

Estrella River Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estrella 17	Salinas/Estrella WPA 14	177,631 acres total with 138,784 acres within San Luis Obispo County	Salinas River – to Pacific Ocean (Monterey Bay National Marine Sanctuary)	Paso Robles	County of San Luis Obispo, Shandon (ptn) Whitley Gardens, Los Padres National Forest



Photo: Althouse and Meade



Description: The Estrella River watershed is located in the Northern part of the County east of the Salinas River. A portion of the watershed is located in Monterey County with a majority of the acreage located within SLO County. The Estrella and some of its tributaries carry perennial underground flows that form a tributary of the Salinas River. The Estrella River forms from the confluence of San Juan Creek and Cholame Creek near Shandon, in the foothills of the Coast Ranges. The confluence of the Salinas and Estrella Rivers occurs in Northern San Luis Obispo County, within the town of San Miguel. The highest elevation in the watershed is approximately 2,854 feet, and the lowest elevation is around 607 feet. Vineyards slightly predominate over oak woodlands and grassland communities. Tree species such as blue oak, and valley oak dominate the oak woodland, while western sycamore, Fremont’s cottonwood, and willows are found in the riparian woodlands along the Estrella River. Agriculture is the dominant use. The Estrella River Valley is generally used most intensively for agriculture because of better soils and water availability. Irrigated production has increased during the last 10 years, particularly in vineyards and alfalfa. Dry farming and grazing operations encompass the rest of the agricultural uses.

Existing Watershed Plans:

No existing plans to date

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Characteristics

Physical Setting	
Rainfall	Mean Annual: 14-24 in. (NRCS shapefile, 2010)
Air Temperature	Summer Range (August 1990-2012): 54°-94°F Winter Range (December 1990-2012): 34°-60°F (Paso Robles Airport, NOAA National Climatic Data Center, viewed 2013)
Geology Description	<p>Lower San Jacinto Creek, Lower Ranchito Canyon, Estrella, Upper and Lower Hog Canyon, Mile 9 to 11 Estrella River, Upper and Lower Keys Canyon, Freeman Canyon, Willow Springs Canyon, Sheep Camp Canyon, Indian Creek, Pine Canyon, Taylor Canyon, Upper and Lower Shimmin Canyon, Bud Canyon, Hopper Canyon, Wood Canyon, Shed Canyon and Upton Canyon are flat highly infiltrative Quaternary.</p> <p>Upper Ranchito Canyon which is moderate steep moderately infiltrative early to mid-Tertiary headwaters with flat highly infiltrative Quaternary inland.</p> <p>Quail Water Creek is steep moderately infiltrative early to mid-Tertiary headwaters with flat pre Quaternary moderately infiltrative valley (Bell, pers. comm., 2013).</p> <p>Groundwater is found in Holocene age alluvium and the Pleistocene age Paso Robles Formation. Specific yield values in the Paso Robles Sub-Basin range from 7 to 11 percent, with an average specific yield of 9 percent (Fugro West 2001c). DWR (1958) estimated the average specific yield for the sub-basin at 8 percent. DWR (1999) estimated the average specific yield at 15 percent for the alluvium and 9 percent for the Paso Robles Formation. Alluvium. Holocene age alluvium consists of unconsolidated, fine- to coarse-grained sand with pebbles and boulders. This alluvium provides limited amounts of groundwater and reaches 130 feet thick near the Salinas River, but is generally less than 30 feet thick in the minor stream valleys (DWR 1999). Its high permeability results in a well production capability that often exceeds 1,000 gpm (Fugro West 2001a). Groundwater in Holocene alluvium is mostly unconfined.</p> <p>Paso Robles Formation. Pleistocene age Paso Robles Formation, which is the most important source of groundwater in the sub-basin, is unconsolidated, poorly sorted, and consists of sand, silt, gravel, and clay (DWR 1979). This formation reaches a thickness of 2,000 feet and groundwater within it is generally confined (DWR 1958).</p>

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Hydrology	
Stream Gage	Yes; USGS 11148500 (Estrella River at Airport Road)(USGS, viewed August 2013)
Hydrology Models	Yes; SLO County Flood Control and Water Conservation District, 2008, Paso Robles Groundwater Sub-basin Water Banking Feasibility Study.
Peak Flow	Average annual peak flow (highest peak flow for each year) 3,746 cfs) (USGS, viewed August 2013)
Base Flow	1.66 cfs (USGS, viewed August 2013)
Flood Reports	No source identified
Flood Control Structures	Bridges: 5 over Ranchita Creek Road on Estrella Road and Ranchita Canyon Road (4); 3 over Estrella River on Estrella Road, River Grove Drive and West Center Road; 1 over Hog Canyon Creek over Hog Canyon Road; 1 over McMillian Canyon Creek over West Center Road (PWD Bridges GIS Layer)
Areas of Known Flood Risk	Shandon: flooding of properties on the side of and adjacent to Highway 41 near the community park in the center of town.
Biological Setting	
Vegetation Cover	<p>Primarily non-native annual grassland with cropland, blue oak-foothill pine consisting mainly of blue oak, chamise-redshank chaparral consisting mainly of chamise, coastal scrub consisting mainly of sagebrush and buckwheat, orchards, vineyards and nurseries. (SLO County vegetation shapefile, 1990) <i>Data limited by age of shapefile</i></p> <p>Wetlands, dry washes, and riparian woodlands in the Estrella watershed provide important wildlife habitat and ecosystem functions despite their small areal extent in the watershed (Althouse and Mead, 2013). <i>Data limited to observations, not complete inventory</i></p>
Invasive Species	<p>European starling, English sparrow, wild pig are in most watersheds in North County.</p> <p>Perennial pepperweed (<i>Lepidium latifolium</i>) known from San Miguel near Estrella River confluence, first reported County occurrence was in this region.</p> <p>The following species were identified in Cross Canyon subwatershed in 2009: Russian olive (<i>Eleagnus angustifolia</i>), Cardoon (<i>Cynara cardunculus</i>)</p> <p>The following species were identified in Estrella River (mile 9-11) subwatershed in 2008: Tree of heaven (<i>Ailanthus altissima</i>), Tamarisk (<i>Tamarix</i> sp.), Rush skeleton weed (<i>Chondrilla juncea</i>), Medusahead (<i>Elymus [=Taeniatherum] caput-medusae</i>) (Althouse and Mead, 2013). <i>Data limited to observations, not complete inventory</i></p>

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Special Status
Wildlife and
Plants

Key: FE - Federal endangered, FT - Federal threatened, SE - State endangered, ST - State threatened, SSC - State Species of Special Concern; FP- Fully Protected, SA – Special Animal, CRPR – CA rare plant rank (CNDDDB, viewed August, 2013)

Locations listed refer to USGS 7.5' quadrangle names. Only the portion overlapping the watershed boundary was considered. *Data limited to observations, not complete inventory.*

Special Status Species	Status	CAMATTA CANYON	CAMATTA RANCH	CHOLAME	CHOLAME HILLS	CHOLAME VALLEY	ESTRELLA	PARKFIELD	PASO ROBLES	RANCHITO CANYON	SHANDON	SHEDD CANYON	STOCKDALE MTN	WILSON CORNER
Animals														
<i>American badger</i>	SSC	x	x								x	x		x
<i>bank swallow</i>	ST			x							x			
<i>Nelson's antelope squirrel</i>	ST										x			
<i>pallid bat</i>	SSC				x			x		x			x	
<i>prairie falcon</i>	SA	x	x	x	x	x	x			x	x	x	x	x
<i>San Joaquin kit fox</i>	FE; ST		x				x				x	x		
<i>San Joaquin pocket mouse</i>	SA		x						x		x			x
<i>silvery legless lizard</i>	SSC													x
<i>Swainson's hawk</i>	ST				x		x				x	x		
<i>Tulare grasshopper mouse</i>	SSC			x							x			
<i>western pond turtle</i>	SSC										x			
<i>western spadefoot</i>	SSC						x							
Plants														
<i>delicate bluecup</i>	CRPR 1B.3													x
<i>Hardham's evening-primrose</i>	CRPR 1B.2		x											
<i>Jared's pepper-grass</i>	CRPR 1B.2						x		x					
<i>Kellogg's horkelia</i>	CRPR 1B.1								x					
<i>La Panza mariposa-lily</i>	CRPR 1B.3		x											x
<i>Lemmon's jewel-flower</i>	CRPR 1B.2								x					x
<i>oval-leaved snapdragon</i>	CRPR 4.2						x		x					
<i>round-leaved filaree</i>	CRPR 1B.1		x				x		x					

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<i>shining navarretia</i>	CRPR 1B.2								x					
<i>Temblor buckwheat</i>	CRPR 1B.2										x			
<i>yellow-flowered eriastrum</i>	CRPR 1B.2													x
Steelhead Streams	None (National Marine Fisheries Service, 2012).													
Stream Habitat Inventory	No source identified													
Fish Passage Barriers	None identified (PAD Database viewed 2013)													
Designated Critical Habitat	Yes; Vernal Pool Fairy Shrimp (USFWS Critical Habitat Portal, viewed 2013) (None listed in NMFS CFR-50)													
Habitat Conservation Plans	Yes; Shandon Community Plan Habitat Conservation Plan, North San Luis Obispo County Habitat Conservation Program													
Other Environmental Resources	<p>Estrella River, Paso Robles Groundwater Basin, San Andreas Fault Zone. (SLO County Flood Control and Water Conservation District, 2007)</p> <p>Tree species such as blue oak (<i>Quercus douglasii</i>) and valley oak (<i>Quercus lobata</i>) dominate the oak woodland, while western sycamore (<i>Platanus racemosa</i>), Fremont's cottonwood (<i>Populus fremontii</i>) and willows (<i>Salix spp.</i>) are found in the riparian woodlands along the Estrella River. Riparian woodlands have limited extent in interior San Luis Obispo County and provide important habitat and movement corridors for wildlife. Sycamore woodlands considered to be a rare vegetation type.</p> <p>Wetlands provide filtration, sediment removal, and nutrient removal. Rare reptiles such as silvery legless lizard and coast horned lizards can utilize dry wash habitat in the dry season. Dry washes are also important movement corridors for wildlife (Althouse and Meade, 2013).</p>													
Land Use														
Jurisdictions & Local Communities	County of San Luis Obispo, Shandon, Whitley Gardens													
% Urbanized	1.4% (City, Commercial Retail, Public Facility, Residential Suburban, Residential Single Family) (SLO County LUC)													
% Agricultural	93.1% (SLO County LUC)													

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% Other	2.2% Rural Lands; 2.1% Rural Residential; 1.2% Open Space (SLO County LUC)
Planning Areas	El-Pomar/Estrella, Shandon-Carrizo Planning Areas
Potential growth areas	Whitley Gardens, Shandon
Facilities Present	Green River Mutual Water Company (Whitley Gardens)
Commercial Uses	Agriculture
Demographics	
Population	3,527 in watershed (US Census Block, 2010)
Race and Ethnicity	<p>Watershed: 67.8% Caucasian; 27.2% Latino; 2.4% Mixed Race; Less than 1% each African American, American Indian, Asian, Pacific Islander (US Census Block, 2010)</p> <p>Shandon: 53.5% Latino; 41.1% Caucasian; 2.6% Black or African American; 0.9% American Indian and Alaska Native; 0.5% Asian; 0.2% Pacific Islander; 1.2% Mixed Race (US Census, 2010)</p> <p>Creston: 89.4% Caucasian; 6.4% Hispanic or Latino; 2.1% American Indian and Alaska Native; 1.1% Mixed Race; 1.1% Asian (US Census, 2010)</p>
Income	<p>MHI \$66,966 in watershed (US Census, 2011) (includes Cholame Creek, Lower San Juan Creek and Huer Huero Creek watersheds)</p> <p>MHI \$65,260 in Shandon (US Census, 2010)</p> <p>MHI \$85,357 in Creston (US Census, 2010)</p>
Disadvantaged Communities	<p>No; 4% of individuals are below poverty level in the watershed (US Census Tract, 2010) (includes Cholame Creek, Lower San Juan Creek and Huer Huero Creek watersheds)</p> <p>19.1% of individuals are below poverty level in Shandon (US Census, 2010)</p> <p>0% of individuals are below poverty level in Creston (US Census, 2010)</p>
Water Supply	
Water Management Entities	Green River Mutual Water Company (Whitley Gardens); County Service Area (CSA) No. 16 (Shandon); other properties served by individual wells
Groundwater	Yes; Paso Robles Basin
Surface Water	No public reservoirs.
Imported Water	CSA 16 holds an allocation for 100 acre-feet per year (AFY) of the State Water Project supply. In order to use this allocation, a turn-out on the State Water Project, which runs north-south along the eastern edge of San Juan Road, would have to be built. (SLO County, 2012)

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Recycled / Desalinated Water	None
Key groundwater percolation area(s)	No complete study identified - Creston Recharge Area Identified as possible key percolation area Natural recharge in the basin is derived from infiltration of precipitation, seepage from streams, and return flow from irrigation and other uses (SLOCFCWCD, 2008)
Water budget	Yes; Todd Engineers, 2013 for Paso Robles Groundwater Basin Update
Water Uses	
Beneficial Uses	<i>Estrella</i> - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Warm Freshwater habitat (WARM), Spawning, Reproduction, and/or Early Development (SPWN), and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
Other Unique Characteristics	
Shandon Vicinity Creek Area and Habitat Area	The riparian forest and a portion of the adjacent upland areas associated with the Estrella River and San Juan Creek in the vicinity of Shandon are important wildlife habitat, and serve as important corridors for wildlife movement. San Joaquin kit fox and Western burrowing owl occur in open grasslands. Another important wildlife movement corridor is located near the base of the hillside near the eastern edge of Shandon.
Climate Change Considerations	
	See IRWMP, 2014 Section H, Climate Change <i>Data is general to county, not Watershed specific</i>

Watershed Codes

Calwater/D WR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3317.000503	0	Undefined	0	Undefined	317.00	Shandon	Hopper Canyon (ptn – also in Cholame)
3317.000504	0	Undefined	0	Undefined	317.00	Shandon	Quail Water Creek
3317.000505	0	Undefined	0	Undefined	317.00	Shandon	Upton Canyon
3317.000506	0	Undefined	0	Undefined	317.00	Shandon	Shed Canyon
3317.000507	0	Undefined	0	Undefined	317.00	Shandon	Wood Canyon

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3317.000508	0	Undefined	0	Undefined	317.00	Shandon	Bud Canyon
3317.000601	0	Undefined	0	Undefined	317.00	Whitley Gardens	Taylor Canyon
3317.000602	0	Undefined	0	Undefined	317.00	Whitley Gardens	Lower Shimmin Canyon
3317.000603	0	Undefined	0	Undefined	317.00	Whitley Gardens	Pine Canyon
3317.000604	0	Undefined	0	Undefined	317.00	Whitley Gardens	Indian Creek
3317.000605	0	Undefined	0	Undefined	317.00	Whitley Gardens	Sheep Camp Canyon
3317.000606	0	Undefined	0	Undefined	317.00	Whitley Gardens	Freeman Canyon
3317.000607	0	Undefined	0	Undefined	317.00	Whitley Gardens	Willow Springs Canyon
3317.000608	0	Undefined	0	Undefined	317.00	Whitley Gardens	Upper Shimmin Canyon
3317.000701	0	Undefined	0	Undefined	317.00	Lower Estrella River	Lower San Jacinto Creek
3317.000703	0	Undefined	0	Undefined	317.00	Lower Estrella River	Upper Ranchito Canyon
3317.000704	0	Undefined	0	Undefined	317.00	Lower Estrella River	Lower Ranchito Canyon
3317.000705	0	Undefined	0	Undefined	317.00	Lower Estrella River	Upper Hog Canyon
3317.000706	0	Undefined	0	Undefined	317.00	Lower Estrella River	Estrella
3317.000707	0	Undefined	0	Undefined	317.00	Lower Estrella River	Lower Hog Canyon
3317.000708	0	Undefined	0	Undefined	317.00	Lower Estrella River	Mile 9 to 11 Estrella River
3317.000709	0	Undefined	0	Undefined	317.00	Lower Estrella River	Lower Keyes Canyon
3317.000711	0	Undefined	0	Undefined	317.00	Lower Estrella River	Upper Keyes Canyon

Major Changes in the Watershed

1857 – Paso de Robles Land Grant sold by Petronilo Rios to James H. Blackburn, Daniel Drew Blackburn, and Lazarus Godehaux for \$8,000.

1920s – State Route 46 built and improved along Estrella River. Was fully paved by 1930, and is a major crossing for the Coast Ranges, connecting the Central Coast near Cambria and US 101 with SR 99 in the San Joaquin Valley

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1942 – Construction of Estrella Army Airfield which was to be used as a Marine Corps Bomber Base begins. San Luis Obispo County gained control of the facilities in 1947, and began offering commercial air service in 1952. In 1973 the county sold the airport to the city of Paso Robles for \$1.00.

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Bud Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Estrella (Watershed)	Ephemeral	Not assessed	Undetermined	Not assessed
Freeman Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Hopper Canyon (ptn)	Undetermined	Not assessed	Undetermined	Not assessed
Indian Creek	Undetermined	Not assessed	Undetermined	Not assessed
Lower Hog Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Lower Keys Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Lower Ranchito Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Lower San Jacinto Creek	Undetermined	Not assessed	Undetermined	Not assessed
Lower Shimmin Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Estrella River (Mile 9 to 11)	Undetermined	Boron, Chloride, Fecal Coliform, Sodium, pH	Agriculture, Grazing-Related sources, Natural Sources,	Not assessed
Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Pine Canyon	Perennial	Not assessed	Undetermined	Not assessed
Quail Water Creek	Undetermined	Not assessed	Undetermined	Not assessed
Shed Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Sheep Camp Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Taylor Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Upper Hog Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Upper Keys Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Upper Ranchito Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Upper Shimmin Canyon	Undetermined	Not assessed	Undetermined	

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Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Paso Robles	97,700 AF (SLO County, 2012)	Physical limitations, water rights and water quality (Carollo, 2012)	Yes; see description below.	None (CCRWQCB, 2011)

Groundwater Quality Description: The predominant cations in the watershed are calcium and sodium and the predominant anion is bicarbonate (DWR 1981; Fugro West 2001b). Analysis of 48 public supply wells in the sub-basin show an average Total Dissolved Solid (TDS) content of 614 ppm and a range of 346 to 1,670 ppm.

In one study (Fugro West 2001b), 23 of 74 samples collected exceeded one or more of the drinking water standards. The Maximum Contaminant Level (MCL) for TDS was exceeded in 14 samples (Fugro West 2001b). The MCL for nitrate was exceeded in 4 samples. The Bradley portion of the sub-basin had the highest percentage of samples with constituents higher than the drinking water standards (Fugro West, 2001b) Trends show an increasing concentration of nitrate between the Salinas and Huer Huelo rivers south of San Miguel (Carollo, 2012)

Generally high concentrations of TDS, chlorides, sulfates, and boron were identified for the Cholame Valley Basin (Chipping, et al., 1993). Increasing chlorides in the deep, historically artesian aquifer northeast of Creston (Carollo, 2012)

Primary Issues

Issue	Potential Causes	Referenced from
Significant water level declines	Range of groundwater uses in close proximity, including agricultural irrigation, municipal supply wells, golf course irrigation, and a relatively dense aggregation of rural “ranchette”) users	Carollo, 2012
Groundwater Quality	High concentrations of TDS, chlorides, sulfates, and boron	Carollo, 2012
Estrella River 303(d) listed for boron, chloride, fecal coliform, sodium and pH	Agriculture, grazing-related, natural sources	Carollo, 2012

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According to multiple studies of this basin, annual basin pumping is now at or near the basin's perennial yield (Paso Robles Groundwater Management Plan, 2011). From 1997–2009, water levels declined on average of 2–6 feet per year, depending on the location. A Todd Engineering monitoring report (2007) indicated that the Basin was not approaching the safe yield level and some areas were experiencing significant declines in groundwater elevations. A later study completed in 2009 suggested groundwater pumping was approaching the safe yield level of the Basin. The 2010 Resource Capacity Study prepared by the San Luis Obispo County Planning Department stated that the Basin is now near or at perennial yield levels. The County Board of Supervisors certified a Level of Severity III for the Paso Robles Basin in October, 2012, due to declining water levels. In August 2013, the County Board of Supervisors adopted an urgency ordinance to limit new draws from the Paso Robles Groundwater basin.

The Paso Robles Groundwater Basin encompasses an area of approximately 790 square miles and is the primary, and in many places the only, source of water available to property owners throughout Northern San Luis Obispo County. The basin extends from the Garden Farms area south of Atascadero to San Ardo in Monterey County, and from the Highway 101 corridor east to Shandon. The basin supplies water for 29% of SLO County's population and an estimated 40% of the agricultural production of the County (Paso Robles Groundwater Basin Blue Ribbon Committee, 2013).

Paso Robles, Atascadero, and Templeton draw their water from the groundwater basin (primarily the Atascadero sub-basin), the underflow of the Salinas River and from the Nacimiento Pipeline Project. The remaining communities (Shandon, San Miguel, Creston, Bradley, Camp Roberts, Whitley Gardens, and Garden Farms) are entirely dependent on the groundwater basin for their water supply.

An established bi-annual well monitoring program overseen by the SLO County Flood Control and Water Conservation District reported these water declines in groundwater dependent communities (Through April, 2013):

- a. Shandon: Water levels have dropped approximately 17 feet from 2011 to 2013.
- b. Creston: Water levels have dropped approximately 25 feet from 2011 to 2013.
- c. Estrella: Water levels have dropped approximately 25 feet from 2011 to 2013.
- d. San Juan: Water levels have dropped approximately 5 feet from 2012 to 2013.

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Significant Studies in Progress:

None identified