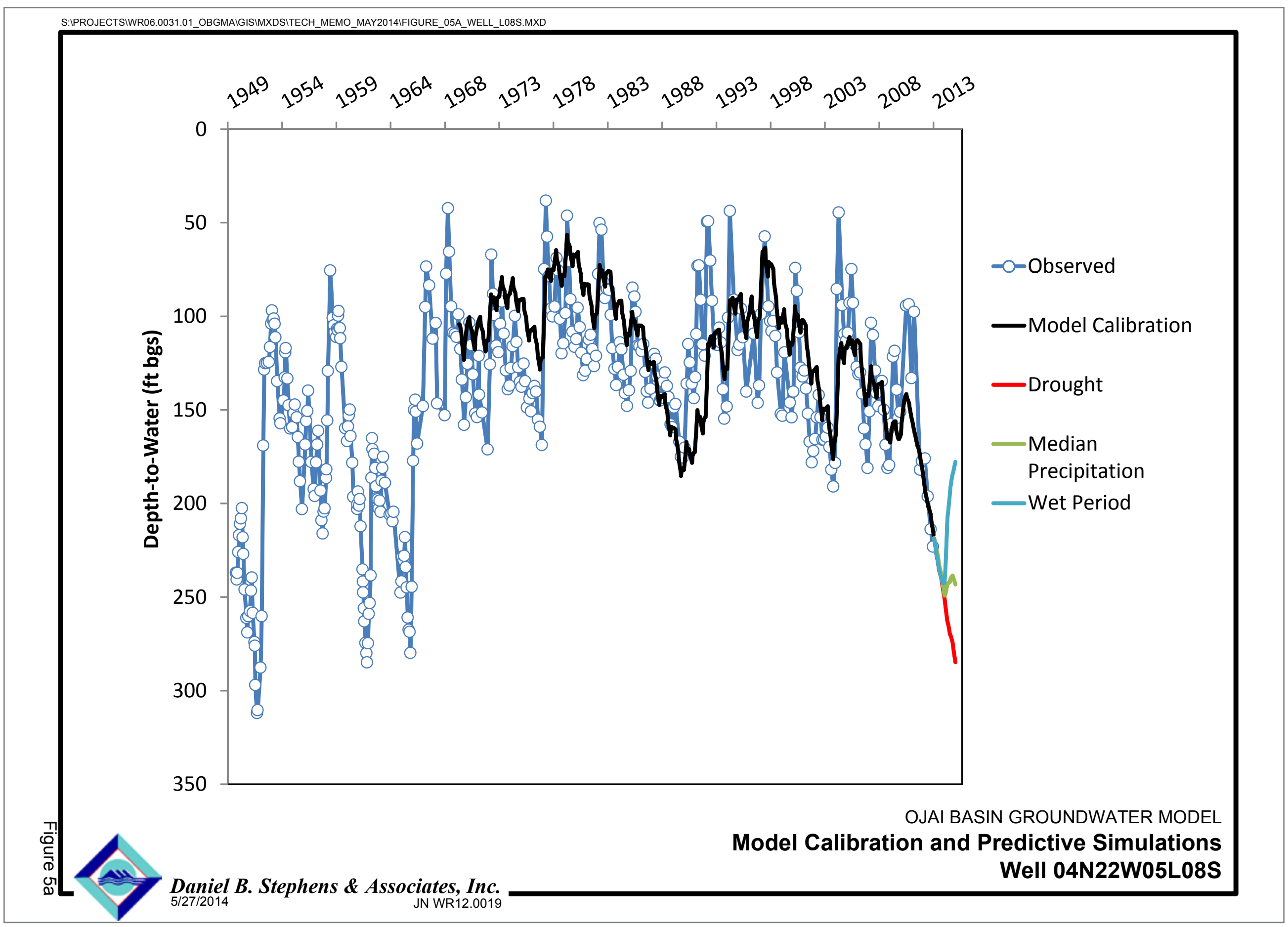


Figure 3.4.2.3.9 Ojai Basin Groundwater Model, 2014 Predictive Simulations. An update to the Ojai Basin Groundwater Model in 2014 found: "groundwater levels are projected to continue to decline significantly under ongoing drought, remain at current-day levels given median precipitation conditions, and increase, albeit to still relatively low levels, assuming a relatively wet upcoming water year." Shown are data from well # 04N22W05L08S.

Source: Update to Ojai Basin Groundwater Model Memo (DBS&A 2014)

3.4.2.4 Key Data and Information Sources/ Further Reading

Below is a summary of some of key documents that address the watershed's water supplies. See "4.3 References" for complete reference citations. Water suppliers and managers also maintain databases of water supplies, use, levels, etc.

2013 Comprehensive Water Resources Report, Ventura Water (RBF 2013)

2014 Comprehensive Water Resources Report, Ventura Water (RBF 2014)

Biological Opinion for US Army Corps of Engineers Permitting of the City of Ventura's Foster Park Well Facility Repairs on the Ventura River, Draft (NMFS 2007)

Bulletin 118: California's Groundwater (CDWR 2003)

Feasibility Study on the Reuse of Ojai Valley Sanitary District Effluent – Final Facilities Planning Report (Nautilus 2007)

Groundwater Budget and Approach to a Groundwater Management Plan Upper and Lower Ventura River Basin (DBS&A 2010)

Groundwater Model Development – Ojai Basin, Ventura County, California (DBS&A 2011)

Inventory of Public & Private Water Purveyors in Ventura County (VCWPD 2006)

Ojai Basin Groundwater Management Agency, 2010 Annual Report (OBGMA 2010)

Ojai Basin Groundwater Management Agency, Annual Report, 2011 & 2012 (OBGMA 2014)

Reclaimed Water Feasibility/Marketing Study (Boyle 1992)

Report on the Environmental Impacts of the Proposed Agreement Between Casitas Municipal Water District and the City of San Buenaventura for Conjunctive Use of the Ventura River – Casitas Reservoir System (EDAW 1978).

The Ventura River Project History (USBR 1995)

Update to Ojai Basin Groundwater Model Memo (DBS&A 2014)

Urban Water Management Plan, Casitas Municipal Water District, 2010 (CMWD 2011)

Urban Water Management Plan, City of Ventura, 2010 (Kennedy/Jenks 2011b)

Acronyms

AF—acre-feet

BO—Biological Opinion

cfs—cubic feet per second

CMWD—Casitas Municipal Water District

EIR—Environmental Impact Report

GSWC—Golden State Water Company

mgd—million gallons per day

MOWD—Meiners Oaks Water District

OBGMA—Ojai Basin Groundwater Management Agency

OVSD—Ojai Valley Sanitary District

SMWC—Sisar Mutual Water Company

SWP—California State Water Project

VCWPD—Ventura County Watershed Protection District

VRWD—Ventura River Watershed District

VRMWD—Ventura River Municipal Waters District

USBR—U.S. Bureau of Reclamation

WY—water year

Urban Water Management Plan, Golden State Water Company, 2010 (Kennedy/Jenks 2011a)

Ventura River Habitat Conservation Plan, Draft (Entrix & URS 2004)

Water Supply and Demand Status Report (CMWD 1989)

Water Supply and Use Status Report (CMWD 2004)

Gaps in Data/Information

Lack of data on groundwater pumping is considered a significant data gap in the watershed. Data on how much water is pumped by private well owners and the smaller water companies will help with understanding the hydrological connections between groundwater and surface water, and will provide water managers and others dependent upon groundwater as a supply source with important information for planning purposes.

Additional data and information that could help with water supply management include:

- A review of current practices and the potential for water savings through conjunctive use of surface water and groundwater supplies.
- An assessment of the potential for enhanced recharge projects.
- A comprehensive groundwater-surface water interaction analysis (described in "3.3.3 Groundwater Hydrology"), including gathering more data on surface flows, such as on San Antonio Creek, and groundwater levels.
- A comprehensive water supply and demand budget, including current uses and future demands.
- An estimate of the potential impacts of climate change on water supply safe yields.
- An assessment of the potential to use local farmland for on-farm stormwater detention and storage.
- An analysis of water rate models and options to better incentivize conservation while covering fixed costs.
- An analysis of the opportunities to use reclaimed water from the Ojai Valley Sanitary District, such as during winter flows when the water is not as critical to the river.

In addition, a groundwater management plan is needed for the Upper Ventura River Groundwater Basin.

3.4.3 Water Demands

3.4.3.1 Current Water Demands

The total average annual water demand for the watershed is estimated at 32,500 acre-feet (AF), with 54% (17,500 AF) from surface water sources and 46% (15,000 AF) from groundwater sources (See "3.4.2 Water Supplies" for details).

Water Demand as Defined Here

In this section, *water demand* is defined as all demands on this watershed's water supplies from the areas it serves, including some areas outside the watershed's boundaries. Water demands in the adjacent coastal watersheds—in the Rincon area and the City of Ventura—are included if the source of the water is the Ventura River watershed.

Definiton: Acre-foot

An acre-foot is 325,851 gallons of water.

Annual and Seasonal Demand Variability

The annual variability of rainfall in the watershed affects both the total amount of water used each year as well as the relative amounts of surface water versus groundwater used. In very wet years, groundwater use goes up and demand on Lake Casitas goes down; in very dry years the reverse happens. The long-term average demand on Lake Casitas is 17,530 AF, but demand was 24,420 AF, or 139% of average, in water year 1989—a major drought year; and 11,690 AF, or 67% of average, in water year 1993—a very wet year

Table 3.4.3.1.1 CMWD Water Deliveries in Wet and Dry Years

Total Deliveries (AF)		
Average (1976–2013)	1989 (Very Dry Year)	1993 (Very Wet Year)
17,530	24,420	11,690

In very dry years, demand on Lake Casitas goes up; in very wet years the reverse happens.
Data Sources: CWMD Use Patterns Database and Casitas Consumption Reports.

Water demand in the watershed also varies seasonally. Demand is greater in the drier months of summer and fall, and lesser in the wetter months of winter and spring. A greater seasonal variability is seen in the inland areas, where it is hotter and irrigation needs are greater, than on the coast. Figure 3.4.3.1.1 shows the fluctuation in Lake Casitas water deliveries in 2010, a normal year in terms of rainfall and runoff.

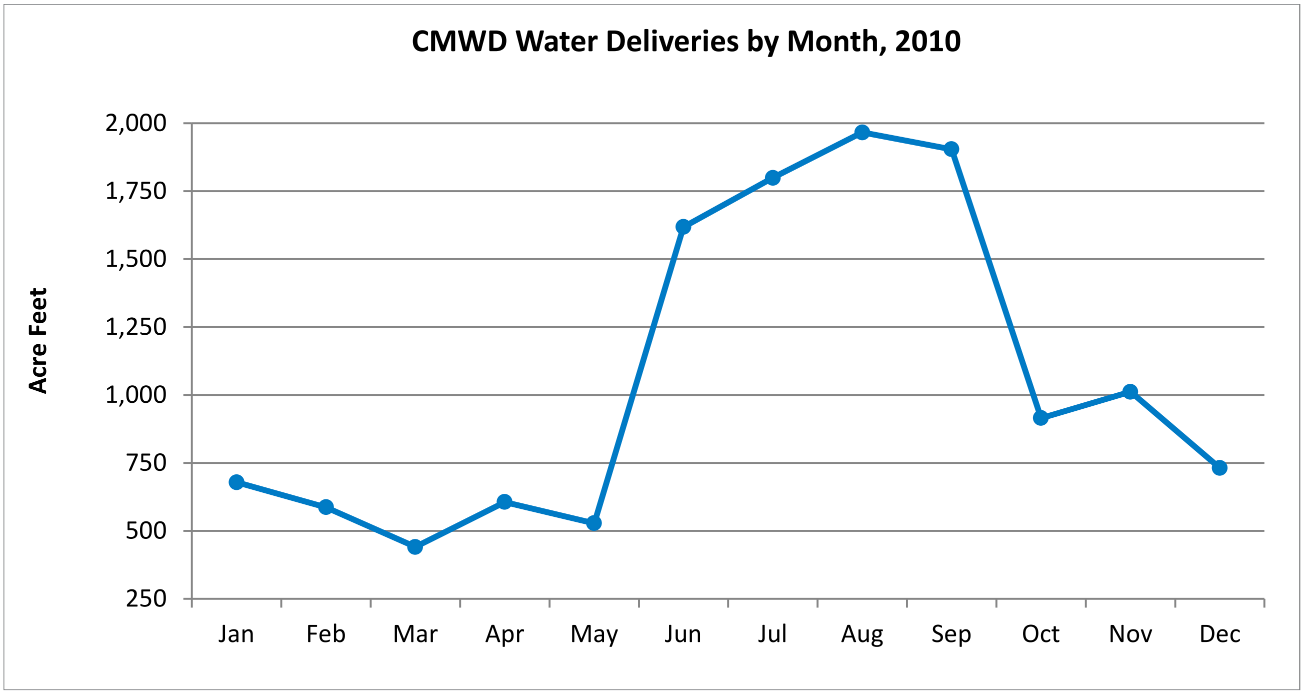


Figure 3.4.3.1.1 CMWD Water Deliveries by Month, 2010

Data Source: CMWD Public Water System Statistics Report

Evaporation

A significant amount of water is lost to evaporation from the 2,760-acre (when full) surface area of Lake Casitas. CMWD takes daily evaporation pan measurements at Casitas Dam and at the Recreation Area. Between 1959 and 2010, an average of 7,986 AF per year evaporated from the lake (Wickstrum 2011).

Urban Water Use

Urban (non-agricultural) water use comprises about 55% of total water demand, with residential use making up the majority of urban water demand. (As stated above, water demand is defined here to include all demands on the watershed's water supplies from the areas it serves—which include some areas outside the watershed's boundaries.) (See "Water Use By Sector" later in this section.)

Urban water demands have not increased significantly in recent decades. The greatest growth in demand for urban water has been in the City of Ventura outside of the watershed. Since 2005, 271 single-family units, 1,369 multi-family units, and 1,398,798 square feet of non-residential development have been constructed in the City of Ventura (RBF 2014). Although this growth has not necessarily been within the watershed boundaries, water from the Ventura River watershed currently supplies almost half of the City of Ventura's water needs (RBF 2013).

Water Fountain in Downtown Ojai
Photo courtesy of Michael McFadden

Per capita water use varies from place to place, depending on each community's unique mix of land uses, weather, and other variables.

Per Capita Water Use

Per capita water use is calculated by dividing the total volume of public water produced daily by the number of people being served. The per capita use figure represents an individual's share of a community's average daily water needs and includes not only water used at home, but also water used at businesses such as restaurants, hotels, and offices; at community facilities like schools, parks, and hospitals; and for other uses like fighting fires (CDWR 2013a). CMWD's agricultural water use is excluded from their per capita calculation; the City of Ventura included their small amount of agricultural water use in their calculation.

Per capita water use varies from place to place, depending on each community's unique mix of land uses, weather, and other variables. Regions near the coast typically have smaller irrigated landscapes and cooler climates compared with the warmer climates and larger irrigated landscapes of inland regions. The statewide average per capita water use is 198 gallons per day (CDWR 2013a).

Table 3.4.3.1.2 provides the average annual per capita water use of the watershed's three largest water suppliers, and Figure 3.4.3.1.3 charts their historical annual per capita water use. As these data show, inland per capita water use (Casitas, Golden State) is significantly higher than coastal (Ventura Water). Warmer weather and many large landscapes (i.e., golf courses, schools, parks and private estates) contribute to these higher numbers. Per capita water use is further discussed in "Urban Water Management Plan Projections" later in this section.

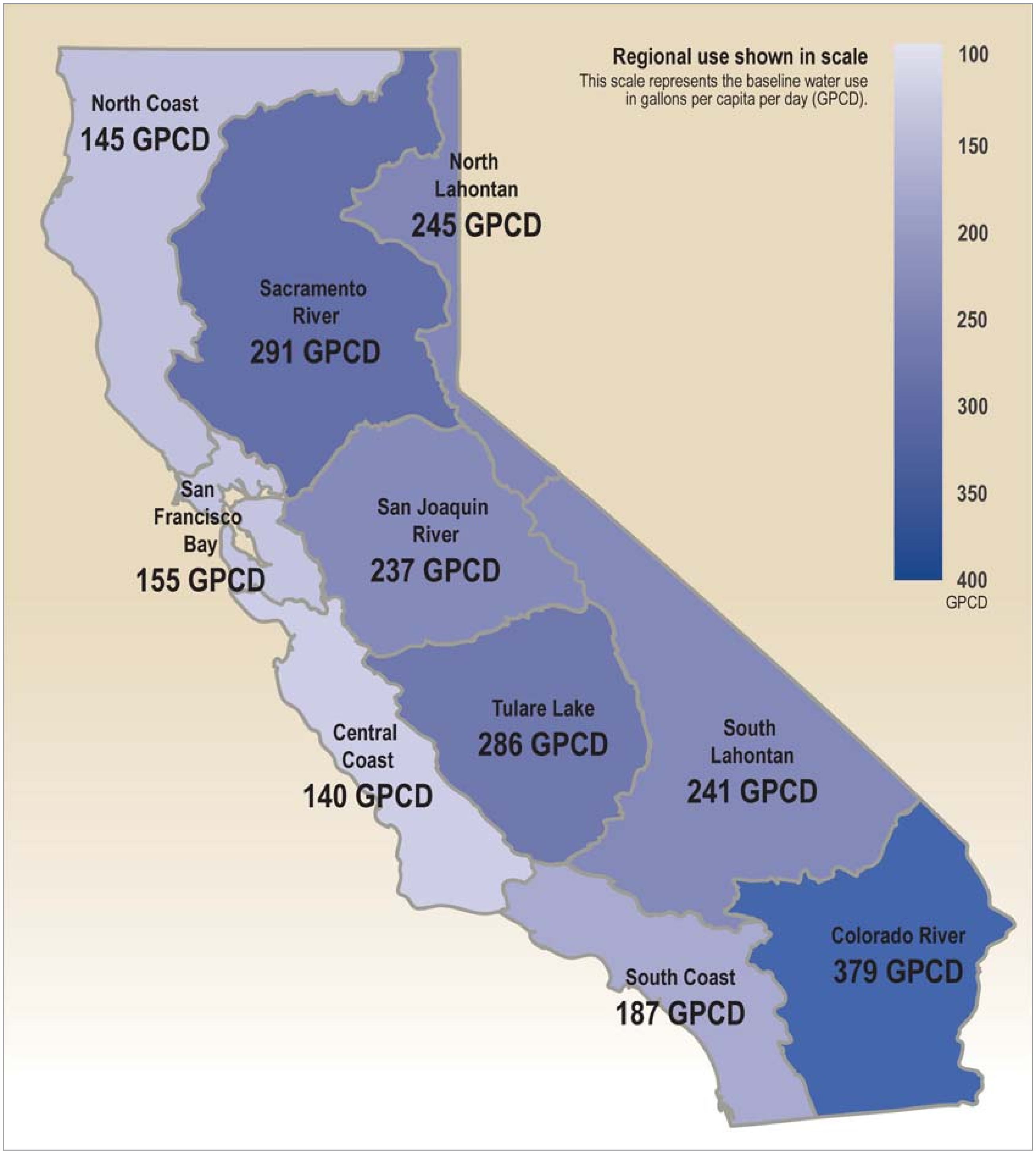


Figure 3.4.3.1.2 Statewide Per Capita Water Demand

Source: California Water Plan (CDWR 2013a)

Table 3.4.3.1.2 Average Annual Per Capita Water Use, 1999 to 2008

Casitas Municipal Water District	Ventura Water	Golden State Water Co.
Gallons/Capita/Day		
319.2	165.1	298.5

Data Source: Data Sources: 2010 Urban Water Management Plans (CMWD 2011, Kennedy/Jenks 2011a, Kennedy/Jenks 2011b)

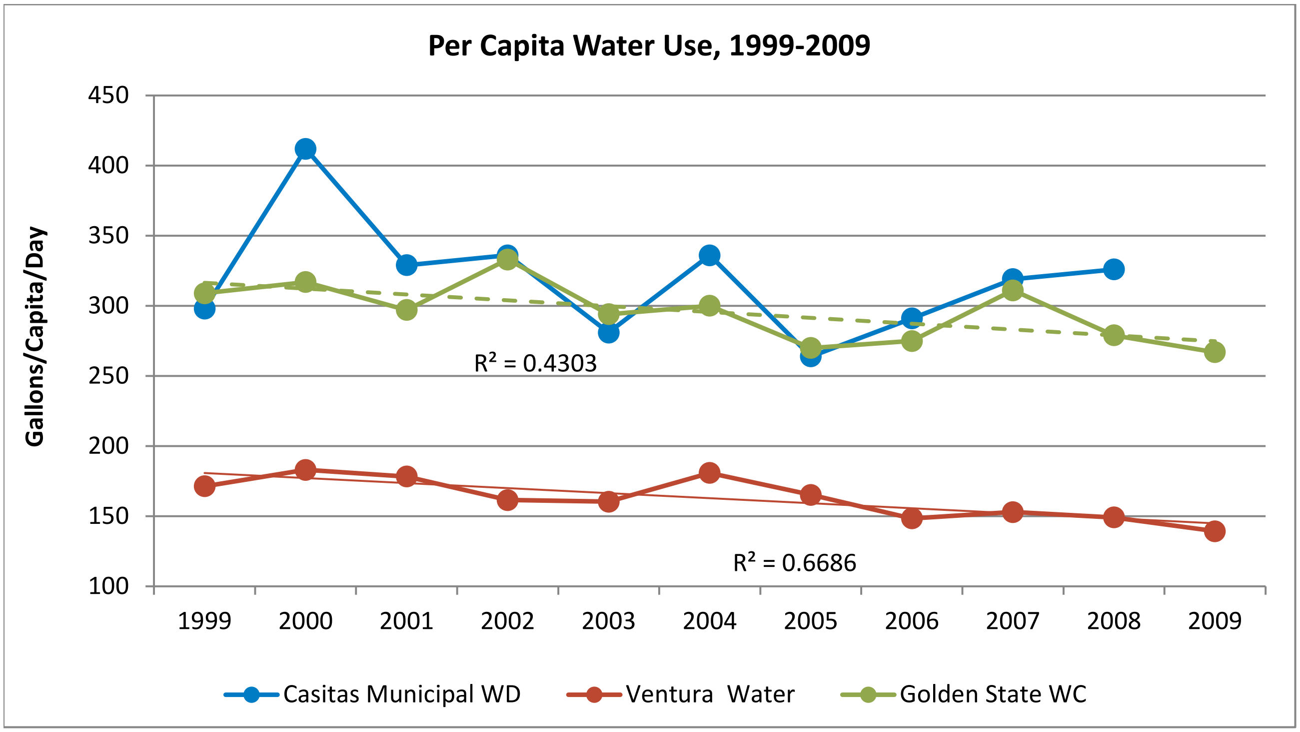


Figure 3.4.3.1.3 Per Capita Water Use, 1999–2009. The data show inland per capita water use (Casitas Municipal Water District, Golden State Water Company) as significantly higher than coastal (Ventura Water). Warmer weather and many large landscapes (i.e., golf courses, schools, parks and private estates) contribute to these higher numbers. Because so much water is used for irrigation in the non-coastal watershed, per capita water use can change considerably depending upon the type of rain year. (Agricultural water use is excluded from Casitas's per capita calculation.)

Per capita use for Ventura Water and Golden State show a statistically meaningful decreasing trendline. (Note: Casitas calculated their per capita use based on water year, Ventura Water and Golden State used a calendar year.)

Data Sources: 2010 Urban Water Management Plans (CMWD 2011, Kennedy/Jenks 2011a, Kennedy/Jenks 2011b); Ventura River Water District

Oil Industry Water Use

Oil recovery is a major industry in the watershed. The amount of groundwater used by the industry in the watershed is not known; their use of potable water supplies is relatively minor and has been decreasing in recent years.

All of the water used by Aera Energy for their waterflood injection in the Ventura Field in the lower watershed is brackish groundwater that comes up with the produced oil. This groundwater is filtered, cleaned, and reinjected into the same aquifer from which it was removed (Lampara

2014). (Note: water suppliers do not use aquifers in this area of the lower watershed).

CMWD serves water to oil and gas production facilities in the Rincon area for high-pressure water injection oil recovery. The district reported in their 2010 Urban Water Management Plan that one of their oil customers recently switched to an alternative groundwater source, reducing demand on CMWD. The average demand from all of CMWD's industrial customers between 2008 and 2012 was only 38 AF per year.

The City of Ventura reported in their 2010 UWMP that water usage for oil recovery between 1995 and 2000 averaged 1,500 AF per year. Between 2001 and 2005 it was approximately 900 AF per year, and between 2006 and 2010 it was approximately 500 AF per year. Purchased potable water is used primarily in offices, and purchased raw water is used for dust control and equipment cooling (Lampara 2014).

Agricultural Water Use

Agricultural water use comprises about 45% of water demand in the Ventura River watershed, which provides irrigation for over 6,000 acres of agricultural land, including some land outside and adjacent to the watershed (in the Rincon area).

Supplying water to agriculture was a primary impetus for the development of the watershed's reservoirs:

> Many agricultural wells in the productive Ojai Valley began going dry in the 1930's and '40's, forcing Ventura County to build 7,000 ac-ft Matilija Dam in 1949. The purpose of the dam was to replenish groundwater basins used for farming in Ojai and by the City of Ventura for its municipal supply.
>
> —*Ventura River Project* (USBR 1995)

> Upon conception of the Ventura River Project in 1953–54, it was hoped that a total of 13,200 acres of agricultural lands could ultimately be irrigated within project boundaries. Due to urban expansion, much of the potential farm lands were developed for other uses. As a result, the project has never supplied water to more than 7,000 acres of agricultural lands, with even that number being frozen as of 1995 by CMWD for conservation purposes. The Rincon area of the project, located near the coast to Ventura's west, has increased its agricultural acreage over the years, growing mostly avocados.
>
> —*Ventura River Project* (USBR 1995)

Young Avocados Adjacent to Robles Diversion Facility

Citrus and avocado are the primary crops grown within the watershed; citrus comprises about 44% of the acreage, and avocados 25%. Other crops include grains, row crops, berries, flowers, and other tree crops.

Groundwater is less expensive than Casitas water, so if growers have access to it, via their own wells or those of small water companies, most will depend first on groundwater and use Casitas water for supplemental or backup water. Some growers using groundwater have no Casitas connection for backup; some growers use Casitas (or other small water companies) as their only water source.

Even with the recent addition of a couple of large groundwater-dependent agricultural operations, the acreage of irrigated agriculture in the watershed appears to be decreasing. CMWD requires that all growers using their water, including supplemental/backup users, report annually on crop type and irrigated acres. CMWD's 2013 crop data indicates that Casitas provides agricultural water—either as a primary source or as supplemental/backup—to a total of 5,264 acres. This is down from 6,276 acres in 2000; a decrease of 1,012 acres or 16%.

Because so many growers use groundwater directly, and reporting on this water use is not required, data on water demand by agricultural users are incomplete. The exception to this is in the Ojai Valley Groundwater Basin, where the Ojai Basin Groundwater Management Agency requires irrigators to report their extractions.

Many factors affect agricultural water demand. Demand is greater inland than on the coast. In dry years, when growers receive less water from rainfall, agricultural demand increases. Late rains or excessively heavy rains are less beneficial than moderate rains spaced evenly over the rainy season. Mature tree crops require more water than young trees, but young trees need to be watered more frequently. If frosts threaten orchards in the winter, a grower's first line of defense is often to turn the water on, as wet ground holds heat from the day better. Wind has a drying effect on vegetation, so water demand will increase in winters and falls with more wind—this is especially true for avocados, which dry easily in wind events. Some Ojai soils, especially on the East End, are very rocky and don't hold water well; this necessitates more water than crops grown in soils with more clay and organic matter (Ayala 2012).

The cost of water also affects agricultural water demand, and the source of water that growers choose. Over the years, increases in potable water rates have caused some growers to switch to groundwater sources.

The cost of water also affects agricultural water demand, and the source of water that growers choose. Over the years, increases in potable water rates have caused some growers to switch to groundwater sources. In the early 1990s, a number of growers shifted to using groundwater instead of Casitas water as their primary source of water (Entrix & URS 2004); this occurred again in the late 2000s when CMWD raised agricultural rates 53%.

CMWD has found that tree crops in the watershed use an average 2.5 AF per acre per year inland, and 2.0 AF near the coast, but crop demand can vary significantly year to year (see Table 3.4.3.1.3). This irrigation demand variability has a significant effect on total water demand—something that is not seen in more urban areas where a smaller percentage of water is used for irrigation.

Table 3.4.3.1.3 Agricultural Water Demand from CMWD

Average AF (1976–2012)	High AF 1989 (Dry Water Yr.)	Low AF 1983 (Very Wet Water Yr.)
7,172	10,449	4,094

Between 1976 and 2012, CMWD's total agricultural demand averaged 7,172 AF per year; however annual demand ranged from 1989's high of 10,449 AF—50% more than the average, to 1983's low annual demand of 4,094 AF— 43% of the average.

Data Source: CWMD Use Patterns Database and Casitas Consumption Reports

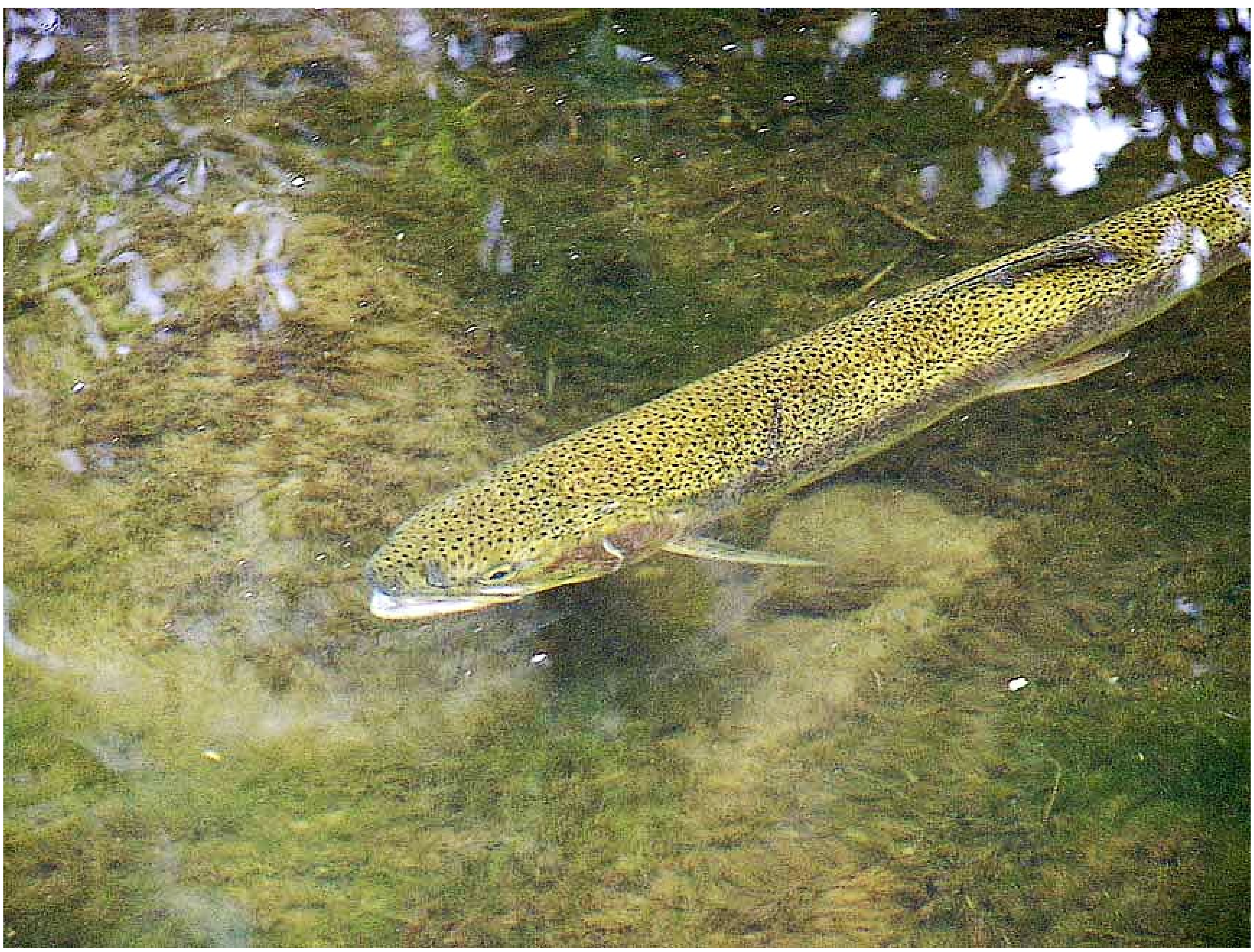
Environmental Water Use

Definition: Environmental Water

Environmental water is defined by the state of California as "water serving environmental purposes, including instream fishery flow needs, wild and scenic river flows, water needs of fresh-water wetlands, and Bay-Delta requirements" (CDWR 2003).

The Ventura River watershed has more natural habitat than it does developed land. Over half of the watershed's acreage is in protected status. Over 2,300 acres of land is now protected in perpetuity by two local land conservancies, with much of this land centered around riverine and stream habitats. The river and stream network is largely unchannelized and provides a considerable amount of natural riparian habitat. These existing natural habitats are also important users of local water, and requirements to provide this water are increasingly integrated into the permits of water supply projects.

The Ventura River and key tributaries have been designated by the National Marine Fisheries Service (NMFS) as critical habitat for endangered southern California steelhead. The overall environmental water needs of steelhead have not been quantified for these critical habitat drainages. On a case-by-case basis however, water projects in the watershed have been required to reduce the amount of water withdrawn in order to provide for steelhead.



22–24" Steelhead in Ventura River Above Shell Road Bridge, 2007

Photo courtesy of Mark Capelli

The Robles Diversion is the facility that diverts Ventura River water via a canal to Lake Casitas. A "Biological Opinion," (BO) written by the National Marine Fisheries Service, outlines operational rules for the Robles Diversion and Fish Passage Facility on the Ventura River. The BO includes complex operational and flow guidelines to provide for the migration and passage of the steelhead up and down the main stem of the river and through the diversion during the steelhead migration season (January 1 to June 30). Outside of migration season, if there is any flow, a minimum flow of 20 cubic feet per second (cfs) must be allowed to flow downstream to protect rights of downstream groundwater users. Implementation of the flow release requirements of the BO started in 2005.

The BO also includes a number of drought protection measures. These include: 1) tying the operation of the fishway to naturally occurring river flows, rather than stored water; 2) providing a mechanism for further limiting operation of the fishway when Casitas Reservoir reaches 100,000 acre-feet of storage (approximately half of the reservoir's maximum storage); and 3) temporarily suspending operation of the fishway when the Casitas Reservoir reaches 17,000 acre-feet, and not resuming fishway operations until the level of Casitas Reservoir reaches 65,000 acre-feet (NMFS 2003a).

The Ojai Valley wastewater treatment plant below Foster Park has released its treated effluent into the Ventura River for decades. This water has long been responsible for helping maintain aquatic habitats and supporting the fragile and highly biodiverse Ventura River estuary.

The rehabilitated San Antonio Creek Spreading Grounds, a project completed in 2014 to enhance groundwater recharge, was required to provide a minimum of one foot of bypass water, water allowed to flow past the intake structure, (as measured at the Grand Avenue gauge) before diversion can begin. This translates into approximately 21 cfs left in the creek for the needs of steelhead.

The City of Ventura has adopted a policy to maintain steelhead habitat by voluntarily reducing groundwater extraction and subsurface collections at their Foster Park facilities when flows decline below 15 cfs at the Casitas Vista Road stream gauge (VCWPD 2014c).

The Ojai Valley wastewater treatment plant below Foster Park has released its treated effluent into the Ventura River for decades. The average discharge is 2.1 million gallons per day, or an average of 3.3 cfs. In dry and very dry water years, this water can make up most if not all of the flow in the lower river. This water has long been responsible for helping maintain aquatic habitats and supporting the fragile and highly biodiverse Ventura River estuary. Although discharging effluent to the river did not begin because of a mandate to provide environmental water, the water has essentially become environmental, and discontinuing the discharge could be considered a significant environmental impact by regulators. In addition, the practice is now integrated into the water quality and land use permits under which the district operates (Palmer 2014).

Voluntary Water Transactions

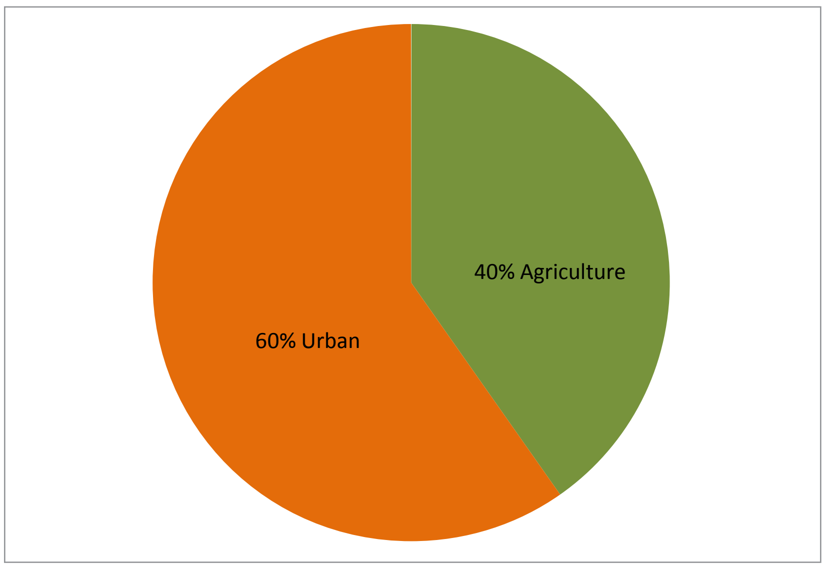
One mechanism to increase water in streams is voluntary water transactions. These are real property transactions where surface water rights from willing sellers are acquired, donated, or leased for instream fish and wildlife beneficial uses. "Increasingly, California land trusts and specialized nonprofits such as the Scott River Water Trust are directly compensating landowners at fair market values—through acquisition, lease, or tax deductible donations—to reduce all or a portion of their surface water diversions to increase instream flows in rivers with salmon and steelhead." (Hicks 2014)

Water Use by Sector

Water originating in the Ventura River watershed is used both within and outside the watershed, and use is divided roughly equally between the agricultural and urban sectors. Urban water use is estimated at 55%, and agricultural water use at 45%.

Figure 3.4.3.1.4 Water Demand by Sector

See "4.4 Appendices" for water demand by sector data calculations and sources.



Water Sector Data Challenges

A number of factors make precise estimates of water use by sector difficult. There are 21 small water companies that do not report their water use by sector. There are hundreds of private wells. Requirements to report groundwater withdrawals are only enforced in the Ojai Valley Groundwater Basin, and no one is collecting groundwater use by sector data. The watershed's largest water supplier, Casitas Municipal Water District (CMWD), acts as a wholesale distributor for 40% of its water sales, and does not track the use by sector of that water. The majority of CMWD's wholesale water is purchased by the City of Ventura. While the City of Ventura does report its use by sector, their data apply to the entire city and their combined water supply sources, not only to the Ventura River watershed or those areas where the watershed's water is used. The estimates of water use by sector in this section must be understood in the context of these data challenges

3.4.3.2 Future Water Demands

Trends

Future water demand can be gauged by analyzing historical trends. Within the watershed, there has been very little growth in recent decades. Local policies, described below in "Water Demand Management" have played a big role in this regard.

Based on trends over the last several decades, overall water use is not expected to change significantly, with the greatest potential for increasing demands likely related to growth in the City of Ventura. Tables 3.4.3.2.1 and 3.4.3.2.2 show that the number of customers served by the watershed's largest water suppliers has not increased significantly over the last decade, and, in fact, has decreased in some cases. The greatest increase in the number of customers is in the City of Ventura's service area. See also "City of Ventura Growth" later in this section.

Table 3.4.3.2.1 Change in Number of Urban Water Customers

	Number of Residential Customers				Number of Commercial/Institutional/Industrial Customers			
Water Supplier	**2003**	**2012**	**Change**	**%**	**2003**	**2012**	**Change**	**%**
Casitas Municipal Water District Retail	2,675	2,698	+23	+0.86%	140	116	−24	−17.1%
Ventura Water[1]	24,899	25,533	+634	+2.55%	2,686	3,433	+751	+27.81%
Golden State Water Company	2,542	2,541	−1	−0.04%	262	277	15	+5.7%
Ventura River Water District	2,498	2,516	+18	+0.72%	50	50	0	0
Meiners Oaks Water District	1191	1192	+1	+.08%	60	62	+2	+3.3%

1. City data is for the entire city, not just the part in the Ventura River watershed.

Data Source: Public Water System Statistics Reports

Table 3.4.3.2.2 Change in Number of Agricultural Water Customers

	Number of Customers			
Water Supplier	**2003**	**2012**	**Change**	**%**
Casitas Municipal Water District Retail	258	252	−6	−2.3%
Ventura Water[1]	10	0	0	0
Meiners Oaks Water District	32	33	+1	+3.1%

1. City data is for the entire city, not just the part in the Ventura River watershed.

Data Source: Public Water System Statistics Reports

Water demand fluctuates from year to year in response to rainfall and runoff conditions. Figure 3.4.3.2.1 shows that CMWD's total annual water deliveries have been quite variable for the record available, and Figure 3.4.3.2.2 shows that there is a strong statistical correlation between these water deliveries and local rainfall. Water deliveries are generally lower in wet and very wet runoff water years, and higher in dry and very dry years. Extractions from the Upper Ventura River Groundwater Basin over time, illustrated in Figure 3.4.3.2.3, have been similarly variable.

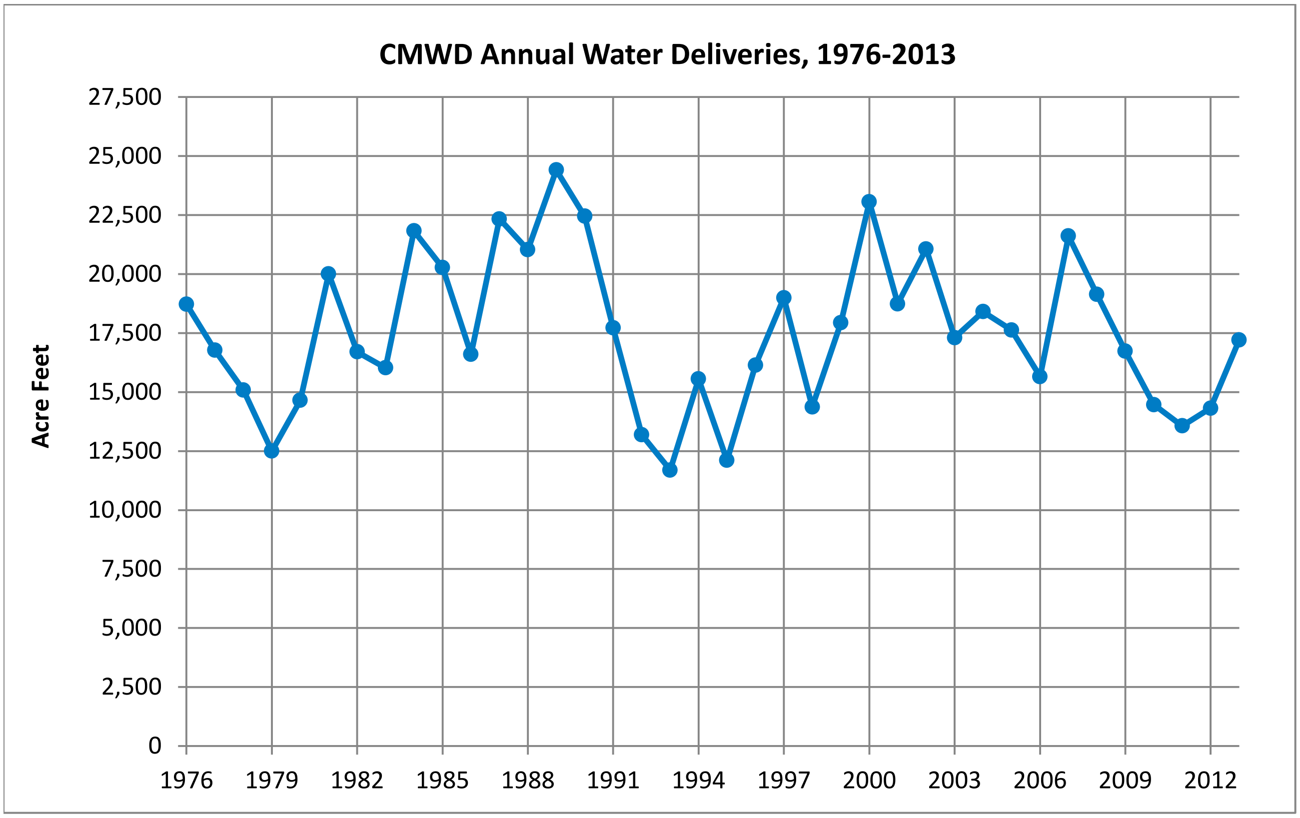


Figure 3.4.3.2.1 CMWD Annual Water Deliveries, Water Years 1976–2013

Data Source: CWMD Use Patterns Database and Casitas Consumption Reports

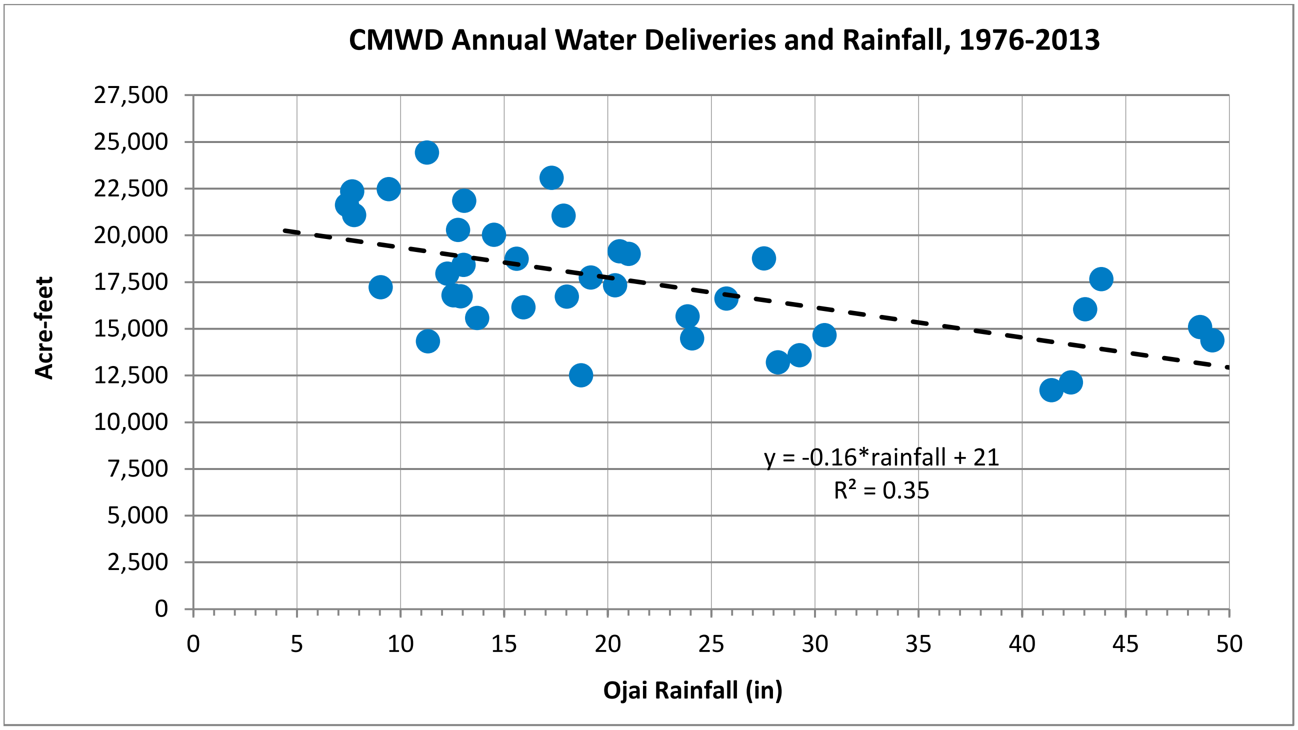


Figure 3.4.3.2.2 CMWD Annual Water Deliveries and Rainfall, Water Years 1976–2013

Data Source: CWMD Use Patterns Database and Casitas Consumption Reports

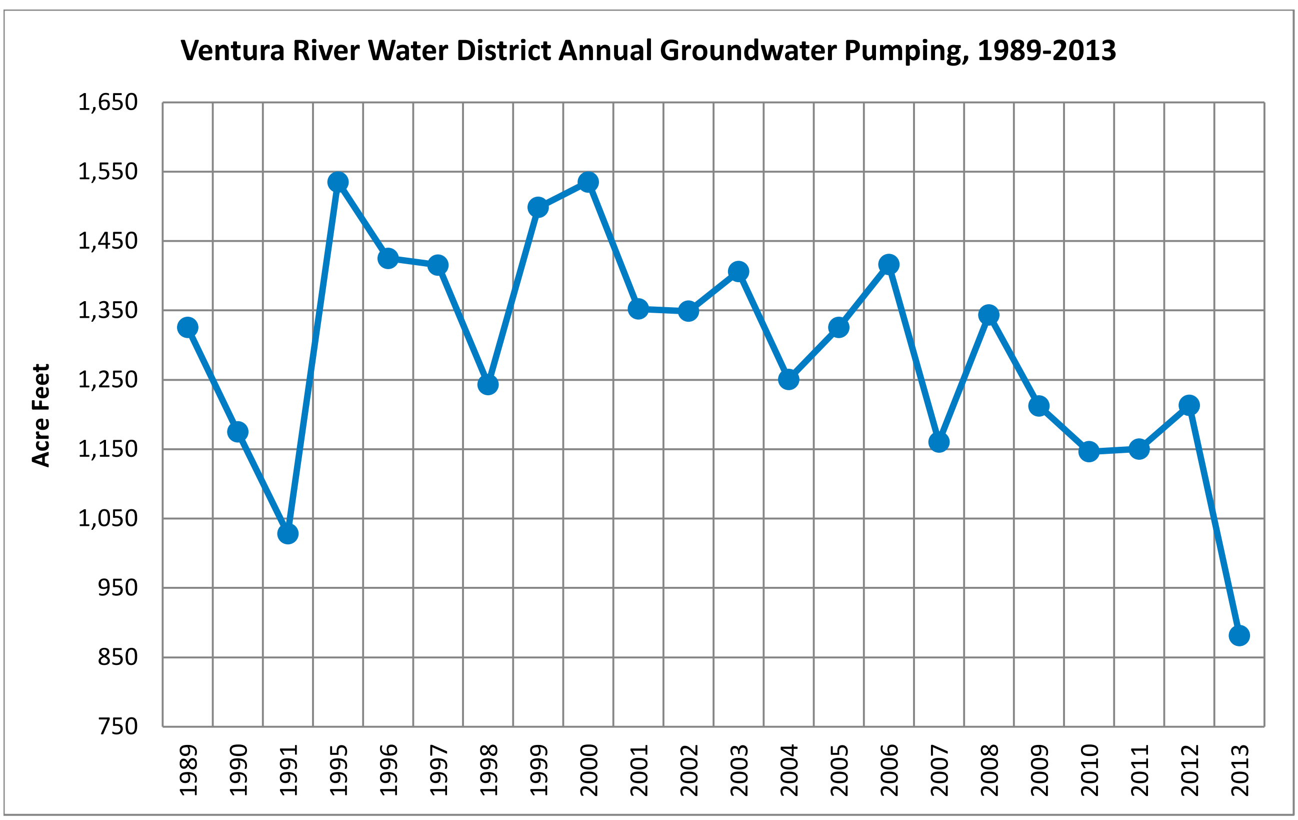


Figure 3.4.3.2.3 VRWD Annual Groundwater Pumping, Fiscal Years 1989–2013. VRWD pumps from the Upper Ventura River Groundwater Basin.

Data Source: VRWD

City of Ventura Growth

As stated previously, the greatest growth in demand for urban water has been in the City of Ventura. In recent years, the City has increased efforts to ensure that projected increases in water demands can be met by available supplies. In 2013, the City produced a *Comprehensive Water Resources Report* to address discrepancies between water supply and demand estimates in various City reports to better refine estimates of supply and demand. An update of this report was prepared in 2014.

The report tallied the estimated water demands of all development projects that were either under construction or that had received all planning approvals as of December 31, 2013. (Projects still pending approvals from the City were not considered in the projections.) The estimated water demands that the City is committed to supply as of 2013 total 18,428 AF per year, and these projects will likely be completed by the year 2020. The City's total demand for 2013 was 17, 723 AF per year. The City's average annual demand over the last 5 years was 17,343 AF per year, and the average annual demand over the last 10 years (2004 to 2013) was 18,373 AF (RBF 2014).

The greatest growth in demand for urban water has been in the City of Ventura. In recent years, the City has increased efforts to ensure that projected increases in water demands can be met by available supplies.

The report stated that the City's current reliable water supply is 19,600 AF per year (citywide), although this could drop to an estimated 16,246 AF per year in 2015 due to drought conditions (RBF 2014). The report characterized the City's current reliable water supply from the Ventura River watershed as 4,200 AF per year from the City's Foster Park facilities and 5,000 AF per year from Lake Casitas (RBF 2013).

The report emphasized how close the City's supplies are to its demands:

> The results of this Report indicate that the spread between the current water demand and the current water supply is very tight, and if the drought continues the supply could be less than the demand. This presents significant challenges for the City moving forward in the ability to allocate water supply to development projects that will generate additional water demands.
>
> —*2014 Comprehensive Water Resources Report* (RBF 2014)

The report provided a series of recommendations, including more rigorous accounting of supplies, demands and projections, as well as developing new water supply sources.

The City of Ventura is currently constrained by their 1995 contract with CMWD for a maximum of 8,000 AF per year from the reservoir for use within CMWD's service area ("in-district"), with that amount decreasing if lake levels drop below 90,000 AF. The City's in-district use in recent years has averaged about 5,000 AF (RBF 2013). The 1995 contract does allow the City to "rent" water, and later return it, for use outside of

CMWD's service area (CMWD 1995). This contract is being reconsidered for relevance to today's water supplies and demands (Wickstrum 2014). The City is further constrained by the vagaries of yield from their Foster Park groundwater wells and surface/subsurface diversions. The City estimates that with restoration of their Foster Park wellfield and expansion of their Avenue Treatment Plant to its maximum capacity, the City could restore its historical production capabilities from Foster Park to 6,700 AF per year (RBF 2013).

Population Projections

Population forecasts are generally developed by city or county—not by watershed, which makes deriving watershed estimates challenging. The only population forecast entirely applicable to the watershed is for the City of Ojai; forecasts for the City of Ventura or unincorporated Ventura County may or may not reflect the portion of the watershed within those jurisdictions.

In addition, the forecasts of different sources can vary considerably. Table 3.4.3.2.4 shows the population forecasts of three sources: Ventura Local Agency Formation Commission (VLAFCO), city or county general plans, and Southern California Association of Governments (SCAG). It should be noted that SCAG projections in recent years have significantly overestimated actual population.

Table 3.4.3.2.3 Population – Past

Area	2000	2010	2011	2012	2013	2014	2000–2014 % Change
Ojai	7,862	7,461	7,511	7,500	7,581	7,594	–3.41%
Ventura[1]	100,916	106,433	107,124	106,667	108,387	108,961	7.97%
Unincorporated Ventura County[1]	93,127	94,937	94,775	96,147	96,635	97,313	4.49%

1. These population data represent the entirety of the City of Ventura and the Unincorporated County, not just the part within the Ventura River watershed.

Data Sources: Numbers for 2000 and 2010 reflect US Census counts. Numbers for 2011–2014 reflect January 1st, Department of Finance Population Estimates (E-4)

Table 3.4.3.2.4 Population Projections

Area	Data Source	2020	2025	2030	2035
Ojai	VLAFCO	7,315	7,181	7,049	—
	City General Plan	7,751	7,886	8,021	8,156
	SCAG	8,400	—	—	9,400
Ventura	VLAFCO	111,706	114,641	117,653	—
	City General Plan - 0.88% growth rate	—	126,153	—	—
	City General Plan - 1.14% growth rate	—	133,160	—	—
	SCAG	116,900	—	—	128,800
Unincorporated Ventura County	County General Plan	100,500	—	107,200	—
	SCAG	100,500	—	107,200	—

These data indicate that population projections are quite varied, depending on source.

Data Sources: Ventura Local Agency Formation Commission (VLAFCO 2012), city or county general plans: (City of Ventura 2005a), (City of Ojai 1991), (VCPD 2013), and 2012–2035 Regional Transportation Plan/Sustainable Communities Strategy Growth Forecast Southern California Association of Governments (SCAG 2012)

Urban Water Management Plan Projections

The California Urban Water Management Planning Act of 1983 requires all publicly or privately owned entities that serve water for municipal purposes to more than 3,000 service connections or serve more than 3,000 acre-feet of water per year to prepare an urban water management plan (UWMP). These plans must be updated once every five years, at the beginning or mid-point of each decade, to support long-term resource planning.

The primary goals of the UWMP are to: 1) plan the water supply over a 20-year period; 2) identify and quantify water supply for future demands in normal, single-dry, and multiple-dry year conditions; and 3) implement conservation and efficient water use practices in urban settings. The submission of an UWMP also qualifies the water supplier for state funding opportunities.

Three water supplier UWMPs are applicable to the Ventura River watershed: CMWD, Ventura Water, and Golden State Water Company (GSWC). GSWC prepared an UWMP even though they are not required to do so given their small size. UWMPs address urban water uses, which include residential, commercial, governmental, and industrial uses. Agricultural water use is not addressed by UWMPs. Only about 30% of CMWD's water deliveries are for (non-resale) urban uses.

Per capita water use is reported in these UWMPs; projected water demands are based on this per capita rate plus projections of population growth.

Table 3.4.3.2.5 provides a summary of past and projected urban water demands for CMWD, Ventura Water, and GSWC. Table 3.4.3.2.6 provides the baseline per capita water use for these suppliers, which is calculated per state guidelines, along with their 20 x 2020 targets.

Table 3.4.3.2.5 UWMP Water Demand Projections

Year (calendar)	CMWD[1]	City of Ventura[2]	Golden State WC
Actual Demand[3] (AF/yr)			
2005	23,060	20,808	1,955
2010	16,398	17,351	1,780
Projected Deliveries[4] (AF/yr)			
2015	19,347	22,286	2,248
2020	20,102	23,256	2,384
2025	20,855	24,270	2,483
2030	21,809	25,330	2,569
2035	21,247	26,436	2,625
Projected Demand w/ Conservation[5] (AF/yr)			
2015	17,354	20,163	2,494
2020	17,354	19,657	2,331
2025	17,354	20,514	2,428
2030	17,354	21,410	2,513
2035	17,354	22,345	2,567
% Change from 2010 Demand			
2015	5.8%	16.2%	40.1%
2020	5.8%	13.3%	31.0%
2025	5.8%	18.2%	36.4%
2030	5.8%	23.4%	41.2%
2035	5.8%	28.8%	44.2%

1. 45% of CMWD's demand is agricultural, and another 45% is resale. Only 10% of their total demand is subject to the state's 20% by 2020 requirement.

2. Includes the entire city, not just the portion in the Ventura River watershed.

3. Actual demand includes water sold/delivered, water lost during conveyance, and any recycled water.

4. The projected deliveries category does not include water lost during conveyance. Note: each water supplier used different sources for projecting population growth.

5. Projected demand includes water sold/delivered plus water lost during conveyance, minus anticipated conservation and recycled water use.

Data Sources: 2010 Urban Water Management Plans (CMWD 2011; Kennedy/Jenks 2011b; Kennedy/Jenks 2011a)

Table 3.4.3.2.6 20 x 2020 Per Capita Water Use

	Gallons/Capita/Day		
Water Supplier	**Baseline**	**2015 Target**	**2020 Target**
Casitas Municipal Water District	319	287	255
Ventura Water	162	152	142
Golden State Water Company	299	269	239
Ventura River Water District[1]	196	NA	NA

The Water Conservation Act of 2009 required water suppliers to establish a baseline daily per capita water use in order to derive their 20% reduction target for the year 2020, as well as a 2015 interim target.

The water demand projections are based on estimates of per capita water demand multiplied by projected population growth.

1. Ventura River Water District is not subject to the Act, but their per capita use was included for comparison purposes.

Data Sources: 2010 Urban Water Management Plans (CMWD 2011, Kennedy/Jenks 2011a, Kennedy/Jenks 2011b); Ventura River Water District

California Water Conservation Act of 2009: 20% by 2020

In 2008, amid a statewide drought, California's governor directed state agencies to develop a plan to reduce statewide per capita potable water use by 20% by the year 2020. This "20x2020" goal was ultimately enacted into state law, the Water Conservation Act of 2009 (SBx7-7). The legislation is applicable to urban water retail agencies that deliver more than 3,000 AF of water annually or have more than 3,000 customer connections—the same category of water retailers that must produce and update an urban water management plan (UWMP) every five years.

The legislation does not require a reduction in the *total volume* of water used in the urban sector, because factors such as changes in economics or population will affect water use. Rather, the legislation requires a reduction in *per-capita* water consumption. Water consumption is calculated in gallons per capita per day.

The Water Conservation Act required water suppliers to report, in their 2010 UWMPs, a 2020 daily per capita water use target that is 20% less than the supplier's baseline daily per capita water use, which could be derived using a few different methods per the legislation. Establishing an interim 2015 daily per capita water use target was also required.

The consequence for non-compliance with the Water Conservation Act is that the urban water supplier is not eligible for water grants or loans administered by the state.

An important consideration is the potential for orchard land conversions. If existing orchards are destroyed because of ACP infestations or because extended drought makes water too expensive, converting to other income-making land uses will likely be considered by landowners.

Future Agricultural Water Use

CMWD reported in their 2010 UWMP that they had not had any additional agricultural accounts in the last five years, and did not anticipate any additional agricultural accounts over the next 25 years (CMWD 2011).

> Agricultural is not expected to increase over the next twenty years. Agricultural expansion requires approval and purchase of additional allocation, which is cost prohibitive for most agricultural interests. CMWD has not had any new agricultural allocations purchased in the last several years.
>
> —*2010 Urban Water Management Plan, Casitas Municipal Water District* (CMWD 2011)

Groundwater supplies approximately half of agricultural water demand. The extent to which agricultural water demands may increase or decrease is unknown. Factors that could cause a significant change in agricultural water demand include extended drought, tree deaths from the lethal Asian Citrus Psyllid (ACP), changes to higher- or lower-water-using crop types, and changes to groundwater regulations.

An important consideration is the potential for orchard land conversions. If existing orchards are destroyed because of ACP infestations or because extended drought makes water too expensive, converting to other income-making land uses will likely be considered by landowners. Potential alternative land uses, such as different crop types, livestock operations, horse boarding, and housing, could significantly affect water demand in the watershed.

Future Environmental Water Use Projections

The extent to which environmental water demands may increase is unknown. Factors that could cause an increase in environmental water demands include new information becoming available that causes regulators to increase existing bypass flow requirements, future laws and regulations, and new water supply or infrastructure projects with a "federal nexus." Any project that requires a federal permit or involves federal funding has a federal nexus, and because water supply projects in the watershed could affect steelhead, this nexus triggers the requirement under Section 7 of the federal Endangered Species Act to consult the NMFS. NMFS would then outline the conditions under which the project could move forward, including operational measures such as bypass flows that must be implemented.

Factors that could cause an increase in environmental water demands include new information becoming available that causes regulators to increase existing bypass flow requirements, future laws and regulations, and new water supply or infrastructure projects with a "federal nexus."

Water quality regulations also have the potential to require the provision of environmental water. The Regional Water Quality Control Board's (RWQCB) water quality control plan, called the Basin Plan, is geared towards protecting the "beneficial uses" of waterbodies. Beneficial uses include not only the use of a water supply for people, but also the use of water for aquatic organisms and recreation. Reaches 3 and 4 of the Ventura River are on the Section 303(d) list of impaired waterbodies for pumping and water diversion because the lack of water in these reaches interferes with the migration of the endangered southern California steelhead. In other words, the lack of water in the river has been identified as a water quality impairment for steelhead. However, the RWQCB does not have the authority to regulate surface flow volumes (water diversions). Authority lies with the State Water Resources Control Board, where the issue may be addressed at some point in the future. Pumping of the Upper and Lower Ventura River Basins, which underlie Reaches 3 and 4, has not historically been regulated at either the state or local level. (However, in September of 2014, Governor Jerry Brown signed three groundwater bills that will create a groundwater management framework for the first time in California.) Still, the pumping and diversion impairments remain on the 303(d) list.

In addition, water rights regulators have the authority to require the provision of environmental water. Water rights regulations in California include a requirement to protect certain resources—such as fisheries and wildlife—that are held in trust for the public. The State Water Resources Control Board is charged with protecting these resources as part of their regulation of water rights.

Water rights regulations in California include a requirement to protect certain resources—such as fisheries and wildlife—that are held in trust for the public.

> One of the State Water Board's charges is to ensure that the State's waters are put to the best possible use, and that the public interest is served. In making decisions, the State Water Board must keep three major goals in mind, to: develop water resources in an orderly manner; prevent the waste and unreasonable use of water; and protect the environment. This is consistent with the California Constitution Article X Section 2.
>
> —*Water Rights: Public Trust Resources website* (SWRCB 2014c)

Climate Change

Climate change adds uncertainty to future water demand estimates. Climate change could influence where rain falls, produce altered runoff patterns, bring more extreme or extended floods and droughts, change water supply reliability, cause more fires, and result in increased water demands. Water supply and delivery infrastructure may have to be updated to address these issues.

3.4.3.3 Water Demand Management

A combination of policies, water rates, and conservation education and incentives are used to manage water demand in the watershed.

Policy

Local land use and air quality policies and the policies of CMWD have served to ensure that the rate of growth and associated new water demands are kept within resource constraints.

The allocation program prohibits new connections unless a new supply can be demonstrated or supply/demand trends indicate that the new connections do not compromise safe yield management.

Land Use and Air Quality Policies that Limit Growth

The most significant local land use and air quality policies that have served to limit water demand are listed below, and are described in more detail in "3.7.3 Land Use and Demographics."

- Ventura County Guidelines for Orderly Development (1969)
- Ventura County General Plan, Ojai Valley Area Plan (1979)
- Ventura County large-lot zoning
- Ventura County SOAR ordinance (1998)
- Ventura County's Ojai Valley Clean Air Ordinance (1982)
- City of Ventura SOAR ordinance (1995)
- City of Ojai's residential and commercial growth control policies (1979, 1991)

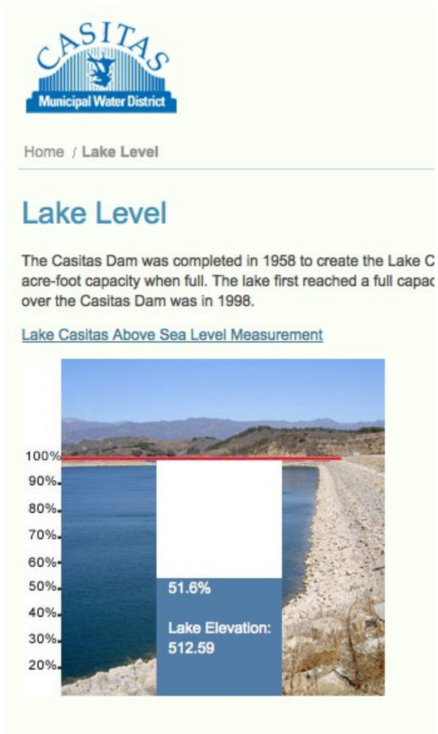
Casitas Municipal Water District Policies

CMWD is committed to limiting water deliveries to maintain the safe annual yield of Lake Casitas. ("3.4.2 Water Supplies" discusses the safe yield of the reservoir in more detail.) Described below are district policies that serve to implement the commitment to safe yield management.

Water Efficiency and Allocation Program

In 1989, in the middle of a drought, with lake levels at nearly 50%, and following years of development in the watershed, CMWD analyzed the reservoir's water reserves relative to demand and acknowledged that demand was approaching the safe annual yield of the lake. In response, the CMWD board instituted a temporary moratorium on providing new water service connections while staff worked to develop an equitable plan for distribution and management of supplies under the new conditions (CMWD 2004).

The board ultimately adopted a "Water Efficiency and Allocation Program" in 1992. Since then, this powerful policy, along with the pricing mechanisms described in the following section, have played an important role in limiting growth in the watershed, and have been the tools used by Casitas to manage the reservoir—unlike most other reservoirs in California—on a safe yield basis.



Lake Casitas Water Level Webpage

Source: www.casitaswater.org/lower.php?url=lake-level

The Water Efficiency and Allocation Program (WEAP) is a comprehensive policy, but key features include:

- All service connections were assigned an allocation of water, which was 80% of 1989 usage. The year 1989 was the year of greatest water demand at that time. Together, these allocations are within the annual safe yield of the lake. Residential, business, industrial, resale, and interdepartmental service connections were assigned individual allocations; agricultural service connections were combined into a single allocation for the entire group (CMWD 2004). The number of new customers between 2005 and 2010 averaged five per year, most being residential customers and some agricultural-residential customers (CMWD 2011).
- The allocation program prohibits new connections unless a new supply can be demonstrated or supply/demand trends indicate that the new connections do not compromise safe yield management. For example, CMWD activated a groundwater well in Mira Monte in 1992, with an average annual yield of 300 AF. With this new water source, Casitas was able to issue a limited number of new service connections between 1992 and 2003. Between 2004 and 2013, the number of Casitas customers in all categories dropped by 49 customers (CMWD 2013a).
- The allocation program outlines the district's response, in a five-stage process, to reduced water supplies. The different stages can be triggered by the reservoir's water levels, and each stage employs different pricing mechanisms and/or rationing levels to reduce demand. The first stage calls for a voluntary 20% reduction in water use, and CMWD has remained in this stage since the policy's adoption. The district has not yet needed to enact the rationing stages of the program.

In response to the drought of 2012–2014 (in effect as of this writing), and reservoir levels approaching their lowest levels since 1991, CMWD is considering changes to the WEAP to limit future demand (CMWD 2011).

Fees for New Allocations

New connections to CMWD are very expensive, and this has played a big role in limiting new water demand.

For every 1 AF per year of new water demand or allocation, a one-time fee of $18,644 is charged (plus the cost of the meter). The smallest allocation allowed is 0.32 AF, so the minimum charge for a new allocation is $5,966.08 (0.32 x $18,644). If a grower of citrus wanted a new allocation, the rate would be 2.0 (reflecting the per acre water demand) times $18,644 times the number of acres. So a new connection for a five-acre farm would be charged a one-time allocation fee of $186,440 (2.0 x $18,644 x 5). (This assumes Casitas has the water to allocate to agriculture, which at the time of this writing is limited.)

Water District Water Shortage Contingency Plans

CMWD, Ventura Water, and GSWC all have water shortage contingency plans. These plans establish the steps each supplier will take during the various stages of a water shortage. The action stages begin with education and requests for voluntary conservation, and as water supplies diminish further the successive stages move into mandatory cutbacks and progressively more stringent requirements and penalties. These plans are documented in the UWMPs of these water suppliers.

Water Rates

The watershed's five major water suppliers (CMWD, Ventura Water, Golden State Water Company, Ventura River Water District, Meiners Oaks Water District) use tiered rate structures, at least for their residential customers. Tiered rate structures use price signals to discourage the waste of water and encourage conservation. Customers pay a flat fee for a basic use allocation; rates increase as the customer's water use increases.

Proposition 218, passed by voters in 1996, changed the way public agencies (including special districts such as water districts) can finance operations and collect revenue. Proposition 218 contains "proportionality requirements" that prohibit public agencies from imposing any fee or charge "upon a parcel or upon a person as an incident of property ownership" that is more than "the proportional cost of the service attributable to the parcel." Proposition 218 requires a "significant nexus" between the cost of service and the price of water. Meanwhile, the California Water Code (Sections 370 to 374) encourage a tiered rate structure "as a means of increasing efficient uses of water, and further discouraging wasteful or unreasonable use of water." In an effort to resolve these conflicting stipulations, water districts subject to these requirements have become more deliberate with their water rate-setting process. Using rates to encourage behavior or support certain water users can only be taken so far; higher rates for one class of user cannot be used to subsidize other users. Proposition 218 has called into question water districts' ability to provide "lifeline" discounts to low-income households, or to provide lower rates for agricultural water users.

Proposition 218 also requires that any changes to property-related fees (such as water rates) go through a notification procedure that allows customers to submit protests. Proposed water rate changes can be rejected if a majority of affected customers submit formal protests (Donnelly & Christian-Smith 2013).

In the Ventura River watershed, agricultural customers buy considerably more water than urban customers; however, the residential sector has considerably more customers who are thus in the majority. In the late 2000s when water districts adjusted rates in an effort to comply with

Proposition 218, agricultural customers were at a disadvantage to protest water rate changes that affected them.

Conservation and Efficiency Programs

One of the most cost-effective options water suppliers have to improve water supply reliability is increasing water use efficiency. Every AF reduction in water demand has the same benefit as increasing supply by an AF, and efficiency measures are usually less costly to implement (CDWR 2013a).

Water District Programs

The watershed's three largest water suppliers, CMWD, Ventura Water, and GSWC, are all members of the California Urban Water Conservation Council (CUWCC) and signatory to a CUWCC Memorandum of Understanding (MOU). The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California, which oversees standards for urban water efficiency. These standards, known as "Best Management Practices" (BMPs), have been developed to provide proven, reliable, and often quantifiable water savings when rigorously implemented.

By becoming a signatory to CUWCC's MOU, water districts commit to implement a specific set of locally cost-effective conservation practices in their service areas. Assembly Bill 1420, which became effective in January of 2009, requires that issuance of state loans or grant funding be conditioned on implementation of the Demand Management Measures (DMMs) described in Water Code Section 10631. The California Department of Water Resources equates the DMMs with the CUWCC BMPs.

The UWMPs of CMWD, Ventura Water, and GSWC describe their current BMPs/DMMs.

Ventura River Watershed Council's SAVE MORE WATER website. The Watershed Council's SAVE MORE WATER website serves as a clearinghouse of information on saving water throughout the watershed. The site features many videos, lists of upcoming classes and events, and links to water-saving resources provided by local water suppliers and organizations—free equipment, rebates, free on-site irrigation surveys, and more. SAVE MORE WATER is aimed at motivating and informing residential, commercial, and agricultural water users to conserve.

CMWD Landscape Survey

Described below are some of the BMPs of these agencies that may be more visible to the public. These conservation programs are further described and illustrated in "2.3.4 Extreme Efficiency Campaign" and in "2.2 Existing Projects, Programs, and Recent Accomplishments."

The conservation and efficiency programs offered by CMWD are available to all water users within the Casitas wholesale service area (whether a direct customer of Casitas's or not). CMWD's current programs include:

- Distribution of free water saving devices, including showerheads, toilet flappers, kitchen and bathroom faucet aerators, and dye tables for testing toilets for leaks.
- Free, on-site, residential and commercial, indoor and outdoor water use surveys and leak detection.
- Hobby farm (1 to 2 acres) irrigation evaluations and equipment rebates, in partnership with the Resource Conservation District of Ventura County. As part of the program, a 50% cost share for water use efficiency equipment is offered.

- Rebates on residential and commercial high-efficiency toilets, washing machines, and weather-based irrigation controllers.
- Free educational classes on various ways to save water, such as landscaping with native plants or installing a graywater system.
- Classroom and field trip water education.
- Customer education through newsletters.
- Participation in local community events and speaks to local community groups.

Ventura Water Provides Water Education to Students
Photo courtesy of Ventura Water

Ventura Water's current programs include:

- Rebates on rain barrels.
- Promotion of Ocean-Friendly Gardens.
- School water education.
- Free educational classes and events.
- Educational videos on a variety of water saving topics, such as how to use rain barrels or how to check your water meter for leaks.
- Active use of their website and social media for outreach and education.
- Customer education through newsletters.
- Participation in local community events and speaks to local community groups.

In 2014, in response to the three-year drought, the City of Ventura established a Water Shortage Task Force to evaluate the City's existing Water Shortage Contingency Plan, identify conservation measures and incentives, and investigate drought water rates.

Other Programs

The Ojai Valley Green Coalition (OVGC) is an important voice for water conservation in the watershed. OVGC seeks out many opportunities to educate the public, including classes and member meetings, an annual Green Living Home Tour, displays at public venues, newsletter promotions, and distribution of free water saving equipment on behalf of CMWD. The OVGC has an extensive lending library with books, videos, and literature at its downtown Resource Center. The group is active in advancing policies to protect local resources.

The Ojai Valley Green Coalition Provides Many Public Education Programs

The Ventura County Building and Safety Division actively promotes graywater systems since the state of California eased regulations regarding "laundry to landscape" graywater systems, making this important water reuse option more available to many residents.

Agricultural Irrigation Evaluation, Ventura County Resource Conservation District

Photo courtesy of Ventura County Resource Conservation District

Surfrider Foundation of Ventura County actively promotes Ocean Friendly Gardens through education, hands-on activities, and policy change.

Free agricultural irrigation evaluations are provided by the Ventura County Resource Conservation District's (RCD) Mobile Irrigation Lab. This program provides on-site irrigation system analysis and technical assistance to improve water use efficiency. The RCD Mobile Irrigation Lab also includes a cost share program to help fund BMP implementation for irrigation systems of orchard, row crop, and nursery operations.

3.4.3.4 Key Data and Information Sources/ Further Reading

Below is a summary of some of key documents that address water demand and use in the watershed. See "4.3 References" for complete reference citations. Water suppliers and managers also maintain records of water use.

Biological Opinion for US Army Corps of Engineers Permitting of the City of Ventura's Foster Park Well Facility Repairs on the Ventura River, Draft (NMFS 2007)

2013 Comprehensive Water Resources Report, Ventura Water (RBF 2013)

2014 Comprehensive Water Resources Report, Ventura Water (RBF 2014)

Groundwater Budget and Approach to a Groundwater Management Plan Upper and Lower Ventura River Basin (DBS&A 2010)

Ojai Basin Groundwater Management Agency, Annual Report, 2011 & 2012 (OBGMA 2014)

San Antonio Creek Spreading Grounds Rehabilitation Project (Component 10) Component Report (VCWPD 2014c)

The Ventura River Project History (USBR 1995)

Urban Water Management Plan, Casitas Municipal Water District, 2010 (CMWD 2011)

Urban Water Management Plan, City of Ventura, 2010 (Kennedy/Jenks 2011b)

Urban Water Management Plan, Ojai, 2010 (Kennedy/Jenks 2011a)

Ventura River Habitat Conservation Plan, Draft (Entrix & URS 2004)

Water Supply and Use Status Report (CMWD 2004)

Gaps in Data/Information

As mentioned in "3.4.2 Water Supplies," lack of data on groundwater pumping is considered a significant data gap in the watershed, and a comprehensive water supply and demand budget is needed.

Acronyms

ACP—Asian Citrus Psyllid

AF—acre-feet

AF/yr—acre-feet per year

BMP—Best Management Practice

BO—Biological Opinion

cfs—cubic feet per second

CMWD—Casitas Municipal Water District

DMM—Demand Management Measure

CUWCC—California Urban Water Conservation Council

GPCD—gallons per capita per day

GSWC—Golden State Water Company

MOU—Memorandum of Understanding

NMFS—National Marine Fisheries Service

OVGC—Ojai Valley Green Coalition

UWMP—Urban Water Management Plan

CMWD—Casitas Municipal Water District

GSWC—Golden State Water Company

NMFS—National Marine Fisheries Service

RCD—Resource Conservation District

RWQCB—Regional Water Quality Control Board

SCAG—Southern California Association of Governments

UWMP—Urban Water Management Plan

VLAFCO—Ventura Local Agency Formation Commission

WEAP—Water Efficiency and Allocation Program

3.5 Water Quality

Water Quality Sampling, Ventura River
Just Above San Antonio Creek Confluence
Photo courtesy of Santa Barbara Channelkeeper

3.5 Water Quality

Section 303(d) of the Clean Water Act requires states to identify waters that do not meet water quality standards and to classify them by category. States must submit their lists to the USEPA for review and approval. These state-developed lists are known as Section 303(d) lists of impaired waterbodies.

Water quality in the Ventura River watershed is relatively good. The developed area of the watershed is very limited compared to the open-space areas. Residential, commercial, agricultural, and industrial land uses comprise only 13% of the land area (SCAG 2008); and approximately half of the watershed lies within the Los Padres National Forest. However, like most other watersheds where people live and work, the Ventura River watershed has water quality impairments that need to be addressed.

The description of water quality has been organized into four sections: surface water, groundwater, wastewater, and drinking water. While the regulations for water quality differ for each of these water types, the water quality issues are often highly interrelated.

These sections provide a review of water quality impairments, existing water quality studies, the regulatory framework, and ongoing monitoring programs. Many stakeholders, including public agencies, nonprofits, companies, and people who live, work, and recreate within the watershed, have been working on solutions to the watershed's water quality issues for many years. With sufficient funding of projects (see "2.4.2 Priority Projects and Programs"), many of the water quality objectives of the stakeholder group can be achieved.

3.5.1 Surface Water Quality

The surface water quality concerns that have been identified in the watershed are nutrient pollution (along with its associated problems of algal growth and low dissolved oxygen), risk of pathogens, trash, and excessive total dissolved solids. Lack of streamflow and barriers to fish migration are also considered water quality impairments in the watershed; these topics are briefly discussed in this section and are more thoroughly described in other sections (see "3.3 Hydrology" and "3.6 Ecosystems and Access to Nature").

3.5.1.1 Surface Water Quality Impairments

Algae, Nitrogen, Dissolved Oxygen, and Eutrophication

Ventura River Reaches 1 and 2 and the Ventura River estuary are on the Clean Water Act's Section 303(d) list of impaired waterbodies for algae.