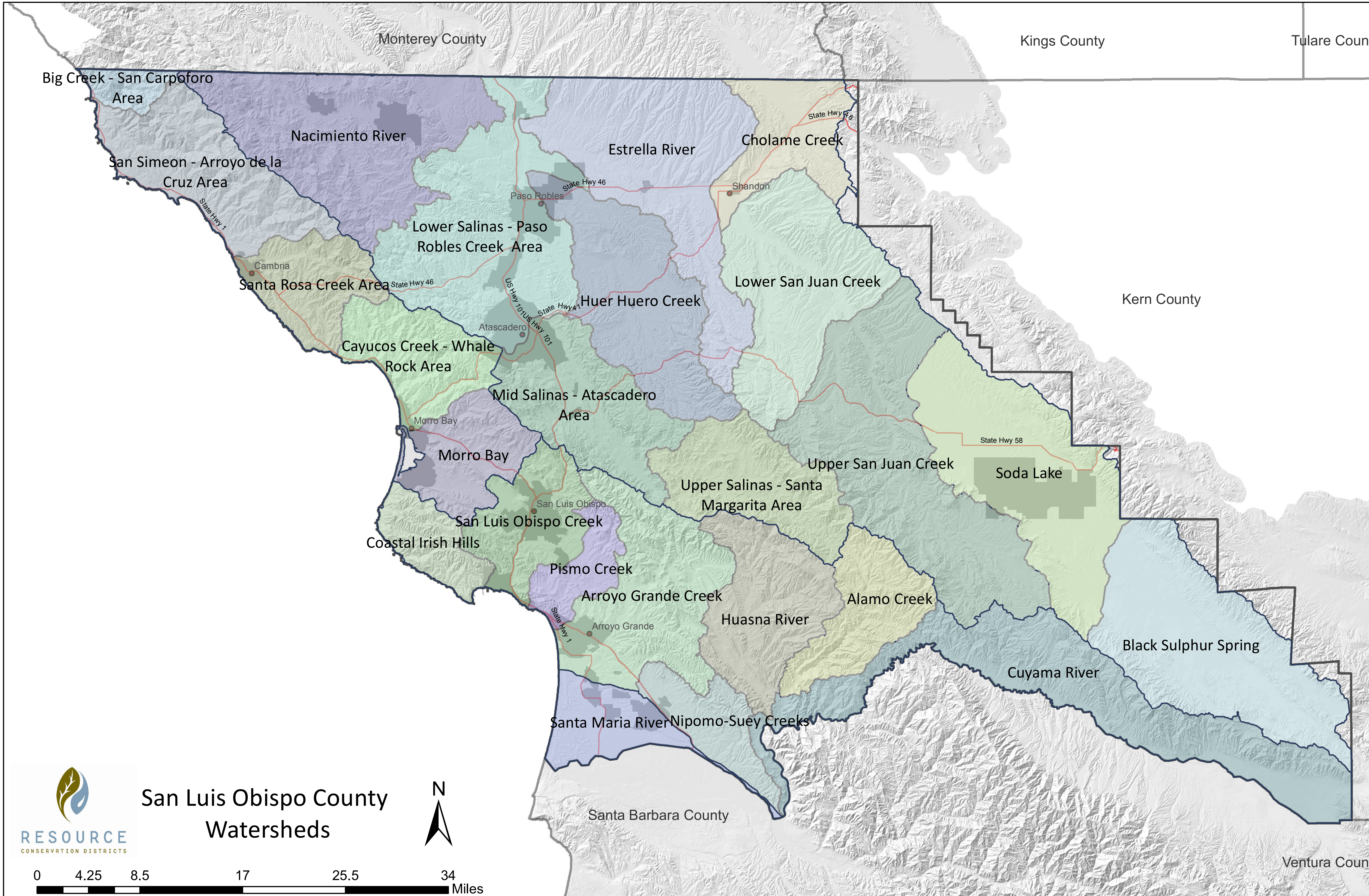
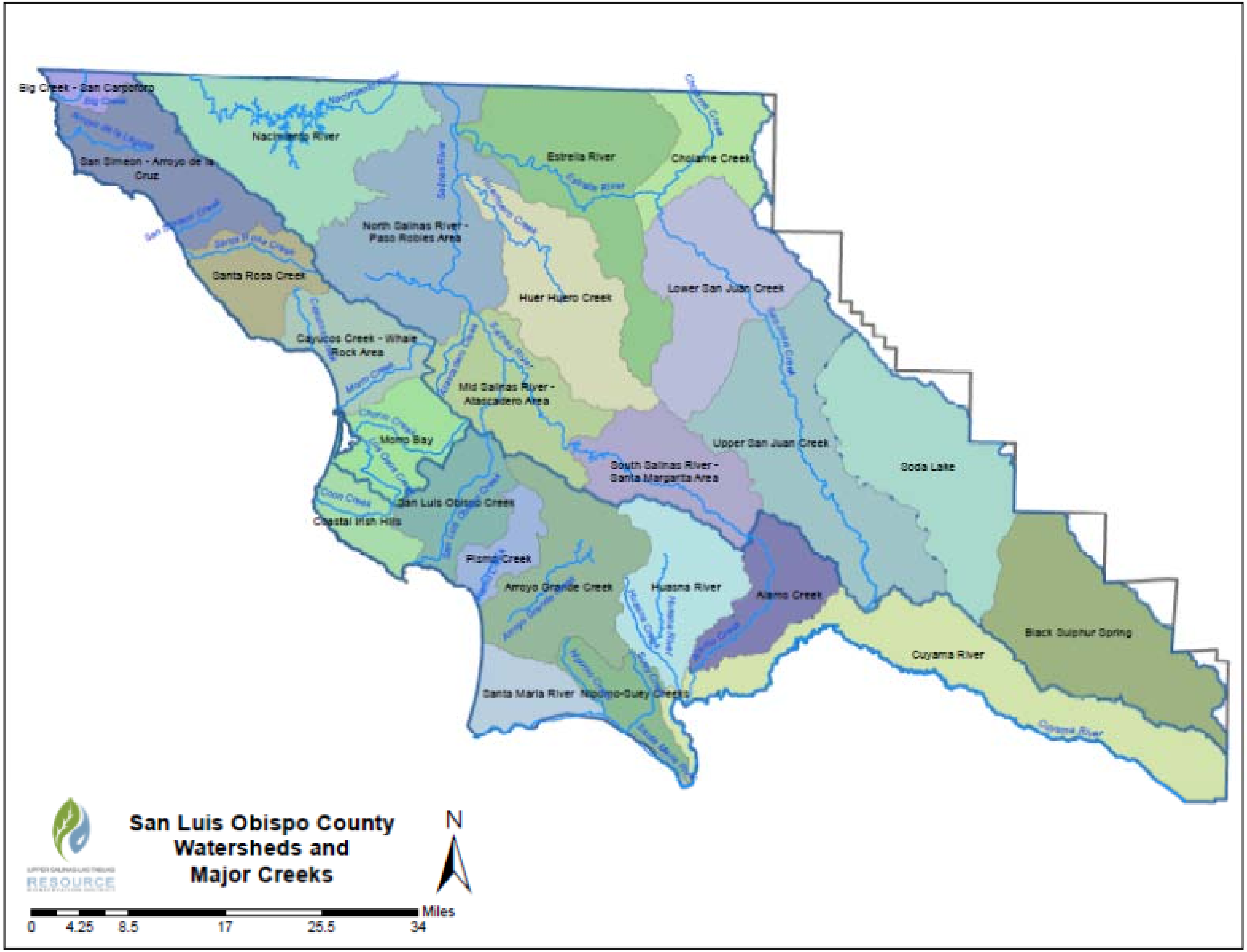
Appendix A

Map of County Watershed Areas


San Luis Obispo County Watersheds
RESOURCE
CONSERVATION DISTRICTS
Monterey County
Kings County
Tulare County
Kern County
Santa Barbara County
Ventura County
Big Creek - San Carpoforo Area
Nacimiento River
San Simeon - Arroyo de la Cruz Area
Estrella River
Cholame Creek
Lower Salinas - Paso Robles Creek Area
Santa Rosa Creek Area
Huer Huero Creek
Lower San Juan Creek
Cayucos Creek - Whale Rock Area
Mid Salinas - Atascadero Area
Morro Bay
Upper San Juan Creek
Soda Lake
Upper Salinas - Santa Margarita Area
San Luis Obispo Creek
Coastal Irish Hills
Pismo Creek
Arroyo Grande Creek
Huasna River
Alamo Creek
Black Sulphur Spring
Cuyama River
Santa Maria River
Nipomo-Suey Creeks
Paso Robles
Shandon
Cambria
Atascadero
Morro Bay
San Luis Obispo
Arroyo Grande
State Hwy 46
State Hwy 41
State Hwy 1
State Hwy 58
US Hwy 101
N
0
4.25
8.5
17
25.5
34
Miles



Big Creek - San Carpoforo
Nacimiento River
San Simeon - Arroyo de la Cruz
Estrella River
Cholame Creek
North Salinas River - Paso Robles Area
Santa Rosa Creek
Huer Huero Creek
Lower San Juan Creek
Cayucos Creek - Whale Rock Area
Mid Salinas River - Atascadero Area
Morro Bay
Upper San Juan Creek
South Salinas River - Santa Margarita Area
Soda Lake
San Luis Obispo Creek
Coastal Irish Hills
Pismo Creek
Arroyo Grande Creek
Huasna River
Alamo Creek
Black Sulphur Spring
Cuyama River
Santa Maria River
Nipomo-Suey Creeks
Salinas River
Estrella River
Cuyama River

San Luis Obispo County
Watersheds and
Major Creeks
RESOURCE
N
Miles
0
4.25
8.5
17
25.5
34

Appendix B

Outcomes of Public Participation

IRWM Countywide Master Watershed Planning Project, Phase 2 Development

Summary of Municipality Interviews

Total Respondents: 12

Question 1

Would you or someone from your organization participate in a working group to guide the WMP development?

No	4	33%
Yes	6	50%
Maybe	2	17%
Responses Tallied	12	100%

Question 2

How do you want to be updated on this WMP Process? Some respondent's asked to participate in more than one way.

Email	12	55%
Workshops	5	22.5%
Review of Draft Documents	5	22.5%
Responses Tallied	22	100%

Question 3

Do you currently use watershed management plans in your organization?

Yes	3	25%
No	9	75%
Not Sure	0	0%
Responses Tallied	12	100%

Question 4

How do you use WMPs in your organization?

I don't	7	58%
I don't understand how WMPs apply to our work	0	0%
I don't have time of staff support to cross reference WMPs in our work	1	8%

Other	4	34%
Responses Tallied	12	100%

Question 5

Have you or your organization ever participated in the creation of a collaborative WMP?

Yes	4	36%
No	6	55%
Not Sure	1	9%
Responses Tallied	11	100%

Question 6

How helpful have current WMPs been for you?

Very useful	1	8%
Medium Usefulness	1	8%
Not Useful	9	76%
Other	1	8%
Responses Tallied	12	100%

Question 7

What would you like to see used for Countywide watershed management planning approach and how? Some respondents selected multiple approach styles when answering this question.

Identification of management strategies by watershed for land use planning	8	25%
Process that streamlines implementation of conservation projects with permitting agencies	7	22%
Prioritization of conservation needs byy watershed and between county watersheds	7	22%
Communal/Collaborative GIS tools	6	19%
Mitigation banks or similar	4	12%
Others	0	0%
Responses Tallied	32	100%

Question 8

Do you have sufficient data with which to manage water conservation locally?

Yes	5	42%
No	4	33%
Unsure	3	25%
Responses Tallied	12	100%

Question 9

Which data sources do you most commonly rely upon in making your conservation management decisions? Some respondent's selected multiple sources when answering this question.

WMPs	3	13%
County Flood Reports	5	23%
Growth management plans	3	13%
Transportation reports	1	5%
Predesignated conservation plans created from agencies outside this region	2	10%
Other	8	36%
Responses Tallied	22	100%

Question 10

Do you use GIS mapping and/or layering in your (conservation) planning work?

Yes	7	58%
No	3	25%
Sometimes	2	17%
Don't Know	0	0%
Responses Tallied	12	100%

Question 11

What is your interest level in utilizing a conservation focused GIS system in collaboration with other regional Cities, Utilities, CSD's, County and Conservation Organizations?

Very interested	7	58%
Medium Interest	3	25%
Low interest	2	17%
Responses Tallied	12	100%

Other Comments Captured:

- Sees some stormwater and water supply connections
- Avila gets all current water from AG Watershed and not locally & has consultant as manager. No sure of water supply connection
- greatly understaffed but see stormwater connection
- One respondent had these comments:
    - 1. Would be interested to look over draft documents periodically. 2. priority is providing water & wastewater services to community - don't initiate new projects or installations often. 3. Watershed

management plans are not relevent to their authority (non-regulatory) 4. Do not have good internal database (not enough on microclimates & irrigation) 5. WMP could be useful in project planning & impacts associated with them, (need a "how to use" guide)

- One respondent had these comments:
  Concerned about regulatory element of watershed management plans. Must be understanding of City autonomity. Provide solutions and suggestions for proactive measures but not policy change focused. Have to get City Council buy-in to move forward. Focus on flexibility of project application with regulatory agencies.
- One respondent had these comments:
  - A watershed plan that is non-regulatory, focused on uniqueness of watershed areas for flexibility of project application with regulatory agencies would be most ideal.
- One respondent had these comments:
  Would peer review plans, Have an EIR they use related to Fiscalini Ranch which includes their portion of Santa Rosa Creek management, use plans only when related to areas they manage, most plans are outside their management area, they have a water conservation specialist to manage a retrofit program, have new demand reports and seasonal use data which is adaptive from historical water use
- One respondent had these comments:
  Future full time stormwater manager would be an ideal participant to be involved in future planning, do not use plans because they don't have one AND current IRWM plan doesn't have adequate or relevant info, participated in creating the Carmel River Watershed plan, would like to see more watershed data on groundwater recharge areas, use GIS frequently

Questionnaire to Help Guide Watershed Issue Prioritization for Phase 2: Survey Results

Water Resource Advisory Committee Meeting- December 4, 2013

Total Attendees: Roughly 50

Survey Participants: 15, representing roughly 30% of total attendees

Question 1

Which of the following grouping classifications could lead to improvements on local watershed management and or stewardship?

	Number of votes per category	Percentage of total votes per category
Group watersheds by improve, mitigate/prevent and maintain	3	20.1%
Group watersheds by Develop, Restore and Protect	4	26.3%
Group Watersheds By: (survey respondents choice)	4	26.3%
Do not classify watersheds	4	26.3%
Total Respondent's	15	100%

Comments: Group watersheds by dammed versus undammed; Group watersheds by Assess/Mitigate and Prevent/Implement; Group watersheds by Geographic Region

Question 2

In considering the prioritization of projects and programs aimed at accomplishing natural resource management goals, which of the following would represent the most effective solution?

County-wide approach which measures all watersheds against a common metric	3	20%
Sub-region approach which measures sub-regions against metrics specific to the region	11	73%
Other method?	1	7%
Total Respondent's	15	100%

Comments: Specific local issues should control prioritization

Question 2b

If you selected a regional based approach for Question #2, at what scale would you define those regions?

By water planning area	10	84%
Coastal vs Inland	1	8%
Other	1	8%
Total Respondent's	12	100%

Question 3

Should a flexible, decision making tool (e.g. Interactive GIS database) that allows municipal planners to explore different development scenarios or options in relation to natural resources:

Be created in addition to classifying watersheds and management strategies and be a high priority for phase2	6	40%
Be created in addition to classifying watersheds and management strategies and be a low priority for phase 2	3	20%
Be created instead of classifying watersheds and be a high priority	3	20%
Be created instead of classifying watersheds and be a low priority	0	0%
Should not be created	3	20%
Total Respondent's	15	100%

Comments: Should not be created for this use because planners would be inclined to not use their head/judgment for decision making

Question 4

If a watershed classification approach was used, who do you envision to be the primary audience? (circle all that apply) (Respondents selected multiple answers to this question)

County	12	18%
Other Municipalities	11	16%
Resource Conservation Districts	13	19%
Other conservation organizations	10	15%
Growers, ranchers, other land managers	9	13%
Community at Large	9	13%
Other	4	6%
Total Respondent's	68	100%

Comments: Other- Industry, RWQCB, Purveyors

Question 5

Which of the county watersheds do you consider to need greater focus and studying?

Comments: Arroyo Grande Creek, Santa Margarita, Jack Creek, Santa Rita Creek, Nipomo-Suey Creek, Pismo Creek, those with flood problems, those with recharge opportunities.

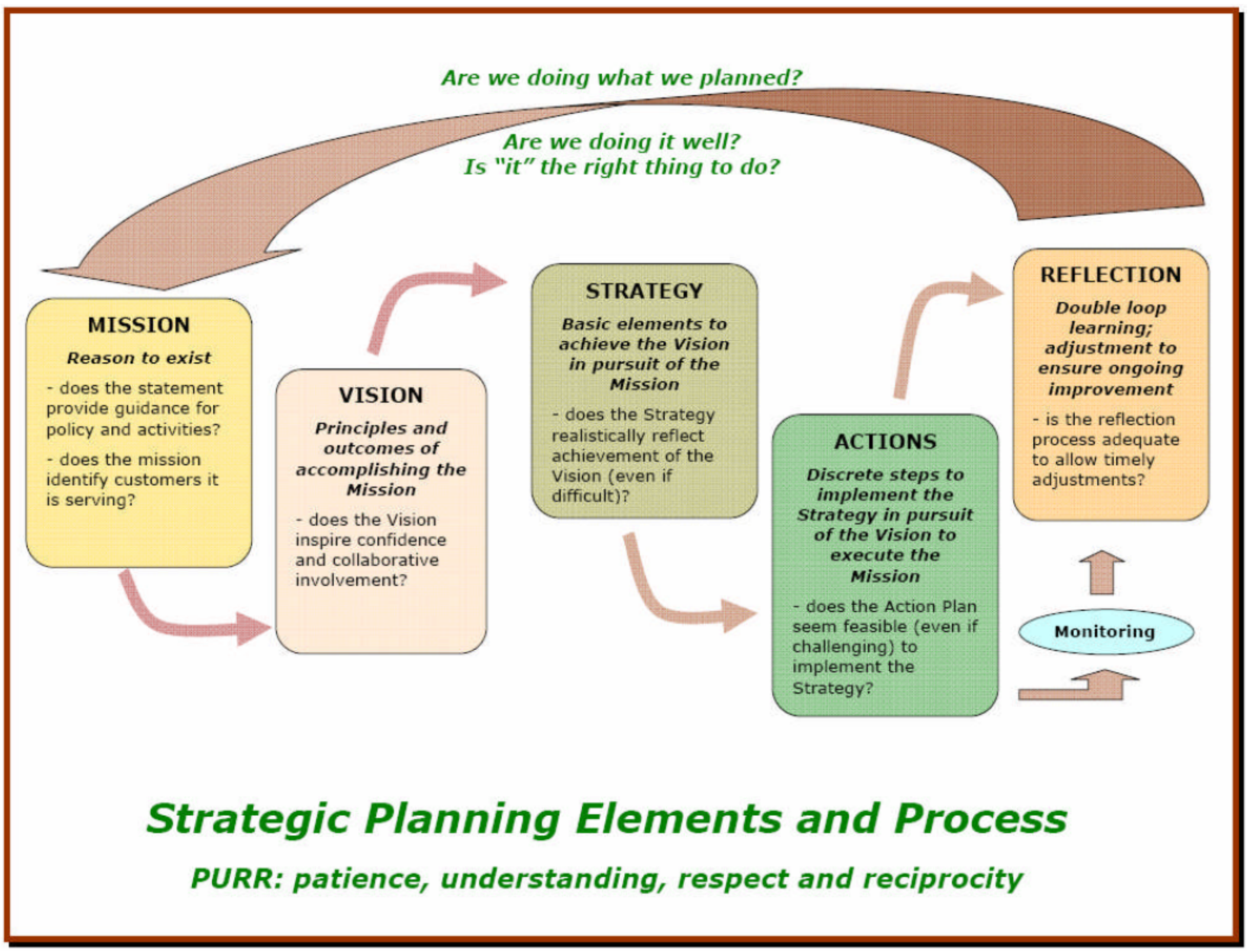
Draft Strategic Plan Outline

for the SLO County Watershed Management Plan

version March 25, 2014

This document summarizes the thoughts of the Watershed Working Group, Technical Advisory Committee and RCD Project Team related to the Countywide Watershed Management Plan process. As part of an iterative, living document, statements are not set in stone but instead act as a blueprint to guide community action.

Strategic Process



Draft Vision (Long term Goal)

SLO county watersheds are managed for present and future generations. The county's first watershed management plan engages the community to steward our watershed resources through collaboration and partnership.

Draft Goals (Mission)

These were developed by the RCD Project Team.

1. Collaboratively develop a countywide plan that prioritizes conservation efforts
2. Increase knowledge and value of ecosystem services and watersheds in community
3. Strengthen competitiveness of watershed restoration projects when competing at the County level for IRWM and other funds.

Draft Goals and Objectives

These were developed by the RCD Project Team.

1) Collaboratively develop a countywide plan that prioritizes conservation efforts
   a) Tap into the community to collect and share data
   b) Develop indicators and metrics to describe condition of watersheds
   c) [Add suggestion]
   d) [Add suggestion]

2) Increase knowledge and value of ecosystem services and watersheds in community
   a) Use SLOWatershedProjects.org to share data
   b) [Add suggestion]
   c) [Add suggestion]

3) Strengthen competitiveness of watershed restoration projects when competing at the County level for IRWM and other funds.
   a) Use indicators to better illustrate need
   b) [Add suggestion]
   c) [Add suggestion]

Interests

These were extracted and interpreted from existing individual watershed management plans. Consider if these can be summarized as vibrant healthy communities, viable economies and functioning ecology.

- experience in nature
- visual appeal of creek
- channel capacity to minimize flooding
- safety
- reduced risk to home and health
- economic viability (defer loss)
- protect wildlife T&E
- healthy fisheries
- protect ecological functions for benefit of all
- community viability/health
- drinking water source
- water for economic production
- improved information for decision making
- regulatory burden

Additionally the Technical Advisory Committee identified the following needs and drivers specific to the County scale.

- IRWMP requirements like depreciation are not always applicable to conservation projects. Need an improved process to evaluate conservation project benefits.
- A way to communicate conservation ideas to the community i.e. risk, TMDLs. This could be a one-stop shop for information
- prioritizing watersheds and project issues
- illustrate/develop partnerships
- succinct, communication of needs and priorities

Some of these may fit an interest to complete good watershed restoration projects and describe County needs and priorities to funders.

Desired Future State

These were provided by the Watershed Working Group and Project Team during a Road Map Activity in September 2013.

- Effective, long range watershed planning
- Balanced use by all stakeholders
- Placing a value on ecosystem services
- Comprehensive steelhead restoration countywide
- Resilient communities & ecological functions in the face of drought, flood, sea level rise and other hazards

- Strengthen competitiveness of watershed restoration projects when competing at the County level for IRWMP and other funds.

Preferred Approach to Countywide WMP

These were provided by the Technical Advisory Committee during an activity in June 2013.

- Set stage for meeting long term goals
- Evaluate biochemical cycles in terms of risk/land use similar to Birch Bay, WA study
- Consider making recommendations, not County approved
- Succinct
- Living document
- Metrics

Existing Resources

These were provided by the Watershed Working Group and Project Team during a Road Map Activity in September 2013.

- Local expertise i.e. conservation orgs, municipalities, consultants, etc.
- Stakeholder involvement to guide activities
- Online databases, portals, etc.
- SLO County Permit Coordination Program
- Watershed Management Plans
- SLOWatershedsProject.org
- Creek Stewardship Guide and a multitude of other resource guides

Other existing resources

- Cal Poly professors and students
- Volunteer networks i.e. Rotary Club, Morro Bay National Estuary Program, Earth Day Alliance, Surfriders, Outside Now, Pacific Wildlife Care, Master Gardeners, and more.
- Private donors, crowd-sourcing, foundations, grants.

Communication Map

- Still to come

Themes to incorporate into future funding requests

- Community resilience to climate risk and natural hazards
- Multiple partnerships that leverage funds
- Vulnerable or disadvantaged communities
- Measurable results
- Stakeholder involvement

Appendix C

Watershed Snapshots By Sub-Region

Appendix C.1 North Coast Sub-region Watersheds

1. **Big Creek-San Carpoforo Creek Watersheds**
2. **San Simeon-Arroyo de La Cruz Area Watersheds**
3. **Santa Rosa Creek Area Watershed**
4. **Cayucos Creek-Whale Rock Area Watersheds**
5. **Morro Bay Watershed**

Big Creek – San Carpoforo Creek Area Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay 10	Cambria WPA 2	264,552 acres total 13,046 acres (within San Luis Obispo County)	Pacific Ocean at Monterey Bay National Marine Estuary	San Carpoforo Valley	County of San Luis Obispo

Description:

The Big Creek Watershed straddles San Luis Obispo County and Monterey County with 13,046 acres out of 264,552 total acres within SLO County. This snapshot represents data related to those sub-watersheds located within the CalWater HUC 10 watershed grouping in San Luis Obispo County. The watershed lies along the Pacific Ocean with the southernmost outfall at Ragged Point, north of San Simeon. The most notable waterway within the San Luis Obispo portion of the Big Creek watershed is San Carpoforo Creek, which has its headwaters in the Los Padres National Forest at the Santa Lucia Range. Pacific Ocean outfall of San Carpoforo Creek is designated as State Marine Conservation Area and State Marine Reserve within the Monterey Bay National Marine Sanctuary. Peak elevation for the watershed is approximately 2,610 feet high with the low being roughly 16 feet above sea level with ocean outfall in Monterey County. The dominant land use is Los Padres National Forest and rangeland agriculture, with a majority of rangeland concentrated in the area of Hearst Ranch. A rugged shoreline and mountainous eastern ridge characterize the northern portion of the watershed. The creek was the route of the historic Portola Expedition and was identified as an area of high ecological significance by the Forest Service.

Watershed Plans:

No existing plans to date

Big Creek – San Carpoforo Creek Area Watershed

Characteristics

	Physical Setting	
	Rainfall	Average Annual: 19 in. (coast) - 36 in. (mountains) (NRCS Shapefile, 2010)
	Air Temperature	Summer Range (August 2001-2012): 50°-77°F Winter Range (December 2001-2012): 44°-62°F (Big Sur, ncdc.noaa.gov)
	Geology Description	Steep Franciscan non-infiltrative headwaters – Category #6 (Bell, pers. comm., 2013). Mountains of the rugged Big Creek Watershed coastline notably rise to 5,000 foot summits within two miles of ocean in Monterey County, the most abrupt elevation change of the entire Pacific shore. Several hundred million years ago, river-borne sediments from a mountain range in what is now Mexico were deposited along the west coast. Layers of sandstone, siltstone and limestone were compressed and folded by the underriding of tectonic plates at the continent's edge. The sediments metamorphosed with pressure into schist, gneiss, granofels and marbles of the Franciscan Formation, now the oldest rocks in the Santa Lucia Range. By 65 million years ago this plate, called the Salinan Block, began to drift northward by plate tectonic movement. The block's progress was halted by Pacific Ocean crust and started a process of faulting and uplifting which continues today. Seismic activity is frequent along lateral faults that result in canyons running parallel to the coast instead of directly into it. Highest peaks are granitic rock, which are more resistant to erosion. Taller peaks may also be marble (metamorphosed limestone). Original sediments of sandstone and siltstone have been tilted up into cliffs in some areas (Chipping, 1987). The San Carpoforo Valley Groundwater Basin underlies San Carpoforo Valley in northwestern San Luis Obispo County. The basin is bounded on the west by the Pacific Ocean and on all other sides, by impermeable rocks of the Jurassic to Cretaceous age Franciscan Group (Ca Dept of Water Resources, 2003).
	Hydrology	
	Stream Gage	Yes; USGS 11142550, last recorded in 1978. (San Carpoforo Creek near Hwy 1)
	Hydrology Models	No source identified
	Peak Flow	14,200 cfs, 1978 (USGS, viewed August 2013)

Big Creek – San Carpoforo Creek Area Watershed

Base Flow	148.6 cfs, 1978 (USGS, viewed August 2013)
Flood Reports	No source identified
Flood Control Structures	No data available
Areas of Heightened Flood Risk	No data available
Biological Setting	
Vegetation Cover	Primarily coast live oak woodland, and mixed evergreen forest consisting of continuous coast live oak and California bay with some coastal redwood. Some coastal scrub, buckbrush chaparral, serpentine chaparral, and chamise chaparral, non-native annual grassland, intermittent ponderosa pine, and valley foothill riparian consisting of continuous coast live oak are present. (SLO County vegetation shapefile, 1990) Coastal redwood has limited distribution in San Luis Obispo County and is primarily found along the North Coast. *Data limited by age of shapefile available*
Invasive Species	No data available
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 (CNDDB, 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*

Species	Status	BURNETT PEAK	BURRO MOUNTAIN	PIEDRAS BLANCAS	SAN SIMEON
Animals					
black swift	SSC		x		
foothill yellow-legged frog	SSC		x		
monarch butterfly	SA	x	x	x	x
prairie falcon	SA Nesting	x	x	x	x
Smith's blue butterfly	FE		x		
steelhead - south/central California coast DPS	FT		x		
western pond turtle	SSC		x		
Plants					
Brewer's spineflower	CRPR 1B.3		x		

Big Creek – San Carpoforo Creek Area Watershed

Species	Status	BURNETT PEAK	BURRO MOUNTAIN	PIEDRAS BLANCAS	SAN SIMEON
bristlecone fir	CRPR 1B.3	x	x		
Cone Peak bedstraw	CRPR 1B.3		x		
Cook's triteleia	CRPR 1B.3		x		
Hardham's bedstraw	CRPR 1B.3	x	x		
late-flowered mariposa-lily	CRPR 1B.2	x	x		
most beautiful jewel-flower	CRPR 1B.2		x		
Palmer's monardella	CRPR 1B.2		x		
San Luis Obispo sedge	CRPR 1B.2	x	x	x	x
Santa Lucia bedstraw	CRPR 1B.3		x		

Steelhead Streams	Yes; San Carpoforo Creek (Becker et. al, 2010) The California Department of Fish and Game considers the San Carpoforo Creek to be one of two of the most important spawning streams for threatened steelhead in San Luis Obispo County (Ventana Wilderness Alliance, 2007).
Stream Habitat Inventory	Yes; Department of Fish and Game, 1995 *Data limited by age of last inventory*
Fish Passage Barriers	None identified
Designated Critical Habitat	Yes; Steelhead Trout (USFWS Critical Habitat Mapper, viewed 2013)
Habitat Conservation Plans	None identified
Other Environmental Resources	San Luis Obispo Coastal Zone, Monterey Bay National Marine Sanctuary, Hearst Ranch Conservation Project (SLO County Flood Control and Water Conservation District, 2007)
Land Use	
Jurisdictions & Local Communities	County of San Luis Obispo
% Urbanized	0% (SLO County LUC)
% Agricultural	82% - 17.3 sq mi: rangeland (SLO County LUC)
% Other	1% recreation; 17% rural residential (SLO County LUC)
Planning Areas	North Coast Planning Area (SLO County)
Potential growth areas	None identified

Big Creek – San Carpoforo Creek Area Watershed

	Facilities Present	Hearst Ranch
	Commercial Uses	Ragged Point Inn and Resort, tourism, agriculture (livestock grazing)
	Demographics	
	Population	13 (US Census Block, 2010)
	Race and Ethnicity	Caucasian, representing 100%. (US Census Block, 2010)
	Income	MHI $51,557 (includes rural lands of coastal communities from northern SLO boundary to Morro Bay) (US Census Tracts, 2010)
	Disadvantaged Communities	No; 0% individuals below poverty (US Census Tracts, 2010)
	Water Supply	
	Water Management Entities	None identified for the portion of the watershed located within San Luis Obispo County – existing uses served by Individual wells
	Groundwater	Yes; Alluvial, San Carpoforo Valley Basin San Carpoforo Valley
	Surface Water	No public reservoirs in the watershed. Identified as fully appropriated stream system for entire year according to the SWRCB's Water Code 1205-1207.
	Imported Water	None
	Recycled/Desalinated Water	None
	Key groundwater percolation area(s)	No data on key areas identified Recharge to the basin is largely by percolation of stream flow and to a lesser extent from infiltration of precipitation and excess irrigation flow *(*Ca Dept. of Water Resources, 2003).
	Water budget	None to date
	Water Uses	
	Beneficial Uses	*San Carpoforo Creek* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM). *Chris Flood Creek* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Groundwater Recharge (GRW), Water Contact

Big Creek – San Carpoforo Creek Area Watershed

		Recreation(REC-1), Noncontact Water Recreation(REC-2), Wildlife Habitat(WILD), Cold Freshwater Habitat(COLD), Warm Freshwater Habitat (WARM), and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
	Other Unique Characteristics	
	Monterey Bay National Sanctuary	Flows south out of the Santa Lucia Range in the northern Los Padres National Forest, onto lands owned by the Hearst Corporation and then to the Pacific Ocean. Pacific Ocean outfall designated as State Marine Conservation Area and State Marine Reserve within the Monterey Bay National Marine Sanctuary. Supports one of the few remaining populations of sensitive foothill yellow legged frogs on the Central Coast, as well as endangered California red-legged frogs.
	San Luis Obispo Coastal Zone	Spanning 118 miles of coastline with numerous wide sandy beaches, sheltered bays, and vista points offering scenic views of the Pacific Ocean. The coastal zone of San Luis Obispo County is known throughout the state for its beauty and diversity. The north coast is characterized by the rugged headlands to Big Sur. The rocky shoreline along the Hearst Ranch is highly valued for offshore views of marine mammals as well as scenic cliffs and rocky points.
	Hearst Ranch	Hearst Ranch encompasses an impressive variety of habitats and topography - elevations on the Ranch rise from sea level along the coastline to 3,600 feet on some of the peaks along the ridgeline of the Santa Lucia Mountains. Grassland-covered coastal terraces extend to natural sea bluffs, rocky headlands and sandy beaches. Over 1,400 acres of riparian woodland is present on the property. Riparian woodland species include Sycamore and Coast live oak.
	Climate Change Considerations	
		See IRWMP, 2014 Section H, Climate Change *Data general to North County, not watershed specific*

Watershed Codes

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic sub-area name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.110101	1	Cambria	1	San Carpoforo	310.11	Jones Mtn.	Chris Flood Creek
3310.110102	1	Cambria	1	San Carpoforo	310.11	Jones Mtn.	Upper San Carpoforo Creek

Big Creek – San Carpoforo Creek Area Watershed

3310.110201	1	Cambria	1	San Carpoforo	310.11	Breaker Point	Lower San Carpoforo Creek
3310.110203	1	Cambria	1	San Carpoforo	310.11	Breaker Point	Mount Mars
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- Native American use of the Big Creek watershed goes back at least 6,500 years. Shell middens along the creek can be as much as 14 feet deep, indicating a long history of use. In addition, the remains of historic homestead sites still exist, like those of Gamboa and Boronda (Ventana Wilderness Alliance, 2007)
- San Carpoforo Creek was the route of the historic Portola Expedition of 1769, which led to the establishment of the California Missions and ultimately the European colonization of northern California. According to journal entries by Portola members, contact between Portola and native people took place on the banks of the San Carpoforo and therefore, the area is considered to be one of the last primal remnants of the original encounter between indigenous and European consciousness anywhere on the Pacific coast. In addition, a venerable grove of olive trees near the confluence of San Carpoforo and Dutra Creeks marks the location where an outpost of the Mission San Antonio de Padua once stood (Ventana Wilderness Alliance, 2007)
- In 1937, Highway 1 between Carmel and San Luis Obispo was completed, providing a coastal ink between the Central Coast and Northern California. (Monterey County Historical Society, 2013)

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Chris Flood Creek	Undetermined	Not assessed	Undetermined	Not assessed
Lower San Carpoforo Creek	Undetermined	Not assessed	Undetermined	Spring: 2.0 cfs Summer: 0.62 cfs
Mount Mars Creek	Undetermined	Not assessed	Undetermined	Not assessed
Upper San Carpoforo Creek	Undetermined	Not assessed	Undetermined	Not assessed

Watershed Health by Major Groundwater Basin

Big Creek – San Carpoforo Creek Area Watershed

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
San Carpoforo Valley	No data available	physical limitations and potential water quality issues (Carollo, 2012)	No	None (CCRWQCB, 2011)

* No new data available since 1975

Groundwater Quality Description: Groundwater is found in Holocene and late Pleistocene age alluvium. Issues affecting the basin include seawater intrusion and limited basin yield. Recharge to the basin is largely by percolation of stream flow and to a lesser extent from infiltration of precipitation and excess irrigation flow (DWR 1958). The estimated total groundwater storage capacity is 1,800 AF (DWR 1975).

No information is available describing water quality in the basin (Carollo, 2012).

Primary Issues

Issue	*Potential Causes*	*Referenced from*
Seawater intrusion into GW basin	Reduced groundwater quantity	Carollo, 2012
Limited GW basin yield		Carollo, 2012
Outdated Groundwater Basin data		Carollo, 2012

The northern part of the San Luis Obispo Coastline and the southern part of the Monterey coastline remains one of the few minimally disturbed watersheds within our study area. However, impacts due to climate change continue to affect all areas of the County and, in combination with periods of drought, coastal creeks continue to see diminished flows which impacts the health of the ecological community.

To date, no watershed plans were identified to provide further detailed analysis of the health and/or issues facing this watershed. Further analysis is needed to know whether threats exist and what steps should be taken to maintain and enhance the health of the watershed.

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San Simeon - Arroyo de la Cruz Area Watersheds

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay 10	1, San Simeon	60,141 acres	Pacific Ocean (Monterey Bay National Marine Sanctuary)	Arroyo de la Cruz Valley, Piedras Blancas Point, San Simeon Point, San Simeon Valley, Santa Rosa Valley	County of San Luis Obispo, San Simeon, Cambria (ptn)

Description:

The San Simeon-Arroyo de la Cruz area watershed grouping ("watershed") is located within the North Coast region of the county. This watershed drains approximately 51,500 acres and originates on the western slopes of the Santa Lucia Mountains, flowing to the Pacific Ocean at San Simeon State Beach. Although smaller creeks within this watershed grouping have direct drainages to the ocean, there are two major drainages – Arroyo de la Cruz and San Simeon Creek. San Simeon Creek headwaters occur in the Coast Ranges to the northeast of Cambria. Elevations in the watershed range from 3,559 feet above sea level in the Santa Lucia Range at the eastern most watershed boundary to sea level along the coast. The dominant land use throughout the watershed is agriculture, specifically rangeland. The watershed includes the disadvantaged community of San Simeon, the northern portion of Cambria and the Hearst San Simeon State Historical Monument. San Simeon Estuary is located within San Simeon State Beach and is the home to several biotic communities including salt and freshwater marshes, grasslands, Monterey pine forest, as well as estuarine habitats. The watershed also contains multiple creeks that support critical Steelhead Trout habitat.

Existing Watershed Plans:

No existing plans to date

San Simeon - Arroyo de la Cruz Area Watersheds

Characteristics:

	Physical Setting	
	Rainfall	Average Annual: 19 in. (coast) - 42 in. (mountains) (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1999-2012): 58°-77°F Winter Range (December 1999-2012): 45°-59°F (Hearst Castle, NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Lower Arroyo de la Cruz sub-watershed has steep Franciscan non-infiltrative headwaters with a flat Franciscan low infiltrative valley – Category #2. Upper Arroyo de la Cruz, Burnett Creek, Arroyo de los Chinos, Arroyo de Corral and Pico Creek have steep pre-Quaternary non-infiltrative headwaters with flat Franciscan low infiltrative valleys – Category #4. Middle Arroyo de la Cruz, Oak Knoll Creek and Broken Bridge Creek sub-watersheds have steep Franciscan non-infiltrative headwaters – Category #6 (Bell, pers. comm., 2013). The name San Simeon refers to some of the geologic structures present in the area, particularly elements of the coastal Jurassic Age landforms and ophiolite mineral formations. The San Simeon Terrain is a mass of ophiolite, Franciscan Melange, and Lospe and Monterey Formation that lies on the west side of the San Simeon Fault and was considered to have moved along the San Simeon-Hosgri fault system. The area is part of the Coastal Melange Zone, with the main rock type being Franciscan Formation, a mixture of metamorphic and igneous rocks formed under high pressure and temperature during subduction 300 to 50 million years ago (Chipping, 1987) Present in this watershed are mainly marine-sedimentary and metasedimentary rocks. Nearer to the coast minor-marine and nonmarine parent rock types dominate with little metavolcanic rock and some scattered plutonic rock inclusions. The soils found in the watershed are moderate to well-drained fine to

		moderately coarse textured with moderate permeabilities in stream channels. Poor to moderately well drained, fine or clay soils, with shallow over nearly impervious layers with slow permeability. Sand and sandy loams near coast, predominately loam textured soils in middle region, and very cobbley and gravelly clay loams in hills. Groundwater is found in Holocene and late Pleistocene age alluvium that consists of sand, gravel, and clay and ranges to 130 feet thick (Carollo, 2012; Chipping, 1987).
	Hydrology	
	Stream Gage	Yes; USGS 11142500 (Arroyo de la Cruz near Hwy 1) The San Simeon Stream Gage Station is located at Lower San Simeon Creek (#22) 35-35-59 121-06-52 (USGS, viewed August 2013)
	Hydrology Models	No source identified
	Peak Flow	23,700 cfs (USGS, 1950-1979 viewed August 2013) San Simeon Creek 45,380 AFY (SLO County Flood Control and Water Conservation District, 2005)
	Base Flow	San Simeon Creek 1200 AFY (SLO County Flood Control and Water Conservation District, 2005)
	Flood Reports	No source identified
	Flood Control Structures	Bridges:1 over Hearst Ranch Creek on SLO San Simeon Road (PWD Bridges GIS layer) Cambria Flood Control Project: 1. Bypass channel along Santa Rita Creek in the West Village 2. Gravity pressure stormdrain system to collect runoff from central residential area and divert to Santa Rosa Creek
	Areas of Heightened Flood Risk	Cambria: poor drainage facilities, steep topography, location of residential parcels below street grade. Santa Rosa Creek in West Village – up to 8 feet of water in storms of 1995 Cayucos: steep topography, poor drainage network
	Biological Setting	

	Vegetation Cover	Primarily coastal oak woodland consisting of continuous, coast live oak; and non-native annual grassland mixed chaparral consisting of chamise, scrub oak and serpentine Manzanita; buckbrush and chamise chaparral; coastal scrub consisting of black sage; intermittent ponderosa pine; montane hardwood consisting of coast live oak; and open foothill pine. (SLO County vegetation shapefile, 1990) Many drainages in this watershed are lined with willow riparian scrub, and provide unique habitats for shorebirds, waterfowl and songbirds. *Data limited by age of shapefile*
	Invasive Species	Wild oats (*Avena fatua*), field mustard (*Brassica rapa*), and ripgut grass (*Bromus diandrus*), as well as rapidly spreading species, such as Italian thistle (*Carduus pycnocephalus*) and yellow star-thistle (*Centaurea solstitialis*) (Caltrans, 2006) *Data limited to observations, not complete inventory*
	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 (CNDDB, 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*

Species	Status	ATASCADERO	CAYUCOS	CYPRESS MTN	MORRO BAY NORTH	MORRO BAY SOUTH
	Animals					
black legless lizard	SSC				x	x
California red-legged frog	FT	x	x	x	x	
coast horned lizard	SSC				x	
Coast Range newt	SSC			x		
globose dune beetle	SA		x		x	x

San Simeon - Arroyo de la Cruz Area Watersheds

Species	Status	ATASCADERO	CAYUCOS	CYPRESS MTN	MORRO BAY NORTH	MORRO BAY SOUTH
monarch butterfly	SA		x		x	
Morro Bay blue butterfly	SA				x	x
Morro shoulderband (=banded dune) snail	FE				x	
pallid bat	SSC		x		x	x
San Luis Obispo pyrg	SA				x	
sandy beach tiger beetle	SA		x		x	x
southern steelhead - southern California DPS	FE		x			
steelhead - south/central California coast DPS	FT		x	x	x	
tidewater goby	FE		x		x	
western pond turtle	SSC	x	x	x	x	
western snowy plover	FT				x	
Plants						
adobe sanicle	SR; CRPR 1B.1		x			
Betty's dudleya	CRPR 1B.2		x		x	
Blochman's dudleya	CRPR 1B.1		x		x	x
Blochman's leafy daisy	CRPR 1B.2				x	
Brewer's spineflower	CRPR 1B.3	x			x	
California seablite	FE; CRPR 1B.1		x		x	
Cambria morning-glory	CRPR 4.2		x			
Carmel Valley bush-mallow	CRPR 1B.2	x		x		
compact cobwebby thistle	CRPR 1B.2		x			
Cook's triteleia	CRPR 1B.3			x		
Cuesta Ridge thistle	CRPR 1B.2	x			x	
Eastwood's larkspur	CRPR 1B.2		x	x	x	
Hardham's bedstraw	CRPR 1B.3			x		
Jones' layia	CRPR 1B.2		x		x	
late-flowered mariposa-lily	CRPR 1B.2					x
Miles' milk-vetch	CRPR 1B.2		x		x	
Monterey spineflower	FT; CRPR 1B.2					x
most beautiful jewel-flower	CRPR 1B.2	x		x	x	
Palmer's monardella	CRPR 1B.2	x			x	

San Simeon - Arroyo de la Cruz Area Watersheds

Species	Status	ATASCADERO	CAYUCOS	CYPRESS MTN	MORRO BAY NORTH	MORRO BAY SOUTH
San Benito fritillary	CRPR 1B.2				x	
San Joaquin spearscale	CRPR 1B.2				x	
San Luis Obispo owl's-clover	CRPR 1B.2		x		x	x
San Luis Obispo sedge	CRPR 1B.2	x				
Santa Lucia bush-mallow	CRPR 1B.2	x		x	x	
woodland woollythreads	CRPR 1B.2			x		

Steelhead Streams	Yes; Arroyo de los Chinos Creek, Arroyo de la Cruz Creek, Pico Creek, San Simeon Creek, Steiner Creek (Becker et. al., 2010.
Stream Habitat Inventory	Yes; DFG, August 1973 and September 1992 *Data limited by age of last inventory*
Fish Passage Barriers	Van Gordon Creek, 0.2 mile east (upstream) of Van Gordon Creek Rd. on San Simeon Creek Rd. ID #167; Unnamed Tributary of San Simeon Creek, 7 miles upstream of Hwy 1 on San Simeon Creek Rd., ID #46 (PAD Database)
Designated Critical Habitat	Yes; For Steelhead - San Simeon Hydrologic Sub-area 331013. Outlet(s) = Arroyo del Corral (Lat 35.6838, Long –121.2875); Arroyo del Puerto (35.6432, –121.1889); Little Pico Creek (35.6336, –121.1639); Oak Knoll Creek (35.6512, –121.2197); Pico Creek (35.6155, –121.1495); San Simeon Creek (35.5950, –121.1272) upstream to endpoint(s) in: Arroyo Laguna (35.6895, –121.2337); Arroyo del Corral (35.6885, –121.2537); Arroyo del Puerto (35.6773, –121.1713); Little Pico Creek (35.6890, –121.1375); Oak Knoll Creek (35.6718, –121.2010); North Fork Pico Creek (35.6886, –121.0861); San Simeon Creek (35.6228, –121.0561); South Fork Pico Creek (35.6640, –121.0685); Steiner Creek (35.6032, –121.0640); Unnamed Tributary (35.6482, –121.1067); Unnamed Tributary (35.6616, –121.0639); Unnamed Tributary (35.6741, –121.0981); Unnamed Tributary (35.6777, –121.1503); Unnamed

San Simeon - Arroyo de la Cruz Area Watersheds

		Tributary (35.6604, –121.1571); Unnamed Tributary (35.6579, –121.1356); Unnamed Tributary (35.6744, –121.1187); Unnamed Tributary (35.6460, –121.1373); Unnamed Tributary (35.6839, –121.0955); Unnamed Tributary (35.6431, –121.0795); Unnamed Tributary (35.6820, –121.2130); Unnamed Tributary (35.6977, –121.2613); Unnamed Tributary (35.6702, –121.1884); Unnamed Tributary (35.6817, –121.0885); Van Gordon Creek (35.6286, –121.0942). (Federal Register- Vol. 70, No. 170 / Friday, September 2, 2005) California Red-Legged Frog (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	No; HCP/NCCP meeting occurred on 3.19.01 (D. Highland, CDFW files)
	Other Environmental Resources	San Simeon State Beach, William Randolph Hearst Memorial State Beach, Hearst Ranch Conservation Project, San Simeon Creek Groundwater Basin, Rocky Butte Botanical Area (SLO County Flood Control and Water Conservation District, 2007)
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo, Town of San Simeon, North portion of the Town of Cambria
	% Urbanized	3% (commercial, multi-family residential, and residential single family)(U.S. Census Block, 2010).
	% Agricultural	94.4% Agriculture (row crop, orchards, rangeland)(U.S. Census Block, 2010).
	% Other	1.4% rural land; 1.2% Recreation (U.S. Census Block, 2010).
	Planning Areas	North Coast Planning Area
	Potential growth areas	Hearst Corporation property; North Coast Planning Area, Hearst Castle staging area, San Simeon Village, Pine Resort Area (SLO County, 2011)
	Facilities Present	Piedras Blancas Light House, Hearst Ranch / Hearst Castle (Hearst San Simeon State Historical Monument), San Simeon State Park

		Three wells for Cambria Community Services District are located in Lower San Simeon Creek. Wastewater treatment spray fields are also located in this area. Treated wastewater infiltrates back into the groundwater aquifer.
	Commercial Uses	Industrial facilities - Cambria Rock (Sand and Gravel mine along San Simeon Creek); Rancho San Simeon Pit (Decomposed Granite Mine); Arroyo Del Oso Pit (Sand and Gravel mined at the mouth of Arroyo Del Oso Alo); Agriculture – majority rangeland; Recreation and tourism at San Simeon, Coastal Beaches, and Hearst Castle.
	Demographics	
	Population	998 in watershed (US Census Blocks, 2010) 450 in San Simeon (US Census Blocks, 2010) 392 in Cambria (US Census Blocks, 2010)
	Race and Ethnicity	Watershed: Caucasian, representing 27.7%. Latinos represent 6.57% in City. 16% are mixed race individuals with the remainder including African American, American Indian, and Asian (US Census Block, 2010) San Simeon: 55.3% Latino; 40% Caucasian; 1.7% Mixed Race; 1.3% Asian; 1.1% American Indian and Alaska Native (US Census Blocks, 2010) Cambria: 91% Caucasian; 5.4% Latino; 2% Mixed Race (US Census Blocks)
	Income	MHI $51,557 (U.S. Census Tracts, 2010) MHI $44,583 in San Simeon (US Census, 2010) MHI $76,271 in Cambria (US Census, 2010)
	Disadvantaged Communities	Yes; San Simeon (Department of Water Resources) 0.0% of individuals below poverty level in Watershed (US Census Tracts, 2010) 0.0 % of individuals below the poverty level in San Simeon (2007-2011 American Community Survey 5-Year Estimates) 5.0% of individuals below poverty level in Cambria (2007-2011 American Community Survey 5-Year Estimates)
	Water Supply	
	Water Management Entities	Cambria CSD, San Simeon CSD (Carollo, 2012)
	Groundwater	Yes; Alluvial; and Arroyo de la Cruz Valley, Piedras Blancas Point, San Simeon Point, San

		Simeon Valley, and Santa Rosa Valley Basins (Carollo, 2012)
	Surface Water	No public reservoirs (Carollo, 2012).
	Imported Water	None (Carollo, 2012)
	Recycled/Desalinated Water	The CCSD currently operates a wastewater treatment plant at the northern boundary of Cambria. The treated wastewater effluent is percolated into the ground between the San Simeon well field and the Pacific Ocean to create a hydraulic barrier that slows the fresh water underflow in the San Simeon Creek aquifer. This mound of fresh water also prevents seawater intrusion into the up-gradient potable groundwater aquifer, and maintains down-gradient surface flows. (CCSD Master Plan, 2008)
	Key Infiltration Areas	No data available
	Water Budget	Yes; Yates and Van Konyenburg, 1998. *Data limited by age of last water budget calculated*
	Water Uses	
	Beneficial Uses	*Arroyo de Corral* - 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), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), Estuarine Habitat (EST), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM) *Arroyo de los Chinos* – 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), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Threatened, or Endangered Species (RARE), Estuarine Habitat (EST), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM) *Arroyo de la Cruz* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR),

Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM)

Oak Knoll Creek – 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), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Threatened, or Endangered Species (RARE), Estuarine Habitat (EST), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM)

Pico Creek - 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), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Preservation of Biological Habitats of Special Significance (BIOL), Threatened, or Endangered Species (RARE), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM)

San Simeon Creek Estuary - Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Estuarine Habitat (EST), Commercial and Sport Fishing (COMM) and Shellfish Harvesting (SHELL).

		San Simeon Creek - Municipal & Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Fresh Water Habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Freshwater Replenishment (FRSH) and Commercial and Sport Fishing (COMM). *Steiner Creek* - 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), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM) (CCRWQCB, 2011)
	Other Unique Characteristics	
	Cambria Mercury Mines	No longer operating, partially reclaimed, with annual reports indicating low concentrations of metals and salts continue to leave the site, sometime exceeding receiving water standards (New Times, 2009)
	San Simeon Point Conservation Easement	319 acres held by the California Department of Park and Recreation (National Conservation Easement Database, viewed 2013)
	California Trade Lands Easement	5 acres held by The Nature Conservancy (National Conservation Easement Database, viewed 2013)
	Cambria Pines Easement	1450 acres held by The Nature Conservancy (National Conservation Easement Database, viewed 2013)
	Hearst San Simeon State Historical Monument	▪ Ranch encompasses over 118,000 acres, 77,000 acres in San Luis Obispo County. Three Spanish land grants in the early 1840's

		were basis for the acquisition of the ranch property including Rancho Piedra Blanca, Rancho San Simeon and Rancho Santa Rosa ▪ Attracts over one million visitors annually ▪ Proposed development of five separate coastal areas for resort recreation and limited residential uses.
	San Simeon Acres	▪ Small commercial village developed to provide tourist and recreation services ▪ Provides food and lodging facilities for Hearst Castle visitors as well as tourists driving Highway One. ▪ Evolved from 1940 sale of the area by W. R. Hearst to facilitate recreational development
	North Coast Shoreline	• Valuable scenic and natural resource • Consists of low marine terraces with accessible beaches and coves, interspersed with rocky shorelines and steep bluffs. Offshore are rocks, reefs, and kelp beds. • The Monterey Bay Marine Sanctuary provides protection for rich offshore marine habitat.
	Monterey Pine Forests	• 2,500 acres surrounding Cambria • 500 acres at Pico Creek • Stands are extremely important as a “gene pool” – genetic variations found there protect some trees from pine pitch canker • Preservation of finer specimen stands recommended through use of open space easements, avoidance by development, and direct purchase. The introduction of hybrid species is discouraged
	North Coast Creeks	• Important fish streams for migration and spawning • Adjacent riparian and wetland areas provide wildlife habitat • Groundwater and surface waters linked, maintenance of creek habitats essential to protect coastal resources • Support number of declining species such as Tidewater Goby, Striped Garter Snake, Western Pond Turtle, Red-legged Frog and Steelhead Trout
	San Simeon Creek Lagoon	• Estuary located within San Simeon State Beach. • Composed of several biotic communities including salt and freshwater marshes,

		grasslands, Monterey pine forest, as well as estuarine habitats. • Supports steelhead trout and other fish species • Major waterfowl feeding and nesting site. Close to 190 bird species reported at lagoon and in adjacent areas
	Hearst San Simeon State Park	One of the oldest units in the Ca State Park System. Coastal bluffs offer scenic views of the ocean and rocky shore. A 3.3 mile trail runs through parts of San Simeon Natural Preserve and the Washburn Campground. The trail includes scenic overlooks, rest-stop benches and interpretive panels with information on wildlife and habitat. • Santa Rosa Creek Preserve – includes valuable riparian forests and coastal wetlands, that provide habitat for endangered Tidewater Goby • San Simeon Natural Preserve – contains vast wetlands, riparian areas, and several undisturbed native plant communities including mina mound topography. The Preserve is a wintering site for monarch butterfly populations. • Pa-nu Cultural Preserve – 13.7 acres with the most significant archeological sites within the San Simeon State Park. The site has been dated to 5850 years before the present. Contains significant evidence documenting prehistoric technology, subsistence practices and social organization over the course of several centuries. • W. R. Hearst Memorial Beach – Dedicated to the County in 1953. Has a 795 foot pier, completed in January 1969. Ownership transferred to State in 1970. The National Oceanic and Atmospheric Administration runs the Coastal Discovery Center at San Simeon Bay. It offers interactive exhibits and education programs which highlight the cultural and natural history of Old San Simeon, California State Parks and the Monterey Bay national Marine Sanctuary (parks.ca.gov)

San Simeon - Arroyo de la Cruz Area Watersheds

	Piedras Blancas Light Station	Located on a rugged windswept point of land six miles north of Hearst Castle, along California's scenic Highway One. First illuminated as an aid to navigation in 1875, the lighthouse is still in operation. Access by guided tours only, operated by U.S. Dept of Interior, Bureau of Land Management (blm.gov).
	Historical Resources	Van Gordon Archaeological Site (Located in San Simeon State Park, 500 San Simeon Creek Road; San Simeon); Hearst Ranch (California 1, San Simeon); The Sebastian Store (442 Slo San Simeon Road, San Simeon) (PLN_DES_HISTORIC_POINTS GIS layer)
	Climate Change Considerations	
		See IRWMP, 2014 Section H, Climate Change *Data is general for County, not watershed specific*

Watershed Codes

Calwater / DWR umber	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.110202	1	San Carpoforo	1	Breaker Point	310.11	Breaker Point	Arroyo de los Chinos
3310.120001	1	Arroyo de la Cruz	2	Undefined	310.12	Undefined	Upper Arroyo de la Cruz
3310.120002	1	Arroyo de la Cruz	2	Undefined	310.12	Undefined	Middle Arroyo de la Cruz
3310.120003	1	Arroyo de la Cruz	2	Undefined	310.12	Undefined	Lower Arroyo de la Cruz
3310. 120004	1	Arroyo de la Cruz	2	Undefined	310.12	Undefined	Burnett Creek
3310.130101	1	San Simeon	3	San Simeon Creek	310.13	San Simeon Creek	Steiner Creek
3310.130102	1	San Simeon	3	San Simeon Creek	310.13	San Simeon Creek	Lower San Simeon Creek
3310.130103	1	San Simeon	3	San Simeon Creek	310.13	San Simeon Creek	Upper San Simeon Creek
3310.130201	1	San Simeon	3	Oak Knoll	310.13	Oak Knoll	Broken Bridge Creek
3310.130202	1	San Simeon	3	Oak Knoll	310.13	Oak Knoll	Oak Knoll Creek
3310.130203	1	San Simeon	3	Oak Knoll	310.13	Oak Knoll	Arroyo del Corral
3310.130204	1	San Simeon	3	Oak Knoll	310.13	Oak Knoll	Pico Creek

San Simeon - Arroyo de la Cruz Area Watersheds

Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)

Major Changes in the Watershed

Clark Colahan's 2011 account of the settling of the San Simeon Creek watershed by his ancestor EA Clark in *On the Banks of San Simeon Creek*, indicates that EA arrived in California in 1850, traveling by way of the Isthmus of Nicaragua and arriving in the spring of 1858, then homesteaded for a decade on San Simeon Creek in San Luis Obispo County. In *On the Banks*, Colahan compiled extensive diary entries which paint a picture of the developing commerce in the watershed related to the natural resources available, extracted or otherwise utilized in settling and developing a means of survival and providing sustenance.

- Coal mining—William Leffingwell discovered outcropping of coal on the beach south of San Simeon Creek in 1863 (Hamilton, 1999)
- Quicksilver (mercury in the form of cinnabar) mining began in mid 1860's
- Dairying began in mid-to late 1860's
- San Simeon - Leffingwell Landing used in the 1860's followed by pier in late 1860's as well as whaling pier in same time period

The general pattern of land use change in SSC watershed follows that of neighboring watersheds wherein the settlement period following division of Spanish land grants brought grazing, small agricultural concerns, mining, water diversion and pumping, followed by more intense dairy farming, irrigated row crops, further land division, road building and more pumping for irrigated agriculture and residential development. As of the early 1990's, water resource availability has been the primary factor in the lack of continued development and sub-division in the watershed (Central Coast Salmon Enhancement, 2011).

Cambria:

- Located within Rancho Santa Rosa, an original Mexican land grant. Established in 1860's to accommodate shipping of mining and agricultural products in the central coast region.
- Once an important service center for pioneer residents of the coastal region. Locally produced products included whale oil, lumber, mercury, gold and dairy products, most of which were exported. Depletion of mineral resources and replacement of coastal shipping by inland transportation reduced Cambria's position of economic importance in the county.
- Continues to provide limited services to nearby agricultural areas. Role as a resort and retirement community grown in importance since 1920's.
- Today visitors come for pleasant natural setting, seashore and numerous recreational opportunities such as art, craft and antique shops and fine restaurants.
- Annual dry-season water shortage long been cause for concern. 1990-1993: mandatory conservation program which reduced consumption by approximately 28% compared to 1989.
- Early 1990's: Cambria CSD spray field operation changed to percolation pond system. Raised water well levels while serving as a hydraulic mound to slow fresh water outflow at ocean boundary.
- All new developments must participate in off-site plumbing fixture retrofit program – conventional plumbing fixtures replaced with low-flow fixtures

San Simeon

San Simeon - Arroyo de la Cruz Area Watersheds

- 1878 – George Hearst, proprietor of Piedras Blancas Rancho built a new 1,000 foot wharf at a cost of $20,000.
- Piedras Blancas Lighthouse was built on the old property of Juan Castro. The light house was 100 feet high, built of brick and iron, and cost $100,000. It contains a Fresnel light of great power (Storke, 1891).
- On this coast there are a number of whaling stations ï¿½ at Monterey, San Simeon, Point San Luis, and Point Concepcion. The whaling business was begun here as early as 1864, and it has proved quite profitable. The least catch during the season was three whale, the greatest twenty-three. The whale hunts, conducted in open boats off these rugged coasts, is exciting but dangerous sport (Storke, 1891).

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Arroyo de Corral	Undetermined	Not assessed	Undetermined	Not assessed
Arroyo de los Chinos	Undetermined	Not assessed	Undetermined	**Lower**: Spring: 0.4 cfs. Summer: 0.22 cfs.
Broken Bridge Creek	Undetermined	Not assessed	Undetermined	Not assessed
Burnett Creek	Undetermined	Not assessed	Undetermined	Not assessed
Arroyo de la Cruz	Undetermined	Escherichia coli (E. coli), Low Dissolved Oxygen	Agriculture, Natural Sources, Grazing-Related Sources	**Lower**: Spring: 2.33 cfs. Summer: 0.71 cfs.
Oak Knoll Creek	Undetermined	Not assessed	Undetermined	**Lower**: Spring: 0.63 cfs. Summer: 0.27 cfs.
Pico Creek	Undetermined	Low Dissolved Oxygen	Grazing-related Sources, Unknown Sources, Natural Sources	Spring: 0.61 cfs. Summer: 0.27 cfs.
San Simeon Creek	Ephemeral	Chloride, Nitrate, Lo Dissolved Oxygen, Sodium	Agriculture, Grazing related sources, Natural Sources, Wastewater –	**Lower**: Spring: 1.6 cfs. Summer: 0.52 cfs. **Middle**: Spring: 1.51 cfs.

			land disposal	Summer: 0.5 cfs **Upper**: Spring: 0.79 cfs. Summer: 0.32 cfs.
Steiner Creek	Undetermined	Not assessed	Undetermined	Not assessed

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Arroyo de la Cruz Valley	1,244 AFY (Envicom, 1982 / SLO County WMP, 2012)	None (Carollo, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011)
Piedras Blancas Point	None (Carollo, 2012)	None (Carollo, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011)
San Simeon Point	None (Carollo, 2012)	None (Carollo, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011)
San Simeon Valley	1040 AFY (IRWMP, 2011)	The State Water Resources Control Board (State Board) allows a maximum extraction of 1,230 AFY in the San Simeon Valley Groundwater Basin and a maximum dry season extraction of 370 AF (Cambria CSD, 2008).	None (Carollo, 2012)	None (CCRWQCB, 2011)
Santa Rosa Valley	2,260 AFY (SLO	None (Carollo,	None (Carollo,	None

	County WMP, 2012)	2012)	2012)	(CCRWQCB, 2011)
Pico Creek	120 AFY (Cleath, 1986 / SLO County WMP, 2012).	The primary constraints on water availability in the basin include physical limitations and potential water quality issues. (Carollo, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011)

During January of 2003, CCSD began investigating the process of adjudicating the San Simeon Basin. To date, neither basin has been adjudicated (Cambria Community Services District, 2004).

CCSD Water Rights
Under CCSD's diversion permit for the San Simeon Basin, Permit No. 17287, the following restrictions apply:

- Maximum rate of diversion: 5.0 AF/day (2.5 cubic feet per sec [cfs])
- Maximum annual diversion: 1,230 AF
- Maximum dry season diversion: 370 AF. The dry season is defined as the date surface flow ceases at the Palmer Flats gaging station until October 31 of that year.

(Cambria Community Services District, 2004)

Groundwater supplies can be provided from either the San Simeon or Santa Rosa Creek wells. Both sources have appropriative water rights and, with the completion of water treatment facilities for the Santa Rosa Creek wells, the District's two supplies can be utilized conjunctively to manage groundwater levels in both basins (Kennedy and Jenks, 2000).

Groundwater Quality Description: (Groundwater samples from 31 wells collected from 1955 to 1994 show total dissolved solids (TDS) concentration ranging from 46 to 2,210 mg/l (DWR, 2003). Samples from three public supply wells show a TDS concentration range of 400 to 420 mg/l with an average concentration of 413 mg/l. Manganese concentrations in the downstream regions of the basin have exceeded the MCL, with a range of 0.002 to 1.6 mg/l (Carollo, 2012).

Primary Issues

Issue	***Potential Causes***	***Referenced from***
Loss of riparian vegetation		J. Nelson, pers. comm., 2013
Lack of instream flow	Excessive pumping/diversion	J. Nelson, pers. comm., 2013
Excessive sedimentation		J. Nelson, pers. comm., 2013
Gravel mining		J. Nelson, pers. comm., 2013
Grazing/Cattle		J. Nelson, pers. comm., 2013
Low dissolved oxygen kills fish in		J. Nelson, pers. comm., 2013

the lagoon		
Water pollution	Sewage leaks/overflow, general agriculture/row crops	J. Nelson, pers. comm., 2013
Poaching		J. Nelson, pers. comm., 2013
Sea Water Intrusion		Carollo, 2012
Currently the water supply of San Simeon CSD is at a certified Level III severity rating (resource capacity has been met or exceeded) due to unreliability of the groundwater supply to meet existing demands (SLO County, 2008). As a result, a moratorium on development has been in place since 1991.		SLO County Flood Control and Water Conservation District, 2008
Outdated hydrological studies for area GW basins		Carollo, 2012
Arroyo de la Cruz 303(d) listed for Escherichia coli (E. coli), low dissolved oxygen	Agriculture, natural sources, grazing related sources	Carollo, 2012
Pico Creek 303(d) listed for low dissolved oxygen	Grazing related, natural sources	Carollo, 2012
San Simeon Creek 303(d) listed for chloride, nitrate, low dissolved oxygen, sodium	Agriculture, grazing related and natural sources, wastewater (land disposal)	Carollo, 2012

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Significant Studies in Progress:

The San Simeon Creek Watershed Management Plan was initiated by Greenspace-the Cambria Land Trust in 2011 and subsequently discontinued. A draft unpublished annotated bibliography document was produced.

Water Master Plan for Cambria: In-stream flow management study for San Simeon Creek. Water management strategy, small lot reduction ballot measure

Santa Rosa Creek Area Watersheds

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay 10	Cambria WPA 2	46,997 acres	Pacific Ocean – (Monterey Bay National Marine Sanctuary)	Santa Rosa Valley, Villa Valley	County of San Luis Obispo Town of Cambria, Town of Harmony

Existing Watershed Plans:

Santa Rosa Creek Watershed Management Plan (Greenspace Cambria, 2010)

Cambria forest management plan (Greenspace Cambria, 2002)

Description:

Santa Rosa Creek Area Watershed lies within the southern portion of the California Coast Ranges. The watershed is bounded to the east by the Santa Lucia Mountain Range and to the west by the Pacific Ocean. The grouping of watersheds herein is consistent with the CalWater HUC 10 scale. The watershed contains 2 major sub-watersheds: Santa Rosa Creek, which contains Santa Rosa Creek and Green Valley (Perry Creek) and Villa Creek. Santa Rosa Creek and its tributaries flow mostly unobstructed down steep hill-slopes mantled with shallow soils and sparse shrub vegetation and through agricultural areas and the small town of Cambria before reaching the Pacific Ocean. Villa Creek begins in the Santa Lucia range flowing to the Pacific Ocean and encompassing a majority of the coastal area within the total watershed. The Town of Cambria is near the mouth of Santa Rosa Creek. The urbanized area of Cambria is located within both the Santa Rosa Creek sub-watershed and the Villa Creek sub-watershed. Topography includes steep upland areas and low gradient valley bottoms bordering the creek reaches. Cypress Mountain, the highest peak, lies in the Upper Santa Rosa creek watershed and reaches an elevation of approximately 3,411 ft. At its lowest elevation (sea level), Santa Rosa Creek flows through a lagoon contained by an annually formed sandbar at Moonstone Beach. The dominant land use is agriculture.

Santa Rosa Creek Area Watersheds

Characteristics:

Physical Setting	
Rainfall	Average Annual: 15 in. (coastal) - 38 in. (mountains) (NRCS shapefile, 2010)
Air Temperature	Summer Range (August 2012): 54°-70°F Winter Range (December 2012): 48°-59°F (Cambria, NOAA National Climatic Data Center, viewed 2013)
Geology Description	Lower Santa Rosa Creek and Villa Creek: composed of steep Franciscan non-infiltrative headwaters; with flat pre Quaternary moderate infiltrative valley – Category #1 Steiner Creek, Upper Green Valley Creek, Upper San Simeon Creek and Upper Santa Rosa Creek: steep Franciscan non-infiltrative headwaters – Category #6 Lower Green Valley Creek and Lower San Simeon Creek: flat Franciscan low infiltrative valleys – Category #10 (Bell, pers. comm., 2013). This watershed is composed of Franciscan mélange: a mix of hard graywacke (sandstone) and weak, sheared argillite (silt/claystone) (Chipping 1987, Dibblee 2007a 2007b). Following the complete subduction of the Farallon Plate beneath the North American Plate, the eventual transition to a transform (strike-slip) plate boundary began about 25 million years ago with the gradual contact between the northwest-moving Pacific Plate and the southeast-moving North American Plate (Atwater and Molnar 1973). This transition marked a geologically brief period of coastal volcanism which locally produced the erosion-resistant Cambria Felsite rocks, as seen today at Scott Rock located east of Cambria near Taylor Creek (Dibblee 2007a). Other volcanic rocks formed during this period include the now highly weathered basalts and hardened tuffs (solidified volcanic ash) of the Obispo Formation that run along a northwest-trending band in the upper watershed. Terrestrial and marine sedimentary rocks formed during this period include a mix of hard, coarse-grained sandstones and weak, fine-grained shales (Greenspace Cambria, 2012)
Hydrology	
Stream Gage	Yes; upper watershed - USGS 11142200 (Santa Rosa Creek near Santa Rosa Creek Rd); lower watershed - SLO County San Simeon Station (718); SLO County Santa Rosa Station (716).
Hydrology Models	Yes; part of the Highway 1 by-pass bridge project, 1999 and updated in 2002 for a pump station evaluation for the west village. The flow from

		that model was used in the design of Ferrasci road bridge. *Data limited by project scope, not watershed level model*
	Peak Flow	3,350 cfs (upper Santa Rosa Creek) 12,000 cfs (lower Santa Rosa Creek), (USGS, viewed August, 2013)
	Base Flow	0 – 5 cfs (USGS, viewed August, 2013)
	Flood Reports	Yes; Cambria Drainage and Flood Control Study, February 2004; Raines, Melton and Carella, Inc.
	Flood Control Structures	Bridges: 1 over Villa Creek on Villa Creek Rd; 1 over Harmony Valley Creek on Old Creamery Road; 6 over Santa Rosa Creek on Santa Rosa Creek Road (3), Burton Drive, Windsor Boulevard and Main Street; 4 over San Simeon Creek on San Simeon Creek Road; 1 over Leffingwell Creek on Moonstone Beach Drive. (PWD Bridges GIS layer) Additional by-pass channel; storm drains; pumping systems along Santa Rose Creek in West Village (SLO County Flood Control and Water Conservation District, 2009) Gravity Pressure Stormdrain System: Diverts residential runoff directly into Santa Rosa Creek (SLO County Flood Control and Water Conservation District, 2009) Dams proposed for San Simeon Creek near Van Gordon tributary, proposed Jack Creek Dam (Cambria Community Services District, 2004).
	Areas of Known Flood Risk	The combination of the area's steep topography, lack of underground drainage facilities, and location of residential parcels below the street grade has resulted in localized poor drainage and/or flooding around some residences, buildings, and roadways. The magnitude of flooding varies by the districts in Cambria and by location in each district. Drainage from a number of uphill lots flows along the edge of street pavement and drains onto lower lots, creating flooding and erosion problems. Drainage problems also exist where curbs are present, but the topography creates conditions where lots adjacent to the roadway are much lower than the roadway surface. SLOCFCWCD has earmarked over $500,000 to fund one of the projects, has obtained funding assistance from the local community totaling $1.1 million and obtained a FEMA HMGP (Hazard Mitigation Grant Program) grant of $3.5 million towards regional flood improvements. Total cost for the unfunded projects is estimated to be $11.0 million (SLO County Flood Control and Water Conservation District, 2009). Villa Creek is a flood-prone natural drainage course that should be maintained in its natural state to protect native vegetation and wildlife habitats (SLO County Flood Control and Water Conservation District, 2009).
	Biological Setting	

Santa Rosa Creek Area Watersheds

Vegetation Cover	Primarily annual non-native grassland with continuous coast live oak woodland, Montane hardwood consisting mainly of coast live oak and black oak woodland, and Closed-Cone Pine-Cypress consisting of Monterey pine. Some coastal scrub and cypress forest present. (1990 vegetation layer) grassland, scrub/shrub, mixed forest, evergreen forest, cultivated crops, woody wetlands, pasture/hay, and emergent herbaceous wetland (DFG, 2005) Willow riparian scrub is present along some coastal drainages in this watershed. *Data limited by age of shapefile.*
Invasive Species	Cape Ivy, Pampass grass (National Marine Fisheries Service, 2007) *Data limited in scope, not representative of entire watershed*
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 (CNDDB, 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*

Species	**Status**	**BURRO MOUNTAIN**	**CYPRESS MTN**	**LIME MTN**	**PEBBLESTONE SHUT-IN**	**PICO CREEK**
Animals						
California red-legged frog	FT		x	x	x	x
Coast Range newt	SSC		x			
fringed myotis	SA					x
monarch butterfly	SA	x				x
prairie falcon	SA (Nesting)				x	x
steelhead - south/central California coast DPS	FT		x		x	x

Santa Rosa Creek Area Watersheds

Species	Status	BURRO MOUNTAIN	CYPRESS MTN	LIME MTN	PEBBLESTONE SHUT-IN	PICO CREEK
tidewater goby	FE					x
two-striped garter snake	SSC				x	x
western pond turtle	SSC		x		x	x
Yuma myotis	SA					x
Plants						
Arroyo de la Cruz manzanita	CRPR 1B.2				x	x
Carmel Valley bush-mallow	CRPR 1B.2		x		x	
Chorro Creek bog thistle	FE; SE; CRPR 1B.2				x	
Cook's triteleia	CRPR 1B.3		x		x	
Eastwood's larkspur	CRPR 1B.2		x			
Hardham's bedstraw	CRPR 1B.3		x		x	
late-flowered mariposa-lily	CRPR 1B.2				x	
Monterey pine	CRPR 1B.1					x
most beautiful jewel-flower	CRPR 1B.2		x	x	x	x
San Luis mariposa-lily	CRPR 1B.2				x	
San Luis Obispo owl's-clover	CRPR 1B.2					x
San Luis Obispo sedge	CRPR 1B.2				x	
San Simeon baccharis	CRPR 1B.2				x	
Santa Lucia bush-mallow	CRPR 1B.2		x		x	x
woodland woollythreads	CRPR 1B.2		x		x	x

Santa Rosa Creek Area Watersheds

	Steelhead Streams	Yes; Santa Rosa Creek Upper, Santa Rosa Creek Lower, Lower Perry Creek (DFG, 2005)
	Stream Habitat Inventory	Yes; Santa Rosa Creek Steelhead Habitat and Population Survey completed in 2005 by California Department of Fish and Wildlife and California Conservation Corps
	Fish Passage Barriers	Unnamed tributary to Santa Rosa Creek, Culvert at Santa Rosa Creek Road crossing, Partial barrier PAD# 712027.00000; Curti Creek, Culvert at Santa Rosa Creek Road crossing, Total barrier PAD# 712044.00000; Unnamed tributary to Santa Rosa Creek, Culvert at Santa Rosa Creek crossing, Total barrier PAD# 712043.00000; North Fork Santa Rosa Creek, Culvert at Santa Rosa Creek Road crossing, Total barrier PAD# 712045.00000; Unnamed tributary, Culvert at Highway 1 crossing, Unknown status PAD# 731784.00000; Fiscalini Creek, Culvert at road crossing, Unknown status PAD# 731365.00000; Perry Creek, Highway 46 bridge with potential passage constraints, Unknown status PAD# 736678.00000 Perry Creek, Culvert at road crossing, Unknown status (No ID #); Green Valley Creek, Highway 46 bridge with potential passage constraints, Unknown status PAD# 736483.00000; Unnamed tributary to Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736475.00000; Unnamed tributary to Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736538.00000; Unnamed tributary to Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736487.00000; Unnamed tributary to Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736431.00000; Unnamed tributary to Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736457.00000; Unnamed tributary to Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736621.00000; Green Valley Creek, Unspecified, Unknown status PAD# 716213.00000; Unnamed tributary to Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736625.00000; Green Valley Creek, Culvert at Highway 46 crossing, Unknown status PAD# 736583.00000 (Protected Access Database, viewed 2013)
	Designated Critical Habitat	Yes; Steelhead Trout: Santa Rosa Hydrologic Sub-area 331014. Outlet(s) = Santa Rosa Creek (Lat 35.5685, Long –121.1113) upstream to endpoint(s) in: Green Valley Creek (35.5511, –120.9471); Perry Creek (35.5323–121.0491); Santa Rosa Creek (35.5525, –120.9278); Unnamed Tributary (35.5965, –120.9413); Unnamed Tributary (35.5684, –120.9211); Unnamed Tributary (USFWS Critical Habitat Mapper, viewed 2013) California red-legged frog (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	Yes; A Habitat Conservation Plan was envisioned as part of the original request for proposals by the Cambria Community Services District as part of its effort to complete a comprehensive water master plan as well as its existing water supply and need for an evaluation of alternative water sources (Cambria Community Services District, 2004).
	Other	San Luis Obispo Coastal Zone, Monterey Bay National Marine Sanctuary,

Santa Rosa Creek Area Watersheds

Environmental Resources	Santa Rosa Creek Groundwater Basin, Cambria Monterey Pine Forest (SLO County Flood Control and Water Conservation District, 2007).
Land Use	
Jurisdictions & Local Communities	County of San Luis Obispo, Town of Cambria (portion), Town of Harmony
% Urbanized	2.45% total (0.2% Commercial, 0.25% Public Facilities, 2% residential) (SLO County LUC)
% Agricultural	93.35% (SLO County LUC)
% Other	4.2% total (2.6% rural lands, 0.3% recreation, 1.3% open space)(SLO County LUC)
Planning Areas	Adelaida, North Coast, Estero Planning Areas (SLO County)
Potential growth areas	Hearst Corporation property
Facilities Present	Cambria Wastewater Treatment Plant; CCSD well sites (Santa Rosa Creek)
Commercial Uses	Cambria Pit (Stone – Base Mine by Winsor Construction at Santa Rosa Creek Rd); Bianchi Quarry (Stone – Base Mine by Winsor Construction: North East Cambria); Land Red Rock Pit (Stone Mine by Negranti Construction at Hwy 46W) Recreation and tourism in Cambria; Wineries in Cambria and Harmony; Agriculture – rangeland, orchards, etc., Hearst Ranch
Demographics	
Population	5,941 in watershed (US Census Blocks, 2010) 5,601 in the town of Cambria(US Census Blocks, 2010)
Race and Ethnicity	Watershed: Caucasian, representing 76%. Latinos represent 21%. Asians represent 1.3%. The remaining races each represent less than 4%, including African American, American Indian, and Pacific Islander. (US Census Blocks, 2010) Cambria: Caucasian, representing 75.6%. Latinos represent 20.8%. Mixed Race represents 1.3%. (US Census, 2010)
Income	MHI $51,557 in watershed (US Census Tracts, 2010) MHI $75,747.5 in Cambria (U.S. Census, 2010)
Disadvantaged Communities	No; 1.5% of individuals are below poverty level in watershed (US Census Tracts, 2010) 5% of individuals below poverty level in Cambria (US Census, 2010)
Water Resources	
Water Management Entities	Cambria Community Services District (CCSD)
Groundwater	Yes; Alluvial; Santa Rosa Valley, Villa Valley Use of wells for domestic supplied water (CCSD) from Santa Rosa Creek

Santa Rosa Creek Area Watersheds

		The State Board allows a maximum extraction of 518 AFY in the Santa Rosa Valley Groundwater Basin and a maximum dry season extraction of 260 AF (Carollo, 2012) CCSD – Level III severity declaration for water supplies (CCSD Water Master Plan, 2008)
	Surface Water	No public reservoirs in the watershed. Identified as fully appropriated stream system for entire year according to the SWRCB's Water Code 1205-1207.
	Imported Water	None
	Recycled/ Desalinated Water	CCSD has made an effort over the past 15 years to bring a desalination operation to Santa Rosa/San Simeon. The most recent effort failed in 2012. Proposed water recycling plant for agricultural irrigation (Cambria Community Services District, 2004).
	Key groundwater percolation area(s)	None Identified: Recharge to the basin is largely by percolation of stream flow and, to a lesser extent, from infiltration of precipitation and excess irrigation flow (Ca. Dept. of Water Resources, 2003)
	Water Budget	Yes; Yates and Van Konynenburg, 1998 (Carollo, 2012). *Data limited by age since last report*
	Water Uses	
	Beneficial Uses	*Santa Rosa Creek Estuary* - Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Fresh Water Habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Commercial and Sport Fishing (COMM) and Shellfish Harvesting (SHELL). *Santa Rosa Creek* - Municipal & Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Fresh Water Habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Rare, Threatened, or Endangered Species (RARE), Freshwater Replenishment (FRSH) and Commercial and Sport Fishing (COMM). *Green Valley Creek* - Municipal & Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Fresh Water Habitat (WARM), Rare, Threatened, or Endangered Species (RARE) and Commercial and Sport Fishing (COMM).

	Villa Creek - 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), Cold Fresh Water Habitat (COLD), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), Estuarine Habitat (EST), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM) (CCRWQCB, 2011)
Other Unique Characteristics	
Historical Resources	Arthur Beale House (Nitt Witt Ridge, 881 Hillcrest, Cambria); Guthrie-Bianchini House (2251 Center Street, Cambria); The Paul Squibb House (4063 Burton Drive, Cambria); The Bluebird Inn (1880 Main Street, Cambria); Carroll's Blacksmith Shop (Cinnabar, 4121 Burton Drive, Cambria); Heart's Ease (4101 Burton Drive, Cambria); Ian's Restaurant (2150 Center Street, Cambria); Robin's Restaurant (4095 Burton Drive, Cambria); The Brambles Restaurant (4005 Burton Drive, Cambria); Rigdon Hall Restaurant (4022 Burton Drive, Cambria); The Big Red House (370 Chelsea Lane, Cambria); The Bucket of Blood Saloon (Painted Sky Recording Studios, 4111 Bridge St, Cambria); Louis Maggetti's House (2261 Center Street, Cambria); Camozzi's (2262 Main Street, Cambria); Soto's Market (2244 Main Street, Cambria); The Leffingwell House (2420 Main Street, Cambria); The Olallieberry Inn (2476 Main Street, Cambria); The Lull House (1880 Main Street, Cambria); The Old Santa Rosa Chapel (2353 Main Street, Cambria); The Thorndyke House (4286 Bridge Street, Cambria); The First Presbyterian Church (4314 Bridge Street, Cambria); The Bank of Cambria (2255 Main Street, Cambria); Fog's End (2735 Main Street, Cambria) (PLN_SDE_PLN_DES_HISTORIC_Points GIS Layer)
Shamel Park	Day use park operated by the County of San Luis Obispo
Estero Bluffs State Park	355 acres consisting of grassland dominated coastal terrace that slopes from Highway One to the Pacific Ocean. The purpose of the park is to preserve and protect a rich, diverse, and scenic area of the Pacific Ocean coast. There are intertidal areas, wetlands, low bluffs and coastal terraces punctuated by a number of perennial and intermittent streams, as well as a pocket cove and beach at Villa Creek. The area provides a natural habitat for a number of endangered species including the snowy plover (slostateparks.com).
Harmony Headlands State Park	Located 2.6 miles south of Harmony. Constant winds and salt spray result in vegetation tolerant of these conditions. The flat coastal terraces, valleys and steep coastal bluffs are home to grasslands and coastal scrub containing plants such as San Luis Obispo morning glory, California buttercup, yarrow and lupine. The area contains diverse and unique habitats supporting rare, endangered and sensitive plant and animal species (slostateparks.com).

Santa Rosa Creek Area Watersheds

Cambria Pines Easement	1450 acres held by The Nature Conservancy (National Conservation Easement Database, 2013)
Hearst Ranch	Hearst Ranch encompasses an impressive variety of habitats and topography - elevations on the Ranch rise from sea level along the coastline to 3,600 feet on some of the peaks along the ridgeline of the Santa Lucia Mountains. Grassland-covered coastal terraces extend to natural sea bluffs, rocky headlands and sandy beaches. Over 1,400 acres of riparian woodland is present on the property. Riparian woodland species include Sycamore and Coast live oak (Ca. Resources Agency, 2004).
Climate Change Considerations	
	In the Santa Rosa Creek watershed, such a rise in sea-level would put new areas at risk of flooding, increase the likelihood and intensity of floods in areas that are already at risk, and accelerate shoreline recession due to erosion (Figure 2-6) (Heberger, et al. 2009). See also IRWMP, 2014 Section H, Climate Change *General County data, not specific to watershed*

Watershed Codes:

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.140201	1	Cambria	4	Santa Rosa	310.14	Green Valley Creek	Lower Green Valley Creek
3310.140101	1	Cambria	4	Santa Rosa	310.14	Santa Rosa Creek	Lower Santa Rosa Creek
3310.140202	1	Cambria	4	Santa Rosa	310.14	Green Valley Creek	Upper Green Valley Creek
3310.140102	1	Cambria	4	Santa Rosa	310.14	Santa Rosa Creek	Upper Santa Rosa Creek
3308.000603	0	Undefined	0	Undefined	308.00	Undefined	Villa Creek
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- The first recorded accounts of Santa Rosa Creek valley are those made during the Portola Expedition where, in September 1769, the party encountered a "canyon… and arroyo surrounded with hills of pine". On numerous instances, the expedition party noted flowing streams, both along what is now known as the mainstem Santa Rosa Creek and from many of its "springs", or tributaries. Few other records of this area's natural resources were made for several decades despite the establishment of Mission San Miguel (1779) near present-day Paso Robles and the growing use of the Santa Rosa and San Simeon watershed areas for timber and wild game to support the Spanish population throughout the southern Coast Range region.

- 1840 – Don Julian Estrada granted possession of Rancho Santa Rosa, 13,200 ac land encompassing a portion of western half of watershed.
- In the early 1800's, the area of Cambria was established with rapid growth occurring between 1860 and 1880. The town of Cambria was established in 1866. Rapid urban population growth began in the 1950's with the population rowing from 788 in 1950 to 6,624 in 2009. Existing vegetation cover was cleared for land use activities which led to the widespread formation of erosion features and channel incision. Scrub/shrub vegetation cover would not begin to recover until the late 1900's.
- There was a severe drought in 1863-1864 which killed off a large portion of the livestock.
- Logging began in the watershed in 1779, with the peak of activity occurring between the late 1800's and the early 1900's. In 1916, logging declined steeply following the removal of old growth timber. The last saw mill in the area closed in 1971.
- In 1840 Cattle Ranching began in the watershed and continued to build through current day.
- In 1840, Don Julian Estrada was granted possession of Rancho Santa Rosa – a 13,200-ac land holding encompassing a portion of the western half of the watershed.
- In 1862, Mercury was discovered in the region. In 1874, Oceanic mine began production with activities increasing in 1916 associated with WWI.
- In the early 1870's the Estrada land was sold to George Hearst who converted the land to agricultural uses. This included the draining of a wetland area that extended from the Perry and Green Valley creek confluence north towards Santa Rosa Creek. This created an artificial stream course for lower Perry Creek which remains today.
- In the late 1800's, gullies were filled in to accommodate agricultural land uses.
- In 1939, Highway 1 and Santa Rosa Road were improved. IN 1964, the Highway 1 bypass was constructed around downtown Cambria.
- In 1974, Highway 46 was constructed through Green Valley.
- Floods occurred in the region in 1914, 1956, 1969, and 1995.
- 2001 –building moratorium based on limited water availability established
- 2005 - San Luis Obispo County stream crossing inventory and fish passage evaluation*,* Fiscalini streambank stabilization
- 2006 - Burton Street Bridge Barrier removal
- 2007-08 - Steelhead enhancement, bank stabilization, and educational signs downstream of Highway 1 Bridge
- 2010 - Non-native eucalyptus tree removal downstream of Highway 1
- 2011 - Ferrasci Road barrier removal

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	**Pollution Sources** NP (non-point) MP (Major Point)	Environmental Flows

Santa Rosa Creek Area Watersheds

Green Valley Creek	Undetermined	Not assessed	n/a	Not assessed
Santa Rosa Creek	Undetermined	Temperature, water	Water Diversions, Urban Runoff, Agriculture, Disturbed Sites (Land Dev.), Grazing Related sources	Lower: Spring: 2.5 cfs. Summer 0.75 cfs. Upper: Spring: 2.5 cfs. Summer: 0.35 cfs
Villa Creek	Undetermined	Not assessed	None	Lower: Spring: 1.03 cfs. Summer: 0.38 cfs.

Watershed Health by Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Santa Rosa Valley	2,260 AFY (Cambria County Water District, 1976; Carollo, 2012)	Sea Water Intrusion (DWR, 1975) Wide seasonal fluctuation in groundwater availability (Carollo, 2012)	Yes; see description below.	None, CCRWQB, 2011
Villa Valley	1,000 AFY (DWR 1958; Carollo, 2012))	Physical limitations and water quality issues (Carollo, 2012)	None (Carollo, 2012)	None, CCRWQB, 2011

Groundwater Quality Description: Chloride content increased more than ten times from 80 ppm in 1955 to 933 ppm in 1975. Background chloride concentrations typically ranged from 30 to 270 ppm. One well had a concentration of 1,925 ppm in November 1961. The Santa Rosa Creek management plan also reports corrosivity effects by water supplies and natural or industrial influenced balance of hydrogen, carbon and oxygen in the water which is affected by temperature and other factors.

Groundwater is found in alluvial deposits with an average specific yield of 17 percent. Groundwater is unconfined and generally flows westward. (Ca. Dept of Water Resources, 2003)

Santa Rosa Creek Area Watersheds

Holocene-aged alluvial deposits consist of unconsolidated sand, clay, silt, and gravel of primarily fluvial origin. Commonly, the deposits are about 100 feet thick beneath the center of the valley and more than 120 feet thick at the coast (Ca. Dept. of Water Resources, 2003)

Primary Issues

Issue	*Potential Causes*	*Referenced from*
Surface flow quantity	Extraction and diversions	Greenspace Cambria, 2012
Surface Water Temperature – Santa Rosa Creek 303(d) listed	Limited riparian cover	Greenspace Cambria, 2012
Low dissolved oxygen in lagoon	Low instream flows	Greenspace Cambria, 2012
Fine sediment in lower reaches	Historical land clearing	Greenspace Cambria, 2012
Fish Passage Barriers	Infrastructure changes over time	Greenspace Cambria, 2012
Non-native invasive species	n/a	Greenspace Cambria, 2012
Sedimentation	Grazing/Cattle	National Marine Fisheries Service, 2007.
Water Quantity	Groundwater extraction, low summer flow	National Marine Fisheries Service, 2007
GW basin seawater intrusion		Ca DWR, 2003
GW quality - chloride		Ca DWR, 2003
Outdated basin studies – Villa Valley basin		Carollo, 2012

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Significant Studies in Progress:

Lower Santa Rosa Creek Enhancement Plan

Water quality monitoring snapshot days (ongoing, annual), Cambria Community Services District.

Cayucos Creek – Whale Rock Area Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay 10	Cayucos WPA 3	54,974 acres	Pacific Ocean / Estero Bay	Cayucos Valley, Old Valley, Toro Valley & Morro Valley	County of San Luis Obispo, Cayucos, Morro Bay (ptn) Los Padres National Forest

Description:

The Cayucos Creek Area Watershed(s) lies within the southern portion of the California Coast Range. The watershed is bounded to the west by Pacific Ocean and the east by the Santa Lucia Mountain Range. Consistent with the CalWater HUC 10 grouping scale, the watershed area contains four major drainages: Cayucos Creek, Old Creek, Toro Creek and Morro Creek, the latter of which borders and shares some attributes with the Morro Bay watershed. The headwaters of the watershed are in Santa Lucia Range, reaching a maximum elevation of approximately 2,345 feet with the lowest elevation at around at sea level, draining in to the Pacific Ocean. Whale Rock reservoir is located in the Cayucos Creek drainage approximately ½ mile east of the community of Cayucos. The dominant land use in the watershed is Agriculture with the sea side town of Cayucos providing an urban core area with tourist oriented opportunities.

Existing Watershed Plans:

None to date

Cayucos Creek – Whale Rock Area Watersheds

Characteristics:

	Physical Setting	
	Rainfall	Average Annual: 16 in (coast) - 32 in. (mountains) (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1990-2012): 54°-67°F Winter Range (December 1990-2012): 43°-62°F (Morro Bay, *outside of watershed*, NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Cayucos Creek and Cottontail Creek are steep Franciscan non-infiltrative headwaters with flat pre-Quaternary moderate infiltrative valleys – Category #1. Torro Creek sub-watershed is steep Franciscan non-infiltrative – Category #2. Old Creek is moderately steep to steep pre-Quaternary non-infiltrative material – Category #9. The Morro Creek sub watershed consists of steep pre-Quaternary non-infiltrative headwaters and a flat Franciscan low infiltrative valley – Category #4 Whale Rock Reservoir is composed of flat Franciscan low infiltrative valley – Category #10 (Bell, pers. comm., 2013). Groundwater is found in Pleistocene and Holocene alluvium and terrace deposits. The specific yield is estimated at 15 percent. Alluvium consists of unconsolidated sand, clay, silt, and gravel. The deposits are often about 100 feet thick near the center of the valley and more than 120 feet thick at the coast. Stream-terrace deposits are primarily unconsolidated deposits of marine origin. They are generally less than 10 feet thick. (Chipping, 1987)
	Hydrology	
	Stream Gage	Yes; USGS 11142100 (Toro Creek at Toro Creek Road, viewed August 2013) Yes, Morro Creek installed in 1970. (SLO County Water)
	Hydrology Models	None to date.
	Peak Flow	4,600 cfs, Jan. 1973 (USGS, 1970-78, viewed August 2013)
	Base Flow	5.74 cfs (USGS, 1970-78, viewed August 2013)
	Flood Reports	Yes, SLO County Flood Control and Water Conservation District, 2009
	Flood Control Structures	Bridges: 3 over Toro Creek on Toro Creek Road; 2 over Old Creek on Santa Rita Road and Cabrillo Street; 1 over Cottontail Creek on Cottontail Creek Road; 1 over Willow Creek on Ocean Boulevard; 4 over Cayucos Creek on

Cayucos Creek – Whale Rock Area Watersheds

		Ocean Avenue, Cayucos Creek Road and Picachio Drive (2); 1 over Little Cayucos Creek on Ash Street (PWD Bridges GIS Layer) Pipelines; levees; pump station; stormdrain; inlets; outfall structures; diversion pipe (SLO County Flood Control and Water Conservation District, 2009).
	Areas of Flood Risk	Toro, Old, Cayucos, Little Cayucos Creeks are flood-prone natural drainage courses that should be maintained in their natural state to protect native vegetation and wildlife habitats. A lack of suitable conveyance facilities for stormwater runoff has led to frequent flooding problems in the coastal community of Cayucos, including serious flooding adjacent to Cayucos Creek. (SLO County Flood Control and Water Conservation District, 2009) Serious flooding occurs in the floodplain of Cayucos Creek west of HWY 1, bounded by the mobile home park to the North and Cayucos Drive to the South: Flooding occurs during storm events due to flows overtopping Cayucos Creek, west of highway 1, creating inability for local drainage to enter creek and dissipate. (SLO County Flood Control and Water Conservation District, 2009)
	Biological Setting	
	Vegetation Cover	Primarily non-native annual grassland with coast live oak woodland, coastal scrub consisting mainly of chamise and California sagebrush, some mixed evergreen forest, and coastal dune. (SLO County vegetation shapefile, 1990) Many drainages are partially lined with willow riparian scrub near the coast. *Data limited by age of shapefile*
	Invasive Species	No data available
	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 (CNDDB, 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*

Cayucos Creek – Whale Rock Area Watersheds

Common Name	Status	BURNETT PEAK	BURRO MOUNTAIN	LIME MTN	PEBBLESTONE SHUT-IN	PIEDRAS BLANCAS	SAN SIMEON
Animals							
California red-legged frog	FT			x	x	x	x
ferruginous hawk	SA (Wintering)						x
foothill yellow-legged frog	SSC						x
fringed myotis	SA						x
long-legged myotis	SA						x
monarch butterfly	SA	x	x			x	x
pallid bat	SSC						x
prairie falcon	SA (Nesting)	x			x		x
steelhead - south/central California coast DPS	FT				x	x	x
tidewater goby	FE					x	x
Townsend's big-eared bat	SSC	x					x
tufted puffin	SSC					x	
two-striped garter snake	SSC				x		x
western pond turtle	SSC				x	x	x
Plants							
adobe sanicle	SR; CRPR 1B.1					x	
Arroyo de la Cruz manzanita	CRPR 1B.2				x	x	x
Arroyo de la Cruz mariposa-lily	CRPR 1B.2					x	
bristlecone fir	CRPR 1B.3	x					x
Cambria morning-glory	CRPR 4.2					x	
Carmel Valley bush-mallow	CRPR 1B.2				x		

Cayucos Creek – Whale Rock Area Watersheds

Common Name	Status	BURNETT PEAK	BURRO MOUNTAIN	LIME MTN	PEBBLESTONE SHUT-IN	PIEDRAS BLANCAS	SAN SIMEON
Chorro Creek bog thistle	FE; SE; CRPR 1B.2				x		
compact cobwebby thistle	CRPR 1B.2					x	x
Cook's triteleia	CRPR 1B.3	x			x		
Dudley's lousewort	SR; CRPR 1B.2					x	x
dwarf goldenstar	SR; CRPR 1B.2					x	
Hardham's bedstraw	CRPR 1B.3	x			x		x
Hearsts' ceanothus	SR; CRPR 1B.2					x	x
Hearsts' manzanita	SE; CRPR 1B.2					x	x
Hickman's onion	CRPR 1B.2					x	x
late-flowered mariposa-lily	CRPR 1B.2				x		
maritime ceanothus	SR; CRPR 1B.2					x	x
marsh microseris	CRPR 1B.2					x	
Monterey pine	CRPR 1B.1						x
Monterey spineflower	FT; CRPR 1B.2						x
most beautiful jewel-flower	CRPR 1B.2			x	x	x	x
Palmer's monardella	CRPR 1B.2	x				x	
perennial goldfields	CRPR 1B.2					x	
pink Johnny-nip	CRPR 1B.1					x	
San Luis mariposa-lily	CRPR 1B.2				x		
San Luis Obispo owl's-clover	CRPR 1B.2					x	x
San Luis Obispo sedge	CRPR 1B.2	x			x	x	x

Cayucos Creek – Whale Rock Area Watersheds

Common Name	Status	BURNETT PEAK	BURRO MOUNTAIN	LIME MTN	PEBBLESTONE SHUT-IN	PIEDRAS BLANCAS	SAN SIMEON
San Simeon baccharis	CRPR 1B.2				x	x	
Santa Lucia bush-mallow	CRPR 1B.2				x		
Toro manzanita	CRPR 1B.2	x					
woodland woollythreads	CRPR 1B.2				x	x	

Steelhead Streams	Yes; Cayucos Creek, Old Creek, Cottontail Creek, Toro Creek, Morro Creek (Carollo, 2012).
Stream Habitat Inventory	Yes; USFW, 1994 *Data limited by age of study*
Fish Passage Barriers	Morro Creek: Crossing at Morro Creek Ranch, Cerro Alto Campground on Highway 41, Highway 41 culvert, Dam, Natural bedrock falls (National Marine Fisheries Service, 2007). Old Creek: Whale Rock Dam/Reservoir very close to mouth (National Marine Fisheries Service, 2007). Toro Creek: Toro Creek Rd.-2 barriers coming from Highway 41 side, Flashboard dams-1 on Borg property on Highway 41 side, 1 location unknown (National Marine Fisheries Service, 2007)
Designated Critical Habitat	Yes; Steelhead Trout; California red-legged frog (USFWS Critical Habitat Portal, 2013)
Habitat Conservation Plans	Yes; Morro Bay Estuary Comprehensive Conservation and Management Plan, Chorro and Morro Groundwater Basin Management Plan
Other Environmental Resources	San Luis Obispo Coastal Zone, Cayucos Beach, Cayucos State Beach, Critical Coastal Area, Whale Rock Reservoir (SLO County Flood Control and Water Conservation District, 2007)
Land Use	
Jurisdictions and Local Communities	County of San Luis Obispo, Town of Cayucos, Portion of Morro Bay
% Urbanized	6% (3% in City of Morro Bay, 0.8% in City of Atascadero city limits, 0.04% Cayucos Commercial, 0.03% Public Facilities, 2.5% Residential) (SLO County LUC)

Cayucos Creek – Whale Rock Area Watersheds

% Agricultural	68% Agriculture (row crops, vineyards, orchards and rangeland) (SLO County LUC)
% Other	26% (11% open space - Coastal and surrounding Whale Rock Reservoir, 1.6% Recreation - beaches, Morro Strand State Beach, whale rock reservoir, Cerro Alto campground, 13% rural lands) (SLO County LUC)
Planning Areas	Adelaida, Estero, Salinas River Planning Areas
Potential growth areas	Cayucos
Facilities Present	Whale Rock Reservoir, Cayucos Area Water Organization; Cayucos Water Treatment Plant (Whale Rock Reservoir water treatment)
Commercial Uses	Industrial facilities: (Whale Rock Pit -Negranti Construction, Guerra Quarry - Weyrick Companies, Standard Oil Company Tank Farm, Chevron); agriculture; tourism; retail outlets; hotels; restaurants; fishing
Demographics	
Population	9,795 in watershed 2,592 in the community of Cayucos (U.S. Census, 2010).
Race and Ethnicity	Caucasian, representing 81.3%. Latinos represent 13% in City. Mixed Race representing 2%. The remaining races each represent less than 3%, including African American (0.3%), American Indian (0.6%), Pacific Islander (0.1%), and Asian (2.4%) (U.S. Census Blocks, 2010). Cayucos: Caucasian, representing 91.3%. Asians representing 2.1%. Mixed Race representing 2.4%. The remaining races each represent less than including African American (0.2%), American Indian and Alaska Native (0.5%), Pacific Islander (0.3%). (US Census, 2010)
Income	MHI \$49,312 in watershed (U.S. Census Tracts, 2010) MHI \$59,130 in Cayucos (US Census, 2010)
Disadvantaged Communities	No; 18.3% of individuals are below poverty level in watershed (U.S. Census Tract, 2010). 11% of individuals are below poverty level in Cayucos (US Census, 2010)
Water Supply	
Water Management Entities	Yes; Cayucos Area Water Organization, which consists of San Luis Obispo County Services 10A (Southern Cayucos), Paso Robles Beach Water Association, the Cayucos Cemetery District and Morro Rock Mutual Water Company (Boyle, 2007)
Groundwater	Yes; Alluvial; Cayucos Valley, Old Valley, Toro Valley & Morro Valley Basins Cayucos Area Water Organization well located in Old Valley Creek – downstream from Whale Rock Reservoir.
Surface Water	Yes; Whale Rock Reservoir (San Luis Obispo 22,283 AFY, Cal Poly 13,707 AFY, California Men's Colony 4,570 AFY, Paso Robles Beach Water Association 222 AFY, County Service Area 10A 190 AFY, Cayucos-Morro Bay Cemetery District 18 AFY, Mainini Ranch 50 AFY, Ogle 14 AFY) (SLOCountyWater.org)

Cayucos Creek – Whale Rock Area Watersheds

Imported Water	Yes; agreements with City of SLO for transfer of 25 to 90 AFY from Nacimiento Water Project (Carollo, 2012)
Recycled / Desalinated Water	None
Key groundwater percolation area(s)	No data on key areas identified Basin recharge comes primarily from seepage of surface flows in creeks, deep percolation of precipitation, and residential/agricultural return flows. Old Valley basin recharge is augmented by dam underflow and seepage from reservoir releases. (Carollo, 2012)
Water budget	None to date
Water Uses	
Beneficial Uses	*Cayucos Creek* - 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), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Preservation of Biological Habitats of Special Significance (BIOL), Threatened, or Endangered Species (RARE), Estuarine Habitat (EST), Freshwater Replenishment (FRESH), and Commercial and Sport Fishing (COMM). *Morro Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN) (CCRWQCB, 2011)
Other Unique Characteristics	
Whale Rock Reservoir	Whale Rock Reservoir is located on Old Creek Road approximately one-half mile east of the community of Cayucos. The project was planned, designed, and constructed under the supervision of the State Department of Water Resources. Construction took place between October 1958 and April 1961. The reservoir is jointly owned by the City of San Luis Obispo (55.05%), the California Men's Colony (CMC) (11.24%), and Cal Poly (33.71%). These three agencies, with the addition of a representative from the Department of Water Resources, form the Whale Rock Commission, which is responsible for operational policy and administration of the reservoir and related facilities. Day-to-day operation is provided by the City of San Luis Obispo.

	In April 1996, the downstream water rights agreement was amended and replaced with a new agreement, establishing water entitlements for adjacent and downstream water users. The downstream water users (Cayucos Area Water Organization or CAWO) affected by this agreement consist of three public water purveyors and the cemetery, plus two other rural/agricultural users, all in the Cayucos area. These agencies are the Paso Robles Beach Water Association, Morro Rock Mutual Water Company, County Service Area 10A, and Cayucos-Morro Bay Cemetery District.
Historical Resources	Captain James Cass House (222 Ocean Ave., Cayucos); Cayucos Pier (PLN_DES_HISTORIC_POINTS GIS Layer)
Los Padres National Park	Provides a diverse wildlife habitat with 23 threatened and endangered animals. The Forest has one endangered plant, two threatened plant species and 71 sensitive plant species. Management of riparian vegetation focuses on supporting fish and wildlife populations. There are over 870,000 acres of livestock grazing allotments in the Forest. Prehistoric and historic Native American sites, properties related to the practice of Indian and non-Indian religion, historic properties and districts are also in the Park. The Big Sur Coast is on of the outstanding features of the Los Padres National Forest. Several popular recreation facilities along the coast that attract visitors year-round. Land acquisitions in this area from 1992 to the present included a total of almost 9,300 acres. The Forest acquired the 1,226-acre Brazil Ranch in the Bixby Creek through a partnership with the Trust for Public Land.
San Luis Obispo Coastal Zone	Spanning 118 miles of coastline with numerous wide sandy beaches, sheltered bays, and vista pints offering scenic views of the Pacific Ocean. - The coastal zone of San Luis Obispo County is known throughout the state for its beauty and diversity. The north coast is characterized by the rugged headlands to Big Sur. The rocky shoreline along the Hearst Ranch is highly valued for offshore views of marine mammals as well as scenic cliffs and rocky points. The beach, sandspit, and extensive wetlands of Morro Bay form a unique setting for wetland habitat study.
Cayucos State Beach	Park operated by the State of California. Known for its fishing pier, beautiful beach and historical buildings. Buildings left over from the prospering old town still stand as a variety of shops such as restaurants, antique stores, and specialty items. The sandy beach offers mild weather, watersports such as surfing and swimming and tidepooling. There are picnic tables, play equipment, restrooms, and outside showers available. The pier is lit for night fishing.
Hardie Park, Norma Rose Park (undeveloped), Paul Andrew Park	Group Day-Use facilities operated by the County of San Luis Obispo.

Cayucos Creek – Whale Rock Area Watersheds

	Climate Change Considerations	
		See IRWMP, 2014 Section H, Climate Change *Data is general for County, not Watershed specific*

Watershed Codes

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.160000	-	Cambria	-	Cayucos	3310.16	Unidentified	Cayucos Creek
3310.170001	1	Cambria	7	Old	3310.17	Undefined	Cottontail Creek
3310.170002	1	Cambria	7	Old	3310.17	Undefined	Whale Rock Reservoir
3310.170003	1	Cambria	7	Old	3310.17	Undefined	Old Creek
3310.180000	8	Cambria	1	Toro	3310.18	Unidentified	Toro Creek

Major Changes in the Watershed

- Prehistorically the local area was inhabited by the Chumash people, who settled the coastal San Luis Obispo area approximately 10,000 to 11,000 BC, including a large village to the South of Cayucos at Morro Creek (Cayucos by the Sea).
- Captain James Cass left his New England home, sailed around the Horn and settled in Cayucos in 1867 on 320 acres of the original Rancho Moro Y Cayucos Spanish Land Grant of 8,845 acres. He realized the future possibilities of the excellent location as a shipping port of cheese, hides, beef and fresh water (Cayucos by the Sea).
- The Cayucos pier was constructed by Captain James Cass, the founder of Cayucos, in 1872 and was rebuilt and lengthened to 982 feet into deeper water in 1876. The pier was an immediate commercial success with steamships from Los Angeles and San Francisco docking several times per week. The severe drought of the late 1890's weakened Cayucos economically. And while in 1915 the pier received an economic boost when an abalone canning plant was built about half way out, it became less commercially viable through the early 1900's (Cayucos Pier Project).
- Pier became state property in 1920 and over the next 30 years once again became central to the economic health of the community. As residents of the San Joaquin Valley discovered Cayucos and its Mediterranean climate the pier became very popular with sport fishermen and has remained popular for generations. Anglers young and old have

caught a wide variety of fish including: red snapper, smelt, sea trout, halibut, salmon, rock fish, perch, shark and rays. For those who wanted larger catches and bigger fish, in the 1940's, 50's & 60's party boats used Cayucos as a fair-weather anchorage every summer. They took their customers deep water fishing north of Cayucos, loading and unloading fishermen from the pier (Cayucos Pier Project).

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Cayucos Creek (Pacific Ocean Outlet)	Undetermined	Enterococcus	Agriculture	**Lower**: Spring: 0.82 cfs. Summer: 0.32 cfs.
Cottontail Creek	Undetermined	Not assessed	Undetermined	Not assessed
Old Creek	Undetermined	Not assessed	Undetermined	**Lower**: Spring: 1.31 cfs. Summer: 0.45 cfs **Upper**: Spring: 0.83 cfs. Summer 0.33 cfs.
Toro Creek	Undetermined	Fecal Coliform , Low Dissolved Oxygen	Industrial Activities (Oil), Natural Sources, Agriculture	**Lower**: Spring: 1.01 cfs Summer: 0.37 cfs
Morro Creek	Undetermined	No	Undetermined	See instream flow study by Stillwater Sciences (appendix X)
Whale Rock Reservoir	n/a	n/a	n/a	

Cayucos Creek – Whale Rock Area Watersheds

Watershed Health by Major Groundwater Basin

Groundwater Basin	**Estimated Safe Yield** (Carollo, 2012)	**Water Availability Constraints** (Carollo, 2012)	**Drinking Water Standard Exceedance**	**Water Quality Objective Exceedance**(CCRWQB, 2011)
Cayucos Valley	600 AF	Physical limitations and water quality issues. The shallow alluvial deposits are typically more susceptible to drought impacts	*Yes; see description below.	No for basin. No information for sub-basin
Old Valley	505 AF	Physical limitations, water rights and environmental considerations	**Yes; see description below.	No for basin. No information for sub-basin
Toro Valley	532 AF	Physical limitations, water quality	None	No
Morro Valley	1500 AFY	Physical limitations, water quality issues, and water rights	***Yes; see description below.	

Groundwater Quality Description: Toro Valley: Total dissolved solids (TDS) typically range between 400 to 700 mg/L. In the lower basin near Highway 1, petroleum hydrocarbon contamination associated with Chevron marine tracker terminal has been detected in groundwater and remedial activities are ongoing (Carollo, 2012).

*Analysis of groundwater from 32 wells in this basin taken during 1957 through 1993 show TDS content ranging from 346 to 2,462 ppm. Portions of the basin have chloride levels exceeding 100 ppm, indicating seawater intrusion has occurred (Carollo, 2012).

**Analyses of groundwater from 33 wells in this basin taken during 1957 through 1993 show TDS content ranging from 346 to 2,462 ppm. Portions have chloride levels exceeding 100 mg/L. (Carollo, 2012).

*** In the mid-1980's TDS concentrations in groundwater downstream of the narrows near Highway 1 began to exceed 1,000 mg/l seasonally due to sea water intrusion. Measured in 2007, basin TDS concentrations were typically between 400 and 800 mg/l and increasing toward the coast, except for an area beneath agricultural fields in the lower valley where TDS concentrations reached 1000 mg/l, and nitrate concentrations reached 220 mg/l as nitrate (Cleath & Associates 1993a; 2007).

Cayucos Creek – Whale Rock Area Watersheds

Critical Issues

Issue	*Potential Causes*	*Referenced from*
Treat to lagoon	Channelization, pollution	National Marine Fisheries Service, 2007
Loss of riparian width	Agriculture	National Marine Fisheries Service, 2007
Lack of enforcement		National Marine Fisheries Service, 2007
Water quantity	Agricultural and residential extractions	National Marine Fisheries Service, 2007
Erosion and Sedimentation		National Marine Fisheries Service, 2007
Sea Water Intrusion (Cayucos Valley basin)		Carollo, 2012
Nitrates	Agriculture	Carollo, 2012
Outdated Basin study – Cayucos Valley basin		Carollo, 2012
Alluvial water deposits subject to drought impacts		Carollo, 2012
Outdated groundwater basin analysis – Toro Valley		Carollo, 2012
Cayucos Creek 303(d) listed for enterococcus	Agriculture	Carollo, 2012
Toro Creek 303(d) listed for fecal coliform and low dissolved oxygen	Industrial Activities (Oil), Natural Sources, Agriculture	Carollo, 2012

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Cayucos Creek – Whale Rock Area Watersheds

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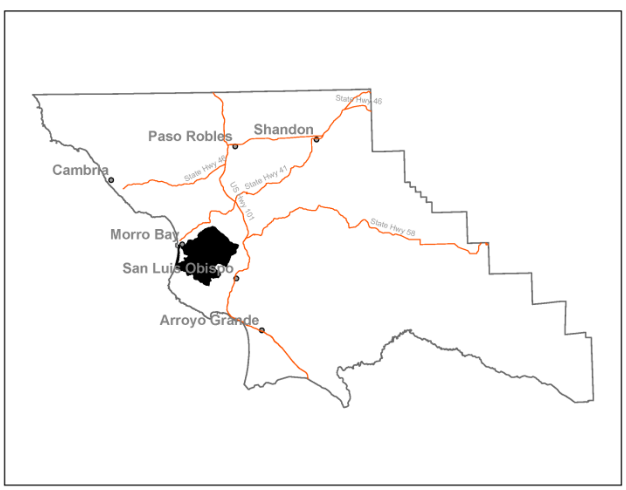
Significant Studies in Progress:

Morro Bay Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay HU 10	Morro Bay WPA 4 Los Osos WPA 5	46,598 acres	Pacific Ocean via Morro Bay estuary	Los Osos Valley, Chorro Valley	County of San Luis Obispo City of Morro Bay Town of Los Osos Camp San Luis Obispo California Men's Colony California Polytechnical State University U.S. Forest Service CA Department of Parks and Recreation

Photo by: N. Smith



Description:

The Morro Bay Watershed is located in the central area of coastal San Luis Obispo County. It is composed of two major sub-watersheds that drain into Chorro and Los Osos Creeks. The Chorro Creek sub-watershed accounts for about 60 percent of the total land area draining into the estuary.

Much of the watershed remains in open space that is used primarily for agriculture and a range of public uses, including parks, golf courses, nature preserves, a military base, and university-owned rangeland. The developed portions of the watershed include the community of Los Osos/ Baywood Park, parts of the City of Morro Bay, Cuesta College, Camp San Luis Obispo, the California Men's Colony, and various facilities of the County of San Luis Obispo.

Due to the uniqueness of Morro Bay, the watershed has been studied since the late 1980's with watershed plans from that era being completed and forming the foundation

Watershed Plans:

Morro Bay Comprehensive Conservation Management Plan (MBNEP, 2013)

Morro Bay Watershed

Characteristics:

	Physical Setting	
	Rainfall	16 – 35 inches (NRCS Precipitation 1981 – 2010) 20 – 22 inches Mean Annual (SLO County Water.org)
	Air Temperature	Summer Range (August 1981-2010): 56°- 69° F Winter Range (December 1981-2010): 45°- 65° F At Morro Bay Fire Station, Morro Bay, CA. (NOAA National Climatic Data Center, viewed 2013)
	Geology Description	The Warden Creek and Los Osos Creek sub watersheds consist of steep pre-Quaternary non-infiltrative headwaters and a flat highly infiltrative Quaternary valley – category #12. The Chorro Creek sub watershed consists of steep pre-Quaternary non-infiltrative headwaters and a flat Franciscan low infiltrative valley- category #4. (Bell, personal communication, 2013) Morro Bay was formed during the last 10,000 to 15,000 years. A post-glacial rise in sea level of several hundred feet resulted in a submergence of the confluence of Chorro and Los Osos creeks. The geology of the watershed is highly varied, consisting of complex igneous, sedimentary, and metamorphic rock. Over fifty diverse soils, ranging from fine sands to heavy clays, have been mapped in the area. (US EPA, 2003)
	Hydrology	
	Stream Gage	Yes; No USGS gages identified. County gages at Chorro Creek at Canet Road (1978 – present, active); San Luisito Creek at Highway 1 (1985-present, active); and Los Osos Creek and Los Osos Valley Road (1993 - present, active) (SLO County Water.org, viewed 2013).
	Hydrology Models	Yes; Tetra Tech developed the Chorro Creek sediment model. (MBNEP, 2011) Limited data that is not at the watershed scale.
	Peak Flow	Chorro Creek: 5,956 - 7,490 cfs at Canet Road (MBNEP, 2011) No source identified for Los Osos Creek or Warden Creek. Limited data.
	Base Flow	Chorro Creek: 63 – 76 cfs at Canet Road (MBNEP, 2011) No source identified for Los Osos Creek or Warden Creek. Los Osos Creek regularly goes dry during the summer at its crossing with Los Osos Valley Road (MBNEP, personal communication, 2013). Limited data.
	Flood Reports	Yes; Preliminary Engineering Evaluation, Los Osos/Baywood Park Community Drainage Project for San Luis Obispo County Service Area No. 9J (Engineering Development Associates, December 1997).

The most significant residential flooding problems experienced by the Los Osos and Baywood Park communities are from natural sumps.

Primary areas of flooding concern are Los Osos Valley Road in the town of Los Osos, and east of town near its intersection with Cimarron Road (SLO County FCWCD, 2009).

Biological Setting

Vegetation Cover

Primarily non-native grassland with some coast live oak forest, northern coastal salt marsh, willow riparian forest, coastal scrub, morro manzanita, chaparral (chamise, leather oak and pine), beaches and coastal dunes, Serpentine-foothill-pine chaparral-woodland , cypress forest, agricultural land and urban land. (SLO County, vegetation shapefile, 1990)

Grassland, coastal scrub, oak woodland, riparian, and wetland (CNPS WHR 1997)

Limited spatial data. No alliance level vegetation mapping was available for the entire County.

Invasive Species

Eucalyptus, African veldt grass, cape ivy, American bullfrog, Sacramento pike minnow, European green crab (MBNEP, Invasive Action Plan, 2010); Several aquatic invertebrates (SLOSEA, viewed 2013).

Special Status Wildlife and Plants

Key: Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern – SSC, CRPR – CA rare plant ranking

Common Name	**Status**	**ATASCADERO**	**MORRO BAY NORTH**	**MORRO BAY SOUTH**	**SAN LUIS OBISPO**
Animals					
American badger	SSC			x	
big free-tailed bat	SSC			x	
black legless lizard	SSC		x	x	
burrowing owl	SSC (Burrow sites and some wintering sites)				x
	ST; Fully Protected			**x**	

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	California black rail	**FE; SE; Fully Protected**		**x**	
	California clapper rail	SSC (Nesting)			x
	California horned lark	Special Animal			x
	California linderiella	**FT**		**x**	**x**
	California red-legged frog	SSC		x	x
	coast horned lizard	Special Animal (Nesting)		x	
	Cooper's hawk	Special Animal		x	
	globose dune beetle	Special Animal		x	
	mimic tryonia (=California brackishwater snail)	Special Animal		x	
	monarch butterfly	Special Animal	x	x	
	Morro Bay blue butterfly	**FE; SE; Fully Protected**		**x**	
	Morro Bay kangaroo rat	**FE**		**x**	
	Morro shoulderband (=banded dune) snail	SSC	x	x	x
	pallid bat	SSC		x	
	San Diego desert woodrat	Special Animal			x
	San Luis Obispo pyrg	Special Animal	x	x	
	sandy beach tiger beetle	SSC		x	x
	silvery legless lizard	**FT**	**x**	**x**	**x**
	steelhead - south/central California coast DPS	**FE**		**x**	

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tidewater goby	SSC				x
Townsend's big-eared bat	SSC (Nesting)				x
tricolored blackbird	SSC				x
western pond turtle	**Fully Protected**				**x**
white-tailed kite	**SR**				**x**
Plants/ Lichen					
adobe sanicle	CRPR 1B.2			x	x
Arroyo de la Cruz manzanita	**ST**			**x**	
beach spectaclepod	CRPR 1B.2		x	x	x
Betty's dudleya	CRPR 1B.1		x	x	x
Blochman's dudleya	CRPR 1B.2			x	
Blochman's leafy daisy	CRPR 1B.3	x	x	x	x
Brewer's spineflower	**FE**			**x**	
California seablite	CRPR 4.2			x	x
Cambria morning-glory	CRPR 1B.2	x			
Carmel Valley bush-mallow	CRPR 2B.2				x
chaparral ragwort	**FE; SE**	**x**	**x**	**x**	**x**
Chorro Creek bog thistle	CRPR 1B.2			x	
coast woolly-heads	CRPR 1B.2			x	
coastal goosefoot	CRPR 1B.1				x
Congdon's tarplant	CRPR 1B.1			x	
Coulter's goldfields	**SR**	**x**			**x**

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	Cuesta Pass checkerbloom	CRPR 1B.2	x	x		x
	Cuesta Ridge thistle	CRPR 1B.1			x	
	dacite manzanita	CRPR 1B.2			x	
	Diablo Canyon blue grass	CRPR 1B.2				x
	dwarf soaproot	CRPR 1B.2			x	x
	Eastwood's larkspur	CRPR 1B.2			x	
	Hardham's evening-primrose	**FE; SE**			**x**	
	Indian Knob mountain-balm	CRPR 1B.2		x	x	x
	Jones' layia	**FE; SE**			**x**	
	marsh sandwort	CRPR 1B.1				x
	mesa horkelia	CRPR 1B.2	x	x	x	
	Miles' milk-vetch	**FT**			**x**	**x**
	Morro manzanita	CRPR 1B.2	x	x	x	x
	most beautiful jewel-flower	CRPR 1B.3			x	x
	mouse-gray dudleya	CRPR 1B.2			x	
	Oso manzanita	CRPR 1B.2	x	x	x	x
	Palmer's monardella	CRPR 1B.2			x	
	Pecho manzanita	**FE; SE**			**x**	
	salt marsh bird's-beak	CRPR 1B.2				x
	San Benito fritillary	CRPR 1B.2		x	x	
	San Joaquin spearscale	CRPR 1B.2	x		x	x
	San Luis mariposa-lily	CRPR 1B.2		x	x	x

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	San Luis Obispo owl's-clover					
	San Luis Obispo sedge	CRPR 1B.2	x		x	x
	Santa Lucia manzanita	CRPR 1B.2			x	
	Santa Margarita manzanita	CRPR 1B.2			x	
		Limited by the type of data collected in the CA Natural Diversity Database.				
	Steelhead Streams	Chorro Creek and Los Osos Creek (NMFS, 2012) Chorro Creek tributaries including Dairy Creek, Pennington Creek, San Bernardo Creek, San Luisito Creek, and 2 unnamed tributaries (NOAA, 2005, p.52574). Walter's Creek (Hardy,M., personal communication, 2013)				
	Stream Habitat Inventory	Yes; Completed 2001 for Chorro Creek, Dairy Creek and Pennington Creek as landowner access allowed by California Conservation Corps. (CEMAR, 2008) There are drafts for Pennington and San Luisito Creeks (Hardy, M., personal communication, 2013) Limited data that does not include other major tributaries.				
	Fish Passage Barriers	San Luisito Creek, Culvert at Adobe road, Temporary Barrier, PAD # 700065.00000; Rancho El Chorro Diversion Dam with Ladder at Pennington Creek, Temporary Barrier, PAD # 700043.00000; Cuesta College Fish Ladder at Pennington Creek, Temporary Barrier, PAD # 700041.00000; Hwy 1 culvert at Pennington Creek, Partial Barrier, PAD # 700040.00000; El CHorro park Culvert at Dairy Creek, Temporary Barrier, PAD # 700039.00000; El Chorro park Dam at Dairy Creek, Temporary Barrier, PAD # 700038.00000; Hwy 1 Culvert at Dairy Creek, Partial Barrier, , PAD # 700037.00000; Camp San Luis Bridge Pilings at Chorro Creek, Partial Barrier, PAD # 700034.00000; Camp San Luis Bedrock falls at Chorro Creek, Temporary Barrier, PAD # 700033.00000; CMC Pipe crossing at Chorro Creek, Temporary Barrier, PAD # 700032.00000; San Anselmo Creek at Hwy 1 Culvert, Unknown status, PAD # 731130.00000; Chorro Stream Grouted Rock Dam and Culvert at Chorro creek, Temporary Barrier, PAD # 705749.00000; Dairy Bedrock Falls at Dairy Creek, Total Barrier, PAD # 705751.00000; Pennington Creek Boulder Cascade, Total Barrier, PAD # 705752.00000; Bridge Apron with grouted rock pool at Chorro Creek, Unknown Status, PAD # 707007.00000; Bedrock falls upstream of Cal Poly Corrals at Pennington Creek, Temporary Barrier, PAD # 707013.00000; Private Drive on San Bernardo Creek Rd at San Bernardo Creek, Temporary Barrier, PAD # 712310.00000; Private Drive on San Bernardo Creek Rd at San Bernardo Creek, Total Barrier, PAD # 712311.00000; Private Drive on San Bernardo Creek Rd at San Bernardo Creek, Partial Barrier, PAD #				

		712312.00000; CMC bridge at Chorro Creek, Unknown Status, PAD # 712313.00000; San Luisito Bridge at San Luisito Creek, unknown Status, PAD #712314.00000; Crossing on private property at San Luisito Creek, Unknown Status, PAD #712316.00000; Diversion Dam at San Luisito Creek, Total Barrier, PAD # 712318.00000; Camp SLO Bridge at Dairy Creek, Unknown Status, PAD #712323.00000; Road Crossing, O'sullivan Airfield at Chorro Creek, Unknown Status, PAD #712331.00000; Road Crossing with gauge station at Chorro Creek, Unkown Status, PAD #712333.00000; South Bay Boulevard Bridge at Chorro Creek, Unknown Status, PAD #712335.00000; CMC bridge at Chorro Creek, Unknown Status, PAD #712337.00000; Chorro Creek Dam at Chorro Creek, Total Barrier PAD # 718832.00000; Fish Passage Project at Los Osos Creek, Unassessed, PAD #707127.00000; Los Osos Bedrock Falls at Los Osos Creek, Total Barrier, PAD # 705750.00000. (CDFW Passage Assessment Database, 2013)
	Designated Critical Habitat	Yes; California red-legged frog, Morro shoulderband snail and Four Plant including Morro Manzanita, Indian Knob mountainbalm, Chorro Creek bog thistle and Pismo clarkia, Western snowy plover, Morro kangaroo rat (USFWS Critical Habitat Portal, viewed 2013) (USFWS, 1998); Steelhead trout (NMFS,2005).
	Habitat Conservation Plans	Yes; Morro shoulderband snail (USFWS Critical Habitat Portal, viewed 2013); South-Central California Steelhead Trout Recovery Plan (NMFS, 2012)
	Other Environmental Resources	San Luis Obispo Coastal Zone, Public Coastal Access, Critical Coastal Area, Morro Rock Ecological Preserve, Morro Bay National Estuary, Sweet Springs Ecological Preserve, Chorro Flats, Morro and Chorro Valley Groundwater Basin, Nine Sisters of San Luis Obispo, Elfin Forest, Los Osos Oaks State Reserve, Morro Bay State Park including a Marine Reserve and a Marine Recreational Management Area, Fishery, eelgrass beds, Pismo and Morro clam preserves
	Land Use	
	Jurisdictions & Local Communities	City of Morro Bay, Town of Los Osos.
	% Urbanized	10.3% (4.37% urban, 5.62% residential and less than 1% commercial/office professional)(SLO County LUC)
	% Agricultural	68.2% (SLO County LUC)
	% Other	21.5% (8.46% open space, 7.30% public facility, 3.08% recreation, 2.48% rural lands and less than 1% wetlands habitat)(SLO County LUC)
	Planning Areas	Estero, San Luis Obispo, Salinas River, San Luis Bay Inland
	Potential growth areas	Los Osos (SLO County Estero Planning Area, 2009)
	Facilities Present	Morro Bay Wastewater Treatment Plant with discharge to Ocean;

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		California Men's Colony and Wastewater Treatment Plant; Cuesta College; Camp San Luis; Chorro Dam
	Commercial Uses	Recreation and tourism at Morro Bay; Homeplace Pit Mine for stone, Beecham Pit, El Chorro Regional Park, and fisheries.
	Demographics	
	Population	26,919 in watershed (US Census Block, 2010) 10,234 in Morro Bay (US Census, 2010) 14,276 in Los Osos (US Census, 2010)
	Race and Ethnicity	Watershed: 64.5% Caucasian (17,376), 18.2% Latino (4907), 9.9% black (2,686), 3.4% Asian (906), 3.7% other (U.S. Census Tract, 2010) Morro Bay: Caucasian, representing 79.4%. Latinos represent 14.9% of the total population in Morro Bay. The remaining races each represent less than 3%, including African American, American Indian, Pacific Islander, and Asian(US Census, 2010). Los Osos: Caucasian, representing 77.7%. Asian persons represent 5.2%. Latinos represent 13.8% of the total population in Los Osos. The remaining races each represent less than 3%, including African American, American Indian, and Pacific Islander. (US Census, 2010).
	Income	MHI $53,461 in watershed.(US Census Tract, 2010) MHI $52,582 in Morro Bay (U.S. Census, 2010) MHI $57,500 in Los Osos (U.S. Census, 2010) Census tract is very large crossing multiple watersheds.
	Disadvantaged Communities	No; 5% of individuals are below poverty level in watershed (U.S. Census Tract, 2010) 13.9% of individuals are below poverty level in Morro Bay (U.S. Census, 2010) 7.1% of individuals are below poverty level in Los Osos (U.S. Census, 2010) Census tract is very large crossing multiple watersheds.
	Water Supply	
	Water Management Entities	City of Morro Bay, Los Osos CSD, Golden State Water Company and S&T Mutual Water Company
	Groundwater	Yes; alluvial, Chorro Valley and Los Osos Valley.
	Surface Water	Chorro Reservoir owned by Camp San Luis Obispo and operated by California Men's Colony; Small reservoirs on agricultural lands.
	Imported Water	Yes; City of Morro Bay has wells in Morro Creek watershed and receives water through the Chorro Valley pipeline of the State Water Project. CA Men's Colony and Cuesta College also receive State Water through the Chorro Valley Turnout. (SLO County State Water Fact Sheet)

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	Recycled/ Desalinated Water	Yes; City of Morro Bay owns a desalination plant, and plans to consider recycled water.
	Infiltration Zones	No source identified.
	Water Budget	None to date. One is planned for Chorro Creek subwatershed by Trout Unlimited.
	Water Uses	
	Beneficial Uses	*Chorro Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *Los Osos Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *Morro Bay Estuary* – Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD), Estuarine Habitat (EST), Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Shellfish Harvesting (SHELL)(RWQCB, 2011)
	Other Unique Characteristics	
	Historical Resources	Morro Rock State Historic Landmark (State Parks, viewed 2013).
	Archeological Resources	There were Chumash towns called Petpatsu, Wexetmimu, Tipexpa and Chitqawi at the time of European settlement (SB Museum of Natural History, viewed 2013). Limited data.
	Nine Sisters	The Nine Sisters, a line of volcanic plugs, dominate the landscape

		from Morro Rock through the City of San Luis Obispo. Morro Rock (576 ft.) is the Pacific terminus, with Black Hill (665 ft.), Cabrillo Peak (911 ft.), Hollister Peak (1,404 ft.) in the Morro Bay watershed.
	Climate Change Considerations	
		State climate change maps show sea level affecting portions of the City of Morro Bay and town of Los Osos with inundation along the State Parks beach and back bay (USGS,Cal-Adapt, viewed 2013). The Morro Bay National Estuary Program and California State Polytechnic University contracted with Battelle–Pacific Northwest Division to enhance an existing circulation and transport model of Morro Bay and to provide estimates of how the bay might respond to sea level rise over the next century (PNWD, 2012). The U.S. Environmental Protection Agency's Climate Ready Water Utilities and Climate Ready Estuaries initiatives coordinated their efforts and engaged water resource stakeholders in a climate change adaptation exercise in Morro Bay, California. Both EPA initiatives focus on addressing climate change and water resource issues with stakeholders that share common interests regarding watershed management (EPA, 2013). See IRWMP, 2014 Section H. Climate Change

Watershed Codes

CalWater / DWR Number	HA	Hydrolgic Area Name	HAS	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.220002	2	Point Buchon	2	Chorro	310.22	undefined	Morro Bay
3310.220001	2	Point Buchon	2	Chorro	310.22	undefined	San Luisito Creek
3310.220003	2	Point Buchon	2	Chorro	310.22	undefined	Chorro Reservoir
3310.230002	2	Point Buchon	3	Los Osos	310.23	undefined	Mouth of Los Osos Creek
3310.230003	2	Point Buchon	3	Los Osos	310.23	undefined	Warden Lake
3310.230001	2	Point Buchon	3	Los Osos	310.23	undefined	Los Osos Creek
3310.270000	2	Point Buchon	7	Morro Bay	310.27	undefined	undefined

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Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)

Major Changes in the Watershed

- In 1542, Portuguese explorer Juan Rodriguez Cabrillo named Morro Bay's magnificent landmark "El Morro" (Spanish for crown shaped hill).
- In 1772, Mission San Luis Obispo was established bringing ranching to the area.
- In 1928, Camp San Luis Obispo was built by the Army National Guard.
- In 1941, Chorro Reservoir was constructed to store runoff water for expanding Camp San Luis Obispo.
- In 1954, California Men's Colony, a state prison, was opened. (MBNEP, 2001)
- In 1963, Cuesta College was opened.
- In 1972, El Chorro Regional Park was created from land donated by Camp San Luis Obispo.
- In 2001, the first Comprehensive Conservation Management Plan was approved for the Morro Bay National Estuary.

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Chorro Creek	Perennial (Sanford, personal communication, 2013)	Yes on 303d list for E. coli, Fecal Coliform, Nutrients, Sediment. Approved USEPA TMDL for Pathogens and Sediment in 2004 and for Nutrients in 2005. (SWRCB, 2010)	Agriculture, Agricultural Storm Runoff, Channel Erosion, Channelization, Dredging, Erosion/Sedimentation, Habitat Modification, Irrigated Crop Production, Grazing Riparian and/or Upland, Natural, Stream bank Modification/ Destabilization, Major Municipal Point Source, Urban Runoff, Unknown(SWRCB, 2010)	X Cfs (Stillwater Sciences, 2013)

Morro Bay Watershed

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Dairy Creek	Ephemeral (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform, Low Dissolved Oxygen. Approved USEPA TMDL for Pathogens and Low Dissolved Oxygen in 2004 (SWRCB, 2010)	Confined Animal Feeding Operation, Unknown(SWRCB, 2010)	
Pennington Creek (and tributary Chumash Creek)	Ephemeral (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform. TMDL for estimated date of completion 2021. (SWRCB, 2010)	Unknown (SWRCB, 2010)	
Walters Creek	Ephemeral (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform. TMDL for estimated date of completion 2021. (SWRCB, 2010)	Unknown (SWRCB, 2010)	
San Luisito Creek	Perennial (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform. TMDL for estimated date of completion 2021. (SWRCB, 2010)	Unknown (SWRCB, 2010)	
San Bernardo Creek	Ephemeral (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform. TMDL for estimated date of completion 2021.	Unknown (SWRCB, 2010)	
Los Osos Creek	Ephemeral (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform, Low Dissolved Oxygen, Nitrate, Nutrients,	Agriculture, Agricultural Storm Runoff, Channel Erosion, Channelization,	

Morro Bay Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	**Pollution Sources** NP (non-point) MP (Major Point)	Environmental Flows
		Sediment. Approved USEPA TMDL for Fecal Coliform and Sediment in 2004 and for Nitrate, Nutrients in 2005. (SWRCB, 2010) TMDL for estimated date of completion 2021. (SWRCB, 2010)	Dredging, Erosion/Sedimentation, Habitat Modification, Irrigated Crop Production, Grazing Riparian and/or Upland, Removal of Riparian Vegetation, Natural, Stream bank Modification/ Destabilization, Urban Runoff, Unknown(SWRCB, 2010)	
Warden Creek	Ephemeral (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform, Low Dissolved Oxygen, Nitrate. Approved USEPA TMDL for Fecal Coliform in 2004 and for Nitrate in 2005. TMDL estimated date of completion 2021. (SWRCB, 2010)	Agriculture, Grazing Related, Unknown (SWRCB, 2010)	
Morro Bay	NA	Yes on 303d list for Fecal Coliform, Low Dissolved Oxygen, Nitrate, Nutrients, Sediment. Approved USEPA TMDL for Fecal Coliform and Sediment in 2004 and for Nitrate,		

Morro Bay Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
		Nutrients in 2005. TMDL for estimated date of completion 2021. (SWRCB, 2010)		

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Chorro Valley Basin	2,210 AFY(San Luis Obispo County, Master Water Report, 2012)	Physical Limitations, water quality issues, environmental demand, and water rights. (San Luis Obispo County, Master Water Report, 2012)	Yes; see description below. (San Luis Obispo County, Master Water Report, 2012)	No. (RWQCB, Table 3-8, 2011)
Los Osos Valley Basin*	3,200 AFY(San Luis Obispo County, Master Water Report, 2012)	Water quality due to sea water intrusion and nitrate contamination(San Luis Obispo County, Master Water Report, 2012)	Yes; see description below. (San Luis Obispo County, Master Water Report, 2012)	Undetermined. (RWQCB, Table 3-8, 2011)
Morro Valley Basin	1,500 AFY(San Luis Obispo County, Master Water Report, 2012)	Physical Limitations, water quality issues, and water rights. (San Luis Obispo County, Master Water Report, 2012)	No. (San Luis Obispo County, Master Water Report, 2012)	Undetermined. (RWQCB, Table 3-8, 2011)

* A court-mandated group comprised of LOCSD, Golden State Water Company, the County of SLO, and S&T Mutual Water Company released a draft Comprehensive Basin Plan for Management of Groundwater Resources in the Los Osos Basin (August, 2013).

Groundwater Quality Description: Chorro Valley Basin- Nitrate concentrations are a concern for water quality in the lower portion of Chorro Valley basin. Sea water intrusion has been documented historically and is a potential future concern in the Chorro Flats area, should pumping patterns change significantly. Recent basin TDS concentrations (measured in 2008) were typically between 500 and 700 mg/l (DWR, 1975; Cleath-Harris Geologists, 2009).

Los Osos Valley Basin - TDS concentrations are generally between 200 mg/L and 400 mg/L. Nitrates are the primary constituent of concern in the upper aquifer, with concentrations in excess of the State drinking water standard of 45 mg/L as nitrate throughout the urban area (Cleath & Associates, 2005, 2006a, 2006b).

Lower aquifer displays characteristics of sea water intrusion on the west side of the basin. TDS concentrations also vary significantly by location, and have been reported at up to 950 mg/L in west side supply wells, although average values in the urban area are closer to 500 mg/L. Sea water intrusion is the main concern for lower aquifer water quality (Cleath & Associates, 2005; GSWC, 2009). (SLO County, 2012)

Primary Issues

Issue	Potential Causes	Referenced from
Accelerated sedimentation	Natural, increased impervious area, lack of vegetation due to land management and fire	MBNEP, 2012
Bacterial contamination	Urban runoff, grazing area runoff, waste disposal from boats, domestic and wild animal waste, septic systems	MBNEP, 2012
Elevated nutrient levels	Wastewater treatment effluent from California Men's Colony, cropland runoff, rangeland runoff, and natural	MBNEP, 2012
Toxic pollutants	Historic mining operations, household and agricultural pesticides, detergents, soaps, oils and lubricants from street drainage, and household or commercial cleaning products, non-fouling paints and other chemicals used for boat maintenance, fuel spills, illegal dumping and emerging contaminants	MBNEP, 2012
Scarce freshwater resources	Natural conditions plus use and impacted groundwater water	MBNEP, 2012

	quality	
Preserving biodiversity	species and habitat loss	MBNEP, 2012
Environmentally balanced use	Important human uses necessarily have some impact on natural resources	MBNEP, 2012

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

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Morro Bay Watershed

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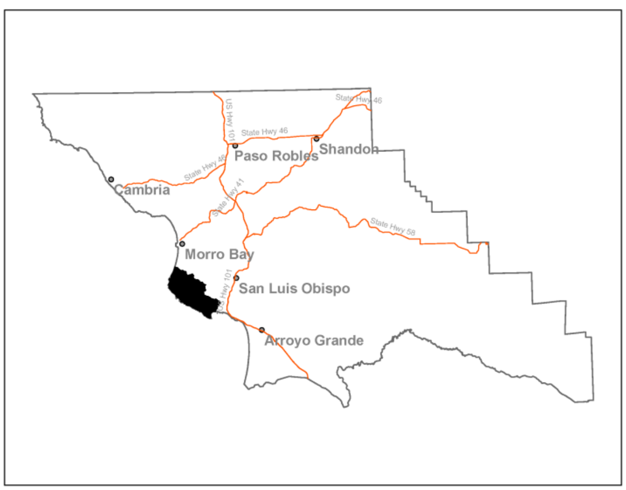
Appendix C.2 South County Sub-region Watersheds

6. Irish Hills Coastal Watersheds
7. San Luis Obispo Creek Watershed
8. Pismo Creek Watershed
9. Arroyo Grande Creek Watershed
10. Santa Maria River Valley Watershed
11. Nipomo-Suey Creeks Watersheds
12. Huasna River Watershed
13. Alamo Creek Watershed
14. Cuyama River Watershed

Irish Hills Coastal Watersheds

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay HU 10	San Luis Obispo/ Avila WPA 6	27,922 acres	Pacific Ocean	None	County of San Luis Obispo CA Department of Parks and Recreation



Description:

The Irish Hills Coastal Watersheds are located in the San Luis Range, along the remote San Luis Obispo County coastline between the communities of Los Osos and Avila Beach. The drainages rise to a maximum elevation of 1,819 feet above sea level at Saddle Peak. The major creeks flowing to the Pacific Ocean and with their headwaters in the Coastal Range Mountains are Hazard Canyon, Islay Creek, Coon Creek, Diablo Creek, Irish Creek, Rattlesnake Creek, Hanford Creek and Wild Cherry Canyon.

The watersheds are dominated by grazing lands some in conservation or agricultural easements and public lands. Other land uses include a regional nuclear power plant, passive recreation, natural resource preservation and limited oil drilling.

Watershed Plans:

Irish Hills Coastal Watershed Conservation Plan (Coastal Conservancy, 2001)

Irish Hills Coastal Watersheds

Characteristics:

	Physical Setting	
	Rainfall	17 – 25 inches (NRCS Precipitation 1981-2010) 18 inches Mean Annual (SLO County Water)
	Air Temperature	Summer Range (August 1981-2010): 56° - 69° F Winter Range (December 1981-2010): 45°- 65° F At Morro Bay Fire Station, Morro Bay, CA. (NOAA National Climatic Data Center, viewed 2013)
	Geology Description	The Islay and Coon Creek sub watersheds consists of steep moderately infiltrative early to mid-Tertiary headwaters – category #8. The Diablo Creek and Pecho Creek sub watersheds consists of steep moderately infiltrative early to mid-Tertiary headwaters; flat pre-Q moderately infiltrative valley - category #11. (Bell, Ethan, personal communication, 2013) The wave-cut marine terraces, rocky headlands, and the rugged to rolling mountains and valleys are the result of millions of years of erosion of land that has been uplifted, folded, and tilted. Most of the oldest rocks are derived from the Franciscan Formation that forms the basement of most of the Coast Ranges. The Franciscan Formation is a result of the deformation of ancient sea floor sediments caught in a deep-water trench created by two colliding tectonic plates some 29 million years ago. Overlain on the Franciscan Formation are younger formations of sedimentary rock that are composed of mudstone deposited when the remains of tiny marine organisms such as diatoms and plankton drifted to the bottom and mixed with silt and sand. The mud solidified into thick layers of diatomite, clay porcellanite, dolomite, and chert. These sedimentary rocks and the basement rock itself were worn down again as the range was uplifted, although not uniformly throughout the area. As a result, sedimentary rock formations of many different ages and character occur. A number of faults occur within or in the vicinity. The Rinconada fault is the major northwest-striking fault east of the Indian Knob area. (Coastal Conservancy, 2001)
	Hydrology	
	Stream Gage	None.
	Hydrologic Models	None.
	Peak Flow	No source identified.
	Base Flow	No source identified.

Irish Hills Coastal Watersheds

	Flood Reports	No source identified.
	Biological Setting	
	Vegetation Cover	Primarily non-native grassland with some coastal scrub, coast live oak forest, blue brush chaparral, chamise and beaches and coastal dunes. (SLO County vegetation shapefile, 1990) Nearshore habitats, Coastal scrub, Maritime Chaparral, grassland, Bishop pine forest, oak woodland (Coastal Conservancy, 2001) Limited spatial data. No alliance level vegetation mapping was available for the entire County.
	Invasive Species	No source identified.
	Special Status Wildlife and Plants	*Key:* Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern – SSC, CA rare plant ranking – CRPR (CDFW CNDDB, August 2013)

Common Name	**Status**	**MORRO BAY SOUTH**	**PISMO BEACH**	**PORT SAN LUIS**
Animals				
American badger	SSC		x	
black legless lizard	SSC	x		x
California red-legged frog	**FT**		**x**	
coast horned lizard	SSC		x	
globose dune beetle	Special Animal		x	
monarch butterfly	Special Animal		x	
prairie falcon	Special Animal (Nesting)		x	
sandy beach tiger beetle	Special Animal		x	
steelhead - south/central California coast DPS	**FT**		**x**	

Irish Hills Coastal Watersheds

tidewater goby	**FE**		**x**	
vernal pool fairy shrimp	**FT**		**x**	
western pond turtle	SSC		x	
western snowy plover	**FT**		**x**	
Plants/Lichen				
Arroyo de la Cruz manzanita	CRPR 1B.2	x		
beach spectaclepod	**ST**		**x**	
black-flowered figwort	CRPR 1B.2		x	
Blochman's dudleya	CRPR 1B.1		x	
Blochman's leafy daisy	CRPR 1B.2		x	
Brewer's spineflower	CRPR 1B.3		x	
Cambria morning-glory	CRPR 4.2		x	
Chorro Creek bog thistle	**FE; SE**		**x**	
Congdon's tarplant	CRPR 1B.1		x	
Eastwood's larkspur	CRPR 1B.2	x		x
Hoover's bent grass	CRPR 1B.2		x	x
Hoover's button-celery	CRPR 1B.1		x	
Indian Knob mountain-balm	**FE; SE**		**x**	
Jones' layia	CRPR 1B.2		x	
La Panza mariposa-lily	CRPR 1B.3		x	

Irish Hills Coastal Watersheds

	marsh sandwort	**FE; SE**		**x**	
	mesa horkelia	CRPR 1B.1		x	
	Morro manzanita	**FT**	**x**	**x**	**x**
	most beautiful jewel-flower	CRPR 1B.2			x
	mouse-gray dudleya	CRPR 1B.3		x	
	Pecho manzanita	CRPR 1B.2	x	x	x
	Pismo clarkia	**FE; SR**		**x**	
	San Benito fritillary	CRPR 1B.2	x		
	San Luis mariposa-lily	CRPR 1B.2		x	
	San Luis Obispo County lupine	CRPR 1B.2		x	
	San Luis Obispo owl's-clover	CRPR 1B.2	x	x	
	San Luis Obispo sedge	CRPR 1B.2	x		
	Santa Margarita manzanita	CRPR 1B.2	x	x	x
	surf thistle	**ST**		**x**	
		Limited by the type of data included in CA Natural Diversity Database.			
Steelhead Streams		No streams listed in the Steelhead Recovery Plan (NMFS, 2012). Islay Creek and Coon Creek (USFWS Critical Habitat Mapper, viewed 2013) Diablo Canyon (CEMAR, 2008)			
Stream Habitat Inventory		None identified.			
Fish Passage Barriers		Concrete Dam at Islay Creek, Total Barrier, PAD #711911.00000; Islay Falls at Islay Creek, Unknown, PAD #720498.00000 (CDFW Passage Assessment Database, viewed 2013)			
Designated Critical Habitat		Yes; Steelhead Trout, Morro shoulderband snail, Morro Bay kangaroo rat, Western snowy plover (USFWS Critical Habitat Portal, viewed July 2013)			
Habitat Conservation		Yes; Morro shoulderband snail (USFWS Critical Habitat Portal, viewed July 2013)			

Irish Hills Coastal Watersheds

	Plans	
	Other Environmental Resources	Coastal Zone, Montana de Oro State Park, Irish Hills Limited data.
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo
	% Urbanized	0% (SLO County LUC)
	% Agricultural	42.3% (SLO County LUC)
	% Other	57.7% (4.6% public facility, 27.85% recreation, and 25.26% rural land) (SLO County LUC)
	Planning Areas	San Luis Obispo, San Luis Bay Coastal, San Luis Bay Inland
	Potential growth areas	No source identified.
	Facilities Present	Diablo Canyon Power Plant and Water Treatment System, Private wells and septic systems Limited data.
	Commercial Uses	Diablo Nuclear Power Plant; Montana de Oro State Park; Beecham Red Rock Pit for decomposed granite (SLO County, extractive shapefile)
	Demographics	
	Population	17 (U.S. Census Block, 2010)
	Race and Ethnicity	76.5% Caucasian (13), 17.6% Latino (3), and 5.9% Asian (1) (U.S. Census Block, 2010)
	Income	$62,829 (U.S. Census Tract, 2010) Census tract covers multiple watersheds.
	Disadvantaged Communities	No; 3% of individual are below poverty (U.S. Census, 2010) Census tract covers multiple watersheds.
	Water Supply	
	Water Management Entity	No source identified.
	Groundwater	Yes; alluvial only.
	Surface Water	No public reservoirs.
	Imported Water	No source identified.

	Recycled/ Desalinated Water	Yes; Desalinated water is used at the Diablo Canyon Power Plant for cooling and on-site potable drinking water. (Prato, et al., 2002)
	Infiltration Zones	No source identified.
	Water Budget	None to date.
	Water Uses	
	Beneficial Uses	*Islay and Coon Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *Diablo Creek*– Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN). (RWQCB, 2011)
	Other Unique Characteristics	
	Historic Resources	No source identified.
	Archeological Resources	Human habitation of the watershed dates back over 9,000 years as evidenced by analyses of hundreds of archaeological discoveries including several village sites, numerous thick deposits of refuse mounds, called middens, burial sites, and bedrock mortars and tools. A majority of these findings have been made near the creek mouths on the coastal terraces. The site near the Diablo Canyon Nuclear Power Plant is considered the County's most significant archaeological site. (Coastal Conservancy, 2001) There were Chumash towns called Tsikyiw and Chanu at the time of European settlement (SB Museum of Natural History, viewed 2013).
	Other	No source identified.
	Climate Change Considerations	

Irish Hills Coastal Watersheds

State climate change maps do not show dramatic increased areas of inundation due to sea level rise along the coast (USGS,Cal-Adapt, viewed 2013).

See IRWMP, 2014 Section H. Climate Change

Limited data and not local.

Watershed Codes

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.250001	2	Point Buchon	5	Point San Luis	310.25	undefined	Islay Creek
3310.250003	2	Point Buchon	5	Point San Luis	310.25	undefined	Coon Creek
3310.250002	2	Point Buchon	5	Point San Luis	310.25	undefined	Pecho Creek
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- Human habitation of the watershed dates back over 9,000 years as evidenced by analyses of hundreds of archaeological discoveries including several village sites, numerous thick deposits of refuse mounds, called middens, burial sites, and bedrock mortars and tools. A majority of these findings have been made near the creek mouths on the coastal terraces. The site near the Diablo Canyon Nuclear Power Plant is considered the County's most significant archaeological site.
- Pedro Unamuno, commander of a Manila galleon that sailed along the California coast in 1587, was the first to record the presence of San Luis Bay, noting the protected landing in the curve of the bay where Port San Luis is located today.
- In 1769, the diary of Franciscan Padre Juan Crespi provides the first written account of what is now the Irish Hills. (Coastal Conservancy, 2001)
- In 1772, a mission was established at San Luis Obispo.
- By the early 1840s, the lands in the vicinity of the Irish Hills begun to be divided among several great Spanish ranchos which were used for raising livestock for the lucrative hide-and-tallow trade.
- Between 1870 and 1890’s, the pier, breakwater, a narrow gauge rail line, hotel and lighthouse were constructed.
- The Southern Pacific Railroad line, completed in 1894, shifted the focus of development and trade from coastal port towns of Port Harford (now called Port Son Luis) and Port Avila, to San Luis Obispo, on the inland roil route.

- Today the majority of the watershed is still used for cattle grazing. (Coastal Conservancy, 2001)

Irish Hills Coastal Watersheds

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Islay Creek	No source identified.	Not assessed. (SWRCB, 2010)	Not assessed. (SWRCB, 2010)	X cfs (Stillwater Sciences, 2013)
Coon Creek	No source identified.	No. (SWRCB, 2010)	Undetermined	
Diablo Creek	No source identified.	Not assessed. (SWRCB, 2010)	Not assessed. (SWRCB, 2010)	
Port San Luis	Near-shore	No. (SWRCB, 2010)	Undetermined	

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Los Osos Basin	3,200 AFY(San Luis Obispo County, Master Water Report, 2012)	Water quality due to sea water intrusion and nitrate contamination. (San Luis Obispo County, Master Water Report, 2012)	Yes; See description below. (San Luis Obispo County, Master Water Report, 2012)	No objective for basin. (RWQCB, Table 3-8, 2011)

Groundwater Quality Description: Nitrate is the primary constituent of concern in the upper aquifer, with concentrations in excess of the State drinking water standard of 45 mg/l as nitrate in shallow monitoring wells throughout the urban area (San Luis Obispo County, Master Water Report, 2012 from Cleath & Associates).

Primary Issues

Issue	Potential Causes	Referenced from
Residential development; loss of habitat	Growth inducing roads	Coastal Conservancy, 2001
Agricultural development; loss of habitat		Coastal Conservancy, 2001
Sedimentation and loss of riparian cover	Overgrazing	Coastal Conservancy, 2001

Irish Hills Coastal Watersheds

Issue	Potential Causes	Referenced from
Proliferation of non-native species	Recreational uses	Coastal Conservancy, 2001
Habitat degradation	Recreational uses	Coastal Conservancy, 2001

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

Irish Hills Coastal Watersheds

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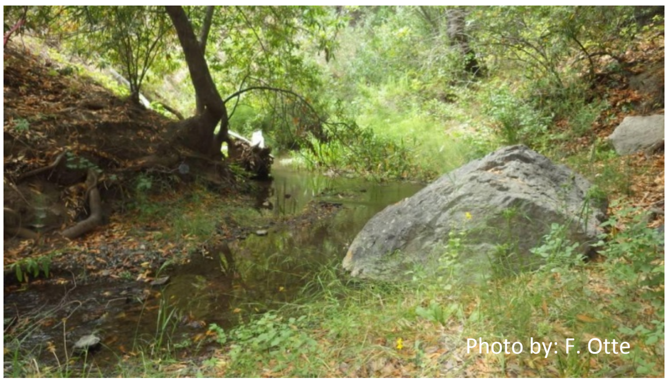
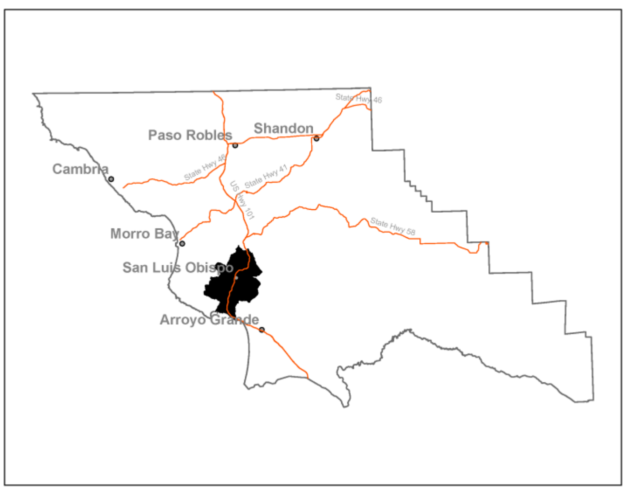
San Luis Obispo Creek Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin	Jurisdictions
Estero Bay HU 10	San Luis Obispo/ Avila WPA 6	53,271 acres	Pacific Ocean	San Luis Obispo Valley	County of San Luis Obispo City of San Luis Obispo Town of Avila Beach Port San Luis Harbor District





Description:

The San Luis Obispo Creek Watershed is a coastal basin located in southern San Luis Obispo County. The drainage rises to a maximum elevation of approximately 2,500 feet above sea level in the Santa Lucia Range. San Luis Obispo Creek flows to the Pacific Ocean and has six major tributary basins: Stenner Creek, Prefumo Creek, Laguna Lake, East Branch San Luis Obispo Creek, Davenport Creek, and See Canyon.

The watershed is dominated by agricultural land uses including ranches and open space. The urban core of the City of San Luis Obispo is at the confluences of several tributaries with the mainstem starting in the upper watershed and bisecting the City. The unincorporated community of Avila Beach is adjacent to the mouth of San Luis Obispo Creek at the Pacific Ocean. Other land uses include the California Polytechnical State University, rural residential, a regional airport and two wastewater treatment plants.

Watershed Plans:

San Luis Obispo Creek Watershed Enhancement Plan (The Land Conservancy of San Luis Obispo County, 2002)

Prefumo Creek Watershed Management Plan. (City of San Luis Obispo, expected 2014)

San Luis Obispo Creek Watershed

Characteristics:

	Physical Setting	
	Rainfall	17 – 33 inches (NRCS Precipitation 1981-2010) 24 – 29 inches, Mean Annual (SLO County Water.org)
	Air Temperature	Summer Range (August 1981-2010): 55° - 77° F Winter Range (December 1981-2010): 43° - 61° F At Cal Poly San Luis Obispo, CA. (NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Stenner Creek consists of steep pre-Quaternary non-infiltrative headwaters and a flat Franciscan low infiltrative valley – category #2. Reservoir Canyon Creek consists of steep moderately infiltrative early to mid-Tertiary headwaters and a flat pre-Quaternary moderately infiltrative valley – category #11. Prefumo Creek consists of steep moderately infiltrative early to mid-Tertiary headwaters; flat youngest Tertiary highly infiltrative valley – category #15. (Bell, personal communication, 2013) East Branch SLO Creek and Davenport Creek consist of flat Franciscan headwaters and flat Quaternary valley. Rock types in the SLO area are mainly comprised of volcanic, metavolcanics and mélanges of serpentinite and greywacke sandstone. These rocks are highly fractured and are part of the Mesozoic aged Franciscan Formation. Intrusive and extrusive volcanic deposits of Tertiary age and marine sedimentary deposits of the Miocene aged Monterey Formation are also found in the area. The most distinctive geomorphological feature of the San Luis Obispo area is the series of Tertiary aged volcanic plugs (remnants of volcanoes) which extend from the City of San Luis Obispo to Morro Bay. Hollister Peak, Bishop Peak, Cerro San Luis Obispo, Islay Hill and Morro Rock are all comprised of these volcanic plugs. (City of SLO, 2010)
	Hydrology	
	Stream Gage	Yes; USGS 11142000 Steiner Creek near San Luis Obispo, CA (no data online for this site, inactive) (USGS NWIS, viewed 2013). Andrews Street at San Luis Obispo Creek (2001-present, active); Stenner Creek at Nipomo Street (2001 -present, active); Elks lodge bridge and San Luis Obispo Creek (2001 -present, active); Laguna Lake outflow at Madonna (2001 -present, active); East Fork at Jespersen Bridge (2001 -present, active) (SLOCountyWater.org, viewed 2013). City of SLO Los Osos Valley Road at San Luis Obispo

		Creek (2004/5, status unknown) (Otte, personal communication, 2013). Historically, at least two stream gauges existed in the San Luis Obispo Creek Watershed that would have been capable of recording flood peaks. One was located on lower San Luis Obispo Creek near Avila, and the other was located on Upper San Luis Obispo Creek, in San Luis Obispo. Unfortunately, both of these gauges were put out of service in 1992. Since that time, the City of San Luis Obispo has re-installed a gauge on Upper San Luis Obispo Creek. However, there is no gauge record for the 1995 water year (Questa Engineering, County of San Luis Obispo, 2003 p C-19).
	Hydrologic Models	Yes; Questa Engineering for San Luis Obispo Creek Watershed Waterway Management Plan, 2003.
	Peak Flow	19,800 cfs San Luis Obispo Creek above See Canyon (FEMA Flood Insurance Study,1978); 22,000 cfs San Luis Obispo Creek at Squire Canyon (Questa/Zone 9 Model); "…, the Corps/Nolte/FEMA study used an actual recorded rainfall event (in this case, the January 19, 1973 event) to define a storm that theoretically represented the maximum precipitation possible for a given part of the watershed."(Questa Engineering, County of San Luis Obispo, 2003, pC-28).
	Base Flow	No source identified for measured summer base flows. City of San Luis Obispo Wastewater Treatment Plant is required to discharge a minimum of 2.5 cfs into San Luis Obispo Creek. "A conservative estimate was made by assuming that base flow in the creek during a large storm would be similar to the base flow in the creek that was observed over the week following the storm of March 2, 1983.The average base flow for this time period, omitting days when rainfall occurred, was approximately 14 cms (500 cfs). Divided over the upstream area of 207 km2 (80 mi2) this gives an average base flow rate of 0.067 cms/km2 (6.3 cfs/mi2), which was then applied to each [of 61 individual] sub-basin [formed for the watershed model]. This base flow rate is significantly higher than the long term average winter-season flow rate in San Luis Obispo creek, and is intended to represent the base flow in the creek during a series of wet storms. It is much greater than any likely winter time releases from the City of San Luis Obispo Water Reclamation Facility, which discharges into San Luis Obispo Creek downstream from the Prado Road Bridge."(Questa Engineering, 2003, pC-8)
	Flood Report	Yes; San Luis Obispo Creek Waterway Management Plan (Questa Engineering, 2003). The City manages several flood by-pass channels along SLO Creek and Laguna Lake for flood control. (Otte, personal communication,

	2013) Areas of flood risk include Highway 101 near Los Osos Valley Road (LOVR) and extends extends up Prefumo Creek to Calle Joaquin; San Luis Obispo Creek near Elks Lane; between Marsh Street and Madonna Road; San Luis Obispo Creek above Cuesta Park; across Santa Rosa Street and through a residential neighborhood toward Chorro Street and Old Garden Creek; East Fork of SLO Creek at Buckley Road.(Questa Engineering, 2003, p78-84)
Biological Setting	
Vegetation Cover	Primarily non-native grassland with some chaparral (chamise, leather oak, mixed serpentine), coastal scrub, coastal live oak forest, agricultural land and urban land. (SLO County, vegetation shapefile, 1990) SLO Creek is dominated by a willow (*Salix spp*.) riparian canopy with a mixture of oaks, sycamore, and cottonwood trees making up the rest of the native canopy. The understory consists of blackberry vines, coyotebrush, sage species, coffee berry, toyon, elderberry and a large number of ornamental non-native species (Questa Engineering, 2003). Limited current spatial data. No alliance level vegetation mapping was available for the entire County.
Invasive Species	*Arundo donax* (Giant Reed), *Delairea oderata* (Cape Ivy), poison hemlock (*Conium maculatum*), tree of heaven (*Ailanthus altissima*), several species of eucalyptus, and castor bean (*Ricinus communis*). Other various weeds including anise, cocklebur, yellow star thistle, milk thistle and Italian thistle (Land Conservancy, 2002). There are non-native palm trees and myoporum and other ornamental escapee's which have colonized the creek channel. Himalayan blackberry, kikuyu grass, vinca, pampas grass, French and Spanish broom, English ivy, and bullfrogs. (Otte, personal communication, 2013) Limited spatial data.
Special Status Wildlife and Plants	*Key:* Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern – SSC, CA rare plant ranking – CRPR (CDFW CNDDB, August 2013)

Common Name	**Status**	**ARROYO GRANDE NE**	**LOPEZ MTN**	**PISMO BEACH**	**PORT SAN LUIS**	**SAN LUIS OBISPO**

San Luis Obispo Creek Watershed

Animals						
American badger	SSC	x		x		x
Atascadero June beetle	Special Animal					x
black legless lizard	SSC				x	
California red-legged frog	**FT**	**x**	**x**	**x**		**x**
coast horned lizard	SSC	x		x		
Coast Range newt	SSC		x			x
ferruginous hawk	Special Animal (Wintering)					x
foothill yellow-legged frog	SSC		x			x
globose dune beetle	Special Animal			x		
loggerhead shrike	SSC (Nesting)	x				x
monarch butterfly	Special Animal			x		x
pallid bat	SSC					x
prairie falcon	Special Animal (Nesting)	x	x	x		x
San Luis Obispo pyrg	Special Animal		x			x
sandy beach tiger beetle	Special Animal			x		
silvery legless lizard	SSC		x			
steelhead - south/central California coast DPS	**FT**	**x**	**x**	**x**		**x**
tidewater goby	**FE**			**x**		
vernal pool fairy shrimp	**FT**			**x**		**x**
western mastiff bat	SSC					x

	western pond turtle	SSC	x	x	x		x
	western snowy plover	**FT**			**x**		
	western yellow-billed cuckoo	Federal Candidate; SE					x
	white-tailed kite	Fully Protected		x			x
	Plants/Lichen						
	adobe sanicle	**SR**					**x**
	Arroyo de la Cruz manzanita	CRPR 1B.2					x
	beach spectaclepod	**ST**	**x**		**x**		
	Betty's dudleya	CRPR 1B.2					x
	black-flowered figwort	CRPR 1B.2	x		x		
	Blochman's dudleya	CRPR 1B.1			x		x
	Blochman's leafy daisy	CRPR 1B.2			x		
	Brewer's spineflower	CRPR 1B.3	x	x	x		x
	Cambria morning-glory	CRPR 4.2	x	x	x		x
	chaparral ragwort	CRPR 2B.2		x			x
	Chorro Creek bog thistle	**FE; SE**		**x**	**x**		**x**
	Congdon's tarplant	CRPR 1B.1	x		x		x
	Cuesta Pass checker-bloom	**SR**					**x**
	Cuesta Ridge thistle	CRPR 1B.2		x			x
	dune larkspur	CRPR 1B.2		x			
	dwarf soaproot	CRPR 1B.2		x			x

San Luis Obispo Creek Watershed

Eastwood's larkspur	CRPR 1B.2	x	x		x	x
Hoover's bent grass	CRPR 1B.2	x	x	x	x	
Hoover's button-celery	CRPR 1B.1			x		x
Indian Knob mountain-balm	**FE; SE**			**x**		
Jones' layia	CRPR 1B.2		x	x		x
La Panza mariposa-lily	CRPR 1B.3			x		x
marsh sandwort	**FE; SE**	**x**		**x**		
mesa horkelia	CRPR 1B.1	x		x		x
Miles' milk-vetch	CRPR 1B.2					x
Morro manzanita	**FT**			**x**	**x**	**x**
most beautiful jewel-flower	CRPR 1B.2		x		x	x
mouse-gray dudleya	CRPR 1B.3	x	x	x		x
Palmer's monardella	CRPR 1B.2		x			x
Pecho manzanita	CRPR 1B.2		x	x	x	
Pismo clarkia	**FE; SR**	**x**		**x**		
saline clover	CRPR 1B.2					x
San Benito fritillary	CRPR 1B.2					x
San Luis mariposa-lily	CRPR 1B.2	x	x	x		x
San Luis Obispo owl's-clover	CRPR 1B.2		x			
San Luis Obispo County lupine	CRPR 1B.2	x		x		
San Luis Obispo owl's-clover	CRPR 1B.2	x	x	x		x

	San Luis Obispo sedge	CRPR 1B.2		x			x
	Santa Lucia manzanita	CRPR 1B.2	x	x			x
	Santa Margarita manzanita	CRPR 1B.2	x	x	x	x	x
	straight-awned spineflower	CRPR 1B.3	x				
	surf thistle	**ST**	**x**		**x**		
		Limited by the type of data collected in the CA Natural Diversity Database.					
Steelhead Streams		San Luis Obispo Creek, San Miguelito (See Canyon) Creek, Froom Creek, Prefumo Creek, Stenner Creek, Brizzolari Creek, Unnamed tributary (NMFS, 2005). Dry Creek, Acacia Creek, Reservoir Canyon (Otte, personal communication, 2013).					
Stream Habitat Inventory		Yes; Completed in 1995 by Paul Cleveland on mainstem San Luis Obispo Creek. (Land Conservancy, 2002) Limited data that does not include major tributaries. Last data collected in mid 1990's.					
Fish Passage Barriers		Cuesta Park Fishway at Concrete Ford on SLO creek, Temporary Barrier, PAD # 700062.00000; Golf cart route on Prefumo Creek, Temporary Barrier, PAD # 700045.00000; Los Osos Valley Road Culvert and ladder on Prefumo Creek, Temporary Barrier, PAD # 700046.00000; Stenner Creek Road Bridge Apron on Stenner Creek, Temporary Barrier, PAD # 700069.00000; Railroad Crossing Culvert at Stenner Creek, Total Barrier, PAD # 700071.00000; Highland Drive Dam at Stenner Creek, Partial Barrier, PAD # 700072.00000; Cheda Reservoir Diversion Dam for Reservoir, Temporary Barrier, PAD # 700073.00000; Stenner Glen Dam at Stenner Creek, Temporary Barrier, PAD # 700074.00000; Cormorant Way Marre Dam and Denil Ladders at SLO Creek, Temporary Barrier, PAD # 700056.00000; Stagecoach rd. bridge apron on SLO creek, Temporary Barrier, PAD # 700057.00000; Reservoir Canyon Dam, Total Barrier, PAD # 700060.00000; End of Oceanair Blvd. Drop structure at Prefumo Creek, Temporary Barrier, PAD # 700049.00000; Rip Rap dam at Laguna Lake Golf Course on Prefumo Creek, Temporary Barrier, PAD # 700051.00000; Concrete Dam at Stenner Creek, Temporary Barrier, PAD # 707022.00000; Hwy 227 Culvert at Davenport Creek, Unknown Status, PAD # 731372.00000; Highland Drive Fish Ladder at Brizziolari Creek, Partial Barrier, PAD # 707004.00000; Blacksmith Road Culvert at Brizziolari Creek, Temporary Barrier, PAD # 707005.00000; Culvert at Poly Canyon rd. on Brizziolari Creek, Temporary Barrier, PAD # 707006.00000; Concrete Spillway at Laguna lake on Prefumo Creek, Unknown Status, PAD #					

		707014.00000; Rock Weir at Laguna Lake Golf Course, Unknown Status, PAD # 707015.00000; Hwy 101 Culvert at Castro Canyon, Unknown Status, PAD # 731538.00000; Hwy 101 Culvert at SLO creek, Unknown status PAD #731909.00000; Hwy 101 culvert at Stenner Creek, Unknown Status PAD #731962.00000; Hwy 101 culvert at Froom Creek, Unknown Status PAD # 732077.00000; Marsh St. Culvert on SLO creek, Partial Barrier, PAD # 712028.00000; Murray St. on Stenner Creek, Temporary Barrier, PAD # 712030.00000; Stenner Creek Rd. Bridge at Stenner Creek, Partial Barrier, PAD # 712031.00000; Unnamed Cal poly road at Brizzolari Creek, Total Barrier, PAD # 712037.00000; Black Walnut Road at See Canyon Creek, Total Barrier, PAD # 712038.00000; Santa Fe. Rd at Dry Creek, Total Barrier, PAD # 712047.00000; Diversion Weir at Stenner Creek, Unknown Status, PAD # 707023.00000; Black Walnut Road at See Canyon Creek, Partial Barrier, PAD # 712039; Fish Passage Facility at Loomis St. on SLO creek, Temporary Barrier, PAD # 700062. (CDFW Passage Assessment Database, 2013)
	Designated Critical Habitat	Yes; Steelhead Trout and California red-legged frog (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	None. (USFWS Critical Habitat Portal, viewed 2013)
	Other Environmental Resources	Critical Coastal Area, San Luis Obispo Greenbelt Program, Nine Sisters of San Luis Obispo, Cuesta Ridge Botanical Area, Serpentine outcrops and related endemic species
	Land Use	
	Jurisdictions & Local Communities	City of San Luis Obispo; unincorporated Avila Beach; Avila Beach Community Service District; Port San Luis Harbor District
	% Urbanized	25% (15.27% urban, 2.22% commercial, industrial and public facility, 7.69% residential) (SLO County LUC)
	% Agricultural	49% (SLO County LUC)
	% Other	26% (4.07% open space, 20.3% rural lands, 1.67% recreation)(SLO County LUC)
	Planning Areas	San Luis Obispo, San Luis Bay Inland, San Luis Bay Coastal, Salinas River, Los Padres
	Potential growth areas	Los Ranchos/Edna Village area; Margarita Area; Orcutt Area; Airport Area (City of San Luis Obispo Specific Plans,) and the Dalidio Ranch (County of San Luis Obispo Land Use Ordinance, 2013)
	Facilities Present	San Luis Obispo Wastewater Treatment Plant with discharge to San Luis Obispo Creek; Country Club Wastewater Treatment Plant; Avila Beach Wastewater Treatment Plant with discharge to the ocean; Stenner Creek Water Treatment Plant; San Miguelito Mutual Water Company percolation beds; other private water systems; San Luis Obispo County Regional Airport; San Luis Obispo Tank Farm; former Avila Tank Farm; Harford Pier; Avila Pier.

San Luis Obispo Creek Watershed

	Commercial Uses	Agricultural production, recreation and tourism in City of San Luis Obispo and community of Avila Beach; golf courses; wineries in Edna Valley; regional airport; commercial and sport fishing at Harford Pier in Port San Luis, Froom Ranch Pit for Stone, Alberti Ranch Quarry for stone. (SLO County, extractive resources)
	Demographics	
	Population	56,220 in watershed (US Census Block, 2010) San Luis Obispo: 45,119 in City (US Census, 2010); Avila Beach: 1,627 in Avila Beach (US Census, 2010)
	Race and Ethnicity	Watershed: 42,827 or 76.2% white, 3198 or 5.7% Asian, 1.7% other, 1701 or 3% two or more, 7636 or 13.6% Latino. San Luis Obispo: Caucasian, representing 75.8%. Latinos represent 14.7% of the total population in Grover Beach. The remaining races each represent less than 5%, including African American, American Indian, Pacific Islander, and Asian(US Census, 2010). Avila Beach: Caucasian, representing 88.7%. Latinos represent 6.8% of the total population in Grover Beach. The remaining races each represent less than 2%, including African American, American Indian, Pacific Islander, and Asian(US Census, 2010).
	Income	MHI $55,352 in watershed (US Census Tract, 2010) MHI $42,528 in San Luis Obispo (US Census, 2010) Census tracts cross multiple watersheds.
	Disadvantaged Communities	Yes; 7% of individuals are below poverty level in watershed. 31.5% of individuals are below poverty level in San Luis Obispo. Census tracts cross multiple watersheds.
	Water Supply	
	Water Management Entities	City of San Luis Obispo, Avila Beach Community Services District, San Luis Obispo County Flood Control and Water Conservation District, Zone 3 (to CSA 12).
	Groundwater	Yes; alluvial and San Luis Obispo Valley (SLO County, 2012)
	Surface Water	No public reservoirs in the watershed. Identified as fully appropriated stream system for entire year according to the SWRCB's Water Code 1205-1207.
	Imported Water	Yes; State Water Project and County Service Area 12 (Avila CSD, viewed 2013); South San Luis Water Corporation to Avila Beach (Avila CSD, 2013); from Salinas Reservoir in Santa Margarita; from Whale Rock in Cayucos; from Nacimiento Reservoir near Paso Robles. (City of SLO, 2013)
	Recycled/ Desalinated Water	Yes; Recycled water is produced from San Luis Obispo Wastewater Treatment Plant. At build out, the system will provide its customers approximately 1,000 acre feet per year of recycled water (City of

		SLO, viewed 2013)
	Infiltration Zones	The alluvial deposits are underlain by hard Franciscan rocks, which are exposed in the lower creek banks and creek bed in the northern part of the City, and by reddish brown siltstones, claystones, and conglomerate of the Paso Robes Formation (older Pleistocene) throughout much of the central and southern part of the City. This weakly to moderately consolidated rock is also exposed in the channel bottom and lower bank slopes along much of the middle reaches of SLO Creek, and along the southern side of Los Osos Valley. Locally it may form a subsurface barrier or retardance layer to water infiltration and groundwater recharge (Questa Engineering, SLO Waterway Management Plan, 2003 p14). Limited data.
	Water Budget	None to date.
	Water Uses	
	Beneficial Uses	*SLO Creek above W. Marsh St.* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *SLO Creek below W. Marsh St.* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *SLO Creek East Fork*– Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *Stenner Creek* – Municipal and Domestic Supply (MUN), Agricultural

		Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *Prefumo Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *SLO Creek Estuary* – Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD), Estuarine Habitat (EST), Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Shellfish Harvesting (SHELL) (RWQCB, 2011)
	Other Unique Characteristics	
	Historical Resources	A number of buildings in the City of San Luis Obispo are on the National Register of Historic Places. (NRHP, viewed 2013)
	Archeological Resources	At least one Chumash towns named Tsipxatu was in the watershed at European settlement . (SB Natural History Museum, 2013) Limited data.
	Other	No source identified.
	Climate Change Considerations	
		State climate change maps show sea level affecting portions of the town of Avila Beach with inundation along the lower reach of San Luis Obispo Creek (USGS,Cal-Adapt, viewed 2013). See IRWMP, 2014 Section H. Climate Change Limited data and not watershed specific.

San Luis Obispo Creek Watershed

Watershed Codes

Calwater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.240103	2	Point Buchon	4	San Luis Obispo Creek	310.24	Upper San Luis Obispo Creek	Stenner Lake
3310.240101	2	Point Buchon	4	San Luis Obispo Creek	310.24	Upper San Luis Obispo Creek	Reservoir Canyon
3310.240102	2	Point Buchon	4	San Luis Obispo Creek	310.24	Upper San Luis Obispo Creek	Laguna Lake
3310.240202	2	Point Buchon	4	San Luis Obispo Creek	310.24	Lower San Luis Obispo Creek	Perfumo Canyon
3310.240201	2	Point Buchon	4	San Luis Obispo Creek	310.24	Lower San Luis Obispo Creek	See Canyon
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- In 1772, Mission San Luis Obispo was established bringing ranching to the area.
- By 1846 mission lands were transferring to private ownership establishing land grants or ranchos.
- In 1897, Laguna Lake was smaller in size, with open water and a large wetland surrounding it.
- In 1884, Southern Pacific Railroad completed its line from San Fransciso to San Luis Obispo.
- In 1897, a large tidal marsh was present to the east of the lagoon [estuary], under present location of western Avila Beach. At that time the lagoon mouth was substantially larger and wider (about 1/3 larger than current size). (SLO WaterwayMP, 2003).
- Damaging floods have occurred in 1868-62, 1884, 1897, 1911, 1948, 1952, 1962, 1969, 1973, 1983, 1995, and 1998. (SLO County FCWCD, 2009)
- In 1911, Stage Coach Dam and Reservoir Canyon Dam were constructed for water supply.
- In 1926, a lighting strike caused fire at the Union Oil Tank Farm sending a stream of burning oil down East Branch Creek to San Luis Obispo Creek and to the ocean.

San Luis Obispo Creek Watershed

- In the 1950's through today numerous sections of creek were straightened removing natural meanders.
- In 1960's Prefumo Creek was rerouted into Laguna Lake which was expanded to outlet under Madonna Road.
- In 1969 the Luigi Marre Land and Cattle Company constructed a dam across the lower SLO Creek to halt saltwater intrusion.
- In early 1970's flood control levees were constructed along various sections of channel.
- In 1977, the San Luis Obispo Creek lagoon is constrained by Avila Bay Drive, similar to its present configuration.
- In 1994, the Avila Beach Golf Course displaced the historic meander loop and sand bar. It appears that the original migration of the bend to the north was natural but golf course construction made significant alterations.
- In 1994, a major fire burned portion of the Upper Stenner, Brizziolari and SLO Creeks west of Cuesta pass.
- The 1995 Flood was reportedly caused by the wettest three month period in 116 years of record.
- In 1996, the Natural Resources Program is formed at the City of San Luis Obispo. Habitat improvements, barrier removal, invasive species control, erosion control, open space protection and acquisition.

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources	Environmental Flows
San Luis Obispo Creek (below Osos Street)	Perennial	Yes on 303d list for Chloride, Chlorpyrifos, Nitrate, Nutrients, Pathogens, Sodium. Approved USEPA TMDLs for Pathogens in 2004, for Nutrients in 2007 and for Nitrates in 2007. TMDL estimated date of completion 2021. (SWRCB, 2010)	Agriculture, Grazing Related, Natural, Major Municipal Point Source, Transient Encampments, Urban Runoff, Upstream Impoundment (SWRCB, 2010)	X Cfs (Stillwater Sciences, 2013)
San Luis Obispo		Yes on 303d list	Unknown (SWRCB,	

San Luis Obispo Creek Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources	Environmental Flows
Creek (above Osos Street)		for Fecal Coliform. TMDL estimated date of completion 2021. (SWRCB, 2010)	2010); Pigeons, Transients, Cattle grazing, Natural sources, Urban Runoff (Otte, personal communication, 2013)	
Stenner Creek	Partially Perennial	Yes on 303d list for Fecal Coliform. TMDL estimated date of completion 2021. (SWRCB, 2010)	Agriculture, Grazing Related, Natural, Urban Runoff (SWRCB, 2010)	
Davenport Creek	Ephemeral	No. (SWRCB, 2010)	Undetermined.	
East Fork San Luis Obispo Creek	Ephemeral	No. (SWRCB, 2010)	Undetermined.	
Prefumo Creek	Partially Perennial	Yes on 303d list for Fecal Coliform, Low Dissolved Oxygen, Nitrate, Turbidity. TMDL estimated date of completion 2021. (SWRCB, 2010)	Agriculture, Urban Runoff, Unknown (SWRCB, 2010); Grazing related, Transients (Freddy Otte, 2013, personal communication)	
See Canyon/ San Miguelito Creek	Perennial	No. (SWRCB, 2010)	Undetermined.	

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
San Luis Obispo Valley Basin	6,000 AFY (SLO County, Master Water Report, 2012)	See sub-basins. (SLO County, Master Water Report, 2012)	See sub-basins. (SLO County, Master Water Report, 2012)	No. (RWQCB, Table 3-8, 2011)
San Luis	2,000 AFY (DWR,	Physical limitations,	Yes; see	No objective for

San Luis Obispo Creek Watershed

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Obispo Valley – San Luis Valley Subbasin	1997) (SLO County, Master Water Report, 2012)	water quality issues, and environmental demand. (SLO County, Master Water Report, 2012)	description below. (SLO County, Master Water Report, 2012)	sub-basin. (RWQCB, Table 3-8, 2011)
San Luis Obispo Valley – Edna Valley Subbasin	4,000 AFY (DWR, 1997) (SLO County, Master Water Report, 2012)	Physical limitations and environmental demand. (SLO County, Master Water Report, 2012)	No. (SLO County, Master Water Report, 2012)	No objective for sub-basin. (RWQCB, Table 3-8, 2011)
San Luis Obispo Valley – Avila Valley Subbasin	No basin yield numbers have been published (SLO County, Master Water Report, 2012)	Physical limitations and environmental demand. (SLO County, Master Water Report, 2012)	No. (SLO County, Master Water Report, 2012)	No objective for sub-basin. (RWQCB, Table 3-8, 2011)

Groundwater Quality Description: Water quality problems vary by location within the [San Luis Valley sub-basin, with nitrates, salinity, hardness, and perchloroethylene (PCE) historically being the constituents of greatest concern. PCE contamination was a major issue for two wells used by the City of San Luis Obispo during the period from 1987-91. Two high capacity wells were also shut down in the 1990's due to elevated nitrate concentrations. Hardness and TDS/chloride are more of a concern in the airport area (Cleath, T. S., 1987, 1988; Boyle, 1991). (SLO County Public Works Master Water Report, 2012)

The general mineral character of groundwater in the Edna Valley sub-basin is magnesium-calcium bicarbonate with a TDS range of 630-780 mg/l (average 690 mg/l), based on public water company testing during 2008. This is consistent with surface water samples collected in 2007 from tributaries to Pismo Creek in the Edna Valley, where the water was magnesium-calcium bicarbonate with 500-800 mg/ TDS (Balance Hydrologics, 2008; GSWC, 2009). (SLO County Public Works Master Water Report, 2012)

The alluvium [in the Avila Valley sub-basin] extends out to the ocean but the fresh water portion of the alluvium is upstream of the Marre weir at San Luis Bay Estates. Prior to installation of this weir in the early 1970's, seawater intrusion had occurred as far up the valley as the confluence with See Canyon Creek. Since the installation of the weir and with the supplemental flow from the City of San Luis Obispo wastewater treatment plant, there has not been any seawater intrusion documented upstream of the weir. General mineral character in the alluvial groundwater upstream of the Marre weir is sodium-magnesium bicarbonate, with TDS concentrations averaging close to 700 mg/l in the late 1970's (J.M. Montgomery, 1982). (SLO County Public Works Master Water Report, 2012)

San Luis Obispo Creek Watershed

Primary Issues

Issue	Potential Causes	Referenced from
Riparian Vegetation / Buffer Quality (Lack of riparian canopy)	Removal of riparian vegetation by landowners and livestock,	Land Conservancy, 2002
Surface Water Nutrients and Dissolved Oxygen	Agriculture, municipal, lack of riparian canopy	Land Conservancy, 2002
Surface Water Temperature	Lack of riparian canopy	Land Conservancy, 2002
Surface Water Pathogens	Described in TMDL for Pathogens (RWQCB, 2004)	Land Conservancy, 2002
Surface Water Treated Effluent	City of San Luis Obispo's Wastewater Facility discharged	Land Conservancy, 2002
Surface Water Priority Organics	Unknown	Land Conservancy, 2002
Surface Water Quantity	Natural, diversions (permitted and unpermitted), evaporation, and exotic plants	Land Conservancy, 2002
Instream Fish Habitat	Lack of riparian canopy and instream shelter, sedimentation of stream cobble	Land Conservancy, 2002
Fish Passage Barriers	Roads, culverts, other instream structures	Land Conservancy, 2002
Streambank Stability (Erosion)	Development encroachment, channel incision, vegetation removal, overgrazing, agriculture, roads and utility construction	Land Conservancy, 2002 and Questa Engineering, 2003
Upland Erosion and Sedimentation	Vegetation removal, intensified grazing, unpaved roads, and disturbance associated with construction	Land Conservancy, 2002
Exotic Plant Species	None identified.	Land Conservancy, 2002
Non-Native Fish – Carp and Chinook Salmon	None identified.	Land Conservancy, 2002
Debris Accumulation	garbage, residential, commercial and agricultural products	Land Conservancy, 2002
Flooding	Natural, increased impervious areas, encroachment on floodplain	Questa Engineering, 2003

San Luis Obispo Creek Watershed

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

San Luis Obispo Creek Watershed

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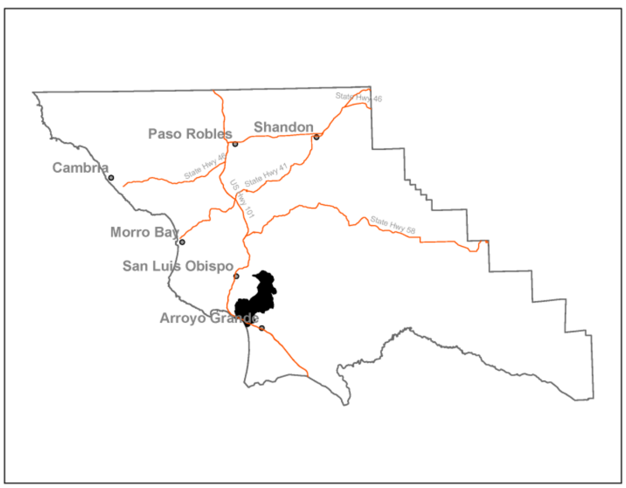
Hydrologic Unit Name	Water Planning Area	Total Acres	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay HU 10	South Coast WPA 7	26,030 acres	Pacific Ocean	San Luis Obispo Valley	County of San Luis Obispo City of Pismo Beach



Description:

The Pismo Creek Watershed is a coastal basin located in southern San Luis Obispo County. The drainage rises to a maximum elevation of almost 2,865 feet above mean sea level. Pismo Creek flows to the Pacific Ocean and has three major tributary basins with their headwaters in the Santa Lucia Mountains: West Corral de Piedra, East Corral de Piedra, and Cañada Verde. A fourth significant tributary, Cuevitas Creek, enters Pismo Creek from the west in lower Price Canyon. The mouth of Pismo Creek is in the dune region known locally as Pismo Beach.

The watershed is dominated by agricultural land uses in its upper reaches including vineyards, ranches and row crops. The urban core of the City of Pismo Beach is adjacent to the Pismo Creek Estuary. Other land uses include a regional landfill, oil exploration and a wastewater treatment plant.

Watershed Plans:

Pismo Creek/ Edna Area Watershed Management Plan (CCSE, 2009)

Pismo Creek Watershed

Characteristics:

	Physical Setting	
	Rainfall	16 -29 inches (NRCS precipitation shapefile, 2010)
	Air Temperature	Summer Range (August 1981-2010): 54°- 73° F Winter Range (December 1981-2010): 39°- 63° F At Santa Maria Public Airport, CA (NOAA National Climatic Data Center, viewed 2013) Limited data.
	Geology Description	The West Corral de Piedra Creek, East Corral de Piedra Creek, and the Canada Verde Creek consist of moderately infiltrative early to mid-Tertiary headwaters and a flat Quaternary highly infiltrative valley – category #14. Pismo Creek consists of steep moderately infiltrative early to mid-Tertiary headwaters and a flat pre-Quaternary moderately infiltrative valley – category #11 (Bell, personal communication, 2013). The Pismo Creek watershed consists of three distinct geologic blocks separated by the Edna and Huasna fault zones. The upper watershed is underlain by Franciscan metasediments and ultrabasic rocks (mainly serpentines), and upper Cretaceous and early Tertiary sedimentary units. The Edna Valley comprises the middle third of the watershed, with a critical veneer of water-bearing sedimentary rocks typically 100 feet in thickness – ranging up to 300 feet -- overlying Franciscan and consolidated-sedimentary rocks (Balance Hydroligics, 2008 from Van Vlack, 1991). The Coastal San Luis Range is composed of mainly mid- to late-Miocene (late-Tertiary) consolidated sedimentary rocks of the Monterey and Pismo formations, plus coeval volcanic units of the Obispo formation, forming most of the ridge along the coast. (CCSE, 2009)
	Hydrology	
	Stream Gage	No; Hydrology can be compared to Arroyo Grande Creek which has a USGS and San Luis Obispo County stream gage station. (Balance Hydrologics, 2008)
	Hydrology Models	Yes; A HEC-HMS watershed model for Pismo Creek was developed for the *Hydrology and Geology Assessment* and looked at peak flows (Balance Hydrologics, 2008).
	Peak Flow	No source identified for measured peak flows. Peak flows (100-year recurrence) can be expected to be on the order of 150 to 200 cfs per square mile and intermediate (1.6-year recurrence) flows can be expected to be on the order of 15 to 90 cfs per square mile, based on the modeling conducted, and

Pismo Creek Watershed

		calibrated to measured flows in nearby similar watersheds (Balance Hydrologics, 2008).
	Base Flow	September low flows are estimated to have ranged from 0 to 7.5 cfs since 1968. This is equal to approximately 0 to 0.20 cfs per square mile (Balance Hydrologics, 2008).
	Flood Reports	No locally specific source identified. The SLO County Flood Insurance Study was revised in 2012. Pismo Creek Mainstem channelized from Hwy 101 downstream to Pismo Beach; A levee, faced with soil sediment, was constructed along the south over bank of Pismo Creek between river miles 0.8 and 0.5 to protect the wastewater treatment plant. According to a 1997 Federal Emergency Management Agency (FEMA) report, the levee does not confine 100-year flood flows, and could be been washed out during an event of that magnitude; While not designed as a flood control mechanism, the private dam on West Corral de Piedra may function to hold storm water from upper West Corral de Piedra. (CCSE, 2009) Areas of Flood Risk include East Corral de Piedra upstream of intersection of Twin Creeks Way and Mira Cielo Drive and intersection of Twin Creeks Way with Hwy 227; Lower Pismo Creek from Hwy 101 downstream to Pacific Ocean and south to State Parks Campground/Carpenter Creek. (CCSE, 2009)
	Biological Setting	
	Vegetation Cover	Primarily non-native grassland with some coast live oak, chaparral (ceanothus, buck brush, mixed serpentine), mixed evergreen forest, black sage and urban land.(SLO County, vegetation shapefile, 1990) Limited spatial data. No alliance level vegetation mapping was available for the entire County.
	Invasive Species	Arundo, Cape Ivy (CCSE, 2009) Limited data.
	Special Status Wildlife and Plants	*Key:* Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern- SSC, CA rare plant ranking – CRPR (CDFW CNDDB, viewed August 2013)

Common Name	**Status**	**ARROYO GRANDE NE**	**LOPEZ MTN**	**PISMO BEACH**
Animals				

American badger	SSC	x		x
California red-legged frog	**FT**		**x**	**x**
coast horned lizard	SSC			x
Coast Range newt	SSC		x	
foothill yellow-legged frog	SSC		x	
globose dune beetle	Special Animal			x
monarch butterfly	Special Animal			x
prairie falcon	Special Animal (Nesting)	x	x	x
San Luis Obispo pyrg	Special Animal		x	
sandy beach tiger beetle	Special Animal			x
steelhead - south/central California coast DPS	**FT**	**x**	**x**	**x**
tidewater goby	**FE**			**x**
vernal pool fairy shrimp	**FT**			**x**
western mastiff bat	SSC			
western pond turtle	SSC	x	x	x
western snowy plover	**FT**			**x**
Plants/Lichen				
beach spectaclepod	**ST**	**x**		**x**
black-flowered figwort	CRPR 1B.2	x		x
Blochman's dudleya	CRPR 1B.1			x

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Blochman's leafy daisy	CRPR 1B.2			x
Brewer's spineflower	CRPR 1B.3	x	x	x
Cambria morning-glory	CRPR 4.2	x	x	x
chaparral ragwort	CRPR 2B.2		x	
Chorro Creek bog thistle	**FE; SE**		**x**	**x**
Congdon's tarplant	CRPR 1B.1	x		x
Cuesta Ridge thistle	CRPR 1B.2		x	
dune larkspur	CRPR 1B.2		x	
dwarf soaproot	CRPR 1B.2		x	
Eastwood's larkspur	CRPR 1B.2	x	x	
Hoover's bent grass	CRPR 1B.2	x	x	x
Hoover's button-celery	CRPR 1B.1			x
Indian Knob mountain-balm	**FE; SE**			**x**
Jones' layia	CRPR 1B.2		x	x
La Panza mariposa-lily	CRPR 1B.3			x
marsh sandwort	**FE; SE**	**x**		**x**
mesa horkelia	CRPR 1B.1	x		x
Morro manzanita	**FT**			**x**
most beautiful jewel-flower	CRPR 1B.2		x	
mouse-gray dudleya	CRPR 1B.3	x	x	x
Palmer's monardella	CRPR 1B.2		x	
Pecho manzanita	CRPR 1B.2		x	x

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Pismo clarkia	**FE; SR**	**x**		**x**
saline clover	CRPR 1B.2			
San Luis mariposa-lily	CRPR 1B.2	x	x	x
San Luis Obispo County lupine	CRPR 1B.2	x		x
San Luis Obispo owl's-clover	CRPR 1B.2	x	x	x
San Luis Obispo sedge	CRPR 1B.2		x	
Santa Lucia manzanita	CRPR 1B.2		x	
Santa Margarita manzanita	CRPR 1B.2	x	x	x
straight-awned spineflower	CRPR 1B.3	x		
surf thistle	**ST**	**x**		**x**

Limited by the type of data collected in the CA Natural Diversity Database.

Steelhead Streams	Pismo Creek; East and West Corral de Piedra Creeks (NMFS,2005)
Stream Habitat Inventory	Yes; Completed 2005 for Pismo Creek and West Corral de Piedra as landowner access allowed by California Department of Fish and Game staff. None completed for other tributaries. (CCSE, 2009)
Fish Passage Barriers	Fish Ladder at Railroad Crossing of Pismo Creek: stream mile 5.3, Temporary Barrier, PAD # 700044.00000; Arizona Crossing of Pismo Creek: stream mile 4.6, Temporary Barrier, PAD # 736885.00000; County bridge Crossing of West Corral de Piedra Creek at Righetti Road: stream mile 8.2, Temporary Barrier, PAD # 700080.00000; (San Luis Obispo County Stream Crossing Inventory and Fish Passage Evaluation, 2005) Other potential barriers identified by landowners: Bridge Creek Road Crossing of West Corral de Piedra Creek, stream mile 9.1; Righetti Dam spillway on West Corral de Piedra Creek, stream mile 9.8; West Corral de Piedra Creek at Hwy 227 and Old Edna where boulders may have been placed, stream mile 5.7, PAD # 731304.00000; A concrete stream crossing with two culverts observed on East Corral de Piedra Creek may also be a fish passage barrier. (CCSE, 2009) Bedrock Falls at West Corral de Piedra Creek, Total Barrier, PAD # 700079.00000 (CDFW Passage Assessment Database, 2013)

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	Designated Critical Habitat	Yes; Tidewater goby and Steelhead trout (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	None.(USFWS Critical Habitat Portal, viewed 2013)
	Other Environmental Resources	Coastal Zone
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo, City of Pismo Beach, Town of Shell Beach
	% Urbanized	13% (5.44% urban, 6.58% residential, less than 1% of commercial, industrial and public facilities) (SLO County LUC)
	% Agricultural	74% (SLO County LUC)
	% Other	13% (12.78% rural lands, less than 1% of recreation open space) (SLO County LUC)
	Planning Areas	San Luis Obispo, San Luis Bay Coastal, San Luis Bay Inland, Los Padres
	Potential growth areas	Los Ranchos/Edna Village area (Specific Plan, 2001); Price Canyon and Los Robles del Mar areas (recent development proposals)
	Facilities Present	Private Dam on West Corral de Piedra Creek; Cold Canyon Landfill; Plains Exploration Oil Field; Pismo Beach Wastewater Treatment Plant with discharge to Ocean; Country Club Wastewater Treatment Plant.
	Commercial Uses	Plains Exploration and Production Company; Recreation and tourism at Pismo Beach; Wineries in Edna Valley; 3 Bar S Ranch/Spreafico Mine for decorative rock, Patchett Pit Mine for sand and gravel (SLO County extractive resources)
	Demographics	
	Population	8,945 (U.S. Census Block, 2010) 7,655 in City of Pismo Beach (US Census, 2010)
	Race and Ethnicity	86% Caucasian, 9% Latinos, 2% Asian, and 2% two or more races. The remaining races each represent less than 1%, including African American, American Indian, Pacific Islander, and other (U.S. Census Block, 2010).
	Income	MHI $79,171 in watershed.(US Census Tract, 2010) MHI $65,682 in City (US Census, 2010) Census tract crosses multiple watersheds.
	Disadvantaged Communities	No; 2% of individuals are below poverty level in watershed.(US Census Tract, 2010) 4.9% of individuals are below poverty level in City (US Census, 2010) Census tract crosses multiple watersheds.
	Water Supply	

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	Water Management Entities	City of Pismo Beach. No source identified. "The Los Ranchos/Edna Village area obtains water through a central system owned by the California Cities Water Company. Developed parcels within the remainder of the village area obtain water from individual wells or two small mutual water companies." (Draft Los Ranchos Village Plan, 2013) Limited data identified.
	Groundwater	Yes; alluvial and San Luis Obispo Valley (SLO County, 2012)
	Surface Water	No public reservoirs. There is a private dam on West Corral de Piedra Creek (CCSE, 2009).
	Imported Water	Yes; entitled to 896 AFY from Lake Lopez, 1,100 AFY of State Water and 700 AFY of groundwater from the Arroyo Grande aquifer. (City of Pismo Beach, 2013)
	Recycled/ Desalinated Water	None in the City of Pismo Beach. No source identified.
	Infiltration Zone	The rolling hills of Canada Verde's tributaries are largely incised into the Paso Robles formation, with limited volumes of recent alluvium. Soils are mapped in this area largely as belonging to hydrologic soil group A and B, indicating that these areas may be especially suitable for ground-water recharge during storms, and also slow release of ground-water to streams during base flow periods. (Balance Hydrologics, 2008) Limited data.
	Water Budget	None to date. One is planned by Central Coast Salmon Enhancement for completion in 2015.
	Water Uses	
	Beneficial Uses	*Pismo Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *Pismo Creek Estuary* – Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD), Estuarine Habitat (EST), Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early

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		Development (SPWN), Shellfish Harvesting (SHELL) (RWCQB, 2011)
	Other Unique Characteristics	
	Historic Resources	The Price House is listed on the National Register of Historic Places (NRHP, viewed 2013). The Tognazzini General Store is identified a historic site by the SLO County (Draft Los Ranchos Village Plan, 2013).
	Archeological Resources	There was a Chumash town called Pismu at the time of European settlement (SB Museum of Natural History, viewed 2013). Limited data.
	Other	No source identified.
	Climate Change Considerations	
		State climate change maps show sea level affecting portions of the City of Pismo Beach and town of Oceano with inundation areas along lower Pismo Creek and Carpenter Creek particularly between Highway 101 and the ocean (USGS,Cal-Adapt, viewed 2013). See IRWMP, 2014 Section H. Climate Change Limited data and not watershed specific.

Watershed Codes

Calwater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.260005	2	Point Buchon	6	Pismo	310.26	undefined	West Corral de Piedra Creek
3310.260001	2	Point Buchon	6	Pismo	310.26	undefined	East Corral de Piedra Creek
3310.260002	2	Point Buchon	6	Pismo	310.26	undefined	Canada Verde
3310.260004	2	Point Buchon	6	Pismo	310.26	undefined	Lower Pismo Creek
3310.260003	2	Point Buchon	6	Pismo	310.26	undefined	Upper Pismo Creek
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Pismo Creek Watershed

Major Changes in the Watershed

- In 1772, Mission San Luis Obispo was established bringing ranching to the area.
- The watershed covers portions of three Mexican land grants; the San Miguelito, the Pismo and the Corral de Piedra (Effie McDermott Archives).
- In 1865, Edgar Willis Steele and his brothers purchased 45,000 acres in the Edna Valley and introduced the modern dairy industry to San Luis Obispo County. In 1866, Edgar Steele bought portions of Corral de Piedra, El Pismo, Bolsa de Chamisal and Arroyo Grande ranchos. They operated five dairy farms, each with 150 head of dairy cattle.
- Railroad
- Prior to 1911, Pismo Creek's lower drainage included Pismo Lake, and what today is called Meadow Creek. Lower Pismo Creek joined with Arroyo Grande Creek in its lowest reaches and flowed into the ocean.
- In 1953, the Pismo Beach Wastewater Treatment Plant began operation.
- In 1965, Cold Canyon Landfill began accepting non-hazardous waste.
- In the late 1970's, Plains Exploration & Production started production of the oil field in Price Canyon.

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources	Environmental Flows
Pismo Creek Mainstem	Perennial	Yes on 303d list for Chloride, E. coli, Fecal Coliform, Low Dissolved Oxygen, and Sodium. TMDL estimated date of completion 2021. (Central Coast RWQCB, 2011)	Agriculture, grazing-related, natural sources, resource extraction, petroleum activities, transient encampments (Central Coast RWQCB, 2011)	X Cfs (Stillwater Sciences, 2013)
West Corral de Piedra	Ephemeral?	No.	Undetermined.	
East Corral de Piedra	Ephemeral?	No.	Undetermined.	
Canada Verde	Perennial?	No.	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,
San Luis Obispo Valley – Pismo Creek Valley Subbasin	200 AFY, although this is before any consideration for environmental habitat demand (Fugro, 2009). (SLO County, Master Water Report, 2012)	Physical limitations and environmental demand. The shallow alluvial deposits are typically more susceptible to drought impacts. (SLO County, Master Water Report, 2012)	Yes; see description below. (SLO County, Master Water Report, 2012)	No for basin. No objective for subbasin. (RWQCB, 2011)
San Luis Obispo Valley – Edna Valley Subbasin	4,000 AFY (DWR, 1997) (SLO County, Master Water Report, 2012)	Physical limitations and environmental demand (SLO County, Master Water Report, 2012)	No. (SLO County, Master Water Report, 2012)	No for basin. No objective for subbasin. (RWQCB, 2011)

Groundwater Quality Description: The general mineral character of groundwater in the Edna Valley subbasin is magnesium-calcium bicarbonate with a TDS range of 630-780 mg/l (average 690 mg/l), based on public water company testing during 2008. This is consistent with surface water samples collected in 2007 from tributaries to Pismo Creek in the Edna Valley, where the water was magnesium-calcium bicarbonate with 500-800 mg/ TDS (Balance Hydrologics, 2008; GSWC, 2009).

Results of six groundwater samples collected from Pismo Creek Valley subbasin wells in 1999 indicate magnesium bicarbonate and magnesium sulfate-bicarbonate are the dominant water types, with a median TDS of 620 mg/l. One well exceeded the State drinking water standards for TDS and sulfate, and most of the wells also had iron and/or manganese concentrations above the drinking water standards (Fugro, 2009). (SLO County Public Works Master Water Report, 2012)

Primary Issues

Issue	Potential Causes	Referenced from
Surface Water Quality - Temperature	Lack of riparian canopy	CCSE, 2009
Surface Water Quality - Nutrients and Dissolved Oxygen	Agriculture, increased runoff due to development	CCAMP
Ocean Water Quality – Fecal	Birds, domestic animal waste,	Kitts, 2009

Pismo Creek Watershed

Issue	Potential Causes	Referenced from
coliform	faulty septic systems, homeless encampments	
Surface flow Quantity	Natural, groundwater diversions, impoundment	CCSE, 2009
Groundwater Quantity	Physical limitations, production	SLO County Master Water Report, 2012
Fish Passage Barriers	Multiple sites inaccessible to fish traffic	CCSE, 2009
Erosion and Sedimentation	Drought/storm years weaken banks, agricultural practices	CCSE, 2009
Flood Management	Development in floodplains	CCSE, 2009

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

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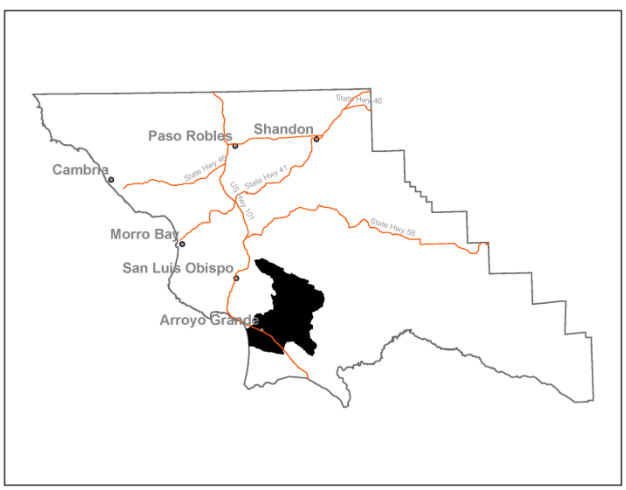
Arroyo Grande Creek Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay HU 10	South Coast WPA 7	95,998 acres	Pacific Ocean	Santa Maria River Valley; Arroyo Grande Creek; Edna Valley	County of San Luis Obispo City of Arroyo Grande City of Grover Beach Community of Oceano Los Padres National Forest Pismo State Beach


Photo by: N. Smith



Description:

The Arroyo Grande Creek Watershed is a coastal basin located in southern San Luis Obispo County. The drainage rises to a maximum elevation of approximately 3,100 feet above sea level. The watershed includes the tributaries of Tally Ho (Corbett), Tar Springs and Los Berros Creeks. Meadow Creek is a remnant marsh drainage system that enters Arroyo Grande Creek, just upstream of the confluence with the ocean. Arroyo Grande Creek empties into an estuary adjacent to the Oceano lagoon.

The watershed is dominated by agricultural land uses including vineyards, ranches and row crops. The urban core of the City of Arroyo Grande is at the confluence of Tally Ho Creek with Arroyo Grande Creek. Other land uses include Lake Lopez Reservoir and a regional airport in Oceano.

Watershed Plans:

Arroyo Grande Creek Watershed Management Plan (CCSE, 2009)

Arroyo Grande Creek Watershed

Characteristics:

	Physical Setting	
	Rainfall	15 – 28 inches (NRCS, 2010)
	Air Temperature	Summer Range (August 1981-2010): 54° - 73° F Winter Range (December 1981-2010): 39° - 63° F At Santa Maria Public Airport, CA. (NOAA National Climatic Data Center, viewed 2013) Limited data in watershed.
	Geology Description	The Arroyo Grande Creek, Carpenter Creek, Tar Springs Creek, and Vasquez Creek sub watersheds consist of steep moderately infiltrative early to mid-Tertiary headwaters – category # 8. The Wittenberg Creek sub watershed consists of steep pre-Quaternary, non-infiltrative headwaters with steep moderately infiltrative early to mid-Tertiary valley-category # 5. The Los Berros Creek sub watershed consists of steep pre-quaternary non-infiltrative headwaters with a flat highly infiltrative Quaternary valley-category # 3. (Stillwater Sciences, 2013) The Arroyo Grande Creek watershed lies at a structural and geomorphic transition between the north-northwest trending Coast Ranges and the west trending Transverse Ranges and has been described by Nitchman (1988) and Namson and Davis (1990) as an active fold and thrust belt. The lower watershed occurs within a geomorphic province known as the Pismo Basin that is bound on the northeast by the West Huasna Fault Zone and on the southwest by the Santa Maria River Fault Zone. The Wilmar Avenue Fault Zone also dissects the lower watershed, running parallel to the Highway 101 corridor. The lower watershed is primarily underlain by sedimentary and volcanic rocks from the Cenezoic age though portions of the watershed in the vicinity of Lopez Dam are melange and serpentine rocks from the Franciscan Formation. The sedimentary or pyroclastic nature and relatively young age of much of the underlying bedrock material results in the presence of highly erodible, friable material that is unconconsolidated and easily weathered. Dune formations and extensive alluvial deposits in the valley floor of the mainstem and tributary channels also results in high erosion potentials. The alluvium primarily consist of unconsolidated, poorly bedded, poorly sorted to sorted sand, gravel, silt, and clay, with cobbles and boulders.(Swanson Hydrology &Geomorphology, 2004) Water supply aquifers are within Holocene alluvial deposits in Arroyo Grande Valley, which is drained by Arroyo Grande Creek. The alluvial deposits reach approximately 100 feet thick (DWR, 2002). Recharge

Arroyo Grande Creek Watershed

		to the subbasin comes primarily from seepage from Arroyo Grande Creek (including Lopez Reservoir releases) and tributaries, deep percolation of precipitation, and residential/agricultural return flows. (Master Water Plan, 2012)
	Hydrology	
	Stream Gage	Yes; USGS 11141280 at Lopez Creek near Arroyo Grande (1967 - present, active) and USGS/County 11141500 Arroyo Grande Creek at the City of Arroyo Grande (1940 – 1986 by USGS 1986 - present by County, active). The County has total of 9 active stream flow gages in the watershed. There are 5 USGS stream gage stations discontinued (Stetson Engineering, 2004).
	Hydrologic Models	Yes; Swanson Hydrology & Geomorphology used a HEC-RAS to study the flood control channel in 2005. The County Public Works Department uses a model to plan.
	Peak Flow	4,620 - 5,400 cfs at USGS 11141500 (1940-1986, change in management to County) (USGS, viewed 2013). The 100 year discharge estimates are 19,500 cfs (Swanson Hydrology & Geomorphology, 2005).
	Base Flow	11 – 19 cfs at USGS 11141500 (1940 – 1986, change in management to County) (USGS viewed 2013) It is unknown whether gage was placed to capture base flows accurately. Many stream gages are installed as alert systems for peak flows.
	Flood Reports	Yes; Arroyo Grande Creek Erosion, Sedimentation and Flood Alternatives Study (Swanson Hydrology & Geomorphology, 2006); Arroyo Grande Creek Channel Waterway Management Plan (Waterways Consulting, 2010) The County manages Zone 1/1A Flood Control and Water Conservation District along the lower Arroyo Grande Creek including the channel and associated levees and flap gates for flood protection. (SLOCountyWater.org, viewed 2013)
	Biological Setting	
	Vegetation Cover	Primarily non-native annual grassland, chaparral (chamise, buck brush, and redshanks), and coast live oak forest with some sage scrub, central coastal scrub, beaches and coastal dune, agricultural land, and urban land. (SLO County vegetation shapefile, 1990) Limited spatial data. No alliance level vegetation mapping was available for the entire County.
	Invasive Species	Largemouth bass, Black Crappie, Green Sunfish, English ivy, Cape ivy, *Arundo donax,* pampas grass, castor bean, and bullfrog. (CCSE, 2009 and Cindy Cleveland, personal communication, 2013) Limited data and no spatial data.

Arroyo Grande Creek Watershed

Special Status Wildlife and Plants

Key: Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern – SSC, CRPR – CA rare plant ranking. (CDFW CNDDB, August viewed 2013)

Common Name	Status	ARROYO GRANDE NE	CALDWELL MESA	LOPEZ MTN	NIPOMO	OCEANO	SANTA MARGARITA LAKE	TAR SPRING RIDGE
Animals								
arroyo chub	SSC							x
California condor	**FE; SE**						**x**	**x**
California red-legged frog	**FT**	**x**			**x**	**x**		**x**
coast horned lizard	SSC	x						
Coast Range newt	SSC							x
foothill yellow-legged frog	SSC			x				
mimic tryonia (=California brackish water snail)	Special Animal					x		
monarch butterfly	Special Animal					x		
Oso Flaco flightless moth	Special Animal					x		
Oso Flaco robber fly	Special Animal					x		
prairie falcon	Special Animal (Nesting)	x	x	x	x	x	x	x
steelhead - south/central California coast DPS	**FT**	**x**			**x**	**x**		**x**
western pond turtle	SSC	x				x		

western snowy plover	**FT**			**x**		
white sand bear scarab beetle	Special Animal			x		
Plants						
Blochman's leafy daisy	CRPR 1B.2			x		
California saw-grass	CRPR 2B.2			x		
coastal goosefoot	CRPR 1B.2			x		
crisp monardella	CRPR 1B.2			x		
Cuesta Ridge thistle	CRPR 1B.2		x			
dune larkspur	CRPR 1B.2			x		
Eastwood's larkspur	CRPR 1B.2		x		x	x
Gambel's water cress	**FE; ST; CRPR 1B.1**			**x**		
Hardham's evening-primrose	CRPR 1B.2				x	
Hoover's bent grass	CRPR 1B.2	x	x	x		
La Graciosa thistle	**FE; ST; CRPR 1B.1**			**x**		
La Panza mariposa-lily	CRPR 1B.3				x	
marsh sandwort	**FE; SE; CRPR 1B.1**			**x**		
Nipomo Mesa lupine	**FE; SE; CRPR 1B.1**			**x**		
Ojai fritillary	CRPR 1B.2				x	
Pecho manzanita	CRPR 1B.2		x			
Pismo clarkia	**FE; SR; CRPR 1B.1**	**x**		**x**		
Robbins' nemacladus	CRPR 1B.2					x
San Bernardino aster	CRPR 1B.2			x		
San Luis mariposa-lily	CRPR 1B.2	x				

Arroyo Grande Creek Watershed

		San Luis Obispo County lupine	CRPR 1B.2				x			x
		San Luis Obispo monardella	CRPR 1B.2					x		
		San Luis Obispo owl's-clover	CRPR 1B.2	x						
		sand mesa manzanita	CRPR 1B.2					x		
		Santa Lucia manzanita	CRPR 1B.2	x		x				
		Santa Margarita manzanita	CRPR 1B.2	x				x		x
		straight-awned spineflower	CRPR 1B.3	x						
		umbrella larkspur	CRPR 1B.3 Data is limited by the CA Natural Diversity Database.		x					x
	Steelhead Streams		Yes; Arroyo Grande Creek. (NMFS, 2012) Los Berros (CEMAR, 2008). There are rainbow trout populations above Lopez Dam (CEMAR, 2008)							
	Stream Habitat Inventory		Yes; Completed 2004 for Arroyo Grande Creek as landowner access allowed by California Conservation Corps. None completed for other tributaries. (CCSE, 2009) Data limited to mainstem.							
	Fish Passage Barriers		Modify County Stream Gage at stream mile 4.98; Replace Cecchetti Road Culvert at steam mile 8, Temporary Barrier, PAD # 700030.00000; Modify Abandoned Dam at stream mile 9.5; Modify Concrete Dam at stream mile 5.82; Remove Debris at Huasna Road; Modify Los Berros Creek Gage at stream mile 5.6; Replace Los Berros Creek Culvert; Modify Tar Springs Creek Road Crossing at stream mile 0.5; Replace Biddle Park Culvert at stream mile 10.9, Temporary Barrier, PAD # 707002.00000; Hwy 101 culvert at Meadow Creek, Unknown Status, PAD # 732175.00000; Little Falls Natural Falls, Total Barrier, PAD # 735375.00000; Big Falls Canyon, Total Barrier, PAD # 735376.00000; Big falls Canyhon upper falls, Total Barrier, PAD # 735377.00000; Beaver Dam at Arroyo Grande Creek, Temporary Barrier, PAD # 736888.00000; Rip-Rap dam at Arroyo Grande Creek, Unknown Status, PAD # 736890.00000; Concrete dam at Arroyo Grande Creek, Partial Barrier, PAD # 736891.00000; Concrete Grade Control weir at Arroyo Grande Creek, Temporary Barrier, PAD # 736893.00000; Los Berros Creek rd. crossing/ gauging station at Los							

Arroyo Grande Creek Watershed

		berros creek, Temporary Barrier, PAD # 736894.00000; Low Flow Concrete Structure at Branch Mil Rd. on Tar Springs Creek, Total barrier, PAD # 736895.00000; Culvert Replacement at Los Berros Creek, Partial barrier, PAD # 736896.00000; Dam at Lopez drive on Arroyo Grande Creek, Temporary Barrier, PAD # 718830; Road Crossing at Valley Road and Los Berros Creek, Partial Barrier, PAD # 712029. (CDFW Passage Assessment Database, viewed 2013 and CCSE, 2009)
	Designated Critical Habitat	Yes; South-Central California Coast Steelhead Trout , California Condor, California red-legged frog, La Grasiosa thistle, Western snowy plover (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	Yes; In development by County of San Luis Obispo for California red-legged frog and Steelhead trout along mainstem Arroyo Grande Creek. (USFWS Critical Habitat Portal, viewed 2013)
	Other Environmental Resources	Coastal Zone, Lopez Lake, Santa Lucia Wilderness, Los Padres National Forest, Oceano Dunes, Dunes Lakes
	Land Use	
	Jurisdictions and Local Communities	City of Arroyo Grande, City of Grover Beach, Town of Oceano
	% Urbanized	17.6% (6.1% urban and 11.1% residential with less than 1% commercial, industrial and public facilities) (SLO County LUC).
	% Agricultural	45.6% (SLO County LUC)
	% Other	36.8% (17.91% open space, 5.02% recreation, and 13.82% rural lands) (SLO County LUC).
	Planning Areas	San Luis Bay Coastal, San Luis Bay Inland, South County Inland, Huasna-Lopez, Los Padres, San Luis Obispo
	Potential growth areas	City of Arroyo Grande, Oceano, Los Berros Village Area
	Facilities Present	Lopez Dam on Arroyo Grande Creek; Terminal Reservoir and Lopez Water Treatment Plant; Oceano Wastewater Treatment Plant with discharge to Ocean; Oceano Airport; Arroyo Grande Flood Control Channel
	Commercial Uses	Cropland in Cienega Valley; Recreation and tourism at Lake Lopez, City of Arroyo Grande, State Park Beaches and the Oceano Dunes; Grieb Ranch Quarry for dimension stone, Oceano Sand Company Pit for specialty sand.(SLO County, Extractive resources shapefile)
	Demographics	
	Population	47,830 in watershed. 17,249, 36.1% in the City of Arroyo Grande. 13,156, 27.5% in the City of Grover Beach. 7,286, 15.2% in the Community of Oceano (U.S. Census Block, 2010).
	Race and Ethnicity	Watershed: 70% Caucasian (33,490), 22.9% Latino (10,949) 3.2% Asian (1,517), 2.5% 2 or more races/ethnicity (1,213) and 1%

		Other (77). (U.S. Census Tract, 2010). Arroyo Grande: Caucasian, representing 76.9%. Latinos represent 15.7% of the total population in the watershed. The remaining races each represent less than 4%, including African American, American Indian, Pacific Islander, and Asian(U.S. Census, 2010). Grover Beach: Caucasian, representing 62.3%. Latinos represent 29.2% of the total population in Grover Beach. The remaining races each represent less than 4%, including African American, American Indian, Pacific Islander, and Asian(U.S. Census, 2010). Oceano: Caucasian, representing 47.4%. Latinos represent 47.8% of the total population in Oceano. The remaining races each represent less than 3%, including African American, American Indian, Pacific Islander, and Asian (U.S. Census, 2010).
	Income	MHI $63,535 in watershed (U.S. Census Tracts, 2010). MHI $64,900 in Arroyo Grande(U.S. Census, 2010) MHI $47,708 in Grover Beach (U.S. Census, 2010) MHI $37,219 in Oceano (U.S. Census, 2010) Census tract covers multiple watersheds.
	Disadvantaged Communities	Yes, Oceano; 5% of individuals are below poverty level in watershed (U.S. Census Tract, 2010). 7.2% of individuals are below poverty level in Arroyo Grande. 14.3% of individuals are below poverty level in Grover Beach. 14.1% of individuals are below poverty level in Oceano. (US Census, 2010) Census tract covers multiple watersheds.
	Water Supply	
	Water Management Entities	Zone 3 Flood Control and Water Conservation District; City of Arroyo Grande; City of Grover Beach; Oceano Community Services District; Northern Cities Management Area participants including City of Pismo Beach, City of Arroyo Grande, City of Grover Beach, Oceano Community Services District, small public water systems, and residential and agricultural overlying users.
	Groundwater	Yes; alluvial, Arroyo Grande Valley and Santa Maria Valley Basins (SLO County, 2012)
	Surface Water	Yes; Lake Lopez is operated for municipal water supply storing 49,400 acre-feet and downstream irrigation water supply. Average annual diversion in 1969 through 1996 was about 4,630 acre-feet (Stetson Engineering, 2004).
	Imported Water	Yes; State Water enters the watershed and serves the Oceano Community Services District which has considered selling its surplus (in surplus years) to surrounding cities.

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	Recycled/ Desalinated Water	No recycled water production. There is the potential at South SLO County Sanitation District.
	Infiltration Zones	Arroyo Grande Creek by releases from Lake Lopez. Other areas undetermined. Limited data.
	Water Budget	Water Balance Study for Northern Cities Area (Todd Engineers, 2007). Limited data.
	Water Uses	
	Beneficial Uses	*Arroyo Grande Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN). *Arroyo Grande Estuary* – Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Shellfish Harvesting (SHELL) (RWQCB, 2011) *Dunes Lakes* – Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN).
	Other Unique Characteristics	
	Historic Resources	The City of Arroyo Grande has a building on the National Register of Historic Places.
	Archeological Resources	There were Chumash towns called Chimoli, Chiliqin, and Stemeqtatimi at the time of European settlement (SB Museum of Natural History, viewed 2013). Limited data and low priority for this effort.
	Los Padres National Forest	The Los Padres National Forest, Santa Lucia District in the watershed includes one campground, portions of the Santa Lucia Wilderness

Arroyo Grande Creek Watershed

		and general recreation.
	Climate Change Considerations	
		State climate change maps show sea level affecting the City of Grover Beach and town of Oceano with inundation areas along Meadow Creek and the historic Los Berros Creek (USGS, Cal-Adapt, viewed 2013). See IRWMP, 2014 Section H. Climate Change Limited data and not local.

Watershed Codes

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3310.310101	3	Arroyo Grande	1	Oceano	310.31	Lopez Lake	Vasquez Creek
3310.310102	3	Arroyo Grande	1	Oceano	310.31	Lopez Lake	Wittenberg Creek
3310.310103	3	Arroyo Grande	1	Oceano	310.31	Lopez Lake	Arroyo Grande Creek
3310.310104	3	Arroyo Grande	1	Oceano	310.31	Lopez Lake	Clapboard Canyon
3310.310105	3	Arroyo Grande	1	Oceano	310.31	Lopez Lake	Big Falls Canyon
3310.310206	3	Arroyo Grande	1	Oceano	310.31	Grover City	Guaya Canyon
3310.310204	3	Arroyo Grande	1	Oceano	310.31	Grover City	Carpenter Canyon
3310.310201	3	Arroyo Grande	1	Oceano	310.31	Grover City	Tarspring Creek
3310.310205	3	Arroyo Grande	1	Oceano	310.31	Grover City	Cienega Valley
3310.310203	3	Arroyo Grande	1	Oceano	310.31	Grover City	Los Berros Creek
3310.310202	3	Arroyo Grande	1	Oceano	310.31	Grover City	Los Berros Canyon
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Arroyo Grande Creek Watershed

Major Changes in the Watershed

- Chumash Indians are thought to have lived in the Lopez Valley as long ago as 2000 years. Four major villages were within the Lopez Valley, including the Chmoli and Chojuale villages.
- In 1772, Mission San Luis Obispo was established. Canada del Trigo, now Lopez Canyon, supplied wheat to Mission San Luis Obispo. Soon after the mission's founding, the padres established a garden and plantation on the plain of Arroyo Grande Creek where they raised corn, beans, potatoes and other vegetables.
- In the early 1800's, the first white settlers move to the valley and begin a dairy and prune orchard at the junction of Arroyo Grande and Lopez Creeks.
- Around 1899, over fourteen oil companies bored for oil in areas including Bore Porter Huasna Ranch, Phoenix Canyon, Records Ranch, Rosa Porter Ranch, Mrs. Flora Harloe Huasna Ranch, the upper valleys and in the town of Arroyo Grande.
- Between 1862 - 2000 there were approximately numerous flood years (Honeycutt, 2000)
- In 1929, fire season burned thousands of acres of AG watershed in Lopez, Clapboard, Tar Springs, and Phoenix canyons.
- In 1930, Plowed Hillside Farms washed out with every heavy rain; Corralitas, Corbett, Carpenter, and Oak Park Canyons. Oak Park Canyon pea farmers have to build brush and straw dykes at the head of the slopes. Civilian Conservation Corps (CCC) build drainage ditches and terraces to control runoff near Noyes Road and east of Printz Road. CCC stabilized hills in Carpenter Canyon-Poorman Canyon. (Honeycutt, 2000)
- In 1957, US Forest Service Intensifies fire prevention steps in Los Padres National Service. (Honeycutt)
- Early 1960s, Oceano wastewater treatment plant is constructed.
- In 1961, construction of the flood control channel was finished.
- In 1968, Lopez Dam completed; Dam filled to capacity and spills April 1969.
- In 2001, Flood Zone 1/1A Advisory Committee convenes following March 2001 levee breaches.

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Arroyo Grande	Perennial (ptn)	Yes; E coli., Fecal coliform TMDL estimated date of completion 2021.	Agriculture, grazing related sources, urban runoff/storm sewers	X cfs (Stillwater Sciences, 2013)
Los Berros	Ephemeral	Yes; Chloride,Nitrate, Sodium TMDL estimated date of completion 2021. (SWRCB, 2010)	Agriculture, grazing related sources, source unknown	X cfs (Stillwater Sciences, 2013)

Arroyo Grande Creek Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Tar Springs	Undetermined	Not assessed.	Undetermined.	X cfs (Stillwater Sciences, 2013)
Corbett Creek	Undetermined	Not assessed.	Undetermined.	X cfs (Stillwater Sciences, 2013)

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Arroyo Grande Valley Subbasin	No estimated safe yield value reported. (San Luis Obispo County, Master Water Report, 2012)	water quality issues, environmental demand, and water rights The shallow alluvial deposits are typically more susceptible to drought impacts. (San Luis Obispo County, Master Water Report, 2012)	Yes; see description below. (San Luis Obispo County, Master Water Report, 2012)	No. No objective for subbasin. (RWQCB, Basin Plan, Table 3-8, 2011)
Northern Cities Management Area of Santa Maria Valley Basin	4,000 AFY (DWR, 1997)	Water quality, environmental demand and water rights. (San Luis Obispo County, Master Water Report, 2012)	Yes; see description below. (San Luis Obispo County, Master Water Report, 2012)	No. No objective for subbasin. (RWQCB, Basin Plan, Table 3-8, 2011)

*Note: The Santa Maria Valley groundwater basin has been adjudicated. In 2005, the Superior Court of California entered a Stipulated Judgment for a basin-wide groundwater litigation case that defined three basin management areas encompassing approximately 256 square miles. These management areas are the Northern Cities Management Area, the Nipomo Mesa management Area, and the Santa Maria Management Area, which are used herein for planning by the County of San Luis Obispo. The Stipulated Judgment was adopted, with a declaratory judgment and physical solution adjudged and decreed in the Judgment after Trial, dated January 25, 2008. The three DWR subbasins included herein as separate basin components are outside of the adjudicated area.

Groundwater Quality Description: Historical groundwater quality in the Arroyo Grande Valley Subbasin, based on samples collected in the 1980's, shows a progressive deterioration in a downstream direction.

Arroyo Grande Creek Watershed

The general mineral character of groundwater in the valley was calcium-magnesium bicarbonate upstream of the Tar Springs Creek confluence and calcium-magnesium sulfate downstream of the confluence. The downstream section overlies a zone of multiple faults that may contribute highly mineralized water, along with irrigation water returns. With one exception, TDS, sulfate, and chloride concentrations in groundwater samples from wells in the upstream section met drinking water standards and the water was classified as suitable for agricultural irrigation. In the downstream section, TDS from wells typically exceeded 1,500 mg/l (the short term maximum drinking water standard), with sulfate concentrations exceeding the 500 mg/l upper limit for drinking water. The water was also classified as marginal to unsuitable for agricultural irrigation (DWR, 2002).

Northern Cities Management Area: Six of 35 wells tested exceeded the State drinking water standard for nitrate, which has been a concern in the area. In the Arroyo Grande Plain, historical data between 1950 and 1987 indicate that the chemical character was typically either calcium magnesium sulfate or calcium magnesium sulfate-bicarbonate. Approximately three-quarters of the wells sampled on the Arroyo Grande Plain had TDS values between 500-1,500 mg/l, with half the wells reporting sulfate concentrations greater than 250 mg/l (DWR, 2002).

Primary Issues

Issue	Potential Causes	Referenced from
Surface Water Quality - Temperature	Lack of riparian canopy	CCSE, 2009
Surface Water Quality - Nutrients and Dissolved Oxygen	Increase in urban land use	CCSE, 2009
Surface flow Quantity	Natural, groundwater diversions, impoundment	CCSE, 2009
Fish Passage Barriers	Road crossings, culverts, dams and other structures	CCSE, 2009
Erosion and Sedimentation	Natural, “hungry water” from dam release, lowering base flow level of mainstem, increased impervious areas, unvegetated roads and fields	CCSE, 2009
Flood Management	Loss of floodplain and encroachment of development, sedimentation in the flood control channel results in reduced capacity	CCSE, 2009 and Swanson Hydrologic, 2006

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

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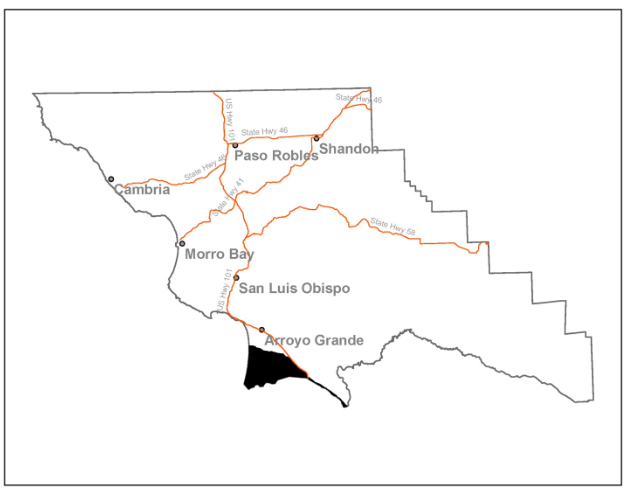
Santa Maria River Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estero Bay & Santa Maria HU 10 & 12	South Coast WPA 7	33,205 acres	Pacific Ocean	Santa Maria Valley	County of San Luis Obispo, Town of Nipomo


Photo by: G. Bates



Description:

The Santa Maria River Watershed is located in southern San Luis Obispo County and northern Santa Barbara County. The watershed includes the major tributaries of the Cuyama and Sisquoc Rivers as well as a number of smaller tributaries. The Santa Maria River (downstream of the confluence with Cuyama and Sisquoc Rivers) rises to a maximum elevation of approximately 390 feet and flows to the Pacific Ocean. Drainage in the watershed is linked to the soils and geology with a dune lake complex, Black Lake Canyon slough, Oso Flaco Creek and portions of the Santa Maria River within the County of San Luis Obispo.

The watershed is dominated by residential and agricultural land uses including ranches, row crops, greenhouses and orchards. Other land uses include recreation and oil refinery.

Watershed Plans:

Santa Maria River Estuary Enhancement and Management Plan (Dunes Center, 2004)

Santa Maria River Watershed

Characteristics:

	Physical Setting	
	Rainfall	15 – 17 inches (NRCS Precipitation 1981-2010)
	Air Temperature	Summer Range (August 1981-2010): 54°- 73°F Winter Range (December 1981-2010): 39°- 63°F At Santa Maria Public Airport, CA. (NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Santa Maria River, Black Lake Canyon and Oso Flaco Creek watersheds consist of flat highly infiltrative Quaternary headwaters – category #3. (Bell, personal communication, 2013) The watershed lies at the boundary of two geomorphic regions – the Coast Ranges and the Transverse Ranges – both highly influenced by right-lateral movement along the San Andreas Fault Zone. The lithology of the watershed is characterized as … young, weakly consolidated marine and some non-marine sedimentary rocks composing the valley bottoms. The … and Santa Maria valleys are the two principal depositional basins in the watershed and support the watershed's two main groundwater basins. It has been estimated that each basin has a maximum thickness of sediments reaching 2.0 and 2.9 km, respectively that has been filling continuously over the past 4 million years. (Stillwater Sciences, 2012) The Paso Robles Formation is water bearing (Morro Group, 1996). The watershed in underlain by an ancient sheet of windblown sand (Morro Group, 1996). The Nipomo Mesa west of U.S. 101 is basically its own watershed, having no watercourses entering from outside. With the exception of certain portions of Black Lake Canyon, the Mesa's undulating terrain creates a series of contiguous, undrained basins having ponding potentials (Lawrance, Fisk & McFarland, Inc 1987).
	Hydrology	
	Stream Gage	No; USGS 11141600 Los Berros C Nr Nipomo Ca (1968-1978, discontinued); USGS 11141000 Santa Maria R A Guadalupe (1941 - 1987, discontinued) Limited water quality data with instantaneous discharge was collected at USGS 350146120352501,Little Oso Flaco Lake Near Guadalupe CA (years unknown, active); USGS 350121120351301 Unnamed Trib To Oso Flaco Creek Near Guadalupe Ca (2008-08-06,active); USGS 350059120351501 Oso Flaco CA Oso Flaco Lake Rd Near Guadalupe Ca (2008-08-06, active); USGS 345945120341301

		Oso Flaco C A Hwy 1 Near Guadalupe Ca (2008-08-06,active); USGS 345955120330901, Oso Flaco C 1.0 Mi Us Of Hwy 1 Near Guadalupe Ca (dates unknown, active); USGS 350001120261101,Nipomo CA Hwy 101 Bridge Ca (1975-02-12,inactive) Limited data for major creeks.
	Hydrologic Models	Yes; for Santa Maria River Estuary (Dunes Center, 2004). Limited data for major creeks.
	Peak Flow	No source identified for Black Lake Canyon. Overall average annual discharge [for Oso Flaco Creek] measured over rain years 2009, 2010, 2011 is 2,062.25 million gallons for Site OFC 20. The highest monthly average flow was 17.46 cfs. (A&M, 2012) Limited data for major creeks.
	Base Flow	No source identified for Black Lake Canyon. Overall average annual discharge [for Oso Flaco Creek] measured over rain years 2009, 2010, 2011 is 2,062.25 million gallons for Site OFC 20. The lowest monthly average flow was 5.12 cfs for Site OFC20. (A&M, 2012). The Guadalupe gage (USGS 11141000) [on the Santa Maria River] record from 1941–1987 reported periods every year of continuous zero discharge, some up to three years in duration (Stillwater Sciences, 2012). Limited data for major creeks.
	Flood Reports	Yes; Nipomo Drainage and Flood Control Study (SLO County, 2004); No sources identified for Black Lake Canyon, Oso Flaco or Santa Maria River areas. The [Nipomo] Mesa's undulating topography creates numerous depressions, including low spots having no outflow drainage paths, which lead to a high incidence of localized ponding (SLO County FCWCD, 2009). Large portions of the Oso Flaco Creek subwatershed are within the FEMA 100 year flood zone; connecting to the Santa Maria River in large events. Flood risk is localized in the Black Lake Canyon area. (FEMA, Flood Maps) Limited data for major creeks.
	Biological Setting	
	Vegetation Cover	Primarily agricultural land and coastal beaches and dunes with some central coastal scrub (sagebrush and heather goldenbush),

coast live oak forest, coastal and valley freshwater marsh and urban land. (SLO County, vegetation shapefile, 1990)

Grassland, coastal dune scrub/chaparral, riparian/freshwater marsh, cypress/eucalyptus (Morro Group, 1996).

Limited spatial data. No alliance level vegetation mapping was available for the entire County.

Invasive Species	Eucalyptus, Giant reed, Cape ivy, Perennial pepperweed, Hoary cress, bull thistle, non-native grasslands. (Dunes Center, 2004) Limited data.
Special Status Wildlife and Plants	Special status plant taxa observed on or adjacent to the project site: California spineflower, sand almond, Gambel's watercress, marsh sandwort (Morro Group, 1996). Special status wildlife for which appropriate habitat is present on the project site include silver legless lizard, southwestern pond turtle, California red-legged frog, Cooper's hawk, sharp-shinned hawk, golden eagle, prairie falcons, Peregrine falcons and monarch butterfly. (Morro Group, 1996) *Key:* Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern- SSC, CA rare plant ranking – CRPR (CDFW CNDDB, viewed August 2013)

Common Name	**Status**	**GUADALUPE**	**NIPOMO**	**OCEANO**	**POINT SAL**	**SANTA MARIA**
Animals						
American badger	SSC			x		
arroyo chub	SSC				x	
burrowing owl	SSC (Burrow sites and some wintering sites)				x	
California black rail	**ST**			**x**		
California least tern	**FE; SE**			**x**	**x**	
California red-legged frog	**FT**	**x**	**x**	**x**		**x**
California tiger salamander	**FT; ST**					
coast horned lizard	SSC	x		x	x	x

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globose dune beetle	Special Animal			x		
mimic tryonia (=California brackish water snail)	Special Animal			x		
monarch butterfly	Special Animal			x		x
Morro Bay blue butterfly	Special Animal			x		
Oso Flaco flightless moth	Special Animal			x		
Oso Flaco patch butterfly	Special Animal			x		
Oso Flaco robber fly	Special Animal			x		
prairie falcon	Special Animal (Nesting)		x	x		
sandy beach tiger beetle	Special Animal			x		
sharp-shinned hawk	Special Animal (Nesting)		x	x		
silvery legless lizard	SSC	x		x	x	
steelhead - south/ central California coast DPS	**FT**		**x**	**x**		
tidewater goby	**FE**			**x**	**x**	
two-striped garter snake	SSC				x	
western pond turtle	SSC			x		
western snowy plover	**FT**			**x**	**x**	
western spadefoot	SSC		x			x

white sand bear scarab beetle	Special Animal			x	x	
Plants						
beach spectacle-pod	**ST**			**x**	**x**	
Blochman's leafy daisy	CRPR 1B.2			x	x	
California saw-grass	CRPR 2B.2			x		
coast woolly-heads	CRPR 1B.2			x		
coastal goosefoot	CRPR 1B.2	x		x	x	
crisp monardella	CRPR 1B.2	x		x	x	
Davidson's saltscale	CRPR 1B.2	x				
dune larkspur	CRPR 1B.2			x		x
Gambel's water cress	**FE; ST**			**x**		
Hoover's bent grass	CRPR 1B.2			x		
Kellogg's horkelia	CRPR 1B.1			x		
La Graciosa thistle	**FE; ST; CRPR 1B.1**	**x**		**x**	**x**	
marsh sandwort	**FE; SE**			**x**		
Miles' milk-vetch	CRPR 1B.2		x			
Nipomo Mesa lupine	**FE; SE**			x		
Pismo clarkia	**FE; SR**			**x**		
San Bernardino aster	CRPR 1B.2			x		
San Luis Obispo monardella	CRPR 1B.2			x	x	

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	sand mesa manzanita	CRPR 1B.2	x	x	x		x
	Santa Margarita manzanita	CRPR 1B.2		x	x		
	San Luis Obispo County lupine	CRPR 1B.2		x			
	short-lobed broomrape	CRPR 4.2			x	x	
	surf thistle	**ST; CPRR 1B.2**			**x**	**x**	
		Limited by the type of data collected in the CA Natural Diversity Database.					
Steelhead Streams		Santa Maria River (NMFS, 2005)					
Stream Habitat Inventory		No source identified.					
Fish Passage Barriers		Road Crossing Unnamed tributary to Santa Maria River, Unknown Status, PAD # 731125; Black Lake Canyon and Hwy 1 Culvert, Unknown Status, PAD # 731671. (CDFW Passage Assessment Database, 2013)					
Designated Critical Habitat		Yes; La Graciosa thistle (A&M, 2012); Western snowy plover (USFWS Critical Habitat Portal, viewed 2013); Steelhead trout (NMFS, 2005)					
Habitat Conservation Plans		None. (USFWS Critical Habitat Portal, viewed 2013)					
Other Environmental Resources		Guadalupe Dunes Complex, Coastal Zone, Oso Flaco Lake Natural Reserve, Nipomo Dunes, Dune Lakes, Black Lake Canyon and wetlands (freshwater marsh, peat bog, riparian)					
Land Use							
Jurisdictions & Local Communities		Nipomo Community Services District					
% Urbanized 33,205.3		27% (22.6% residential, 4.39% commercial, industrial and public facility) (SLO County LUC)					
% Agricultural		37.2% (SLO County LUC)					
% Other		35.9% (2.31% open space, 27.48% recreation, 6.07% rural lands) (SLO County LUC)					
Planning Areas		South County Inland, South County Coastal					
Potential growth areas		Nipomo Mesa					
Facilities Present		Private wells and septic systems; small water companies include Rural Water Company, Mesa Dunes Mobile home Estates, La Mesa Water Company, Las Flores Water Company, Troesh Recycling and others.					

		Limited data.
	Commercial Uses	Proposed oil processing facilities, agriculture including greenhouses, row crops, cattle grazing, recreation Limited data.
	Demographics	
	Population	13,720 in watershed (U.S. Census Block, 2010)
	Race and Ethnicity	63.9% Caucasian (8,775), 2.5% Asian (349), 30.1% Latino (4,128), 3.5% Other (U.S. Census Block, 2010)
	Income	MHI $56,538 (U.S. Census Tract, 2010) Census tract crosses multiple watersheds.
	Disadvantaged Communities	No; 7% of individuals are below poverty in the watershed.(U.S. Census Tract, 2010) Census tract crosses multiple watersheds.
	Water Supply	
	Water Management Entities	Nipomo Community Services District; Rural Water Company; Golden State Water Company; Woodlands Water Company; about 29 small purveyors are on the Nipomo Mesa (LAFCO, 2010) Limited data.
	Groundwater	Yes; alluvial and Santa Maria River Valley (SLO County, 2012)
	Surface Water	No public reservoirs.
	Imported Water	Planned; supplemental water from Santa Maria which is blended state water and groundwater (Douglas Wood & Ass., 2009).
	Recycled/ Desalinated Water	Yes; Woodlands Wastewater Treatment Plant for irrigation of golf course; Desalinated water is not currently used but is being explored. (LAFCO, 2010)
	Infiltration Zones	Seepage of river flows through the river bed along the Santa Maria River and along the lower reaches of the Cuyama and Sisquoc Rivers is the primary source of recharge to the Santa Maria Groundwater Basin. Percolation of river flows through unconsolidated, permeable alluvial deposits account for approximately 75-85% of the average annual recharge to the groundwater basin. A significant portion of the groundwater recharge attributable to river bed seepage is due to the operation of the Twitchell Dam. (SLO County & SB County, 1998) Limited data.
	Water Budget	None to date. Santa Maria Basin is adjudicated. The Nipomo Valley Sub-basin is part of the Santa Maria Valley Groundwater Basin as defined by DWR but outside of the adjudicated basin area (SLO County, Master Water Plan, 2012).

Santa Maria River Watershed

		Limited data.
	Water Uses	
	Beneficial Uses	*Dunes Lakes* – Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN). *Oso Flaco Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN). *Oso Flaco Lake*– Municipal and Domestic Supply (MUN), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN). *Santa Maria River* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), *Santa Maria River Estuary* – Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN).(RWQCB, 2011)

Santa Maria River Watershed

	Other Unique Characteristics	
	Historic Resources	No source identified.
	Archeological Resources	There are a number of archaeological sites in the [Nipomo] area which are large but of a low density (Morro Group, 1996). Limited data.
	Other	No source identified.
	Climate Change Considerations	
		State climate change maps show sea level inundation at the Oso Flaco Creek and Santa Maria River Estuaries (USGS,Cal-Adapt, viewed 2013). See IRWMP, 2014 Section H. Climate Change Limited data and not watershed specific.

Watershed Codes

Calwater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning Area	CDF Watershed Name
3310.320000	3	Arroyo Grande	2	Nipomo Mesa	310.32	undefined	undefined
3312.100300	1	Guadalupe	0	undefined	312.10	Santa Maria Valley	Santa Maria Valley
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Santa Maria River Watershed

Major Changes in the Watershed

- Nipomo Creek, during the Pliocene Epoch, flowed to the north joining Los Berros Creek and Arroyo Grande Creek. During the Quaternary period of the Holocene Epoch, rapid melting of glaciers caused changes in sea levels and rapid migration of shoreline dunes inland blocking the flow of Nipomo Creek. The blockage created shallow lakes which broke thought the dunes of the Nipomo Mesa creating Black Lake Canyon. Further encroachment of sand eventually blocked this direct seaward exist of Nipomo. The subsequent build up of water in Nipomo valley found its weakest point to exit through a southern route becoming a tributary of the Santa Maria watershed (Ardoin/Bishop, 2004)
- 9,000 years. Most of the recorded cultural sites occur on the bluff of the mesa overlooking several creeks and in the foothills near larger tributaries. Sites on the Nipomo Mesa did not support as dense a population as neighboring coastal areas, and represent temporary occupations or small villages (Wheeler, 2005).
- In 1772, a mission was established in San Luis Obispo.
- A portion of the watershed is part of the Rancho Nipomo Mexican Land Grant awarded to Captain William Dana in 1835 bringing cattle and sheep to the area.
- In 1878, the Pacific Coast Railway was granted land.
- The 1890's brought growth to the area with expanding agriculture and an influx of immigrant families to work the land.
- In 1936, Dorthea Lange chronicled the dire poverty of the migrant "pea pickers" in Nipomo, taking the iconic photo of the depression, Migrant Mother.
- The three largest fires of the last half-century were the 1966 Wellman fire, the 2007 Zaca fire, and the 2009 LaBrea fire.
- Between 1980 – 2000, Nipomo experienced dramatic population growth at a total growth rate of 140% (Biorn, 2005).

Santa Maria River Watershed

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Oso Flaco Creek	Perennial	Yes on 303d list for Ammonia, Chloride, Fecal Coliform, Nitrate, Sediment Toxicity, Sodium, Unknown Toxicity. TMDL estimated date of completion 2013. (SWRCB, 2010)	Agriculture, Natural, Groundwater Loading, Unknown (SWRCB, 2010)	X cfs (Stillwater Sciences, 2013)
Little Oso Flaco Creek	Perennial	Yes on 303d list for Fecal Coliform, Nitrate, Sediment Toxicity, Unknown Toxicity. TMDL estimated date of completion 2013. (SWRCB, 2010)	Agriculture, Groundwater Loading, Unknown (SWRCB, 2010)	cfs
Black Lake Canyon	Isolated	Not assessed. (SWRCB, 2010)	Undetermined.	
Santa Maria River	Ephemeral	Yes on 303d list for Chloride, Chlorpyrifos, DDT, Dieldrin, Endrin, E. coli, Fecal Coliform, Nitrate, Sediment Toxicity, Sodium, Toxaphene, Turbidity, Unknown Toxicity. TMDL estimated date of completion 2013. (SWRCB, 2010)	Agriculture, Natural, Grazing Related, Natural, Onsite Waste-water Systems (Septic), Urban Runoff Unknown(SWRCB, 2010)	

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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
Santa Maria Valley – Nipomo Valley Subbasin	No existing yield. (SLO County, Master Water Report, 2012)	Physical limitations and water quality. (SLO County, Master Water Report, 2012)	No. (SLO County, Master Water Report, 2012)	No objective for the basin. (RWQCB, Table 3-8, 2011)
Santa Maria Valley- Nipomo Mesa Management Area	4,800-6,000 AFY (SLO County, Master Water Report, 2012)	Physical limitations, water quality, and water rights. (SLO County, Master Water Report, 2012)	No. (SLO County, Master Water Report, 2012)	Yes. (RWQCB, 2011)

Groundwater Quality Description:

Nipomo Valley subbasin: Water quality is variable across the sub-basin, and the available data set does not distinguish between older alluvial wells and fractured rock wells, although most of the water represented is from the fractured rock reservoirs. Groundwater samples collected from 22 wells between 1962 and 2000 displayed the following characteristics: TDS concentrations ranged from 750 mg/L to 1,300 mg/L; sulfate concentrations between 200 and 340 mg/L; chloride concentrations between 64 and 130 mg/L; and nitrate concentrations from non-detect to 3.4 mg/L. Groundwater is classified as suitable to marginal under water quality guideline for irrigated agriculture (DWR 2002).

Nipomo Mesa Management Area*:* Water quality varies in general mineral character across the Nipomo Mesa. The median TDS in 35 wells sampled between 1990 and 2000 was approximately 500 mg/L. Nitrate has been detected in excess of the drinking water standard in relatively few wells (DWR 2002; NMMA Technical Group, 2009). According to the database maintained by the California Department of Public Health (CDPH), production wells used for public drinking and industrial use in the NMMA met drinking water quality standards in 2008. One of the ConocoPhillips production wells had a reported value of 1,000 mg/L TDS, the highest reported to the CDPH within the NMMA; the well is used for industrial processing (NMMA Technical Group, 2009). (SLO County, Master Water Report, 2012)

Primary Issues

Issue	Potential Causes	Referenced from
Effects of Cattle grazing Unknown	Limited Study	Dunes Center, 2004
Impaired surface water quality	Grazing, crop land	Dunes Center, 2004; Althouse

Santa Maria River Watershed

Issue	Potential Causes	Referenced from
		and Meade, 2012; RWQCB, 2012 and 2013.
Occurrence of endangered or threatened species on private land and potential for incidental take.	None	Dunes Center, 2004
Lack of data on plant and wildlife species.	Limited study	Dunes Center, 2004
Vegetation in the channel concentrates and diverts flows, and causes erosion and flooding of low-lying areas.	Vegetation in the channel	Dunes Center, 2004
Land use practices on [Santa Maria River] study reach and dune parcels may be incompatible with plan goals.	Limited land available for enhancement	Dunes Center, 2004
Presence of levees that restrict or otherwise modify flows, flow channels and sediment transport corridors.	Levees along Santa Maria River	Dunes Center, 2004
Invasive riparian plant species that establish in the [Santa Maria River] study reach may impede flood flows, interfere with agricultural operations, cause ecological degradation, and spread into adjacent habitats	Invasive riparian plants	Dunes Center, 2004
Sediment accretion in the [Santa Maria River] study reach and erosion along the shoreline.	Twitchell dam changes to sediment transport	Dunes Center, 2004
Run-off from urban areas contributes nitrates and other pollutants into the [Santa Maria River] study reach.	Urban	Dunes Center, 2004
Oso Flaco Lake – DDT and dieldrin	Undetermined, sediment	Davis, 2010

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

Santa Maria River Watershed

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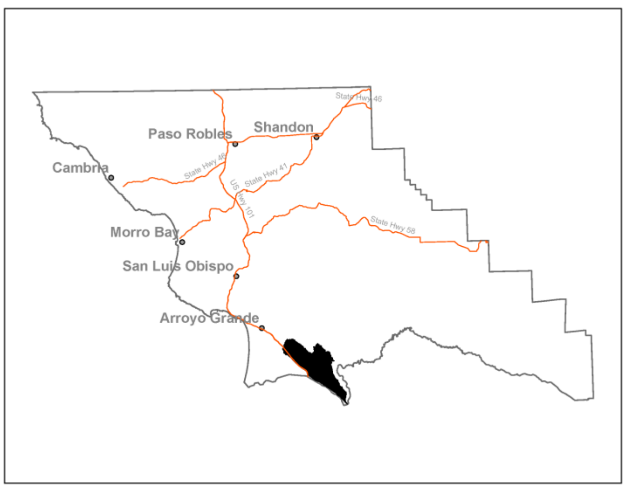
Nipomo – Suey Creeks Watersheds

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Santa Maria HU 12	South County WPA 7	36,912 acres	Santa Maria River	Santa Maria Valley	County of San Luis Obispo Community of Nipomo



Description:

The Nipomo - Suey Watersheds are basins located in southern San Luis Obispo County and northern Santa Barbara County. The watersheds rises to a maximum elevation of approximately 1,800 feet above mean sea level. The area includes two tributary basins to the Santa Maria River with their headwaters in the foothills of the Coast Range: Nipomo Creek and Suey Creek.

The watersheds are dominated by agricultural land uses including ranches, row crops, greenhouses and orchards. Other land uses include residential.

Watershed Plans:

Nipomo Creek Watershed Management Plan (Land Conservancy of San Luis Obispo and CCSE, 2005)

Nipomo – Suey Creeks Watersheds

Characteristics:

	Physical Setting	
	Rainfall	15 – 20 inches (NRCS Precipitation, 1981-2010) 16-18 inches Mean Annual (SLOCountyWater.org)
	Air Temperature	Summer Range (August 1981-2010): 54°- 73° F Winter Range (December 1981-2010): 39°- 63° F At Santa Maria Public Airport, CA. (NOAA National Climatic Data Center, ncdc.noaa.gov, viewed 2013) Limited data, not watershed specific.
	Geology Description	Nipomo Creek consists of steep pre-Quaternary non-infiltrative headwaters and a flat highly infiltrative Quaternary valley – category #12. Suey Creek consists of moderately infiltrative early to mid-Tertiary headwaters and a flat Quaternary highly infiltrative valley – category #14. (Bell, personal communication, 2013) The bedrock of the watershed is typical of the Monterey and Franciscan formations of the California Coastal Range and is composed primarily of shale, chert, and other mélange components (Chipping, 1987).
	Hydrology	
	Stream Gage	No source identified.
	Hydrology Models	No source identified.
	Peak Flow	8,000 cfs Nipomo at confluence with Santa Maria River (Land Conservancy and CCSE, 2005, pg. 41); No source identified for Suey Creek Limited data based on FEMA study and not stream gage.
	Base Flow	800 – 925 acre feet average annual base runoff for Nipomo (DWR, 2002); No source identified for Suey Creek Limited data. It is unknown how this estimate was determined as there is no stream gage.
	Flood Reports	Yes; Nipomo Drainage and Flood Control Study (County of SLO, 2004). Areas at risk for flooding are Olde Town Nipomo (Land Conservancy and CCSE, 2005)
	Biological Setting	
	Vegetation Cover	Primarily agricultural land and non-native grassland with some coast live oak forest (blue oak, coast live oak and valley oak), buck brush chaparral and venturan coastal sage scrub (SLO County, vegetation shapefile,1990)

Nipomo – Suey Creeks Watersheds

	Limited spatial data. No alliance level vegetation mapping was available for the entire County.
Invasive Species	Periwinkle (CCSE & Land Conservancy, 2005) Limited data.
Special Status Wildlife and Plants	Based on surveys of the project site and assessment of habitat, the project site supports potential habitat for 14 special status species, [including] American badger, pallid bat, California red-legged frog, coast range newt, southern pacific pond turtle, silvery legless lizard, coast horned lizard, two-striped garter snake, sharp-shinned hawk, burrowing owl, white-tailed kite, southwestern willow flycatcher, prairie falcon and least bell's vireo (SLO County, DANA EIR, 2012) *Key:* Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern – SSC, CA rare plant ranking – CRPR (CDFW CNDDB, viewed 2013).

Common Name	**Status**	**NIPOMO**	**OCEANO**	**SANTA MARIA**	**HUASNA PEAK**	**TWITCHELL DAM**
Animals						
American badger	SSC		x		x	
California black rail	**ST; Fully Protected**		**x**			
California least tern	**FE; SE**		**x**			
California red-legged frog	**FT**	**x**	**x**	**x**	**x**	**x**
California tiger salamander	**FT; ST**					**x**
coast horned lizard	SSC		x	x		
globose dune beetle	Special Animal		x			
mimic tryonia (=California brackish water snail)	Special Animal		x			

	monarch butterfly	Special Animal		x	x		
	Morro Bay blue butterfly	Special Animal		x			
	Oso Flaco flightless moth	Special Animal		x			
	Oso Flaco patch butterfly	Special Animal		x			
	Oso Flaco robber fly	Special Animal		x			
	prairie falcon	Special Animal (Nesting)	x			x	x
	sandy beach tiger beetle	Special Animal		x			
	sharp-shinned hawk	Special Animal (Nesting)		x			
	silvery legless lizard	SSC		x			
	steelhead - south/ central California coast DPS	**FT**	**x**	**x**			
	tidewater goby	**FE**		**x**			
	western pond turtle	SSC		x		x	
	western snowy plover	**FT**		**x**			
	western spadefoot	SSC	x		x		x
	white sand bear scarab beetle	Special Animal		x			
	Plant/Lichen						
	beach spectaclepod	**ST**		**x**			
	Blochman's leafy daisy	CRPR 1B.2		x			
	California saw-grass	CRPR 2B.2		x			

Nipomo – Suey Creeks Watersheds

coast woolly-heads	CRPR 1B.2		x			
coastal goosefoot	CRPR 1B.2		x			
crisp monardella	CRPR 1B.2		x			
dune larkspur	CRPR 1B.2		x	x		
Gambel's water cress	**FE; ST**		**x**			
Hoover's bent grass	CRPR 1B.2		x			
Kellogg's horkelia	CRPR 1B.1		x			
La Graciosa thistle	**FE; ST**		**x**			
La Panza mariposa-lily	CRPR 1B.3					
marsh sandwort	**FE; SE**		**x**			
Miles' milk-vetch	CRPR 1B.2	x			x	x
Nipomo Mesa lupine	**FE; SE**		**x**			
Pismo clarkia	**FE; SR**		**x**			
San Luis Obispo County lupine	CRPR 1B.2	x				
San Luis Obispo monardella	CRPR 1B.2		x			
sand mesa manzanita	CRPR 1B.2	x	x	x		
Santa Margarita manzanita	CRPR 1B.2	x	x		x	
short-lobed broomrape	CRPR 4.2		x			
surf thistle	**ST**		**x**			

Limited by the type of data collected in the CA Natural Diversity Database.

Nipomo – Suey Creeks Watersheds

	Steelhead Streams	No. Historical information suggests that the Santa Maria River supported a steelhead run in the early 1900's. There is no evidence suggesting this species has been present for several decades. (CCSE & Land Conservancy, 2005 pg 56)
	Stream Habitat Inventory	None. (CEMAR, 2008)
	Fish Passage Barriers	Hwy 166 culvert at Suey Creek, Unknown Status, PAD # 736549.00000 (CDFW Passage Assessment Database, viewed 2013)
	Designated Critical Habitat	None. (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	None.(USFWS Critical Habitat Portal, viewed 2013)
	Other Environmental Resources	No source identified.
	Land Use	
	Jurisdictions & Local Communities	Town of Nipomo
	% Urbanized	7.3% (6.62% residential and less than 1% commercial, industrial and public facilities)(SLO County LUC)
	% Agricultural	82.7% (SLO County LUC)
	% Other	10% (9.71% rural lands and less than 1% open space and recreation) (SLO County LUC)
	Planning Areas	South County Inland
	Potential growth areas	Olde Town Nipomo, Los Berros Village area
	Facilities Present	Private wells and septic systems Liimited data.
	Commercial Uses	Proposed oil processing facilities, Agriculture Limited data.
	Demographics	
	Population	4,160 in watershed (US Census Block, 2010); 16,714 in Nipomo (US Census, 2010)
	Race and Ethnicity	50.2% White (2,088), 44.4% Latino (1,845), 3.2% other in the watershed. (US Census Block, 2010) Caucasian, representing 54.3%. Latinos represent 39.8% of the total population in the watershed. The remaining races each represent less than 3%, including African American, American Indian, Pacific Islander, and Asian(US Census, 2010).
	Income	MHI $99,115 in watershed. (US Census Tract, 2010) MHI $61,265 in Nipomo (US Census Tract, 2010). Census tract crosses multiple watersheds.

Nipomo – Suey Creeks Watersheds

	Disadvantaged Communities	No; 4% in watershed (US Census Tract, 2010); 9.6% of individuals are below poverty level in Nipomo (US Census, 2010). Census tract crosses multiple watersheds.
	Water Supply	
	Water Management Entity	Nipomo Community Services District; A large number of other water purveyors exist in the Nipomo Mesa area, but a source was not identified that records which are specifically in the Nipomo and Suey Creeks area. Limited data.
	Groundwater	Yes; alluvial and Santa Maria River Valley (SLO County, 2012)
	Surface Water	No public reservoirs.
	Imported Water	No; planned supplemental water from Santa Maria.
	Recycled/ Desalinated Water	No source identified.
	Infiltration Zones	No source identified.
	Water Budget	No source identified.
	Water Uses	
	Beneficial Uses	*Nipomo Creek* –No beneficial uses identified *Suey Creek* –No beneficial uses identified. (RWQCB, 2011)
	Other Unique Characteristics	
	Historic Resources	Dana Adobe Limited data.
	Archeological Resources	There was a Chumash town called Nipumu at the time of European settlement (SB Museum of Natural History, viewed 2013). Limited data.
	Other	No source identified.
	Climate Change Considerations	
		See IRWMP, 2014 Section H. Climate Change Limited data and not watershed specific.

Watershed Codes

Nipomo – Suey Creeks Watersheds

Calwater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3312.100104	1	Guadalupe	0	undefined	312.10	Nipomo	Nipomo Valley
3312.100102	1	Guadalupe	0	undefined	312.10	Nipomo	Suey Creek
3312.100103	1	Guadalupe	0	undefined	312.10	Nipomo	South of Twitchell Res.
3312.100101	1	Guadalupe	0	undefined	312.10	Santa Maria Valley	Nipomo Creek

Major Changes in the Watershed

- Nipomo Creek, during the Pliocene Epoch, flowed to the north joining Los Berros Creek and Arroyo Grande Creek. During the Quaternary period of the Holocene Epoch, rapid melting of glaciers caused changes in sea levels and rapid migration of shoreline dunes inland blocking the flow of Nipomo Creek. The blockage created shallow lakes which broke thought the dunes of the Nipomo Mesa creating Black Lake Canyon. Further encroachment of sand eventually blocked this direct seaward exist of Nipomo. The subsequent build up of water in Nipomo valley found its weakest point to exit through a southern route becoming a tributary of the Santa Maria watershed (Ardoin/Bishop, 2004)
- 9,000 years. Most of the recorded Chumash cultural sites occur on the bluff of the mesa overlooking several creeks and in the foothills near larger tributaries. Sites on the Nipomo Mesa did not support as dense a population as neighboring coastal areas, and represent temporary occupations or small villages (Wheeler, 2005).
- In 1772, a mission was established in San Luis Obispo.
- The watershed is part of the Rancho Nipomo Mexican Land Grant awarded to Captain William Dana in 1835 bringing cattle and sheep to the area.
- In 1878, the Pacific Coast Railway was granted a 14 mile long strip by the Dana Brothers.
- The 1890's brought growth to the area with expanding agriculture and an influx of immigrant families to work the land.
- In 1936, Dorthea Lange chronicled the dire poverty of the migrant "pea pickers" in Nipomo, taking the iconic photo of the depression, Migrant Mother.

Nipomo – Suey Creeks Watersheds

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Nipomo Creek	Perennial	Yes on 303d list for Fecal Coliform, Nitrate, Unknown Toxicity. TMDL estimated date of completion 2013. (SWRCB, 2010)	Agriculture, Collection System Failure, Grazing Related, Natural, Onsite Wastewater Systems (Septic), Urban Runoff(SWRCB, 2010)	X Cfs (Stillwater Sciences, 2013)
Suey Creek	Unknown.	No. (SWRCB, 2010)	Undetermined. (SWRCB, 2010)	

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Santa Maria Valley – Nipomo Valley Subbasin	No existing yield. (San Luis Obispo County, Master Water Report, 2012)	Phyisical limitations and water quality. (San Luis Obispo County, Master Water Report, 2012)	No. (San Luis Obispo County, Master Water Report, 2012)	No objective for subbasin. (RWQCB, Table 3-8, 2011)
Santa Maria Valley- Nipomo Mesa Management Area	4,800-6,000 AFY(San Luis Obispo County, Master Water Report, 2012)	Physical limitations, water quality, and water rights. (San Luis Obispo County, Master Water Report, 2012)	No. (San Luis Obispo County, Master Water Report, 2012)	Yes. (RWQCB, Table 3-8, 2011)

Groundwater Quality Description: Water quality is variable across the [Nipomo Valley] subbasin, and the available data set does not distinguish between older alluvial wells and fractured rock wells, although most of the water represented is from the fractured rock reservoirs. TDS concentrations in groundwater samples collected from in 22 wells between 1962 and 2000 ranged from 750 mg/l to 1,300 mg/l; sulfate concentrations between 200 and 340 mg/l; chloride concentrations between 64 and 130 mg/l; and nitrate concentrations from non-detected to 3.4 mg/l. Groundwater is classified as suitable to marginal under water quality guideline for irrigated agriculture (DWR, 2002). (San Luis Obispo County, Master Water Report, 2012)

Nipomo – Suey Creeks Watersheds

Primary Issues

Issue	Potential Causes	Referenced from
Flooding	Development in 100 year flood hazard zone, improperly sized culverts, lack of maintenance of existing drainage structures	CCSE&LC, WMP, 2005 pg 70 & 71
Habitat Fragmentation	Development	CCSE&LC, WMP, 2005
Surface Water Quality	Erosion, Sedimentation, bacteria from wildlife, domestic animals/livestock and urban areas, nutrients from	CCSE&LC, WMP, 2005 and RWQCB, Santa Maria River Watershed TMDLs, 2012
Invasive Species		CCSE&LC, WMP, 2005 pg 67
Groundwater Quantity	Connection to Santa Maria Groundwater Basin and Nipomo Mesa Management Area	CCSE&LC, WMP, 2005 pg 43 and 89 and NMMA, 2011

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

Nipomo – Suey Creeks Watersheds

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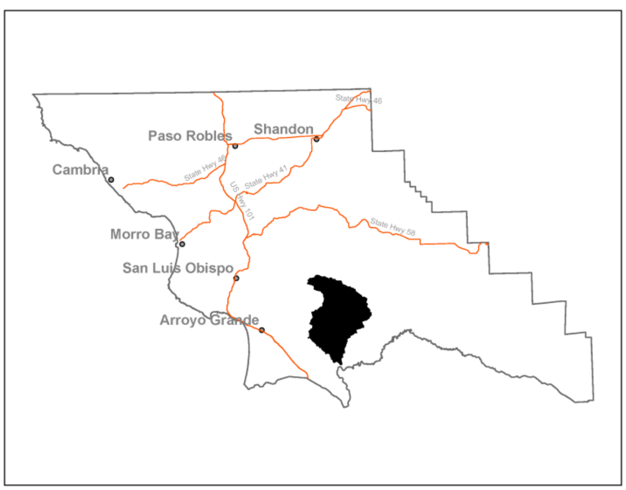
Huasna River Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Santa Maria HU 12	Huasna Valley WPA 8	75,122 acres	Cuyama River at Twitchell Reservoir	Huasna Valley	County of San Luis Obispo; Los Padres National Forest



Description:

The Huasna River Watershed is an inland basin located in southern San Luis Obispo County. The drainage rises to a maximum elevation of approximately 3,000 feet above sea level. Huasna River flows to the Cuyama River at Twitchell Dam and has a number of tributary basins with their headwaters in the Santa Lucia and La Panza Mountain Ranges: Huasna Creek, Carrie Creek, Haystack Creek and Arroyo Seco Creek.

Agriculture is the principal land use in the area, ranging from small irrigated farms to large cattle ranches. A substantial portion of the area consists of hilly and mountainous land with chaparral and oak woodlands, suitable only for limited grazing. Other land uses includes oil exploration.

Watershed Plans:

None

Huasna River Watershed

Characteristics:

	Physical Setting	
	Rainfall	18 – 27 inches (NRCS Precipitation,1981-2010)
	Air Temperature	Summer Range (August 1981-2010): 50°- 82° F Winter Range (December 1981-2010): 36°- 66° F At Twitchell Dam (CA-NOAA National Climatic Data Center, viewed 2013)
	Geology Description	The Huasna Creek, Deer Canyon, and Joaquin Canyon sub watersheds consist of steep moderately infiltrative early to mid-Tertiary headwaters – category #8. The Haystack Canyon, Carrie Creek, Lower Arroyo Seco, and Upper Arroyo Seco sub watersheds consist of steep pre-Quaternary non-infiltrative headwaters; steep moderately infiltrative early to mid-Tertiary valley – category #5. The Salt Creek sub watershed consists of steep pre-Quaternary non-infiltrative headwaters – category #13 (Bell, personal communication, 2013) The Huasna River basin contains thick mostly marine sedimentary Tertiary deposits that lay on top of a Jurassic-Cretaceous complex. The Huasna Basin lies between the West Huasna fault zone on the west and the East Huasna fault zone on the east (SLO County, 2012). The principal water bearing unit is Quaternary age alluvium. (DWR,2003)
	Hydrology	
	Stream Gage	No. USGS 11137900 Huasna River near Arroyo Grande, CA (1960-2012, discontinued) and USGS 11138000 Huasna River near Santa Maria, CA (1930-1961, discontinued). (USGS, viewed 2013) Limited data and no current stream gage.
	Hydrology Models	No source identified.
	Peak Flow	10,000 - 11,400cfs at USGS 11138000. (USGS, viewed 2013)
	Base Flow	6.5 – 7.10 cfs at USGS 11138000.(USGS, viewed 2013) It is unknown if these gages were placed to accurately capture base flows. Many gages are placed as alert systems and only capture peak flows.
	Flood Reports	Yes; Floods in Cuyama Valley, California (USGS, 1998). Though normally dry, wetter winters have seen the [Twitchell] reservoir inundate the lower five miles of Huasna Valley …, rendering areas below the 652-foot elevation unsuitable for permanent

		buildings. Upstream portions of these watercourses (and other creeks in the planning area) are potential flood hazard areas during intense or prolonged rainfall.(San Luis Obispo County, Huasna-Lopez Area Plan, 2003) Limited data.
	Biological Setting	
	Vegetation Cover	Primarily buck brush chaparral, oak woodland (blue oak woodland and coast live oak woodland, coast live oak forest) and foothill pine-oak woodland with some non-native grassland, venturan coastal sage scrub and permantently flooded lucustrine (SLO County vegetation shapefile, 1990) Annual grassland, foothill oak woodland, chaparral and coastal scrub, anthropogenic and ruderal, freshwater marsh wetland (MRS, 2012) Limited spatial data. No alliance level vegetation mapping was available for the entire County.
	Invasive Species	Ripgut brome, wild radish, Russian thistle, Italian thistle, sweet fennel, bull thistle, bur clover, prickly wild lettuce, horseweed? (MRS, 2012) Limited data.
	Special Status Wildlife and Plants	Paniculate tarplant is listed by the California Native Plant Society (CNPS) but is not listed by USFWS or CDFG as threatened or endangered. Well's Manzanita were documented and it is on the CNPS List. (MRS, 2012) Key: Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern – SSC, CRPR – CA rare plant ranking (CDFW CNDDB, viewed August 2013)

Common Name	**Status**	**CALDWELL MESA**	**CHIMNEY CANYON**	**HUASNA PEAK**	**LOS MACHOS HILLS**	**NIPOMO**	**POZO SUMMIT**	**SANTA MARGARITA LAKE**	**TAR SPRING RIDGE**
Animals									
American badger	SSC			x					
California condor	**FE; SE**							**x**	**x**

Huasna River Watershed

California red-legged frog	**FT**			**x**					
prairie falcon	Special Animal (Nesting)	x	x	x	x	x	x	x	x
two-striped garter snake	SSC	x							
Plants									
Hardham's evening-primrose	CRPR 1B.2							x	
La Panza mariposa-lily	CRPR 1B.3							x	
Miles' milk-vetch	CRPR 1B.2			x		x			
Palmer's mariposa-lily	CRPR 1B.2	x			x				
San Luis Obispo County lupine	CRPR 1B.2	x				x			x
Santa Margarita manzanita	CRPR 1B.2	x		x		x			x
umbrella larkspur	CRPR 1B.3	x							

Limited by the type of data collected in the CA Natural Diversity Database.

Steelhead Streams	No. Santa Maria River is a steelhead stream. Twitchell Dam creates a barrier to access Huasna River. (NMFS, 2009)
Stream Habitat Inventory	None identified.
Fish Passage Barriers	None identified. Twitchell Dam creates a barrier to access Huasna River. (NMFS, 2009) Limited data. Large downstream fish barrier may not warrant upstream barrier surveys.
Designated Critical Habitat	None identified.
Habitat Conservation Plans	None identified.
Other Environmental Resources	Los Padres National Forest
Land Use	
Jurisdictions & Local Communities	None.

Huasna River Watershed

	% Urbanized	0% (SLO County LUC)
	% Agricultural	64.4% (SLO County LUC)
	% Other	35.6% (21.46% open space and 14.12% rural lands)(SLO County LUC)
	Planning Areas	South County-Inland, Huasna-Lopez, Los Padres
	Potential growth areas	No source identified.
	Facilities Present	Private wells and septic systems Limited data.
	Commercial Uses	Huasna River Pit – sand and gravel (SLO County Mines); Proposed oil processing facilities, Recreation; agriculture – grazing Limited data.
	Demographics	
	Population	237 (U.S. Census Block, 2010)
	Race and Ethnicity	65.4% Caucasian (155), 11.8% Latinos (28), 3.5% Other, 2.5% mixed race (6) (U.S. Census Block, 2010)
	Income	MHI $99,115 (U.S. Census Tract, 2010). Census tract is large covering portions of multiple watersheds.
	Disadvantaged Communities	None; 4% of individuals were below poverty level (U.S. Census Tract, 2010). Census tract is large covering portions of multiple watersheds.
	Water Supply	
	Water Management Entities	Twitchell Management Authority Limited data.
	Groundwater	Yes; alluvial and Huasna Valley (SLO County, 2012)
	Surface Water	No public reservoirs. Twitchell Dam recharges the Santa Maria Valley groundwater basin.
	Imported Water	No source identified.
	Recycled/ Desalinated Water	No source identified.
	Infiltration Zones	No source identified.
	Water Budget	None to date.
	Water Uses	
	Beneficial Uses	*Huasna River* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2),

Huasna River Watershed

		Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE).(RWQCB, 2011)
	Other Unique Characteristics	
	Historic Resources	No source identified.
	Archeological Resources	There was a Chumash town called Wasna at the time of European settlement (SB Museum of Natural History, viewed 2013). Limited data and low priority for this effort.
	Other	No source identified.
	Climate Change Considerations	
		See IRWMP, 2014 Section H. Climate Change Limited data and not watershed specific.

Watershed Codes

CalWater /DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3312.301301	3	Cuyama Valley	0	undefined	312.30	Bald Mtn.	Haystack Canyon
3312.301302	3	Cuyama Valley	0	undefined	312.30	Bald Mtn.	Carrie Creek
3312.301303	3	Cuyama Valley	0	undefined	312.30	Bald Mtn.	Salt Creek
3312.301304	3	Cuyama Valley	0	undefined	312.30	Bald Mtn.	Joaquin Canyon
3312.301305	3	Cuyama Valley	0	undefined	312.30	Bald Mtn.	Stony Creek
3312.301308	3	Cuyama Valley	0	undefined	312.30	Bald Mtn.	Deer Canyon
3312.301306	3	Cuyama Valley	0	undefined	312.30	Tassajara Hot Springs	Lower Arroyo Seco
3312.301307	3	Cuyama Valley	0	undefined	312.30	Tassajara Hot Springs	Upper Arroyo Seco
3312.301401	3	Cuyama	0	undefined	312.30	Twitchell	Huasna Creek

		Valley				Reservoir	
3312.301402	3	Cuyama Valley	0	undefined	312.30	Twitchell Reservoir	Lower Twitchell Reservoir
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- The watershed is near the boundary of the areas historically occupied by Obispeno Chumash and the Playanos Salinan (MRS, 2012).
- The area was made part of the Mission San Luis Obispo holdings
- In 1843, title to 22,153 acres of the Huasna Rancho was granted to Isaac Sparks. Upon his death the property was divided among is daughters Flora Harloe, Rosa Porter and Sally Harkness.
- In 1870's the first hunt for oil was conducted in the region.
- In 1899, the first hole was bored for oil by Fredrick Harkness on the Porter Ranch. Other holes were bored in the 1900's on the Records Ranch and Rosa Porter Ranch. Waives of oil exploration occurred in the 1930's and again in the 1950's. (MRS, 2012)
- In 1958, Twitchell Dam and Reservoir was constructed by the Army Corps of Engineers and the Bureau of Reclamation on behalf of the Santa Barbara County Water Agency (TMA, 2010).

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Huasna River	No source identified.	No. (SWRCB, 2010)	Not assessed. (SWRCB, 2010)	X Cfs (Stillwater Sciences, 2013)
All Other Tribs	No source identified.	Not assessed. (SWRCB, 2010)	Not assessed. (SWRCB, 2010)	

Watershed Health by Major Groundwater Basin

Groundwater Basin	**Estimated Safe Yield**	**Water Availability Constraints**	**Drinking Water Standard Exceedance**	**Water Quality Objective Exceedance**
Huasna Valley Basin	No existing data. (San Luis Obispo County, Master Water Report, 2012)	Physical Limitations and Water Quality Issues. Shallow alluvial deposits are typically more susceptible to drought impacts	No historical water quality data. (San Luis Obispo County, Master Water Report, 2012)	No objective for the basin. (RWQCB, Table 3-8, 2011)

		than deeper formation aquifers, (San Luis Obispo County, Master Water Report, 2012)		

Groundwater Quality Description: No historical water quality data for the alluvial basin has been published in public documents or is available through the STORET Legacy Database. (SLO County, Master Water Report, 2012)

Primary Issues

Issue	Potential Causes	Referenced from
Sedimentation of Twitchell Dam	Natural and upland erosion primarily from Cuyama River.	TWA, 2010

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

Huasna River Watershed

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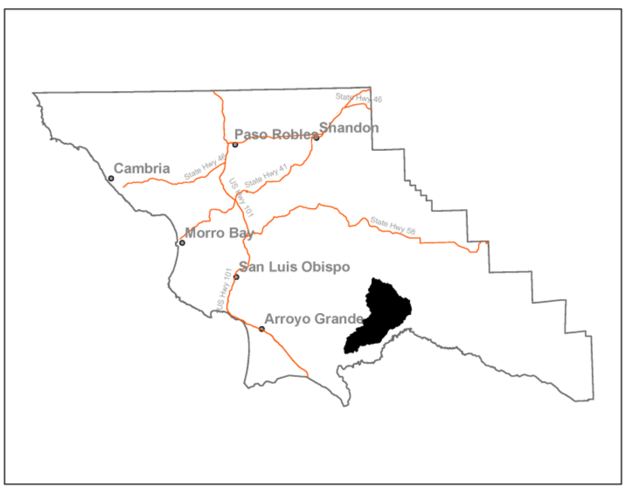
Alamo Creek Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Santa Maria HU 12	Huasna Valley WPA 8	56,277 acres	Cuyama River at Twitchell Reservoir	Santa Maria River Valley	County of San Luis Obispo U. S. Forest Service



Description:

The Alamo Creek Watershed is an inland basin located in southern San Luis Obispo County. The drainage rises to a maximum elevation of approximately 3,800 feet above sea level. Alamo Creek flows to the Cuyama River at Twitchell Reservoir. Major tributary basins with their headwaters in the La Panza Mountain Range: Little Jollo, Sheep, Kennel, Los Machos, and Branch Creeks.

The watershed is dominated by the Los Padres National Forest which permits recreation including camping, hunting, and off-highway vehicle uses. The watershed also has agricultural land uses.

Watershed Plans:

None

Alamo Creek Watershed

Characteristics:

	Physical Setting	
	Rainfall	18 – 25 inches (NRCS, 2010) 17 inches Mean Annual (SLOCountyWater.org, viewed 2013)
	Air Temperature	Summer Range (August 1981-2010): 50°- 82° F Winter Range (December 1981-2010): 36° - 66° F At Twitchell Dam, CA. (NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Alamo Creek, Branch Creek, Kennel Creek, and Sheep Creek sub watersheds are composed of steep moderately infiltrative early to mid-Tertiary headwaters – category #11. Little Jollo Creek sub watershed is composed of moderately steep to steep pre-quaternary non-infiltrative headwaters – category #9. (Stillwater Sciences, personal communication, 2013) The Alamo Creek watershed is characterized by a Middle to Upper Jurassic island-arc ophiolite and an overlying thick forearc of Upper Jurassic and Cretaceous marine sedimentary rocks resembling those on the west side of the Great Valley of CA. Along the south are Paleocene and Eocene strata which consist mainly of submarine-fan deposits which overlie the Mesozoic succession in the Santa Ynez Mountains and southern San Rafael Mountains. Flanking the Stanley Mountain terrane on the northeast of the watershed is the southern part of the Salinia terrane which is defined by ~95 to ~80 million year old granitic plutons that intrude older metasedimentary rocks of unknown origin and overlying Upper Cretaceous and Paleogene marine and nonmarine forearc strata. The Sur-Nacimiento fault zone marks the northeast edge of the Stanley Mountain terrane. The Paleocene rocks unconformably overlie Upper Cretaceous strata in a shallow syncline near the convergence of the Sur-Nacimiento and East Huasna fault zones. This thin Paleogene sequence is unlike any in the adjacent Huasna syncline southwest of the East Huasna fault zone. The limited extent and thinness of the sequence near upper Pine Creek contrast sharply with the widely distributed, thick Paleocene and lower Eocene submarine-fan sequences northeast of the Sur-Nacimiento fault zone. (Vedder, 1991)
	Hydrology	
	Stream Gages	No; USGS 11137400 Alamo Creek near Nipomo CA (1959 - 1978, discontinued); USGS 11137500 Alamo Creek near Santa Maria CA (1943 - 1962, discontinued). (USGS California Water Science Center, viewed 2013) Last data is from late 1970's.

Alamo Creek Watershed

	Hydrologic Models	Yes; There is a USGS HEC-HMS used to calculate reservoir water surface elevation on Twitchell Dam. (TMA, 2010) Hydrologic model does not include entire watershed.
	Peak Flow	3,120 - 9,020 cfs at USGS 11137400 (USGS, viewed 2013); 2,820 - 3,120 cfs at USGS 11137500 (USGS, viewed 2013) Last data is from late 1970's.
	Base Flow	0 – 3 cfs at USGS 11137400 (USGS, viewed 2013) ; 3 – 6 cfs at USGS 11137500 (USGS, viewed 2013) It is unknown if these gages were placed to accurately capture base flows. Many gages are placed as alert systems and only capture peak flows.
	Flood Reports	No sources identified. Though normally dry, wetter winters have seen the [Twitchell] reservoir inundate …the lower two miles of Alamo Creek, rendering areas below the 652-foot elevation unsuitable for permanent buildings. Upstream portions of these watercourses (and other creeks in the planning area) are potential flood hazard areas during intense or prolonged rainfall. (San Luis Obispo County, Huasna-Lopez Area Plan, 2003) Limited data.
	Biological Setting	
	Vegetation Cover	Primarily buck brush chaparral (Chamise)and blue oak woodland with some non-native annual grassland, venturan coastal sage scrub, coast live oak forest, semi desert chaparral, central coastal scrub, agricultural land, and permanently flooded lacustrine (San Luis Obispo County vegetation, 1990) Limited current spatial data. No alliance level vegetation mapping was available for the entire County.
	Invasive Species	No sources identified.
	Special Status Wildlife and Plants	*Key*: Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, SSC – State Species of Concern, CRPR – CA rare plant rank. (CNDDB, viewed August 2013)

Species	**Status**	**BRANCH MTN**	**CHIMNEY CANYON**	**HUASNA PEAK**	**LA PANZA**	**LOS MACHOS HILLS**	**MIRANDA PINE MTN**
Animals							
American badger	SSC			x			

Alamo Creek Watershed

California red-legged frog	**FT**					**x**	
prairie falcon	Special Animal (Nesting)	x	x	x	x	x	x
two-striped garter snake	SSC					x	
western pond turtle	SSC			x		x	
	Limited by the type of data collected in the CA Natural Diversity Database.						
Steelhead Streams	No. Santa Maria River is a steelhead stream. Twitchell Dam creates a barrier to access Alamo Creek. (NMFS, 2009)						
Stream Habitat Inventory	None identified.						
Fish Passage Barriers	Bridge with potential passage constraints at Alamo Creek, unknown status, PAD # 736587.00000 (CDFW Passage Assessment Database, viewed 2013)						
Designated Critical Habitat	Yes; Steelhead trout. The Southern California Steelhead Trout Recovery Plan calls out recovery actions related to management of Twitchell Dam. Alamo Creek itself is not identified. (NOAA, 2009)						
Habitat Conservation Plans	No source identified.						
Other Environmental Resources	Los Padres National Forest Limited data.						
Land Use							
Jurisdictions & Local Communities	County of San Luis Obispo, U.S. Forest Service						
% Urbanized	0% (SLO County LUC)						
% Agricultural	29.5% (SLO County LUC)						
% Other	70.5% (64.45% open space and 6% rural lands) (SLO County LUC)						
Planning Areas	Huasna-Lopez and Shandon-Carrizo						
Potential growth areas	None identified.						
Facilities Present	Twitchell Dam for groundwater recharge and flood protection. (TWM, 2010)						
Commercial Uses	Extractive resource area (SLO County Extractive Resources shapefile)						
Demographics							
Population	11; No cities or unincorporated communities. (U.S. Census Block, 2010)						

Alamo Creek Watershed

	Race and Ethnicity	63.6% white, 36.4% latino, and 0% other (U.S. Census Block, 2010)
	Income	Approximately $100,000. (U.S. Census Tract, 2010) Census tract crosses multiple watersheds.
	Disadvantaged Communities	None. Approximately 4%. (U.S. Census Tract, 2010) Census tract crosses multiple watersheds.
	Water Supply	
	Water Management Entity	Twitchell Management Authority; individual wells. (TMA, 2010) No source identified. Limited data.
	Groundwater	Yes; alluvial, Santa Maria Valley (SLO County Master Water Plan, 2012)
	Surface Water	Yes; Twitchell Reservoir supplies about 20,000 AF of recharge to the Santa Maria Groundwater Basin annually. (SMVWCD, 2010)
	Imported Water	No source identified.
	Recycled/ Desalinated Water	No source identified.
	Infiltration Zones	No source identified.
	Water Budget	No source identified.
	Water Uses	
	Beneficial Uses	*Alamo Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD), Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN).(RWQCB, 2011)
	Other Unique Characteristics	
	Historic Resource	No source identified.
	Archeological Resources	There was a Chumash town called Tso at the time of European settlement (SB Museum of Natural History, viewed 2013). Limited data and low priority for this effort.
	Los Padres National Forest	As a part of the Los Padres National Forest, Santa Lucia District the watershed has two campgrounds, an off-highway vehicle area, and is open to general recreation. (Los Padres National Forest Map, 2005)
	Climate Change Considerations	

Alamo Creek Watershed

See IRWMP, 2014 Section H. Climate Change

Limited data and not watershed specific.

Watershed Codes

Cal Water/ DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3312.301206	3	Cuyama Valley	0	undefined	312.30	Stanley Mtn.	Sheep Creek
3312.301207	3	Cuyama Valley	0	undefined	312.30	Stanley Mtn.	Kennel Creek
3312.301205	3	Cuyama Valley	0	undefined	312.30	Stanley Mtn.	Alamo Creek
3312.301204	3	Cuyama Valley	0	undefined	312.30	Stanley Mtn.	Branch Creek
3312.301203	3	Cuyama Valley	0	undefined	312.30	Stanley Mtn.	Little Jollo Creek
3312.301202	3	Cuyama Valley	0	undefined	312.30	Stanley Mtn.	Lower Alamo Creek
3312.301201	3	Cuyama Valley	0	undefined	312.30	Stanley Mtn.	Upper Alamo Creek
3312.301403	3	Cuyama Valley	0	undefined	312.30	Twitchell Reservoir	Upper Twitchell Reservoir
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- In 1772, Mission San Luis Obispo was established bringing ranching to the area.
- In 1936, Los Padres National Forest was established.
- In 1958, Twitchell Dam and Reservoir was constructed by the Army Corps of Engineers and the Bureau of Reclamation on behalf of the Santa Barbara County Water Agency. (TMA, 2010)
- In 1997, the Logan Fire burned approximately 49,500 acres, some of which was in the upper watershed.(CDF, Strategic Fire Plan, 2012)
- In 2009, the La Brea Fire burned approximately 336,020 acres of which approximately 15% (50,403 acres) was in the Twitchell Reservoir watersheds. (CDF, Strategic Fire Plan, 2012)

Alamo Creek Watershed

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Alamo Creek	Perennial	Yes; Fecal Coliform TMDL estimated date of completion 2021. (SWRCB, 2010)	Agriculture, grazing-related, natural sources (SWRCB, 2010)	X cfs (Stillwater Sciences, 2013)
Sheep Creek	No source identified.	Not assessed.	No source identified.	
Kennel Creek	No source identified.	Not assessed.	No source identified.	
Alamo Creek	No source identified.	Not assessed.	No source identified.	
Branch Creek	No source identified.	Not assessed.	No source identified.	
Little Jollo Creek	No source identified.	Not assessed.	No source identified.	

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Cuyama Valley - Cuyama Valley Basin (portion)	10,667 AFY (San Luis Obispo County, Master Water Report, 2012)	Physical limitations. (San Luis Obispo County, Master Water Report, 2012)	No. (San Luis Obispo County, Master Water Report, 2012)	No. (RWQCB, Table 3-8, 2011)
*Santa Maria Valley - Orcutt Sub-basin	Unknown. (San Luis Obispo County, Master Water Report, 2012)	Unknown. (San Luis Obispo County, Master Water Report, 2012)	Unknown. (San Luis Obispo County, Master Water Report, 2012)	Yes. (RWQCB, Table 3-8, 2011)
*Santa Maria Valley – Santa Maria Management Area (SMVMA) (portion)	124,000 -125,100 AFY of groundwater production in the basin. For the portion of the Santa Maria Valley in San Luis Obispo County, dependable yield,	Water quality and water rights. (San Luis Obispo County, Master Water Report, 2012)	Yes for Sulfate and TDS (San Luis Obispo County, Master Water Report, 2012)	Yes for basin. No objective for management area. (RWQCB, Table 3-8, 2011)

Alamo Creek Watershed

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
	was estimated between 11,100 AFY and 13,000 AFY prior to the formal establishment of the SMVMA (DWR 2002).			

*Note: The Santa Maria Valley Groundwater Basin has been adjudicated. In 2005, the Superior Court of California entered a Judgment for a basin-wide groundwater litigation case that defined three basin management areas. These management areas are the Northern Cities Management Area (NCMA), the Nipomo Mesa Management Area (NMMA), and the Santa Maria Valley Management Area (SMVMA), which are used herein for planning by the County of San Luis Obispo. The Judgment incorporated a Stipulated Settlement which was made binding by the Court on the signatories, with a declaratory judgment and physical solution adjudged and decreed in the Judgment after Trial, dated January 25, 2008.

Groundwater Quality Description: Sulfate and TDS are the primary constituents of concern within the San Luis Obispo County portion of the SMVMA. TDS concentrations collected in four area wells between 1992 and 1998 ranged from approximately 750 mg/L to 1,300 mg/L, with a median of 1,200 mg/L, which exceeds the State drinking water standard upper limit of 1,000 mg/L. All the sulfate concentrations exceeded the recommended drinking water standard of 250 mg/L and some exceeded the upper limit of 500 mg/L. TDS was up to 800 mg/L greater in the alluvial aquifer, when compared to the underlying Paso Robles Formation aquifers. Nitrates are also a concern in several areas of the valley, although the majority of groundwater sample results in the San Luis Obispo County portion of the valley are below the MCL (DWR 2002).

Primary Issues

Issue	Potential Causes	Referenced from
Sedimentation of Twitchell Reservoir	Natural and upland erosion primarily from Cuyama River	TMA, 2010

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

Alamo Creek Watershed

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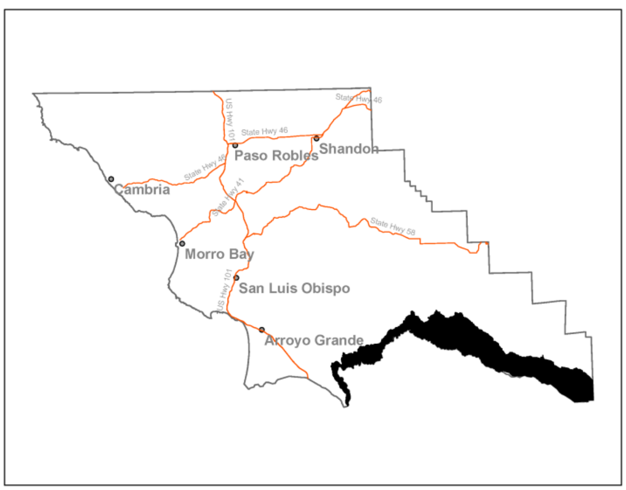
Cuyama River Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Santa Maria HU 12	Cuyama Valley WPA 9 Huasna Valley WPA 8	140,408 acres in County; 729,600 acres total	Santa Maria River	Cuyama Valley; Santa Maria Valley	County of San Luis Obispo Los Padres National Forest



Description:

The Cuyama River Watershed starts in Ventura County. The river generally flows in a westerly direction to a point of confluence with the Sisquoc River near the town of Garey where it joins the Santa Maria River. A portion of the northern tributaries are within the southwestern part of San Luis Obispo County. These northern tributaries rise to a maximum elevation of almost 4,950 feet above sea level at Caliente Mountain with their headwaters in the La Panza and Caliente Mountain Ranges.

The watershed is dominated by rural and agricultural land uses including ranches, orchards, vineyards and row crops. Other land uses include oil and gas production, Los Padres National Forest and Bureau of Land Management lands.

Watershed Plans:

None.

Cuyama River Watershed

Characteristics:

	Physical Setting	
	Rainfall	7 – 24 inches in County 7 – 30 inches for entire watershed (NRCS Precip 1981-2010)
	Air Temperature	Summer Range (August 1981-2010): 50°- 82° F Winter Range (December 1981-2010): 36°- 66° F At Twitchell Dam, CA. (NOAA National Climatic Data Center, viewed 2013)
	Geology Description	The Chimney Canyon sub watershed consists of steep pre-quaternary non-infiltrative headwaters and a steep moderately infiltrative early to mid-Tertiary valley – category #5. The Buckhorn Canyon sub watershed consists of moderately steep to steep pre-quaternary non-infiltrative headwaters – category #9. (Bell, personal communication, 2013) The Cuyama Valley was formed by a down faulted block that is bordered on the north by the Morales and Whiterock faults, and on the south by the South Cuyama and Ozena faults. The basin has been filled with continental deposits resulting from the active faults that border the valley to the north and south, and by alluvium deposited by the Cuyama River. These deposits coupled with the semi-arid climate of the region have created a wide distribution of soil types (Roehrdanz, et al, 2009).
	Hydrology	
	Stream Gage	Yes; USGS 11136800 Cuyama River below Buckhorn Canyon (1959-2007, discontinued); USGS 11138100 Cuyama River below Twitchell Dam (1959-1983, discontinued). Limited data.
	Hydrology Models	Yes; There is a USGS HEC-HMS used to calculate reservoir water surface elevation on Twitchell Dam. (TMA, 2010) Hydrologic model does not include entire watershed.
	Peak Flow	17,800 - 26,200 cubic feet per second occurred at the USGS 11136800 Cuyama River below Buckhorn Canyon, near Santa Maria (TMA, 2010). The Cuyama River is characterized as “flashy” with relatively rapid response to rainfall and little or no flow in its reaches during the summer months. The annual mean flow is approximately 27.8 cfs, however during the 1998 floods flow rates reached 26,200 cfs (SB County Water Agency, 2000).
	Base Flow	Average flow of only 18 cfs at the Cuyama River near Santa Maria River gage just above Twitchell Reservoir (USGS 11137000) for the

	period 1941–1962 (Stillwater Sciences, 2012) It is unknown if these gages were placed to accurately capture base flows. Many gages are placed as alert systems and only capture peak flows.
Flood Reports	Yes; Twitchell Project Manual (TMA, 2010); Floods in Cuyama Valley, California (USGS, 1998)
Biological Setting	
Vegetation Cover	Primarily sage scrub and salt brush scrub with some chaparral (chamise, semi-desert, buck brush), non-native grassland, blue oak woodland, coast live oak forest, orchard or vineyard and agricultural lands. (SLO County, vegetation shapefile, 1990) Annual grasslands, chaparral and scrub habitats, blue oak woodlands and pinyon-juniper woodlands dominate the area, but rare habitats such as saltbush scrub, alkaline marshes, and riparian forests are also present. (Roehrdanz, et al, 2009) Limited spatial data. No alliance level vegetation mapping was available for the entire County.
Invasive Species	No source identified.
Special Status Wildlife and Plants	*Key:* Federal endangered – FE, Federal threatened – FT, State endangered – SE, State threatened – ST, CDFW State Species of Concern – SSC, CA rare plant ranking – CRPR (CDFW CNDDB, August 2013)

Common Name	Status	BALLINGER CANYON	BRANCH MTN	CALIENTE MTN	CHIMINEAS RANCH	CHIMNEY CANYON	CUYAMA	CUYAMA PEAK	ELKHORN HILLS	HUASNA PEAK	MIRANDA PINE MTN	NEW CUYAMA	PAINTED ROCK	PEAK MTN	TAYLOR CANYON	TWITCHELL DAM	WELLS RANCH
Animals																	
American badger	SSC					x	x			x					x		
blunt-nosed leopard lizard	**FE; SE; Fully Protected**	**x**					**x**	**x**				**x**					
California condor	**FE; SE**	**x**															
California red-legged frog	**FT**														**x**	**x**	
coast horned lizard	SSC				x							x			x		
giant kangaroo rat	**FE; SE**	**x**		**x**			**x**					**x**		**x**	**x**		

Kern primrose sphinx moth	**FT**	**x**		**x**			**x**	**x**	**x**			**x**		**x**			**x**
long-eared owl	SSC														x		
longhorn fairy shrimp	**FE**		**x**		**x**						**x**				**x**		
Nelson's antelope squirrel	**ST**	**x**					**x**					**x**					
prairie falcon	Special Animal (Nesting)	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x
San Joaquin kit fox	**FE; ST**	**x**		**x**			**x**				**x**	**x**		**x**	**x**		
San Joaquin whipsnake	SSC														x		
silvery legless lizard	SSC										x						
Swainson's hawk	**ST**						**x**		**x**			**x**					
tricolored blackbird	SSC (Nesting)						x								x		
Tulare grasshopper mouse	SSC														x		
two-striped garter snake	SSC					x					x						
vernal pool fairy shrimp	**FT**		**x**								**x**						
western pond turtle	SSC										x			x			
western spadefoot	SSC														x		
Plants																	
woven-spored lichen	CALS Listed													x			
Blakley's spineflower	CRPR 1B.3											x		x			
California jewel-flower	**FE; SE; CRPR 1B.1**	**x**					**x**					**x**					
Hoover's eriastrum																	

Cuyama River Watershed

	Jared's pepper-grass																		
	Kern mallow	**Federally Delisted; CRPR 4.2**						**x**											
	La Panza mariposa-lily	CRPR 1B.2																x	
	Lemmon's jewel-flower	**FE; CRPR 1B.1**	**x**		**x**			**x**	**x**							**x**			
	Lost Hills crownscale	CRPR 1B.3				x	x									x			
	Miles' milk-vetch	CRPR 1B.2	x			x		x	x				x			x			
	Munz's tidy-tips	CRPR 1B.2						x		x			x					x	
	oval-leaved snapdragon	CRPR 1B.2															x		
	pale-yellow layia	CRPR 1B.2						x											
	Parish's checker-bloom	CRPR 4.2			x	x												x	
	round-leaved filaree	CRPR 1B.1	x		x			x								x			
	San Gabriel manzanita	**SR; CRPR 1B.2**													**x**				
	San Joaquin woolly-threads	CRPR 1B.1			x	x										x			
	showy golden madia	CRPR 1B.2										x			x	x			
	stinkbells	**FE; CRPR 1B.2**	**x**		**x**			**x**					**x**			**x**			
	umbrella larkspur	CRPR 1B.1				x		x					x			x			
		CRPR 4.2			x			x										x	
		CRPR 1B.3				x	x									x			
		Limited by the type of data collected in the CA Natural Diversity Database.																	
Steelhead Streams		No. Santa Maria River is a steelhead stream. Twitchell Dam creates a barrier to access. (NMFS, 2009)																	
Stream Habitat Inventory		No source identified.																	
Fish Passage		Bridge with potential passage constraints at the Cuyama River,																	

Cuyama River Watershed

	Barriers	Status Unknown, PAD # 736548.00000; Alamo Creek Bridge with potential passage constraints, Status Unknown, PAD # 736590.00000; Bridge with potential passage constraints at the Cuyama River, Status unknown, PAD # 736651.00000; Culvert at Hwy 166 and Cuyama River, Status Unknown, PAD #736667.00000; Twitchell Dam at the Cuyama River, Total Barrier, PAD #718831.00000; Road Crossing at the Cuyama River, Partial Barrier, PAD # 723386.00000 (CDFW Passage Assessment Database, 2013).
	Designated Critical Habitat	None. (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	No source identified.
	Other Environmental Resources	Los Padres National Forest, Carrizo National Monument, The Nature Conservancy has identified the Cuyama Valley as a potential priority region due to its ecological richness, rare plant communities, and its potential to function as a wildlife corridor between the conserved lands of the Carrizo Plain National Monument and Los Padres National Forest.
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo.
	% Urbanized	0% in County (SLO County LUC)
	% Agricultural	44% in County (SLO County LUC)
	% Other	56% (12.47% open space and 43.48% rural lands) in County (SLO County LUC)
	Planning Areas	Shandon-Carrizo, Los Padres, Huasna-Lopez, South County Inland
	Potential growth areas	No source identified.
	Facilities Present	Twitchell Dam Limited data.
	Commercial Uses	Agriculture Limited data.
	Demographics	
	Population	128 (U.S. Census Block, 2010)
	Race and Ethnicity	21.9% Caucasian (28), 76.6% Latino (98), and 0.8% Other. (U.S. Census Block, 2010)
	Income	MHI $60,676 (U.S. Census Tract 127.02, 2010) Census tracts are very large crossing multiple watersheds.
	Disadvantaged Communities	No; 7% of individuals are below poverty (U.S. Census Tract 127.02, 2010)

Cuyama River Watershed

		Census tracts are very large crossing multiple watersheds.
	Water Supply	
	Water Management Entities	Twitchell Management Authority Limited data.
	Groundwater	Yes; alluvial, Cuyama Valley, Santa Maria Valley (SLO County, 2012)
	Surface Water	Yes; Twitchell Dam recharges the Santa Maria Valley groundwater basin. (TMA, 2010)
	Imported Water	No source identified.
	Recycled/ Desalinated Water	No source identified.
	Infiltration Zones	Seepage of river flows through the river bed along the Santa Maria River and along the lower reaches of the Cuyama and Sisquoc Rivers is the primary source of recharge to the Santa Maria Groundwater Basin. Percolation of river flows through unconsolidated, permeable alluvial deposits account for approximately 75-85% of the average annual recharge to the groundwater basin. A significant portion of the groundwater recharge attributable to river bed seepage is due to the operation of the Twitchell Dam. (SLO County & SB County, 1998) Limited data.
	Water Budget	A water budget was developed for the Cuyama Valley that acknowledges limited data (Roehrdanz, et. al, 2009). The County of Santa Barbara and U.S Geological Society is developing the *Geohydrology and Water Availability of the Cuyama Valley, California,* expected to be completed in 2014. Limited data.
	Water Uses	
	Beneficial Uses	*Cuyama River, upstream of Twitchell Reservoir* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Freshwater Replenishment (FRSH), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN). (RWQCB, 2011)
	Other Unique Characteristics	
	Historic Resources	No source identified.

	Archeological Resources	There were Chumash towns called Wenexe'l and Sxaliwilimu' at the time of European settlement (SB Museum of Natural History, viewed 2013). Limited data and low priority for this effort.
	Other	No source identified.
	Climate Change Considerations	
		See IRWMP, 2014 Section H. Climate Change Limited data and not watershed specific.

Cuyama River Watershed

Watershed Codes

Calwater/ DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning Watershed Name	CDF Watershed Name
3312.301006	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Carrizo Canyon
3312.301009	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Brown Canyon
3312.301002	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Moon Canyon
3312.301003	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Taylor Canyon
3312.301004	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Miranda Canyon
3312.301007	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Sycamore Creek
3312.301008	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Gypsum Canyon
3312.301010	3	Cuyama Valley	0	undefined	312.30	Gifford Spring	Pearson Spring
3312.301101	3	Cuyama Valley	0	undefined	312.30	Porter Peak	Rice Ranch
3312.301105	3	Cuyama Valley	0	undefined	312.30	Porter Peak	Buckhorn Canyon
3312.301106	3	Cuyama Valley	0	undefined	312.30	Porter Peak	Clear Creek
3312.300902	3	Cuyama Valley	0	undefined	312.30	Chalk Mtn.	Lower Aliso Canyon
3312.300905	3	Cuyama Valley	0	undefined	312.30	Chalk Mtn.	Post Canyon
3312.300907	3	Cuyama Valley	0	undefined	312.30	Chalk Mtn.	Lower Schoolhouse Canyon
3312.300908	3	Cuyama Valley	0	undefined	312.30	Chalk Mtn.	Morales Canyon
3312.300909	3	Cuyama Valley	0	undefined	312.30	Chalk Mtn.	Morales Canyon Oil Field
3312.301403	3	Cuyama Valley	0	undefined	312.30	Twitchell Reservoir	Upper Twitchell Reservoir
3312.301404	3	Cuyama Valley	0	undefined	312.30	Twitchell Reservoir	Chimney Canyon
3312.301405	3	Cuyama Valley	0	undefined	312.30	Twitchell Reservoir	Canada de los Coches
3312.301406	3	Cuyama Valley	0	undefined	312.30	Twitchell Reservoir	Mouth of Cuyama River

Cuyama River Watershed

Calwater/ DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning Watershed Name	CDF Watershed Name
3312.300804	3	Cuyama Valley	0	undefined	312.30	New Cuyama	Sulfur Canyon
3312.300803	3	Cuyama Valley	0	undefined	312.30	New Cuyama	Padrones Canyon
3312.300802	3	Cuyama Valley	0	undefined	312.30	New Cuyama	Quail Canyon
3312.300805	3	Cuyama Valley	0	undefined	312.30	New Cuyama	New River
3312.300801	3	Cuyama Valley	0	undefined	312.30	New Cuyama	Stubblefield Road
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- In 1958, Twitchell Dam and Reservoir was constructed by the U.S. Army Corps of Engineers and the Bureau of Reclamation on behalf of the Santa Barbara County Water Agency. (TMA, 2010)

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Cuyama River (above Twitchell Reservoir)	Ephemeral	Yes on 303d list for Boron, Chloride, Electrical Conductivity, Fecal Coliform, pH, Sodium. TMDL estimated date of completion 2021. (SWRCB, 2010)	Agriculture, grazing-related, municipal point sources, natural , resource extraction (SWRCB, 2010)	X Cfs (Stillwater Sciences, 2013)

Cuyama River Watershed

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Cuyama Valley Basin	9,000 - 13,000 AFY (San Luis Obispo County, Master Water Report, 2012)	Physical Limitations. (San Luis Obispo County, Master Water Report, 2012) DWR identifies it as in "critical condition of overdraft" (Roehrdanz, et al., 2009).	Yes (San Luis Obispo County, Master Water Report, 2012)	No. (RWQCB, Table 3-8, 2011)
Santa Maria Valley Basin	Adjudicated. (San Luis Obispo County, Master Water Report, 2012)			Yes. (RWQCB, Table 3-8, 2011)

*Note: The Santa Maria Valley Groundwater Basin has been adjudicated. In 2005, the Superior Court of California entered a Judgment for a basin-wide groundwater litigation case that defined three basin management areas. These management areas are the Northern Cities Management Area (NCMA), the Nipomo Mesa Management Area (NMMA), and the Santa Maria Valley Management Area (SMVMA), which are used herein for planning by the County of San Luis Obispo. The Judgment incorporated a Stipulated Settlement which was made binding by the Court on the signatories, with a declaratory judgment and physical solution adjudged and decreed in the Judgment after Trial, dated January 25, 2008.

Groundwater Quality Description: Analyses of water from three public supply wells show an average TDS content of 858 mg/L and a range from 755 to 1,000 mg/L. USGS analyses show TDS content as high as 1,750 mg/L. Because of constant cycling and evaporation of irrigation water in the basin, water quality has been deteriorating (DWR 2003; SBCWA 1996; SBCWA 2001). Groundwater near the Caliente Range has high salinity, which has been attributed to seepage out of the basement marine rocks. Nitrate content reached 400 mg/L in some shallow wells (DWR 2003; County of Santa Barbara Planning and Development Department, 1994). (SLO County, 2012)

Primary Issues

Issue	Potential Causes	Referenced from
Sedimentation of Twitchell Reservoir	Natural and upland erosion	TMA, 2010
Groundwater Supplies	Natural, water extraction	Roehrdanz, et al., 2009

The issues described above are in no way an exhaustive list but were identified by entities working in the watershed. Additional research would be needed to flush out all the issues facing the watershed. Issues were vetted by the community to various degrees based on the individual document. There was no countywide vetting process to identify the relative priority of each issue.

Cuyama River Watershed

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Appendix C.3 North County Sub-region Watersheds

15. Black Sulphur Spring Watershed
16. Soda Lake Watershed
17. Upper San Juan Creek Watershed
18. Lower San Juan Creek Watershed
19. Upper Salinas-Santa Margarita Area Watersheds
20. Mid Salinas- Atascadero Area Watersheds
21. Lower Salinas-Paso Robles Creek Area Watersheds
22. Huer Huero Creek Watershed
23. Estrella River Watershed
24. Cholame Creek Watershed
25. Nacimiento River Watershed

Black Sulphur Spring Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Carrizo Plain 11	Carrizo Plain WPA 10	143,160 acres total; 137,489 acres within San Luis Obispo County	Soda Lake	Carrizo Plain	County of San Luis Obispo, Bureau of Land Management


Elkhorn Plain
Photo: Althouse and Meade

Description:

The Black Sulphur Spring Watershed lies in the eastern portion of San Luis Obispo's North County region and includes the southern portion of the Carrizo National Monument. The total watershed area is approximately 143,160 acres with a majority of the acreage located within San Luis Obispo County (137,489 acres). The remaining acreage is located within Kern County to the East. The watershed is bounded by Temblor Range to the east, Caliente Range and San Juan Hills to the west and drains entirely into Soda Lake. The Black Sulphur Watershed contains two major drainages: the Caliente Range and Elkhorn Plain. The highest elevation in the watershed is about 3,411 feet and the lowest elevation is approximately 1,919 feet. Elkhorn Plain is in this watershed, draining toward the basin floor. The watershed is transected by San Andreas Fault. The groundwater basin underlying the watershed, the Carrizo Plain basin, is recharged from percolation of stream flow and infiltration of precipitation. Users of the basin include a small public water system serving local school, agricultural and residential purposes, and solar farms. The dominant land use is rangeland.

Existing Watershed Plans:

No existing plans to date

Black Sulphur Spring Watershed

Characteristics

	Physical Setting	
	Rainfall	Average Annual: 7-13 in. (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1991-2012): 64°-88°F Winter Range (December 1991-2012): 39°-52°F (Carrizo NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Carrizo Plain and Elkhorn Scarp sub-watersheds composed of flat highly infiltrative Quaternary geologic material – Category #3. Beam Flat, Abbot Canyon, Goat Spring, and Cottonwood Spring are composed of moderate steep moderately infiltrative early to mid-Tertiary headwaters and flat highly infiltrative Quaternary inland – Category #7. Cochora Ranch, and Simm sub-watersheds are steep moderately infiltrative early to mid-Tertiary materials – Category #8 (Bell, pers. comm., 2013). Groundwater is found in alluvium and the Paso Robles and Morales Formations. Upper Pleistocene to Holocene alluvium consists of unconsolidated to loosely consolidated sands, gravels, and silts with a few beds of compacted clays. Paso Robles Formation. The Pleistocene age Paso Robles Formation consists of poorly sorted, mostly loosely consolidated gravels, sands, and silts. The combined thickness of these deposits is more than 3,000 feet in the eastern portion of the basin along the San Andreas fault and decreases toward the west. Morales Formation. The Upper Pliocene Morales Formation consists of sands, gravels, and silts, which generally are more stratified and compacted than in the overlying Paso Robles Formation (Chipping, 1987).
	Hydrology	
	Stream Gage	No
	Hydrology Models	None
	Peak Flow	No source identified
	Base Flow	No source identified
	Flood Reports	No source identified
	Flood Control Structures	No source identified
	Areas of Heightened Flood Risk	No source identified
	Biological Setting	

Black Sulphur Spring Watershed

Vegetation Cover	Primarily annual grassland and alkali desert scrub. Valley saltbush scrub with juniper and California sagebrush are common (SLO County vegetation shapefile, 1990) *Data limited due to age of shapefile* CNPS recently (2013) completed a vegetation survey of the Carrizo Plain National Monument. Mapped vegetation characterized stands to the alliance level. Desert scrub, alkaline/scrub, coastal scrub, chaparral, woodlands, saline and alkali marshes, grasslands and herblands, and arroyo wash alliances were all represented. Juniper and blue oak woodlands are primarily on the southwestern edge of the watershed in the hills. Alkali, desert, and coastal scrub are common on eastern hills. Goldfield-plantain-fescue fields are common along the basin floor. Alkali wetlands and marsh vegetation are patchy in thenorthern watershed south of soda lake. Many additional alliances are mapped in small patches. The CNPS inventory provides high-resolution vegetation data at fine scale for this watershed. Vernal pools, alkali wetlands, and rare arid-land plant communities are important resources with small areal extent in this watershed (Althouse and Meade, 2013). *Data limited to observations, not complete inventory*
Invasive Species	Slim oat (*Avena barbata*), Common wild oat (*Avena fatua*), Black Mustard (*Brassica nigra*), Bromegrass (*Bromus Diandrus*), Red brome (*Bromus rubens*), Italian thistle (*Carduus pycnocephalus*), Spear thistle (*Cirsium vulgare*), Cut-leaved cranesbill (*Geranium dissectum*), Farmer's foxtail (*Hordeum marinum*), Italian ryegrass (*Lolium multiflorum*), Foxtail fescue (*Vulpia myuros*), Tamarisk (*Tamarix* spp.) (California Native Plant Society, 2011) *Data limited to observations, not complete inventory*
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 (CNDDB, 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*

Species	Status	BALLINGER CANYON	CALIENTE MTN	CUYAMA	ELKHORN HILLS	FELLOWS	MARICOPA	MCKITTRICK SUMMIT	PAINTED ROCK	PANORAMA HILLS	REWARD	WELLS RANCH

Black Sulphur Spring Watershed

Animals												
American badger	SSC								x			x
blunt-nosed leopard lizard	FE; SE; FP	x			x		x	x	x	x		x
burrowing owl	SSC				x				x			
California condor	FE; SE	x										
giant kangaroo rat	FE; SE	x	x	x	x		x		x	x		x
Kern primrose sphinx moth	FT	x	x	x	x	x				x		x
Morrison's blister beetle	SA				x							
mountain plover	SSC (Wintering)				x				x	x		x
Nelson's antelope squirrel	ST				x				x	x		x
pallid bat	SSC								x			
prairie falcon	SA (Nesting)	x	x	x				x	x	x		x
San Joaquin kit fox	FE; ST	x		x	x		x	x	x	x		x
San Joaquin whipsnake	SSC	x							x			
short-nosed kangaroo rat	SSC									x		x
Swainson's hawk	ST			x	x							
Tulare grasshopper mouse	SSC									x		x
western spadefoot	SSC	x										
Plants												
California jewel-flower	FE; SE				x				x			x
chaparral ragwort	CRPR 2B.2									x		
Coulter's goldfields	CRPR 1B.1				x				x	x		
Jared's pepper-grass	CRPR 1B.2				x				x	x		x
Kern mallow	FE				x				x	x		x
Lemmon's jewel-flower	CRPR 1B.2		x						x			
Species	**Status**	**BALLINGER CANYON**	**CALIENTE MTN**	**CUYAMA**	**ELKHORN HILLS**	**FELLOWS**	**MARICOPA**	**MCKITTRICK SUMMIT**	**PAINTED ROCK**	**PANORAMA HILLS**	**REWARD**	**WELLS RANCH**
Lost Hills crownscale	CRPR 1B.2								x			x
Munz's tidy-tips	CRPR 1B.2				x				x			x

Black Sulphur Spring Watershed

oval-leaved snapdragon	CRPR 4.2	x									x
pale-yellow layia	CRPR 1B.1			x			x			x	x
recurved larkspur	CRPR 1B.2							x	x		
round-leaved filaree	CRPR 1B.1	x									x
San Joaquin woollythreads	FE	x		x	x			x	x		x
showy golden madia	CRPR 1B.1			x							x
stinkbells	CRPR 4.2	x									x
Temblor buckwheat	CRPR 1B.2			x					x		

Steelhead Streams	None
Stream Habitat Inventory	None
Fish Passage Barriers	No source identified, fish populations not historically supported
Designated Critical Habitat	None
Habitat Conservation Plans	Yes; Carrizo Plain Natural Area Plan, Stewardship Council Land Conservation Plan
Other Environmental Resources	Carrizo Plains National Monument and Ecological Reserve and Soda Lake, San Andreas Fault Zone of Eastern San Luis Obispo County, Caliente Wildlife Area (SLO County Flood Control and Water Conservation District, 2007)
Land Use	
Jurisdictions & Local Communities	County of San Luis Obispo, BLM - Carrizo Plains National Monument
% Urbanized	0% (Land Use Category GIS Layer)
% Agricultural	62% (SLO County Land Use Category GIS Layer)
% Other	38% (Rural) (SLO County Land Use Category)
Planning Areas	Shandon-Carrizo Planning Area
Potential growth areas	None Identified
Facilities Present	None identified
Commercial Uses	Agriculture, tourism
Demographics	
Population	2 (US Census Block, 2010)
Race and Ethnicity	Latinos represent 100%.
Income	MHI $65,482 in watershed (US Census Tracts, 2010, spans 11 watersheds)

Black Sulphur Spring Watershed

Disadvantaged Communities	No; 7.0% of individuals are below poverty level in watershed (US Census Tracts, 2010, spans 11 watersheds)
Water Supply	
Water Management Entities	None; users served by individual wells
Groundwater	Carrizo Plain (total storage capacity is estimated at 400,000 af)
Surface Water	No public reservoirs in the watershed.
Imported Water	None
Recycled/ Desalinated Water	None
Key groundwater percolation area(s)	No key percolation areas identified - Recharge to the basin is largely by percolation of stream flow and infiltration of rainfall to the valley floor (Ca. Dept of Water Resources, 2003)
Water budget performed	Yes; Aspen Environmental Group, 2011 for Topaz Solar Farm. *Data limited to region affected by the Topaz Solar Farm, which is similar to, but not included in this watershed*
Water Uses	
Beneficial Uses	*Soda Lake* - Industrial Service Supply (IND), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Warm Fresh Water Habitat (WARM), Significance (BIOL), Rare, Threatened, or Endangered Species (RARE) and Commercial and Sport Fishing (COMM) (CCRWQB, 2011)
Other Unique Characteristics	
San Andreas Fault Zone	The San Andres Fault traverses the eastern portion of the county and is one of the most seismically active faults in North America. The fault zone is important from a botanical and geological standpoint. The San Andres Fault in the Carrizo Plain has the largest post-early Miocene offset and is the oldest reach of the entire active fault system. (The sag ponds along the fault have special ecological significance (Pollard et. al., 1995).
Carrizo Plain National Monument	A cooperative effort since 1985 between Bureau of Land Management, California Fish and Wildlife and the Nature Conservancy. 250,000 acres of relatively undisturbed habitat.
Elkhorn Plain Ecological Reserve	A 160 acre, semi-desert state reserve with many unusual plants: the endangered San Joaquin wooly threads, desert boxthorn, cottony and spotted buckwheat, Arizona popcorn flower, Kern Tarplant and thistle sage. Has a population of blunt nose leopard lizard.
Caliente National Cooperative Land and Wildlife Management Area	Includes 58,000 acres of Bureau of Land Management property. Caliente Mountain, part of the Cuyama River Watershed, is the highest peak in the county at more than 5,100 feet. Partially or entirely in the range of the California Condor and Blunt Nosed Leopard Lizard,

Black Sulphur Spring Watershed

	endangered species, and San Joaquin Kit Fox, a rare species.
Vernal Pools	Present in the Black Sulphur Spring watershed. These pools are more alkaline than pools of the Paso Region. Rare plants and wildlife utilize vernal pool habitat in the Carrizo.
San Joaquin Kit Fox	Carrizo Plain supports a core population of federally endangered San Joaquin Kit Fox. Additionally, giant kangaroo rat precincts are known from Black Sulphur Spring watershed. Blunt nose leopard lizard and Nelson's antelope squirrel are known from the Elkhorn Plain. Rare plants of limited extent in the state and globally are reported from this watershed.
Wildflower Fields	Mid-March to mid-April is the usual time for wildflower season, but it is dependent on the weather and varies from season to season. Temperature and rainfall affect which flowers bloom. Every year is not spectacular and only a few flowers may prevail in some years. Typical species include: goldenbush shrubs, bush lupine, pale yellow astragalus, locoweed, filaree, yellow tropidocarpum, white popcorn flower, orange fiddleneck, poppies, hillside daises, sun cups and baby-blue eyes. One of the three remaining habitats for the California jewelflower as well as other special status plants (BLM, 2013)
Climate Change Considerations	
	Saltbrush and other native shrubs are expected to decline and marginal farmland may become less productive and retired in the Carrizo Plain area. Pronghorn and Tule elk populations could decline. (ClimateWise, 2010). See IRWMP, 2014 Section H. Climate Change *General County data, not watershed specific*

Watershed Codes

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic sub-area name	SWRCB Number	CDF Super Planning	Sub-watersheds (CDF Watershed Name)
3311.000103	0	Undefined	0	Undefined	311.00	Panorama Hills	Old Cooper Ranch
3311.000201	0	Undefined	0	Undefined	311.00	Elkhorn Plain	South of Cochoro ranch
3311.000202	0	Undefined	0	Undefined	311.00	Elkhorn Plain	Beam Flat
3311.000203	0	Undefined	0	Undefined	311.00	Elkhorn Plain	Elkhorn Scarp
3311.000204	0	Undefined	0	Undefined	311.00	Elkhorn Plain	Cochora Ranch
3311.000301	0	Undefined	0	Undefined	311.00	Caliente Range	Abbot Canyon

Black Sulphur Spring Watershed

3311.000302	0	Undefined	0	Undefined	311.00	Caliente Range	Goat Spring
3311.000303	0	Undefined	0	Undefined	311.00	Caliente Range	Cottonwood Spring
3311.000304	0	Undefined	0	Undefined	311.00	Caliente Range	Lawson Spring
3311.000404	0	Undefined	0	Undefined	311.00	West of Soda Lake	Simm
3311.000500	0	Undefined	0	Undefined	311.00	Soda Lake	Soda Lake / Carrizo Plain (ptn)
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- 4000-8000 years before present – The Carrizo Plains were a meeting place for Salinan, Yokut, Chumash and other Indian tribes. Vaqueros Formation rock monoliths are decorated with art that is being protected today.
- 1780 – First contact by Europeans. Large herds of sheep, horse and cattle brought into the area by Spanish. Introduce non-native species to the Carrizo grasslands
- 1857 – Major earthquake that shaped much of the natural landscape of the Carrizo Plains area (Pollard et. al., 1995)
- 1876 – First homesteads established on Carrizo Plains. Dry grain farming was intensive after invention of mechanized agricultural equipment in 1912, resulting in as much as 2 feet of top soil loss in some field margins
- 1939 to Post World War II – A combination of good weather and post War expansion led to increased profitability and productivity of the areas farms and ranches.
- 1964 – Creation of California Valley. Chicote Ranch, a 7,500 acre ranch just south of 58, was divided into two-and-a half acre parcels which were promoted all over the state as retirement homes.
- 2001 – Carrizo Plain National Monument created by President Clinton under the authority of the Antiquities Act of 1906.

Source: Santa Margarita Historical Society, http://www.santamargaritahistoricalsociety.org/pages/carrisa_plains.html unless otherwise noted

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)

Black Sulphur Spring Watershed

Abbot Canyon	Unknown	None	n/a
Beam Flat	Unknown	None	n/a
Carrizo Plain	Unknown	None	n/a
Cochora Ranch	Unknown	None	n/a
Cottonwood Spring	Perennial	None	n/a
Elkhorn Scarp	Unknown	None	n/a
Goat Spring	Unknown	None	n/a
Simm	Unknown	None	n/a

Watershed Health by Major Groundwater Basin

Groundwater Basin	**Estimated Safe Yield**	**Water Availability Constraints**	**Drinking Water Standard Exceedance**	**Water Quality Objective Exceedance, Table 3-8**
Carrizo Plain	8000-11,000 AF (Carollo, 2012)	Physical limitations and environmental demand. The shallow alluvial deposits are typically more susceptible to drought impacts (Carollo, 2012).	Yes; see description below.	Exceeds usable mineral quality for total dissolved solids, chloride, sulfate, boron, sodium, and nitrogen (CCRWQB, 2011).

Groundwater Quality Description: Analyses of groundwater from 79 wells in this basin during 1957 through 1985 show Total Dissolved Solids (TDS) content ranging from 161 to 94,750 ppm. A highly mineralized groundwater zone is found in the lower part of the alluvium and the upper part of the Paso Robles Formation where they underlie Soda Lake. Water in a deeper zone Paso Robles Formation is of higher quality and confined in the vicinity of Soda Lake. Groundwater in the Morales Formation is likely to be brackish. Locally high nitrate and salinity concentrations as well as high Selenium and Arsenic as result of geology (Carollo, 2012).

Primary Issues

Issue	***Potential Causes***	***Referenced from***
Groundwater quality		Carollo, 2012
Groundwater Quantity	Physical Limitations	Carollo, 2012
Outdated Studies of the GW basins		Carollo, 2012

Black Sulphur Spring Watershed

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Significant Studies in Progress:

Soda Lake Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Carrizo Plain 11	Carrizo Plain WPA 10	141,876 total acres with 136,015 acres within San Luis Obispo County	Soda Lake	Carrizo Plain, Big Spring Area (ptn)	County of San Luis Obispo, California Valley, Bureau of Land Management

Description:

The Soda Lake Watershed lies in the eastern portion of San Luis Obispo County and includes the northern portion of the Carrizo National Monument. The watershed is 141,876 acres with a majority of the acreage located within San Luis Obispo County (136,015 acres) and the remaining acreage in Kern County. The watershed is bounded by Temblor Range to the east, Caliente Range and San Juan Hills to the west and drains entirely into Soda Lake. Soda Lake itself is primarily contained within the watershed, with a portion in the Black Sulphur Springs watershed. The Watershed contains two major drainages: Panorama Hills and West of Soda Lake. The highest elevation in the watershed is approximately 4,100 feet and the lowest elevation is about 1,920 feet. The watershed, combined with the adjacent Black Sulphur Spring watershed, is an alkali closed basin with no outflow beyond Soda Lake. The watershed is transected by San Andreas Fault. The major groundwater basin underlying the watershed is the Carrizo Plain basin which is recharged from percolation of stream flow and infiltration of precipitation. The dominant land uses are grazing and solar farms.

Existing Watershed Plans:

No existing plans to date

Soda Lake Watershed

Characteristics

	Physical Setting	
	Rainfall	Average Annual: 7-14 in. (NRCS shapefile, 2010).
	Air Temperature	Summer Range (August 1996-2012): 64-88°F Winter Range (December 1996-2012): 38-52°F (Branch Mountain, NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Carrizo Plain sub-watershed is flat highly infiltrative Quaternary material – Category #3. Painted Rock, Goodwin Ranch and San Diego Creek are moderate steep moderately infiltrative early to mid-Tertiary headwaters and are flat and highly infiltrative Quaternary inland – Category #7 (Bell, pers. comm., 2013). Groundwater is found in alluvium and the Paso Robles and Morales Formations. Upper Pleistocene to Holocene alluvium consists of unconsolidated to loosely consolidated sands, gravels, and silts with a few beds of compacted clays. Paso Robles Formation. The Pleistocene age Paso Robles Formation consists of poorly sorted, mostly loosely consolidated gravels, sands, and silts. The combined thickness of these deposits is more than 3,000 feet in the eastern portion of the basin along the San Andreas fault and decreases toward the west. The Upper Pliocene Morales Formation consists of sands, gravels, and silts, which generally are more stratified and compacted than in the overlying Paso Robles Formation (Chipping, 1987).
	Hydrology	
	Stream Gage	None
	Hydrology Models	Yes; North Coast Engineering. 2008. Preliminary investigation for the California Valley solar ranch, San Luis Obispo County, CA. Taney Engineering. 2009. Hydrology Report of Topaz Solar Facility.
	Peak Flow	No data available
	Base Flow	No data available
	Flood Reports	None
	Flood Control Structures	Bridges: 1 over Carrizo Drain on Soda Lake Road (PWD Bridges GIS Layer)
	Areas of Flood Risk	No data available

Soda Lake Watershed

Biological Setting	
Vegetation Cover	Primarily annual grassland with alkali desert scrub, juniper woodland,semi-desert chaparral, sagebrush, saltbush, barren dry salt flats, as well as mixed chaparral consisting of mainly narrowleaf golden bush (SLO County vegetation shapefile, 1990) *Data limited by age of shapefile* CNPS recently (2013) completed a vegetation survey of the Carrizo Plain National Monument; a portion of the Soda Lake watershed was included in the survey. Mapped vegetation characterized stands to the alliance level. Desert scrub, alkaline/scrub, coastal scrub, chaparral, woodlands, saline and alkali marshes, grasslands and herblands, and arroyo wash alliances were all represented. Grasslands are mapped along the western hills and lower portions of the eastern hills; alkali, desert, and coastal scrub are common on upper eastern hills. Goldfield-plantain-fescue fields and other wildflower alliances are present along the basin floor. Alkali wetlands and marsh vegetation are patchy in near Soda Lake. Many additional alliances are mapped in small patches. The CNPS inventory provides high-resolution vegetation data at fine scale for the south part of this watershed. Private lands have not been inventoried. Vernal pools are present on the plain floor, and become less alkaline in the north part of the watershed. Annual grasslands and recently farmed croplands are common in the north part of the watershed (Althouse and Meade, 2013).
Invasive Species	Slim oat (*Avena barbata*), Common wild oat (*Avena fatua*), Black Mustard (*Brassica nigra*), Bromegrass (*Bromus Diandrus*), Red brome (*Bromus rubens*), Italian thistle (*Carduus pycnocephalus*), Spear thistle (*Cirsium vulgare*), Cut-leaved cranesbill (*Geranium dissectum*), Farmer's foxtail (*Hordeum marinum*), Italian ryegrass (*Lolium multiflorum*), Foxtail fescue (*Vulpia myuros*) Cheat grass (*Bromus diandrus*), Tamarisk (*Tamarix* spp.), Tree of heaven (*Ailanthus altissima*), Russian thistle (*Salsola tragus*), Perennial pepperweed (*Lepidium latifolium*), Barbed goat grass (*Aegilops triuncialis*), Skeleton weed (*Chondrilla juncea*), Russian knapweed (*Acroptilon repens*), and Yellowstar thistle (*Centaurea solstitialis*) (Los Padres Forest Watch, 2011). Several of these species have limited distribution within the watershed and a coordinated effort with landowners could make significant contribution to control of spread. Many of these species were identified and mapped during biological surveys for Topaz Solar Farm, and through personal communications with the County Department of Agriculture. These occurrences pre-date the solar projects (Althouse and Meade, 2013). *Data limited to observations, not complete inventory*

Soda Lake Watershed

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 (CNDDB, 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

Species	Status	CALIENTE MTN	CALIFORNIA VALLEY	CARNEROS ROCKS	CHIMINEAS RANCH	LA PANZA NE	LA PANZA RANCH	LAS YEGUAS RANCH	MCKITTRICK SUMMIT	PAINTED ROCK	SIMMLER
Animals											
American badger	SSC		x			x	x		x		
blunt-nosed leopard lizard	FE; SE; FP								x	x	x
Burrowing owl	SSC (Burrow sites ,some wintering sites)				x	x					x
coast horned lizard	SSC										x
giant kangaroo rat	FE; SE		x		x			x	x	x	x
longhorn fairy shrimp	FE		x		x			x			x
mountain plover	SSC - Wintering									x	
Nelson's antelope squirrel	ST		x						x	x	x
pallid bat	SSC		x							x	x
pocket pouch fairy shrimp	SA									x	
prairie falcon	SA (Nesting)	x	x	X	x	x	x	x	x	x	x
San Joaquin kit fox	FE; ST		x		x	x		x	x	x	x
San Joaquin pocket mouse	SA								x		x
San Joaquin whipsnake	SSC					x			x		

Soda Lake Watershed

Species	Status	CALIENTE MTN	CALIFORNIA VALLEY	CARNEROS ROCKS	CHIMINEAS RANCH	LA PANZA NE	LA PANZA RANCH	LAS YEGUAS RANCH	MCKITTRICK SUMMIT	PAINTED ROCK	SIMMLER
Tipton kangaroo rat	FE; SE				x					x	x
Tulare grasshopper mouse	SSC								x		x
vernal pool fairy shrimp	FT										x
western spadefoot	SSC		x								x
Plants											
Coulter's goldfields	CRPR 1B.1							x		x	
diamond-petaled California poppy	CRPR 1B.1							x			x
Eastwood's larkspur	CRPR 1B.2				x					x	
heartscale	CRPR 1B.2									x	x
Jared's pepper-grass	CRPR 1B.2				x					x	x
Kern mallow	FE		x						x		x
Lemmon's jewel-flower	CRPR 1B.2				x	x			x	x	
Lost Hills crownscale	CRPR 1B.2		x		x	x			x	x	x
Munz's tidy-tips	CRPR 1B.2					x			x	x	x
oval-leaved snapdragon	CRPR 4.2				x					x	x
recurved larkspur	CRPR 1B.2		x		x				x	x	x
round-leaved filaree	CRPR 1B.1	x	x		x	X					x
San Joaquin woollythreads	FE										x
shining navarretia	CRPR 1B.2		x								
showy golden madia	CRPR 1B.1					x					
spiny-sepaled button-celery	CRPR 1B.2		x								
Steelhead	None										

Soda Lake Watershed

Streams	
Stream Habitat Inventory	No source identified, not historically fish habitat
Fish Passage Barriers	None identified
Designated Critical Habitat	Yes; Longhorn Fairy Shrimp and Vernal Pool Fairy Shrimp (USFWS Critical Habitat Portal, viewed 2013)
Habitat Conservation Plans	Yes; Carrizo Plain Natural Area Plan, Stewardship Council Land Conservation Plan
Other Environmental Resources	Carrizo Plains National Monument and Ecological Reserve and Soda Lake, San Andreas Fault Zone of Eastern San Luis Obispo County (SLO County Flood Control and Water Conservation District, 2007)
Land Use	
Jurisdictions and Local Communities	County of San Luis Obispo, California Valley Community Services District, BLM (Carrizo Plains National Monument)
% Urbanized	14% (Residential Suburban) (SLO County LUC)
% Agricultural	80% (SLO County LUC)
% Other	9% (5% Rural; 1% Open Space; 0.1% Recreational, commercial retail or public facility; 3% Industrial solar farms) (SLO County LUC)
Planning Areas	Carrizo Plain, Los Padres National Forest
Potential growth areas	California Valley
Facilities Present	Goodwin Education Center within the Carrizo Plain National Monument, Soda Lake, Chimineas Ranch, Carrizo Plain Ecological Reserve, California Valley Solar Ranch, Topaz Solar Farms, Elementary School, microwave station operated by the U.S. Navy, oil well operations
Commercial Uses	California Valley Solar Ranch (includes the remediation of Farm Camp Quarry/California Gypsum), Topaz Solar Farms, oil well drilling, cattle ranching, dry land farming, retail stores
Other Notable Land Use characteristics	As part of conditions for approval of California Valley Solar Ranch and Topaz Solar Farm, the county required the development of a program to retire lots within California Valley sub-division. For TSF, the county required habitat to be preserved through the use of permanent open space easements within the Carrizo Plain (North Coast Engineering, 2008).
Demographics	
Population	464 in watershed (US Census Block, 2010)
Race and Ethnicity	Watershed: Caucasian, representing 76%. Latinos represent 18% in City. The remaining races each represent less than 4%, including African

Soda Lake Watershed

	American, American Indian, Pacific Islander, and Asian (US Census Bock, 2010).
Income	MHI $60,676 in watershed (US Census Tract, 2010)
Disadvantaged Communities	No; 7.0% of individuals are below poverty level in watershed (U.S. Census Tract, 2010).
Water Supply	
Water Management Entities	None; area residents and commercial uses served by Individual wells (Carollo, 2012)
Groundwater	Yes; Carrizo Plains and Big Spring Area (ptn) Basins (Carollo, 2012) Users of the basin include small public water system serving local school, agricultural and residential purposes, and solar farms.
Surface Water	No public reservoirs.
Imported Water	None
Recycled/ Desalinated Water	As of 2013 there is under construction a brine pond and reverse osmosis system at California Valley Solar Ranch on the north-east Carrizo to serve the solar plant's needs (North Coast Engineering, 2008).
Key groundwater percolation area(s)	None Identified - Recharge to the basin is largely by percolation of stream flow and infiltration of rainfall to the valley floor (Ca. Dept. of Water Resources, 2003).
Water Budget	Yes; Aspen Environmental Group, 2011, for Topaz Solar Project
Water Uses	
Beneficial Uses	*San Diego Creek* - Municipal & 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 Fresh Water Habitat (WARM), Significance (BIOL), Rare, Threatened, or Endangered Species (RARE), Freshwater Replenishment (FRSH) and Commercial and Sport Fishing (COMM). *Soda Lake* - Industrial Service Supply (IND), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Warm Fresh Water Habitat (WARM), Significance (BIOL), Rare, Threatened, or Endangered Species (RARE) and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
Other Unique Characteristics	
Carrizo Plain National Monument	A cooperative effort since 1985 between Bureau of Land Management, California Fish and Wildlife, and the Nature Conservancy. 250,000 acres of relatively undisturbed habitat.

Soda Lake Watershed

Soda Lake	A 13,000 acre ephemeral alkaline lake at the center of the Carrizo Plain. Provides an important habitat for migratory birds and is one of the largest undisturbed alkali wetlands in California. Without an outlet, water from the lake evaporates leaving behind residual sulfates and carbonates. Wintering area for sandhill cranes. The alkaline conditions support one of the most highly localized plant species in the world, alkaline peppergrass (*Lepidium jaredii*)
Painted Rock	The single largest individual pictograph site in the country, Painted Rock is an isolated rock formation which Yokut, Salinan, and Chumash Indians decorated with unique rock paintings (“pictographs”) and figures scratched into rocks (“petroglyphs”). These rock paintings have almost been entirely vandalized. Part of the Carrizo Plain Rock Art Discontiguous National Register District dating to circa 400 to 800 years before present.
California Valley	An undeveloped village settlement encompassing 24,083 acres located on the Carrizo Plain, about 60 miles east of San Luis Obispo. It came into being in l960, when part of the El Chicote Ranch was subdivided into more than 7,200 2.5-acre "ranchos" and sold through nationwide advertising as "the geographic center of this spectacular California growth area with unbounded future." This proposed new town has never developed and each year many of the subdivided parcels are sold at tax auctions.
San Andreas Fault Zone	One of the most seismically active faults in North America. Important from a biological and geological standpoint. The San Andres Fault in the Carrizo Plain has the largest post-early Miocene offset and is the oldest reach of the entire active fault system (Pollard et. al., 1995). Sag ponds have special ecological significance due to scarcity of water in this region. Much of the fault zone has agricultural preserve status.
Hubbard Hill Freeborn Mountain	These ridges along the westerly border of the Carrizo Plains, include 7,000 acres under Bureau of Land Management control. Diverse native species are found in the area, with no single dominant plant association
Wildflower Fields	Mid-March to mid-April is the usual time for wildflower season, but it is dependent on the weather and varies from season to season. Temperature and rainfall affect which flowers bloom. Every year is not spectacular and only a few flowers may prevail in some years. Typical species include: gold fields, valley phacelia, goldenbush shrubs, bush lupine, pale yellow astragalus, locoweed, filaree, yellow tropidocarpum, white popcorn flower, orange fiddleneck, poppies, hillside daises, sun cups and baby-blue eyes. One of the three remaining locations known to support extant populations for the California jewelflower as well as other special status plants (BLM, 2013)
Climate Change Considerations	
	Saltbrush and other native shrubs are expected to decline and marginal farmland may become less productive and retired in the Carrizo Plain area (ClimateWise, 2010).

Soda Lake Watershed

	See IRWMP, 2014 Section H, Climate Change *Information is general for County, not watershed specific*

Watershed Codes

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-area Name	SWRCB Number	CDF Super Planning	Sub-watersheds (CDF Watershed Name)
3311.000101	0	Undefined	0	Undefined	311.00	Panorama Hills	East of Simmler
3311.000102	0	Undefined	0	Undefined	311.00	Panorama Hills	San Diego Creek
3311.000104	0	Undefined	0	Undefined	311.00	Panorama Hills	North of California Valley
3311.000401	0	Undefined	0	Undefined	311.00	West of Soda Lake	Painted Rock
3311.000402	0	Undefined	0	Undefined	311.00	West of Soda Lake	Goodwin Ranch
3311.000403	0	Undefined	0	Undefined	311.00	West of Soda Lake	East of Freeborn Mtn
3311.000500	0	Undefined	0	Undefined	311.00	Soda Lake	Soda Lake / Carrizo Plain (ptn)

Major Changes in the Watershed

- 4000-8000 years before present – The Carrizo Plains were a meeting place for Salinan, Yokut, Chumash and other Indian tribes. Vaqueros Formation rock monoliths are decorated with art that is being protected today.
- 1780 – First contact by Europeans. Large herds of sheep, horse and cattle brought into the area by Spanish. Introduce non-native species to the Carrizo grasslands
- 1857 – Major earthquake that shaped much of the natural landscape of the Carrizo Plains area (Pollard et. al., 1995)
- 1876 – First homesteads established on Carrizo Plains. Dry grain farming was intensive after invention of mechanized agricultural equipment in 1912, resulting in as much as 2 feet of top soil loss in some field margins
- 1939 to Post World War II – A combination of good weather and post War expansion led to increased profitability and productivity of the areas farms and ranches.

Soda Lake Watershed

- 1964 – Creation of California Valley. Chicote Ranch, a 7,500 acre ranch just south of 58, was divided into two-and-a half acre parcels which were promoted all over the state as retirement homes.
- 2001 – Carrizo Plain National Monument created by President Clinton under the authority of the Antiquities Act of 1906.
- 2013 – Large solar farms established in the watershed

Source: Santa Margarita Historical Society, http://www.santamargaritahistoricalsociety.org/pages/carrisa_plains.html unless otherwise noted

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)
Soda Lake	Ephemeral	Ammonia	Unknown Source
Carrizo Plain	Unknown	None	n/a
Goodwin Ranch	Unknown	None	n/a
Painted Rock	Unknown	None	n/a
San Diego Creek	Unknown	None	n/a

Watershed Health by Major Groundwater Basin

Soda Lake Watershed

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints (Master Water Report)	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Carrizo Plain	8000-11,000 AF (Carollo, 2012)	Physical limitations and water quality issues (Carollo, 2012).	Yes; see description below.	Exceeds usable mineral quality for total dissolved solids, chloride, sulfate, boron, sodium, and nitrogen (SLO County Flood Control and Water Conservation District, 2007).
Big Spring Area (ptn)	No data available (Carollo, 2012)	Constraints on water availability in this basin are primarily based on physical limitations. (Carollo, 2012)	No data available	No data available

Groundwater Quality Description: Analyses of groundwater from 79 wells in this basin during 1957 through 1985 show Total Dissolved Solids (TDS) content ranging from 161 to 94,750 ppm. A highly mineralized groundwater zone is found in the lower part of the alluvium and the upper part of the Paso Robles Formation where they underlie Soda Lake. Water in a deeper zone Paso Robles Formation is of higher quality and confined in the vicinity of Soda Lake. Groundwater in the Morales Formation is likely to be brackish. There are areas with locally high nitrate and salinity concentrations based on well water sampling (Carollo, 2012).

Primary Issues

Issue	*Potential Causes*	*Referenced from*
Groundwater quality		Carollo, 2012
Groundwater Quantity	Physical Limitations	Carollo, 2012
Outdated Studies of the GW basins		Carollo, 2012
Soda Lake 303(d) listed for ammonia		Carollo, 2012

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Soda Lake Watershed

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Significant Studies in Progress:

The compliance reporting required of the developing solar ranches has generated many studies informing water quality, listed species, and restoration schema and groundwater quantity.

Upper San Juan Creek Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estrella 17	Rafael/ Big Spring WPA 11, Salinas/ Estrella WPA 14	164,198 acres	Estrella River – to Salinas River and Pacific Ocean (Monterey Bay National Marine Sanctuary)	Paso Robles, Big Spring Area, Rafael Valley, Cuyama Valley (ptn)	County of San Luis Obispo, Los Padres National Forest

Description:

The Upper San Juan Creek Watershed is located in the eastern portion of the County directly adjacent to the Carrizo Plain. The headwaters are located in the La Panza range with the highest point at approximately 3900-feet. The confluence of San Juan Creek with the Estrella River occurs north of Creston. San Juan Creek, a permanent stream, affords recreational possibilities. The mountain slopes are excellent for hiking and riding. Wildlife is abundant, and geology and natural vegetation are of special interest. A spectacular view of the Carrizo Plain is provided from these mountains. The San Juan Creek Valley is generally used most intensively 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

Upper San Juan Creek Watershed

Characteristics

Physical Setting	
Rainfall	Average Annual: 8-23 in. (NRCS shapefile, 2010)
Air Temperature	Summer Range (August 1990-2012): 52°-95°F Winter Range (December 1990-2012): 29°-60°F (La Panza, NOAA National Climatic Data Center, viewed 2013)
Geology Description	French Camp, Carnaza Creek and La Panza Ranch are composed of flat highly infiltrative Quaternary material – Category #3. Windmill Creek, Placer Creek, Willow Canyon, Beartrap Creek, Hay Canyon, Piletas canyon and Anderson Canyon have steep pre-Quaternary non-infiltrative headwaters with steep moderately infiltrative early to mid-Tertiary valleys – Category #5. Carissa Ranch and Wild Hog Creek sub-watersheds have moderate steep moderately infiltrative early to mid-Tertiary headwaters and are flat highly infiltrative Quaternary inland – Category #7. La Panza Canyon, Tajea Flat and Turkey Camp Well are composed of steep moderately infiltrative early to mid-Tertiary materials – Category #8. Barett Creek has steep moderately infiltrative early to mid-Tertiary headwaters with a flat pre-Quaternary moderately infiltrative valley – Category #11. McGinnis Creek has steep pre-Quaternary non-infiltrative headwaters with a flat highly infiltrative Quaternary valley – Category #12. Cedar Canyon, Rogers Creek and Rafael Creek have moderately infiltrative early to mid-Tertiary headwaters with flat Quaternary highly infiltrative valleys – Category #14 (Bell, pers. comm., 2013). 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

Upper San Juan Creek Watershed

		Holocene alluvium is mostly unconfined. 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) (Carollo, 2012).
	Hydrology	
	Stream Gage	None (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 *Data general for Paso Robles Subbasin,, not watershed specific*
	Peak Flow	No data available (USGS, viewed August 2013)
	Base Flow	No data available (USGS, viewed August 2013)
	Flood Reports	No source identified
	Flood Control Structures	No data available
	Areas of Heightened Flood Risk	No data available
	Biological Setting	
	Vegetation Cover	Primarily non-native grassland; mixed chaparral consisting mainly of buckbrush and chamise; blue oak woodland with chamise-redshank chaparral consisting mainly of chamise chaparral; juniper consisting mainly of semi-desert chaparral; coastal scrub consisting mainly of diablan sage scrub; 3 blue oak-foothill pine consisting mainly of foothill pine. (SLO County vegetation shapefile, 1990) *Data limited by age of shapefile*
	Invasive Species	No data available
	Special Status Wildlife and Plants	*Key*: 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 (CNDDB, 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*

Upper San Juan Creek Watershed

Species	Status	BRANCH MTN	CALIFORNIA VALLEY	CAMATTA RANCH	CHIMINEAS RANCH	HOLLAND CANYON	LA PANZA	LA PANZA NE	LA PANZA RANCH	LOS MACHOS HILLS	PACKWOOD CREEK	POZO SUMMIT	SIMMLER
Animals													
American badger	SSC				x	x		x	x		x		
blunt-nosed leopard lizard	FE; SE; FP	x			x								
burrowing owl	SSC (Burrow sites, some wintering sites)				x								
California condor	FE; SE						x						
giant kangaroo rat	FE; SE					x			x		x		
long-eared owl	SSC				x								
longhorn fairy shrimp	FE	x	x		x								x
Nelson's antelope squirrel	ST		x		x								x
pallid bat	SSC		x				x						
prairie falcon	SA-Nesting	x	x	x		x	x	x	x	x	x	x	
San Joaquin kit fox	FE; ST				x			x	x				
San Joaquin whipsnake	SSC				x								
silvery legless lizard	SSC	x											
Tulare grasshopper mouse	SSC						x						
western pond turtle	SSC	x			x								
western spadefoot	SSC				x								
Plants													
California jewel-flower	FE; SE						x		x				
Camatta Canyon amole	FT; SR			x									
chaparral ragwort	CRPR 2B.2			x									
diamond-petaled California poppy	CRPR 1B.1						x		x				
dwarf calycadenia	CRPR 1B.1			x			x		x				
Indian Valley spineflower	CRPR 1B.2							x	x				
Kern mallow	FE				x				x				
La Panza mariposa-lily	CRPR 1B.3	x			x		x					x	
Lemmon's jewel-flower	CRPR 1B.2						x	x	x			x	
Munz's tidy-tips	CRPR 1B.2							x					

Upper San Juan Creek Watershed

Species	Status	BRANCH MTN	CALIFORNIA VALLEY	CAMATTA RANCH	CHIMINEAS RANCH	HOLLAND CANYON	LA PANZA	LA PANZA NE	LA PANZA RANCH	LOS MACHOS HILLS	PACKWOOD CREEK	POZO SUMMIT	SIMMLER
oval-leaved snapdragon	CRPR 4.2				x								
pale-yellow layia	CRPR 1B.1						x						
Palmer's mariposa-lily	CRPR 1B.2											x	
Parish's checkerbloom	SR						x						
round-leaved filaree	CRPR 1B.1				x				x				
Santa Margarita manzanita	CRPR 1B.2						x					x	
showy golden madia	CRPR 1B.1				x								
straight-awned spineflower	CRPR 1B.3	x											
umbrella larkspur	CRPR 1B.3	x											

Steelhead Streams	No (Not listed in Holland Canyon or Camatta Canyon Quads in CNDDB Database viewed 2013)
Stream Habitat Inventory	No source identified
Fish Passage Barriers	None listed in PAD Database
Designated Critical Habitat	Yes; California Condor, Purple Amole (USFWS Critical Habitat Mapper, viewed 2013)
Habitat Conservation Plans	Yes; North San Luis Obispo County Habitat Conservation Program – multiple species, initially San Joaquin kit fox *HCP is general for North County, not watershed specific*
Other Environmental Resources	None listed (SLO County Flood Control and Water Conservation District, 2007)
Land Use	
Jurisdictions & Local Communities	County of San Luis Obispo
% Urbanized	0.7% Public Facility and Residential Suburban
% Agricultural	74.9%
% Other	22% Open Space; 2.4% Rural Land
Planning Areas	Shandon-Carrizo Planning Area
Potential growth areas	None listed

Upper San Juan Creek Watershed

Facilities Present	No data available
Commercial Uses	Agriculture
Demographics	
Population	38 in watershed (US Census, 2010)
Race and Ethnicity	Watershed: 86.8% Caucasian, 5.3% Latino, 5.3% Two Plus Races, 2.6% American Indian
Income	MHI $62,773 in watershed (US Census, 2011, based on interpolation of two census tracts covering multiple watersheds)
Disadvantaged Communities	No; 6.0% of individuals are below poverty level in watershed
Water Supply	
Water Management Entities	Uses served by individual wells
Groundwater	Yes; Paso Robles, Big Spring Area, Rafael Valley, and Cuyama Valley (ptn) Basins
Surface Water	No public reservoirs.
Imported Water	None
Recycled/Desalinated Water	None
Key infiltration zone	No comprehensive study has been completed to date however the Shell Creek/Camatta Creek and Lower San Juan Creek Recharge Areas were identified by the SLO County Flood Control and Water Conservation District in 2008. Natural recharge in the basin is derived from infiltration of precipitation, seepage from streams, and return flow from irrigation and other uses (SLO County Flood Control and Water Conservation District, 2008*)*
Water budget performed?	Yes; Todd Engineers, 2013, for Paso Robles Groundwater Subbasin Management Plan Update *Data is general for Paso Robles Subbasin, not watershed specific*
Water Uses	
Beneficial Uses	*San Juan Creek* - 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), Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
Other Unique Characteristics	

Upper San Juan Creek Watershed

Valley Sink Scrub	A unique natural community known as valley sink scrub exists in the watershed. Characterized by low, open succulent shrublands dominated by alkali tolerant plant species such as frankenia (*Frankenia salina*), spear oracle (*Atriplex patula*), wedge scale (*Atriplex truncata*), alkali weed (*Cressa truxillensis*) and saltgrass (*Districhlis spicata*). Valley scrub soils are typically dark, sticky clay soils that often have a brilliant white salty crust over them. Grazing has altered much of this community where non-native grasses now dominate much of the valley floor.
Climate Change Considerations	
	See IRWMP, 2014 Section H, Climate Change *Data is general for County, not watershed specific*

Upper San Juan Creek Watershed

Watershed Codes

Calwater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Area
3317.000101	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Carrisa Ranch
3317.000102	0	Undefined	0	Undefined	317.00		Barrett Creek
3317.000103	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Tajea Flat
3317.000104	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Wild Hog Creek
3317.000105	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Rafael Creek
3317.000106	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Rogers Creek
3317.000107	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Anderson Canyon
3317.000108	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Piletas Canyon
3317.000109	0	Undefined	0	Undefined	317.00	Headwaters San Juan Creek	Turkey Camp Well
3317.000201	0	Undefined	0	Undefined	317.00	Sixteen Spring	Beartrap Creek
3317.000202	0	Undefined	0	Undefined	317.00	Sixteen Spring	Hay Canyon
3317.000203	0	Undefined	0	Undefined	317.00	Sixteen Spring	Willow Canyon
3317.000204	0	Undefined	0	Undefined	317.00	Sixteen Spring	Placer Creek
3317.000205	0	Undefined	0	Undefined	317.00	Sixteen Spring	La Panza Canyon
3317.000206	0	Undefined	0	Undefined	317.00	Sixteen Spring	La Panza Ranch
3317.000207	0	Undefined	0	Undefined	317.00	Sixteen Spring	Carnaza Creek
3317.000208	0	Undefined	0	Undefined	317.00	Sixteen Spring	Cedar Canyon
3317.000301	0	Undefined	0	Undefined	317.00	Navajo Creek	Windmill Creek

3317.000302	0	Undefined	0	Undefined	317.00	Navajo Creek	French Camp
3317.000303	0	Undefined	0	Undefined	317.00	Navajo Creek	McGinnis Creek
3317.000401	0	Undefined		Undefined	317.00	San Juan Valley	Bellyache Spring
3317.000410		Undefined		Undefined	317.00	San Juan Valley	Sandy Canyon
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

The San Juan is the southern branch of the Estrella River, albeit the summer season finds only occasional pools in its broad, sandy channel. The rains convert this into a veritable river, fifty to 100 yards wide, running through small valleys and hills softly rounded, clothed in a luxuriant growth of alfilaria?, wild oats, bunch-grass and flowering shrubs (Storke, 1891).

This section is a paradise to the stockman, being devoted almost entirely to pasturage. Nevertheless, its resources would suffice for varied industries. There is here much oak timber, the soil is very fertile, there are mineral springs, ore-bearing rocks, and diverse elements to support a large population. This valley may be considered as including the following tracts: That section between the San Jose Range and the Carriso Plain; the ranches Las Chimeneas and Avenales in the southern part; La Panza and the mining district in the central part; and La Cometa or Comate, California, and San Juan Capistrano in the north (Storke, 1891).

Among the old settlers were: John Gilkey, on the Comate, murdered in 1858; Baratie and Borel, on the San Juan Capistrano, murdered in 1858; Philip Biddle, Robert G. Flint, .fames Mitchell, Joseph Zumwalt, D. W. James and John D. Thompson, all of whom located there twenty to thirty-five years since (Storke, 1891).

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Anderson Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Barett Creek	Undetermined	Not assessed	Undetermined	Not assessed
Beartrap Creek	Undetermined	Not assessed	Undetermined	Not assessed
Camaza Creek	Undetermined	Not assessed	Undetermined	Not assessed
Carissa Ranch	Undetermined	Not assessed	Undetermined	Not assessed

Upper San Juan Creek Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Cedar Canyon	Undetermined	Not assessed	Undetermined	Not assessed
French Camp	Undetermined	Not assessed	Undetermined	Not assessed
Hay Canyon	Undetermined	Not assessed	Undetermined	Not assessed
La Panza Canyon	Undetermined	Not assessed	Undetermined	Not assessed
La Panza Ranch	Undetermined	Not assessed	Undetermined	Not assessed
McGinnis Creek	Undetermined	Not assessed	Undetermined	Not assessed
Piletas Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Placer Creek	Undetermined	Not assessed	Undetermined	Not assessed
Rafael Creek	Undetermined	Not assessed	Undetermined	Not assessed
Rogers Creek	Undetermined	Not assessed	Undetermined	Not assessed
Tajea Flat	Undetermined	Not assessed	Undetermined	Not assessed
Turkey Camp Well	Undetermined	Not assessed	Undetermined	Not assessed
Wild Hog Creek	Undetermined	Not assessed	Undetermined	Not assessed

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 RCS, 2011).	Physical limitations, water rights and water quality issues (Carollo, 2012).	Yes; see description below.	None (CCRWQCB, 2011
Big Spring Area	None (Carollo, 2012)	None (Carollo, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011
Rafael Valley	None (Carollo, 2012)	None (Carollo, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011
Cuyama Valley (ptn)	None (Carollo, 2012)	None (Carollo, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011

Upper San Juan Creek Watershed

Groundwater Quality Description: The predominant cations are calcium and sodium and the predominant anion is bicarbonate (DWR 1981; Fugro West, 2001b). Analysis of 48 public supply wells in the subbasin show an average Total Dissoved 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 drinking water standards. The maximum contaminant level (MCL) for nitrate was exceeded in 4 samples (Fugro West, 2001b). Water quality trends indicate an increasing concentration of TDS and chloride in the deep, historically artesian aquifer northeast of Creston (Carollo, 2012).

Another major problem is the unpredictable occurrence of hydrogen sulfide in the ground water (DWR, 1981)

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

Groundwater: Paso Robles Groundwater Basin

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).

Upper San Juan Creek Watershed

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:

Lower San Juan Creek Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estrella 17	Rafael/ Big Spring WPA 11, Salinas/ Estrella WPA 14	114,329 acres	Salinas River via Estrella River – to Pacific Ocean (Monterey Bay National Marine Sanctuary)	Paso Robles	County of San Luis Obispo Shandon (ptn) Los Padres National Forest

Description:

The Lower San Juan Creek watershed is located in the eastern portion of the county to the north-west of the Carrizo Plains. The headwaters are located in the La Panza range with the highest point at approximately 3600-feet. The confluence of San Juan Creek with the Estrella River occurs at Shandon. The dominant land use is agriculture. The San Juan Creek 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. 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.

Existing Watershed Plans:

No existing plans to date

Lower San Juan Creek Watershed

Characteristics

	Physical Setting	
	Rainfall	Average Annual: 9-13 in. (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1990-2012): 58°-100°F Winter Range (December 1990-2012): 36°-56°F (Parkfield (*not a part of the watershed*), NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Tucker Canyon, Gillis Canyon, Hughes Canyon, McDonald Canyon, Camata Canyon, Tin Pan Canyon, and Lower Shell Creek have steep pre-Quaternary non-infiltrative headwaters with steep moderately infiltrative early to mid-Tertiary valleys – Category #3. Upper Shell Creek, Fernandez Creek and Camatta Creek are flat highly infiltrative Quaternary materials – Category #5 (Bell, pers. comm., 2013). Groundwater is found in Holocene age alluvium and the Pleistocene age Paso Robles Formation. Specific yield values in the Paso Robles Subbasin 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 subbasin 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. The Pleistocene age Paso Robles Formation, which is the most important source of groundwater in the subbasin, 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) (Carollo, 2012).
	Hydrology	
	Stream Gage	None (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	No data available (USGS, viewed August 2013)

Lower San Juan Creek Watershed

	Base Flow	No data available (USGS, viewed August 2013)
	Flood Reports	No source identified
	Flood Control Structures	No data available
	Areas of Heightened Flood Risk	Poor drainage in Shandon (source); San Juan and Camatta creek listed as flood hazard areas (Shandon-Carrizo Inland Area Plan, County of San Luis Obispo, 2012)
	Biological Setting	
	Vegetation Cover	Primarily non-native annual grassland with mixed chaparral consisting mainly of California buckwheat and chamise; cropland, orchards and vineyards; chamise-redshank chaparral consisting mainly of chamise; blue oak and foothill pine; blue oak woodland; and valley foothill riparian consisting mainly of willow and saltbush. (SLO County vegetation shapefile, 1990) *Data limited by age of shapefile*
	Invasive Species	No data available
	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 (CNDDB, 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**	**HOLLAND CANYON**	**LA PANZA RANCH**	**ORCHARD PEAK**	**POZO SUMMIT**	**SHANDON**	**SHEDD CANYON**	**WILSON CORNER**
Animals											
American badger	SSC	x	x		x	x					x
bank swallow	ST			x					x		
blunt-nosed leopard lizard	FE; SE; FP	x			x						
burrowing owl	SSC (Burrow sites, some wintering sites)				x						

Lower San Juan Creek Watershed

Species	Status	CAMATTA CANYON	CAMATTA RANCH	CHOLAME	HOLLAND CANYON	LA PANZA RANCH	ORCHARD PEAK	POZO SUMMIT	SHANDON	SHEDD CANYON	WILSON CORNER
giant kangaroo rat	FE; SE	x			x						
prairie falcon	SA (Nesting)	x	x	x	x	x	x	x	x	x	
San Joaquin kit fox	FE; ST	x	x		x						
San Joaquin pocket mouse	SA	x									
Swainson's hawk	ST								x	x	
Tulare grasshopper mouse	SSC	x		x					x		
western spadefoot	SSC		x								
Plants											
Camatta Canyon amole	FT; SR		x								
chaparral ragwort	CRPR 2B.2		x								
dwarf calycadenia	CRPR 1B.1		x								
Indian Valley spineflower	CRPR 1B.2		x								
Kern mallow	FE		x								
La Panza mariposa-lily	CRPR 1B.3		x								
Lemmon's jewel-flower	CRPR 1B.2		x								
Mason's neststraw	CRPR 1B.1	x	x								
Munz's tidy-tips	CRPR 1B.2		x								
oval-leaved snapdragon	CRPR 4.2						x				
round-leaved filaree	CRPR 1B.1		x								
showy golden madia	CRPR 1B.1		x								
stinkbells	CRPR 4.2		x								
straight-awned spineflower	CRPR 1B.3		X								

Steelhead Streams	None (Not listed in Holland Canyon or Camatta Canyon Quads in CNDDB Database viewed 2013)
Stream Habitat Inventory	No source identified
Fish Passage Barriers	None listed in PAD Database
Designated Critical Habitat	Yes; Purple Amole (USFWS Critical Habitat Mapper, viewed 2013)
Habitat Conservation Plans	Yes; Shandon Community Plan Habitat Conservation Plan

Lower San Juan Creek Watershed

	Other Environmental Resources	San Juan River, Paso Robles Groundwater Basin, San Andreas Fault Zone of Eastern San Luis Obispo County (SLO County Flood Control and Water Conservation District, 2007)
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo, Community of Shandon
	% Urbanized	Less than 1%
	% Agricultural	90.4% (vineyard, alfalfa, dry farming)
	% Other	8.3% Open Space; 1.2% Rural Land
	Planning Area	Shandon-Carrizo Planning Area
	Potential growth areas	Shandon
	Facilities Present	Los Padres National Forest
	Commercial Uses	Agriculture
	Demographics	
	Population	488 in watershed (US Census Block, 2010) Approximately 305 in Shandon (US Census, 2010)
	Race and Ethnicity	Watershed: 49.2% Latino; 47.3% Caucasian; 1.4% Mixed Race; Less than 1% African American, Asian, American Indian (US Census Block, 2010) 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)
	Income	MHI $66,966 in watershed (US Census Tract, 2011) (from tract covering 6 watersheds) MHI $65,260 in Shandon (2007-2011 American Community Survey 5-Year Estimates)
	Disadvantaged Communities	No; 4% of individuals are below poverty level in watershed (US Census Tract, 2010) (from tract covering 6 watersheds) 19.1% of individuals are below poverty level in Shandon (2007-2011 American Community Survey 5-Year Estimates)
	Water Supply	
	Water Management Entities	County Service Area (CSA) No. l6 (Shandon); outlying properties served by individual wells - Depths of wells ranged from 100 to 665 feet (Carollo, 2012)
	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

Lower San Juan Creek Watershed

		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)
	Recycled/Desalinated Water	None
	Key infiltration zone	No comprehensive studies have been completed to date however the Shell Creek/Camatta Creek and Lower San Juan Creek Recharge Areas in the Paso Robles Groundwater Subbasin Water Banking Feasibility Study, 2008. Natural recharge in the basin is derived from infiltration of precipitation, seepage from streams, and return flow from irrigation and other uses (SLO County Flood Control and Water Conservation District, 2008)
	Water budget	Yes; Todd Engineers, 2013 for Paso Robles Groundwater Subbasin Management Plan Update. *Water budget information limited by lack of data for the region*
	Water Uses	
	Beneficial Uses	*San Juan Creek* - 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), Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
	Other Unique Characteristics	
	San Andreas Fault Zone	Identified as Special Studies Zone by the State Geologist and is one of the most seismically active faults in North America. Because of the scarcity of wetlands in this arid part of the county, sag ponds along the fault have ecological significance
	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 for the San Joaquin kit fox, Western burrowing owl and other wildlife species, and serve as important corridors for wildlife movement. Another important wildlife movement corridor is located near the base of the hillside near the eastern edge of Shandon.
	Hubbard Hill-Freeborn Mountain	Designated in Open Space land use category to emphasize protection of the area n its natural state, and use for passive recreation activities only. San Juan Creek has recreational possibilities. Mountain slopes excellent for hiking and riding with a spectacular view of Carrizo Plain.
	San Juan Ranch	44,000 acres with livestock production dating back to era of Mexican land grants. Antonio Herrera began grazing sheep in the area in 1843. In 1874, Canadian Robert Flint purchased headquarters of San Juan Ranch as well as acreage extending up

Lower San Juan Creek Watershed

		San Juan Creek.
	Palo Prieto	Located at an important crossroads for San Joaquin kit fox movement between the Carrizo Plain population, the Cirvo-Panoche population and the Salinas River Valley. Properties contain a natural lake (sag pond), Grant Lake, and numerous small vernal and seasonal ponds and pools. Wetlands support rare amphibians, crustaceans and flora. Sag ponds historically habitat for California tiger salamander, Western spadefoot toad and California toad.
	Climate Change Considerations	
		See IRWMP, 2014 Section H, Climate Change *Data is general for County, not watershed specific*

Watershed Codes

Calwater/DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3317.000402	0	Undefined	0	Undefined	317.00	San Juan Valley	San Juan Ranch
3317.000403	0	Undefined	0	Undefined	317.00	San Juan Valley	Wilinson Canyon
3317.000404	0	Undefined	0	Undefined	317.00	San Juan Valley	Upper Long Canyon
3317.000405	0	Undefined	0	Undefined	317.00	San Juan Valley	Lower Long Canyon
3317.000406	0	Undefined	0	Undefined	317.00	San Juan Valley	Holland Canyon
3317.000407	0	Undefined	0	Undefined	317.00	San Juan Valley	Tin Pan Canyon
3317.000408	0	Undefined	0	Undefined	317.00	San Juan Valley	Hughes Canyon
3317.000409	0	Undefined	0	Undefined	317.00	San Juan Valley	West of Red Hills
3317.000501	0	Undefined	0	Undefined	317.00	Shandon	Tucker Canyon
3317.000502	0	Undefined	0	Undefined	317.00	Shandon	Gillis Canyon
3317.000509	0	Undefined	0	Undefined	317.00	Shandon	McDonald Canyon
3317.001001	0	Undefined	0	Undefined	317.00	Shell Creek	Camata Canyon

Lower San Juan Creek Watershed

3317.001002	0	Undefined	0	Undefined	317.00	Shell Creek	Lower Shell Creek
3317.001003	0	Undefined	0	Undefined	317.00	Shell Creek	Camatta Creek
3317.001004	0	Undefined	0	Undefined	317.00	Shell Creek	Fernandez Creek
3317.001005	0	Undefined	0	Undefined	317.00	Shell Creek	Upper Shell Creek
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

The San Juan is the southern branch of the Estrella River, albeit the summer season finds only occasional pools in its broad, sandy channel. The rains convert this into a veritable river, fifty to 100 yards wide, running through small valleys and hills softly rounded, clothed in a luxuriant growth of alfilaria?, wild oats, bunch-grass and flowering shrubs (Storke, 1891).

1890s - Original settlement of Shandon. Planning for original townsite done by West Coast Land Company.

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Camata Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Camatta Creek	Undetermined	Not assessed	Undetermined	Not assessed
Fernandez Creek	Undetermined	Not assessed	Undetermined	Not assessed
Gillis Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Holland Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Hughes Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Lower Long Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Lower Shell Creek	Undetermined	Not assessed	Undetermined	Not assessed
McDonald Canyon	Undetermined	Not assessed	Undetermined	Not assessed
San Juan Ranch	Undetermined	Not assessed	Undetermined	Not assessed
Tin Pan Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Tucker Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Upper Long Canyon	Undetermined	Not assessed	Undetermined	Not assessed

Lower San Juan Creek Watershed

Upper Shell Creek	Undetermined	Not assessed	Undetermined	Not assessed
Wilkinson Canyon	Undetermined	Not assessed	Undetermined	Not assessed

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 RCS, 2011)	Physical limitations, water rights and water quality issues (Master Water Report).	Yes; see description below.	No for basin. No information for subbasin.

Groundwater Quality Description: The predominant cations are calcium and sodium and the predominant anion is bicarbonate (DWR 1981; Fugro West, 2001b). Analysis of 48 public supply wells in the subbasin show an average Total Dissoved 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 drinking water standards. The maximum contaminant level (MCL) for nitrate was exceeded in 4 samples (Fugro West, 2001b). Water quality trends indicate an increasing concentration of TDS and chloride in the deep, historically artesian aquifer northeast of Creston (Carollo, 2012).

Another major problem is the unpredictable occurrence of hydrogen sulfide in the ground water (DWR, 1981)

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

Lower San Juan Creek Watershed

Groundwater: Paso Robles Groundwater Basin

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:

Upper Salinas – Santa Margarita Area Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Salinas 9	Santa Margarita WPA 12, Atascadero/ Templeton WPA 13	82,156 acres	Salinas River to Pacific Ocean (Monterey Bay National Marine Sanctuary)	Paso Robles; Atascadero sub-Basin; Rinconada Valley	County of San Luis Obispo, City of Atascadero, Town of Santa Margarita, Los Padres National Forest

Description:

The Upper Salinas- Santa Margarita Area Watershed is located in northern San Luis Obispo County and includes a portion of the Salinas River and adjacent tributaries. The drainage rises to a maximum elevation of approximately 2,800 feet above mean sea level with steep topography categorizing much of the western portion of the watershed. The watershed contains two major drainages; Atascadero Creek and Parole Canyon. The watershed contains a mix of urban and rural residential land uses as well as agricultural land uses. A portion of the Los Padres National Forest is also contained within the watershed along the western boundary. The City of Atascadero is located at the northern end of the watershed boundary and the community of Santa Margarita is located within the central and southern portions of the watershed. Other land uses include two quarries, Atascadero Lake, and a wastewater treatment plant. Water supply for the watershed area is dominated by wells, including those used by the Atascadero Mutual Water Company to supply urban residents and commercial uses.

Existing Watershed Plans:

Salinas River Watershed Action Plan

Upper Salinas – Santa Margarita Area Watershed

Characteristics:

	Physical Setting	
	Rainfall	Average annual: 21-37 inches (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1990- 2012): 52°-92°F Winter Range (December 1990-2012): 32°-61°F (Paso Robles (*not in watershed*), NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Rincon Creek is composed of flat highly infiltrative Quaternary material. Santa Margarita Creek and Hale Creek sub-watersheds have steep pre-Quaternary non-infiltrative headwaters with steep moderately infiltrative early to mid-Tertiary valleys. Trout Creek has steep pre-Quaternary non-infiltrative headwaters with flat highly infiltrative Quaternary valleys. Calf Canyon, Moreno Creek and Pilitas Creek have steep pre-Quaternary non-infiltrative headwaters. Paloma Creek sub-watershed has moderately infiltrative early to mid-Tertiary headwaters with flat Quaternary highly infiltrative valleys (Bell, pers. comm., 2013). Water Bearing Formations. The principal water-bearing unit is Quaternary age alluvium (Carollo, 2012) The Middle Salinas-Atascadero Watershed is more complex than northern San Luis Obispo Counties other watersheds because it is dissected by the Rinconada Fault. Atascadero draws water from a sub-basin, a pocket located on the western edge of the main basin (just 3 percent of the basin) that is smaller, narrower and replenishes water far more easily with rainfall. The Rinconada Fault separates the two. The local public water utility doesn't need a treatment plant because the natural geology along the Salinas River in Atascadero allows it to treat the water by filtering it through a sandy layer adjacent to the Salinas River (Tribune, 2013). The Santa Margarita Formation in this watershed is present as Miocene aged, nearly white, coarse, arkosic sandstones which are interbedded with small amounts of mudstone, siltstone, diatomite, and conglomerate. The sandstones are commonly massively cross-bedded, indicative of a high energy, shallow marine bottom depositional environment. Minerals indicate a granitic origin for the sands, while the pebbles in the conglomerates appear to have been reworked from older conglomerates. Some beds are tuffaceous, and some diatomaceous beds altered to chert by redeposition of silica. Significant in environmental interpretation of the formation are the thick biostromes, consisting of masses of pectin, oyster shells, and broken shell debris. Such masses appear to have been storm constructed masses.

		They imply shallow water, high energy conditions, as supported by thick shells of many fossils, deposited in a structural trough between the Rinconada and Nacimiento fault zones, reaching 2,000 ft thick northeast of Santa Margarita but 200 feet west of Atascadero (Chipping, 1987). Southern Salinas Valley contains extensive outcroppings of Monterey Formation. The Hames member forms extensive outcrops between Atascadero and Santa Margarita. The Monterey Formation is dominated by thin, siliceous shales, and diatomaceous beds, which contains few, thin phosphatic beds. Sandstones are usually calcareous, well-cemented, and laced with small calcite veins. Some beds, like Graves Creek near Atascadero for example, were buried while still in a slurry-like state, and injected into overlying beds as sandstone dikes. The calcareous nature of the Monterey Formation is due to the high foraminifera content (Chipping, 1987). The Salinas Valley near Santa Margarita is bounded by the Sur-Nacimiento Fault on the east and Rinconada Fault to the west. The Sur-Nacimiento fault marks the boundary between the old oceanic crust of the Franciscan mélange to the west, and the Salinian continental crust made up of granite to the east. The Salinan granite basement extends to the San Andreas Fault to the east. The Salinan Block represents a slice of continental granitic crust sandwiched between two oceanic crustal plates of the younger Franciscan on the west, and the older Franciscan of the San Joaquin Valley to the east. The Rinconada Fault is a branch off the SAF and continues N until it goes offshore N of Monterey. It is a right lateral wrench similar to the San Andreas and forms the mountains on the westside of the Salinas Valley. The fault passes through Paso Robles and is the source of the mineral hot springs in town (Chipping, 1987).
	Hydrology	
	Stream Gage	Yes; USGS 11145500 (Salinas River near CA-58); USGS 11145000 (Salinas River at Las Pilitas Road); USGS 11144600 (Salinas River near Santa Margarita Lake) (USGS, viewed August 2013)
	Hydrology Models	Yes; Klinchuch. 2012. Groundwater model to analyze the sustainability of the Atascadero Sub-basin; Montgomery Watson, 1997, Monterey County Water Resource Agency's Salinas Valley Integrated Groundwater and Surface Water Model Update, Final Report; Todd Engineers, Oct 2013, Paso Robles Groundwater Basin Model.
	Peak Flow	16,600 cfs (USGS, viewed August 2013).
	Base Flow	7.5 cfs (USGS, viewed August 2013).

	Flood reports	None
	Flood Control Structures	Bridges: 1 over Rinconada Creek on Pozo Road; 2 over Salinas River on Las Pilitas Road; 3 over Las Pilitas Creek on Las Pilitas Road; 5 over Santa Margarita Creek on El Camino Real, Walnut Avenue, Norte Road, Linden Ave and Tassajara Creek Road; 4 over Yerba Buena Creek on H Street, J Street, I Street and Encina Avenue; 1 over Tassajara Creek on Tassajara Creek Road (PWD Bridges GIS layer)
	Areas of Heightened Flood Risk	Creeks in Atascadero overflow banks and cause local flooding • Major flooding problems in Santa Margarita are caused by inadequate culverts/ bridges, and inadequate channel capacity in Yerba Buena Creek, where water overtops the banks and floods adjacent low topographic areas. • Santa Margarita has a serious lack of sufficient drainage ditches, culverts, and storm drains. These facilities are often under maintained and filled with sediment or debris, which prevents the drainage system from properly conveying urban runoff to Yerba Buena and Santa Margarita Creeks. • Proposed Solutions (2009): Construction of a levee and major retention basins to address frequently recurring flooding problems • Proposed Improvements (2009): The local CSA 23 advisory group has been active in mobilizing community support for the projects and pursuing an easement for the levee and retention basins from the owners of adjacent Santa Margarita Ranch (SLO County Flood Control and Water Conservation District, 2009).
	Biological Setting	
	Vegetation Cover	Primarily oak woodland, consisting mainly of coast live oak, blue oak, intermittent valley oak, chamise chaparral some buckbrush chaparral, non-native annual grassland, coastal scrub, foothill pine woodland, mixed evergreen forest around Cuesta grade, and cropland. (SLO County vegetation shapefile, 1990) Riparian vegetation is present along creeks and the Salinas river, ranging from willow scrub to multi-layer mature riparian woodland with cottonwood, sycamore, black walnut, and willow. (Althouse and Meade, 2013). Forest Service Calveg data from 2002 for this watershed also describe chamise chaparral, mixed chaparral, sage scrub, and woodlands. Woodland types include blue oak woodland, coast live oak woodland, foothill woodland with mixed oak and foothill pine, mixed hardwoods, and coulter pine. Riparian woodlands with sycamore, valley oak, and mixed hardwood are also noted. Willow scrub is mapped along some drainages. This shapefile does not have complete coverage in this watershed. (Calveg R5 Zone 6, EvegTile42_97_02, 2007, based on 2002 aerials) *Data limited by age and incomplete coverage of shapefiles*

	Invasive Species	Star thistle, tocolote, spotted knapweed, Blue gum/Eucalyptus (Althouse and Meade, 2005) *Data limited to observations, not complete inventory*
	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 (CNDDB, 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*

Species	**Status**	**ATASCADERO**	**LOPEZ MTN**	**SAN LUIS OBISPO**	**SANTA MARGARITA**	**SANTA MARGARITA LAKE**	**TEMPLETON**	**WILSON CORNER**
	Animals							
American badger	SSC				x			
Atascadero June beetle	SA	x					x	
California linderiella	SA				x			
California red-legged frog	FT	x	x		x			
Coast Range newt	SSC		x	x				
ferruginous hawk	SA (Wintering)		x		x			
foothill yellow-legged frog	SSC				x			
golden eagle	FP	x						
grasshopper sparrow	SSC (Nesting)				x			
loggerhead shrike	SSC (Nesting)		x					
merlin	SA (Wintering)		x					
pallid bat	SSC	x						
prairie falcon	SA (Nesting)		x	x	x	X		x
purple martin	SSC (Nesting)	x	x					
San Luis Obispo pyrg	SA			x				
silvery legless lizard	SSC		x					
Townsend's big-eared bat	SSC				x			
western pond turtle	SSC	x	x	x	x			
western spadefoot	SSC				x			x
white-tailed kite	FP		x		x			

Species	Status	ATASCADERO	LOPEZ MTN	SAN LUIS OBISPO	SANTA MARGARITA	SANTA MARGARITA LAKE	TEMPLETON	WILSON CORNER
	Plants							
Brewer's spineflower	CRPR 1B.3	x		x				
Cambria morning-glory	CRPR 4.2		x	x				
caper-fruited tropidocarpum	CRPR 1B.1		x					
Cuesta Pass checkerbloom	SR	x		x				
Cuesta Ridge thistle	CRPR 1B.2	x		x				
dwarf soaproot	CRPR 1B.2			x				
Eastwood's larkspur	CRPR 1B.2	x					x	
Hardham's evening-primrose	CRPR 1B.2				x			
hooked popcornflower	CRPR 1B.2	x		x				
Hoover's bent grass	CRPR 1B.2		x			x		
La Panza mariposa-lily	CRPR 1B.3				x	x		
mesa horkelia	CRPR 1B.1	x		x			x	
Miles' milk-vetch	CRPR 1B.2	x			x			
most beautiful jewel-flower	CRPR 1B.2	x						
pale-yellow layia	CRPR 1B.1				x			
Palmer's monardella	CRPR 1B.2	x		x		x		
Pecho manzanita	CRPR 1B.2		x					
round-leaved filaree	CRPR 1B.1	x			x		x	
San Benito fritillary	CRPR 1B.2			x				
San Luis mariposa-lily	CRPR 1B.2	x		x				
San Luis Obispo County lupine	CRPR 1B.2		x					
San Luis Obispo owl's-clover	CRPR 1B.2		x					
San Luis Obispo sedge	CRPR 1B.2	x		x		x		
Santa Lucia manzanita	CRPR 1B.2		x	x				
Santa Margarita manzanita	CRPR 1B.2	x	x	x				
shining navarretia	CRPR 1B.2				x			
straight-awned spineflower	CRPR 1B.3	x	x		x			
yellow-flowered eriastrum	CRPR 1B.2	x			x	x	x	X

	Steelhead Streams	Yes; Atascadero (Hale) Creek (FR 50) Atascadero (Hale) Creek, Santa Margarita Creek, Tassajara Creek, Salinas River (US-LT RCD, 2002)
	Stream Habitat Inventory	Yes; DFG, 2005
	Fish Passage Barriers	PAD ID: 707003– Bedrock waterfall on Atascadero Creek. Total Barrier. 22.565639 miles upstream. PAD ID: 707244- Utility crossing on Atascadero Creek at Curbail Avenue. Temporal Barrier. 25.51314 miles upstream. PAD ID: 719388- Dam at Atascadero Park on unnamed tributary to Atascadero. Unknown Status.PAD ID: 731745- Road crossing at Highway 41 on unnamed tributary to Atascadero Creek. Unknown Status. PAD ID: 732138- Road crossing at Highway 41 on unnamed tributary to Atascadero Creek. Unknown Status. PAD ID: 707246- Culvert under Highway 101 on Santa Margarita Creek. Total Barrier. 5.52855 miles upstream.PAD ID: 712052- Road Crossing at El Camino Real Bridge on Santa Margarita Creek. Partial Barrier.69.42864 miles upstream. PAD ID: 707245- Culvert on Santa Margarita Creek. Temporal Barrier. 7.00901 miles upstream.
	Designated Critical Habitat	Yes; Atascadero (Hale) Creek for Steelhead Trout (NMFS CFR 50 226) Steelhead Trout: Tassajara (trout) creek, Santa Margarita Creek, Salinas River (US Fish and Wildlife – Critical Habitat Mapper) California Red-Legged Frog (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	Yes; North San Luis Obispo County Habitat Conservation Program – Multiple species, initially San Joaquin kit fox. *HCP general for North County, not watershed specific*
	Other Environmental Resources	Salinas River, Paso Robles Groundwater Basin, Salinas Reservoir/Santa Margarita Lake, Los Padres National Forest, Santa Lucia Wilderness, Cuesta Ridge Botanical Area, Rinconada Mine Botanical Area (SLO County Flood Control and Water Conservation District, 2007)
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo, City of Atascadero, Town of Santa Margarita
	% Urbanized	9.6% in City of Atascadero, 0.05% Commercial (majority in Santa Margarita), 5% residential (majority Santa Margarita and South Atascadero: non-city)
	% Agricultural	42% rangeland, small scale vineyard and crop production.
	% Other	12.6% open space (Los Padres national Forest), 0.04% Public Facilities, 0.2% recreation, 3% rural lands
	Planning Areas	Salinas River Planning Area

	Potential growth areas	Eagle Ranch (South Atascadero); Santa Margarita Ranch; City of Atascadero Urban Core, South Atascadero
	Facilities Present	Atascadero Wastewater Treatment Plant discharges to the Salinas River; Atascadero Lake; Los Padres National Forest, The Garden Farms Water District
	Commercial Uses	City of Atascadero – Urban Core, Santa Margarita Ranch, hobby vineyards, Livestock and Ag – east Salinas River, Kaiser Quarry, Rocky Canyon Quarry (Union Asphalt), Santa Margarita Quarry (Hansen Aggregates), various industrial facilities, agricultural service provides, residential service providers, commercial districts, restaurants, wine related tourism
	Demographics	
	Population	24,098 in watershed (U.S. Census Block, 2010). 19,333 in Atascadero (US Census Blocks, 2010) 386 in Garden Farms (US Census Blocks, 2010) 1,259 in Santa Margarita (US Census Blocks, 2010)
	Race and Ethnicity	Watershed: Caucasians representing 76%, Latinos representing 16.3%, Mixed-race individuals representing 2.4%, Asians representing 2.2%, African Americans representing 2.2% of the total population in the watershed. The remaining races include Native American, Pacific Islander, and other. Atascadero: 74% Caucasian; 18% Latino; 2.5% Mixed Race; 2.4% Asian (US Census Blocks, 2010) Garden Farms: 87.3% Caucasian; 10.4% Hispanic or Latino; 1.3% Asian (US Census, 2010) Santa Margarita: 76.5% Caucasian; 16.4% Hispanic or Latino; 3.2% Mixed Race; 2.2% Asian; 1.2% American Indian and Alaska Native (US Census, 2010)
	Income	MHI $60,676 for watershed (U.S. Census Tracts, 2010). MHI $68,502 in Atascadero (US Census, 2010) MHI $49,032 in Santa Margarita (US Census, 2010)
	Disadvantaged Communities	No; 7% of individuals are below poverty level in the watershed (U.S. Census Tracts, 2010). 8.7% of individuals are below poverty level in Atascadero (US Census, 2010) 16.7% of individuals are below poverty level in Garden Farms (2007-2011 American Community Survey 5-Year Estimates) 18.9% of individuals are below poverty level in Santa Margarita (2007-2011 American Community Survey 5-Year Estimates)
	Water Resources	
	Water Management Entities	Atascadero Mutual Water Company, County Waterworks District No. 6

		County Waterworks District No. 6: three wells located in the Paso Robles groundwater basin that provide water to residents of Santa Margarita Atascadero Mutual Water Company – Salinas River wells located in the Atascadero Sub-basin that provide water to the City of Atascadero and surrounding areas.
	Groundwater	Yes; Paso Robles; Atascadero sub-Basin; Rinconada Valley
	Surface Water	No public reservoirs. The rights to surface water flows in the Salinas River and associated pumping from the alluvium have been fully appropriated by the State Board and no future plans exist to increase these demands beyond the current allocations. (Carollo, 2012)
	Imported Water	Yes; Nacimiento Pipeline (Atascadero Mutual Water Company)
	Recycled/Desalinated Water	Yes; The City of Atascadero uses reclaimed water from the Wastewater Treatment Plant for use at Heilman Regional Park and Golf Course, as well as recharge for Paso Robles Groundwater Basin.
	Key Infiltration Areas	No comprehensive study has been completed to date. The main source of recharge in the alluvium is the Salinas River. Recharge to the Paso Robles Formation occurs from the overlying Salinas River alluvium as well as from overlying channel deposits of the Santa Margarita, Atascadero, Graves, and Paso Robles Creeks (Carollo, 2012)
	Water Budget	Yes; Todd Engineers, 2013, Paso Robles Groundwater Basin Model Update *Water budget limited by lacking well data*
	Water Uses	
	Beneficial Uses	*Atascadero Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD), Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), and/or Early Development (SPWN). *Atascadero Lake* - Municipal and Domestic Supply (MUN), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Freshwater habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Navigation (NAV), and/or Early Development (SPWN). *Salinas River (Nacimiento River-Santa Margarita Reservoir)* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Process Supply (PRO), Ground Water Recharge (GWR),

		Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE) and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
	Other Unique Characteristics	
	Historical Resources	Santa Margarita de Cortona (22515 H Street, Santa Margarita) (PLN_DES_HISTORIC_POINTS GIS layer)
	Los Padres National Monument	Ecosystems in Los Padres National Forest range from semi-desert in interior areas to redwood forest on the coast. Forest vegetation classified into two major types: chaparral and forested lands. Provides a diverse wildlife habitat with 23 threatened and endangered animals. Member of the California Condor Recovery Program, and has been an active player in the reintroduction of California condors in the wild. The Forest has one endangered plant, two threatened plant species and 71 sensitive plant species. Management of riparian vegetation focuses on supporting fish and wildlife populations. There are over 870,000 acres of livestock grazing allotments in the Forest.
	Heilman Regional Park, Santa Margarita Community Park and Chalk Mountain Golf Course	Group day-use facilities owned and managed by the County of San Luis Obispo.
	Atascadero Lake Park	Man-made lake managed by the City of Atascadero. There is a walking path that follows the edge of the lake for a stroll, jog or bike ride lakeside. The park also has a playground, paddle/kayak boats, workout stations, restroom facilities, large and small barbecue areas, horseshoe pits, sand volleyball court and the Charles Paddock Zoo.
	Stadium Park	During the 1920's, Stadium Park was a gathering place for community events, concerts, and theater. Performances were held on a big stage under an Oak tree. That stage was later moved to where the Atascadero Lake Pavilion now stands. Besides being a beautiful park, it is a natural amphitheater with gently sloping hills leading to the basin. Acoustics are ideal just as nature made them.
	Sunken Gardens	Inspired by “The Grand Basin” at the 1904 St. Louis World’s Fair, Atascadero founder E.G. Lewis envisioned a formal Sunken Garden to adorn the civic center in his new colony. Restored in 2005 as originally designed with walkways crossing the length and width of the gardens and meeting at a central fountain designed by architect Walter D. Bliss of the San Francisco firm of Bliss and Faville.
	Rinconada Mine Botanical Area	Significant as an outstanding representative foothill woodland community with a wide diversity of species. *Monardella palmeri*, a plant on the California Native Plant Society’s list of rare and

		endangered species is known to this area
	Climate Change Considerations	
		See IRWMP, 2014 Section H, Climate Change *Data is general for county, not watershed specific*

Watershed Codes

Calwater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3309.811303	8	Paso Robles	1	Atascadero	309.81	Parole Canyon	Pilitas Creek
3309.811304	8	Paso Robles	1	Atascadero	309.81	Parole Canyon	Rincon Creek
3309.811306	8	Paso Robles	1	Atascadero	309.81	Parole Canyon	Moreno Creek
3309.811401	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Santa Margarita Creek
3309.811402	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Calf Canyon
3309.811403	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Paloma Creek
3309.811404	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Hale Creek
3309.811405	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Henry
3309.811408	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Trout Creek

Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)

Major Changes in the Watershed

- Since late 1700's Salinas River Valley used for agriculture. After Spanish missionary priests established the mission at San Luis Obispo, they built Santa Margarita de Cortona Asistencia in 1817 to provide crops and livestock.

Atascadero

- First building in the area in 1812. Adobe that served as the southern grazing outpost for Mission San Miguel Portions of the adobe walls stood until late 1900's near Traffic Way.

Upper Salinas – Santa Margarita Area Watershed

- 1876 – A. F. Benton purchased the Eagle Rancho, near the headwaters of Atascadero Creek. Uses the land the raise hogs, but as many encounters with grizzly bears that make ranching difficult, but attracts big game hunters to the area (Storke, 1891).
- During 19th century cattle ran in large tracts that had been Mexican land grants. Toward the end of the century, J. H. Henry consolidated a number of tracts into the 23,770 acre Atascadero Ranch.
- During the early 20th century, U.S. Army used the central plains of the ranch for annual encampments and maneuvers and at one time considered the acquisition of the ranch for permanent military camp.
- In 1913, Edward Gardner "E. G. Lewis" selected the Atascadero Ranch as the ideal location for a model colony. Lewis purposely chose a location halfway between major urban center of the state on both a railway and state highway.
- Lewis subdivided the entire 38 square miles, built 100 miles of roads, a water system of tanks, wells and mains, nearly 3,000 acres of orchards, parks, the Sunken Gardens and public buildings.
- A twenty-mile road through the Santa Lucia Mountains connecting the Colony to the 1,000 acre Atascadero Beach properties near Morro Bay which had schools, a community center, hospital and hotel.
- Two important factors that stimulated growth in the 1950's have also significantly affected design and demographics of the community: bisection of the City in 1954 by Highway 101, and the siting of the Atascadero State Hospital on the edge of the community in 1956.
- 2006 – Severely eroded bank on south side of Atascadero Creek repaired. Rock slope protection installed along the bank and heavily vegetated with native riparian species.

Watershed Health by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Salinas River	Undetermined	Yes; Sodium and Chloride	Undetermined	Not assessed

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Atascadero Creek (Hale)	Perennial	Yes on 303d list for Chloride, E. coli, Fecal Coliform, Low Dissolved Oxygen, and Sodium. TMDL estimated	NP: Agriculture, grazing-related, natural sources, resource extraction, petroleum activities, transient encampments	**Lower**: Spring: 0.99 cfs. Summer: 0.37 cfs.

		date of completion 2021.	MP: None defined as such on 303d list	
Paloma Creek	Undetermined	Not assessed	Undetermined	Not assessed
Santa Margarita Creek	Undetermined	Not assessed	Undetermined	**Upper**: Spring: 0.81 cfs. Summer: 0.32 cfs.
Calf Canyon Creek	Undetermined	Not assessed	Undetermined	**Upper**: Spring: 0.49 cfs. Summer: 0.24 cfs.
Moreno Creek	Undetermined	Not assessed	Undetermined	Spring: 0.53 cfs. Summer: 0.24 cfs.
Trout Creek	Undetermined	Not assessed	Undetermined	**Upper**: Spring: 0.63 cfs. Summer: 0.27 cfs.
Rincon Creek	Undetermined	Not assessed	Undetermined	Not assessed
Pilitas Creek	Undetermined	Not assessed	Undetermined	Spring: 0.65 cfs. Summer: 0.28 cfs.

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 RCS, 2011)	Physical limitations, water rights and water quality issues (Master Water Report).	Yes; see description below.	None (CCRWQCB, 2011)
Atascadero	None (Carollo, 2012)	Water rights and physical limitations (SLO County WMP, 2012)	The 2008 Water Quality Report for both Templeton CSD and Atascadero MWC found that none of the tested regulated and secondary substances in water samples exceeded their MCL values (Carollo, 2012)	None (CCRWQCB, 2011)

Rinconada	None (Carollo, 2012)	Physical Limitations (SLO County WMP, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011)

Groundwater Quality Description:

Paso Robles Groundwater Basin: Based on Todd monitoring report (2007), the Basin was not at the safe yield although some areas were experiencing significant declines in groundwater elevations. A later study completed in 2009 suggests groundwater pumping was approaching the safe yield of the Basin, which led to the recommendation to do a groundwater management plan. The Resource Capacity Study prepared by the San Luis Obispo County Planning Department in November 2010 states that the Basin is near or at perennial yield, and contains land use and water use monitoring and conservation recommendations within the authority of the County and District to help ensure the sustainability of the Basin into the future (Paso Robles Groundwater Basin – Groundwater Advisory Committee, 2011).

The predominant cations 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 Dissoved 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 drinking water standards. The maximum contaminant level (MCL) for nitrate was exceeded in 4 samples (Fugro West, 2001b). Water quality trends indicate an increasing concentration of TDS and chloride in the deep, historically artesian aquifer northeast of Creston (Carollo, 2012).

Salinas River recharge typically contains calcium and magnesium bicarbonate. Santa Margarita Creek water contains magnesium-calcium-bicarbonate. Atascadero and Paso Robles Creeks have calcium bicarbonate rich waters. Increasing Total Dissolved Solids and chlorine, physical limitations (Carollo, 2012).

Atascadero sub-basin: In terms of physical limitations, Todd (2009) estimated the gross groundwater pumping in the sub-basin during 2006 to be 15,545 AF, which is 95 percent of the sub-basin perennial yield of 16,400 AFY. Ongoing studies may revise the estimated outflow from the sub-basin. According to Fugro (2010), whereas total groundwater in storage in the main part of the Paso Robles Groundwater Basin is predominantly in the Paso Robles Formation, the Salinas River alluvium in the Atascadero Groundwater Sub-basin accounts for a significant percentage of the total groundwater storage in the sub-basin. Pumping from the alluvium should be accounted for separately from pumping from the Paso Robles Formation.

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”)	Carollo, 2012

	users	
Groundwater Quality	High concentrations of TDS, chlorides, sulfates, and boron	Carollo, 2012
Limited Groundwater Basin information (Rinconada basin)		Carollo, 2012
Atascadero (Hale) Creek 303(d) listed for chloride, Escherichia coli (E. coli), fecal coliform, low dissolved oxygen, sodium	Agriculture, grazing related and natural sources, resource extraction petroleum activities, transient encampments	Carollo, 2012
Steelhead passage	Several tributaries and the Salinas are designated critical habitat which must be considered in planning water use.	*50 CFR 226 - National Marine Fisheries Service - NOAA*

Groundwater: Paso Robles Groundwater Basin

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:

Mid Salinas – Atascadero Creek Area Watersheds

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Salinas 9	Santa Margarita WPA 12, Atascadero/ Templeton WPA 13	82,156 acres	Salinas River to Pacific Ocean (Monterey Bay National Marine Sanctuary)	Paso Robles; Atascadero sub-Basin; Rinconada Valley	County of San Luis Obispo, City of Atascadero, Town of Santa Margarita, Los Padres National Forest

Description:

The Atascadero Creek - Mid Salinas Watershed is located in northern San Luis Obispo County and includes a portion of the Salinas River and adjacent tributaries. The drainage rises to a maximum elevation of approximately 2,800 feet above mean sea level with steep topography categorizing much of the western portion of the watershed. The watershed contains two major drainages; Atascadero Lake and Parole Canyon. The watershed contains a mix of urban and rural residential land uses as well as agricultural land uses. A portion of the Los Padres National Forest is also contained within the watershed along the western boundary. The City of Atascadero is located at the northern end of the watershed boundary and the community of Santa Margarita is located within the central and southern portions of the watershed. Other land uses include two quarries, Atascadero Lake, and a wastewater treatment plant. Water supply for the watershed area is dominated by wells, including those used by the Atascadero Mutual Water Company to supply urban residents and commercial uses.

Existing Watershed Plans:

Salinas River Watershed Action Plan

Mid Salinas – Atascadero Creek Area Watersheds

Characteristics:

	Physical Setting	
	Rainfall	Average annual: 21-37 inches (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1990- 2012): 52°-92°F Winter Range (December 1990-2012): 32°-61°F (Paso Robles (*not in watershed*), NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Category #3: Rincon Creek is composed of flat highly infiltrative Quaternary material – Category #3. Category #5: Santa Margarita Creek and Hale Creek sub-watersheds have steep pre-Quaternary non-infiltrative headwaters with steep moderately infiltrative early to mid-Tertiary valleys – Category #5. Category #12: Trout Creek has steep pre-Quaternary non-infiltrative headwaters with flat highly infiltrative Quaternary valleys – Category #12. Category #13: Calf Canyon, Moreno Creek and Pilitas Creek have steep pre-Quaternary non-infiltrative headwaters – Category #13. Category #14: Paloma Creek sub-watershed has moderately infiltrative early to mid-Tertiary headwaters with flat Quaternary highly infiltrative valleys – Category #14 (Bell, pers. comm., 2013). Water Bearing Formations. The principal water-bearing unit is Quaternary age alluvium (Carollo, 2012) The Middle Salinas-Atascadero Watershed is more complex than northern San Luis Obispo Counties other watersheds because it is dissected by the Rinconada Fault. Atascadero draws water from a sub-basin, a pocket located on the western edge of the main basin (just 3 percent of the basin) that is smaller, narrower and replenishes water far more easily with rainfall. The Rinconada Fault separates the two. The local public water utility doesn't need a treatment plant because the natural geology along the Salinas River in Atascadero allows it to treat the water by filtering it through a sandy layer adjacent to the Salinas River (Tribune, 2013).

The Santa Margarita Formation in this watershed is present as Miocene aged, nearly white, coarse, arkosic sandstones which are interbedded with small amounts of mudstone, siltstone, diatomite, and conglomerate. The sandstones are commonly massively cross-bedded, indicative of a high energy, shallow marine bottom depositional environment. Minerals indicate a granitic origin for the sands, while the pebbles in the conglomerates appear to have been reworked from older conglomerates. Some beds are tuffaceous, and some diatomaceous beds altered to chert by redeposition of silica. Significant in environmental interpretation of the formation are the thick biostromes, consisting of masses of pectin, oyster shells, and broken shell debris. Such masses appear to have been storm constructed masses. They imply shallow water, high energy conditions, as supported by thick shells of many fossils, deposited in a structural trough between the Rinconada and Nacimiento fault zones, reaching 2,000 ft thick northeast of Santa Margarita but 200 feet west of Atascadero (Chipping, 1987).

Southern Salinas Valley contains extensive outcroppings of Monterey Formation. The Hames member forms extensive outcrops between Atascadero and Santa Margarita. The Monterey Formation is dominated by thin, siliceous shales, and diatomaceous beds, which contains few, thin phosphatic beds. Sandstones are usually calcareous, well-cemented, and laced with small calcite veins. Some beds, like Graves Creek near Atascadero for example, were buried while still in a slurry-like state, and injected into overlying beds as sandstone dikes. The calcareous nature of the Monterey Formation is due to the high foraminifera content (Chipping, 1987).

The Salinas Valley near Santa Margarita is bounded by the Sur-Nacimiento Fault on the east and Rinconada Fault to the west. The Sur-Nacimiento fault marks the boundary between the old oceanic crust of the Franciscan mélange to the west, and the Salinian continental crust made up of granite to the east. The Salinan granite basement extends to the San Andreas Fault to the east. The Salinan Block represents a slice of continental granitic crust sandwiched between two oceanic crustal plates of the younger Franciscan on the west, and the older Franciscan of the San Joaquin Valley to the east. The Rinconada Fault is a branch off the SAF and continues N until it goes offshore N of Monterey. It is a right lateral wrench similar to the San Andreas and forms the mountains on the west side of the Salinas Valley. The fault passes through Paso Robles and is the source of the

		mineral hot springs in town (Chipping, 1987).
	Hydrology	
	Stream Gage	Yes; USGS 11145500 (Salinas River near CA-58); USGS 11145000 (Salinas River at Las Pilitas Road); USGS 11144600 (Salinas River near Santa Margarita Lake) (USGS, viewed August 2013)
	Hydrology Models	Yes; Klinchuch. 2012. Groundwater model to analyze the sustainability of the Atascadero Sub-basin; Montgomery Watson, 1997, Monterey County Water Resource Agency's Salinas Valley Integrated Groundwater and Surface Water Model Update, Final Report; Todd Engineers, Oct 2013, Paso Robles Groundwater Basin Model.
	Peak Flow	16,600 cfs (USGS, viewed August 2013).
	Base Flow	7.5 cfs (USGS, viewed August 2013).
	Flood reports	None
	Flood Control Structures	Bridges: 1 over Rinconada Creek on Pozo Road; 2 over Salinas River on Las Pilitas Road; 3 over Las Pilitas Creek on Las Pilitas Road; 5 over Santa Margarita Creek on El Camino Real, Walnut Avenue, Norte Road, Linden Ave and Tassajara Creek Road; 4 over Yerba Buena Creek on H Street, J Street, I Street and Encina Avenue; 1 over Tassajara Creek on Tassajara Creek Road (PWD Bridges GIS layer)
	Areas of Heightened Flood Risk	Creeks in Atascadero overflow banks and cause local flooding • Major flooding problems in Santa Margarita are caused by inadequate culverts/ bridges, and inadequate channel capacity in Yerba Buena Creek, where water overtops the banks and floods adjacent low topographic areas. • Santa Margarita has a serious lack of sufficient drainage ditches, culverts, and storm drains. These facilities are often under maintained and filled with sediment or debris, which prevents the drainage system from properly conveying urban runoff to Yerba Buena and Santa Margarita Creeks. • Proposed Solutions (2009): Construction of a levee and major retention basins to address frequently recurring flooding problems

		• Proposed Improvements (2009): The local CSA 23 advisory group has been active in mobilizing community support for the projects and pursuing an easement for the levee and retention basins from the owners of adjacent Santa Margarita Ranch (SLO County Flood Control and Water Conservation District, 2009).
	Biological Setting	
	Vegetation Cover	Primarily chamise-redshank chaparral consisting mainly of continuous chamise; mixed chaparral consisting mainly of continuous buckbrush chaparral; and valley oak woodland consisting mainly of intermittent valley oak, blue oak and coast live oak; with non-native annual grassland; coastal scrub consisting mainly of continuous chamise; blue oak-foothill pine consisting of continuous blue oak and coast live oak; blue oak woodland; and cropland. (SLO County vegetation shapefile, 1990) *Data limited by age of shapefile*
	Invasive Species	Star thistle, tocolote, spotted knapweed, Blue gum/Eucalyptus (Althouse and Meade, 2005) *Data limited to observations, not complete inventory*
	Special Status Wildlife and Plants	*Key*: FE - Federal endangered, FT - Federal threatened, SE - State endangered, ST - State threatened, SSC - State Special Species of Concern, CRPR – CA rare plant rank (CNDDB, viewed August 2013) *Data limited to observations, not complete inventory*

Species	Status	ATASCADERO	LOPEZ MTN	SAN LUIS OBISPO	SANTA MARGARITA	SANTA MARGARITA LAKE	TEMPLETON	WILSON CORNER
Animals								
American badger	SSC				x			
Atascadero June beetle	Special Animal	x					x	
California linderiella	Special Animal				x			
California red-legged frog	FT	x	x		x			
Coast Range newt	SSC		x	x				

	ferruginous hawk	Special Animal (Wintering)		x		x			
	foothill yellow-legged frog	SSC				x			
	golden eagle	Fully Protected	x						
	grasshopper sparrow	SSC (Nesting)				x			
	loggerhead shrike	SSC (Nesting)		x					
	merlin	Special Animal (Wintering)		x					
	pallid bat	SSC	x						
	prairie falcon	Special Animal (Nesting)		x	x	x	X		x
	purple martin	SSC (Nesting)	x	x					
	San Luis Obispo pyrg	Special Animal			x				
	silvery legless lizard	SSC		x					
	Townsend's big-eared bat	SSC				x			
	western pond turtle	SSC	x	x	x	x			
	western spadefoot	SSC				x			x
	white-tailed kite	Fully Protected		x		x			
	Plants								
	Brewer's spineflower	CRPR 1B.3	x		x				
	Cambria morning-glory	CRPR 4.2		x	x				
	caper-fruited tropidocarpum	CRPR 1B.1		x					
	Cuesta Pass checkerbloom	SR	x		x				
	Cuesta Ridge thistle	CRPR 1B.2	x		x				
	dwarf soaproot	CRPR 1B.2			x				
	Eastwood's larkspur	CRPR 1B.2	x					x	
	Hardham's evening-primrose	CRPR 1B.2				x			
	hooked								

		popcornflower	CRPR 1B.2	x		x				
		Hoover's bent grass	CRPR 1B.2		x			x		
		La Panza mariposa-lily	CRPR 1B.3				x	x		
		mesa horkelia	CRPR 1B.1	x		x			x	
		Miles' milk-vetch	CRPR 1B.2	x			x			
		most beautiful jewel-flower	CRPR 1B.2	x						
		pale-yellow layia	CRPR 1B.1				x			
		Palmer's monardella	CRPR 1B.2	x		x		x		
		Pecho manzanita	CRPR 1B.2		x					
		round-leaved filaree	CRPR 1B.1	x			x		x	
		San Benito fritillary	CRPR 1B.2			x				
		San Luis mariposa-lily	CRPR 1B.2	x		x				
		San Luis Obispo County lupine	CRPR 1B.2		x					
		San Luis Obispo owl's-clover	CRPR 1B.2		x					
		San Luis Obispo sedge	CRPR 1B.2	x		x		x		
		Santa Lucia manzanita	CRPR 1B.2		x	x				
		Santa Margarita manzanita	CRPR 1B.2	x	x	x				
		shining navarretia	CRPR 1B.2				x			
		straight-awned spineflower	CRPR 1B.3	x	x		x			
		yellow-flowered eriastrum	CRPR 1B.2	x			x	x	x	X

	Steelhead Streams	Yes; Atascadero (Hale) Creek (FR 50) Atascadero (Hale) Creek, Santa Margarita Creek, Tassajara Creek, Salinas River (US-LT RCD, 2002)
	Stream Habitat Inventory	Yes; DFG, 2005
	Fish Passage Barriers	PAD ID: 707003– Bedrock waterfall on Atascadero Creek. Total Barrier. 22.565639 miles upstream. PAD ID: 707244- Utility crossing on Atascadero Creek at Curbail Avenue. Temporal Barrier. 25.51314 miles upstream. PAD ID: 719388- Dam at Atascadero Park on unnamed tributary to Atascadero. Unknown Status.PAD ID: 731745- Road crossing at Highway 41 on unnamed tributary to Atascadero Creek. Unknown Status. PAD ID: 732138- Road crossing at Highway 41 on unnamed tributary to Atascadero Creek. Unknown Status. PAD ID: 707246- Culvert under Highway 101 on Santa Margarita Creek. Total Barrier. 5.52855 miles upstream.PAD ID: 712052- Road Crossing at El Camino Real Bridge on Santa Margarita Creek. Partial Barrier.69.42864 miles upstream. PAD ID: 707245- Culvert on Santa Margarita Creek. Temporal Barrier. 7.00901 miles upstream.
	Designated Critical Habitat	Yes; Atascadero (Hale) Creek for Steelhead Trout (NMFS CFR 50 226) Steelhead Trout: Tassajara (trout) creek, Santa Margarita Creek, Salinas River (US Fish and Wildlife – Critical Habitat Mapper) California Red-Legged Frog (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	Yes; North San Luis Obispo County Habitat Conservation Program – Multiple species, initially San Joaquin kit fox. *HCP general for North County, not watershed specific*
	Other Environmental Resources	Salinas River, Paso Robles Groundwater Basin, Salinas Reservoir/Santa Margarita Lake, Los Padres National Forest, Santa Lucia Wilderness, Cuesta Ridge Botanical Area, Rinconada Mine Botanical Area (SLO County Flood Control and Water Conservation District, 2007)
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo, City of Atascadero, Town of Santa Margarita
	% Urbanized	9.6% in City of Atascadero, 0.05% Commercial (majority in Santa Margarita), 5% residential (majority Santa Margarita and South Atascadero: non-city)

	% Agricultural	42% rangeland, small scale vineyard and crop production.
	% Other	12.6% open space (Los Padres national Forest), 0.04% Public Facilities, 0.2% recreation, 3% rural lands
	Planning Areas	Salinas River Planning Area
	Potential growth areas	Eagle Ranch (South Atascadero); Santa Margarita Ranch; City of Atascadero Urban Core, South Atascadero
	Facilities Present	Atascadero Wastewater Treatment Plant discharges to the Salinas River; Atascadero Lake; Los Padres National Forest, The Garden Farms Water District
	Commercial Uses	City of Atascadero – Urban Core, Santa Margarita Ranch, hobby vineyards, Livestock and Ag – east Salinas River, Kaiser Quarry, Rocky Canyon Quarry (Union Asphalt), Santa Margarita Quarry (Hansen Aggregates), various industrial facilities, agricultural service provides, residential service providers, commercial districts, restaurants, wine related tourism
	Demographics	
	Population	24,098 in watershed (U.S. Census Block, 2010). 19,333 in Atascadero (US Census Blocks, 2010) 386 in Garden Farms (US Census Blocks, 2010) 1,259 in Santa Margarita (US Census Blocks, 2010)
	Race and Ethnicity	Watershed: Caucasians representing 76%, Latinos representing 16.3%, Mixed-race individuals representing 2.4%, Asians representing 2.2%, African Americans representing 2.2% of the total population in the watershed. The remaining races include Native American, Pacific Islander, and other. Atascadero: 74% Caucasian; 18% Latino; 2.5% Mixed Race; 2.4% Asian (US Census Blocks, 2010) Garden Farms: 87.3% Caucasian; 10.4% Hispanic or Latino; 1.3% Asian (US Census, 2010) Santa Margarita: 76.5% Caucasian; 16.4% Hispanic or Latino; 3.2% Mixed Race; 2.2% Asian; 1.2% American Indian and Alaska Native (US Census, 2010)
	Income	MHI $60,676 for watershed (U.S. Census Tracts, 2010). MHI $68,502 in Atascadero (US Census, 2010) MHI $49,032 in Santa Margarita (US Census, 2010)
	Disadvantaged Communities	No; 7% of individuals are below poverty level in the watershed (U.S. Census Tracts, 2010). 8.7% of individuals are below poverty level in Atascadero (US Census, 2010) 16.7% of individuals are below poverty level in Garden

		Farms (2007-2011 American Community Survey 5-Year Estimates) 18.9% of individuals are below poverty level in Santa Margarita (2007-2011 American Community Survey 5-Year Estimates)
	Water Resources	
	Water Management Entities	Atascadero Mutual Water Company, County Waterworks District No. 6 County Waterworks District No. 6: three wells located in the Paso Robles groundwater basin that provide water to residents of Santa Margarita Atascadero Mutual Water Company – Salinas River wells located in the Atascadero Sub-basin that provide water to the City of Atascadero and surrounding areas.
	Groundwater	Yes; Paso Robles; Atascadero sub-Basin; Rinconada Valley
	Surface Water	No public reservoirs. The rights to surface water flows in the Salinas River and associated pumping from the alluvium have been fully appropriated by the State Board and no future plans exist to increase these demands beyond the current allocations. (Carollo, 2012)
	Imported Water	Yes; Nacimiento Pipeline (Atascadero Mutual Water Company)
	Recycled/Desalinated Water	Yes; The City of Atascadero uses reclaimed water from the Wastewater Treatment Plant for use at Heilman Regional Park and Golf Course, as well as recharge for Paso Robles Groundwater Basin.
	Key Infiltration Areas	No comprehensive study has been completed to date. The main source of recharge in the alluvium is the Salinas River. Recharge to the Paso Robles Formation occurs from the overlying Salinas River alluvium as well as from overlying channel deposits of the Santa Margarita, Atascadero, Graves, and Paso Robles Creeks (Carollo, 2012)
	Water Budget	Yes; Todd Engineers, 2013, Paso Robles Groundwater Basin Model Update *Water budget limited by lacking well data*
	Water Uses	
	Beneficial Uses	*Atascadero Creek* – Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water

		Recreation (REC-2), Commercial and Sport Fishing (COMM), Cold Fresh Water Habitat (COLD), Wildlife Habitat (WILD), Rare, Threatened, or Endangered Species (RARE), and/or Early Development (SPWN). *Atascadero Lake* - Municipal and Domestic Supply (MUN), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Commercial and Sport Fishing (COMM), Warm Freshwater habitat (WARM), Cold Fresh Water Habitat (COLD) , Wildlife Habitat (WILD), Navigation (NAV), and/or Early Development (SPWN). *Salinas River (Nacimiento River-Santa Margarita Reservoir)* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Process Supply (PRO), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE) and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
	Other Unique Characteristics	
	Historical Resources	Santa Margarita de Cortona (22515 H Street, Santa Margarita) (PLN_DES_HISTORIC_POINTS GIS layer)
	Los Padres National Monument	Ecosystems in Los Padres National Forest range from semi-desert in interior areas to redwood forest on the coast. Forest vegetation classified into two major types: chaparral and forested lands. Provides a diverse wildlife habitat with 23 threatened and endangered animals. Member of the California Condor Recovery Program, and has been an active player in the reintroduction of California condors in the wild. The Forest has one endangered plant, two threatened plant species and 71 sensitive plant species. Management of riparian vegetation focuses on supporting fish and wildlife populations. There are over 870,000 acres of livestock grazing allotments in the Forest.
	Heilman Regional Park, Santa Margarita Community Park and Chalk Mountain Golf Course	Group day-use facilities owned and managed by the County of San Luis Obispo.
	Atascadero Lake Park	Man-made lake managed by the City of Atascadero. There is a walking path that follows the edge of the lake for a stroll, jog or bike ride lakeside. The park also has a

		playground, paddle/kayak boats, workout stations, restroom facilities, large and small barbecue areas, horseshoe pits, sand volleyball court and the Charles Paddock Zoo.
	Stadium Park	During the 1920's, Stadium Park was a gathering place for community events, concerts, and theater. Performances were held on a big stage under an Oak tree. That stage was later moved to where the Atascadero Lake Pavilion now stands. Besides being a beautiful park, it is a natural amphitheater with gently sloping hills leading to the basin. Acoustics are ideal just as nature made them.
	Sunken Gardens	Inspired by "The Grand Basin" at the 1904 St. Louis World's Fair, Atascadero founder E.G. Lewis envisioned a formal Sunken Garden to adorn the civic center in his new colony. Restored in 2005 as originally designed with walkways crossing the length and width of the gardens and meeting at a central fountain designed by architect Walter D. Bliss of the San Francisco firm of Bliss and Faville.
	Climate Change Considerations	
		See IRWMP, 2014 Section X. Climate Change *Data is general for county, not watershed specific*

Characteristics:

Watershed Codes:

Mid Salinas – Atascadero Creek Area Watersheds

Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)

Calwater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3309.811303	8	Paso Robles	1	Atascadero	309.81	Parole Canyon	Pilitas Creek
3309.811304	8	Paso Robles	1	Atascadero	309.81	Parole Canyon	Rincon Creek
3309.811306	8	Paso Robles	1	Atascadero	309.81	Parole Canyon	Moreno Creek
3309.811401	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Santa Margarita Creek
3309.811402	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Calf Canyon
3309.811403	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Paloma Creek
3309.811404	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Hale Creek
3309.811405	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Henry
3309.811408	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Trout Creek

Major Changes in the Watershed

- Since late 1700's Salinas River Valley used for agriculture. After Spanish missionary priests established the mission at San Luis Obispo, they built Santa Margarita de Cortona Asistencia in 1817 to provide crops and livestock.

Atascadero

- First building in the area in 1812. Adobe that served as the southern grazing outpost for Mission San Miguel Portions of the adobe walls stood until late 1900's near Traffic Way.
- 1876 – A. F. Benton purchased the Eagle Rancho, near the headwaters of Atascadero Creek. Uses the land the raise hogs, but as many encounters with grizzly bears that make ranching difficult, but attracts big game hunters to the area (Storke, 1891).
- During 19th century cattle ran in large tracts that had been Mexican land grants. Toward the end of the century, J. H. Henry consolidated a number of tracts into the 23,770 acre Atascadero Ranch.
- During the early 20th century, U.S. Army used the central plains of the ranch for annual encampments and maneuvers and at one time considered the acquisition of the ranch for permanent military camp.

Mid Salinas – Atascadero Creek Area Watersheds

- In 1913, Edward Gardner "E. G. Lewis" selected the Atascadero Ranch as the ideal location for a model colony. Lewis purposely chose a location halfway between major urban center of the state on both a railway and state highway.
- Lewis subdivided the entire 38 square miles, built 100 miles of roads, a water system of tanks, wells and mains, nearly 3,000 acres of orchards, parks, the Sunken Gardens and public buildings.
- A twenty-mile road through the Santa Lucia Mountains connecting the Colony to the 1,000 acre Atascadero Beach properties near Morro Bay which had schools, a community center, hospital and hotel.
- Two important factors that stimulated growth in the 1950's have also significantly affected design and demographics of the community: bisection of the City in 1954 by Highway 101, and the siting of the Atascadero State Hospital on the edge of the community in 1956.
- 2006 – Severely eroded bank on south side of Atascadero Creek repaired. Rock slope protection installed along the bank and heavily vegetated with native riparian species.

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Salinas River	Undetermined	Yes; Sodium and Chloride	Undetermined	Not assessed
Atascadero Creek (Hale)	Perennial	Yes on 303d list for Chloride, E. coli, Fecal Coliform, Low Dissolved Oxygen, and Sodium. TMDL estimated date of completion 2021.	NP: Agriculture, grazing-related, natural sources, resource extraction, petroleum activities, transient encampments MP: None defined as such on 303d list	**Lower**: Spring: 0.99 cfs. Summer: 0.37 cfs.
Paloma Creek	Undetermined	Not assessed	Undetermined	Not assessed
Santa Margarita Creek	Undetermined	Not assessed	Undetermined	**Upper**: Spring: 0.81 cfs. Summer: 0.32 cfs.
Calf Canyon Creek	Undetermined	Not assessed	Undetermined	**Upper**: Spring: 0.49 cfs. Summer: 0.24 cfs.
Moreno Creek	Undetermined	Not assessed	Undetermined	Spring: 0.53 cfs. Summer: 0.24 cfs.
Trout Creek	Undetermined	Not assessed	Undetermined	**Upper**:

				Spring: 0.63 cfs. Summer: 0.27 cfs.
Rincon Creek	Undetermined	Not assessed	Undetermined	Not assessed
Pilitas Creek	Undetermined	Not assessed	Undetermined	Spring: 0.65 cfs. Summer: 0.28 cfs.

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 RCS, 2011)	Physical limitations, water rights and water quality issues (Master Water Report).	Yes; see description below.	None (CCRWQCB, 2011)
Atascadero	None (Carollo, 2012)	Water rights and physical limitations (SLO County WMP, 2012)	The 2008 Water Quality Report for both Templeton CSD and Atascadero MWC found that none of the tested regulated and secondary substances in water samples exceeded their MCL values (Carollo, 2012)	None (CCRWQCB, 2011)
Rinconada	None (Carollo, 2012)	Physical Limitations (SLO County WMP, 2012)	None (Carollo, 2012)	None (CCRWQCB, 2011)

Groundwater Quality Description:

Paso Robles Groundwater Basin: Based on Todd monitoring report (2007), the Basin was not at the safe yield although some areas were experiencing significant declines in groundwater elevations. A later study completed in 2009 suggests groundwater pumping was approaching the safe yield of the Basin, which led to the recommendation to do a groundwater management plan. The Resource Capacity Study prepared by the San Luis Obispo County Planning Department in November 2010 states that the Basin is near or at perennial yield, and contains land use and water use monitoring and conservation recommendations within the authority of the County and District to help ensure the sustainability of the Basin into the future (Paso Robles Groundwater Basin – Groundwater Advisory Committee, 2011).

The predominant cations 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 Dissoved 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 drinking water standards. The maximum contaminant level (MCL) for nitrate was exceeded in 4 samples (Fugro West, 2001b). Water quality trends indicate an increasing concentration of TDS and chloride in the deep, historically artesian aquifer northeast of Creston (Carollo, 2012).

Salinas River recharge typically contains calcium and magnesium bicarbonate. Santa Margarita Creek water contains magnesium-calcium-bicarbonate. Atascadero and Paso Robles Creeks have calcium bicarbonate rich waters. Increasing Total Dissolved Solids and chlorine, physical limitations (Carollo, 2012).

Atascadero sub-basin: In terms of physical limitations, Todd (2009) estimated the gross groundwater pumping in the sub-basin during 2006 to be 15,545 AF, which is 95 percent of the sub-basin perennial yield of 16,400 AFY. Ongoing studies may revise the estimated outflow from the sub-basin. According to Fugro (2010), whereas total groundwater in storage in the main part of the Paso Robles Groundwater Basin is predominantly in the Paso Robles Formation, the Salinas River alluvium in the Atascadero Groundwater Sub-basin accounts for a significant percentage of the total groundwater storage in the sub-basin. Pumping from the alluvium should be accounted for separately from pumping from the Paso Robles Formation.

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
Limited Groundwater Basin information (Rinconada basin)		Carollo, 2012
Atascadero (Hale) Creek 303(d) listed for chloride, Escherichia coli (E. coli), fecal coliform, low dissolved oxygen, sodium	Agriculture, grazing related and natural sources, resource extraction petroleum activities, transient encampments	Carollo, 2012

Groundwater: Paso Robles Groundwater Basin

Mid Salinas – Atascadero Creek Area Watersheds

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:

Lower Salinas - Paso Robles Area Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Salinas 9	Atascadero/ Templeton WPA 13 Salinas/ Estrella WPA 14	143,654 acres	Salinas River (to Monterey Bay National Marine Sanctuary)	Paso Robles, Paso Robles Creek	County of San Luis Obispo Paso Robles (ptn), Atascadero (ptn), Templeton, San Miguel, Camp Roberts

Existing Watershed Management Plans:

No existing plans to date

Description:

The portion of the Salinas River Watershed classified here is located centrally within San Luis Obispo's North County region and encompasses Paso Robles Creek. Because of the extensive reach of the Salinas River watershed, we have utilized a watershed grouping scale that is consistent with the CalWater hydrologic unit code 10, which separates the River into 3 segments within San Luis Obispo County. We have merged 3 of the Indian Valley subwatersheds into this grouping since the bulk of the Indian Valley watershed is located in Monterey County. All or portions of the City of Paso Robles, City of Atascadero, community of San Miguel, and community of Templeton are all located within this watershed. It is within this watershed that most development has occurred along the Salinas River, both urban and rural agricultural. The western portion of the watershed is characterized by higher elevations with more dense oak woodlands whereas east of the Salinas River is characterized by more rolling hills and terraces. The peak elevation within the watershed occurs at the westernmost boundary reaching approximately 2,460 feet. The northern portion of the watershed contains the point at which the Salinas River leaves San Luis Obispo County and flows into Monterey County. The headwaters are in the Coast Ranges, west of city of Paso Robles. The dominant land use is agriculture with a strong urban component located adjacent to the Salinas River.

Lower Salinas - Paso Robles Area Watershed

Characteristics

	Physical Setting	
	Rainfall	Average Annual: 11-18 in, (northeast portion), 25-33 in. (southwest portion) (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1990-2012): 52°-98°F Winter Range (December 1990-2012): 32°-62°F (Paso Robles, NOAA National Climatic Data Center, viewed 2013)
	Geology Description	McKay, Mahoney Canyon, Lower Vineyard Canyon, Fern Canyon, Neals Spring, Templeton (including Toad Creek) and Asuncion sub-watersheds are composed of flat highly infiltrative Quaternary materials – Category #3. Graves Creek and Upper Paso Robles Creek are steep pre-Quaternary non-infiltrative headwaters with steep moderately infiltrative early to mid-Tertiary valleys – Category #5. Sheepcamp Creek and Summit Creek are composed of steep moderately infiltrative early to mid-Tertiary fill – Category #8. Mustard Creek has steep pre-Quaternary non-infiltrative headwaters with flat highly infiltrative Quaternary valley floor – Category #12. Upper San Marcos Creek, San Francisco Canyon, Cienega Canyon and Santa Rita Creek have steep pre-Quaternary non-infiltrative headwaters – Category #13. Lower San Marcos Creek, Bethel School and Lower Paso Robles Creek sub-watersheds have moderately infiltrative early to mid-Tertiary headwaters with flat Quaternary highly infiltrative valleys – Category #14 (Bell, pers. comm., 2013). 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. 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, 2001). Groundwater in Holocene alluvium is mostly unconfined. 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). Bedrock is composed of granitic and metamorphic materials of the Salinian Block. The Salinian basement block is separated from the adjacent Franciscan basement by the San Andreas Fault in the northeast corner of the area and by the Nacimiento Fault zone in the Southwest corner. Overlying both basement blocks is a sequence of Cretaceous and Tertiary marine deposits and the nonmarine Paso Robles Formation. Serpentines occur in the area as ultramafic Franciscan Formation. Granite outcrops are typically coarse grained biotites. The Santa Margarita Formation crops out in the eastern part of the San Miguel quadrangle. The Pancho Rico Formation lies in a broad belt from the northeastern part of the Bradly quadrangle across the San Miguel quadrangle. These two units are exposed in the same stratigraphic sequence. Monterey shale is generally deformed into broad folds where it is thick, but near faults it is commonly tightly folded, contorted and overturned. Sandy and conglomerate units are tilted or warped into broad folds (Burch and Durham, 1970).
	Hydrology	
	Stream Gage	Yes; USGS 11147500 (Salinas River at 13th Street, Paso Robles); USGS 11147070 (Santa Rita Creek near Santa Rita Road); USGS 11147040 (Santa Rita Creek near Old Creek Road); USGS 11147000 (Jack Creek near Highway 46W) (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. Todd Engineers, 2013, Paso Robles Groundwater Basin Update.
	Peak Flow	Peak flow: 28,400cfs. (USGS, viewed August 2013)
	Base Flow	Salinas River: 600 cfs. (USGS, viewed August 2013)

Lower Salinas - Paso Robles Area Watershed

	Flood Control Structures	Bridges: 1 over Vineyard Creek on Indian Valley Road; 1 over Salinas River on River Road (PWD Bridges GIS Layer) Caltrans culverts convey HWY 1 stormwater onto road surfaces of 10th, 12th, 14th, and 16th Street.
	Flood Reports	The SLO County Flood Control and Water Conservation District commissioned a community wide master drainage study for Templeton. The initial and subsequent phases of the study are intended to characterize existing drainage patterns, analyze flood problems and identify proposed near and short term solutions. The study focussed on a section of Toad Creek with community stakeholders responding (Fugro North Coast Engineering, 2010 2011 draft: SLO County Flood Control and Water Conservation District, 2009; TAAG Toad Creek Watershed Report 2013). *Data limited by scope of related study, does not address Watershed level flooding, more specific to Templeton area*
	Areas of Heightened Flood Risk	Templeton lacks a formal drainage system and flood control infrastructure. Tributaries of Toad Creek collect drainage from the west side of the town, and convey them under Highway 101 through densely developed residential neighborhoods between Highway 101 and Main Street. (County of SLO facilities Inventory, draft viewed 2013) The freeway culverts at both the south and middle area are undersized, restricting flow causing potential flooding at the inlets. The length of Toad Creek between Main Street Highway 101 and the Southern Pacific Railroad is susceptible to flooding. Urbanization of the north sub area could have a very significant impact on this flooding. The area west and east of Main Street is currently in a Flood Hazard Zone. The community stakeholders proposed flood control and basin re-charge areas. (Templeton Design Plan, 1990; TAAG Toad Creek Watershed Report, 2013). 1.38 square miles of Paso Robles is within an identified floodplain of the Salinas River and its tributaries. San Luis Obispo County has also identified additional areas in the vicinity of Marquita Road, and an area bounded by Herdsman Way to the south, West Bethel Road to the west, and Highway 46 West to the north; and an area north of Highway 46 West, west of Arbor Road, and south of Live Oak Road as flood prone (City of Paso Robles, 2005). Illegal off-road use of the Salinas River causes displacement of the river bed, pollution of the river, and destruction of riparian vegetation along 20 miles of the river (US-LT RCD, 2003).

Lower Salinas - Paso Robles Area Watershed

		The community of San Miguel lacks formal drainage. Local runoff follows the gentle northeasterly slope of the community and either flows to the Salinas River or infiltrates into the historic flood plain. Low spots cause frequent ponding and shallow flooding at several locations (SLO Flood Control and Water Conservation District, 2009) Abandoned vehicles and illegal dumping in the Salinas River continues to be a problem. (US-LT RCD, 2003) In San Miguel, ponding of stormwater west of Union Pacific Railroad tracks can result in the flooding of Mission Street from 11th to 16th street. The tracks bisect the community and impede flows from reaching Salinas River on the eastside. The primary cause of flooding in San Miguel is due to the absence of a continuous slope and drainage conveyance path from L Street to the Salinas River (SLO County Flood Control and Water Conservation District, 2009).
	Biological Setting	
	Vegetation Cover	Primarily coastal oak woodland consisting mainly of continuous coast live oak; chamise-redshank and mixed chaparral consisting mainly of chamise; orchards and vineyards with non-native annual grassland; oak woodland consisting mainly of continuous coast live oak and blue oak; urban; montane hardwood consisting mainly of continuous coast live oak. (SLO County vegetation shapefile, 1990 and Templeton-Atascadero Bikeway Connector Trail Constraints, 2003) *Data limited by age of shapefile.* Bunchgrass grasslands, wetlands, riparian woodlands, seeps, and vernal pools are also present. These habitats support uniquely adapted plants and provide important ecological functions. They also provide habitat for wildlife, including rare and endangered species. The Salinas River Riparian corridor is mature, multi-layered woodland habitat with sycamore (*Platanus racemosa*), cottonwood (*Populus fremontii*), and willow (*Salix* spp.) that provide habitat for many species of songbirds and raptors. Riparian canopy also provides shade that can regulate water temperature (Althouse and Meade, 2013). *Data limited to observations, not complete inventory*
	Invasive Species	The following invasive species have been identified in the Lower Salinas-Paso Robles Creek Area Watershed: Giant

reed grass (*Arundo donax*), tree of heaven (*Ailanthus altissima*), pampas grass (*Cortaderia selloana*), Perennial pepperweed (*Lepidium latifolium*), Skeleton weed (*Chondrilla juncea*), common unicorn (*Proboscidea louisianica*), Russian thistle (*Salsola tragus*), Medusahead (*Taeniatherum caput-medusae*), Tamarisk (*Tamarix* sp.) (Althouse and Meade, 2013). Poison hemlock, yellow star thistle, cheeseweed mallow, black mustard, ripgut brome, horseweed, Prickley lettuce and milkthistle have also been identified (Sierra Delta Corporation, 2007)

Data limited to observations, not complete inventory

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 (CNDDB, 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**	**ADELAIDA**	**ATASCADERO**	**CRESTON**	**CYPRESS MTN**	**PASO ROBLES**	**TEMPLETON**	**YORK MTN**
			Animals					
American badger	SSC	x					x	
Atascadero June beetle	SA		x			x	x	
California red-legged frog	FT				x		x	x

Special Status Species	**Status**	**ADELAIDA**	**ATASCADERO**	**CRESTON**	**CYPRESS MTN**	**PASO ROBLES**	**TEMPLETON**	**YORK MTN**
Coast Range newt	SSC		x					x
least Bell's vireo	FE; SE					x		
Lompoc grasshopper	SA					x	x	
Monterey dusky-footed woodrat	SSC	x						
Salinas pocket mouse	SSC	x						
San Joaquin kit fox	FE; ST	x				x	x	
San Joaquin pocket mouse	SA					x		

silvery legless lizard	SSC	x					x	
vernal pool fairy shrimp	FT	x					x	
western pond turtle	SSC					x	x	x
western spadefoot	SSC	x					x	
Plants								
Carmel Valley bush-mallow	CRPR 1B.2				x			
Cook's triteleia	CRPR 1B.3	x						
dwarf calycadenia	CRPR 1B.1	x						
Eastwood's larkspur	CRPR 1B.2		x				x	
Kellogg's horkelia	CRPR 1B.1					x		
Lemmon's jewel-flower	CRPR 1B.2					x	x	
mesa horkelia	CRPR 1B.1		x				x	
most beautiful jewel-flower	CRPR 1B.2		x		x			
round-leaved filaree	CRPR 1B.1						x	
Santa Cruz Mountains pussypaws	CRPR 1B.1	x						
Santa Lucia bush-mallow	CRPR 1B.2				x			
Santa Lucia dwarf rush	CRPR 1B.2	x		x			x	
shining navarretia	CRPR 1B.2	x				x	x	
umbrella larkspur	CRPR 1B.3	x						
woodland woollythreads	CRPR 1B.2	x				x		
yellow-flowered eriastrum	CRPR 1B.2		x				X	

Steelhead Streams	Yes; Paso Robles Creek, Jack Creek (watershed fisheries report) Salinas River, Graves Creek, Santa Rita Creek, Summit Creek, Sheepcamp Creek, San Marcos Creek (US Fish and Wildlife – Critical Habitat Mapper) Likely to be present: Willow Creek (NMFS South-Central California Coast Steelhead Trout Dataset, 2005). Toad Creek is identified as a previous steelhead creek (Watershed Fisheries Report 2002).
Stream Habitat Inventory	Yes; DFG, 1997.
Fish Passage Barriers	No total, partial, temporal or unassessed barriers on Paso Robles Creek (CalFish PAD). PAD ID: 718835- Dam at Hartzell Dam on Santa Rita Creek, Tributary to Paso Robles Creek. Total Barrier. 14.86411 miles upstream.

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		PAD ID: 736536- Culvert at Highway 46 on Sheepcamp Creek, tributary to Paso Robles Creek. Unknown Status
	Designated Critical Habitat	Yes; Salinas River, Paso Robles Creek, Jack Creek, Sheepcamp Creek, Santa Rita Creek, Graves Creek, San Marcos Creek, and Summit Creek for Steelhead trout; South-Central California Coast Steelhead Trout Recovery Plan (50 CFR *226 -* National Marine Fisheries Service - NOAA*);* Vernal Pool Fairy Shrimp (USFWS Critical Habitat Portal, viewed 2013)
	Habitat Conservation Plans	Yes; North San Luis Obispo County Habitat Conservation Program, City of Paso/SLO County, multiple species, initially San Joaquin kit fox *HCP general for County, not watershed specific*
	Other Environmental Resources	Salinas River, Paso Robles Groundwater Basin (SLO County IRWM, 2007)
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo, City of Atascadero (ptn), City of Paso Robles (ptn),Templeton, the community of San Miguel, Camp Roberts (ptn)
	% Urbanized	6.7% City of Paso; 6.4% City of Atascadero; 1.8% the community of Templeton; 6.2% (0.7% commercial, 5.5%residential), the community of San Miguel; 3% Public Facility; 1.7% Residential Suburban; Less than 1% each Commercial Retail, Industrial, Recreational, Residential Multi-family, Residential Single Family, Office Professional and Commercial Service
	% Agricultural	62.5%; row crops, vineyards, orchards and rangeland 73%; row crops, vineyards, forage, and rangeland
	% Other	9.4%Rural Lands; 7.4% Residential Rural
	Planning Areas	Salinas River, Adelaida, El-Pomar/Estella Planning Areas
	Potential growth areas	Adelaida, Olsen Ranch, Chandler Ranch, Beechwood, Borkey, Union Road, Wellsona Area (City of Paso General Plan, 2011), San Miguel Urban Core, San Miguel Freeway Corridor (San Miguel Community Plan, 2013), Templeton.
	Facilities Present	Mission San Miguel, Rios Caledonia Adobe, County Public [?] Works District 1, Camp Roberts, San Miguel Wastewater Treatment Plant, Paso Robles Waste Water Treatment Plant, Paso Robles Youth Correctional Facility, Mid State Fair Grounds, Templeton Wastewater Treatment Plant, Atascadero Mutual Water Company facilities are found near the Salinas River, at the south end of this watershed.
	Commercial Uses	Industrial facilities - North River Road Pit operated by Viborg Construction; North River Road Pit operated by County of SLO; Mountain Springs Shale Pit operated by Viborg Construction; Templeton/Ormonde Sand and Gravel Pit operated by Borzini Sand and Gravel; Finley Sand Pit by

Lower Salinas - Paso Robles Area Watershed

		Weyrick; Smith Sand Pit operated by Paul Viborg; Hartzell Red Rock #1 & Hartzell Red Rock #2 Sand and Gravel Pit operated by Hartzell Ranch; Santa Rita Stone Quarry operated by Santa Rita Quarry, tourism, agriculture: row crops, forage, vineyards, orchards, ranches and Paso Robles Airport; San Miguel commercial core, tourism- mission and wine related; and Templeton downtown and Twin Cities Hospital.
	Demographics	
	Population	54,952 in watershed (US Census Blocks, 2010) 9,078 in the City of Atascadero (US Census Blocks, 2010) 29,524 in the City of Paso Robles (US Census Blocks, 2010) 7,674 in the community of Templeton (US Census, 2010) 2,205 in the community of San Miguel (US Census Blocks, 2010)
	Race and Ethnicity	Watershed: 69.1% Caucasian; 25.1% Latino; 2% Mixed Race; 1.7% Asian; 1.2% African American; Less than 1% each American Indian and Pacific Islander (US Census Blocks, 2010) City of Atascadero: 83.2% Caucasian; 11.4% Latino; 0.4% Black; 0.5% American Indian and Alaska Native; 2% Asian; 2.2% Mixed Race (US Census Blocks, 2010) City of Paso Robles: 58.9% Caucasian; 34.6% Latino; 1.8% Black; 0.5% American Indian and Alaska Native; 1.8% Asian; 2% Mixed Race (US Census Blocks, 2010) Community of Templeton: 79.5% Caucasian; 15.3% Hispanic; 2.2% Mixed Race; 1.6% Asian; 0.7% Black or African American; 0.5% American Indian and Alaskan Native (US Census, 2010) The community of San Miguel: 46% Caucasian; 48.4% Latino; The remaining races each represent less than 6%, including African American, American Indian, Pacific Islander, and Asian. (US Census, 2010)
	Income	MHI $67,028 in watershed (interpolated from 9 US Census tracts, 2010) MHI $49,097 in San Miguel (US Census, 2010) MHI $57,927 in Paso Robles (US Census, 2010) MHI $70,820 in Templeton (US Census, 2010) MHI $68,502 in Atascadero (US Census, 2010)
	Disadvantaged Communities	Yes; San Miguel (DWR); 16.8% of individuals are below poverty level

Lower Salinas - Paso Robles Area Watershed

		6.0% of individuals are below poverty level in the watershed, not including San Miguel (US Census Tracts, 2010) (interpolated from 13 tracts spanning multiple watersheds) 8.7% of individuals are below poverty level in Atascadero (2007-2011 American Community Survey 5-Year Estimates) 10.2% of individuals are below poverty level in Paso Robles (2007-2011 American Community Survey 5-Year Estimates) 4.1% of individuals are below poverty level in Templeton (2007-2011 American Community Survey 5-Year Estimates)
	Water Resources	
	Water Management Entities	Atascadero Mutual Water Company, Templeton CSD, City of Paso Robles, San Miguel CSD, outlying areas served by individual wells
	Groundwater	Yes; Paso Robles Groundwater Basin Natural recharge in the basin is derived from infiltration of precipitation, seepage from streams, and return flow from irrigation and other uses (Ca. Dept. of Water Resources, 2003)
	Surface Water	No public reservoirs. The rights to surface water flows in the Salinas River and associated pumping from the alluvium have been fully appropriated by the State Board and no future plans exist to increase these demands beyond the current allocations. (Carollo, 2012)
	Imported Water	The cities of Atascadero and Paso Robles, and the Templeton CSD are signors of the Nacimiento Water Project, which allows them to draw supplemental water from Lake Nacimiento for their users (Carollo, 2012). Atascadero Mutual Water Company – 2,000 afy City of Paso Robles – 4,000 afy Templeton Community Services District – 250 afy
	Recycled/Desalinated Water	The City of Paso Robles has a wastewater recycling plant in planning phase, scheduled for completion in 2015 (City of El Paso de Robles, 2003). San Miguel CSD has a wastewater treatment plant that discharges recycled wastewater into the Paso Robles Groundwater Basin.
	Key Infiltration Zone	No complete study has been performed however the Salinas River/Highway 46 Recharge Area was identified by the SLO County Flood Control and Water Conservation District in 2008.
	Water Budget	Yes; Todd Engineers, 2013. Paso Robles Groundwater Basin Update. *Water budget figures are limited by unreported well data.*

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	Water Uses	
	Beneficial Uses	*Paso Robles Creek* - 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),Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM) *San Marcos Creek* - 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), and Commercial and Sport Fishing (COMM) *Salinas River (Nacimiento River-Santa Margarita Reservoir)* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Process Supply (PRO), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM),Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE) and Commercial and Sport Fishing (COMM). *Vineyard Canyon Creek* - 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), and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
	Other Unique Characteristics	
	Hot Springs	A geothermal pressure aquifer is located approximately 650 feet below the surface in the Paso Robles and Templeton areas. The water contained in this pressure aquifer is hot (122 degrees +), high in TDS and other minerals including boron. Improper construction of wells in the area may be contributing to contamination of the upper aquifer (CCRWQCB, 2002)
	Historical Resources	Rotta Winery (250 Winery Road, Templeton); York Mountain Winery (7505 York Mountain Rd, Templeton); San Marcos

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		Cemetery (Chimney Rock Road & 24th Street West, Paso Robles); Willow Creek Cemetery (Vineyard & Dover Canyon Roads, Paso Robles); Estrella Adobe Church (Airport Rd, Paso Robles); Bethel Lutheran Church (295 Old County Road, Templeton); Geneseo School (moved in 2004); C.H. Phillips House (91 Main Street, Templeton); San Miguel Mission (775 Mission Street, San Miguel); Rios Caledonia Adobe (700 S. Mission Street, San Miguel) (PLN_DES_HISTORIC_POINTS GIS Layer) (PLN_DES_HISTORIC_POINTS GIS layer) The Juan Bautista de Anza Historic Trail (Anza Trail) is administered by the National Park Services (National Trail System 1990). The trail corridor extends from Atascadero through Paso Robles then northwest towards San Antonio Mission (County Parks and Recreation Element 2006; cities of Atascadero and Paso Robles)
	Camp Roberts	Thirteen ponds and reservoirs (65 acres) which are either natural or artificially created for use as livestock ponds or flood control. A total of 120 aquatic species representing 64 families of organisms were recorded from rivers, ponds, and reservoirs on Camp Roberts. Eight species of fish, 44% of species native to Salinas River drainage, have been recorded at Camp Roberts from Nacimiento River. There are over 100 known archeological prehistoric and historic sites including the Nacimiento Ranch House. 23 animal species designated as California Special Concern Species by CDFW occur at Camp Roberts. There are 32 State-listed species on the special plants list. In process of partnering with Agricultural Land Conservancy to acquire 612-acre Willard property and 1,300-acre Manini property. A population of Tule Elk was established in the early 1980s.
	Jack Creek Reservoir	Over 250 acres of designated Open Space
	Los Padres National Forest	Ecosystems in Los Padres National Forest range from semi-desert in interior areas to redwood forest on the coast. Forest vegetation classified into two major types: chaparral and forested lands. Provides a diverse wildlife habitat with 23 threatened and endangered animals. Member of the California Condor Recovery Program and has been an active player in the reintroduction of California condors in the wild. The Forest has one endangered plant, two threatened plant species and 71 sensitive plant species. Management of riparian vegetation focuses on supporting fish and wildlife populations. There are over 870,000 acres of livestock grazing allotments in the Forest.
	Templeton Park, Duveneck Regional Park (Undeveloped)	County operated day-use recreation areas.

	Mission San Miguel de Archangel	Established in 1797, designated as State Historical Landmark No. 326.
	Rios Caledonia Adobe	Established between 1830-1846, adjacent to Mission San Miguel de Archangel, this site is considered one of the finest examples of early California architecture in the state. Contains preserves historic building, landscaped grounds, a gift shop and restrooms. Includes a 2.8 acre park and museum. Operated by the County of San Luis Obispo.
	San Miguel Park	Day-use recreation area operated by the County of San Luis Obispo.
	Wolf Property Natural Area	Operated by the County of San Luis Obispo.
	San Miguel Staging Area	Located on the Salinas River at the site of the former Camp Roberts swimming pool. Offers parking facilities for hiking and equestrian use along the Salinas River leading to Big Sandy Wildlife Area. Operated by the County of San Luis Obispo.
	Big Sandy Wildlife Area	850 acre grassland park that provides habitat to various species including California quail and wild boar. Provides season hunting and fishing activities to area residents and visitors. Portions of the riparian growth are virtually pristine; however much of the remaining area is highly disturbed. Habitat restoration activities are underway. The area is managed for hunting by California Department of Fish and Wildlife.
	Tom Jermin, Sr. Park	TCSD operated day-use recreation area.
	Salinas River Trails Master Trail Plan – Santa Margarita to San Miguel (Undeveloped)	SLOCOG 2014
	Climate Change Considerations	
		See IRWMP, 2014 Section H, Climate Change *Data is general for County, not watershed specific*

Watershed Codes

Calwater/DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3309.811406	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Graves Creek
3309.811407	8	Paso Robles	1	Atascadero	309.81	Atascadero Lake	Asuncion
3309.811701	8	Paso Robles	1	Atascadero	309.81	Paso Robles Creek	San Francisco Canyon

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3309.811702	8	Paso Robles	1	Atascadero	309.81	Paso Robles Creek	Upper Paso Robles Creek
3309.811703	8	Paso Robles	1	Atascadero	309.81	Paso Robles Creek	Sheepcamp Creek
3309.811704	8	Paso Robles	1	Atascadero	309.81	Paso Robles Creek	Cienega Creek
3309.811705	8	Paso Robles	1	Atascadero	309.81	Paso Robles Creek	Santa Rita Creek
3309.811706	8	Paso Robles	1	Atascadero	309.81	Paso Robles Creek	Lower Paso Robles Creek
3309.811707	8	Paso Robles	1	Atascadero	309.81	Paso Robles Creek	Summit Creek
3309.811801	8	Paso Robles	1	Atascadero	309.81	Templeton to Paso Robles	Bethel School
3309.811802	8	Paso Robles	1	Atascadero	309.81	Templeton to Paso Robles	Neals Spring
3309.811803	8	Paso Robles	1	Atascadero	309.81	Templeton to Paso Robles	Golden Hill
3309.811804	8	Paso Robles	1	Atascadero	309.81	Templeton to Paso Robles	Fern Canyon
3309.811805	8	Paso Robles	1	Atascadero	309.81	Templeton to Paso Robles	Mustard Creek
3309.811806	8	Paso Robles	1	Atascadero	309.81	Templeton to Paso Robles	Templeton (aka Toad Creek)
3309.811901	8	Paso Robles	1	Atascadero	309.81	Lower Nacimiento River	Lower San Marcos Creek
3309.811904	8	Paso Robles	1	Atascadero	309.81	Lower Nacimiento River	Mahoney Canyon (majority)
3309.811907	8	Paso Robles	1	Atascadero	309.81	Lower Nacimiento River	McKay (ptn)
3309.811908	8	Paso Robles	1	Atascadero	309.81	Lower Nacimiento River	Upper San Marcos Creek
3309.812105	8	Paso Robles	1	Atascadero	309.81	Portugese Canyon	Lower Vineyard Canyon (ptn)

Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)

Major Changes in the Watershed

Lower Salinas - Paso Robles Area Watershed

- In 1797, Franciscan padres built Mission San Miguel near the Paso Robles hot springs to take advantage of the waters curative powers. They constructed a crude abutment of logs around the edge of the main spring and an aqueduct that brought the water to the mission. Later, the main spring became the center of the town of Paso Robles. With the demise of the Mission, the Mexican government granted the original 10,519 hectare (25,993 acres) of the Rancho de Paso Robles (Ranch of the Pass of the Oaks) to Pedro Narvaez in 1844. In 1857, with the decaying logs of the padres still at the spring, the Blackburn brothers and partner purchased the rancho for $8,000. A rough bathhouse was built over the main sulphur spring, a stagecoach station was established, and a small hotel was built to accommodate occasional travelers.
- Adelaida area first settled in the 1870’s for immigrating European farmers. Included a general store, post office, school, church, and cemetery at its height
- In 1881 a portion of the Atlantic and Pacific Railway is established through San Miguel.
- In 1886, the Southern Pacific Railroad passed the small hotel in Paso Robles, and in 1889, the City of Paso Robles was incorporated. That same year, the Blackburns began construction of the Hotel El Paso de Robles near the main sulphur spring.
- Mining activity important: minerals extracted include cinnabar (mercury-bearing ore), quicksilver, and limestone.
- In 1889 San Miguel Fire District formed as a volunteer fire company
- The Templeton Fire District was formed in 1909 and today remains a volunteer fire company.
- The Templeton Community Services District was formed in 1976.
- San Miguel Community Services District formed (2000)
- On September 3, 1942 construction began on the Airfield, which was to be used as a Marine Corps Bomber Base. On April 8, 1943, the field was dedicated as Estrella Army Airfield to be used by the Army Air Corps. Estrella Army Airfield consisted of 1259 acres of land, two 4,700-foot long runways, an operations building and a small, three bay fire station.
- The Marine Corps Units occupied buildings to the west, across Airport Road in what is now the California Youth Authority. On August 29, 1947 the Federal Government transferred 1,057 acres to the County of San Luis Obispo to be used as a commercial airport, and 202 acres and buildings to the State of California to be used as a Correctional Facility.
- The County of San Luis Obispo extended runway 01/19 from 4,700 feet to 6,009 feet; installed high intensity lights; and built a large hangar, ten T-Hangars and a terminal building between 1949 and 1952. In 1952 commercial air service for San Luis Obispo County began, with Southwest Airways serving the area, became Pacific Airlines, and later yet merged into Hughes Air West. This service continued until 1974.
- On May 7, 1973, the County of San Luis Obispo sold the airport to the City of Paso Robles for $1.00. At that time the County was unable to derive enough income to support the cost of running the airport. The City subdivided unused land into 81 parcels for commercial development. The City formed an all-volunteer Fire, Crash and Rescue Department to serve the airport and the surrounding area. The City took over the water wells and the sewer treatment plant from the State to serve both the Airport and the Youth Authority. In 1973 there were four businesses employing 22 people on the airport. Today the Paso Robles Municipal Airport houses almost 40 businesses, employing over 700 people.

Lower Salinas - Paso Robles Area Watershed

Watershed Heath by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
Salinas River	Intermittent Perennial	Yes, Sodium and Chloride	Undetermined	Not assessed
Asuncion	Undetermined	Not assessed	Undetermined	Not assessed
Bethel School	Undetermined	Not assessed	Undetermined	Not assessed
Cienega Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Fern Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Graves Creek	Undetermined	Not assessed	Undetermined	**Upper**: Spring: 0.64 cfs. Summer: 0.28 cfs.
Lower Paso Robles Creek	Undetermined	Not assessed	Undetermined	Spring: 2.3 cfs. Summer: 0.7 cfs
Lower San Marcos Creek	Undetermined	Not assessed	Undetermined	Not assessed
Mustard Creek	Undetermined	Not assessed	Undetermined	Not assessed
Neals Spring	Undetermined	Not assessed	Undetermined	Not assessed
San Francisco Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Santa Rita Creek	Undetermined	Not assessed	Undetermined	Spring: 1.22 cfs. Summer: 0.43 cfs.
Sheepcamp Creek	Undetermined	Not assessed	Undetermined	Not assessed
Summit Creek	Undetermined	Not assessed	Undetermined	Not assessed
Templeton	Undetermined	Not assessed	Undetermined	Not assessed
Upper Paso Robles Creek	Undetermined	Not assessed	Undetermined	Not assessed
Upper San Marcos Creek	Undetermined	Not assessed	Undetermined	Not assessed
McKay	Undetermined	Not assessed	Undetermined	Not assessed
Mahoney Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Lower Vineyard Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Salinas River	Undetermined	Yes, for Sodium and Chloride	Undetermined	Not assessed

Lower Salinas - Paso Robles Area Watershed

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield (Master Water Report)	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
Paso Robles	97,700 AF	Physical Limitations, Water Rights, Water Quality Issues(Carollo, 2012).	Yes; see description below.	None (CCRWQCB, 2011

Groundwater Quality Description:

Paso Robles Groundwater Basin: The predominant cations are calcium and sodium and the predominant anion is bicarbonate (DWR 1981; Fugro West, 2001b). Analysis of 48 public supply wells in the subbasin show an average Total Dissoved 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 drinking water standards. The maximum contaminant level (MCL) for nitrate was exceeded in 4 samples (Fugro West, 2001b). Water quality trends indicate an increasing concentration of TDS and chloride in the deep, historically artesian aquifer northeast of Creston (Carollo, 2012).

Another major problem is the unpredictable occurrence of hydrogen sulfide in the ground water (DWR, 1981).

Increasing amounts of total dissolved solids and chlorides near San Miguel. Increasing nitrates in the Paso Robles Formation in the area south of San Miguel. High nitrates and arsenic, presence of gross alpha emitters (SLO County Public Works Master Water Report, 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
Salinas River 303(d) listed for sodium, chloride		Carollo, 2012
Steelhead passage	Several tributaries and the	50 CFR *226* - National Marine

	Salinas are designated critical habitat which must be considered in planning water uses.	Fisheries Service - NOAA

Groundwater: Paso Robles Groundwater Basin

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:

Regional Board Salt Balance Study – define the need and methods of salt reduction

Huer Huero Creek Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Salinas 9	Salinas/ Estrella WPA 14	103,496 acres	Salinas River – to Pacific Ocean (Monterey Bay National Marine Sanctuary)	Paso Robles	County of San Luis Obispo, Creston (ptn),City of Paso Robles (ptn.), Los Padres National Forest

Description:

The Huer Huero watershed is located in the eastern portion of San Luis Obispo's North County region. The Huer Huero creek is an ephemeral underground stream which flows to directly to the Salinas River. The headwaters occur in the Coast Ranges, south of Creston and reach elevations of approximately 3312 feet. The confluence of the Huer Huero with the Salinas River occurs in Paso Robles. The dominant land use in the watershed is agriculture, with vineyards comprising a large percentage. The watershed is divided into two main drainages, the Upper Huer Huero and the Lower Huer Huero. Highway 41 East bisects the watershed. A portion of the Los Padres National Forest is located in the southeast portion of the watershed and contains the highest elevations in the watershed.

Watershed Plans:

No existing plans to date

Huer Huero Creek Watershed

Characteristics:

	Physical Setting	
	Rainfall	Average Annual: 13-18 in. (north portion), 18-24 in. (south portion) (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	Huerto Creek, Union School, Dry Canyon, Jackson and Reinhert Ranch and East Branch Huer Huero Creek sub-watersheds are composed of flat highly infiltrative Quaternary material – Category #3. Grassy sub-watershed is moderate steep moderately infiltrative early to mid-Tertiary headwaters and flat highly infiltrative Quaternary inland – Category #7. Wilson Canyon and the Middle and West Branches of Huer Huero Creek are moderately infiltrative early ot mid-Tertiary headwaters with flat Quaternary highly infiltrative valleys – Category #12 (Bell, pers. comm., 2013). Groundwater is found in Holocene age alluvium and the Pleistocene age Paso Robles Formation. Specific yield values in the Paso Robles Subbasin 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 subbasin 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. The Pleistocene age Paso Robles Formation, which is the most important source of groundwater in the subbasin, 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).

Huer Huero Creek Watershed

	Hydrology	
	Stream Gage	Yes; USGS 11147600 (Huer Huero Creek at Geneseo Road) (USGS, data last recorded in 1972, viewed August 2013)
	Hydrology Models	Yes; SLO County Flood Control and Water Conservation District, 2008, Paso Robles Groundwater Subbasin Water Banking Feasibility Study.
	Peak Flow	13,800 cfs (USGS, 1959-72, viewed August 2013) *Data last recorded in 1972*
	Base Flow	5.86 cfs (USGS, 1959-72, viewed August 2013) *Data last recorded in 1972*
	Flood Reports	No source identified
	Flood Control Structures	Bridges: 1 over Quail Creek on Creston Road; 8 on Huer Huero Creek on Creston Road, Old Donovan Road (3), Union Road (2), Linne Road, River Road (2); 1 over Dry Creek on Union Road (PWD Bridges GIS Layer)
	Areas of Flood Risk	San Luis Obispo County has identified several areas along Huer Huero Creek that are known flood hazards • All areas along Huer Huero Creek • The area south of the airport from Dry Creek • The area along Linne Road (City of Paso Robles, 2005)
	Biological Setting	
	Vegetation Cover	Primarily non-native annual grassland, cropland, and mixed chaparral including buck brush and chamise-redshank chaparral, (mainly continuous chamise) blue oak-foothill pine woodland, as well as, continuous blue oak woodland, orchards, vineyards, and nurseries. (SLO County vegetation shapefile, 1990) *Data limited by age of shapefile* Valley oak savanna is present, and wetlands, vernal pools, and riparian habitats also occur in this watershed. Huerhuero Creek is a dry wash in most locations. Flows are ephemeral. The sandy bed typically supports scattered shrubs and trees, and provides appropriate habitat for several native reptiles during the dry season (Althouse and Meade, 2013). *Data limited to observations, not complete inventory*
	Invasive Species	Silverleaf horsenettle (*Solanum elaeagnifolium*) is known from a small patch on the side of Highway 58 near Huerhuero Road. Tree of heaven (*Ailanthus altissima*) is widespread. Medusahead (*Elymus [=Taeniatherum] caput-medusae*) is known from rangelands in Paso Robles. Other invasive species may be present (Althouse and Meade, 2013). *Data limited to observations, not complete inventory*

Huer Huero Creek Watershed

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 (CNDDB, 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 RANCH**	**CRESTON**	**ESTRELLA**	**PASO ROBLES**	**SANTA MARGARITA**	**SHANDON**	**SHEDD CANYON**	**TEMPLETON**	**WILSON CORNER**
					Animals					
American badger	SSC	x						x		x
golden eagle	FP				x					
prairie falcon	SA		x	x			x	x		
San Joaquin kit fox	FE; ST				x			x	x	
silvery legless lizard	SSC									x
Swainson's hawk	ST		x	x			x	x		
vernal pool fairy shrimp	FT		x	x	x					
western pond turtle	SSC							x		x
western spadefoot	SSC		x			x		x		x
					Plants					
chaparral ragwort	CRPR 2B.2							x		x
dwarf calycadenia	CRPR 1B.1	x	x							
Hardham's evening-primrose	CRPR 1B.2					x				x
hooked popcornflower	CRPR 1B.2									x
La Panza mariposa-lily	CRPR 1B.3					x		x		x
pale-yellow layia	CRPR 1B.1									x
San Luis Obispo owl's-clover	CRPR 1B.2				x					
shining navarretia	CRPR 1B.2		x		x	x		x		

Huer Huero Creek Watershed

Special Status Species	Status	CAMATTA RANCH	CRESTON	ESTRELLA	PASO ROBLES	SANTA MARGARITA	SHANDON	SHEDD CANYON	TEMPLETON	WILSON CORNER
spreading navarretia	FT		x					x		
straight-awned spineflower	CRPR 1B.3					x				
yellow-flowered eriastrum	CRPR 1B.2					x				x

Steelhead Streams	1982 DFG memo listed Huerhuero Creek as having a historical steelhead run (DFG 1982a, CEMAR). Staff from DFG consider Huerhuero Creek as lacking suitable *O. mykiss* habitat due to the seasonal nature of flows (Hill pers. comm., 2013).
Stream Habitat Inventory	None
Fish Passage Barriers	None Identified
Designated Critical Habitat	Yes; Vernal Pool Fairy Shrimp (USFWS Critical Habitat Mapper viewed 2013)
Habitat Conservation Plans	Yes; North San Luis Obispo County Habitat Conservation Programs – multiple species *HCP for North County not Watershed specific*
Other Environmental Resources	Paso Robles Groundwater Basin
Land Use	
Jurisdictions & Local Communities	County of San Luis Obispo, City of Paso Robles (ptn), Community of Creston
% Urbanized	4.5% Residential Rural; 3.5% City of Paso Robles; Less than 1% each Commercial Retail, Public Facility, Residential Suburban, Residential Single Family
% Agricultural	67.3%; row crops, vineyards, fields and rangeland
% Other	17.8% Rural Lands; 5.7% Open Space
Planning Areas	El-Pomar/Estrella & Shandon-Carrizo Planning Areas
Potential growth areas	City of Paso Robles, Creston (SLO County, 2013)
Facilities Present	California Youth Authority, Paso Robles Airport & associated Wastewater treatment plant

Huer Huero Creek Watershed

	Commercial Uses	Creston Sand and Gravel Pit owned by Union Asphalt; Agriculture, retail, service providers
	Demographics	
	Population	5,894 in watershed (US Census Blocks, 2010)
	Race and Ethnicity	Watershed: 80.9% Caucasian; 14.2% Latino; 2.4% Mixed Race; 1.1% Asian; Less than 1% each African American, American Indian and Pacific Islander (US Census Blocks, 2010) Paso Robles: 77.7% Caucasian; 34.5% Hispanic; 3.9% Mixed Race; 2.1% Black or African American; 2% Asian; 0.2% Pacific Islander (US Census, 2010) 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)
	Income	MHI $59,006 in watershed (US Census Tracts, 2010) (interpolated from 4 tracts which include multiple watersheds) MHI $ 85,357 in Creston (US Census, 2010) MHI $ 72, 991 in Paso Robles (US Census, 2010)
	Disadvantaged Communities	No (DWR); 10.2% of individuals are below poverty level in Paso Robles (US Census, 2007-2011); 0% of individuals are below poverty level in Creston (American Community Survey, 2007-2011)
	Water Supply	
	Water Management Entities	City of Paso Robles, outlying areas served by Individual wells
	Groundwater	Paso Robles Basin
	Surface Water	No public reservoirs.
	Imported Water	Nacimiento Pipeline
	Recycled/Desalinated Water	None
	Key groundwater percolation area(s)	No full watershed study identified – One area identified as East Branch Huer Huero Creek direct recharge area (Paso Robles Groundwater Subbasin Water Banking Feasiblity Study, 2008).
	Water budget	Yes; Todd Engineers, 2013 for Paso Robles Groundwater Subbasin Update
	Water Uses	
	Beneficial Uses	*Huer Huero Creek* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water

Huer Huero Creek Watershed

		Recreation (REC-2), Wildlife Habitat (WILD), Warm Freshwater habitat (WARM), Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
	Other Unique Characteristics	
	Historical Resources	Creston Cemetery (La Panza Road, Creston-Intersection of CA State Hwys 41 and 229); Creston Community Church (6265 Adams Street, Creston), Rinconada School (located in Chandler Ranch-Fontana & Linne Road, Paso Robles), Chandler House (Webster), Linne School (Creston & Stagecoach Road, Creston)(PLN_DES_HISTORIC_POINTS GIS Layer)
	Climate Change Considerations	
		See IRWMP, 2014 Section H, Climate Change *Data is general for County, not Watershed specific.*

Watershed Codes

Calwater/DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic sub-Area Name	SRWCB Number	CDF Super Planning	CDF Watershed Name
3309.811501	-	Paso Robles	-	Atascadero	309.81	Upper Huerhuero Creek	East Branch Huer Huero Creek
3309.811502	-	Paso Robles	-	Atascadero	309.81	Upper Huerhuero Creek	Middle Branch Huer Huero Creek
3309.811503	8	Paso Robles	1	Atascadero	309.81	Upper Huerhuero Creek	Grassy
3309.811504	-	Paso Robles	-	Atascadero	309.81	Upper Huerhuero Creek	West Branch Huer Huero Creek
3309.811505	-	Paso Robles	-	Atascadero	309.81	Upper Huerhuero Creek	N. of Creston
3309.811506	0	Paso Robles	0	Atascadero	309.81	Upper Huerhuero Creek	Wilson Canyon
3309.811601	8	Paso Robles	1	Atascadero	309.81	Lower Huerhuerto Creek	Jackson and Reinhert Ranch
3309.811602	8	Paso Robles	1	Atascadero	309.81	Lower Huerhuerto	Geneseo

						Creek	
3309.811603	8	Paso Robles	1	Atascadero	309.81	Lower Huerhuerto Creek	Dry Canyon
3309.811604	8	Paso Robles	1	Atascadero	309.81	Lower Huerhuerto Creek	Union School
3309.811605	8	Paso Robles	1	Atascadero	309.81	Lower Huerhuerto Creek	El Pomar
3309.811606	8	Paso Robles	1	Atascadero	309.81	Lower Huerhuerto Creek	Huerto Creek
3309.811607	8	Paso Robles	1	Atascadero	309.81	Lower Huerhuerto Creek	Ryan
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

Excerpts from a California Genealogy & History Archive recall these historic conditions of the Huer Huero. (A Memorial and Biographical History of the Counties of Santa Barbara,San Luis Obispo, and Ventura, California, 1891).

- 1842 – Rancho Huerhuero – a 15,685 acre Mexican land grand given by Governor Juan Alvarado to Jose Mariano Bonilla. The rancho was composed of lands formerly a part of Mission San Miguel Arcangel.
- 1844 – Ranch Santa Ysabel (Arce) – 17,774 acre Mexican land grant by Governor Manuel Micheltorena to Francisco Arce.
- 1846 – Three square leagues given to Ranch Huerhuero by Governor Pio Pico.
- 1884 – The Huerhuero ranch was sold to Flint, Bixby & Co. who divide and sell the land. The town of Creston is founded.
- 1886 – Chauncey Hatch Phillips bought Ranch Santa Ysabel and subdivided it to be sold as farm lots to individuals ready to settle in the area being opened up by the arrival of the railroad.

Southeastward from the old Mission of San Miguel, the valley of the Estrella Creek stretches toward the mountains dividing San Luis from Kern County. This large tract remained unoccupied and useless for decades, save as grazing ground for a few cattle and sheep. Up to the 1870's it was regarded as a portion of some Mexican grant; then the discovery was made that this was Government land, open to settlement, and, while bare in appearance, of great fertility of soil, and well adapted to agriculture. Thus a rapid immigration set in, settlements were made, schoolhouses built, and a vast change effected. Good crops were had in 1876 and 1878, and by 1880 at least forty families had settled upon this wide and fertile tract. In 1887 the total acreage in wheat and barley, from Santa Margarita on *the south to San Miguel on the north, and from Paso de Robles to Sheid's, was 8,625 acres, of which thirteen-sixteenths was wheat. The land here is a rich, sandy loam, sparsely covered with nutritious grasses, and with live-oak and white-oak trees scattered at intervals. Water is had at an average depth of thirty feet…*

… The Huer-Huero adjoins the Santa Ysabel and the Eureka on the east. It comprises 8,000 acres of valley, 23,000 acres of level and rolling farming lands, and 15,000 acres of hill grazing lands. In two years, 34,000 acres were sold to settlers, mostly of wealth and position, and the region is thickly settled. Wheat, olives, fruit and vines have been planted. About 12,000 acres of this rancho are still unsold…

… As an evidence of progress, the development of the Huer-Huero may be cited. This tract of land, comprising about 48,000 acres, was regarded as an exhausted sheep range, and less than four years ago was sold at $3 an acre. Mr. J. V. Webster, an experienced horticulturist of Alameda County, purchased a large area and soon commenced its cultivation. At the county fair, in the middle of October, 1888, he exhibited from the land grapes of the most choice varieties in large bunches. Also fig and peach trees of six feet growth in the last six months; samples of amber sugar cane, yielding at the rate of 144,000 pounds per acre, and sorghum at the rate of 175,000 pounds per acre. Ho also exhibited hops of exceedingly thrifty and rich growth, flax of good quality, melons, squashes and a great variety of products grown without irrigation, but with good cultivation…

- On September 3, 1942 construction began on the Airfield, which was to be used as a Marine Corps Bomber Base. On April 8, 1943, the field was dedicated as Estrella Army Airfield to be used by the Army Air Corps. Estrella Army Airfield consisted of 1259 acres of land, two 4,700-foot long runways, an operations building and a small, three bay fire station.
- The Marine Corps Units occupied buildings to the west, across Airport Road in what is now the California Youth Authority. On August 29, 1947 the Federal Government transferred 1,057 acres to the County of San Luis Obispo to be used as a commercial airport, and 202 acres and buildings to the State of California to be used as a Correctional Facility.
- The County of San Luis Obispo extended runway 01/19 from 4,700 feet to 6,009 feet; installed high intensity lights; and built a large hangar, ten T-Hangars and a terminal building between 1949 and 1952. In 1952 commercial air service for San Luis Obispo County began, with Southwest Airways serving the area, became Pacific Airlines, and later yet merged into Hughes Air West. This service continued until 1974.
- On May 7, 1973, the County of San Luis Obispo sold the airport to the City of Paso Robles for $1.00. At that time the County was unable to derive enough income to support the cost of running the airport. The City subdivided unused land into 81 parcels for commercial development. The City formed an all-volunteer Fire, Crash and Rescue Department to serve the airport and the surrounding area. The City took over the water wells and the sewer treatment plant from the State to serve both the Airport and the Youth Authority. In 1973 there were four businesses employing 22 people on the airport. Today the Paso Robles Municipal Airport houses almost 40 businesses, employing over 700 people.

Watershed Health by Major Tributary

Huer Huero Creek Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	**Pollution Sources** NP (non-point) MP (Major Point)	Environmental Flows
Dry Canyon	Undetermined	Not assessed	Undetermined	Not assessed
East Branch Huer Huero Creek	Undetermined	Not assessed	Undetermined	Not assessed
Grassy	Undetermined	Not assessed	Undetermined	Not assessed
Huerto Creek	Undetermined	Not assessed	Undetermined	Not assessed
Jackson and Reinhert Ranch	Undetermined	Not assessed	Undetermined	Not assessed
MIddle Branch Huer Huero Creek	Undetermined	Not assessed	Undetermined	Not assessed
Union School	Undetermined	Not assessed	Undetermined	Not assessed
West Branch Huer Huero Creek	Undetermined	Not assessed	Undetermined	Not assessed
Wilson Canyon	Undetermined	Not assessed	Undetermined	Not assessed

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 RCS, 2011)	Physical limitations, water rights and water quality issues (Carollo, 2012).	Yes; see description below.	None (CCRWQCB, 2011)

Groundwater Quality Description: Paso Robles Groundwater Basin - The predominant cat ions are calcium and sodium and the predominant anion is bicarbonate (DWR, 1981; Fugro West, 2001b). Analyses 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 (Fugro West, 2001b). Trends show an increasing concentration of nitrate between the Salinas and Huer Huero rivers in two locations; north of Highway 46 and south of San Miguel (Fugro West, 2001b).

Increasing nitrates and chloride in the Paso Robles Formation in the area of Highway 46 between the Salinas River and Huer Huero Creek (SLO County Flood Control and Water Conservation District, 2008).

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

Groundwater: Paso Robles Groundwater Basin

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.

Huer Huero Creek Watershed

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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Huer Huero Creek Watershed

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Significant Studies in Progress:

None identified

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 northeastern San Luis Obispo County. 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 at 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

Estrella River Watershed

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	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 – Category #3. Upper Ranchito Canyon which is moderate steep moderately infiltrative early to mid-Tertiary headwaters with flat highly infiltrative Quaternary inland – Category #7. Quail Water Creek is steep moderately infiltrative early to mid-Tertiary headwaters with flat pre Quaternary moderately infiltrative valley – Category #11 (Bell, pers. comm., 2013). 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. Paso Robles Formation. Pleistocene age Paso Robles Formation, which is the most important source of groundwater in the subbasin, 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).

Estrella River Watershed

	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	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) *Data limited by age of shapefile* 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). *Data limited to observations, not complete inventory*
	Invasive Species	European starling, English sparrow, wild pig are in most watersheds in North County. Perennial pepperweed (*Lepidium latifolium*) known from San Miguel near Estrella River confluence, first reported County occurrence was in this region. The following species were identified in Cross Canyon subwatershed in 2009: Russian olive (*Eleagnus angustifolia*), Cardoon (*Cynara cardunculus*) The following species were identified in Estrella River (mile 9-11) subwatershed in 2008: Tree of heaven (*Ailanthus altissima*), Tamarisk (*Tamarix* sp.), Rush skeleton weed (*Chondrilla juncea*), Medusahead (*Elymus [=Taeniatherum] caput-medusae* (Althouse and Mead, 2013). *Data limited to observations, not complete inventory*

Estrella River Watershed

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 (CNDDB, 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														
American badger	SSC	x	x								x	x		x
bank swallow	ST			x							x			
Nelson's antelope squirrel	ST										x			
pallid bat	SSC				x			x		x			x	
prairie falcon	SA	x	x	x	x	x	x			x	x	x	x	x
San Joaquin kit fox	FE; ST		x				x				x	x		
San Joaquin pocket mouse	SA		x						x		x			x
silvery legless lizard	SSC													x
Swainson's hawk	ST				x		x				x	x		
Tulare grasshopper mouse	SSC			x							x			
western pond turtle	SSC										x			
western spadefoot	SSC						x							
Plants														
delicate bluecup	CRPR 1B.3												x	
Hardham's evening-primrose	CRPR 1B.2		x											
Jared's pepper-grass	CRPR 1B.2						x		x					
Kellogg's horkelia	CRPR 1B.1								x					
La Panza mariposa-lily	CRPR 1B.3		x											x
Lemmon's jewel-flower	CRPR 1B.2								x					x
oval-leaved snapdragon	CRPR 4.2						x		x					
round-leaved filaree	CRPR 1B.1		x				x		x					

Estrella River Watershed

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
shining navarretia	CRPR 1B.2								x					
Temblor buckwheat	CRPR 1B.2										x			
yellow-flowered eriastrum	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	Estrella River, Paso Robles Groundwater Basin, San Andreas Fault Zone. (SLO County Flood Control and Water Conservation District, 2007) Tree species such as blue oak (*Quercus douglasii*) and valley oak (*Quercus lobata*) dominate the oak woodland, while western sycamore (*Platanus racemosa*), Fremont's cottonwood (*Populus fremontii*) and willows (*Salix spp.*) 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. 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).
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)

Estrella River Watershed

% 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	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) 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) 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)
Income	MHI $66,966 in watershed (US Census, 2011) (includes Cholame Creek, Lower San Juan Creek and Huer Huero Creek watersheds) MHI $65,260 in Shandon (US Census, 2010) MHI $85,357 in Creston (US Census, 2010)
Disadvantaged Communities	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) 19.1% of individuals are below poverty level in Shandon (US Census, 2010) 0% of individuals are below poverty level in Creston (US Census, 2010)
Water Supply	
Water Management Entities	Green River Mutual Water Company (Whitley Gardens); County Service Area (CSA) No. l6 (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)

Estrella River Watershed

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	*Estrella* - 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 *Data is general to county, not Watershed specific*

Watershed Codes

Calwater/DWR 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

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

Estrella River Watershed

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 n 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	Undermined	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	

Watershed Health by Major Groundwater Basin

Estrella River Watershed

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 Huero 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

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

Cholame Creek Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Estrella 17	Cholame WPA 15	151,701 acres total with 47,300 acres in San Luis Obispo County	Estrella River– to Salinas River and Pacific Ocean (Monterey bay National Marine Sanctuary)	Paso Robles	County of San Luis Obispo, Shandon (ptn)


Photo: Althouse and Meade

Existing Watershed Plans:

No existing plans to date

Description:

The Cholame Watershed is located in the North easterly portion of San Luis Obispo County and crosses the county line entering Monterey County to the North. 47,300 acres of the total 151,701 acres are located in SLO County. The watershed is drained by Cholame Creek and its tributaries southeastward and westward into the Estrella River (a tributary to the Salinas River) with the confluence of the Estrella River and Cholame Creek occurring at the town of Shandon. The Cholame Creek watershed is a lightly-populated rural setting and drains into an alluvial valley and surrounding mountains within an ecosystem characterized of grassland, chaparral, oak woodland, and sagebrush and minor amounts of cropland, primarily consisting of grain or hay crops. The dominant land use is agriculture. The area around Shandon 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. The highest watershed elevation within the County limits is at approximately 2,476-feet with the lowest elevation occurring at approximately 1,017-feet. The watersheds headwaters are in Diablo Range in Monterey County.

Cholame Creek Watershed

Characteristics

	Physical Setting	
	Rainfall	Average Annual: 11-14 in. (NRCS shapefile, 2010)
	Air Temperature	Summer Range (August 1990-2012): 53°-96°F Winter Range (December 1990-2012): 32°-60°F (Parkfield, not in Watershed, NOAA National Climatic Data Center, viewed 2013)
	Geology Description	Hopper Canyon and Palo Prieto Canyon sub-watersheds are composed of flat highly infiltrative Quaternary material – Category #3. Cholame Valley sub-watershed is moderate steep moderately infiltrative early to mid-Tertiary headwaters with flat highly infiltrative Quaternary inland – Category #7. Blue Point and Red Rock Canyon are steep moderately infiltrative early to mid-Tertiary geologic materials – Category #8 (Bell, pers. comm., 2013). 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. 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 gallons per minute. Groundwater in Holocene alluvium is mostly unconfined. The 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. This formation reaches a thickness of 2,000 feet and groundwater within it is generally confined (Chipping 1987). The Rinconada fault zone forms a leaky barrier that restricts flow from the Atascadero portion of the subbasin to the main part of the Paso Robles Subbasin (Fugro West 2001a). The San Andreas fault restricts subsurface flow (Ca. Dept. of Water Resources, 2003).

Cholame Creek Watershed

	Hydrology	
	Stream Gage	Yes; USGS 11147800 (Cholame Creek near Highway 41)(USGS, viewed August 2013) *Last data recorded in 1973*
	Hydrology Models	Yes; CCRWQCB. 2011. Synthetic flow record to determine Pathogen TMDL; SLO County Flood Control and Water Conservation District, 2008, Paso Robles Groundwater Sub-basin Water Banking Feasibility Study. *Limited Information for Cholame Valley Basin, Study area is Paso Subbasin as a whole*
	Peak Flow	750 cfs (USGS, 1959-73) (USGS, viewed August 2013).
	Base Flow	5.79 cfs (USGS, 1959-1972) (USGS, viewed August 2013).
	Flood Reports	No source identified
	Flood Control Structures	Bridges: 2 over Cholame Creek on Cholame Valley Road and N. Bitterwater Road (PWD Bridges GIS Layer)
	Areas of Flood Risk	No data available
	Biological Setting	
	Vegetation Cover	Primarily non-native annual grassland with cropland, blue oak-foothill pine consisting mainly of blue oak, coastal scrub consisting mainly of California sagebrush, montane hardwood consisting mainly of oak (SLO County vegetation shapefile, 1990). *Data limited by age of shapefile* Wetlands, perennial grasslands, and riparian woodland are also present in this watershed (Althouse and Meade, 2013). There is a great diversity of plant communities including Central Coast Scrub, Serpentine Scrub, Coast Live Oak Woodland, and Central Coast Cottonwood-Sycamore Riparian Forest in addition to vast areas of non-native grassland. (U.S. Department of Transportation, 2006) *Data limited to observations, not complete inventory*
	Invasive Species	Invasive species known to occur in this watershed include: Tree of Heaven (*Ailanthus altissima*), Tamarisk (*Tamarix* spp.), Russian knapweed (*Acroptilon repens*), Russian thistle (*Salsola tragus*) (Althouse and Mead, 2013). *Data limited to observations, not complete inventory*
	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 (CNDDB, viewed August, 2013) Locations listed refer to USGS 7.5' quadrangle names. Only the portion overlapping the watershed boundary was considered.

Cholame Creek Watershed

Data limited to observations, not complete inventory

Special Status Species	Status	CHOLAME	CHOLAME HILLS	CHOLAME VALLEY	CURRY MOUNTAIN	GARZA PEAK	ORCHARD PEAK	PARKFIELD	SMITH MOUNTAIN	STOCKDALE MTN	TENT HILLS	THE DARK HOLE
		Animals										
American badger	SSC	x										x
bank swallow	ST	x										
burrowing owl	SSC (Burrow sites, some wintering sites)	x					x					
California red-legged frog	FT						x				x	
California tiger salamander	FT; ST		x	x			x					
coast horned lizard	SSC	x		x			x					
giant kangaroo rat	FE; SE	x										
grasshopper sparrow	SSC (Nesting)	x										
mountain plover	SSC (Wintering)	x		x								
Nelson's antelope squirrel	ST										x	
pallid bat	SSC	x	x		x		x	x		x		
prairie falcon	SA (Nesting)	x	x	x	x	x	x	x	x	x	x	x
San Joaquin kit fox	FE; ST	x		x								
San Joaquin whipsnake	SSC	x										
silvery legless lizard	SSC	x										
Tulare grasshopper mouse	SSC	x					x					
western pond turtle	SSC	x						x				
western spadefoot	SSC		x	x			x					
		Plants										
delicate bluecup	CRPR 1B.3									x		
Eastwood's buckwheat	CRPR 1B.3				x			x				
Hall's tarplant	CRPR 1B.1	x		x							x	x
Hernandez spineflower	CRPR 1B.2		x									
Indian Valley bush-mallow	CRPR 1B.2									x		
Lemmon's jewel-flower	CRPR 1B.2	x					x				x	

Cholame Creek Watershed

Species	Status	CHOLAME	CHOLAME HILLS	CHOLAME VALLEY	CURRY MOUNTAIN	GARZA PEAK	ORCHARD PEAK	PARKFIELD	SMITH MOUNTAIN	STOCKDALE MTN	TENT HILLS	THE DARK HOLE
Mason's neststraw	CRPR 1B.1	x		x								
Munz's tidy-tips	CRPR 1B.2	x										
oval-leaved snapdragon	CRPR 4.2	x		x			x				x	
pale-yellow layia	CRPR 1B.1			x			x				x	
Panoche pepper-grass	CRPR 1B.2						x					
round-leaved filaree	CRPR 1B.1	x										
shining navarretia	CRPR 1B.2	x										
showy golden madia	CRPR 1B.1	x		x			x				x	x
straight-awned spineflower	CRPR 1B.3	x										
Temblor buckwheat	CRPR 1B.2						x	x			x	

Steelhead Streams	None (CNDDB Database. Viewed 2013)
Stream Habitat Inventory	No source identified
Fish Passage Barriers	None (PAD Database viewed 2013)
Designated Critical Habitat	Yes; California Red-legged Frog, California Tiger Salamander Area (USFWS Critical Habitat Portal, viewed 2013)
Habitat Conservation Plans	Yes; North San Luis Obispo County Habitat Conservation Program, multiple species *HCP for North County as a whole, not watershed specific*
Other Environmental Resources	Paso Robles Groundwater Basin (SLO County Flood Control and Water Conservation District, 2007)
Land Use	
Jurisdictions & Local Communities	County of San Luis Obispo, Shandon
% Urbanized	1.4% (Commercial Service, Rural Residential, Rural Suburban, Rural Single Family) (SLO County LUC)
% Agricultural	98.4%, (SLO County LUC)
% Other	0%
Planning Areas	Shandon – Carrizo Planning Area
Potential growth areas	Shandon

Cholame Creek Watershed

	Facilities Present	None identified
	Commercial Uses	Agriculture
	Demographics	
	Population	74 in watershed (US Census Block, 2010)
	Race and Ethnicity	Watershed: 63.5% Caucasian; 35.1% Latino; 1.4% Other (US Census Block, 2010) 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)
	Income	MHI $66,966 in watershed (tract spans 6 watershed) (U.S. Census Tract, 2010). MHI $65,260 in Shandon (US Census, 2010)
	Disadvantaged Communities	No; 4% of individuals below poverty level in watershed (U.S. Census Tract, 2010) (tract spans 6 watershed). 19.1% of individuals are below poverty level in Shandon (US Census, 2010)
	Water Supply	
	Water Management Entities	County Service Area (CSA) No. l6 (Shandon); outlying properties served by individual wells - Depths of wells ranged from 100 to 665 feet (Carollo, 2012)
	Groundwater	Yes; Paso Robles and Cholame Valley Basins Cholame Basin: Subsurface groundwater inflow and outflow has been reported to occur through the Paso Robles Formation (Bader 1969)(Ca. Dept. of Water Resources, 2003).
	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)
	Recycled/ Desalinated Water	None
	Key groundwater percolation area(s)	No data on key areas identified Natural recharge in the basin is derived from infiltration of precipitation, seepage from streams, and return flow from irrigation and other uses (Ca. Dept. of Water Resources, 2003)
	Water budget	Yes; Todd Engineers, 2013, for Paso Robles Groundwater Subbasin Update

Cholame Creek Watershed

	Water Uses	
	Beneficial Uses	*Cholame Valley* - 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), Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM) (CCRWQCB, 2011)
	Other Unique Characteristics	
	Cholame Creek	Cholame Valley and the large alkali salt flat in the area offer unique habitat to specialized plant species. A unique natural community known as valley sink scrub exists in the watershed. Characterized by low, open succulent shrublands dominated by alkali tolerant plant species such as frankenia (*Frankenia salina*), spear oracle (*Atriplex patula*), wedge scale (*Atriplex truncata*), alkali weed (*Cressa truxillensis*) and saltgrass (*Districhlis spicata*). Valley scrub soil are typically dark, sticky clay soils that often have a brilliant white salty crust over them. Grazing has altered much of this community where non-native grasses now dominate much of the Cholame Valley floor.
	Palo Prieto Canyon	Located at an important crossroads for San Joaquin kit fox populations of the the Carrizo Plain, the Ciervo-Panoche, and the Salinas River Valley. Properties contain a natural lake (sag pond), Grant Lake, and numerous small vernal and seasonal ponds and pools. Wetlands support rare amphibians, crustaceans and flora. Sag ponds historically habitat for California tiger salamander, Western spadefoot toad and California toad.
	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 for the San Joaquin kit fox, Western burrowing owl and other wildlife species, and serve as important corridors for wildlife movement. 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 *Data is general to County, not Watershed specific*

Watershed Codes

Cholame Creek Watershed

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Number	CDF Super Planning	CDF Watershed Name
3317.000903	0	Undefined	0	Undefined	317.00	Cholame	Blue Point
3317.000904	0	Undefined	0	Undefined	317.00	Cholame	Cholame Valley
3317.000503	0	Undefined	0	Undefined	317.00	Cholame	Hopper Canyon (ptn)
3317.000906	0	Undefined	0	Undefined	317.00	Cholame	Palo Prieto Canyon
3317.000902	0	Undefined	0	Undefined	317.00	Cholame	Red Rock Canyon
3317.000907	0	Undefined	0	Undefined	317.00	Cholame	West side Cholame Valley
3317.000905	0	Undefined	0	Undefined	317.00	Cholame	E. of Palo Preito Canyon
Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)							

Major Changes in the Watershed

- Historic junction where different Native American tribes have met to trade goods from their respective areas. Coastal tribes met with valley tribes and tribes of the Sierra Nevada to exchange food, materials for tools and ceremonial pieces.
- The Migueleno people, a subset of the Salinan cultural group, were the native residents project area. Because of the early impact on them by Spanish colonization beginning in 1769, ethnographic data is limited.
- The Salinan people are believed to have occupied the region for at least several thousand years. Population figures suggest that their numbers probably never surpassed 3,000. The eastern boundary, which followed summit of the Diablo Range, appears to have been somewhat fluid and shared with bands of the Southern Valley Yokut.
- 1844 – Rancho Cholame established. A 26,622 acre Mexican land grant given by Governor Manuel Micheltorena to Mauricio Gonzales from the holdings of Mission San Miguel Arcangel.
- 1867 – William Welles Hollister (1818-1886) purchased Rancho Cholame, sells to Edgar Jack in 1869 who uses it mainly as a sheep range.
- Cholame has long been an area of activity and a place to congregate for residents of the area. A post office was first established there on May 14, 1873.
- The Jack Ranch Café was built in 1923, serving locals and travelers alike. A clump of ailanthus (tree of heaven) trees marks the spot of the former Cholame-Orange schoolhouse.

Cholame Creek Watershed

- In November 1966, Howard Jack sold the 21,450 hectares (53,000 acres) Cholame Ranch to the Hearst Corp., which still owns and operates the Jack Ranch as it is commonly known.

Watershed Health by Major Tributary

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	**Pollution Sources** NP (non-point) MP (Major Point)	Environmental Flows
Blue Point	Undetermined	Not assessed	Undetermined	Not assessed
Cholame Valley	Perennial	Yes; Boron, Chloride, Electrical Conductivity, Escherichia coli (E. coli), Fecal Coliform, Low Dissolved Oxygen, Sodium	Grazing Related sources, Natural Sources, Source Unknown	Not assessed
Hopper Canyon (ptn)	Undetermined	Not assessed	Undetermined	Not assessed
Palo Prieto Canyon	Undetermined	Not assessed	Undetermined	Not assessed
Red Rock Canyon	Undetermined	Not assessed	Undetermined	Not assessed

Watershed Health by Major Groundwater Basin

Groundwater Basin	Estimated Safe Yield	**Water Availability Constraints** (Carollo, 2012)	Drinking Water Standard Exceedance	**Water Quality Objective Exceedance** (CCRWQCB, 2011)
Paso Robles	97,700 AF (SLO County, 2012)	Physical limitations, water rights and water quality	Yes; see description below.	None
Cholame Valley*	No data available	Physical limitations and water quality	None	None

Cholame Creek Watershed

**Last specific groundwater study in 1969.*

Groundwater Qualty 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 Huero rivers south of San Miguel (Fugro West, 2001b; Carollo, 2012)

Generally high concentrations of TDS, chlorides, sulfates, and boron were identified for the Cholame Valley Basin (Chipping, et al., 1993).

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
Limited groundwater quality information – Cholame Valley basin		Carollo, 2012
No yield information and limited hydrogeologic information for Cholame Basin		Carollo, 2012
Groundwater Quality	high concentrations of TDS, chlorides, sulfates, and boron	Carollo, 2012
Cholame Creek 303(d) listed for Boron, Chloride, Electrical Conductivity, Escherichia coli (E. coli), Fecal Coliform, Low Dissolved Oxygen, Sodium	Grazing Related sources, Natural Sources	Carollo, 2012

Paso Robles Groundwater Basin: 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

Nacimiento River Watershed

Hydrologic Unit Name	Water Planning Area	Acreage	Flows to	Groundwater Basin(s)	Jurisdictions
Salinas 9	Nacimiento WPA 16	237,886 acres total with 128,974 acres within San Luis Obispo County (includes 6,578 acres of San Antonio Watershed)	Salinas River (through Monterey County) to Pacific Ocean (Monterey Bay National Marine Sanctuary)	Paso Robles; Tierra Redonda Mountain (San Antonio watershed)	County of San Luis Obispo, Heritage Ranch, Oak Shores, Camp Roberts (ptn)

Description:

The Nacimiento River Watershed is located at the northern boundary of San Luis Obispo County with a few sub-watersheds located in Monterey County. For the purposes of this snapshot, only those sub-watersheds within SLO County are included in this data compilation. This watershed also contains 6,578 acres of land from the San Antonio Watershed, however, the area within the County is relatively small and best categorized with its neighboring Nacimiento Watershed for the purposes of this project. The Nacimiento Watershed contains Lake Nacimiento, the largest reservoir in San Luis Obispo County totaling 2.26 square miles. The highest elevation in the watershed occurs in the Santa Lucia Range, within the Los Padres National Forest, reaching approximately 3,560 feet above sea level. Lake Nacimiento supplies water to the Salinas Valley and, as of 2010, supplies supplemental water to some communities in San Luis Obispo County. The dominant land use is agriculture with a majority of land used for rural grazing activities.

Existing Watershed Plans:

San Antonio and Nacimiento Rivers Watershed Management Plan (MCWRA, 2008)

Nacimiento River Watershed

Characteristics

Physical Setting	
Rainfall	Average Annual: 11 in. (valley floor) - 41 in. (mountain) (NRCS shapefile, 2010)
Air Temperature	Summer Range (August 1990-2012): 49°-95°F Winter Range (December 1990-2012): 32°-62°F (Las Tablas Creek, NOAA National Climatic Data Center, viewed 2013)
Geology Description	Franklin Creek and Town Creek are steep Franciscan non-infiltrative headwaters with flat pre-Quaternary moderate infiltrative valleys – Category #1. Nacimiento Ranch sub-watershed is flat highly infiltrative Quaternary – Category #3. Oro Fino Canyon is moderate steep moderately infiltrative early to mid-Tertiary headwaters and flat highly infiltrative Quaternary inland – Category #6. Little Burnett Creek, Gould Creek, Bee Rock Canyon and Tobacco Creek have steep Franciscan non-infiltrative headwaters – Category #7. Las Tablas Creek is steep moderately infiltrative early to mid-Tertiary material – Category #8. Asbury Creek, Kavanaugh Creek and Pebblestone Creek are steep moderately infiltrative early to mid-Tertiary headwaters with flat pre-Quaternary moderately infiltrative valleys – Category #11. Turtle Creek, Gulch House Creek, Snake Creek, Nacimiento Reservior and Dip Creek have steep pre-Quaternary non-infiltrative headwaters – Category #13. Mile 7 to 11 Nacimiento River is moderately infiltrative early to mid-Tertiary headwaters with a flat Quaternary highly infiltrative valley – Category #14 (Bell, pers. comm., 2013). Paso Robles Formation and Vaqueros Formation are important for groundwater in the Nacimiento River watershed. Paso Roble Formation are mid to late Pliocene aged alluvial sediments. Early stream channels supplied sediment to the Nacimiento basin, allowing for the formation of sedimentary structures from mineral grains, and pebbles. (Chipping, 1987). Vaqueros Formation is well-developed east of Nacimiento and San Antonio Lakes. It is evidenced by bold sandstone and conglomerate outcroppings with beds of shale. The sandstone here is subject to cave formation due to the dissolution of calcareous cements. Lime Mountain has enough shell debris such that mine operations for liming materials is economically viable. The environment in which these fossils and associated Vaqueros materials were deposited is consistent with shallow tropical seas. Pancho Rico Formation is present near the Nacimiento Dam. It is considered to be the deep-water equivalent of the Santa Margarita Formation. The Pancho Rico contains Pliocene aged fossils and has been mapped up to 20

	feet thick in the Adelaida area (Chipping, 1987).
Hydrology	
Stream Gage	Yes; USGS 11149500 (near San Miguel); USGS 11149400 (Nacimiento Dam near Bradley); USGA 11148900 (Sapaque Creek near Bryson) (USGS, viewed August 2013)
Hydrology Models	Yes; Monterey County Water Resources Association. 2001. Hydrologic impact of Salinas Valley Water Project.
Peak Flow	Near Bryson: 57,600 cfs. (USGS, 1971-2012) Near Bradley: 8,110 cfs. (USGS, 1958-2012) (north of SLO County)
Base Flow	Bradley: 402 cfs. (USGS, viewed August 2013) (north of SLO County)
Flood Reports	No source identified
Flood Control Structures	Nacimiento River Dam Bridges: 4 over Las Tablas Creek on Klau Mine Road, Chimney Rock Road and Cypress Mountain Drive (2); 2 over Klau Creek on Cypress Mountain Drive (PWD Bridges GIS Layer)
Areas of Flood Risk	Nacimiento River and Canyon; Dip, Franklin, Las Tablas, Snake and Town Creeks; and Lake Nacimiento - Flood Hazard (FH). These water courses are identified as having potential flood hazards and development proposals must incorporate mitigation measures. All are natural drainage courses which should be maintained in their natural state with native vegetation and habitats retained. At Lake Nacimiento, the 800 foot elevation constitutes the lake's high water level and no habitable structures are permitted below the 825 foot elevation. (Heritage Ranch Village Plan, 2013)
Biological Setting	
Vegetation Cover	Primarily blue oak and foothill pine; chamise chaparral; coastal oak woodland with blue oak and coast live oak; blue oak woodland with non-native annual grassland; valley oak woodland with; coast live oak, foothill pine and valley oak; mixed chaparral consisting mainly of chamise and serpentine Manzanita; orchards, vineyards, and nurseries; and montane hardwood-conifer consisting mainly of coulter pine. (SLO County vegetation shapefile, 1990) *Data limited by age of shapefile* Grassland, scrub/shrub, mixed forest (MCWRA, 2008) Native perennial bunchgrasses occur within the watershed. Valley needlegrass grassland habitat occurs within the watershed; valley needlegrass grassland is designated as a sensitive natural community by the California Department of Fish and Wildlife (Althouse and Meade, Inc. 2006). Valley oak woodland occurs within the watershed, and is designated a sensitive natural community by the California Department of Fish and Wildlife (Althouse and Meade, 2013).

Nacimiento River Watershed

	Wetlands and riparian woodland are present in this watershed, and although their areal extent is small relative to the size of the watershed these habitats provide crucial ecosystem functions (Althouse and Meade, 2013). *Data limited to observations, not complete inventory*
Invasive Species	Bromus spp. (MCWRA, 2008) *Data limited to observations, not complete inventory*
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 (CNDDB, 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*

Species	**Status**	**ADELAIDA**	**ALDER PEAK**	**BEAR CANYON**	**BRADLEY**	**BRYSON**	**BURNETT PEAK**	**BURRO MOUNTAIN**	**CAPE SAN MARTIN**	**CONE PEAK**	**CYPRESS MTN**	**JOLON**	**LIME MTN**	**PASO ROBLES**	**PEBBLESTONE SHUT-IN**	**SAN MIGUEL**	**SAN SIMEON**	**TIERRA REDONDO MOUNTAIN**
								Animals										
American badger	SSC	x			x									x		x		
bald eagle	Federally Delisted; SE; FP				x							x	x					
Burrowing owl	SSC (Burrow sites, some wintering sites)				x											x		
California linderiella	SA											x						
California red-legged frog	FT										**x**		**x**					
California tiger salamander	FT; ST		x									x						
Coast Range newt	SSC								x									
ferruginous hawk	SA (Wintering)				x													
foothill yellow-legged frog	SSC							x										
golden eagle	FP				x													
hoary bat	SSC				x													
monarch butterfly	SA		x				x	x									x	

Nacimiento River Watershed

Species	Status	ADELAIDA	ALDER PEAK	BEAR CANYON	BRADLEY	BRYSON	BURNETT PEAK	BURRO MOUNTAIN	CAPE SAN MARTIN	CONE PEAK	CYPRESS MTN	JOLON	LIME MTN	PASO ROBLES	PEBBLESTONE SHUT-IN	SAN MIGUEL	SAN SIMEON	TIERRA REDONDO MOUNTAIN
Monterey dusky-footed woodrat	SSC	x																
pallid bat	SSC				x				x									
prairie falcon	SA (Nesting)	x			x	x	x	x				x	x		x		x	x
Salinas pocket mouse	SSC	x			x											x		
San Joaquin kit fox	FE; ST	x			x									x		x		
San Joaquin whipsnake	SSC				x													
silvery legless lizard	SSC				x	x												
tricolored blackbird	SSC (Nesting)						x					x						
vernal pool fairy shrimp	FT	x			x							x				x		
western pond turtle	SSC		x	x	x					x		x	x			x		
western spadefoot	SSC	x			x											x		
Plants																		
Abbott's bush-mallow	CRPR 1B.1					x												
Arroyo de la Cruz manzanita	CRPR 1B.2														x		x	
bristlecone fir	CRPR 1B.3		x						x									
caper-fruited tropidocarpum	CRPR 1B.1						x					x						
Carmel Valley bush-mallow	CRPR 1B.2										x							
Carmel Valley malacothrix	CRPR 1B.2				x													
chaparral ragwort	CRPR 2B.2						x					x						
Cone Peak bedstraw	CRPR 1B.3		x				x	x	x	x								
Cook's triteleia	CRPR 1B.3	x					x	x			x		x		x			

Nacimiento River Watershed

Species	Status	ADELAIDA	ALDER PEAK	BEAR CANYON	BRADLEY	BRYSON	BURNETT PEAK	BURRO MOUNTAIN	CAPE SAN MARTIN	CONE PEAK	CYPRESS MTN	JOLON	LIME MTN	PASO ROBLES	PEBBLESTONE SHUT-IN	SAN MIGUEL	SAN SIMEON	TIERRA REDONDO MOUNTAIN
Davidson's bush-mallow	CRPR 1B.2					x	x					x						x
dwarf calycadenia	CRPR 1B.1	x	x		x		x	x		x		x	x					
Hardham's bedstraw	CRPR 1B.3		x				x	x			x						x	
Hardham's evening-primrose	CRPR 1B.2				x													
Hickman's checkerbloom	CRPR 1B.3		x	x			x	x				x						
hooked popcorn-flower	CRPR 1B.2		x		x		x	x				x	x					
Jolon clarkia	CRPR 1B.2									x								
Kellogg's horkelia	CRPR 1B.1													x				
Koch's cord moss	CRPR 1B.3				x													
late-flowered mariposa-lily	CRPR 1B.2		x				x	x							x			
Lemmon's jewel-flower	CRPR 1B.2	x			x													
most beautiful jewel-flower	CRPR 1B.2		x				x	x			x		x		x		x	
Norris' beard moss	CRPR 2B.2						x					x						
pale-yellow layia	CRPR 1B.1	x			x	x	x											x
Palmer's monardella	CRPR 1B.2		x				x	x										
Pecho manzanita	CRPR 1B.2										x		x					
prostrate vernal pool navarretia	CRPR 1B.1				x													
round-leaved filaree	CRPR 1B.1																	x
San Antonio collinsia	CRPR 1B.2						x					x						
San Benito fritillary	CRPR 1B.2		x						x									

Nacimiento River Watershed

Species	Status	ADELAIDA	ALDER PEAK	BEAR CANYON	BRADLEY	BRYSON	BURNETT PEAK	BURRO MOUNTAIN	CAPE SAN MARTIN	CONE PEAK	CYPRESS MTN	JOLON	LIME MTN	PASO ROBLES	PEBBLESTONE SHUT-IN	SAN MIGUEL	SAN SIMEON	TIERRA REDONDO MOUNTAIN
San Luis Obispo owl's-clover	CRPR 1B.2	x			x													
San Luis Obispo sedge	CRPR 1B.2					x	x								x		x	
San Simeon baccharis	CRPR 1B.2							x										
Santa Cruz Mountains pussypaws	CRPR 1B.1		x				x	x				x						
Santa Lucia bedstraw	CRPR 1B.3							x		x								
Santa Lucia bush-mallow	CRPR 1B.2										x							
Santa Lucia dwarf rush	CRPR 1B.2	x																
Santa Lucia manzanita	CRPR 1B.2										x		x					
Santa Lucia mint	SE		x				x	x				x						
Santa Lucia purple amole	FT				x		x					x						
shining navarretia	CRPR 1B.2	x			x									x				
small-flowered calycadenia	CRPR 1B.2		x					x										
straight-awned spineflower	CRPR 1B.3				x													
Toro manzanita	CRPR 1B.2						x											
umbrella larkspur	CRPR 1B.3	x																
yellow-flowered eriastrum	CRPR 1B.2		x									x	x					x

Steelhead Streams	Yes; Lower Nacimiento River (San Antonio and Nacimiento Rivers Watershed Management Plan)
Stream Habitat Inventory	Yes; DFG, lower Nacimiento River 2001; upper Nacimiento River 2002.
Fish Passage Barriers	PAD ID: 718837- Dam at Nacimiento Lake on Nacimiento River. Total Barrier. PAD ID: 719387- Dam at Las Tables Creek on Nacimiento River. Unknown Status. PAD ID: 719878- Dam at Hughes Reservoir on Aqua Fria Creek, tributary

Nacimiento River Watershed

		to Nacimiento River. Total Barrier. 3.95239 miles upstream. PAD ID: 719877- Dam at El Piojo on El Piojo Creek, tributary to Nacimiento River. Total Barrier. 6.01579 miles upstream PAD ID: 718839- Dam at Lower Stony Valley on Stony Creek, tributary to Nacimiento River. Total Barrier. 52.86096 miles upstream. PAD ID: 705325- Non-structural barrier (waterfall, grade, temperature etc) on Salmon Creek, a tributary to Nacimiento River. Total Barrier (End of anadromy). 37.1145 miles upstream.
	Designated Critical Habitat	Yes; Nacimiento *River (*50 CFR 226 - National Marine Fisheries Service - NOAA) and Vernal Pool Fairy Shrimp (US Fish and Wildlife – Critical Habitat Mapper)
	Habitat Conservation Plans	Yes; North San Luis County Habitat Conservation Program – Multiple species, initially San Joaquin kit fox *General for North County, not watershed specific*
	Other Environmental Resources	Paso Robles Groundwater Basin, Nacimiento Reservoir, Lake Nacimiento, Tierra Redonda Mountain National Area, various fisheries
	Land Use	
	Jurisdictions & Local Communities	County of San Luis Obispo, Oak Shores (Lake Nacimiento), Heritage Ranch (Lake Nacimiento), Camp Roberts
	% Urbanized	5.02% [0.02% commercial retail; 5% residential (oak shores & Heritage Ranch)] (SLO County LUC)
	% Agricultural	46%: fields, vineyards, orchards and rangeland (SLO County LUC)
	% Other	49.4 % (9.4% open space; 15.7% public facilities (majority Camp Roberts); 2.3% recreation; 22% rural lands)(SLO County LUC)
	Planning Areas	Nacimiento and Adelaida Planning Areas (SLO County)
	Potential growth areas	Oak Shores, Heritage Ranch (SLO County General Plan, 2011)
	Facilities Present	Camp Roberts, Lake Nacimiento , Heritage Ranch CSD pump station at the southerly bank of Nacimiento River downstream from lake (Heritage Ranch CSD); Jim McWilliams Water Treatment Plant (Heritage Ranch CSD); Heritage Ranch Sewer Treatment Plant; Oak Shores Wastewater Treatment Plant (County service area 7A);
	Commercial Uses	Recreation at Lake Nacimiento, grazing, mining, agriculture, retail and service providers.
	Demographics	
	Population	3,108 in watershed (US Census Blocks, 2010) 337 in the community of Oak Shores (US Census, 2010)
	Race and Ethnicity	Watershed: Caucasian, representing 84%. Latinos represent 10.4%. Mixed-race representing 2.5%. The remaining races each represent less than 4%, including African American, American Indian, Pacific Islander, and Asian. (US Census Blocks, 2010) Oak Shores: 86.9% Caucasian; 9.2% Latino and Hispanic; 1.5% Mixed Race; 0.9%

Nacimiento River Watershed

	Black or African American; 0.9% Asian (2010 Demographic Profile Data, US Census Bureau)
Income	MHI $62,721 in watershed (US Census Tracts, 2010) MHI $ 97,639 in Oak Shores (US Census, 2010)
Disadvantaged Communities	No; 4.0% of individuals are below poverty level in Watershed (US Census Tracts, 2010) 8.6% of individuals below poverty level in Oak Shores (2007-2011 American Community Survey 5-Year Estimates)
Water Supply	
Water Management Entities	Heritage Ranch CSD; Nacimiento Water company (Oak Shores); outlying areas served by Individual wells
Groundwater	Yes; Paso Robles Basin; Tierra Redonda Mountain (San Antonio watershed); Understream flows (Heritage Ranch CSD – Nacimiento River)
Surface Water	Yes. Lake Nacimiento (SLOCountyWater.org) San Luis Obispo County Flood Control and Water Conservation District has an entitlement for 17,500 acre feet per year from the lake (secured in 1959). Of this amount, the proposed Nacimiento Water Supply Project will transport a maximum of 15,750 acre feet of water per year from the lake for delivery to 5 purveyors throughout San Luis Obispo County. (San Luis Obispo County Nacimiento Water project website) Atascadero Mutual Water Company – 2,000 afy City of Paso Robles – 4,000 afy Templeton Community Services District – 250 afy City of San Luis Obispo Community Services Area 10, Benefit Zone A (Southern Cayucos)
Imported Water	None
Recycled/Desalinated Water	None
Key aquifer percolation zone	No data available
Water budget	Yes; Todd Engineers, 2013 for Paso Robles Groundwater Sub-basin Management Plan Update
Water Uses	
Beneficial Uses	*Nacimiento Reservoir* – 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), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), Freshwater Replenishment (FRESH), Navigation (NAV), and Commercial and Sport Fishing (COMM).

	Upper Las Tablas Creek - 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), Cold Fresh Water Habitat (COLD), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE), and Commercial and Sport Fishing (COMM). *Salinas River (Nacimiento River-Santa Margarita Reservoir)* - Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Process Supply (PRO), Ground Water Recharge (GWR), Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Cold Fresh Water Habitat (COLD), Warm Freshwater habitat (WARM), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Threatened, or Endangered Species (RARE) and Commercial and Sport Fishing (COMM). (CCRWQCB, 2011)
Other Unique Characteristics	
Historical Resources	Adelaida School (9001 Chimney Rock Road, Paso Robles); Adelaida Cemetery (Chimney Rock & Adelaida Road, Paso Robles); J.F. MacGillivray Residence (PLN_DES_HISTORIC_POINTS GIS layer)
Tierra Redonda Mountain	Broad table-top mountain that encompasses approximately 1,300 acres in the Santa Lucia Range. Has outstanding ecological importance and been given high priority for preservation by State Department of Parks and Recreation
Camp Roberts	Thirteen ponds and reservoirs (65 acres) which are either natural or artificially created for use as livestock ponds or flood control. A total of 120 aquatic species representing 64 families of organisms were recorded from rivers, ponds, and reservoirs on Camp Roberts. Eight species of fish, 44% of species native to Salinas River drainage, have been recorded at Camp Roberts from Nacimiento River
Buena Vista and Klau mines	Identified as the primary point and nonpoint sources of mercury contamination in the watershed. Annual mercury loadings depend on the proportion of mercury rich sediment that reaches the lake in any given year. Mercury mining and ore processing operations occurred at the mines between 1868 and 1970. The site consists of mining wastes and releases from two abandoned mercury mines located on contiguous properties on a northwest-southeast trending ridge of the Santa Lucia Range in the California coastal mountains
Nacimiento Dam	Facilities include the embankment dam, powerplant, spillway, and high and low-level reservoir outlets. Created primarily for water conservation, flood control and replenishment of the Salinas River groundwater basin, it is one of the major recreational attractions on the Central Coast. It has 165 miles of shoreline and a maximum pool surface of 5,400 acres supporting swimming, boating, water skiing, and fishing
Los Padres National	Forest vegetation classified into two major types: chaparral and forested lands. Provides a diverse wildlife habitat with 23 threatened and endangered animals.

Nacimiento River Watershed

	Forest	Member of the California Condor Recovery Program and has been an active player in the reintroduction of California condors in the wild. The Forest has one endangered plant, two threatened plant species and 71 sensitive plant species. Management of riparian vegetation focuses on supporting fish and wildlife populations. There are over 870,000 acres of livestock grazing allotments in the Forest. Considerable risk of wildfire in the forest, with historic average of 25,000 acres burned per year.
	Hearst Ranch	Hearst Ranch encompasses an impressive variety of habitats and topography - elevations on the Ranch rise from sea level along the coastline to 3,600 feet on some of the peaks along the ridgeline of the Santa Lucia Mountains. Grassland-covered coastal terraces extend to natural sea bluffs, rocky headlands and sandy beaches. Over 1,400 acres of riparian woodland is present on the property. Riparian woodland species include Sycamore and Coast live oak.
	Grasslands Reserve Program	1478 acres held by the Natural Resource Conservation Service (National Conservation Easement Database, viewed 2013)
	Lake Nacimiento Drive Interlake Road – Sensitive Resource Area (SRA).	The portion of this route from Chimney Rock Road northwest to the Monterey County line is an adopted State scenic highway route. All development in this corridor must be sited to minimize visual impacts. (Heritage Ranch Village Plan, 2013)
	Climate Change Considerations	
		See IRWMP, 2014 Section X. Climate Change *Data is general for County, not watershed specific*

Watershed Codes

CalWater / DWR Number	HA	Hydrologic Area Name	HSA	Hydrologic Sub-Area Name	SWRCB Name	CDF Super Planning Watershed Name	CDF Watershed Name
3309.810504	8	Paso Robles	1	Atascadero	309.81	Bradley	Oro Fino Canony
3309.810504	8	Paso Robles	1	Atascadero	309.81	S. Side San Antonio Res.	Bee Rock Canyon
3309.810504	8	Paso Robles	1	Atascadero	309.81	Bryson	Turtle Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Bryson	Gulch House Creek (ptn in Monterey Co.)
3309.810504	8	Paso Robles	1	Atascadero	309.81	Lynch Canyon	Asbury Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Lynch Canyon	Pebblestone
3309.810504	8	Paso Robles	1	Atascadero	309.81	Lynch Canyon	Kavanaugh Creek

3309.810504	8	Paso Robles	1	Atascadero	309.81	McLaughlin Canyon	Tobacco Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	McLaughlin Canyon	Gould Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	McLaughlin Canyon	Town Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	McLaughlin Canyon	S. Shore Nacimiento Res.
3309.810504	8	Paso Robles	1	Atascadero	309.81	McLaughlin Canyon	Little Burnett Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Adelaida	Lower Las Tablas Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Adelaida	Franklin Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Adelaida	Dip Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Adelaida	Snake Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Adelaida	Upper Las Tablas Creek
3309.810504	8	Paso Robles	1	Atascadero	309.81	Lower Nacimiento River	Mile 7 to 11 Nacimiento River
3309.810504	8	Paso Robles	1	Atascadero	309.81	Lower Nacimiento River	Nacimiento Ranch
3309.820000	n/a	Paso Robles	n/a	Nacimiento Reservoir	309.82	Undefined	Undefined

Source: Excerpt from California Interagency Watershed Map of 1999, Calwater 2.2.1 (CA Resource Agency, 2004 Update)

Major Changes in the Watershed

- In 1956, Nacimiento Dam was constructed, designed to provide irrigation water, flood control, and recreation opportunities by the Monterey County Water Authority. They use the lake to recharge their groundwater basins.
- Prior to dam construction Nacimiento River and Las Tablas Creek were among the most important Salinas River tributaries for steelhead populations.
- The concern of low water elevation in Lake Nacimiento is almost an annual occurrence during the fall season. Lake Nacimiento is totally dependent on annual rain fall run off into the main body of the lake. The lake is the most active watershed in the State and can reach capacity during one wet season. Conversely, low rain fall years severely impact the amount of water collected each winter. Historically, the lake has gone through multiple years of high water elevations and corresponding multiple years with low water elevations.
- Heritage Ranch did not really become established and begin to grow before early 70s
- For much of the Ranch's history the community was mainly used as a summer recreation area and as part-time residences with very little development growth. However in the last few years, stimulated by high property values in the County, we have experienced rapid growth with larger traditional single family homes with full-time residents living on large lots with extensive

landscaping. A new school has been built, and plans are moving forward with a commercial retail center.

- The Water Conservation Plan and a Staged Water Use Reduction Plan
- Jill McWilliams Water Treatment Plant constructed in 1994 to comply with Surface Water Treatment Rules.
- The effluent is then collected and piped to the adjacent ephemeral drainage way which courses northeasterly to and across Camp Roberts Military Reservation. The point of discharge, and the entire service area of the District, overlays the “Paso Robles” geological formation whose characteristics include low permeability. The discharge flows largely intact for about 1.5 miles whereupon it percolates almost immediately upon meeting the “Monterey” formation, characteristically a high permeable formation. The discharge is down gradient of Lake Nacimiento, but can occasionally flow all the way to the Nacimiento River during significant storm runoff. The discharge does not impact the water quality of Lake Nacimiento.
- The wastewater system serving Oak Shores adjacent to Lake Nacimiento was originally constructed as part of the community’s development in 1974 and is operated by the county as part of County Service Area No. 7. There are 606 total water connections at Oak Shores, and it’s the county’s understanding that there are 275 permanent residents. North Shore Boat and Ski Club has a total of 40 service connections with 15 permanent residents; and Lake Nacimiento Resort has 300 connections total for their campgrounds with 10-year-round residents – for a grand total of 946 total service connections.
- Oak Shores WWTP constructed in 1975
- 2007 – EPA installed several monitoring probes in streams to measure effects of acid mine drainage on pH levels
- 2008 – Assessment to identify endangered, threatened or sensitive plants or animals that may be affected by site contamination.

Watershed Health – Summary by Major Tributary

Tributary Name	**Ephemeral / Perennial**	**303d Listed/ TMDLs**	**Pollution Sources** NP (non-point) MP (Major Point)	**Environmental Flows**
Asbury Creek	Undetermined	Not assessed	Undetermined	Not assessed
Dip Creek	Undetermined	Not assessed	Undetermined	Not assessed
Franklin Creek	Undetermined	Not assessed	Undetermined	Not assessed
Gould Creek	Undetermined	Not assessed	Undetermined	Not assessed
Gulch House Creek	Undetermined	Not assessed	Undetermined	Not assessed
Kavanaugh Creek	Undetermined	Not assessed	Undetermined	Not assessed
Little Burnett Creek	Undetermined	Not assessed	Undetermined	Not assessed
Las Tablas Creek	Undetermined	Yes; Metals	Surface Mining	Not assessed
Mile 7 to 11 Nacimiento River	Undetermined	Not assessed	Undetermined	Not assessed
Nacimiento Ranch	Undetermined	Not assessed	Undetermined	Not assessed

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Nacimiento Reservior	Perennial	Yes; Mercury, Metals	Surface mining, Natural Sources	Not assessed
Pebblestone Creek	Undetermined	Not assessed	Undetermined	Not assessed
Snake Creek	Undetermined	Not assessed	Undetermined	Not assessed
Tobacco Creek	Undetermined	Not assessed	Undetermined	Not assessed
Town Creek	Undetermined	Not assessed	Undetermined	Not assessed
Turtle Creek	Undetermined	Not assessed	Undetermined	Not assessed
*Bee Rock Canyon (subset)	Undetermined	Not assessed	Undetermined	Not assessed
*Oro Fino Canyon (subset)	Undetermined	Not assessed	Undetermined	Not assessed

Watershed Health – Summary 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 issues (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 subbasin 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 subbasin 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 Huero rivers south of San Miguel (Fugro West, 2001b; 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

Nacimiento River Watershed

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
Las Tablas Creek 303(d) listed for metals	Surface mining	Carollo, 2012
Nacimiento Reservoir 303(d) listed for mercury, metals	Surface mining, natural sources	Carollo, 2012
Steelhead passage	Nacimiento River in this watershed includes designated critical habitat which must be considered in planning.	50 CFR *226 -* National Marine Fisheries Service - NOAA

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:

Appendix D

Charts Linking Data Gaps and Primary Issues

Keys for the Data Gap Assessment

Links to Primary Resource Issues

KEY	
X	Complete Data Gap
X (shaded)	Data Gap is related to Issue
/	Partial Data Gap
/ (shaded)	Partial Data Gap is related to Issue
(shaded)	Link Between Data Category and Critical Issue
-	Complete Data

Data Gap Ranking By Linkage to Sub-Regional Primary Issues

Key	
Low	< 10
Medium	10 - 19
High	20 +

Data Gap Ranking By Linkage to County-wide Primary Issues

Key	
Low	< 20
Medium	20 - 39
High	40 +

KEY

X	Complete Data Gap
X (shaded)	Data Gap is related to Issue
/	Partial Data Gap
(shaded)	A link between data item and critical issue
-	Complete Data

		Watershed Managemetn Plan	Physical Setting		Hydrology					Biological Setting					Land Use			Demographics	Water Supply				Water Uses	Major Changes in the Watershed	Climate Change Considerations	Watershed Health			
Watershed Name	**Primary Issue**	**Watershed Managemetn Plan(s) Needed**	**Microclimate Data (ie. rain and temp)**	**Geology Analysis**	**Stream Gage**	**Hydrology Models**	**Peak Flow**	**Base Flow**	**Flood Risk Identification and Assessment**	**Vegetation Cover Identification**	**Invasive Species Identification and Assessment**	**Special Status Wildlife / Steelhead Trout Habitat Analysis**	**Stream Habitat Inventory**	**Fish Passage Barriers Analysis**	**Land Use Data**	**Potential Growth Areas**	**Other needed land use information**	**Demographic Data**	**Water Management Entities**	**Water Sources**	**Key Groundwater Percolation Area(s)**	**Water Budget**	**Water Uses**	**Watershed History/Major Changes**	**Climate Change Impact Analysis**	**Tributary Health Analysis**	**Water Quality**	**Groundwater Basin Health Analysis**	**Description of Data Gap**
Big Creek- San Carpoforo Area	Seawater Intrusion Into GW Basin	X	--	--	/	X	/	/	X	/	X	/	/	X	--	--	--	--	--	--	X	X	--	--	X	X	X	X	
	Limited GW Basin Yield	X	--	--	/	X	/	/	X	/	X	/	/	X	--	--	--	--	--	--	X	X	--	--	X	/*	X	X	* Determination of tributary health and strategies for increasing/capturing flows
	Outdated Groundwater Basin Data	X	--	--	/	X	/	/	X	/	X	/	/	X	--	--	--	--	--	--	X	X	--	--	X	X	X	X	
Santa Rosa Creek	Surface Flow Quantity	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/*	--	--	X	X	X	--	*water budget data limited by age
	Surface Water Temperature	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	X	X	/	--	
	Low Dissolved Oxygen in Lagoon	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	/	X	X	--	
	Fine Sediment in Lower Reaches	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	/	X	X	--	
	Fish Passage Barriers	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	/	X	/	--	Identified: action ready
	Non-Native Invasive Species	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	/	X	/	--	Identified: action ready
	Sedimentation	--	--	--	--	/*	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	/	X	X	--	* Current Hydrology Models from 2002 outdated?
	Water Quantity	--	--	--	--	/*	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	X	--	--	X	X	/	--	* Current Hydrology Models from 2002 outdated?
	GW Basin Seawater Intrusion	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	X	X	X	--	
	GW Quality-Chloride	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	/	X	X	--	
	Outdated Basin Studies- Villa Valley Basin	--	--	--	--	/	--	--	--	/	/	/	--	--	--	--	--	--	--	--	X	X	--	--	/	X	/	X	
	Threat to Lagoon	X	/	--	/	X	/	/	--	X	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	X	X	--	

Watershed Name	Primary Issue	Watershed Managemetn Plan(s) Needed	Microclimate Data (ie. rain and temp)	Geology Analysis	Stream Gage	Hydrology Models	Peak Flow	Base Flow	Flood Risk Identification and Assessment	Vegetation Cover Identification	Invasive Species Identification and Assessment	Special Status Wildlife / Steelhead Trout Habitat Analysis	Stream Habitat Inventory	Fish Passage Barriers Analysis	Land Use Data	Potential Growth Areas	Other needed land use information	Demographic Data	Water Management Entities	Water Sources	Key Groundwater Percolation Area(s)	Water Budget	Water Uses	Watershed History/Major Changes	Climate Change Impact Analysis	Tributary Health Analysis	Water Quality	Groundwater Basin Health Analysis	Description of Data Gap
Cayucos Creek- Whale Rock Area	Loss of Riparian Width	X	/	--	/	X	/	/	--	X	X	/	/	--	--	--	/*	--	--	--	X	X	--	--	X	/	/	--	* Assess landuse patterns that may have an effect on riparian vegetation - water quality not assessed for cotton tail and old creeks
	Lack of Enforcement	X	/	--	/	X	/	/	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	/	/	/	--	Identified: action ready
	Water Quantity	X	/	--	X	X	X	X	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	X	/	/*	* GW basin should be reassessed taking into consideration climate change impacts
	Sedimentation	X	/	--	/	X	/	/	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	/	X	/	--	
	Sea Water Intrusion (Cayucos Valley Basin)	X	/	--	/	X	/	/	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	/	X	--	
	Nitrates	X	/	--	/	X	/	/	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	/	X	X	--	
	Outdated Basin Study- Cayucos Valley Basin	X	/	--	/	X	/	/	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	/	/	X	
	Alluvial Water Deposits Subject to Drought Impacts	X	/	--	X	X	X	X	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	
	Cayucos Creek 303(d) listed for enterococcus	X	/	--	X	X	X	X	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	X	--	X	
	Toro Creek 303(d) listed for fecal coliform and low dissolved oxygen	X	/	--	X	X	X	X	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	X	--	X	
	Outdated Groundwater Basin Analysis- Toro Valley	X	/	--	/	X	/	/	--	/	X	/	/	--	--	--	--	--	--	--	X	X	--	--	X	/	/	X*	* Deterine impacts to vegetation and analyze land use impacts - GW basin health analysis limited by age of study and lack of climate change impact analysis
	Loss of Riparian Vegetation	X	--	--	--	--	--	--	--	X	/	--	/	--	--	--	/*	--	--	--	X	/	--	--	/	X	/	/	* Assess landuse patterns that may have an effect on riparian vegetation
	Lack of Instream Flow	X	--	--	--	X	X	X	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	X	X	/	/	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Excessive Sedimentation	X	--	--	--	X	--	--	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	/	X	/	/	Identified: action ready - GW basin health analysis limited by age of study and lack of climate change impact analysis

Watershed Name	Primary Issue	Watershed Managemetn Plan(s) Needed	Microclimate Data (ie. rain and temp)	Geology Analysis	Stream Gage	Hydrology Models	Peak Flow	Base Flow	Flood Risk Identification and Assessment	Vegetation Cover Identification	Invasive Species Identification and Assessment	Special Status Wildlife / Steelhead Trout Habitat Analysis	Stream Habitat Inventory	Fish Passage Barriers Analysis	Land Use Data	Potential Growth Areas	Other needed land use information	Demographic Data	Water Management Entities	Water Sources	Key Groundwater Percolation Area(s)	Water Budget	Water Uses	Watershed History/Major Changes	Climate Change Impact Analysis	Tributary Health Analysis	Water Quality	Groundwater Basin Health Analysis	Description of Data Gap
San Simeon- Arroyo de la Cruz	Gravel Mining	X	--	--	--	--	--	--	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	/	/	/	/	Identify prjects and BMP's to address issue - GW basin health analysis limited by age of study and lack of climate change impact analysis
	Grazing/Cattle	X	--	--	--	--	--	--	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	/	/	X	/	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Low Dissolved Oxygen Kills Fish in Lagoon	X	--	--	--	X	X	X	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	X	/	X	/	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Water pollution	X	--	--	--	--	--	--	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	/	/	X	/	Identified: action ready - GW basin health analysis limited by age of study and lack of climate change impact analysis
	Poaching	X	--	--	--	--	--	--	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	/	/	/	/	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Sea Water Intrusion (Cayucos Valley Basin)	X	--	--	--	--	--	--	--	/	/	--	/	--	--	--	--	--	--	--	X	/	--	--	X	/	X	X	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Water Supply of San Simeon CSD is at Certified Level III Severity Rating	X	--	--	--	X	X	X	--	/	/	--	/	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Arroyo de la Cruz 303(d) listed for Escherichia coli, low dissolved oxygen	X	--	--	--	X	X	X	--	/	/	--	/	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Pico Creek 303(d) listed for low dissolved oxygen, grazing related and natural sources	X	--	--	--	X	X	X	--	/	/	--	/	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	GW basin health analysis limited by age of study and lack of climate change impact analysis
	San Simeon Creek 303(d) listed for chloride, nitrate, low dissolved oxygen, sodium	X	--	--	--	X	X	X	--	/	/	--	/	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	GW basin health analysis limited by age of study and lack of climate change impact analysis
	Outdated Hydrological Studies for Area GW Basins	X	--	--	--	X	X	X	--	/	/	--	/	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	

Watershed Name	Primary Issue	Watershed Managemetn Plan(s) Needed	Microclimate Data (ie. rain and temp)	Geology Analysis	Stream Gage	Hydrology Models	Peak Flow	Base Flow	Flood Risk Identification and Assessment	Vegetation Cover Identification	Invasive Species Identification and Assessment	Special Status Wildlife / Steelhead Trout Habitat Analysis	Stream Habitat Inventory	Fish Passage Barriers Analysis	Land Use Data	Potential Growth Areas	Other needed land use information	Demographic Data	Water Management Entities	Water Sources	Key Groundwater Percolation Area(s)	Water Budget	Water Uses	Watershed History/Major Changes	Climate Change Impact Analysis	Tributary Health Analysis	Water Quality	Groundwater Basin Health Analysis	Description of Data Gap
Morro Bay	Accelerated sedimentation	--	--	--	--	/	/	/	--	/	--	/	/	--	--	--	--	--	--	--	X	X	--	--	--	--	--	/	
	Bacterial contamination	--	--	--	--	/	/	/	--	/	--	/	/	--	--	--	--	--	--	--	X	X	--	--	--	--	--	/	
	Elevated nutrient levels	--	--	--	--	/	/	/	--	/	--	/	/	--	--	--	--	--	--	--	X	X	--	--	--	--	--	/	
	Toxic pollutants	--	--	--	--	/	/	/	--	/	--	/	/	--	--	--	--	--	--	--	X	X	--	--	--	--	--	/	
	Scarce freshwater resources	--	--	--	--	/	/	/*	--	/	--	/	/	--	--	--	--	--	--	--	X	X	--	--	--	--	--	/	* there is no stream gage on Warden Creek. Existing stream gages may not capture base flows.
	Preserving biodiversity	--	--	--	--	/	/	/	--	/	--	/	/	--	--	--	--	--	--	--	X	X	--	--	--	--	--	/	
	Environmentally balanced use	--	--	--	--	/	/	/	--	x		/	x	--	--	--	--	--	--	--	X	X	--	--	--	--	--	/	
Of the 5 watershed areas in the North Coast sub-region, what number of data gaps are linked to a primary issue?		**27**	**0**	**0**	**2**	**13**	**7**	**14**	**0**	**9**	**4**	**11**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**16**	**17**	**0**	**0**	**20**	**20**	**18**	**16**	

KEY

X	Complete Data Gap
X (shaded)	Data Gap is related to Issue
/	Partial Data Gap
(shaded)	A link between data item and critical issue
-	Complete Data

			Physical Setting		Hydrology					Biological Setting					Land Use			Demographics	Water Supply				Water Uses	Major Changes in the Watershed	Climate Change Considerations	Watershed Health			
Watershed Name	**Primary Issue**	**Watershed Management Plan**	**Microclimate Data**	**Geology**	**Stream Gage**	**Hydrology Models**	**Peak Flow**	**Base Flow**	**Flood Risk Identification and Assessment**	**Vegetation Cover Identification**	**Invasive Species Identification and Assessment**	**Special Status Wildlife / Steelhead Trout Habitat Analysis**	**Stream Habitat Inventory**	**Fish Passage Barriers**	**Land Use**	**Potential Growth Areas**	**Other needed land use information**	**Demographic Data**	**Water Management Entities**	**Water Sources**	**Key Groundwater Percolation Areas**	**Water Budget**	**Beneficial Water Uses**	**Watershed History/Major Changes**	**Climate Change Impact Analysis**	**Tributary Health Analysis**	**Surface Water Quality**	**Groundwater Basin Health Analysis**	**Description of Data Gap**
Alamo Creek	Sedimentation of Twitchell Reservoir primarily from Cuyama River	X	--	/	/	/	/	/	/	/*	X	/	X	--	--	--	--	/	/	X	X	X	--	/	/	X	X	X	Primary issues are not well defined. * Vegetation data is over 10 years old.
Arroyo Grande Creek	Surface Water Quality - Temperature	--	/	--	--	--	--	/	--	/	/	/	/	--	--	--	--	/	--	--	/	/	--	--	/	/	/	/	See Surface Flow Quantity.
	Surface Water Quality - Nutrients and Dissolved Oxygen	--	/	--	--	--	--	/	--	/	/	/	/	--	--	--	--	/	--	--	/	/	--	--	/	/	/	/	
	Surface Flow Quantity	--	/	--	--	--	--	/*	--	/	/	/	/	--	--	--	--	/	--	--	/	/	--	--	/	/	/	/	*It is unknown if existing stream gages capture base flows.
	Fish Passage Barriers	--	/	--	--	--	--	/	--	/	/	/	/	--	--	--	--	/	--	--	/	/	--	--	/	/	/	/	See Surface Flow Quantity.
	Erosion and Sedimentation	--	/	--	--	--	--	/	--	/	/	/	/	--	--	--	--	/	--	--	/	/	--	--	/	/	/	/	

Watershed Name	Primary Issue	Watershed Management Plan	Microclimate Data	Geology	Stream Gage	Hydrology Models	Peak Flow	Base Flow	Flood Risk Identification and Assessment	Vegetation Cover Identification	Invasive Species Identification and Assessment	Special Status Wildlife / Steelhead Trout Habitat Analysis	Stream Habitat Inventory	Fish Passage Barriers	Land Use	Potential Growth Areas	Other needed land use information	Demographic Data	Water Management Entities	Water Sources	Key Groundwater Percolation Areas	Water Budget	Beneficial Water Uses	Watershed History/Major Changes	Climate Change Impact Analysis	Tributary Health Analysis	Surface Water Quality	Groundwater Basin Health Analysis	Description of Data Gap
	Flood Management	--	/	--	--	--	--	/	--	/	/	/	/	--	--	--	--	/	--	--	/	/	--	--	/	/	/	/	
Coastal Irish Hills	Residential development; loss of habitat	--	/	--	X	X	X	X	X	/*	X	/	X	--	--	/	--	--	X	/	X	X	--	--	/	X	X	--	*Vegetation cover data is not linked spatially in GIS and is not at the alliance level to accurately describe habitat.
Coastal Irish Hills	Agricultural development; loss of habitat	--	/	--	X	X	X	X	X	/*	X	/	X	--	--	/	--	--	X	/	X	X	--	--	/	X	X	--	*Vegetation cover data is not linked spatially in GIS and is not at the alliance level to accurately describe habitat.
Coastal Irish Hills	Sedimentation and loss of riparian cover - over grazing of sensitive areas	--	/	--	X	X	X	X	X	/	X	/	X*	--	--	/	--	--	X	/	X	X	--	--	/	X	X	--	*A stream habitat inventory provides basic instream and riparian habitat information.
Coastal Irish Hills	Proliferation of non-native species	--	/	--	X	X	X	X	X	/	X	/	X*	--	--	/	--	--	X	/	X	X	--	--	/	X	X	--	*A stream habitat inventory provides basic instream and riparian habitat information.
Coastal Irish Hills	Habitat degradation related to recreation	--	/	--	X	X	X	X	X	/*	X	/	X	--	--	/	--	--	X	/	X	X	--	--	/	X	X	--	*Vegetation cover data is not linked spatially in GIS and is not at the alliance level to accurately describe habitat.
Cuyama River	Sedimentation of Twitchell Reservoir	X	--	--	/	/	--	/	--	/	X	/	X	--	--	X	/	--	/	/	/	/	--	/	/	X	X	--	
Cuyama River	Groundwater Supplies	X	--	--	/	/	--	/	--	/	X	/	X	--	--	X	/	--	/	/	/	/*	--	/	/	X	X	--	*Previous studies have acknowledged limited data. A USGS/County of Santa Barbara study is expected to be complete in 2014.
Huasna River	Sedimentation of Twitchell Dam primarily from Cuyama River	X	--	/	/	X	/	/	/	/*	/	/	X	--	--	/	/	--	/	/	X	X	--	/	/	X	X	X	Issues are not well defined for this watershed. * Vegetation data is over 10 years old.
	Flooding	--	/	--	X	X	/	/	--	/	/	/	X	--	--	--	/	--	/	/	X	X	X	--	/	/	/	/	
	Habitat Fragmentation	--	/	--	X	X	/	/	--	/*	/	/	X	--	--	--	/	--	/	/	X	X	X	--	/	/	/	/	*Vegetation cover data is not linked spatially in GIS and is not at the alliance level.

Watershed Name	Primary Issue	Watershed Management Plan	Microclimate Data	Geology	Stream Gage	Hydrology Models	Peak Flow	Base Flow	Flood Risk Identification and Assessment	Vegetation Cover Identification	Invasive Species Identification and Assessment	Special Status Wildlife / Steelhead Trout Habitat Analysis	Stream Habitat Inventory	Fish Passage Barriers	Land Use	Potential Growth Areas	Other needed land use information	Demographic Data	Water Management Entities	Water Sources	Key Groundwater Percolation Areas	Water Budget	Beneficial Water Uses	Watershed History/Major Changes	Climate Change Impact Analysis	Tributary Health Analysis	Surface Water Quality	Groundwater Basin Health Analysis	Description of Data Gap
Nipomo-Suey Creeks	Surface Water Quality - Fecal Coliform & Sediment	--	/	--	X	X	/	/	--	/	/	/	X	--	--	--	/	--	/	/	X	X	X	--	/	/	/	/	
	Groundwater Quantity	--	/	--	X	X	/	/*	--	/	/	/	X	--	--	--	/	--	/**	/	X	X	X	--	/	/	/	/	*It is unknown how DWR determined a base flow estimate. There is no stream gage. **A large number of other water purveyors exist in the Nipomo Mesa area, but a source was not identified that records which are specifically in the Nipomo and Suey Creeks area.
	Invasive species	--	/	--	X	X	/	/	--	/	/	/	X	--	--	--	/	--	/	/	X	X	X	--	/	/	/	/	
Pismo Creek	Surface Water Quality - Temperature	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	/	--	
	Surface Water Quality - Nutrients and Dissolved Oxygen	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	/	--	
	Ocean Water Quality – Fecal coliform	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	/	--	
	Surface Flow Quantity	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	/	--	
	Groundwater Quantity	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	/	--	
	Fish Passage Barriers	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	/	--	
	Erosion and Sedimentation	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	/	--	
	Flood Management	--	/	--	X	--	/	/	--	/	/	/	--	--	--	--	--	--	/	--	/	X	--	--	/	/	x	--	
Santa Maria River	Lack of data on effects of cattle grazing	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	??
	Impaired surface water quality	/	--	--	/	/	/	/*	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	*The is a stream gage on the Santa Maria River itself but not other creeks encompasses in the area, i.e. Black Lake Canyon or Oso Flaco Creek
	Endangered or threatened species potential for incidental take.	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
	Lack of data on plant and wildlife species.	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	

Watershed Name	Primary Issue	Watershed Management Plan	Microclimate Data	Geology	Stream Gage	Hydrology Models	Peak Flow	Base Flow	Flood Risk Identification and Assessment	Vegetation Cover Identification	Invasive Species Identification and Assessment	Special Status Wildlife / Steelhead Trout Habitat Analysis	Stream Habitat Inventory	Fish Passage Barriers	Land Use	Potential Growth Areas	Other needed land use information	Demographic Data	Water Management Entities	Water Sources	Key Groundwater Percolation Areas	Water Budget	Beneficial Water Uses	Watershed History/Major Changes	Climate Change Impact Analysis	Tributary Health Analysis	Surface Water Quality	Groundwater Basin Health Analysis	Description of Data Gap
	Erosion	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
	Flooding	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
	Balancing land use practices with conservation goals	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
	Changes to flows, flow channels and sediment transport	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
	Invasive riparian plant species	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
	Sediment accretion	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
	DDT and dieldrin	/	--	--	/	/	/	/	/	/	/	/	X	--	--	--	/	--	/	--	/	/	--	--	/	/	/	/	
San Luis Obispo Creek	Riparian Vegetation / Buffer Quality (Lack of riparian canopy)	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Surface Water Nutrients and Dissolved Oxygen	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Surface Water Temperature	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Surface Water Pathogens	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Surface Water Treated Effluent	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Surface Water Priority Organics	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Surface Water Quantity	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Instream Fish Habitat	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Fish Passage Barriers	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Streambank Stability (Erosion)	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Upland Erosion and Sedimentation	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Exotic Plant Species	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Non-Native Fish – Carp and Chinook Salmon	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Debris Accumulation	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
	Flooding	/	--	--	--	--	--	/	--	/	/	/	/	--	--	--	--	--	--	--	/	X	--	--	/	/	/	/	
Of the 10 watersheds in the South County sub-region, what number of data gaps are linked to a primary issue?		--	**0**	**0**	**6**	**4**	**9**	**21**	**3**	**16**	**7**	**9**	**14**	**0**	**0**	**2**	**0**	**0**	**5**	**1**	**7**	**7**	**0**	**1**	**13**	**24**	**24**	**7**	

KEY

- X — Complete Data Gap
- X (shaded) — Data Gap is related to Issue
- / — Partial Data Gap
- (shaded) — A link between data item and critical issue
- \- — Complete Data

		Watershed Managemetn Plan	Physical Setting		Hydrology					Biological Setting					Land Use			Demographics	Water Supply				Water Uses	Major Changes in the Watershed	Climate Change Considerations	Watershed Health			
Watershed Name	**Primary Issue**	**Watershed Managemetn Plan(s) Needed**	**Microclimate Data (ie. rain and temp)**	**Geology Analysis**	**Stream Gage**	**Hydrology Models**	**Peak Flow**	**Base Flow**	**Flood Risk Identification and Assessment**	**Vegetation Cover Identification**	**Invasive Species Identification and Assessment**	**Special Status Wildlife / Steelhead Trout Habitat Analysis**	**Stream Habitat Inventory**	**Fish Passage Barriers Analysis**	**Land Use Data**	**Potential Growth Areas**	**Other needed land use information**	**Demographic Data**	**Water Management Entities**	**Water Sources**	**Key Groundwater Percolation Area(s)**	**Water Budget**	**Water Uses**	**Watershed History/Major Changes**	**Climate Change Impact Analysis**	**Tributary Health Analysis**	**Water Quality**	**Groundwater Basin Health Analysis**	**Description of Data Gap**
Black Sulphur Spring	Groundwater Quality	X	--	--	X	X	X	X	--	--	/	/	--	--	--	--	--	--	--	--	X	/	--	--	/	X	X	X	Issues are not well defined for this watershed.
	Groundwater Quantity	X	--	--	X	X	X	X	--	--	/	/	--	--	--	--	--	--	--	--	X	X	--	--	X	X	X	X	Issues are not well defined for this watershed.
	Outdated Studies of the GW Basin	X	--	--	X	X	X	X	--	--	/	/	--	--	--	--	--	--	--	--	X	/	--	--	X	X	X	X	Issues are not well defined for this watershed.
Soda Lake	Groundwater Quality	X	--	--	X	--	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	--	--	--	/	X	X	X	
	Groundwater Quantity	X	--	--	X	--	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	--	--	--	X	X	/	X	
	Soda Lake 303(d) listed for ammonia	X	--	--	X	--	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	--	--	--	X	X	--	/	
	Outdated Studies of the GW Basin	X	--	--	X	--	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	--	--	--	X	X	X	X	
Cholame Creek	Significant Water Level Declines (Paso Robles Basin)	X	/	--	X	/	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	*	--	--	X	X	/	*	* Paso Robles Basin study limited by lack of draw information from private
	Limited Groundwater Quality Information- Cholame Valley	X	/	--	X	/	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	/	--	--	/	X	X	X	
	No Yield Information and Limited Hydrogeologic Information for Cholame Basin	X	/	--	X	/	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	
	Cholame Creek 303(d) listed for boron, chloride, electrical conductivity, Escherichia coli, fecal coliform, low dissolved	X	/	--	X	/	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	/	--	--	X	X	/	/	
	Groundwater quality	X	/	--	X	/	X	X	X	/	/	/	X	--	--	--	--	--	--	--	X	/	--	--	X	X	X	X	
Estrella River	Significant Water Level Declines (Paso Robles Basin)	X	--	--	--	--	--	--	X	/	/	/	X	--	--	--	--	--	--	--	X	*	--	--	X	X	--	*	* Paso Robles Basin study limited by lack of draw information from private
	Estrella River 303(d) listed for boron, chloride, fecal coliform, sodium and pH	X	--	--	--	--	--	--	X	/	/	/	X	--	--	--	--	--	--	--	X	/	--	--	X	X	--	/	
	Groundwater Quality	X	--	--	--	--	--	--	X	/	/	/	X	--	--	--	--	--	--	--	/	/	--	--	X	X	--	X	
Huer Huerro Creek	Significant Water Level Declines (Paso Robles Basin)	X	--	--	/	--	/	/	X	/	/	/	X	X	--	--	--	--	--	--	/	*	--	--	X	X	X	*	* Paso Robles Basin study limited by lack of draw information from private
	Groundwater Quality	X	--	--	/	--	/	/	X	/	/	/	X	X	--	--	--	--	--	--	/	/	--	--	X	X	X	X	Issues are not well defined for this

Watershed Name	Primary Issue	Watershed Managemetn Plan(s) Needed	Microclimate Data (ie. rain and temp)	Geology Analysis	Stream Gage	Hydrology Models	Peak Flow	Base Flow	Flood Risk Identification and Assessment	Vegetation Cover Identification	Invasive Species Identification and Assessment	Special Status Wildlife / Steelhead Trout Habitat Analysis	Stream Habitat Inventory	Fish Passage Barriers Analysis	Land Use Data	Potential Growth Areas	Other needed land use information	Demographic Data	Water Management Entities	Water Sources	Key Groundwater Percolation Area(s)	Water Budget	Water Uses	Watershed History/Major Changes	Climate Change Impact Analysis	Tributary Health Analysis	Water Quality	Groundwater Basin Health Analysis	Description of Data Gap
Nacimiento River	Significant Water Level Declines (Paso Robles Basin)	--	--	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	X	*	--	--	X	X	/	*	* Paso Robles Basin study limited by lack of draw information from private
	Las Tablas Creek 303(d) listed for metals	--	--	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	/	/	--	--	X	X	--	/	
	Nacimiento Reservoir 303(d) listed for mercury, metals	--	--	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	/	/	--	--	X	X	--	/	
	Groundwater Quality	--	--	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	X	/	--	--	X	X	/	X	
	Steelhead Passage	--	--	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	/	/	--	--	X	X	/	X	
Lower Salinas - Paso Robles Creek Area	Significant Water Level Declines (Paso Robles Basin)	X	--	--	--	--	--	X--	/	/	X	/	--	--	--	--	--	--	--	--	X	*	--	--	X	X	/	*	* Paso Robles Basin study limited by lack of draw information from private
	Salinas River 303(d) listed for sodium and chloride	X	--	--	--	--	--	--	/	/	X	/	--	--	--	--	--	--	--	--	/	/	--	--	X	X	--	/	
	Groundwater Quality	X	--	--	--	--	--	--	/	/	X	/	--	--	--	--	--	--	--	--	/	/	--	--	/	X	X	X	
	Steelhead Passage	X	--	--	--	--	--	--	/	/	X	--	--	--	--	--	--	--	--	--	/	/	--	--	X	X	X	X	
Lower San Juan Creek	Significant Water Level Declines (Paso Robles Basin)	X	/	--	X	--	X	X	/	/	X	/	X	--	--	--	--	--	--	--	/	*	--	--	X	X	X	*	* Paso Robles Basin study limited by lack of draw information from private
	Groundwater Quality	X	/	--	X	--	X	X	/	/	X	/	X	--	--	--	--	--	--	--	/	/	--	--	/	X	X	X	Issues are not well defined for this
Upper San Juan Creek	Significant Water Level Declines (Paso Robles Basin)	X	--	--	X	/	X	X	X	/	X	/	X	--	--	--	--	--	--	--	X	*	--	--	X	X	X	*	* Paso Robles Basin study limited by lack of draw information from private
	Groundwater Quality	X	--	--	X	/	X	X	X	/	X	/	X	--	--	--	--	--	--	--	/	/	--	--	/	X	X	X	Issues are not well defined for this
Mid Salinas - Atascadero Area	Significant Water Level Declines (Paso Robles Basin)	X	/	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	X	*	--	--	X	X	X	*	* Paso Robles Basin study limited by lack of draw information from private
	Groundwater Quality	X	/	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	/	/	--	--	/	X	X	X	
	Atascadero (Hale) Creek 303(d) listed for chloride, Escherichia coli, fecal coliform, low dissolved oxygen, and sodium	X	/	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	/	/	--	--	/	X	X	X	
	Limited Groundwater Basin Information (Rinconada Basin)	X	/	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	X	X	--	--	X	X	X	X	
	Steelhead Passage	X	/	--	--	--	--	--	/	/	/	/	--	--	--	--	--	--	--	--	X	X	--	--	X	X	X	X	
Upper Salinas - Santa Margarita Area	No Comprehensive Studies to Determine the Perennial Yield (Pozo Basin)	X	--	--	X	/	X	X	--	/	/	/	X	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	
	Declining Groundwater Levels	X	--	--	X	/	X	X	--	/	/	/	X	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	
	Salinas River 303(d) listed for sodium and chloride	X	--	--	X	/	X	X	--	/	/	/	X	--	--	--	--	--	--	--	/	/	--	--	X	X	--	X	
	Outdated information for Pozo GW Basin	X	--	--	X	/	X	X	--	/	/	/	X	--	--	--	--	--	--	--	X	X	--	--	X	X	/	X	
Of the 11 watersheds in the North County sub-region, what number of data gaps are linked to a primary issues?			**1**	**0**	**14**	**2**	**16**	**16**	**1**	**0**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**14**	**0**	**0**	**29**	**29**	**15**	**25**	

Appendix E

San Luis Obispo County Instream Flow Assessment

FINAL REPORT ◦ JANUARY 2014

San Luis Obispo County Regional Instream Flow Assessment




PREPARED FOR

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A Note on Units of Measurement

This study integrates findings from a number of different disciplines, including hydrology, freshwater ecology, and water quality. Each of these disciplines has a "habitual" system of measurement, whether the English system (e.g., the United States Geological Survey's reporting of discharges in cubic feet per second) or the metric system (e.g., the concentration of water-quality parameters are commonly presented as milligrams per liter). This document makes no effort to translate units from the various systems of measurement into a common framework, but instead maintains the common units of measurement for the physical attribute being described or as used in the original data set. For those readers wishing to make conversions, the following table is provided.

Metric/English unit conversions (abbreviations in parentheses).

Metric	English
1 degree Centigrade (°C)	1.8 degrees Fahrenheit (°F)
1 centimeter (cm)	0.39 inch (in)
1 cubic meter per seconds (cms)	35.3 cubic feet per second (cfs)
1 hectare-meter (hm)	8.10 acre-feet (ac-ft) [1.98 ac-ft = 1 cfs × one day]
1 kilometer (km)	0.62 mile (mi) 3,280 feet (ft)
1 meter (m)	3.28 feet (ft)
1 meter per second (m/s)	3.28 feet per second (ft/s)
1 milligram per liter (mg/L)	1 part per million (ppm)
1 milligram per milliliter (mg/mL)	1 part per thousand (ppt)
1 millimeter (mm)	0.04 inch (in)

EXECUTIVE SUMMARY

Introduction

San Luis Obispo County (SLO, or County) has developed a Master Water Report (MWR) of the current and future water resource management activities being undertaken by various entities within the County (SLO County Water Resources 2012). In addition to total water demand (which includes urban, rural, and agricultural needs), the MWR includes an estimate of *Environmental Water Demand* (EWD), which is defined (MWR Section 4.6.5.1) as, "the amount of water needed in an aquatic ecosystem, or released into it, to sustain aquatic habitat and ecosystem processes." The MWR selected the federally threatened South-Central California Coast steelhead (*Oncorhynchus mykiss)* as the target species for analysis, based on their adequacy as an indicator species (i.e., a species whose habitat requirements are sensitive enough to allow for successful identification of environmental problems, yet broad enough to adequately represent a wide array of aquatic species). However, the MWR did not provide EWD estimates for specific seasons or subwatersheds, and recommended additional analysis. The objectives of this study are to further develop EWD estimates based on the recommendations of the MWR, including producing:

1. a County-wide assessment of instream flow requirements for steelhead based on existing instream flow assessments;
2. an assessment of data needs to support EWD estimates;
3. initial EWD estimates for the County;
4. a prioritization of streams for which detailed instream flow assessments would be most useful; and
5. recommendations for technically appropriate approaches to produce detailed and site-specific instream flow assessments.

The purpose of this analysis is to provide a preliminary estimate of the magnitude and timing of instream flows that would support steelhead in creeks of San Luis Obispo County. This initial assessment is not intended to provide sufficient precision or detail from which to establish regulatory or mandatory water permit limits. In addition, these estimates of EWD are minimum values to maintain aquatic systems and should not be interpreted as "enough" water to support long-term, sustainable steelhead populations or the complex ecosystem in which they live.

Approach

For this analysis, EWD was defined in relation to steelhead life history requirements during the two most flow-sensitive periods for minimum flows, namely the spring period and the summer period. Portions of many County rivers are naturally dry each summer. We recognize that there is no value in predicting summer flow requirements for steelhead in the portion of a creek that is naturally dry during part of the year. Therefore results from a National Oceanic and Atmospheric Administration (NOAA) analysis (Boughton and Goslin 2006) were used to limit analysis of EWD to portions of each watershed determined to have a high potential for steelhead rearing to occur based on intrinsic watershed characteristics, including perennial flows.

Available hydrologic and physical terrain data and available instream flow assessments were reviewed and analyzed to explore appropriate watershed stratification and to assess the ability to extrapolate existing instream flow analyses throughout all watersheds of the County. All available hydrologic and physical terrain data were evaluated to assess patterns of instream flows and stream morphological characteristics, such as channel gradient, channel width, and geologic terrain. Because few existing instream flow analyses are available, a field-based instream flow assessment was conducted in numerous County streams. A predictive model was developed based on results of the field assessment to estimate EWD for the remaining watersheds in the County. A framework for improving these estimates is described, and high-priority data needs and watersheds to focus on are identified.

Results

Twelve sites were evaluated during mid-April 2013, and six of these sites were re-evaluated during early September 2013 to estimate both spring and summer flow requirements. Based on measurements of suitable habitat for specific steelhead life stages, flows to support steelhead in County streams during spring range from 0.5 cfs to 4 cfs. Flows of this magnitude during spring were sufficient to provide fry and juvenile rearing and feeding habitat, migratory connectivity for juveniles between habitat units, and benthic macroinvertebrate production. Flows to support steelhead during summer were observed to range from 0.25 cfs to 1 cfs. Flows of this magnitude provided sufficient water depth to provide fry and juvenile rearing habitat.

Analysis points were established within all County Analysis Watersheds with delineated high potential steelhead rearing habitat. Predictive models were developed based on field assessments and watershed characteristics, including drainage area. Based on the models, EWD was estimated for each Analysis Point based on spring and summer flow requirements. Due to the large number of locations for which EWD is estimated throughout the County, an interactive web-based map was developed, and is available at:
http://geo.stillwatersci.com/maps/slo_rifa/instreamflowassessment.html

To compare EWD estimates with existing conditions, streamflow data were examined for 16 USGS and two County-maintained gages. EWD for spring flows are mostly achieved on average at all gage locations over the period of record, whereas summer flows are either barely achieved, or not at all.

Discussion and Recommendations

Overall, it appears that spring flows are sufficient to provide steelhead habitat in many Analysis Watersheds under existing conditions. However, summer flows are not sufficient to support steelhead in most Analysis Watersheds, despite the NOAA analysis of Boughton and Goslin (2006) results that indicated these watersheds have a high potential for steelhead rearing to occur based on intrinsic watershed characteristics, including perennial flows. It also appears based on channel morphology that even relatively low flows (e.g., <0.5 cfs) during summer allow steelhead to persist in Analysis Watersheds throughout the County.

In summary, we recommend the following:

- Broaden the definition of EWD to consider additional natural resources, especially in the County's 26 coastal lagoons where tidewater goby occur.
- Analyze current streamflow conditions compared with historical streamflow conditions, with consideration for water year type (i.e., wet, normal, or dry) and EWD. This would include the compilation and maintenance of daily mean discharge data for current County stream gaging stations.
- Monitor streamflows in all 25 Analysis Watersheds during spring and summer to determine which streams are exceeding EWD estimates and which are not. Monitoring could include establishment of additional gages, or periodic direct measurements of streamflow during spring and summer.

- Determine if Analysis Watersheds not achieving predicted EWD are mischaracterized in the NOAA analysis as having a high potential to support rearing steelhead, or if other factors are causing flow reductions. Results could be used by resource managers to inform the prioritization of streams for protection, habitat restoration, and/or streamflow enhancement.
- Conduct intensive and more accurate estimates of steelhead habitat relationships with instream flows within those watersheds with high steelhead rearing potential and water management implications.

1 INTRODUCTION AND PURPOSE

San Luis Obispo County (SLO, or County) has developed a Master Water Report (MWR) of the current and future water resource management activities being undertaken by various entities within the County (SLO County Water Resources 2012). The MWR calculates the total County water demand for specific Water Planning Areas. In addition to total water demand (which includes urban, rural, and agricultural needs), the MWR includes an estimate of *Environmental Water Demand* (EWD), which is defined (MWR Section 4.6.5.1) as, "the amount of water needed in an aquatic ecosystem, or released into it, to sustain aquatic habitat and ecosystem processes." The MWR selected the federally threatened South-Central California Coast steelhead (*Oncorhynchus mykiss)* (herein referred to as "steelhead") as the target species for analysis, based on their adequacy as an indicator species (i.e., a species whose habitat requirements are sensitive enough to allow for successful identification of environmental problems, yet broad enough to adequately represent a wide array of aquatic species).

To calculate EWD in the MWR, a methodology developed by Hatfield and Bruce (2000), *Predicting Salmonid Habitat-Flow Relationships for Streams from Western North America*, was applied. The Hatfield and Bruce (2000) methodology uses relationships from studies conducted throughout the western United States to predict annual flow requirements in any watershed for which flows are measured or estimated. However, this approach did not provide estimates for specific seasons or subwatersheds. In addition, the flow estimate is expressed as an annual volume of water, which does not take into account seasonal fluctuations in flow or support real-time flow monitoring. For example, a creek could be dry all summer, effectively extirpating steelhead, and then achieve its annual flow requirement during winter floods, and thus be considered to have met its EWD for the year.

The MWR (Section 5.2.1) concludes that to improve estimates of the EWD, an analysis of the instream flows needed to support steelhead habitat and watershed functions in County rivers and streams is needed. This study was proposed to the Integrated Regional Water Management (IRWM) program with the stated goal to estimate EWD in the County. We originally presumed that this study would be conducted in two stages: Stage 1 – watershed stratification, instream flow study prioritization, and proof of concept; and Stage 2 – instream flow study implementation, data repository, and environmental water demand calculation. Although only the first stage was funded by Department of Water Resources through the IRWM program, during this study we were able to develop estimates of EWD for County streams. These estimates are intended to inform water supply planning efforts by the SLO IRWM participants to better understand environmental instream flows in the County. The EWD estimates developed in this study are not related to any instream flow policy or regulation. The objectives, methods, and results of this analysis were presented to the San Luis Obispo County Flood Control and Water Conservation District Water Resources Advisory Committee.

The specific objectives of this study are to produce:

1. a County-wide assessment of instream flow requirements for steelhead based on existing instream flow assessments;
2. an assessment of data needs to support EWD estimates;
3. initial EWD estimates for the County;
4. a prioritization of streams for which detailed instream flow assessments would be most useful; and

5. recommendations for technically appropriate approaches to produce detailed and site-specific instream flow assessments.

The purpose of this analysis is to provide a preliminary estimate of the magnitude and timing of instream flows that would support steelhead in creeks of San Luis Obispo County. This initial assessment is not intended to provide sufficient precision or detail from which to establish regulatory or mandatory water permit limits. In addition, these estimates of EWD are minimum values to maintain aquatic systems and should not be interpreted as “enough” water to support long-term, sustainable steelhead populations or the complex ecosystem in which they live.

2 APPROACH

For this analysis, Environmental Water Demand (EWD) was defined in relation to specific steelhead life history requirements. Available hydrologic and physical terrain data and available instream flow assessments were reviewed and analyzed to explore appropriate watershed stratification and to assess the ability to extrapolate existing instream flow analysis throughout all watersheds of the County. A California State interagency watershed mapping committee, CalWater, divides California into ten Hydrologic Regions (HR). Each HR is progressively subdivided into six smaller, nested levels: the Hydrologic Unit (HU, major rivers), Hydrologic Area (HA, major tributaries), Hydrologic Sub-Area (HSA), Super Planning Watershed (SPWS), and Planning Watershed (PWS). To support our analysis, we divided all streams in the County into Analysis Watersheds based Hydrologic Areas, Hydrologic Sub-Areas, and Planning Watersheds. For streams in the interior of the County where steelhead streams have a low density, Analysis Watersheds were larger, and based on Hydrologic Areas or Hydrologic Sub-Areas. On the coast of the County where steelhead streams have a higher density, Analysis Watersheds were smaller, and designated based on Planning Watersheds. Streams networks used for analysis were from the National Hydrography Dataset (NHD) at a scale of 1:24,000.

Portions of many County rivers are naturally dry each summer. We recognize that there is no value in predicting flow requirements for steelhead in the portion of a creek that is naturally dry during part of the year. Therefore results from a National Oceanic and Atmospheric Administration (NOAA) analysis (Boughton and Goslin 2006) were used to limit analysis of EWD to portions of each watershed determined to have a high potential for steelhead rearing to occur based on intrinsic watershed characteristics, including perennial flows.

All available hydrologic data and physical terrain information was evaluated to assess patterns of instream flows and stream morphological characteristics, such as channel gradient, channel width, and geologic terrain. Because few existing instream flow analyses are available, a field-based instream flow assessment was conducted in numerous County streams. A predictive model was developed based on results of the field assessment to estimate EWD for remaining watersheds in the County. A framework for improving these estimates is described, and high-priority data needs and watersheds to focus on are identified. Details on this approach are described below.

2.1 Defining Environmental Water Demand

The MWR defines EWD as “…the amount of water needed in an aquatic ecosystem, or released into it, to sustain aquatic habitat and ecosystem processes.” In Appendix D of the MWR for the purposes of estimating EWD, “…the federally threatened South-Central California Coast steelhead was used as the primary indicator species. Although numerous other listed and nonlisted native aquatic species occur throughout the County, a large proportion of these species typically thrive in water bodies known to support steelhead. Furthermore, the threatened status of steelhead requires careful consideration."

Consistent with the MWR, this analysis thus defines EWD as equivalent to the instream flow requirements of steelhead. In addition, occurrences of the federally endangered tidewater goby (*Eucyclogobius newberryi*) are considered qualitatively. Since this approach is based on assessing instream flow requirements primarily for steelhead, all streams and creeks within the County that were identified in a NOAA analysis (Boughton and Goslin 2006) as having a high potential for steelhead to occur based on intrinsic (unmanaged, unimpaired) watershed characteristics (stream gradient, hydrology, air temperature, and channel morphology) were included, regardless of actual current habitat conditions or steelhead distribution. For this analysis, the spatial data from the NOAA (Boughton and Goslin 2006) report were acquired from that study's authors and used to delineate potential steelhead distribution within Analysis Watersheds for all streams in the County (Figure 1).

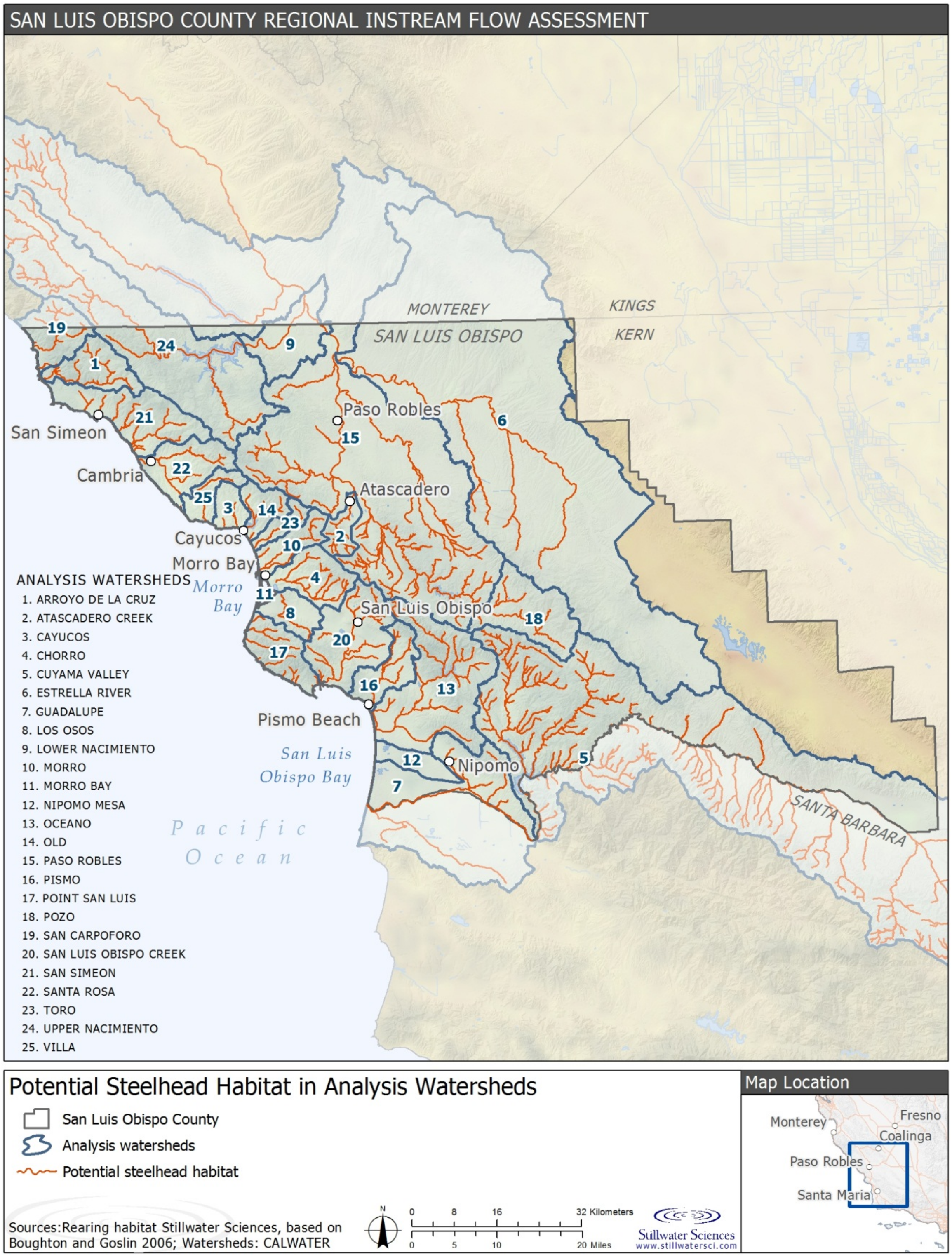


Figure 1. Potential steelhead habitat in San Luis Obispo County.

In addition to steelhead, this analysis also qualitatively considers the freshwater flow requirements of tidewater goby. For all lagoons where tidewater goby currently or historically occur, based on USFWS (2005) (Figure 2), EWD requirements to support suitable habitat were assessed.

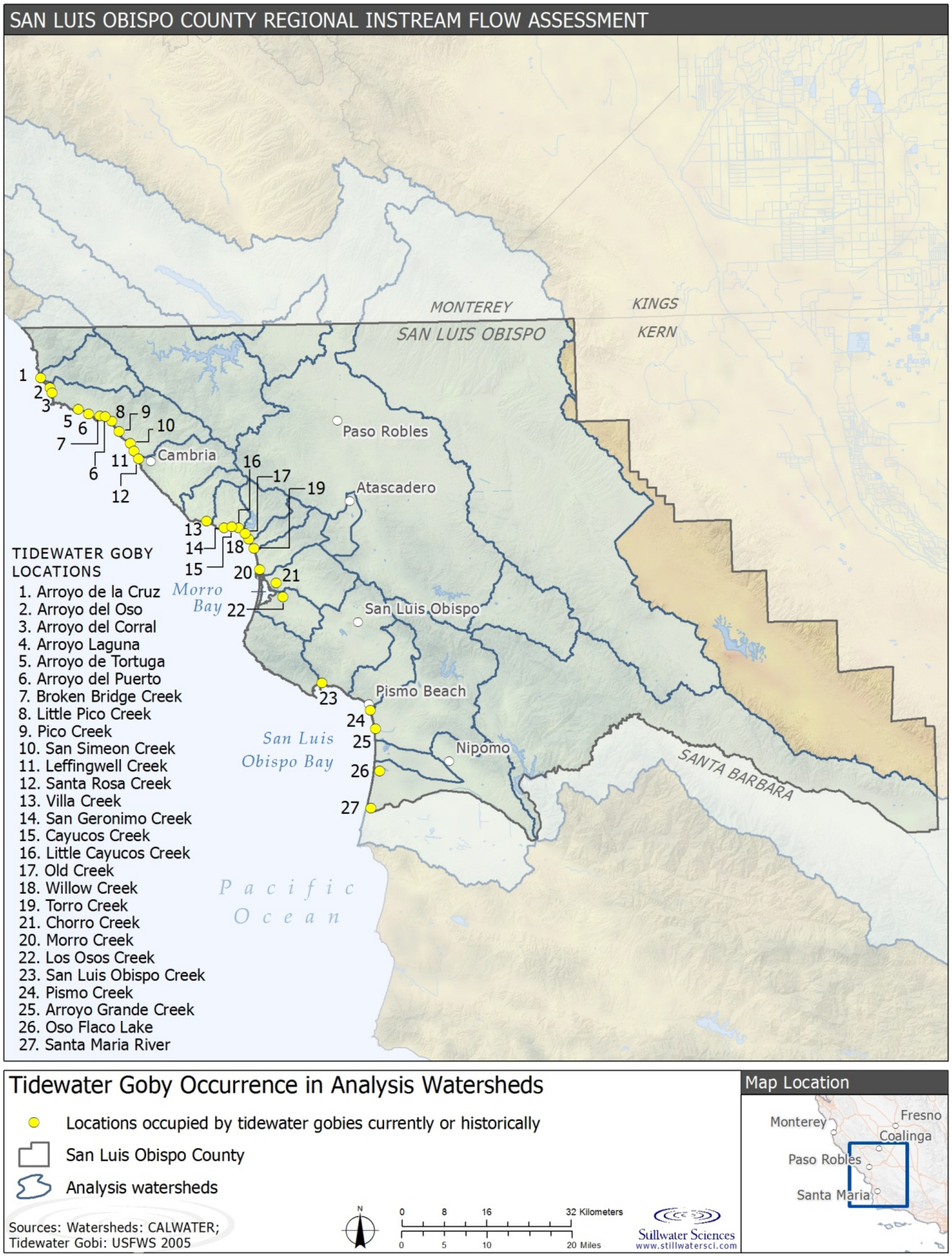


Figure 2. Tidewater goby occurrence in San Luis Obispo County.

2.2 Available Data

All available instream flow analysis, physical terrain, hydrology, and stream network data were assessed and summarized to inform EWD assessments, as described below.

2.2.1 Instream flow analyses

All available instream flow analyses in the County were compiled. Results of each available study were summarized based on common metrics, including the drainage area of study reach and the flow requirements for fish passage, spring rearing, summer rearing, and lagoon function. Based on the limited number of studies conducted, it was not possible to extrapolate results to non-studied watersheds. Therefore, a quantitative field analysis was conducted, as described in Section 2.3.3 below, to collect uniform data throughout the County.

2.2.2 Watershed groupings

Existing spatial data were used to demarcate the geologic/topographic/hydrologic "Physical Landscape Units" (PLU) within the County (Figure 3). These units were defined by their underlying geology and hillslope gradient, grouped into 21 separate classes using the categories developed for the Central Coast Regional Water Quality Control Board in support of their hydromodification control criteria (Stillwater Sciences and Tetra Tech 2012; termed "Physical Landscape Zones" in that document). Using spatial analysis in a Geographic Information System (GIS), the PLU was identified for each stream reach in the County.

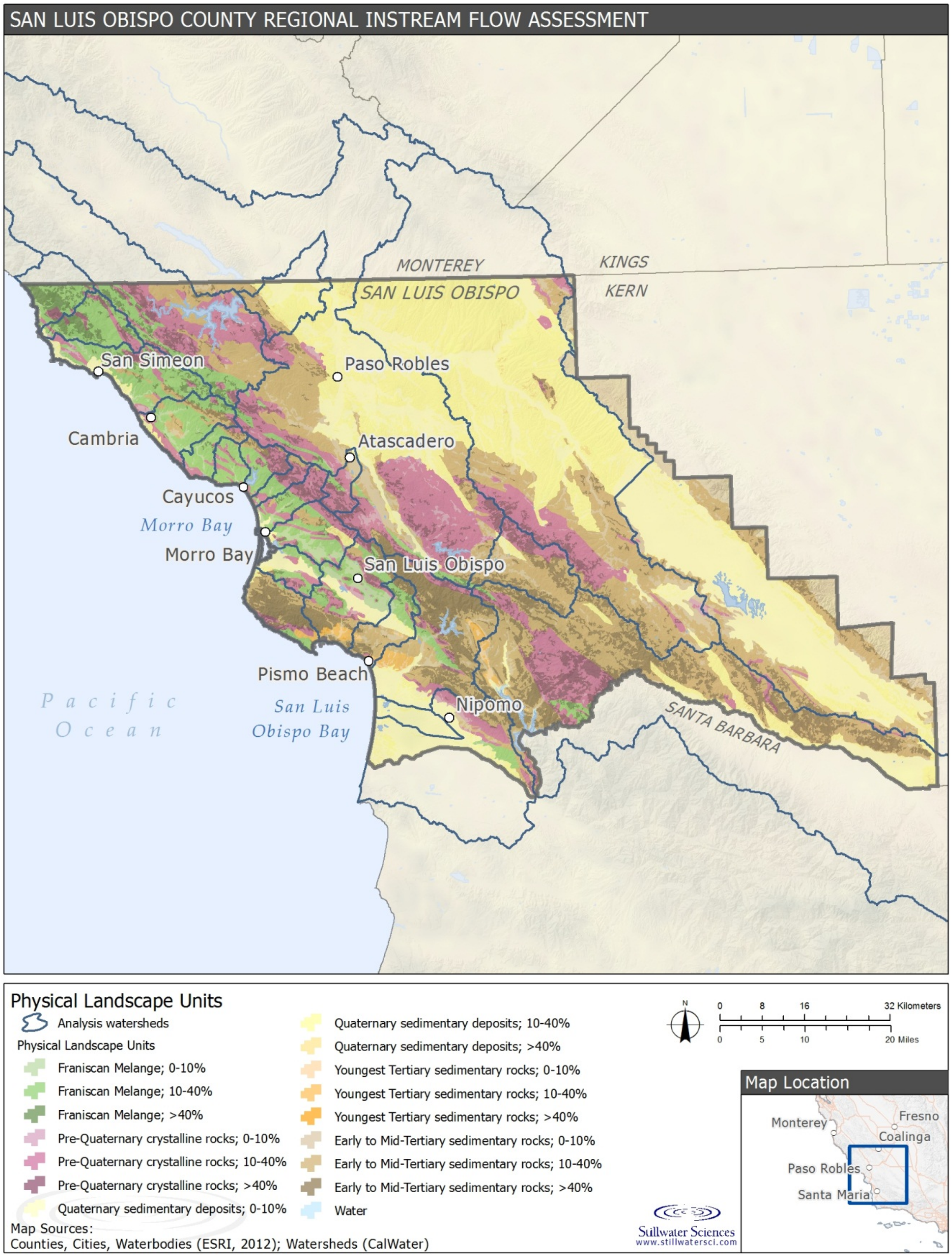


Figure 3. Physical Landscape Units in San Luis Obispo County (Stillwater Sciences and Tetra Tech 2012).

2.2.3 Hydrology

All available United States Geological Survey (USGS) and County streamflow gage data for the County were compiled. Existing flow data were used to examine potential relationships between flows and physical landscape characteristics such as channel slope, channel width, drainage area, and PLUs.

2.3 Quantitative Assessment of Steelhead Flow Requirements

Flow requirements were defined and quantified for steelhead based on their life history, particularly during the two most flow-sensitive periods for minimum flow requirements (Figure 4), namely: (1) the spring period, when sufficient flows are required not only to prevent desiccation but also to provide for production of aquatic macroinvertebrate food source and downstream migration of juveniles; and (2) the summer period, when sufficient flows are required to prevent desiccation of habitat. For the purposes of this analysis, "fry" are considered steelhead recently emerged from the gravel and in their first spring or summer of life, and "juveniles" are steelhead that have resided in freshwater for at least one year.

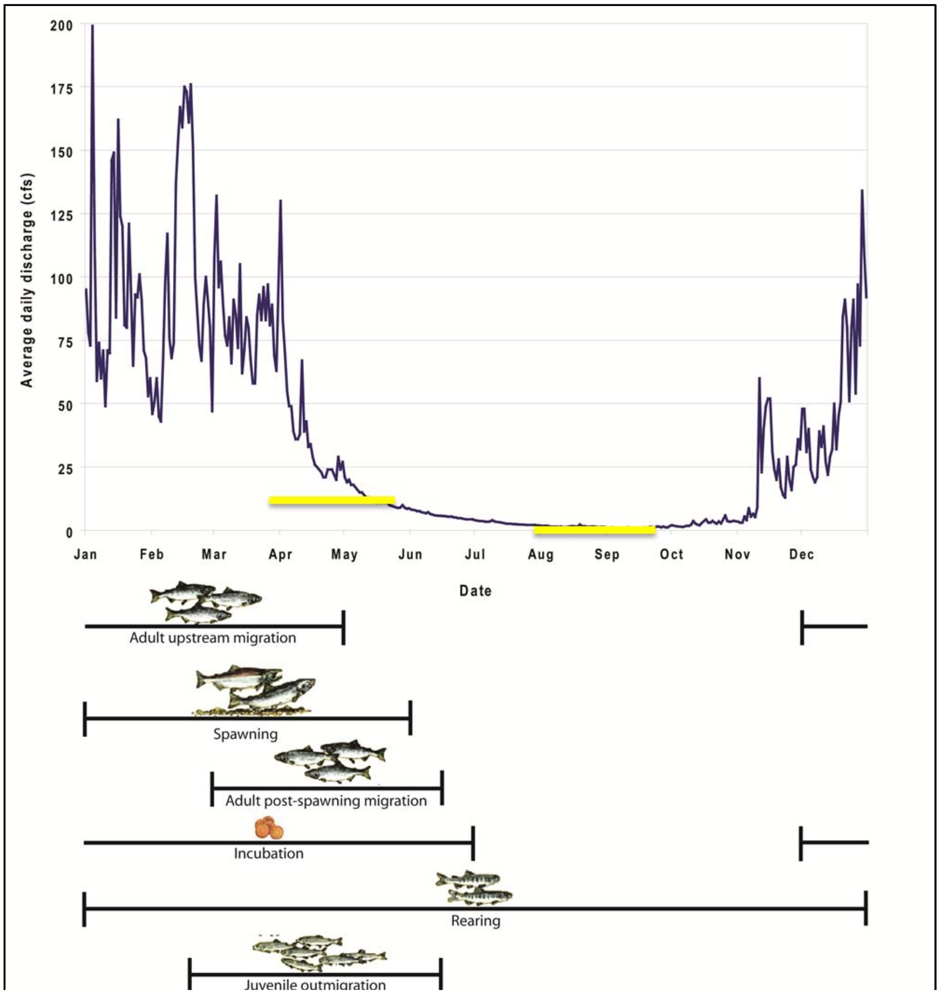


Figure 4. Steelhead life history and hypothetical annual hydrograph. Sensitive time periods are shown in yellow, corresponding to the spring (April through May) and summer (August through September) flow periods.

2.3.1 Spring flows

Spring flows were defined as the mean discharge during the months of April and May, when flows are needed to support the survival, growth, and migration of steelhead. Steelhead can only survive the intrinsically harsh conditions of summer in central California watersheds if conditions to support growth are sufficient during the preceding spring (Harvey et al. 2006, Stillwater Sciences 2007, Sogard et al. 2009). Productive benthic macroinvertebrate (BMI) habitat is considered the most direct measure of the ability of a stream to provide food resources to rearing salmonids, which also is directly affected by instream flows (Harvey et al. 2006). Adequate flows are needed to provide for the production of macroinvertebrates in riffle habitat, as well as the drift of macroinvertebrates from riffles downstream to pools where steelhead rear and feed. In addition, flows of sufficient magnitude are necessary to support downstream migration of juveniles to the ocean.

Flows during spring were assumed to be sufficient if flatwater habitats (e.g., pools and runs) had adequate water depths and velocities for steelhead fry and juveniles, riffles had adequate water depths and velocities to provide productive BMI habitat, and shallow riffles were deep enough to allow migratory connectivity between habitats (Table 1).

Table 1. Summary of habitat criteria values for steelhead rearing during spring.

Life stage	Habitat characteristic	Range of suitable values	Supporting literature
Fry rearing	Depth	0.1–1.5 ft	Sheppard and Johnson (1985), Bugert (1985), Moyle and Baltz (1985)
	Velocity	<0.5 ft/s	Bjornn and Reiser (1991), Dolloff (1983)
Juvenile rearing	Depth	>1.0 ft	Everest and Chapman (1972), Shirvell (1990)
	Velocity	0.5–2.7 ft/s	Everest and Chapman (1972), Smith and Li (1983), Shirvell (1990)
Juvenile migration	Depth	>0.3 ft	CDFG 2013
BMI production	Substrate	Gravel/cobble	Orth and Maugham (1983), Gore et al. (2001), Taylor et al. (2009)
	Depth	Inundate average particles	
	Velocity	> 1.0 ft/s	

2.3.2 Summer flows

Consistent with the approach of Goslin and Boughton (2006), summer flows were defined as the mean discharge during the months of August and September, when flows are needed to support survival of steelhead fry and juveniles. During summer, flows in many central California streams become low, intermittent, or dry up completely (Spina et al. 2005). Summer rearing habitat related to instream flows is therefore thought to be an important limiting factor for steelhead populations in central and southern California (Spina et al. 2005, NMFS 2013), and the shortage of summer habitat restricts steelhead distribution in this region more than available habitat during other seasons (Goslin and Boughton 2006). Although higher flows would be preferred by steelhead to support growth and migration during summer, research has demonstrated that steelhead can survive during summer with minimum flows that prevent desiccation in areas with suitable water temperatures (Harvey et al. 2006, Stillwater Sciences 2007, Sogard et al. 2009). Flows during summer were assumed to be sufficient if there were adequate water depths for steelhead fry and juveniles, as well as the apparent connectivity of water flowing between habitat units (Table 2).

Table 2. Summary of habitat criteria values for steelhead rearing during summer.

Life stage	Habitat characteristic	Range of suitable values	Supporting literature
Fry rearing	Depth	> 0.3 ft	Everest and Chapman (1972), Johnson and Kucera (1985), Sheppard and Johnson (1985)
	Velocity	0.0–0.8 ft/s	Everest and Chapman (1972), Smith and Li (1983), Sheppard and Johnson (1985)
Juvenile rearing	Depth	>1.0 ft	Everest and Chapman (1972), Shirvell (1990)
	Velocity	0.0–2.7 ft/s	Everest and Chapman (1972), Smith and Li (1983), Shirvell (1990)

2.3.3 Field assessment

Because instream flow data in the County are very limited (Section 2.2.1), a field assessment was conducted to evaluate the relationship between instream flows and habitat for steelhead during spring and summer. Field assessment sites were selected to represent a range of watershed areas, instream flows, PLUs, and locations within the County (Figure 5). Twelve sites were evaluated during mid-April 2013, and six of the twelve sites were re-evaluated during early September 2013. An additional ten sites were visited during spring and summer 2013 but had insufficient flow to support assessments.

All observations were made during 2013, which was classified by the California Department of Water Resources as an extreme drought in San Luis Obispo County. Field assessments of steelhead habitat were conducted to determine the relationship between channel characteristics and minimum flow requirements for steelhead, and were not affected by the occurrence of the drought. However, during summer 2013 field visits many sites no longer had visible surface flow, and thus no useful field data could be collected.

Field evaluations were conducted to consider habitat/flow relationships during the season of interest. During each field visit, a study area of approximately 20 channel widths was identified within the stream channel, a rough channel sketch was created (e.g., Figure 6), and flows were measured following the methods of Rantz (1982). Suitable habitat for steelhead was delineated at each field site based on the criteria defined for summer and spring flows, described above (Tables 1 and 2). Suitable habitat areas that met all of the habitat criteria for a specific life stage and season were delineated on channel sketch maps (e.g., Figure 6). Based on this mapping, the minimum flow required to meet the criteria for EWD for both spring and summer was estimated. For example, at some locations, a flow that provided spring habitat was achieved, and not substantially exceeded, and thus the observed flow at time of visit was considered suitable for spring requirements. In other locations, spring flow requirements were substantially exceeded, and a spring flow requirement was estimated to be a lower flow than was observed during the field visit. Nearly all field sites were visited at both spring and summer flow conditions in an attempt to more accurately estimate flow requirements in both seasons (Figure 5). However, many of the sites were dry or had zero flow (wetted with no water velocity) during summer and thus could not be assessed during both seasons.

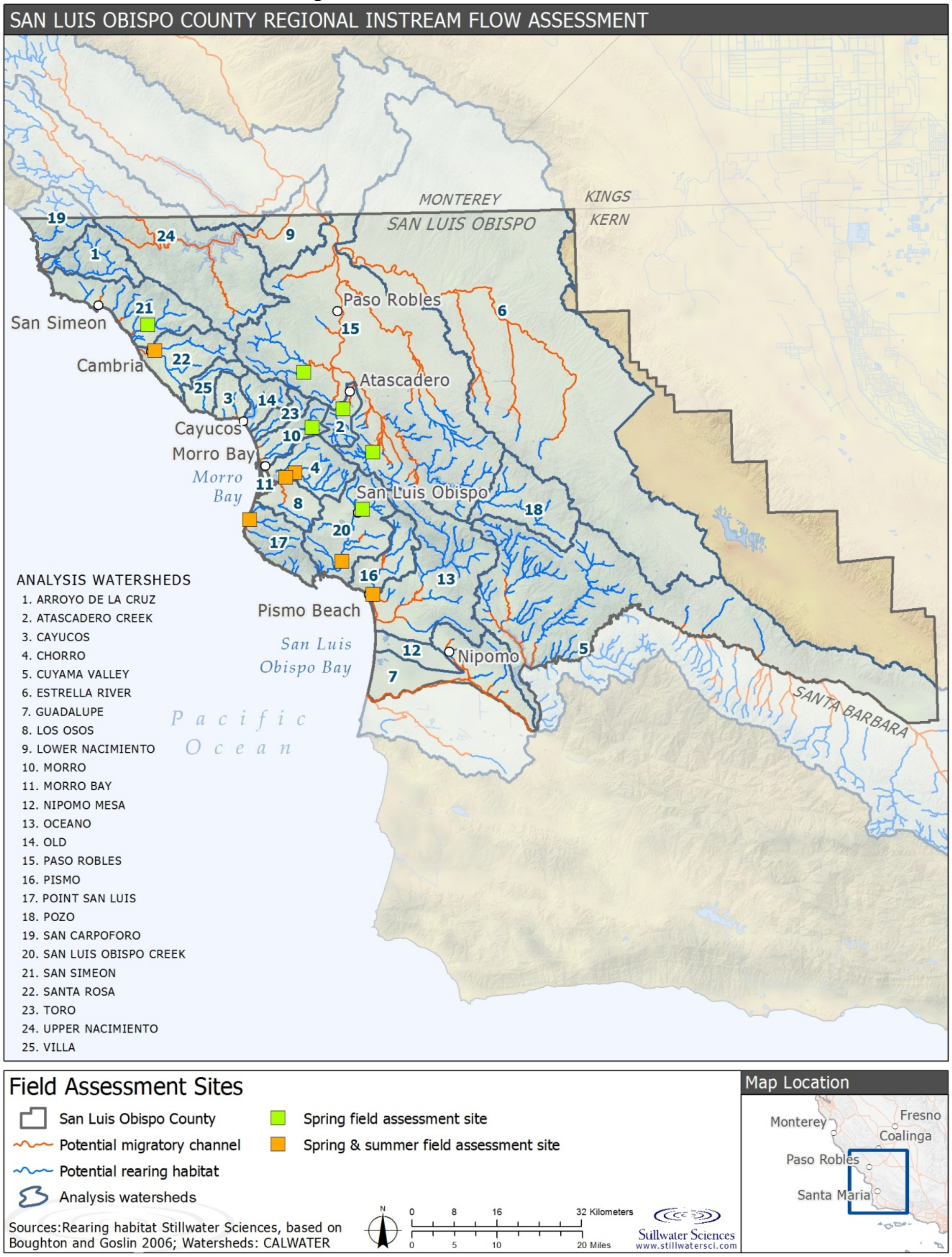


Figure 5. Field assessment sites from spring and summer 2013.

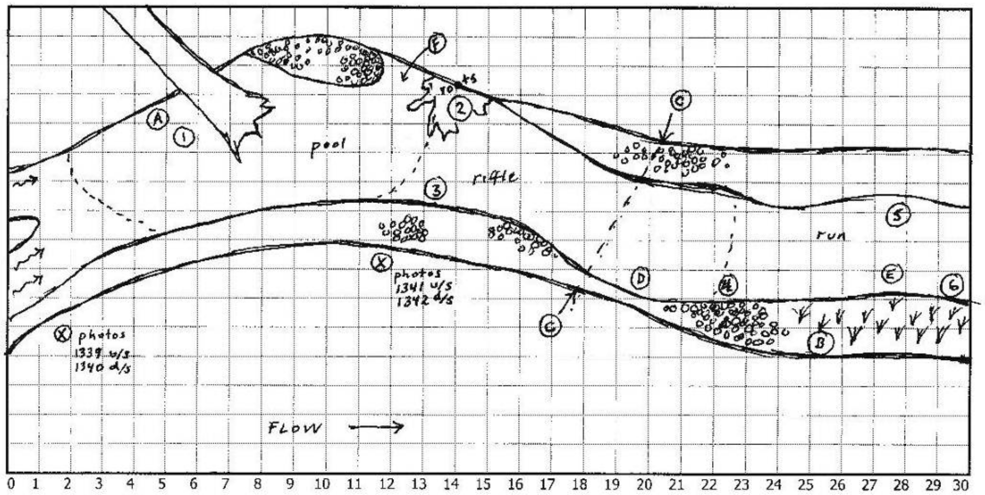
San Luis Obispo County EWD Field Assessment

Date 15 April 2013 Location San Luisito Creek at Alamo Bridge

Measured flow (cfs) 0.27 cfs USGS or County flow (if available) ______

Age 0+ criteria met? Y N Age 1+ criteria met? Y N BMI criteria met? Y N

Suitable flow estimate – spring ($Q_{4,5}$) 0.50 cfs Suitable flow estimate – summer ($Q_{8,9}$) 0.25 cfs



Scale = 1 = 2'

Site	Notes
A	possible lamprey redd – photos 1337 and 1338
B	scattered willow saplings + forbs
C	BFW = 15' depth = 0.9'
D	D50 = 20
E	D50 = 10
F	pocket – possible age 1+ habitat
G	
H	
I	
J	
K	

Site	depth (ft)	velocity (ft/s)
1	1.20	0.21
2	0.26	1.00
3	0.20	0.97
4	0.70	0.26
5	0.30	0.33
6	0.50	0.38
6		
7		
8		
9		
10		

General Notes

Abundant fry and 0+ observed, flow appears suitable for age 1+ and there are a few pockets within reach suitable as well as a slightly larger pool u/s. Juvenile migration unimpeded. Riffles inundated but velocity too low for criteria. Macroinvertebrate production appears high - observed adult caddisflies and mayflies, larval mayflies, leeches. Bridge plunge-pool/barrier d/s between Hwy 1 and San Luisito Rd. - age 0+ and 1+ observed. Redd observed d/s of obstacle.

Figure 6. Example data sheet and channel sketch created during field evaluations.

The following is a list of the habitat characteristics that were measured in the field and a brief description of the methods that were used to determine habitat suitability.

- *Water depth.* Water depth was measured to assess suitable habitat using a stadia rod.
- *Water velocity.* Mean water column velocity was measured with a Marsh-McBirney velocity meter at 0.60 of water column depth. For fry and juvenile rearing habitat, water velocity measurements were taken in the focal position of rearing juvenile fish.
- *Productive BMI habitat.* Average water column velocity was measured using Marsh-McBirney velocity meter. Riffles were described based on areas that were fully wetted and met water velocity criteria for spring (Table 1).

2.3.4 Analyses

"Analysis Points" were identified within Analysis Watersheds in the County for all locations where environmental conditions warranted predictions of EWD (Figure 7). These included stream channels identified by Boughton and Goslin (2006) as having a high potential for steelhead rearing. Since the EWD estimates relate to steelhead rearing life history requirements, Analysis Points were located within stream channels designated as steelhead migration habitat. In smaller watersheds typically one location is identified, whereas in larger watersheds lower, middle, and upper locations were typically identified. Wherever possible, Analysis Points were located at existing gages to support comparisons of EWD predictions with existing flow conditions. Preference was also given to locating Analysis Points where access is better, such as road crossings, to support potential future monitoring efforts.

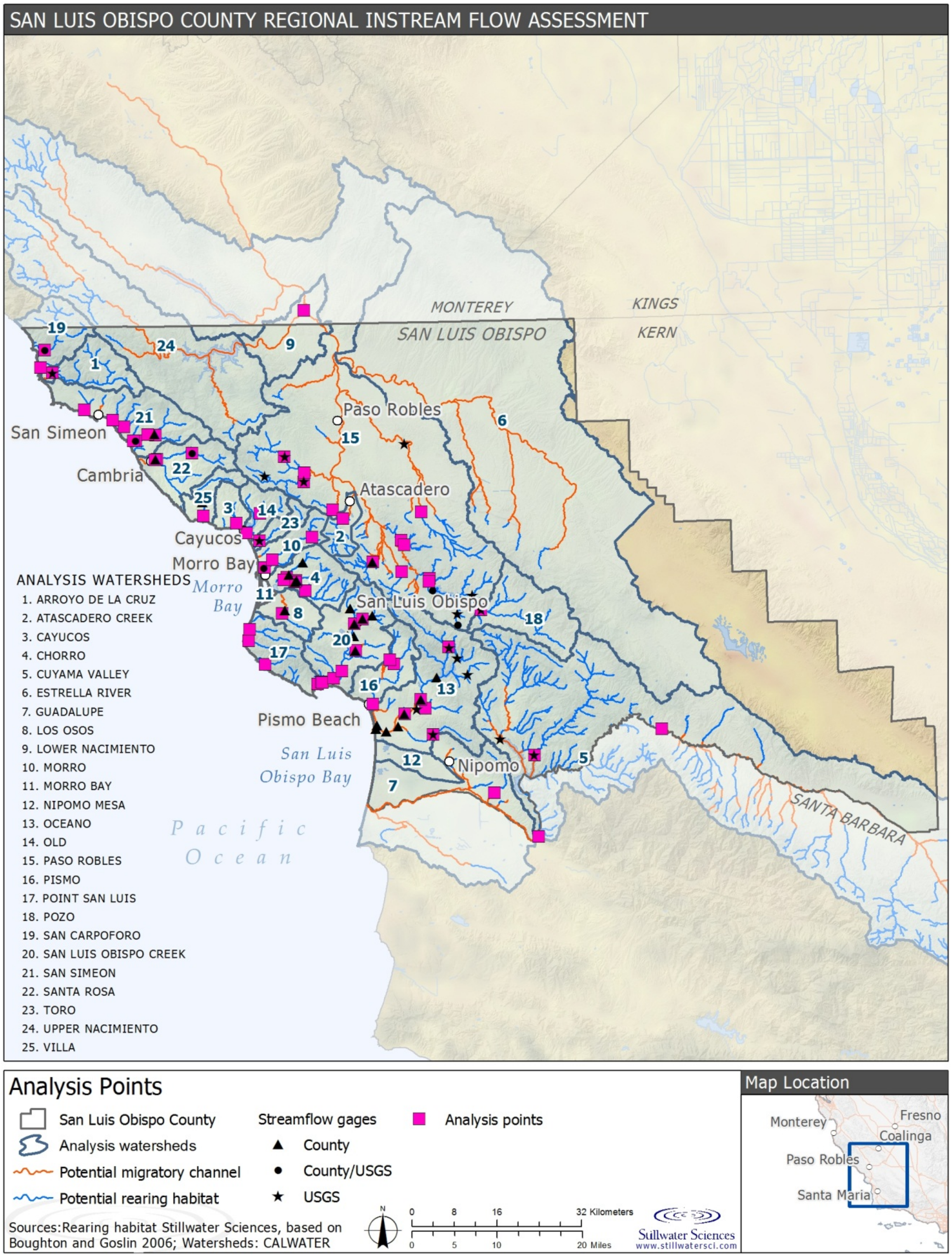


Figure 7. Analysis Points established for SLO County watersheds.

Analyses were conducted to: (1) evaluate patterns between hydrology and watershed characteristics, (2) evaluate relationships between estimated EWD and watershed characteristics,

(3) develop a predictive model of EWD, and (4) apply the predictive model to all Analysis Points. Results of analyses were used to identify gaps in available data, prioritize watersheds for additional focused studies, and recommend methods for subsequent focused studies.

Patterns between watershed hydrology and watershed characteristics in the County were evaluated to identify measureable variables that could be used to predict EWD. All available hydrology data from USGS and County streamflow gages located within steelhead potential rearing habitat were used, and average values for spring flows (average for April through May), and summer flows (average for August through September) were calculated for each gage. Potential patterns between hydrology and watershed characteristics were then evaluated by comparing average spring and summer flows with watershed area, PLU, and an index of the presumptive bankfull channel width (presumed proportional to the square root of drainage area; Dunne and Leopold 1978) for each gage location. Based on this evaluation, watershed characteristics were identified that were related to hydrologic patterns.

The estimated values for EWD based on the field assessment (Section 2.3.3) were compared with watershed characteristics found to be related to hydrologic patterns, including drainage area, channel gradient, channel slope, and valley width. Regression analysis was conducted to identify the variables that best described EWD for both spring and summer, and based on these a predictive model was developed for each season. We observed that a simple linear regression model fit our observed data well, which gave support to its broader application to identify the key variables and predict EWD for all streams not evaluated in the field.

Watershed characteristics were determined for each Analysis Point, including drainage area, PLU, and channel gradient. The predictive model was used to estimate EWD for all Analysis Points. All results were summarized in a web-based interactive map.

2.4 Qualitative Assessment

In addition to quantifying EWD to support specific steelhead life stages as described above, other critical functions of flows to support aquatic ecosystems were qualitative considered. These include fish passage flows, spawning flows, geomorphic flows, and lagoon inflows. For each of these critical flow functions, existing information from within the County was summarized to evaluate whether there are sufficient flows to support aquatic ecosystems in County watersheds.

3 RESULTS

3.1 Field Assessment

Twelve sites were evaluated during mid-April 2013, and six of these sites were re-evaluated during early September 2013 to estimate both spring and summer flow requirements (Figure 5). During spring 2013 visits, the observed flows ranged from 0 cfs (wetted with no water velocity) to 6 cfs; and during summer 2013, 0 cfs to 5.8 cfs (Table 3).

Table 3. Field observations and EWD estimates in spring and summer 2013.

Site	Drainage Area (mi^2)	Date	Measured Flow (cfs)	Estimated EWD (cfs)	
				Spring	Summer
Santa Rita Creek	65.7	5/1/2013	0.29	3.00	1.00
Lower Santa Rosa Creek	45.6	4/18/2013	1.62	3.00	0.75
		9/06/2013	0.00		

Site	Drainage Area (mi^2)	Date	Measured Flow (cfs)	Estimated EWD (cfs)	
				Spring	Summer
San Simeon Creek	24.3	4/18/2013	0.99	1.50	0.50
Lower San Luis Obispo Creek	67.9	4/17/2013	6.04	4.00	1.00
		9/11/2013	5.78		
Islay Creek	9.3	5/03/2013	1.13	1.25	0.33
		9/12/2013	0.76		
Lower Pismo Creek	37.8	4/17/2013	0.46	2.00	0.75
San Luisito Creek	7.4	4/17/2013	0.28	0.50	0.25
		9/10/2013	0.08		
Chorro Creek	21.9	5/3/2013	1.20	1.25	0.50
		9/11/2013	0.62		
Tassajara Creek	2.2	5/1/2013	0.15	0.50	0.20
Upper San Luis Obispo Creek	11.5	4/17/2013	0.51	0.75	0.25
		9/11/2013	0.0		
Atascadero Creek	13.7	4/18/2013	0.09	0.75	0.50
		9/12/2013	0.0		
Upper Morro Creek	9.1	5/1/2013	0.44	0.75	0.25

Based on measurements of suitable habitat for specific steelhead life stages, flows to support steelhead during spring range from 0.5 cfs to 4 cfs (Table 3). Flows of this magnitude were sufficient to provide fry and juvenile rearing and feeding habitat, migratory connectivity for juveniles between habitat units, and benthic macroinvertebrate production. Water depth was adequate in most habitats, and overall suitability was typically limited by water velocity. In some locations, such as San Luisito Creek (Figure 8), the estimated spring Environmental Water Demand (EWD) (0.5 cfs) is relatively low, due to a confined, moderate gradient channel that consolidates available surface flow. In contrast, river channels such as lower San Luis Obispo Creek are relatively unconfined, semi-alluvial gravel-dominated streams in which a higher spring EWD (4 cfs) is required to provide sufficient spring steelhead habitat (Figure 9). In general, the larger, low-gradient channels yield larger spring EWD values. Exceptions included highly incised channels (e.g., lower Pismo Creek) where relatively low flows remained confined and maximized available habitat. In most of the stream channels that were not carrying sufficient flows to provide steelhead habitat, habitat units were hydrologically connected but flows had insufficient water velocity to support food delivery or to provide migration among habitat units (e.g., Atascadero Creek, Figure 10).

Figure 8. San Luisito Creek, with nearly sufficient flows to provide steelhead habitat during spring 2013.

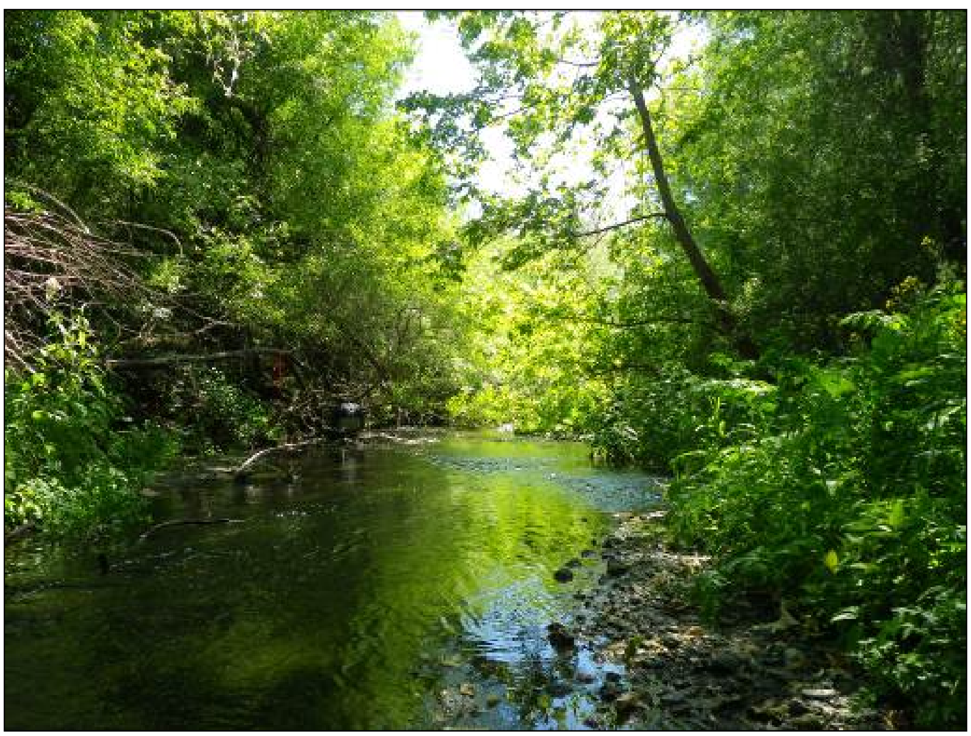


Figure 9. Lower San Luis Obispo Creek, with sufficient flows to provide steelhead habitat during spring 2013. Note that flows are dominated by San Luis Obispo's Water Reclamation Facility releases.

Figure 10. Middle Atascadero Creek, with insufficient flows to provide steelhead habitat during spring 2013. Note that 2013 was an extreme drought in the County.

Based on measurements of suitable habitat for specific steelhead life stages, flows to support steelhead during summer were observed to range from 0.25 cfs to 1 cfs. Flows of this magnitude provided sufficient water depth to provide fry and juvenile rearing habitat, and water velocity is considered less critical during summer than during spring. These EWD flows are typically half or less than that estimated during spring for the same channel. In some locations, such as lower Islay Creek (Figure 11), summer flows needed to support steelhead habitat (0.3 cfs) are relatively low, due to a bedrock-dominated confined channel that supports sufficient pool depths at very low flows. In most cases, the channels that were not providing sufficient summer habitat had intermittent, disconnected habitats, such as lower Santa Rosa Creek (Figure 12).

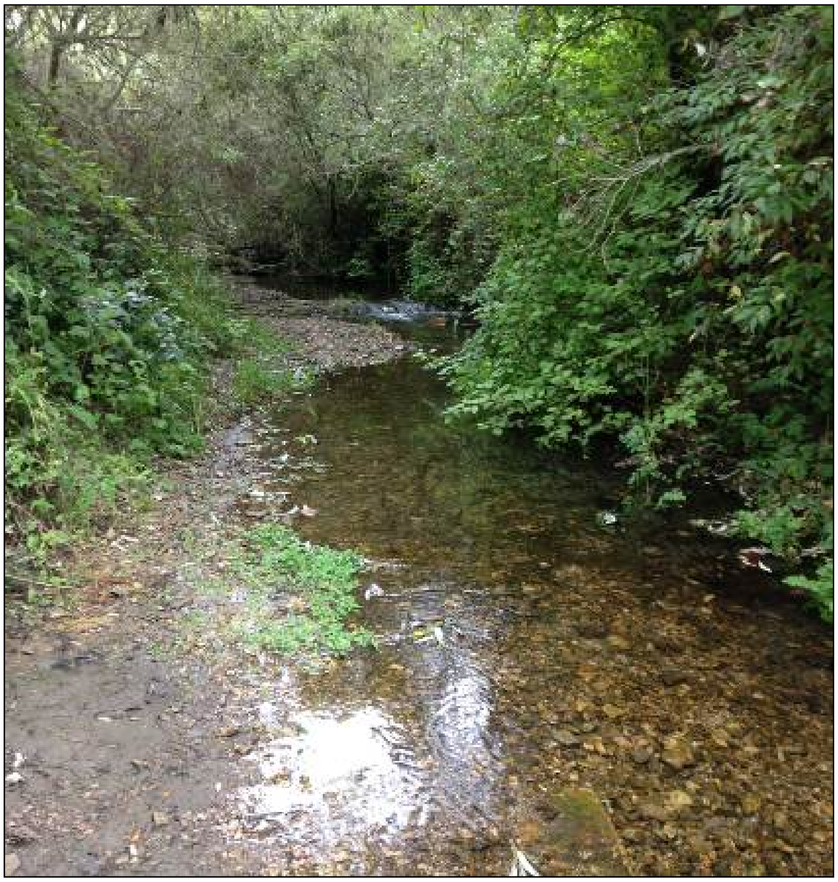


Figure 11. Lower Islay Creek, with sufficient flows to provide steelhead habitat during summer 2013.

Figure 12. Lower Santa Rosa Creek, with no flow and thus no steelhead habitat during summer 2013. Note that 2013 was an extreme drought in the County.

3.2 Environmental Water Demand Model Development

Results from the field assessment (Table 3) were compared with watershed characteristics. We found that of the variables analyzed, drainage area was the only factor that was consistently strongly correlated (Figures 13 and 14) with estimated spring and summer flows to support steelhead habitat. This is likely due to the overarching importance of channel size (and, specifically, channel width) as a function of drainage area. Lower gradient channels, which are also associated with larger drainage areas, require less water to provide suitable water depth to meet EWD than steeper gradient channels. However, drainage area also correlates with wider channels that require more water to provide suitable water *velocity* to meet EWD. Our field observations indicated that water velocity more often limited suitable habitat than water depth, thus explaining the strong, positive proportionality between EWD and drainage area as a consequence of increasing channel width. Locations with larger drainage areas had both lower gradients and wider channels, and they consistently required higher flows to meet EWD (e.g., Figure 15). Stream channels with a smaller contributing drainage area tend to be higher gradient but relatively confined, and thus they require less flow to meet EWD (e.g., Figure 16).

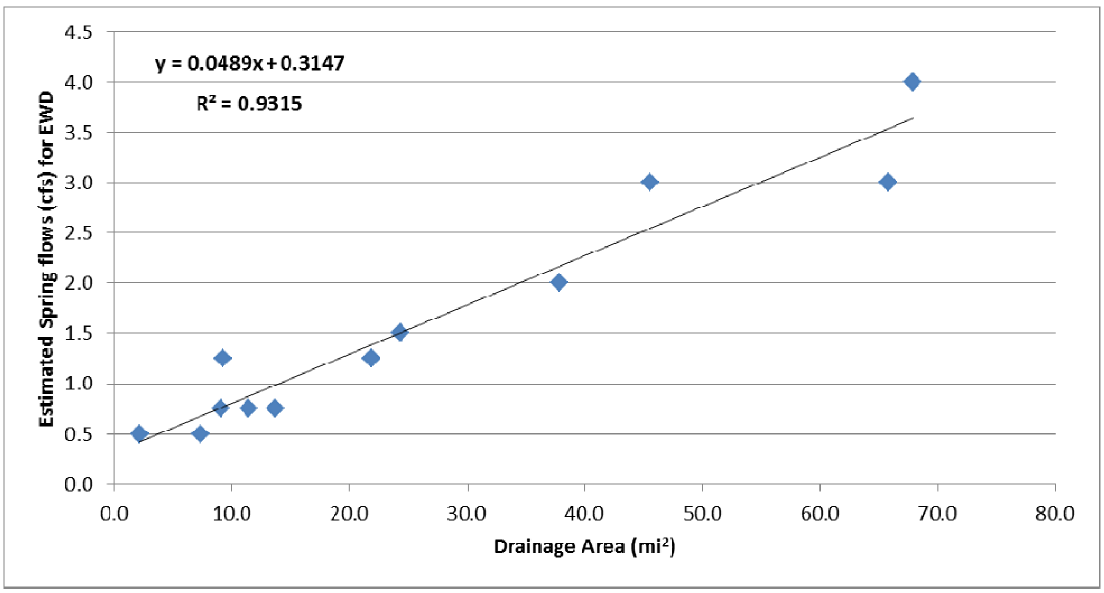


Figure 13. Estimated spring flows for EWD based on field assessments compared with drainage area.

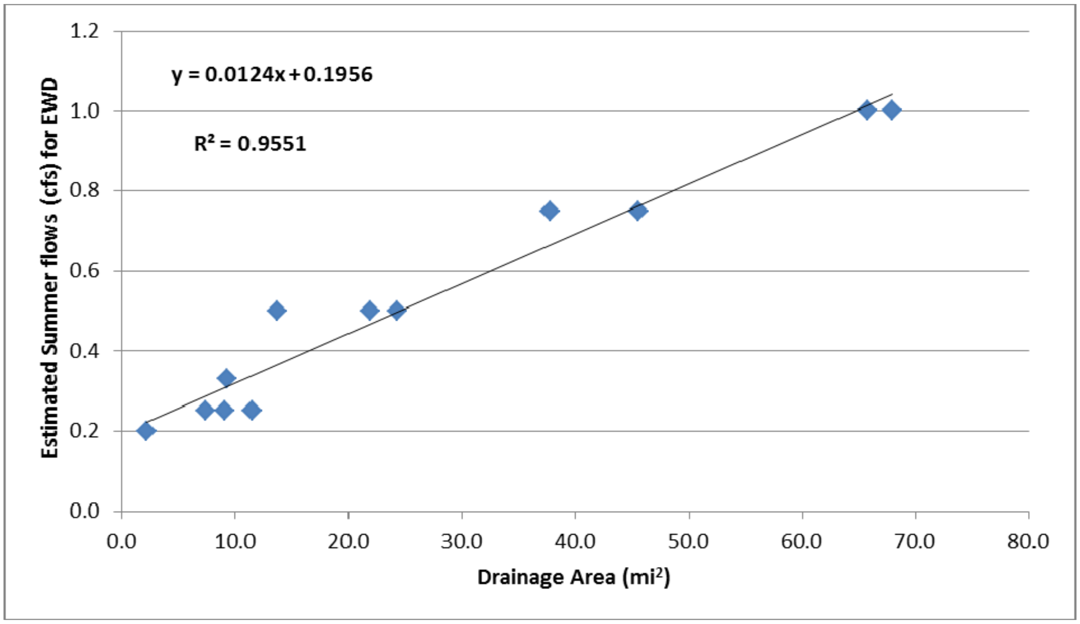


Figure 14. Estimated summer flows for EWD based on field assessments compared with drainage area.

Figure 15. San Simeon Creek with a large drainage area, low gradient, and broad channel; it requires more flow to provide sufficient velocity to meet minimum habitat requirements.

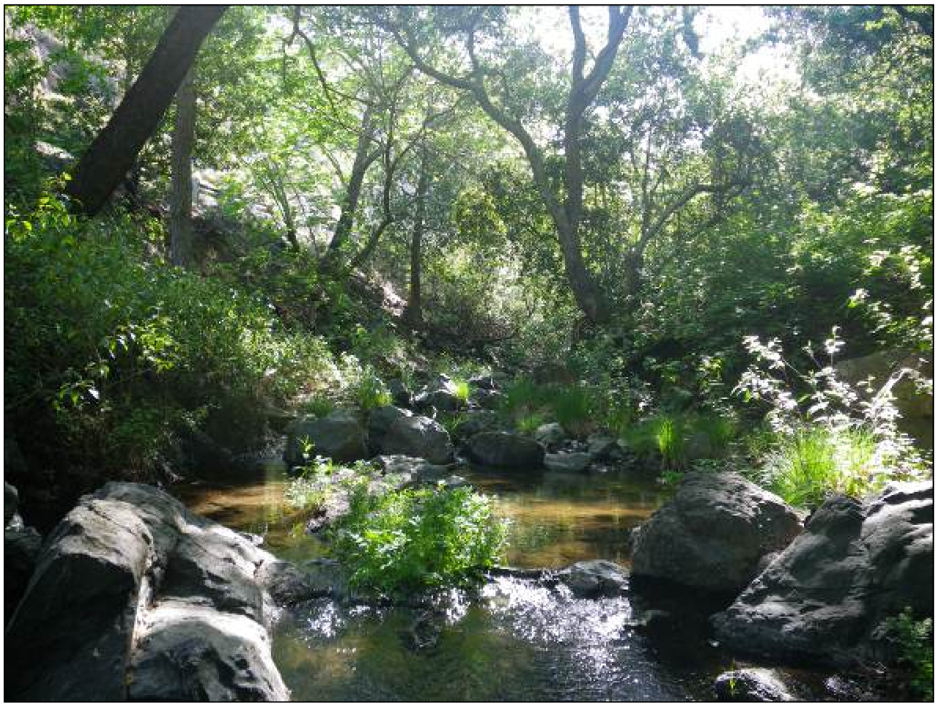


Figure 16. Upper Morro Creek with a small drainage area, high gradient, and confined channel; it requires less flow to provide sufficient depth to meet minimum habitat requirements.

Based on the comparisons of steelhead flow requirements and all assessed variables, estimates for spring flow requirements were best explained by the model $y=0.049x + 0.31$, where x is drainage area in square miles and y is the estimated EWD spring flow in cfs. This model has an R^2 of 0.93.

Based on the comparisons of steelhead flow requirements and all assessed variables, estimates for summer flow requirements were best explained by the model $y = 0.012x + 0.20$, where x is drainage area in square miles and y is the estimated EWD summer flow in cfs. This model has an R^2 of 0.96.

For both seasonal assessments, we encountered no channel that maintained sufficient habitat with less than 0.5 cfs (spring) or 0.2 cfs (summer). This corresponds to the smallest measured channel, supported by the smallest drainage area of 2.2 mi^2 in our sample set. It is unlikely that these simple linear relationships would hold for even smaller drainage basins, and so these results should be extrapolated only cautiously to yet smaller basins and their channels unless additional field calibration has been done.

3.3 Environmental Water Demand Model Application

Analysis points were established within all County watersheds with delineated high potential steelhead rearing habitat (Figure 7). Based on the models described above, the EWD was estimated for each Analysis Point based on spring and summer flow requirements (Table 4). Due to the large number of locations for which EWD is estimated throughout the County, an interactive web-based map was developed, and is available at:
http://geo.stillwatersci.com/maps/slo_rifa/instreamflowassessment.html

Table 4. EWD predications for Analysis Points in SLO County.

Analysis Point	Analysis Watershed[2]	Drainage Area (mi^2)	EWD (cfs)	
			Spring	Summer
Alamo Creek[1]	Alamo Creek Watershed	83.9	4.4	1.2
Arroyo De La Cruz	Arroyo De La Cruz Watershed	41.2	2.3	0.7
Arroyo De Los Chinos Creek[1]	San Carpoforo Watershed	1.8	0.4	0.2
Arroyo Grande Creek, lower	Arroyo Grande Creek Watershed	102	5.3	1.5
Arroyo Grande Creek, middle	Arroyo Grande Creek Watershed	78.3	4.1	1.2
Arroyo Grande Creek, upper	Arroyo Grande Creek Watershed	20.8	1.3	0.5
Atascadero Creek	Atascadero Creek Watershed	13.7	1	0.4
Huerhuero Creek	Huerhuero Creek Watershed	23.7	1.5	0.5
Cayucos Creek	Cayucos Creek Watershed	10.4	0.8	0.3
Chorro Creek, lower	Morro Bay Watershed	40.5	2.3	0.7
Chorro Creek, middle	Morro Bay Watershed	21.9	1.4	0.5
Chorro Creek, upper	Morro Bay Watershed	17.7	1.2	0.4
Calf Canyon	Atascadero Creek Watershed	3.5	0.5	0.2
Coon Creek	Irish Hills Coastal Watersheds	7.9	0.7	0.3
Cuyama River, lower[1]	Cuyama River Watershed	1,143.7	56.2	14.4
Cuyama River, upper[1]	Cuyama River Watershed	796.2	39.3	10.1
Diablo Creek	Irish Hills Coastal Watersheds	5	0.6	0.3
East Corral De Piedra	Pismo Creek Watershed	4.8	0.5	0.3
East Fork SLO Creek	San Luis Obispo Creek	10.2	0.8	0.3
Graves Creek, upper	Lower Salinas River – Paso Robles Creek Area Watersheds	6.7	0.6	0.3
Islay Creek	Irish Hills Coastal Watersheds	9.3	0.8	0.3
Jack Creek	Atascadero Creek Watershed	25.3	1.6	0.5
Little Morro Creek	Morro Creek Watershed	5.2	0.6	0.3
Little Pico Creek	San Simeon – Arroyo de la Cruz Creek Watersheds	6	0.6	0.3
Los Berros Creek	Arroyo Grande Creek Watershed	15.1	1.1	0.4
Los Osos Creek	Morro Bay Watershed	7.1	0.7	0.3
Moreno Creek	Atascadero Creek Watershed	4.3	0.5	0.2
Morro Creek, lower	Morro Creek Watershed	17.9	1.2	0.4
Morro Creek, upper	Morro Creek Watershed	7	0.7	0.3
Nacimiento Creek[1]	Nacimiento River Watershed	369.7	18.4	4.8
Oak Knoll Creek	San Simeon – Arroyo de la Cruz Creek Watersheds	6.4	0.6	0.3
Old Creek, lower	Old Creek Watershed	20.4	1.3	0.4
Old Creek, upper	Old Creek Watershed	10.6	0.8	0.3

Analysis Point	Analysis Watershed[2]	Drainage Area (mi^2)	EWD (cfs)	
			Spring	Summer
Paso Robles Creek	Lower Salinas – Paso Robles Area Watersheds	40.6	2.3	0.7
Perry Creek	Santa Rosa Creek Watershed	44.5	2.5	0.7
Pico Creek	San Simeon – Arroyo de la Cruz Creek Watersheds	13	0.9	0.4
Pilitas Creek	Atascadero Creek Watershed	6.9	0.7	0.3
Pismo Creek	Pismo Creek Watershed	37.9	2.2	0.7
Salinas River	Salinas River Watershed	70.2	3.7	1.1
San Bernardo Creek	Morro Bay Watershed	8.4	0.7	0.3
San Carpoforo Creek	San Carpoforo Creek Watershed	34.5	2	0.6
San Luis Obispo Creek at Avila[1]	San Luis Obispo Creek Watershed	81.4	4.3	1.2
San Luisito Creek[1]	Morro Bay Watershed	0.6	0.3	0.2
San Simeon Creek, lower	San Simeon Creek Watershed	26.2	1.6	0.5
San Simeon Creek, middle	San Simeon Creek Watershed	24.3	1.5	0.5
San Simeon Creek, upper	San Simeon Creek Watershed	9.8	0.8	0.3
Santa Margarita Creek	Atascadero Creek Watershed	10.1	0.8	0.3
Santa Rita Creek	Atascadero Creek Watershed	18.6	1.2	0.4
Santa Rosa Creek, lower	Santa Rosa Creek Watershed	44.8	2.5	0.8
Santa Rosa Creek, upper	Santa Rosa Creek Watershed	12.5	0.9	0.4
See Canyon Creek	San Luis Obispo Creek Watershed	72.1	3.8	1.1
SLO Creek, lower	San Luis Obispo Creek Watershed	67.9	3.6	1
SLO Creek, upper	San Luis Obispo Creek Watershed	11.8	0.9	0.3
Stenner Creek	San Luis Obispo Creek Watershed	10.9	0.8	0.3
Suey Creek	Nipomo-Suey Creeks Watersheds	11.5	0.9	0.3
Tar Spring Creek	Arroyo Grande Creek Watershed	4	0.5	0.2
Toro Creek	Toro Creek Watershed	14.2	1	0.4
Trout Creek	Atascadero Creek Watershed	6.4	0.6	0.3
Unnamed Eastside Trib to Salinas River	Salinas River Watershed	3.4	0.5	0.2
Van Gordon Creek	San Simeon Creek Watershed	2.7	0.4	0.2
Villa Creek	Villa Creek Watershed	14.5	1	0.4
West Corral De Piedra	Pismo Creek Watershed	6.4	0.6	0.3
Wild Cherry Canyon[1]	Irish Hills Coastal Watersheds	1.5	0.4	0.2

[1]Extrapolated values lie beyond the observed range of Figures 13 and 14; values are thus more uncertain. Particular caution should be used in interpreting results for Lower Nacimiento Creek and Upper and Lower Cuyama Creek, which exceed the measured range by more than 5-fold.

[2] Analysis watershed names use local naming conventions, Hydrologic Area or Hydrologic Sub Area names depending on what seemed the most descriptive to the reader.

3.3.1 Comparison with other instream flow evaluations

EWD predictions were compared with the few previous instream flow evaluations that have been conducted in the County (Table 5). In particular, the Instream Flow Incremental Methodology (IFIM) analysis of Thomas R. Payne & Associates (TRPA) (1994) evaluated steelhead suitability in San Luis Obispo Creek. TRPA used the IFIM to generate curves of wetted usable area (WUA) at increasing flows. This analysis allowed the determination of the maximum WUA for steelhead fry, juvenile, and spawners in three reaches of San Luis Obispo Creek. They found that flows of around 6 cfs in lower San Luis Obispo Creek provide maximum habitat for steelhead fry, and substantial amounts of habitat for juveniles. However, habitat for juveniles continued to increase at higher flows up the maximum flow modeled of 20 cfs. In comparison, we estimated EWD as 3.6 cfs for sufficient spring habitat, and 1 cfs for sufficient summer habitat in lower San Luis Obispo Creek. The results of TRPA (1994) corroborate EWD estimates for San Luis Obispo Creek, and they also highlight that EWD estimates are not estimates of the flows that would maximize habitat availability, but rather the flows that would provide a minimum sufficient level of habitat.

Table 5. Instream flow analyses conducted in SLO County.

Location	Drainage Area (mi^2)	Life stage and flow estimate (cfs)				Source
		Fish passage	Spawning	Spring rearing	Summer rearing	
Santa Maria River mainstem	1,860	250	n/a	n/a	n/a	Stillwater Sciences and Kear Groundwater (2012)
San Luis Obispo Creek	68	n/a	20[a]	6	n/a	TRPA (1994)
Santa Rosa Creek	45	34–60	n/a	n/a	n/a	D. W. Alley and Associates (1993)
San Simeon	26	21–67.5	n/a	n/a	n/a	D. W. Alley and Associates (1992)
		40	n/a	n/a	n/a	Water Resource Associates (1990)
Arroyo Grande Creek	102	20	6	3	3	Stetson Engineers, Inc. et al. (2004)

[a] Highest flow modeled/observed
n/a Not assessed

During development of the Arroyo Grande Habitat Conservation Plan (HCP), Stetson Engineers, Inc. et al. (2004) evaluated all life stages of steelhead in Arroyo Grande Creek downstream of Lopez Dam (impassable barrier) using unspecified methods involving qualitatively evaluating streamflow requirements for steelhead spawning and juvenile rearing. Based on observations of habitat conditions during field surveys, flows of 6 cfs were recommended for spawning, and 3 cfs for spring and summer rearing (with exceptions based on Lopez Lake reservoir storage). In comparison, we estimated EWD as 5.3 cfs for spring and 1.5 cfs for summer in Arroyo Grande Creek.

3.4 Qualitative Flow Assessment

3.4.1 Fish passage flows

In addition to flows to support rearing, adult steelhead require sufficient flows to migrate upstream from the ocean to suitable spawning and rearing habitat during winter, and juvenile require sufficient flows to migrate downstream to the ocean as smolts during spring. Adult fish passage flow requirements are typically much higher than flows required for rearing. We identified the portions of each watershed that are potential critical migratory channels. These channels were delineated based on assuming that any river channel that is not identified as having a high potential for rearing habitat but is downstream of a NOAA-identified reach with high rearing potential (Boughton and Goslin 2006) would need to provide flows sufficient to support upstream migration of adult steelhead and downstream migration of juvenile steelhead, at some (indeterminate) frequency and duration. This approach is not precise, and very likely there are river channels identified as migratory habitat that could support rearing, and vice versa. However, this approach identified the general segments of the channel network that should be considered for fish passage flows, such as the low-gradient, lower reaches of large watersheds. In general, migratory channels have local channel gradients less than 1%, are composed of valley-bottom Quaternary deposits, and have an unconfined valley setting.

Conditions necessary to provide fish passage have been identified, and methods exist to determine flows required to achieve passage based on channel conditions (e.g., Thompson 1972, CDFG 2013). However, based on the scope and timeframe of this analysis, it was not possible to conduct site-specific fish passage flow assessments. Existing fish passage and flow analysis that has been conducted in the County includes the Santa Maria River, San Simeon Creek, Santa Rosa Creek and Arroyo Grande Creek, each of which is further discussed below.

Stillwater Sciences and Kear Groundwater (2012) identified the flow necessary to promote and provide effective passage of steelhead to and from the Pacific Ocean into areas of documented spawning and rearing habitat in upper parts of tributaries to the Santa Maria watershed. Based on a combination of field measurements and hydraulic calculations, the study concluded that a discharge of 250 cfs consistently provided adult steelhead passage throughout the critical passage reach of the Santa Maria River, and that 150 cfs would meet the criteria for downstream (juvenile) passage, based on available information. The study also concluded that even under unimpaired conditions, flows are insufficient in most years to provide fish passage.

D. W. Alley and Associates (1992) assessed fish migration streamflow requirements in San Simeon Creek. They surveyed the creek from the mouth to nearly 4 miles upstream and identified critical riffles most likely to limit fish passage. A model for water-surface elevation based on transect data was used in conjunction with the Thompson (1972) method for determining minimum fish passage flows, which specifies water depths within shallow riffles to achieve passage. D.W. Alley estimated that adult upstream migration in San Simeon Creek required between 21 and 67.5 cfs, depending on the critical riffle location. Flows to allow post-spawning adults to migrate downstream were estimated between 7.2 and 19 cfs, and 3.5 to 11 cfs to support downstream migration of juveniles and smolts. These results were consistent with the earlier analysis of Water Resource Associates (1990), who estimated that 40 cfs was required for adult upstream migration by assessing one critical riffle in lower San Simeon Creek.

In Santa Rosa Creek during drier winters, lower reaches may significantly delay or prevent adult steelhead from accessing, and smolts from emigrating from, the upper reaches (Nelson et al. 2009). D. W. Alley and Associates (1993) assessed fish migration streamflow requirements in

Santa Rosa Creek using the same approach described above for San Simeon Creek. They estimated that between 34 and 60 cfs would be required to allow adult steelhead to migrate upstream in Santa Rosa Creek, depending on the critical riffle location. Flows to allow post-spawning adults to migrate downstream were estimated between 13 and 25 cfs depending on the riffle location, and 5.8 to 17 cfs to support downstream migration of juveniles and smolts.

Stetson Engineers, Inc. et al. (2004) assessed fish passage in Arroyo Grande Creek at a low-flow road crossing and at seven additional transects using the Thompson (1972) approach. Analysis indicated that steelhead passage criteria would be met at flows from 10 to 20 cfs at transects, and at 30 cfs at the low-flow road crossing. Based on these results, a release of 20 cfs was the HCP's preferred alternative in Arroyo Grande Creek to achieve fish passage.

Based on existing data, flows to achieve fish passage in County streams range from 20 to 250 cfs (Table 5). These results were assessed to determine if there is a relationship between drainage area (and other metrics) and flow requirements that could be used to predict fish passage requirements in non-studied watersheds. Although in general the designated migratory channels in large rivers such as the Santa Maria River require substantially more flow to provide passage than smaller channels such as lower San Simeon Creek (Table 5), there is no robust association between channel width or drainage area and flow requirements. This is because fish passage flow requirements are site-specific. In low-gradient migratory channels such as the Santa Maria River, adequate flow is required to provide passage through long, shallow riffles, whereas in higher gradient channels adequate flow is required to provide passage past steep, rocky features (Figure 17). Flows required to provide passage past these site-specific features do not relate in a predictable way with any watershed characteristics, such as drainage area. Therefore a predictive model could not be developed to estimate EWD for fish passage requirements, and site-specific evaluations will be necessary to identify watershed-specific fish passage flow requirements.

Despite the importance of fish passage, the definition of EWD used in this study does not include requirements for fish passage flows. However, in general, fish passage flows are not as sensitive to management as other life stages. In most watersheds, fish passage for adults will occur during winter rainfall events, when increased precipitation results in high instream flows. The frequency and duration of rainfall events sufficient to support fish passage flows will depend on specific watershed conditions. There are very few watersheds in the County where water management is capable of storing enough flow to prevent rainfall events from increasing instream flows. Therefore in most County watersheds natural rainfall-driven flows continue, and thus we would expect fish migration is generally not affected. Exceptions include watersheds such as the Santa Maria River, Arroyo Grande Creek, Pismo Creek, Salinas River, Nacimiento River, and Old Creek where reservoirs are capable of storing precipitation. There are also other river reaches where groundwater pumping and water diversions are likely increasing the amount of water required to result in surface flow.

Figure 17. Flow-related critical fish passage features from (a) low-gradient shallow riffles, and (b) high-gradient features.

3.4.1.1 Lagoon sandbars

Although estuary or lagoon sandbars may also prevent fish passage, existing assessments in the County suggest that estuary outlets rarely limit upstream adult fish passage, since flows sufficient to provide passage are also sufficient to open the sandbar (Stillwater Sciences and Kear Groundwater 2012, D. W. Alley and Associates 1992, Figure 18). However, this is typically not the case for downstream-migrating juveniles. Even under unimpaired conditions, downstream migrating juveniles can become "trapped" in lagoons without open bars to the ocean, stressing the importance of the habitat quality in lagoon environments (discussed below).

Figure 18. Lagoon sandbars at (a) Santa Rosa Lagoon, annually closed, and (b) Islay Creek Lagoon, perennially open.

3.4.2 Spawning flows

In addition to flows to support migration, adult steelhead require sufficient flows to spawn. Conditions necessary to support spawning have been identified, and methods exist to determine spawning flows. However, spawning flows are not as sensitive or critical to steelhead life history as flow requirements for rearing. Flows to support spawning in the County are often similar or lower in magnitude than those needed for adult fish passage. Therefore in general when steelhead have sufficient flows to access habitat, there are also typically sufficient flows for spawning. As described above for fish passage flows, spawning flows occur during rainfall events, are not as sensitive to management as other life stages, and are typically similar to fish passage flows.

3.4.3 Geomorphic function

Instream flows provide for the long-term maintenance and creation of functional habitat. This includes transporting excess sediment, creating riffles, and maintaining pools. Functional “geomorphic flows” are defined based on magnitude (e.g., higher than 1,000 cfs), frequency (e.g., occurring every other year on average during spring), and duration (e.g., lasting from hours to weeks). Within a watershed of a particular size, flows capable of transporting sediment or inundating floodplain habitat will have a definable magnitude, frequency, and duration. Based on the scope and timeframe of this analysis, it was not possible to identify geomorphic flows for County watersheds. As described for fish passage flows, geomorphic flows are not as sensitive to management as life-stage-specific fish flows. In most watersheds, geomorphic flows will occur during rainfall events, when increased precipitation results in high instream flows. With a few exceptions where dams impound large reservoirs (e.g., Salinas River and Arroyo Grande Creek), watersheds in the County generally lack enough storage to prevent significant rainfall events from increasing flows to levels that initiate geomorphic processes on the stream channel.

3.4.4 Lagoon habitat quality and instream flows

As discussed above, when steelhead juveniles migrate downstream they enter lagoon habitat and can either voluntarily rear there or may become “trapped” by closed sandbar conditions. Steelhead rearing in lagoons has been shown to be greatly enhanced under appropriate lagoon conditions (Hayes et al. 2008, Bond et al. 2008). In addition, tidewater goby reside in coastal County lagoons (Figure 2) and are dependent on the availability of suitable habitat in lagoons (Smith 1990), which is directly related to freshwater inflow. Reduced freshwater inflows may delay the conversion from salt to brackish water (Capelli 1997). This delay causes the estuary to remain stratified, with saltwater along the bottom and freshwater along the surface, longer into the late spring and early summer. The stratified water column, with salt water on the bottom, collects and stores heat because the saltwater layer cannot lose the heat to the surface like the overlying freshwater, causing sub-optimal to lethal temperatures (up to 30°C [86°F]) along the estuary bottom (Capelli 1997, USFWS 2005).

Few analyses of habitat conditions in County lagoons have been conducted. Stillwater Sciences (2012) found that habitat quality in the Pismo Creek lagoon is strongly influenced by upstream conditions. Much of the lower Pismo Creek watershed is developed and the lower Pismo Creek channel and the upper estuary are constrained by levees, bridge abutments, and other infrastructure. These combined factors decrease floodwater storage and infiltration and increase flow confinement and channel incision, which, when combined with water diversions and groundwater extraction within the watershed, have resulted in decreased local groundwater elevations and a subsequent decrease in baseflows into the lagoon during the drier months compared with historical conditions. Although the presence of a large population of tidewater goby and one healthy smolt-sized steelhead in May 2005 (Hagar Environmental Services 2005) suggests that the estuary currently provides suitable aquatic rearing habitat, recent data and observations suggest that usage (particularly for steelhead) is likely limited by summer and fall inflows entering the lagoon, resulting in low dissolved oxygen concentration, excess nutrients and bacteria, and inadequate habitat features.

In Santa Rosa Creek, it has also been observed that lagoon conditions are worsened by low stream flows resulting from excessive groundwater pumping and diversions (Rathbun et al. 1991, Yates and Van Konyenburg 1998, D. W. Alley and Associates 2008). Reduced freshwater inflows result in water temperatures and dissolved oxygen levels in the lagoon, particularly at the bottom, that can frequently exceed lethal limits for steelhead in the summer and fall (Stillwater Sciences et al. 2012). In some lower flow years such as 2003 and 2004, entire sections of the lower lagoon dried up, reducing the area of suitable steelhead rearing habitat (D. W. Alley and Associates 2008), a condition that was also observed in fall 2013 (Figure 19). When Santa Rosa Creek lagoon inflows ceased entirely in summer 2013, steelhead (adults and presumably juveniles) were observed trapped in a pool that decreased dramatically in extent and water quality.

Site-specific long-term monitoring of lagoon berm formation and lagoon water quality (e.g., water temperature, dissolved oxygen, and salinity profile) in relation to lagoon inflows is needed to inform minimum instream flow requirements for watersheds to maintain and protect lagoon habitat, which was outside the scope and timeline of this analysis.

Figure 19. Santa Rosa Lagoon in (a) June and (b) September.

3.5 Comparison of Environmental Water Demand Estimates with Existing Flows

To compare EWD estimates with existing conditions, streamflow data were examined for 16 USGS and two County-maintained gages (Table 6). All gages were located within potential steelhead rearing habitat for which streamflow data were available for analysis. There are additional gages that were not considered, either because they are located within migratory habitat only or because available records were not organized in a manner that supported analysis. Average spring summer flows were summarized for all suitable gages based on the available period of record and were compared with EWD estimates. EWD for spring flows are mostly achieved on average at all gage locations over the period of record, whereas summer flows are either barely achieved, or not at all. This suggests that in many Analysis Watersheds, spring flows are sufficient to support a steelhead population and that summer flows may be a limitation on survival, consistent with the observations of Spina et al. (2005). However, the period of record for available gages ended over 20 years ago for most locations and in many watersheds, water demand for urban, rural, and agricultural needs may have changed, thus altering the amount of surface flow in streams. Although surface flows have undoubtedly declined in many watersheds since gaging has ended, there are also examples of surface flows increasing over what was occurring during the gaging record. These include lower San Luis Obispo Creek, where the City's Water Reclamation Facility has a required release, downstream of the Pismo Creek Oil Refinery discharge in Pismo Creek, and Arroyo Grande Creek downstream of Lopez Dam.

Table 6. Comparison of streamflow measurements at stream gages with EWD estimates. Results are also summarized in an interactive map at http://geo.stillwatersci.com/maps/slo_rifa/instreamflowassessment.html.

Gage station	USGS ID	Period of record	Drainage Area (mi^2)	Spring flow		Summer flow	
				Gage	EWD[1]	Gage	EWD[1]
Alamo Creek near Nipomo	11137400	1959–1978	83.3	5.7	4.4	0	1.2
Arroyo De La Cruz near San Simeon	11142500	1950–1979	41.2	32.8	2.3	0.2	0.7
Arroyo Grande Creek at Arroyo Grande	11141500	1939–1986	102.0	27.5	5.3	3.8	1.5
Arroyo Grande Creek near Arroyo Grande	11141300	1958–1966	68.3	1.5	5.3	0	1.5
Jack Creek near Templeton	11147000	1949–1978	25.3	11.1	1.6	0	0.5
Lopez Creek near Arroyo Grande	11141280	1967–2013	20.9	10.4	1.3	2.8	0.45
Los Berros Creek near Nipomo	11141600[a]	1969–2001	15.0	2	1.1	0.15	0.4
Los Osos Creek at Los Osos Valley Road	County	1977–2002	7.1	2.74	0.7	0	0.3
Morro Creek near Morro Bay	11142080[a]	1977–2004	24.0	9.7	1.2	0.51	0.4
Salinas River near Pozo	11143500	1942–1983	70.3	16.6	3.7	0.5	1.1
Santa Rita Creek near Templeton	11147070	1961–1994	18.2	9.1	1.2	0	0.4
Santa Rita Creek tributary near Templeton	11147040	1967–1972	3.0	0.6	1.2	0	0.4
Santa Rosa	County	1987–2004	44.8	13.3	2.5	1.2	0.8

Gage station	USGS ID	Period of record	Drainage Area (mi²)	Spring flow		Summer flow	
				Gage	EWD[1]	Gage	EWD[1]
Creek at Main Street in Cambria							
Santa Rosa Creek near Cambria	11142200[a]	1958–1994	12.5	9.2	0.9	0.2	0.4
Tar Spring Creek near Arroyo Grande	11141400	1967–1979	18.2	2.1	0.5	0.3	0.2
Toro Creek near Morro Bay	11142100	1970–1978	14.0	2.4	1	0.5	0.4

[1]EWD values greater than measured flows are shown in red.

[a] Currently maintained by County.

4 DISCUSSION AND RECOMMENDATIONS

Overall, it appears that spring flows are sufficient to provide steelhead habitat in many Analysis Watersheds under existing conditions. However, summer flows are not sufficient to support steelhead in most Analysis Watersheds, despite the NOAA analysis of Boughton and Goslin (2006) results that indicated these watersheds have a high potential for steelhead rearing to occur based on intrinsic watershed characteristics, including perennial flows. It also appears that based on channel morphology that even relatively low flows (e.g., <0.5 cfs) during summer will allow steelhead to persist in Analysis Watersheds throughout the County. These results are consistent with the analysis of Boughton and Goslin (2006), who reported steelhead occurring during summer in streams with flows as low as 0.25 cfs.

This study focused on estimating EWD based on the flow requirements of steelhead, consistent with the County Master Water Report (SLO County Water Resources 2012). However, there are many other environmental resources that rely on surface flow to persist, including other fish species, amphibians, macroinvertebrates, and riparian communities. Since steelhead can potentially occur in most watersheds in the County, EWD for steelhead will also protect other resources. In the streams where steelhead do not potentially occur, we recommend broadening the definition of EWD to include other natural resources requiring protection. It is more challenging to estimate EWD for other resources, since criteria defining the flow needs of other species are less available than for steelhead. For example, in this study we attempted to qualitatively assess flow needs for coastal lagoons to support tidewater goby, and found that available data were not sufficient to estimate EWD in these habitats. Despite these challenges, we recommend that EWD inflows into coastal lagoons, and in particular within the 27 Analysis Watersheds identified as currently or historically supporting tidewater gobies, be investigated to determine minimum flows to support populations of this endangered species (Figure 2).

Although EWD is estimated for numerous watersheds, there are very few watersheds with established gages recording current stream flow conditions to monitor existing conditions. Consistent with the SLO County Flood Control and Water Conservation District Data Enhancement Plan (2008), we recommend establishing additional gages to monitor baseflows within major streams in the County. The Data Enhancement Plan identifies numerous uses for gage data. We recommend monitoring of Analysis Watersheds during both spring and summer to determine which ones are exceeding EWD requirements and which are not. For those that are not, there may be intrinsic watershed characteristics that limit surface flow, or upstream water management may be influencing streamflows and potential steelhead habitat. In particular, we recommend monitoring spring and summer flows at Analysis Points where existing gaging or direct observations made during this study indicate that flows are less than EWD within high potential steelhead rearing habitat, as summarized in Table 7. Site visits in spring and summer 2013 were conducted during an extreme drought, so these sites are assumed to have higher flows during most years. Site visits at remaining Analysis Points and under more conditions are recommended to determine which are exceeding EWD requirements and which are not.

Table 7. Summary of Analysis Points documented to have existing spring or summer flows less than EWD. Not all Analysis Points have existing gaging data or were visited in 2013.

Analysis point	Spring flow (cfs)		Summer flow (cfs)		Notes
	EWD	Existing condition	EWD	Existing condition	
Alamo Creek	4.4	5.7	1.2	0	Based on USGS gaging to 1978.
Arroyo De La Cruz	2.3	32.8	0.7	0.2	Based on USGS gaging to 1979.
Arroyo Grande	5.3	1.5	1.5	0	Based on USGS gaging to 1966. Water releases from Lopez Lake have changed.
East Corral De Piedra	0.5	0	0.3	0	Based on measurements in 2013.[a]
Jack Creek	1.6	11.1	0.5	0	Based on USGS gaging to 1978.
Los Berros Creek	1.1	2	0.4	0.15	Based on USGS gaging to 2001. Observed dry in summer 2013
Los Osos Creek	0.7	2.7	0.3	0	Based on County gaging to 2002.
Lower Atascadero Creek	1	0.09	0.4	0	Based on measurements in 2013.[a]
Lower Morro Creek	1.2	0	0.4	0	Based on measurements in 2013.[a]
Lower Pismo Creek	2.2	0.48	0.7	0.48	Based on measurements in 2013.[a]
Lower Santa Rosa Creek	2.5	1.66	0.8	0	Based on measurements in 2013.[a]
Middle San Simeon Creek	1.5	0.99	0.5	n/a	Based on measurements in 2013.[a]
San Luisito Creek	0.3	0.28	0.2	0.08	Based on measurements in 2013.[a]
Santa Rita Creek	1.2	9.1	0.4	0	Based on USGS gaging to 1994.
See Canyon Creek	3.8	n/a	1.1	0	Based on measurements in 2013.[a]
Suey Creek	0.9	n/a	0.3	0	Based on measurements in 2013.[a]
Upper Salinas River	3.7	16.6	1.1	0.5	Based on USGS gaging to 1983.
Upper SLO Creek	0.9	0.51	0.3	0	Based on measurements in 2013.[a]
West Corral De Piedra	0.6	0	0.3	0	Based on measurements in 2013.[a]

n/a No data collected

[a] 2013 was an extreme drought in the County, and therefore these sites are assumed to have higher flows in most years.

For those gages for which historical and current information is available (e.g., Morro Creek, Santa Rosa Creek, Los Berros Creek, Los Osos Creek), we recommend analysis of the current conditions compared with historical conditions. This analysis should also be summarized based on water year type, to assess differences in EWD between normal, wet, and dry water years. The County is currently maintaining many gages that were previously operated by USGS. However, we were not able to efficiently use these data. Consistent with the SLO County Data Enhancement Plan (SLO County Flood Control and Water Conservation District 2008), we recommend that the County compile and maintain daily mean discharge data for active stream gauging stations. Most mean daily flow data appear to end in 2006 or earlier but raw stage and discharge data appear to be available. In addition, we recommend that the County database be organized to make daily mean discharge data available in two-column format suitable for import into standard statistical software (i.e. date in one column and flow in another column).

Based on the limited data on existing conditions, EWD is currently exceeded in some Analysis Watersheds during spring, summer, or both, within at least portions of the watershed. These areas are likely providing a disproportionate amount of the suitable steelhead rearing habitat in the County, and thus are potentially high priority areas for protection and habitat enhancement. Although not all Analysis Point were monitored or visited, examples include:

- Islay Creek (based on measurements in spring and summer 2013),
- Lower Arroyo Grande Creek (based on measurements in spring and summer 2013),
- Lower San Luis Obispo Creek (based on measurements in spring and summer 2013),
- Middle Chorro Creek (based on measurements in spring and summer 2013),
- Tar Spring Creek (based on USGS gaging to 1979), and
- Torro Creek (based on USGS gaging to 1978).

Based on available data, EWD is not achieved in spring, summer, or both in many County streams. Closer examination of these streams may indicate that water management is reducing surface flow, or that intrinsic watershed conditions limit available flows. In streams with less than sufficient flows, we suggest that streamflow enhancement to protect steelhead is a higher priority than habitat restoration, since without sufficient flows any other restoration efforts are not likely to succeed. These include the following streams:

- Alamo Creek (based on USGS gaging to 1978),
- Arroyo De La Cruz (based on USGS gaging to 1979),
- Arroyo Grande (based on USGS gaging to 1966, existing conditions have changed),
- Jack Creek (based on USGS gaging to 1978),
- Los Berros Creek (based on USGS gaging to 2001),
- Los Osos Creek (based on USGS gaging to 2002),
- Salinas River (based on USGS gaging to 1983),
- Santa Rita Creek (based on USGS gaging to 1994), and
- Santa Rosa Creek (based on measurements in spring and summer 2013).

As noted above, most Analysis Watersheds do not have current stream flow monitoring, and thus it is not possible to compare EWD with existing conditions. We would expect that as current data on these other streams become available, many more streams could be classified as either achieving or not achieving EWD. That information would support a comprehensive County-wide prioritization of streams for habitat restoration, and streamflow protection and/or enhancement.

Streams with Analysis Points for which nearly very little or no data on existing conditions are available include:

- Alamo Creek (no gaging data for over 30 years),
- Arroyo De La Cruz (no gaging data for over 30 years),
- Arroyo De Los Chinos Creek,
- Atascadero Creek,
- Cayucos Creek,
- Chorro Creek,
- Calf Canyon,
- Coon Creek,
- Cuyama Creek,
- Cuyama Creek,
- Diablo Creek,
- East Corral De Piedra,
- East Fork SLO Creek,
- Graves Creek,
- Huerhuero Creek,
- Islay Creek,
- Jack Creek (no gaging data for over 30 years),
- Little Morro Creek,
- Little Pico Creek,
- Moreno Creek,
- Nacimiento Creek,
- Oak Knoll Creek,
- Old Creek,
- Old Creek,
- Paso Riverobles Creek,
- Perry Creek,
- Pico Creek,
- Pilitas Creek,
- Pismo Creek,
- San Bernardo Creek,
- San Carpoforo Creek,
- San Luisito Creek,
- San Simeon Creek,
- Santa Margarita Creek,
- Santa Rita Creek (no gaging data for over 30 years),
- See Canyon Creek,
- Stenner Creek,

- Suey Creek,
- Tar Spring Creek (no gaging data for over 30 years),
- Toro Creek (no gaging data for over 30 years),
- Trout Creek,
- Van Gordon Creek,
- Villa Creek,
- West Corral De Piedra, and
- Wild Cherry Canyon.

In Analysis Watersheds that have substantial amounts of steelhead habitat, where EWD is typically not achieved, and can be influenced by water diversions or water management, we recommend more intensive evaluations of steelhead habitat relationships with instream flows. This would include:

- Chorro Creek,
- Pismo Creek, and
- Santa Rosa Creek.

There are technically appropriate approaches to develop site-specific instream flow recommendations. Traditionally used approaches to studying instream flows and newly applied approaches are available, including IFIM and one-dimensional (1D) PHABSIM, two-dimensional (2D) hydrodynamic modeling, habitat criteria mapping, expert habitat mapping, and macroinvertebrate community assessments. All of these methods are only useful if they are applied to specific and appropriate questions. Many of the disadvantages of these approaches can be avoided by clearly identifying the questions for the project, and applying the methods in a directed way. In addition, these approaches are typically more successful when used in conjunction with other approaches. The following link to the Instream Flow Council website provides detailed information on instream flow methods, including case histories, key considerations, bibliographies, and related issues: http://www.instreamflowcouncil.org/resources/

Instream flow studies consistent with these recommendations have been conducted in San Luis Obispo Creek (TRPA 1994) and is occurring in Pismo Creek. The methods applied in Arroyo Grande Creek (Stetson Engineers, Inc. et al. 2004) are not clearly explained and did not appear to determine the relationship between flow and available habitat. Results from more precise studies can address one of the limitations of the EWD estimates by determining the flows that would maximize habitat availability for steelhead, rather than the minimum flows required to maintain habitat. Results of these types of site-specific studies have greater accuracy than the EWD results reported here and thus would be more appropriate for the development of target instream flows and management actions to achieve them.

In summary, we recommend the following:

- Broaden the definition of EWD to include consideration for additional natural resources, especially in the County's 26 coastal lagoons (Figure 2) where tidewater goby occur.
- Analyze current streamflow conditions compared with historical streamflow conditions, with consideration for water year type (i.e., wet, normal, or dry) and EWD. This would include the compilation and maintenance of daily mean discharge data for current County stream gauging stations.

- Monitor streamflows in all 25 Analysis Watersheds (Figure 1) during spring and summer to determine which streams are exceeding EWD estimates and which are not. Monitoring could include establishment of additional gages, or periodic direct measurements of streamflow during spring and summer.
- Determine if Analysis Watersheds not achieving predicted EWD are mischaracterized in the NOAA analysis as having a high potential to support rearing steelhead, or if other factors are causing flow reductions. Results could be used by resource managers to inform the prioritization of streams for protection, habitat restoration, and/or streamflow enhancement.

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Appendix F

(placeholder for Groundwater Percolation Study)

Appendix G

Response to Public Comment

Response to Public Comments Received 12/2013 and 6/2014
of the Draft Watershed Report & Appendix C Snap Shots

Comment No.	Comment	Response
1	Atascadero Creek - Mid Salinas River - Water Management Entities Santa Margarita does not overlie the Paso Robles basin or the Atascadero sub-basin. I believe the wells tap into the alluvium of Yerba Buena creek. I don't believe there is any Paso Robles Formation in Santa Margarita	Parts of Santa Margarita (Garden Farms, for example) are reported to overlie the Atascadero Sub Basin of the Paso Robles Groundwater Basin and "are extremely dependant on that water source". Useful maps can be found in the Paso Robles Groundwater Basin Management Plan and through the Blue Ribbon Committee's website at: http://prwaterbasin.wordpress.com/about-the-basin/
2	Atascadero Creek - Mid Salinas River - Recycled Water Change to Atascadero sub-basin	Corrected
3	We were completely left out of the study. Cambria and Hearst Ranch were mentioned but there was no connection to our watershed and to the Big Creek Watershed. Is Pico Creek not connected?	This was a data compilation project. Any data published about this watershed by the San Simeon CSD, San Luis Obispo County or otherwise was included in the compilation effort. To remain consistent with the CalWater HUC 10 watershed scale, Pico Creek was included in the San Simeon - Arroyo De La Cruz watershed grouping. Big Creek is in a separate grouping, again remaining consistent with CalWater and the HUC 10 scale.
4	Excerpt fromemail dated 12-30-13,"The County of San Luis Obispo is discussing the watershed of Chorro Creek which includes the subterranean stream, aquifer and Chorro Creek". "....the County is not acknowledging the Coastal Commission's enforcement on the Roandoak building, its illegal wells (ie the new one and the abandoned 9A).	The Watershed Snap Shots are a collection of basic existing information for land/water management to be used by the community. They do not capture policy and regulation or how these decisions impact natural resources. The RCDs understand that policy and regulation are important. We hope that the Snap Shots will raise awareness around water issues and spur future conversations on how our knowledge can improve water management, among other issues. The Resource Conservation Districts are organizations independent of the County that strive to improve natural resource management through voluntary stewardship. We have no enforcement power.

Comment No.	Comment	Response
5	Excerpt from letter dated 12-30-13, "The County of San Luis Obispo Planning stating that they will not enforce the violations, and the County Health department not enforcing the illegal wells, is very serious."	See Response #3.
6	Correct all watershed planning areas.	These were corrected throughout the snapshots based on the Master Water Report.
7	Climate Change section of entire document It is time and page consuming to redundantly give same general climate change information for each watershed. Climate Change information should only be provided if there is specific information relevant to the watershed. Otherwise, the notation to refer to the IRWM Plan 2014, Section X is adequate.	All Watershed Snapshots already following this format. Because snapshots are intended to be untilzed as a combned or segmented resource, we felt it was important to provide complete information for each snapshot.
8	TABLE OF CONTENTS Add: Arroyo Grande Creek Watershed	This comment only applied to the public comment version. The watershed is included in the final report.
9	Alamo Creek Watershed Page 1, Water Planning Area Cuyama WPA 7, correct to Huasna Valley WPA 8 Groundwater Basin : I'll bet there is none, but the county Master Water Report labels it Huasna Valley basin	All South County WPA were corrected. All South County Groundwater Basins were corrected to reflect the Master Water Report. The original information was pulled from County GIS shapefile which were incorrectly labeled.
10	Alamo Creek Watershed page 1, Description edits: Kettle Creek spelling should be corrected to KENNEL Creek Add Los Machos Creek (blue line), which drains into Kennel Creek, as a major tributary Add Branch Creek (blue line), which drains directly into Alamo Creek. (Branch Creek is identified/named later in the document at pages 5 & 7) Little Jolo spelling should be corrected to JOLLO	The spelling corrections were made. Branch Creek was already listed and Los Machos Creek was added.

Comment No.	Comment	Response
11	Page 2, Physical Setting Add Los Machos Creek to Geology Description and correct spelling for Little Jollo Creek	Additional geology information was added for the Alamos Creek watershed that encompasses Los Machos Creek. More information on the geology landscape unit categories is included in the full report.
12	Page 3, Land Use Jurisdictions & Local Communities: Add Los Padres National Forest, since it easily comprises 70% of the watershed. They are responsible for the roads and other enforcement activities in the Nat'l Forest, as examples of their jurisdiction.	The U.S. Forest Service is included on pg 1 under jurisdictions. This cell on pg 4 is meant to call out cities and communities not every jurisdiction.
13	There are 2 open campgrounds (Baja and Buck Spring in that watershed, and the forest service web site notes that recreational uses are hunting, mountain biking and OHV use in those areas. Therefore, need to take into account impacts from those uses- vegetation destruction, increased sediment/erosion vulnerability from legitimate and illegitimate off road travel.	These land uses were added to the description on pg. 1
14	Page 5, Watershed Codes Little Jolo spelling should be corrected to JOLLO	This spelling was corrected.
15	Page 7, Watershed Codes Little Jolo spelling should be corrected to JOLLO	This spelling was corrected.

Comment No.	Comment	Response
16	Page 8, Critical Issues Upland Erosion and Habitat degradation: Potential causes recreational/OHV use. I'm not familiar with the Twitchell Management Authority document, but believe that the Forest Service would be a better source of discussion of upland critical issues. It's easy to see that sediment/erosion in some of those upper drainages would not impact the reservoir, but would impact forest health.	This primary issues list only includes published issues ideally vetted by the community. It was not part of our scope of work to evaluating all the potential issues in a watershed.
17	Arroyo Grande Creek Watershed Page 1 Water Planning Area – Five Cities WPA 5, correct to WPA 7 South Coast Groundwater Basin(s) – Remove San Luis Obispo Valley as a groundwater basin. The Edna Valley subbasin, although in WPA 7 by virtue of a political line, is not in the Arroyo Grande Creek Watershed. The Edna Valley subbasin drains to Pismo Creek Watershed.	All South County WPA were corrected. All South County Groundwater Basins were corrected to reflect the Master Water Report. The original information was pulled from County GIS shapefile which were incorrectly labeled. Based on these sources, it looks like the Edna Valley basin extends to the Terminal Reservoir in Arroyo Grande Creek Watershed. This area is on the border of the Pismo and Arroyo Grande Creek watersheds. If you are aware of a more detailed study of the Edna Valley basin that clearly describes the extent of the basin, please let the RCD know.
18	Show Arroyo Grande Creek as a subbasin of the Santa Maria River Valley basin.	All South County Groundwater Basins were corrected to reflect the Master Water Report.
19	Jurisdictions: Add California Department of Parks and Recreation. (Pismo State Beach is a beach on the Pacific coast of California. It is approximately 17 miles long and fronts the towns of Pismo Beach, Grover Beach, and Oceano. This includes the campgrounds and golf course. This does NOT include the SVRA area, most of it is in a different watershed.)	Keeping in line with the intent, Pismo State Beach was added.
20	Description: ADD to the last sentence, …a regional airport in Oceano.	This suggestion was added.

Comment No.	Comment	Response
21	Page 7, Land Use: Add Ca Dept Parks and Recreation to Jurisdictions and Local Communities. Facilities Present: Add - Oceano Airport. Commercial Uses: modify the sentence, by adding the blue wording. “Recreation and tourism at Lake Lopez, City of Arroyo Grande, State Park Beaches and Oceano Dunes SVRA entrance.”	The Pismo State Park was added to og 1 under jurisdictions. This cell on pg 4 is meant to call out cities and communities not every jurisdiction. Airport was added to the facilities. Commercial wording was altered.
22	Page 8, Disadvantaged Communities: EDIT to Yes, Oceano.	This suggestion was added.
23	Page 8, Water Supply Water Management Entities: ADD Northern Cities Management Area to the list. Someplace the composition of the NCMA should be identified, with an * and listed below the table. Basin groundwater users in the Northern Cities Management Area include City of Pismo Beach, City of Arroyo Grande, City of Grover Beach, Oceano Community Services District, small public water systems (including Halcyon Water Unified School District), and residential and agricultural overlying users.	This suggestion was added.
24	Page 13, Critical Issues Erosion and Sedimentation Flood Management Lack of capacity of the flood control channel	Under Flood Management, we added the following "sedimentation in the flood control channel results in reduced capacity"
25	Bibliography: Edit the 2009 date to the correct March 2005 date for the CCSE AG Watershed Mgmt Plan.	The date was corrected.

Comment No.	Comment	Response
26	Coastal Irish Hills Watershed Suggest that this be retitled to: Irish Hills Coastal Watersheds. Use the plural to clearly identify several watersheds. Using “Irish Hills Coastal” would be consistent with terminology used by the Coastal Conservancy Conservation Plan.	This suggestion will be added after the IRWMP public comment period due to the need to update all maps accordingly.
27	Page 1 Water Planning Area Page 1, Description Suggest edit to 1st sentence: The Irish Hills Coastal Watersheds are located in the San Luis Range, along the remote San Luis Obispo County coastline between the communities of Los Osos in the north and Avila Beach in the south.	The suggestion was added.
28	Jurisdictions: ADD California Department of Parks and Recreation. (Montana de Oro State Park, at 8,000+ acres, and about 85% of that in the Irish Hills, has a hunk of the landscape responsibility)	The suggestion was added.
29	Page 6, Land Use, Jurisdictions: ADD California Department of Parks and Recreation	The State Park was added to pg 1 under jurisdictions. This cell on is meant to call out cities and communities not every jurisdiction.
30	Page 9 Watershed Health by Major Groundwater Basin This shows the Los Osos Basin, but the LO basin is not in the Irish Hills watershed. On page 1, it is stated that there is no groundwater basin in this watershed. Therefore, delete this.	This was corrected based on the Master Water Report.

Comment No.	Comment	Response
31	WATERSHED SNAPSHOTS – NORTH COAST A watershed is the whole region from which a river receives its supply of water. There are several instances throughout the document where the term "watershed" is used incorrectly, resulting in needless confusion. In most cases several proper watersheds of individual creeks are lumped as a mythical and incorrect "watershed" in which the waters of the proper watersheds are not connected in any way. As the entire document is meant to address watersheds in the proper and correct sense, this is a major error.	This grouping of creeks was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee. We have altered the names of some of these watershed groupings (e.g. Big Creek Watershed was altered to "Big Creek - San Carpoforo" watershed) to reflect the inclusion of specific local creeks whose boundaries are shared between San Luis Obispo and Monterey County(s).
32	Starting at page 1, San Carpoforo Creek is lumped into Big Creek Watershed. At page 13, Villa Creek is lumped with Santa Rosa Creek, even though each has a distinct entrance to the ocean. Right after that the Cayucos Creek "Watershed" involves discussion of the completely independent Morro Creek, Toro Creek and Old Creek.	This grouping of creeks was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee. Some snapshot names were changed to reflect creek groupings (e.g. Cayucos Creek was changed to "Cayucos Creek - Whale Rock Area Watershed).
33	It does a disservice to watershed planning when real, actual watersheds are lumped into inaccurate "watershed" descriptions. If the goal is to be useful in the development of management plans for specific areas sharing a common water source, by definition it should be by watershed. At the very least it should follow the watershed definitions of DWR Bulletin #118. True watersheds are the basis of planning for steelhead recovery and a legal limitation to the export of water.	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee.
34	Watersheds that are identified DWR Region Basin and sub basins should have their own descriptions. For example, San Carpoforo Creek, Arroyo de la Cruz, San Simeon, Santa Rosa Creek, Villa Creek, Cayucos, Old Creek, Toro Creek and Morro Creek.	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee. Expanded data on these individual creeks could be a goal of phase 2 of this project.

Comment No.	Comment	Response
35	There is an inconsistency in the treatment of the watersheds in the North Coast Region compared to those of the North County Region. The North County region has had its major watershed basins diced up. On the North Coast, most water is in small shallow aquifers surrounded by large areas of impermeable and dry bedrock. Many drainages, such as Little Pico Creek are 'islands unto themselves' and require specific management planning. North Coast watersheds deserve better representation.	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee.
36	The Hydrologic Unit Name and Water Planning Area information boxes at the beginning of each watershed page provide 'broad brush', regional information. The SLO County IRWM Watershed document should scale down to and focus on the county's watersheds.	The purpose of the first page of the snapshot is to give an overview of the watershed and how it fits into the world both within the County and beyond it. The specific characteristics of each watershed grouping that only focus on occurances within SLO County are highlighted in each snapshot.
37	Big Creek Watershed This is a large scale HUC 10 Frontal Pacific Ocean regional grouping. It is composed of 7 distinct watersheds, 6 of which are along the Big Sur coast in Monterey County. Those 6 drain steep, coastal slopes. San Carpoforo is the 7th, where the lower portion of the weatershed is relatively flat, cutting through a marine terrace. San Carpoforo Creek is a SLO watershed that is recognized by federal and state agencies and governmental departments.	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee.
38	DELETE: Big Creek Watershed and change to San Carpoforo Creek Watershed.	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee. We have altered the names of some of these watershed groupings (e.g. Big Creek Watershed was altered to "Big Creek - San Carpoforo" watershed) to reflect the inclusion of specific local creeks whose HUC 10 boundaries are shared between San Luis Obispo and Monterey County(s).

Comment No.	Comment	Response
39	The acreage of the entire San Carpoforo Creek watershed is 29,316 acres in area (see South-Central Ca Coast Steelhdead Recovery Plan, Dec 2013), with approx half of it in San Luis Obispo County.	The Big Creek - San Carporforo Area Watershed described in this project only includes data relevent to San Luis Obispo County. The HUC 10 scale includes Chris Flood Creek and Mount Mars Creek in addition to Upper and Lower San Carpoforo Creek.
40	It should be noted that that Polar Star Mine (mercury) and its status, is located in the upper watershed.	Aside from a quick mention in an opinion-piece document from the Cambria Historic Society, our research team has not identified published documents about this mine. This could be further explored in phase 2 of this project.
41	DELETE all Special Status Wildlife and Plant information that is keyed to locations in Monterey County.	This has been corrected in the special status species table submitted to Kelly on 1/21. Big Creek table was limited to USGS quads that overlap this HUC 10 for SLO County Only.
42	Cayucos Creek Watershed This is not correct. Old Creek, Toro Creek and Morro Creek (spelling incorrect in description) are separate, distinct watersheds. DELETE these.	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee. Some snapshot names were changed to reflect specific creek groupings (e.g. Cayucos Creek - Whale Rock Area Watershed).
43	ADD: Morro Creek Watershed It should have a separate watershed section. It is geomorphologically, historically, culturally, economically and politically aligned with the City of Morro Bay. The terminus of Morro Creek watershed is within the city limits. The city has wells in the basin. Before the realignment of the Morro Bay harbor entrance, Morro Creek flowed into the mouth of the bay.	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee. Based on advise from the Techical Advisory Committee, the Morro Creek Watershed was grouped with the Cayucos Area Watersheds in part because of similarities in the physical landscape units.
44	ADD: Old Creek Watershed, Whale Rock reservoir is an important county water resource with significant water planning and management considerations. It should not be lumped. Even SLO Public Works uses a different descriptive – they call Old Creek watershed the 'Whale Rock Reservoir Watershed'. (See their reservoir report)	This grouping of creeks (i.e. watershed) was used to remain consistent with the nationally recognized CalWater Hydrologic Unit Classification scale (HUC 10). This was the scale selected at the onset of this project by the Technical Advisory Committee. Some snapshot names were changed to reflect specific creek groupings (e.g. Cayucos Creek - Whale Rock Area Watershed).

Comment No.	Comment	Response
45	Morro Bay Watershed Page 1, Water Planning Area WPA 7, correct to WPA 8 South Coast Groundwater Basin	This comment does not seem to relate to this watershed.
46	Page 1 Water Planning Area – WPA 3, correct to WPA 4 Chorro Valley Basin AND WPA 5 Los Osos Valley Basin	WPA were corrected.
47	Flows to: It should be noted that it flows to Pacific Ocean via Morro Bay estuary.	This suggestion was added.
48	Jurisdictions: ADD California Department of Parks and Recreation. They are listed as a basin water user (Ref A, pg 19) and its size, 2,700 acres with legal authority over it, warrants their listing. Also, Los Padres National Forest. It is the uppermost part of the Chorro watershed.	This suggestion was added.
49	Description: The Morro Bay Watershed is a coastal basin located in northern San Luis Obispo County. Recommended edit: The Morro Bay Watershed is located in the central area of coastal San Luis Obispo County.	This suggestion was added.
50	ADD Camp San Luis Obispo as a developed facility. Also, Morro Bay State Park and El Chorro Regional Park (700 acres) should be listed as examples of large recreational park areas.	We added Camp San Luis Obispo to the description. It is already listed under Facilities. We added El Chorro Regional Park to commericial uses and added Morro Bay State Park to Other Unique Characteristics

Comment No.	Comment	Response
51	Watershed Plans: The user of this document should know the earliest plans for this watershed were performed. Therefore, the following should be listed. They have been the basis/foundation for activity in the watershed.	We do not list every study completed in a watershed. We added "Due to the uniqueness of Morro Bay, the watershed has been studied since the late 1980's with watershed plans from that era being completed and forming the foundation for current activities." to the description to address your comment.
52	Morro Bay Watershed Enhancement Plan, San Luis Obispo County, California (USDA SCS 1989) Erosion and Sediment Study Morro Bay Watershed (USDA SCS 1989)	
53	Page 3, Special Status Wildlife and Plants Why is only steelhead trout spelled out at the top of this section? Red Legged Frog is on Chorro Flats and other places in the watersheds, documented during CF restoration. It should be listed under the steelhead trout. Perhaps every listing that occurs below which is shown in BOLD should be listed at the top of this section?	Steelhead trout is listed in the CNDDB chart and was removed from the top of the cell. Meg's comment: Initially in the tables, we bolded all species that had FESA and CESA rankings. It appears that the bold scheme was kept in the south county snapshots but not in north county and was not spelled out in the key. We had done this because species listed under either endangered species act have a higher level of protection that species listed as special animals, special concern, or rare plant rank alone. It appears the bold may have created some confusion. Replace bolded species in North County and North Coast. Include description in key
54	Page 8, Other Environmental Resources ADD: Chorro Flats (At its size and functions, and public ownership, is certainly as unique and comparable to the Sweet Springs Preserve or Elfin Forest in importance. Perhaps the Nine Sisters of SLO is more appropriately noted on p. 10 at Other Unique Characteristics.	Chorro Flats was added. The Nine Sisters was not moved.
55	Page 8, Jurisdictions and Local Communities ADD all those listed on page 1 jurisdictions, and include State Parks.	This cell on is meant to call out cities and communities not every jurisdiction.

Comment No.	Comment	Response
56	Page 9, Surface Water EDIT: It should be noted that Chorro Reservoir is owned by Camp San Luis Obispo. Cal Poly has some small reservoirs on its ranchlands in the watershed. Do you want the report that Cal Poly prepared in 2005 for RWQCB on water quality mgmt?	Section was reworded as "Chorro Reservoir owned by Camp San Luis Obispo and operated by California Men's Colony;. Small reservoirs on agricultural lands."
57	Page 10, Other Unique Characteristics, Other The Nine Sisters, a line of volcanic plugs, dominate the landscape from Morro Rock through the City of San Luis Obispo. Morro Rock (576 ft.) is the Pacific terminus, with Black Hill (665 ft.), Cabrillo Peak (911 ft.), Hollister Peak (1,404 ft.) in the Morro Bay watershed.	This suggestion was added.
58	Additional Comment Time constraints permitted only a cursory review of the North County Region section of the watershed document. However, I did note the following:	
59	Indian Valley Watershed This is a sub watershed of the Salinas Watershed. Indian Valley Creek terminates on the east side of the Salinas River in Monterey County. Therefore, DELETE this watershed.	Special status species tables for the SLO County portion of the HUC 10 Indian Valley watershed were updated to just the quadrangles that overlap the watershed in SLO County.
60	Description: The statement that the majority of the town of San Miguel is in Indian Creek Valley Watershed is incorrect. It is in the Salinas Valley.	This is a function of the naming system used with the CalWater HUC10 scale, and can be clarified by using a different name for this reach of the Salinas.
61	As a member of WRAC, and the author of a geology field guide used in portions of the watershed document, my intent was to review and verify that information was used accurately.	

Comment No.	Comment	Response
62	This commentary is a result of a quick look-through of the North County region watersheds. It does not represent, in any way, a thorough edit of the document. In many cases, where my comments concern the readability pertaining to a certain data field in a particular watershed, it could probably extend to the same data field in other watersheds. The error level appears to be high.	
63	In general each watershed should have a sketch map that shows the labeled locations of each sub watershed mentioned in the subsequent text.	Interactive map on the website (www.slowatershedproject.org) will help clarify these locations.
64	p.1 Black Sulphur Springs Watershed. This does not exist as described. A drainage divide occurs on the floor of the SE extension of the Carrizo Plain, so that all drainage goes to Soda lake north of the divide, and to a closed drainage near the Elkhorn/Soda Lake junction to the southeast. Statements in this section about use of Soda Lake for recreation and fishing are wrong, as it has never served this purpose. Some drainages on the east side of the southernmost part of Elkhorn Road flow towards Maricopa but have steep headwaters in SLO County. The southern portion of the Elkhorn Plain is essentially a closed basin. The following sentence makes no sense: "The watershed, like the adjacent Soda Lake watershed is an alkali endoheic (closed) basin with no outflow beyond Soda Lake." as it first establishes separation from Soda Lake (correct) and then includes Soda Lake in discussion of basin outflow. The term 'endoheic' is incorrect and is correctly 'endorheic', but use of the term is overly jargonistic when a simple 'closed saline basin' is sufficient. The picture is from the Soda Lake watershed.	We provided some corrections to the description of uses of Soda Lake and recommended that the repeated material regarding the lake be moved out of the Black Sulphur Spring snapshot. Saline basin language was clarified. The picture was incorrectly labeled by Althouse and Meade, and it was correctly replaced with a correctly labeled photo from Elkhorn Plain in Black Sulphur Spring. Removed all other Soda Lake references from the Snapshot.

Comment No.	Comment	Response
65	p.2-3 shows significant confusion with the Soda lake watershed, such as the statement about Vaqueros rock monoliths. Statements like "Beam Flat, Abbot Canyon, Goat Spring, and Cottonwood Spring are composed of moderate steep moderately infiltrative early to mid-Tertiary headwaters and flat highly infiltrative Quaternary inland" defy logical parsing. The hydrology model reference (North Coast Engineering 2008) is for areas north of Soda Lake in a different watershed.	Hydrology models for solar projects were in the Soda Lake watershed, and generally only the northern part, and were removed from the Black Sulphur snapshot.
66	Many of the subsequent pages up to page 21 appear to be a copy and paste from the Soda Lake Watershed.	Removed references to Soda Lake from Black Sulphur Springs
67	p.13 Soda Lake Watershed encompasses essentially the central and northern portions of Carrizo Plain Nat'l Mon. (CPNM) Water from the Padrone Springs Road and Corrals area, plus the Padrone Springs Valley behind Traver Ranch, and the Elkhorn Plain from White Rocks northward - all contribute to Soda Lake. The same errors on uses of Soda Lake are repeated.	We provided some corrections to the description of uses of Soda Lake. Saline basin language was clarified.
68	The dominant land use is not agriculture (it was dry land grain years ago, but is now either CPNM, rural residential or solar plant, with dry land grain only existing at the extreme north end. Parts of the area are used as range.	Until very recently, much of the Soda Lake watershed was range and dry agriculture. Rangeland uses are agricultural uses. Dominant land uses were changed to reflect grazing and solar farm activities.
69	Air temperature is wrong if 88F is considered a high, which is routinely above 100F for about +/- 4 months of the year.	These values were calculated by averaging the high temperature from summer months
70	p.14 The sentence "Painted Rock, Goodwin Ranch and San Diego Creek are moderate steep moderately infiltrative early to mid-Tertiary headwaters and are flat and highly infiltrative Quaternary inland – Category #7 (Bell, pers. comm., 2013). " is opaque and meaningless.	References to Stillwater category numbers were deleted from each snapshot. References to descriptions may need clarification such as providing an appendix item that contains the geologic map used to classify the groupings. Another suggestion could be to remove these descriptions entirely and only use meaningful geologic narratives of the watersheds
71	In regard to vegetation, the recent CDFW - CNPS Vegetation Map should replace the outdated 1990 shape file.	We provided additional clarification of vegetation using a summary of the CNPS vegetation map, which is available online.

Comment No.	Comment	Response
72	p.27 Technically the area around Shandon is either in the San Juan or Estrella watersheds, rather than the Cholame. The watershed headwaters also include drainages along Davis Rd. into the northernmost Temblor Range. There are significant stands of blue oak within the Palo Prieto drainage.	Shandon is at the boundaries of Cholame, Estrella, and San Juan watersheds using boundaries consistent with CalWater HUC10-scale. Portions of the unincorporated town are in each of these.
73	p.28 The mention of the Rinconada fault is not appropriate, as it lies along the trend of the Salinas River and has nothing to do with the Cholame Creek Watershed. Similarly, the quotes from Chipping (1987) pertain to the Paso Robles Groundwater basin rather than the geology of the Cholame Valley. Vegetation cover has blue oak, not black oak.	Vegetation cover summary has been clarified. Remove reference to Rinconada Fault if edits allow.
74	p.32 It is questionable if it is appropriate to discuss CSA16 under this watershed rather than Estrella or San Juan.	See **comment #72,** Shandon is composed of parts of the San Juan, Estrella and Cholame watersheds
75	p.33 The beneficial uses of water include recreation and ground water recharge. Where are facilities that serve these purposes?	Beneficial uses are from the RWQCB basin plan. The RWQCB determines which beneficial uses apply in each watershed.
76	p.36-37 Discussions of groundwater quality should be confined to the Cholame Creek Watershed. There are no concentrations of "rural "ranchette" users" in the Cholame Creek Watershed. Discussions of groundwater changes should also be confined to the watershed, with a notation that they might be affected by drawdowns in the adjacent Estrella valley.	These suggestions require deeper evaluations of the data than were used for our Snapshots. The phrases "rural ranchette users" were pulled from the Master Water Plan and describe the situation for the Paso Robles Groundwater Basin in general. We made no attempt to make the descriptions watershed specific or remove and/or add information to make them specific
77	p. 43 In general, I have no idea where Shimmin Canyon is, and so a sketch of the watershed showing the locations of all sub-watersheds would be useful for each watershed in this document	The interactive maps that will be available on the website will clarify watershed and subwatershed locations and names greatly.
78	p.45 The list of species include areas such as Wilson's Corner and Parkfield, which are not anywhere near the Estrella River Watershed.	The species lists are by USGS 7.5' quadrangle. These were rechecked, and the Parkfield and Wilson's Corner 7.5' USGS quadrangles touch into the Estrella watershed as drawn for these snapshots. A clarification has been added to all species tables specifying that these names refer to quadrangle names, not towns or other locations. Quadrangle name is used by CNPS and CDFW as part of their rare species tracking databases.

Comment No.	Comment	Response
79	p.48 Kit fox is not a riparian species, preferring open grasslands. However, connectivity of open grassland areas between the Carrizo Plain and Camp Roberts have been one of the thrusts of the North County HCP.	language has been corrected - it was meant to refer to upland habitats in the same valley.
80	p.57 While agriculture is important, much of the watershed is chamise dominated scrubland.	Dominant land use characterization was based off land use data from County GIS shapefiles
81	p.58 The geology description of the watershed is highly biased toward valley floor alluvium. Much of the upper West Huer Huero is on granite or granite-derived rocks and the middle fork is on dissected Paso Robles, Santa Margarita, and Monterey Formations. I would suggest doing an overlay from existing geologic maps where appropriate.	Revise Huer Huero geologic description to reflect Dr. Chippings suggestions.
82	p.60 Shedd Canyon is not part of the Huer Huero watershed, as it flows to the Estrella.	See comment 78 above regarding place names.
83	p.72 No part of the Nacimiento River watershed is in the Paso Robles Groundwater Basin.	The Bradley Subarea of the PR Groundwater Basin includes a portion of the Nacimiento River
84	p.73 Sentences like "Franklin Creek and Town Creek are steep Franciscan non-infiltrative headwaters with flat pre-Quaternary moderate infiltrative valleys – Category #1. " do not make things very clear. This sort of language shows up all the way through the document and should be converted to something that resembles a sentence with meaning.	See **Comment #70**. Narrative descriptions may be more valuable to the reader than the geologic language used in the Stillwater groupings.
85	p. 74 Peak flow "near San Miguel" cannot be on the Nacimiento River. It might be worth pointing out that Bryson is in Monterey County and reflects part of the inflow to the reservoir, while Bradley data reflects peak dam release.	This issue was corrected
86	p.92 The concept of watershed works for the Paso Robles Creek drainage, but not for a random section of the Salinas River watershed. Watersheds should be delineated by divides, not arbitrary political lines. This complaint can be carried throughout this document. In this case San Marcos Creek is included in the document with the Paso Robles Creek drainage, except that the two creeks drain to the Salinas on opposite sides of Paso Robles.	This comment addressed by deleting Indian Valley snapshot

Comment No.	Comment	Response
87	p.111 None of the Indian Valley Watershed is in San Luis Obispo County. It is certainly not in the Atascadero/Templeton Planning Area. This is a significant error. This section should be removed from the document.	The lower portion of the Indian Valley HUC10 watershed in the CalWater system is the portion of the Salinas River at San Miguel, creating a misleading name. Indian Valley was folded into Lower Salinas-Paso Robles Creek Area Watershed
88	p.125 The confluence of San Juan Creek and the Estrella river occurs where the Estrella and Cholame creeks merge and become the Estrella (at Shandon), nowhere near Creston (as noted further down the page in regard to Kit Fox)	Reference was corrected to refer to Shandon.
89	p.126 Water is produced from the Santa Margarita Formation in some upper parts of the Shell Creek watershed	Is there a place for this information in the Lower San Juan Watershed Snapshot?
90	p.130 Palo Prieto is at Bitterwater Road in the Cholame watershed, not the Lower San Juan.	Remove references to Palo Prieto from from "Other Unique Characteristics" in Lower San Juan Snapshot
91	p.143 How is the Cuyama Valley a groundwater resource for the Upper San Juan watershed? Also, this upper section of the San Juan is too far away to be considered any part of the Paso Robles groundwater basin. Nearly all water is derived from shallow alluvium along streams, with some wells into bedrock.	Check groundwater basin maps with watershed boundaries to verify Paso Robles GW Basin and Cuyama Valley (ptn) in Upper San Juan and that San Juan Subarea of PRGW basin includes Upper San Juan
92	p.152 typo. National Forest! Also I like being governed by the Count of San Luis Obispo. Gives us a little class, don't you say.	Typos corrected.
93	p. 153 The hard sandstone around Santa Margarita is not moderately infiltrative. It is well cemented and has low permeability.	The geological variability of this region is addressed in the snapshot.
94	p.166 The lumping of Tassajara, Santa Margarita and Trout Creeks with Atascadero Creek is a mistake, and if they were to be lumped, it would be better with the Upper Salinas. The three creeks reach the Salinas well above Atascadero Creek, and the watershed of Santa Margarita Creek has been subject to flooding and water supply issues.	This grouping of creeks was used to remain consistent with the CalWater HUC 10 scale. Part of the Salinas River is included in this grouping. For better clarity, however, we have altered the name of this grouping to Mid Salinas - Atascadero Area Watershed.
95	Arroyo Grande Snap shot p. 12 Estimated safe yield for the Northern Cities Area citing DWR is incorrect. The Master Water Report has an estimate of 9,500 AFY.	This was corrected.
96	Arroyo Grande Snap shot p7. Facilities Present - Replace Oceano with South San Luis Obispo County Wastewater Treatment Plant.	This was corrected.

Comment No.	Comment	Response
97	Pismo Creek Snap shot p.8 Imported water says 1,100 AFY of State Water. The Master Water Report has 1240 AFY Table A Allocation and 1240 AFY of Drought Buffer of State Water	This was corrected.
98	Arroyo Grande - The Ceccheti Road crossing was completed and should be removed from the list of fish passage barriers.	The County made improvement to the Ceccheti crossing in 2013 that were limited to repairing a hole in the top deck. Nothing that interacts with water flow or fish passage was changed so the status as a partial barrier is unchanged.
99	Arroyo Grande - Add Meadow Creek to Other Environmental Resources.	This was added.
100	Add the County of San Luis Obispo to the Jurisdictions listed under Land Use	This was added.
101	Add Halcyon to Potential growth Areas.	This was added.
102	Add City of Pismo Beach to Water Management Entities.	The Northern Cities Management Area and a list of its participants was added.
103	Add the potential for recycled water at the South County Sanitation District.	This was added.
104	Review the Northern Cities Management Area Technical Group Annual report in reference to water budgets.	A references to the NCMA water budget was added. The RCD will follow up with the NCMA to more fully understand the assumptions of the existing water budget.
105	**Comments related to the Draft Instream Flow Assessment (Below).**	See separate listed responses after this document in the Appendix.
106	General (AND VERY IMPORTANT) - page iv. Nicole Smith had advised that due to the extreme coarse nature of this very preliminary effort, there would be a disclaimer that identifies to the reder to NOT use this effort for any regulatory or mandatory requirements when establishing permit limits; however, no such disclaimer is located anywhere within this document. THIS DISCLAIMER MUST BE PROVIDED RIGHT UP FRONT, AND PERHAPS IN SEVERAL LOCATIONS. It must be very clear what the limitation are, who the expected users are, and who the users should not be	

Comment No.	Comment	Response
107	Page iv, Acknowledgement: The statement that the Water Resources Advisory Committee had an involvement in the study is incorrect. The WRAC simply heard two verbal report on this effort, and at no time was the WRAC ever given direction that its listening to these reports was going to be the only involvement in the study. The second report was given so late in the meeting that over half of the Membership had to leave. In no way was the WRAC engaged in this study, and this reference must be changed to simply say that two presentations were given at WRAC meetings, and nothing more	
108	Page iv, Acknowledgement: Everyone receives acknowledgement of where they work or who they are except for Stephanie (is her name misspelled in the report) Wald - who is she? Why is she listed here?	
109	Page iv, Acknowledgement: Second to last line, behind the word "grant", please identify just how much this grant was for, and if appropriate, identify the distribution of the funds to the consultant and the administrating agency. Also , at the end of the sentence, identify what the Proposition Number was for the grant.	
110	Page iv, A Note on Units of Measurement: Fourth line - USGS never measures discharges in "feet per second", they always measre discharge in "cubic feet per second". The units of "feet per second" is a unit of measuring velocity, not discharge	
111	Page iv, A Note on Units of Measurement: Fifth line - the units "grams per millileter" is not the common usage in water quality…that would be "milligrams per liter."	
112	Page iv, A Note on Units of Measurement: In the table, under the column for English units, for the row "1 hectare-meter (hm)", the value of 0.12 acre-feet (ac-ft) is incorrect, and should read 8.10 ac-ft.	

Comment No.	Comment	Response
113	General - the Master Water Report (MWR) in the main text does identify Environmental Water Demand (EWD) as one of the four categories of water demands discussed within the MWR. The one pointed recommendation within the MWR regarding EWD is as follows: "Site and project-specific in-stream flow requirements need to be completed to be able to determine a water balance that accounted for environmental water demand on a water planning area basis in future Master Water Reports" (MWR, Section 5.2.1). It continues by further stating "This would allow the environmental water demand to be quantified and represented on a sub-watershed and creek basis. The first steps in this effort are establishing appropriate data collection sites, identifying opportunities for coordination with appropriate entities on the effort and prioritizing locations to study first. The DRAFT San Luis Obispo County Regional In-Stream Flow Assessment (Study) (page v, under Introduction) indicates that the MWR is the driver behind the development of the Study; therefore, the focus of this study needs to be limited to those recommendations pointed out in the MWR. As such, the objectives of the Study should be as presented below. 1. a County-wide	
114	Page v, in Introduction: The definition for EWD is not written the way it is written in the MWR. It should not be paraphrased in that form because it is misleading (it reads as if the EWD is for steelhead, whereas the MWR says it is for a target species, and that the target species selected is steelhead - a much different meaning). Suggest it be written to match the MWR	
115	Page v, first sentence in the Approach: …Was defined in relations "to" steelhead	

Comment No.	Comment	Response
116	Page v, Third line in the Approach: Available hydrologic and physical terrain data and available in-stream flow assessments were reviewed…Further on, it states that All available hydrologic and physical terrain data were evaluated….This Study needs to list each and every bit of data that was reviewed, evaluated and used. Detailed descriptions of it need to b e made, inclueding periods of records, locations, who provided it, etc. This data must then be placed in an appendix. This Study will be long lasting on a shelf somewhere, and as it ages, the reader of the future need to understand just how old the data that was being used to write this Study is	
117	Page vi, first paragraph: The reference to the interactive map should be deleted from the Study. The work contained herein is so preliminary, is based on such limited information, is not site-specific enough to warrant a full-scale distribution of such a web-based system, that so doing would be misleading the general public, and in particular, regulators, as to the level of sophistication of the results and giving a false sense of accuracy. Furthermore, the interactive map has absolutely no disclaimer information upon it (see earlier comment). The only people who should utilize information from this Study are those that actually read and have the Study in hand so that they know and understand its limitations	
118	Page vi, second paragraph, The end of the paragraph ends without giving any reason as to what this is the case, which is the cause of misleading by omission. Suggest the following sentence be added: "This is because no rain occurs in the summer; therefore, there is no runoff to support summertime discharges".	
119	Page vi, Discussion and Recommendations: First paragraph, second line - the words "This suggests" begs the question "what suggests?" - please provide clarity as to what "this suggests" means.	

Comment No.	Comment	Response
120	Page vi, Discussion and Recommendatios: First paragraph, fifth line, after the word "County" suggest adding - "however, the natural conditions of most streams in the County is they dry up in the summer."	
121	Page vi, Discussions and Recommendations: Delete in the first paragraph the sentence: "However, estimates of EWD are minimum…"If there are limitations in this study (which I know there are) then they are best organized into a section dedicated to listing them. Furthermore, was there a baseline analysis to answer the basic question of "was there ever enough water to support these aquatic systems?" The author should provide a baseline analysis and all the supporting historical data to support the presumption that there was sufficient water in the past; otherwise, it sounds like there is intent to create these aquatic systems.	
122	Page vi, Discussions and Recommendations: The bulleted recommendations are suggested to read as follows: 1. Delete the first bullet entirely. The contents of the statement are outside of the scope of the Study, and the effort provided within the study is qualitative in nature, not quantitative, and thus is judged insufficient to be part of this Study. 2. Anaylze current streamflow...<leave as is, except change "gauging" to "gaging" 3. Monitoring streamflows in all 25...<leave as is except delet the last sentence that reads "Results could be used..." because the District, through stakeholder input, should provide policy, not the Consultant	

Comment No.	Comment	Response
123	Page 1, first paragraph: Delete the last sentence as it is not a stated purpose within the MWR, but instead is a sentence offered in combination with another sentence in the executive summary of the MWR that has been left out, and when left out, completely changes the meaning of things. Neither one of those sentences are identified in the MWR as the "purpose" either! No, the "purpose" of the MWR is given in Section 1.2, and it is that purpose that should be presented in this Study.	
124	Page 1, Second paragraph, at the end of the sentence that is the definition of EWD, the following words need to be added such that the definition is exactly as stated in the MWR: "and ecosystem processes." Furthermore, the reference in the MWR should be shown so the reader knows where to go find it (MWR, Sec 4.6.5.1)	
125	Page 1, Second paragraph, delete the last sentence in that paragraph. It does not fit what is being discussed. It is talking about a water management issue and the purpose of this Study is not at all related to water management. The topic of that sentence is out to the scope of this Study. It is a big threat and there is no justification for this statement	
126	Page 1, third paragraph, the concept in the last sentence that reads "For example, a creek could be dry all summer, effectively extirpating steelhead, and then achieve its annual flow requirement during winter floods" is exactly the behaivior of the streams along the central coast given the hydrology of this region. This fact is naturally ocurring and should be acknowledged at other places within this report.	

Comment No.	Comment	Response
127	Page 1, fourth paragraph, the sentence: "These estimates are intended to inform water supply planning efforts by the SLO IRWM participants to understand, anticipate, and incorporate, to the extent appropriate, environmental in-stream flow requirements into SLO County water supply planning" has wording that is challenging and suggested changes are as follows: "These estimates are intended to inform water supply planning efforts by the SLO IRWM participants to understand in-stream flow estimates within their areas of interest." The way it is worded is too policy oriented, and that should come from the District, not a consultant. Secondly, it mentions "in-stream flow requirements" and throughout this Study the auther mentions that the method is providing an "estimate", so the use of the word "requirement" is too restrictive and filled with authority, indicating that a much greater effort was made in developing the Study, whereas that is not the case. And lastly, this study is so preliminary in nature, that it would be way too early for such a statement constructed as originally worded to be accurate for this Study	
128	Page 1, fouth paragraph, the last sentence: An oral presentation was made to the WRAC twice, and no action or support was taken or provided. This sentence needs to be reflective of this, and this only. To state it in the way written is inaccurate and false. The commenter is a WRAC member and did not vote to "support" the outcome of this Study.	
129	Page 1 and 2, the numbered specific objectives - see the comment above (#8) for a complete list of comments on these	
130	Page 2, Sec 2.1, second paragraph, second sentence - delete as that effort is out of scope of this Study, and the work done was not scientific, but was qualitative, and there is high risk of its misuse by future users	
131	Page 3, fifth line, the words "stream gradient" are used twice	

Comment No.	Comment	Response
132	Page 5, delete the paragraph atop the page for the reasons stated in comments #130	
133	Page 6, Sec 2.2.1, first line "All available in-stream flow analyses" - where is this listed and cataloged? Needs to be listed and placed in this study for future users	
134	Page 6, Sec 2.2.2, third line, end of line, delete the words "and lagoon function" for the reasons given in Comment #130.	
135	Page 10, Section 2.3.3, first paragraph, the period of 2013 just happens to be the driest period of record at most gages (precipitation and streamflow) recorded in the State, and now this Study is utilizing much information from 2013. This is seriously skewing many statements and tables in this document, and the analyses are not likely representative. AMWC has 100 years of precipitation records, and the 2013 year is the single driest year on record	
136	Page 11, last paragraph, last line - the author must advance this discussion and tell the reader why the summer visit was dry … It was because (1) it is a common and natural occurring condition of streams along the central coast, and (2) the Summer 2013 is associated with the single driest precipitation year on record at many recording gages in the area and the State.	
137	Page 13, Figure 6, never is it described how the Measured Flow is determined. Measuring flow in a natural stream is challenging, difficult, and susceptible to error; thus, it needs to be clearly described how the author did this.	
138	Page 13, Figure 6, in the right table, how is the velocity measured?	
139	Page 16, first paragraph, delete the last sentence because the work described is outside the scope of work performed for this Study	

Comment No.	Comment	Response
140	Page 16, third paragraph, the model described is a "simple regression analysis" … Is this the only statistical modeling that applies? Or is there other statistical distributions that could have been utilized but were not used, but their utilization might have resulted in more accurate predictions? Perhaps a footnote could be used to provide additional insights. Stating that a "simple regression analysis" makes the reader that the consultant took a simplified approach to make a point of what is actually a very complicated and complex analysis, and thus, makes one wonder if the effort is accurate. Furthermore in this same paragraph, the phrase "we developed a linear multiple regression model" seems hard to believe that the complexities of hydrology can be simply defined as a straight linear relationship.	
141	Page 16, Section 3.1 - see comment #32 on year 2013 usage	
142	Page 17, it is amazing that the dialogue on San Luis Creek does not discuss two things - that this creek has had in-stream flow studies done upon it, and that the flows in the creek are effluent-dominated by the City's Water Reclamation Facility. Both are very important and the reader should be made aware of this.	
143	Page 18, Figure 9 - See comment #145. The caption should note that the creek flows are dominated by City's Water Reclamation Facility	
144	Page 19, the area of the paragraph that starts "In contrast, river channels such …" is a repeat of words from prior in the report (p. 17) and should be deleted.	
145	Page 20, Figure 12 - note in the figure that 2013 is the driest year on record	

Comment No.	Comment	Response
146	Page 20, Section 3.2 - Multi-comments The statement that channel size and channel gradient are a function of drainage area is a curious one. As the drainage area Is larger, the amount of tributary runoff increases, and with this increase generally comes an increase in discharges from precipitation events; therefore, the channel size is likely to be larger as you go downstream (thus as you increase the drainage area). But does an increase in drainage area naturally mean a relationship change in gradient? This commenter does not believe so. Take the Mississippi River for example. If you go from Ohio to Missouri, the change in gradient is likely small, wheras the change in flow is obvously lagre. Suggest taht this relationship statement be re-thought out and decide whether it even needs to be in this Study The statement of "thus the direct proportionality between EWD and drainage area" is not a correlations with water velocity at all, but instead, is a correlations with discharge to discharge area. The only connection between discharge and velocity is the flow area (Q=V*A). But the geometry of a flowing channel is not linear; thus, it is highly unlikely that a linear relationship exists between drainage area and velocity The statment "locations with larger drainage areas had lower gradient and	

Comment No.	Comment	Response
147	Page 21, Several comments 1. fix the decimal points on the y-axis 2. make the y-axis scale on both graphs the same 3. show the linear equation on both graphs 4. show the R^2 value on both graphs 5. somewhere in this report, list the 12 gages that were used to make these graphs. List their gaging number, their gaging names, their drainage area, their period of record, and their average spring and summer flows that are plotted on this graph. 6. Somewhere in this report identify the limitations of the equations, for example if a watershed hass 1000 mi^2, is the equation still applicable? Or does it have limitations (confidence limits) that run out at say a smaller area, and if so, what is that limiting factor 7. THis analysis has one fatal flaw - at zero area, the in-stream flow should also be zero, but per this model, it is not. There is a y-intercept for both of these situations, and it is obvious that you cannot get runoff from a watershed that has zero drainage area. This mathematical phenomenon should be discussed, and furthermore, it should be discussed as to what the limitations might be for the minimum drainage area. Said another way, is	
148	Page 23, top two paragraphs on page - see comment #45	
149	Page 23, Sec. 3.3, delete reference to interactive map per comment #12	
150	Page 23, Table 3, multiple comments - Add the Analysis Watershed reference to each point Under EWD delete the word "requirements" and replace with "Estimate" because all throughout this Study it talked about how this effort creates an Estimate, and even the graphs say "Estimate"	
151	Page 26, Sec. 3.4 - recommend that all qualitative work be deleted. If a Brief discussion of this information is listed as "out of scope of this Study and can be taken up by the District in the future", then perhaps something can be shown, but there is too much non-scientific and analytical information provided herein that will be misused and should not be here	

Comment No.	Comment	Response
152	Page 32, Sec. 3.5, end of paragraph, change ot read "… and agricultural needs may have changed."	
153	Page 32, Table 5, multiple comments <Delete reference to interactive map (see Comment #12) <add column showing Drainage Area (mi^2) <fourth row, Arroyo Grande Creek	
154	Page 33, Sec. 4, multiple comments 1. first paragraph, fourth line, behind the word "County", add "however, the natural conditions of most streams in the County is they dry up in the summer." 2. First paragraph, delete from the words "However, estimates of Environmental ..."through to the end of the paragraph 3. Second paragraph, fifth line from the bottom, beginning from the words "For example, in this study ..." delete from there to the end - the language is out of scope for this Study 4. Third paragraph, from the words "For those that are not, there may be ..." delete from there through to page 37, just above the second paragraph that starts out with "If more intensive..." The reason for such a large deletion is because all of that discussion is either out of scope of the Study, or in the case of Table 6, the data presented therein is based on the worst hydrological year on record, and thus the results are completely skewed and misleading. Much of the discussion within this reach is completely without any stakeholder meetings and involvements and that is so out of character for a document of this magnitude for this County. The author	
155	Page 37, the paragraph that begins "if more intensive…" the comments are: <Delete the words "if more intensive evaluations are conducted, and capitalize the word "there" <Keep the remainder of the paragraph. It is appropriate to suggest for site-specific efforts the tools that are available for such site-specific work to develop an in-stream flow assessement	

Comment No.	Comment	Response
156	Page 37, see Comment No. 17 for changes to the list of recommendations	
157	Concluding remarks <on page 35, middle of the page, the paragraph that starts off "Based on available data, EWD is not achieved …", even though an earlier comment suggest deleting this entire section, it is important to point out a theme of this paragraph that has much inaccuracy about it. The auther should be ab le to describe what they had in mind by this statements. There shoudl be some mention of what good programs have already been done by water managers within the County (e.g., Lopez HCP, live stream agreement on the Salinas River, Arroyo Grande Oilfield Pismo Creek Discharge permit, SLO City Reclaimed Water Facility studies, etc.) Furthermore, the normal hydrology of the County is that the precipitation is low, and the streams just don't have runoff - period! Especially summertime when there is no precipitation. To state that "the water management is reducing surface flow" is inflammatory, inaccurate, and without justification, and certainly far beyond the scope of work for this Study. Hence, all reasons to delete this from this Study 2. It is clear why this Study was done for a single species, but what would a more detailed study cost if more species were considered (and using	
158	p.198 Chart Groundwater Basins(s) Paso Robles Creek Question. With more recent study, has the Paso Robles Creek basin been re-categorized as the Atascadero sub-basin? If so, because of its size and regional significance shouldn't the Atascadero sub-basin be on this chart?	Re-categorizing Paso Robles Creek into the Atascadero sub-basin would be determined by State Water Resources Control Board or USGS.
159	p. 198 Chart Jurisdictions Question. After each of the cities listed is "(ptn)". What does "ptn" mean? This question is repeated when "ptn" appears in the subject section.	PTN = Public Transit Network

Comment No.	Comment	Response
160	p. 198 Description Comment. As is known, San Miguel and Templeton are unincorporated urban areas. Why is one called a town and the other a community? County Planning generally refers to areas with Urban Reserve Lines as communities and those with Village Reserve Lines as villages. To the best of my knowledge the term town is not used in County documents. Consistency throughout this management plan to agree with county planning documents would seem preferred	Both Templeton and San Miguel should be referred to as community for consistency.
161	Suggested edits based on comment immediately above. This terminology occurs in numerous places within the section. It is flagged where found. “A majority of the City of Paso Robles, approximately one-half of the City of Atascadero (northern portion), the town community of San Miguel, and the community of Templeton …	see above
162	Edit suggestion. “The headwaters are in the Coast Ranges, east west of the city of Paso Robles	Corrected to "west of the city of Paso Robles"
163	p. 199 6. Characteristics, Physical Setting Rainfall Comment. It would seem to me that the higher rainfall of 25-33 inches occurs on the southwest portion of the watershed rather than on the southeast. Please verify	Changed to southwest

Comment No.	Comment	Response
164	Geology Description Paragraph 1 Question. Is the Templeton sub-watershed what we commonly know as Toad Creek? Or perhaps having a different name or no name? The Toad Creek watershed is described in the Templeton Community Design Plan 1990 and TAAG Toad Creek Watershed Report 2013. This watershed is approximately 8 square miles. The headwaters begin south of Vineyard Drive and approximately 3.5 miles northwest of downtown Templeton, and about a .25 mile north of the Main Street - Highway 101 interchange. The Toad Creek watershed flows directly into the Salinas River. Please see enclosure a) Toad Creek Google Map 2011	Sub-watershed would encapsulate any other non-named tributaries in the Paso Robles Creek area watershed, such as on the east side of the Salinas River. Redone to state, "Templeton (including Toad Creek) ".
165	8. Paragraph 7 Question. Is the “Paso Robles Sub-basin” what is now commonly referred to in all current published studies as the Atascadero sub-basin? Please clarify	The Paso Robles Sub-basin is accurate. There is also an Atascadero sub-basin section.
166	p. 201 Flood Reports General Question. The city of Paso Robles and county areas are addressed. Is one to conclude that Atascadero has no flooding risks within this watershed area? Within the boundaries of the watershed, it seems to me there may be flooding risks between Graves Creek and Paso Robles Creek as well as along Salinas River. Please clarify.	These are the known flood reports for this watershed area. There may be flooding that occurs, but nothing documented is available at this time.

Comment No.	Comment	Response
167	Paragraph 1 Edit suggestions. “The SLO County Flood Control and Water Conservation District commissioned a community wide master drainage study for Templeton. The initial and subsequent phases of the study are intended to characterize existing drainage patterns, analyze flood problems and identify proposed near and short term solutions. The study focussed on a section of Toad Creek with community stakeholders responding (Fugro North Coast Engineering, 2010 2011 draft: SLO County Flood Control and Water Conservation District, 2009; TAAG Toad Creek Watershed Report 2013)”	Changed to suggested language.
168	Areas of Heightened Flood Risk Paragraph 1 “(County of SLO facilities Inventory, draft viewed 2013)” Comment. This is confusing. Please clarify.	The draft County report was reviewed for a list of areas of heightened flood risk in 2013.
169	Paragraph 2. Edit suggestions. “The freeway culverts at both the south and middle area are undersized, restricting flow causing potential flooding at the inlets. The length of Toad Creek between Main Street Highway 101 and the Southern Pacific Railroad is susceptible to flooding. Urbanization of the north sub area could have a very significant impact on this flooding. The area west and east of Main Street is currently in a Flood Hazard Zone. The community stakeholders proposed flood control and basin re-charge areas. (Templeton Design Plan, 1990; TAAG Toad Creek Watershed Report, 2013)”	Changed to suggested language.

Comment No.	Comment	Response
170	Paragraph 3. Edit suggestion. “ … West Bethel Road to the west, …”	Done
171	Paragraph 4 Comment. Illegal off-road use such as 4-wheel vehicles, motorcycles and ATVs are a problem and concern along the urbanized corridor of the Salinas River within this subject watershed. Not just in San Miguel.	Corrected.
172	Last Paragraph (next page). Edit suggestion. “In San Miguel, ponding of stormwater	Done.
173	Page 202 Biological Setting. Comment. Another reference that may be useful is the Templeton-Atascadero Bikeway Connector Trail Constraints Report prepared by Rincon Consultants, July 2003.	Included
174	Page 204 Steelhead Streams Paragraph 1 Comment. Toad Creek is identified as a previous steelhead creek (Watershed Fisheries Report 2002.	Included
175	Designated Critical Habitat Comment. Add Toad Creek because preservation and enhancement are discussed in the Templeton Community Design Plan 1990; County Land Use Ordinances, Templeton Area Standards 2003; and TAAG Toad Creek Watershed Report 2013.	Desingation of critical habitat is by USFWS or NMFS.

Comment No.	Comment	Response
176	Page 205 Land Use Jurisdictions & Local Communities Edit suggestions. “County of San Luis Obispo, City of Atascadero (ptn), City of Paso Robles (ptn),Templeton, Town of San Miguel, Camp Roberts (ptn)” Question. What does “ptn” mean?	see above
177	20. % Urbanized Comment. Templeton should be added to this list. Also change “town” to “community” when referring to San Miguel.	
178	21. % Agricultural Comment. I think this percentage addresses all areas outside of the urbanized areas. Therefore delete “in the town of San Miguel”.	Done
179	22. Potential growth areas Edit suggestion. In last line of the paragraph, add a comma before Templeton	Done
180	23. Facilities Present Edit suggestions. Mission San Miguel, Rios Caledonia Adobe, County Public [?] Works District 1, Camp Roberts, San Miguel Wastewater Treatment Plant, Paso Robles Waste Water Treatment Plant, Paso Robles Youth Correctional Facility, Mid State Fair Grounds, Templeton Wastewater Treatment Plant, Atascadero Mutual Water Company facilities are found near the Salinas River, at the south end of this watershed.	Done

Comment No.	Comment	Response
181	24. Commercial Uses Comment. One sand-mining operation in Templeton seems to be missing from this list. It located about a mile downstream from Templeton/Ormonde and is the Finley Sand Pit, which I think is operated by Weyrick.	Done
182	25. Comment. In keeping with the mention of San Miguel commercial areas, it is suggested to add some information about Tempeton's commercial areas - Twin Cities Hospital plus medical services along Las Tablas Road and downtown businesses along Main Street.	Done
183	26. Population Edit Suggestion. "2,205 in the town community of San Miguel (US Census Blocks, 2010)"	Done
184	Page 206 27. Race and Ethnicity Edit suggestion. "Town Community of San Miguel:	Done
185	Page 207 28. Groundwater Comment. The chart at the beginning of this watershed section on page 198 lists two basins. The second basin "Paso Robles Creek" was the subject of earlier comments wherein I suggested this second basin is now known as Atascadero Sub-basin. There should be consistency between the chart on page 198 and discussion through this report. For that reason add Atascadero Sub-basin.	See response above to similar comment.

Comment No.	Comment	Response
186	29. Imported Water Edit suggestions. “The cities of Atascadero and Paso Robles, and the Templeton CSD are signors of the Nacimiento Water Project, which allows them to draw supplemental water from Lake Nacimiento for their users (Carollo, 2012).”	Done
187	30. Beneficial Uses Comment. It is my understanding that the Templeton CSD has a well in the vicinity of Toad Creek near the Salinas River that may qualify this creek to be added to the list.	Need to verify with TCSD.
188	31. Historic Resources. Comment. Add a second paragraph. The Juan Bautista de Anza Historic Trail (Anza Trail) is administered by the National Park Services (National Trail System 1990). The trail corridor extends from Atascadero through Paso Robles then northwest towards San Antonio Mission (County Parks and Recreation Element 2006; cities of Atascadero and Paso Robles).	Done

Comment No.	Comment	Response
189	Page 209 32. Templeton Park, County operated day-use recreation areas. Duveneck Regional Park (Undeveloped) Some additional County recreation facilities for the list: Vineyard Park (dog park) Paso Robles Creek Trail (Undeveloped) Toad Creek Trail (Undeveloped) Salinas River Trail (Undeveloped) Anza Trail (Undeveloped) Salinas River Natural Areas (As opportunities materialize)	
190	33. Rios Caledonia Adobe Comment. This is a County Parks facility.	Done
191	34. Comment. To provide a more complete list of recreation facilities add this section. Tom Jermin, Sr. Park TCSD operated day-use recreation areas. Evers Park Creekside Park (Undeveloped)	Only included Tom Jermin, Sr. park because need to know what organization operates the other two.
192	35. Comment. A new plan for future recreation facilities is currently in the final approval process. Please add. Salinas River Trails Master Trail Plan – Santa Margarita to San (Undeveloped) Miguel (SLOCOG 2014)	Done

Comment No.	Comment	Response
193	36. San Miguel Staging Area Comment. This area is managed by County Parks not a state agency.	Done
194	37. Big Sandy Wildlife Area. Comment. Clarify the agency that manages this property. I believe it is California Fish and Wildlife.	Done
195	Page 210 38. Watershed Codes CDF Watershed Name Question. Is the watershed called “Templeton” what is commonly known as Toad Creek by the Templeton community (Templeton Community Design Plan 1990 and TAAG Toad Creek Watershed Report 2013) and County Parks (County Parks and Recreation Element 2006)? Is there a way to cross-reference these differences?	Added (aka Toad Creek) to help clarify.
196	Page 211 39. Major Changes in the Watershed Comment. Perhaps the first statement might be a quotation from the National Park Service about the Anza expedition, now recognized as the Juan Bautista de Anza National Historic Trail. Please see enclosure b) Anza Info May 2014 In 1776, the first overland colonizing expedition to California passed through present-day San Luis Obispo County, homeland of the Salinan people, on its way to San Francisco Bay. The arrival of this Anza Expedition heralded an era of change for California. These settlers of mixed African, Europeon, and Native ancestry would lay a new cultural foundation for the American West.	This may need greater expansion than what can be accounted for in this section.

Comment No.	Comment	Response
197	40. Comment. Possible other Templeton milestones since this type of information is furnished about San Miguel. The Templeton Fire District was formed in 1909 and today remains a volunteer fire company. The Templeton Community Services District was formed in 1976.	Done
198	Page 212 41. Watershed Health by Tributary Question. As previously questioned is the watershed called "Templeton" what is commonly known as Toad Creek by the Templeton community (Templeton Community Design Plan 1990 and TAAG Toad Creek Watershed Report 2013) and County Parks (County Parks and Recreation Element 2006)? Is there a way to cross-reference these differences?	see above
199	Page 213 42. Watershed Health by Major Groundwater Basis	The Atascadero is a "sub-basin" of the Paso Groundwater basin. This should be clarified in the beginning of Section 3.2.3.8
200	43. Groundwater Quality Description Question. In as much as the chart at the beginning of Section 3.2.3.8 lists two watershed basins, why is only one listed here? I would expect to see the Atascadero Sub-basin listed here since the characteristics of this basin are different from the Paso Robles Groundwater Basin.	see above
201	Page 214 44. Primary Issues – discussion paragraphs Comment. Incorporate the Atascadero Sub-basin in the title of this text or divide the text into two basins. Expand the discussion of the Atascadero Sub-basin to include how it interacts with the larger Paso Robles Groundwater Basin and the effect of seasonal rainfall and other key differences cited recent published documents.	This section is focused on the Paso Groundwater basin. The Atascadero is one of several other sub-basins

Comment No.	Comment	Response
202	Page 215 45. Bibliography Technical Reports Comment. Please add the following resources because they are referenced in this letter. National Park Service, Juan Bautista de Anza National Historic Trail www.nps.gov/juba San Luis Obispo County Parks and Recreation Element (2006) Body of PRE and Appendices http://www.slocountyparks.com/information/prebody_appendix52007.pdf Chapter 8 – Project List and Maps http://www.slocountyparks.com/information/preprojectlist52007.pdf San Luis Council of Governments, Salinas River Master Trail Plan in process Templeton Area Advisory Group (TAAG) Toad Creek Watershed Report (2013) http://www.taaginfo.org/pdf/ToadCreekWatershedReport%2018Feb2013.pdf	

END

Public Comment Received between December 20, 2013 and January 21, 2014 on the San Luis Obispo County Instream Flow Assessment (CSLRCD and Stillwater Sciences, 2014)

Comment No.	Comment	Response to Comment
1.	General (AND VERY IMPORTANT)- page iv. Nicole Smith had advised that due to the extreme coarse nature of this very preliminary effort, there would be a disclaimer that identifies to the reader to NOT use this effort for any regulatory or mandatory requirements when establishing permit limits; however, no such disclaimer is located anywhere within this document. THIS DISCLAIMER MUST BE PROVIDED RIGHT UP FRONT, AND PERHAPS IN SEVERAL LOCATIONS. It must be very clear what the limitations are, who the expected users are, and who the users should not be.	Similar text added to Intro section of Executive Summary and intro of main report.
2.	Page iv, Acknowledgement: The statement that the Water Resources Advisory Committee had an involvement in this study is incorrect. The WRAC simply heard two verbal reports on this effort, and at no time was the WRAC ever given direction that its listening to these reports was going to be the only involvement in the study. The second report was given so late in the meeting that over half of the Membership had to leave. In no way was the WRAC engaged in this study, and this reference must be changed to simply say that two presentations were given at WRAC meetings, and nothing more.	Clarified
3.	Page iv, Acknowledgement: Everyone receives acknowledgement of where they work or who they are, except Stephanie (is her name misspelled in the report?) Wald- who is she? Why is she listed here?	Clarified.
4.	Page iv, Acknowledgement: Second to last line, behind the word {/grant", please identify just how much this grant was for, and if appropriate, identify the distribution of the funds to the consultant and the administrating agency. Also, at the end of the sentence, identify what the Proposition Number was for the grant.	This grant was part of the IRWMP Planning grant received by the county/region. The total grant amount for the Countywide Watershed Planning Phase 1 was $250,000, split between the Resource Conservation Districts. The Instream Flow Assessment component was approximately $73,000. We do not feel this information is appropriate for the report.
5.	Page iv, A Note on Units of Measurement: Fourth line- USGS never measures discharges in 11*feet* per second", they always measure discharge in "cubic feet per second". The units of {/feet per second" is a unit of measuring velocity, not discharge.	Corrected.
6.	Page iv, A Note on Units of Measurement: Fifth line- the units "grams per milliliter" is not the common usage in water quality... that would be {/milligrams per liter".	Corrected.
7.	Page iv, A Note on Units of Measurement: In the table, under the column for English units, for the row "1 hectare-meter (hm)", the value of 0.12 acre-feet (ac-ft) is incorrect, and should read 8.10 ac-ft.	Corrected.

Comment No.	Comment	Response to Comment
8.	General- the Master Water Report (MWR) in the main text does identify Environmental Water Demand (EWD) as one of the four categories of water demands discussed within the MWR. The one pointed recommendation within the MWR regarding EWD is as follows: "Site- and project-specific in-stream flow requirements need to be completed to be able to determine a water balance that accounted for environmental water demand on a water planning area basis in future Master Water Reports" (MWR, Section 5.2.1). It continues on by further stating 11This would allow the environmental water demand to be quantified and represented on a sub-watershed and creek basis. The first steps in this effort are establishing appropriate data collection sites, identifying opportunities for coordination with appropriate entities on the effort and prioritizing locations to study first." The DRAFT San Luis Obispo County Regional In-stream Flow Assessment (Study) (page v, under Introduction) indicates that the MWR is the driver behind the development of the Study; therefore, the focus of this Study needs to be limited to those recommendations pointed out in the MWR. As such, the objectives of the Study should be as presented below: 1. a County-wide assessment of in-stream flow estimates for steelhead based on an in-stream flow assessment of stream gages and field observations of a limited number of streams. 2. an assessment of data needs to support EWD estimates. 3. initial EWD estimates for a select few of the County's streams. 4. recommendations for technically appropriate approaches to produce detailed and site- specific in-stream flow assessments. Additionally, these items presented need to have the specific MWR section number given in parentheses to help the reader point back into the MWR as to where the objective came from. In the list made *above,* the changes that are suggested include: Item 1: re-written to be representative of what was done in this Study. Item 2: unchanged Item 3: unchanged Item 4: deleted as the scope of work provided in this study is too limiting and insufficient to allow for any scientifically justifiable prioritization of any streams in the County. Item 5: deleted the words "cost-effectively and" because any in-	Clarified.

Comment No.	Comment	Response to Comment
	stream study work is very expensive and the use of the word "cost-effectively" will mislead the reader to possible believe that such efforts are minimal in cost, whereas that is not the case. Item 6: delete as this effort was not done in this Study.	Deleted.
9.	Pave *v,* in Introduction: The definition for EWD is not written the way it is written in the MWR. It should not be paraphrased in that form because it is misleading (it reads as if the EWD is for steelhead, whereas the MWR says it is for a target species, and that the target species selected is steelhead- a much different meaning). Suggest it be written to match the MWR.	Revised to match.
10.	Page *v,* first sentence in the Approach: .... Was defined in relations "to" steelhead...	Corrected.
11.	Page *v,* Third line in the Approach: Available hydrologic and physical terrain data and available in-stream flow assessments were reviewed.... Further on, it states that All available hydrologic and physical terrain data were evaluated… This Study needs to list each and every bit of data that was reviewed, evaluated, and used. Detailed descriptions of it need to be made, including periods of records, locations, who provided *it,* etc. This data must then be placed in an appendix. This Study will be long lasting on a shelf somewhere, and as it ages, the readers of the future need to understand just how old the data that was being used to write this Study is.	The information is list in the Methods section (but not the Executive Summary). Improvements were made to better describe the information. All data was cited and public, so an Appendix is not needed.
12.	Page vi, first paragraph: The reference to the interactive map should be deleted from this Study. The work contained herein is so preliminary, is based on such limited information, is not site-specific-enough to warrant a full-scale-distribution of such a web-base *system,* that so doing would be misleading the general public, and in particular, regulators, as to the level of sophistication of the results and giving a false sense of accuracy. Furthermore, the interactive map has absolutely no disclaimer information upon it (see earlier comment). The only people who should utilize information from this Study are those that actually read and have the Study in hand so that they know and understand its limitations.	The interactive map does include metadata that describes the project. One goal of this map is to increase the availability of the data and encourage local discussions on how this information could be used and expanded on to improve water planning.
13.	Page vi, second paragraph: The end of the paragraph ends without giving any reason as to what this is the case, which is the cause of misleading by omission. Suggest that the following sentence be added: *This is because no rain occurs in the summer; therefore, there is no runoff to support summertime discharges.*	Environmental Water Demand was only predicted for streams identified by NOAA as having a high intrinsic potential for steelhead rearing- including summer flows. So, if it is dry under existing conditions it's because that NOAA analysis is wrong, or there are water diversions. This is clarified in the Approach section, and added to Recommendations.
14.	Page vi, Discussion and Recommendations: First paragraph, second line- the words "This suggests" begs the question "what suggests"- please provide clarity as to what "this suggests" means.	Clarified.

Comment No.	Comment	Response to Comment
15.	Page vi, Discussion and Recommendations: First paragraph, fifth line, after the word "County", suggest adding-*;however, the natural conditions of most streams in the County is they dry up in the summer.*	Discussed above in response to comment 13
16.	Page vi, Discussions and Recommendations: Delete in the first paragraph the sentence: "However, estimates of EWD are minimum...." If there are limitations in this study (which I know there are) then they are best organized into a section dedicated to listing them. Furthermore, was there a baseline analysis to answer the basic question of "was there ever enough water to support these aquatic systems? The author should provide a baseline analysis and all the supporting historical data to support the presumption that there was sufficient water in the past; otherwise, it sounds like there's intent to create these aquatic systems.	Revised purpose in intro, and combined with limitations regarding water management. In reference to the baseline analysis question, this is discussed above in response to comment 13.
17.	Page vi, Discussions and Recommendations: The bulleted recommendations are suggested to read as follows: • Delete the first bullet entirely. The contents of the statement are outside the scope of the Study, and the effort provided within the study is qualitative in nature, not quantitative, and thus is judged insufficient to be part of this Study. • Analyze current streamflow.... <leave as is, except change "gauging" to "gaging" • Monitoring streamflows in all 25...." <leave as is except delete the last sentence that reads "Results could be used...." because the District, through stakeholder input, should provide policy, not the Consultant. • Delete the fourth bullet as the effort is out of the scope of the study, and policy statements such as that should be done with stakeholder input and conducted by the District, not a Consultant.	Bullet 1. It follows from the qualitative discussion in this report to "consider" flow needs for lagoon ecosystems. Bullet 2.Corrected Bullet 3. Clarified that, "Results could be used *by resource managers* to inform the prioritization of streams for…" Bullet 4. Doing more precise studies follows directly from this analysis. The list of creeks was removed.
18.	Page 1, first paragraph: Delete the last sentence as it is not a stated purpose within the MWR, but instead is a sentence offered in combination with another sentence in the executive summary of the MWR that has been left out, and when left out, completely changes the meaning of things. Neither one of those sentences are identified in the MWR as the (/purpose" either! No, the (/purpose" of the MWR is given in Section 1.2, and it is that purpose that should be presented in this Study.	Edited as suggested
19.	Page 1, Second paragraph, at the end of the sentence that is the definition of EWD, the following words need to be added such that the definition is exactly as stated in the MWR: "and ecosystem processes." Furthermore, the reference in the MWR should be shown so the reader knows where to go find it (MWR, Sec. 4.6.5.1).	Edited as suggested

Comment No.	Comment	Response to Comment
20.	Page 1, Second paragraph, further changes in the second definition for EWD to match what is in the MWR is as follows: … support the various life states of the target or indicator species, and in the MWR, the species is the federally threatened…. Further comment- while it's understood from the definition with the EWD is, what about the situation when the natural flows of the stream never supported such abilities, and thus, there would not be a EWD for steelhead? This should be addressed in some manner in this document (not necessarily at this location).	Edited as suggested See response to Comment No 13
21.	Page 1, Second paragraph, delete the last sentence in that paragraph. It does not fit what is being discussed. It is talking about a water management issue and the purpose of this Study is not at all related to water management. The topic of that sentence is out of the scope of this Study. It is a big threat and there is no justification for this statement.	Removed.
22.	Page 1, third paragraph, the concept in the last sentence that reads "For example, a creek could be dry all summer, effectively extirpating steelhead, and then achieve its annual flow requirement during winter floods" is exactly the behavior of the streams along the central coast given the hydrology of this region. This fact is naturally occurring and should be acknowledged at other places within this report.	Only stream reaches predicted to be perennial based on intrinsic watershed characteristics are included in this analysis. Portions of some creeks (not all) naturally go dry. Additional clarification has been added.
23.	Page 1, fourth paragraph, the sentence: "These estimates are intended to inform water supply planning efforts by the SLO IRWM participants to understand, anticipate, and incorporate, to the extent appropriate, environmental in-stream flow requirements into SLO County water supply planning" has wording that is challenging and suggested changes are as follows: *These estimates are intended to inform water supply planning efforts by the SLO IRWM participants to understand in-stream flow estimates within their areas of interest.* The way it was worded is too policy oriented, and that should come from the District, not a consultant. Secondly, it mentions "in-stream flow requirements" and throughout this Study the author mentions that the method is providing an "estimate", so the use of the word "requirement" is too restrictive and filled with authority, indicating that a much greater effort was made in developing this Study, whereas that is not the case. And lastly, this study is so preliminary in nature, that it would be way too early for such a statement constructed as originally worded to be accurate in this Study.	Edited as suggested as "These estimates are intended to inform water supply planning efforts by the SLO IRWMP participants to better understand environmental instream flows in the County."

Comment No.	Comment	Response to Comment
24.	Page 1, fourth paragraph, the last sentence: An oral presentation was made to the WRAC twice, and no action or support was taken or provided. This sentence needs to be reflective of this, and this only. To state it in the way written is inaccurate and false. The commenter is a WRAC member and did not vote to "support" the outcome of this Study.	Revised to "The objectives, methods, and results of this analysis were presented to the San Luis Obispo County Flood Control and Water Conservation District Water Resources Advisory Committee" There were no negative comments at that time.
25.	Page 1 and 2, the numbered specific objectives- see the comment above (Comment No.8) for a complete list of comments on these.	See response to 8 above
26.	Page 2, Sec. 2.1, second paragraph, second sentence- delete as that effort is out of scope of this Study, and the work done was not scientific, but was qualitative, and there is high risk of its misuse by future users.	It was within the scope of the study to qualitatively consider tidewater goby, which is what is stated. The Fisheries biologists of Stillwater Sciences are reputable in their field. These qualitative statements could frame future detailed studies where needed and acknowledge the connections between freshwater, brackish water and ocean environments to EWD. It is also helpful for resource managers to consider flow requirements for this listed species that may differ with steelhead trout needs. We are very clear that we conducted a qualitative assessment. Identifying important components for EWD, and assessing existing information, is a first step. We are not limited to the recommendations of the MWR, and this information will be useful for resource managers to consider.
27.	Page 3, fifth line, the words "stream gradient" are used twice.	Corrected
28.	Page 5, delete the paragraph atop the page for the reasons stated in Comment No. 26.	See response the Comment No 26.
29.	Page 6, Sec. 2.2.1, first line "All available in-stream flow analyses"- where is this listed and cataloged? Needs to be listed and placed in this study for future users.	Instream flow analyses are included in the Results section as Table 4.
30.	Page 6, Sec. 2.2.1, third line, end of line, delete the words "and lagoon function" for the reasons given in Comment No. 26.	Lagoon function as related to instream flows is discussed in this study based on existing and available analysis.
31.	Page 10, Section 2.3.2, the sentence in the third line that begins "During summer, flows in many...." is accurate and should be used on pages vi, and 1.	This point was revised and is now made more clearly in the Introduction and Approach sections.

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32.	Page 11, Section 2.3.3, first paragraph, the period of 2013 just happens to be the driest period of record at most gages (precipitation and streamflow) recorded in the State, and now this Study is utilizing much information from 2013. This is seriously skewing many statements and tables in this document, and the analyses are not likely representative. Atascadero Mutual Water Company has 100 years of precipitation records, and the 2013 year is the single driest year on record.	The following statement was added, "All observations were made during 2013, which was classified by the California Department of Water Resources as an extreme drought in San Luis Obispo County. Field assessments of steelhead habitat were conducted to determine the relationship between channel characteristics and minimum flow requirements for steelhead, and were not affected by the occurrence of the drought. However, during summer 2013 field visits many sites no longer had visible surface flow, and thus no useful field data could be collected."
		The 2013 weather does bias the assessment of existing conditions and an effort was made to make this point more clearly throughout.
33.	Page 11, last paragraph, last line-the author must advance this discussion and tell the reader why the summer visit was dry.... It was because (1) it is a common and natural occurring condition of streams along the central coast, and (2) the Summer 2013 is associated with the single driest precipitation year on record at many recording gages in the area, and the State.	See response to Comment No. 22 and 32.
34.	Page 13, Figure 6, never is it described how the Measured Flow is determined. Measuring flow in a natural stream is challenging, difficult, and susceptible to error; thus, it needs to be clearly described how the author did this.	Reference added.
35.	Page 13, Figure 6, in the right table, how is the velocity measured?	As noted below the figure, "Mean water column velocity was measured with a Marsh-McBirney velocity meter"
36.	Page 16, first paragraph, delete the last sentence because the work described is outside the scope of work performed for this Study.	We consider this analysis to be within the scope of the work performed.
37.	Page 16, third paragraph, the model described is a "simple regression analysis".... Is this the only statistical modeling that applies? Or is there other statistical distributions that could have been utilized but were not used, but their utilization might have resulted in more accurate predictions? Perhaps a footnote could be used to provide additional insights. Stating that a "simple regression analysis" makes the reader that the consultant took a simplified approach to make a point of what is actually a very complicated and complex analysis, and thus, makes one wonder if the effort is accurate. Furthermore in this same paragraph, the phrase "we developed a linear multiple regression model" seems hard to believe that the complexities of hydrology can be simply defined as a straight linear relationship.	Removed the term "simple," since it was confusing. Stillwater Sciences shared the same initial disbelief, although geomorphic theory and multiple data sets compiled since the 1950's from around the world also support this simple reliance of channel geometry on drainage area (for a given climate and physiographic region). They were guided by the observed data, however, not by a preconceived notion, and within those constraints selected the simplest explanatory relationship.

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38.	Page 16, Section 2.4 - delete entirely as qualitative assessment is not something asked for in the MWR, is out of scope of this Study, and the work done was not scientific, but was qualitative, and there is high risk of its misuse by future users. Future work to be done by others can go focus on quantitative assessments of the lagoons. For this Study, stay focused on the points discussed in the MWR, i.e., site- and project-specific in- stream flow. Water flows to break sand bars to allow for the fish to escape is a different thing all together (fish passage).	No changes were made. See response to Comment No. 26.
39.	Page 16, Section 3.1 - see Comment No. 32 on year 2013 usage.	Notes on the effects of the drought were moved to Methods, and also mentioned elsewhere.
40.	Page 17, it is amazing that the dialogue on San Luis Creek does not discuss two things - that this creek has had in-stream flow studies done upon it, and that the flows in the creek are effluent-dominated by the City's Water Reclamation Facility. Both are very important and the reader should be made aware of this.	The EWD estimate in San Luis Creek is a function of the channel geometry, not the effluent release. The release of water in SLO and AG is now discussed in Section 3.5 The discussion with the previous IFIM study is provided in Section 3.3.1.
41.	Page 18, Figure 9 - see comment No. 40. The caption should note that the creek flows are dominated by City's Water Reclamation Facility.	Revised.
42.	Page 19, the are of the paragraph that starts "In contrast, river channels such...." is a repeat of words from prior in the report (p. 17) and should be deleted.	Revised.
43.	Page 20, Figure 12 - note in the figure that Year 2013 is the driest year on record.	Revised.

Comment No.	Comment	Response to Comment
44.	Page 20, Section 3.2- Multi-comments. The statement that channel size and channel gradient are a function of drainage area is a curious one. As the drainage area is larger, the amount of tributary runoff increases, and with this increase generally comes an increase in discharges from precipitation events; therefore, the channel size is likely to be larger as you go downstream (thus as you increase the drainage area). But does an increase in drainage area naturally mean a relationship change in gradient? This commenter does not believe so. Take the Mississippi River for example. If you go from Ohio to Missouri, the change in gradient is likely small, whereas the change in flow is obviously large. Suggest that this relationship statement be re-thought out, and decide whether it even needs to be in this Study. The statement of "thus the direct proportionality between EWD and drainage area" is not a correlations with water velocity at all, but instead, is a correlations with discharge to drainage area. The only connection between discharge and velocity is the flow area (Q = V *A). But the geometry of a flowing channel is not linear; thus, it is highly unlikely that a linear relationship exists between drainage area and velocity. The statement "locations with larger drainage areas had lower gradient and wider channels, and thus required higher flows...." begs the question- on a cfs/mi^2 basis, is it really "greater"? Again, as you travel downstream, the land area contributing to runoff increases, thus, flow in the stream is larger- that is what is getting larger. But the unit value of cfs/mi^2 just might be holding near-constant.	This observation is certainly correct, at least with respect to specific examples, and the implication of a universal relationship is softened in the revision. That said, non-continental-scale rivers (i.e., everything in SLO) really do tend to have a concave-up profile, here and elsewhere, and so the relationship is worth exploring. However, the influence of commonly reduced gradient does not appear to have a significant influence on the actual data here, and so (as implied by the comment) the discrimination isn't critical. Actually, the same "hydraulic geometry" relationships mentioned in response to the first comment generally do find relationships between drainage area and velocity, but indeed they are not linear (and in fact are not very strong). However, that was not what was meant in the text, and that sentence has been revised to clarify the relationship between drainage area, channel width, and EWD that was intended. That's a good point, and not one that is emphasized here. The good linear fit to the data on figures 13 and 14 point to exactly such a relationship, and the regression equations presented on the next page quantify that cfs/mi2 relationship (recognizing that there is a non-zero intercept, at least as specified by this data set, and so we can't quite use a simple multiplier).

Comment No.	Comment	Response to Comment
45.	Page 21, several comments: • fix the decimal points on they-axis • make they-axis scale on both graphs the same • show the linear equation on both graphs • show the R^2 value on both graphs • Somewhere in this report, list the 12 gages that were used to make these graphs. List their gaging number, their gaging name, their drainage area, their period of record, and their average spring and summer flows that are thus plotted on this graph. • Somewhere in this report identify the limitations of the equations, for example, if a watershed has 1000 mi2, is the equation still applicable? Or does it have limitations (confidence limits) that run out at say a smaller area, and if so, what is that limiting factor. • This analysis has one fatal flaw-at zero area, the in-stream flow should also be zero, but per this model, it is not. There is a y-intercept for both of these situations, and it is obvious that you cannot get runoff from a watershed that has zero drainage area. This mathematical phenomenon should be discussed, and furthermore, it should be discussed as to what the limitations might be for the minimum drainage area. Said another way, is there a minimal area by which the model breaks down, and the only way to determine the results is to do a physical in-stream flow study? If so, so state	The following revisions were made: Decimals fixed y-axis is not the same because we are not comparing the two seasons. Linear equation shown R^2 shown Graphs are based on field assessments of EWD. A new table is added to show those results, which may make this more clear. We have no basis to quantify the confidence limits of extrapolated values, and we did not show confidence limits around the existing data. Inspection of the two graphs, however, suggests that the limits are about +/- 0.2 cfs for spring flows, and +/- 0.1 cfs for summer flows (i.e., 10% or better). A caveat for the use of these relationships outside of their measured range has been added. Agreed, and this omission in the original text has been added. In the world of "fatal flaws," however, this one is actually rather benign.
46.	Page 23, top two paragraphs on page-see Comment No. 45.	See response to Comment No. 45
47.	Page 23, Sec. 3.3, delete reference to the interactive map per-see Comment No. 12	The interactive map has metadata that was updated. See response to Comment No. 12.
48.	Page 23, Table 3, multiple comments- Add the Analysis Watershed reference to each point. Under EWD, delete the word "requirements" and replace with "Estimate" because all throughout this Study it talked about how this effort creates and Estimate, and even the graphs say "Estimate"	Analysis watershed were added for general reference. It should be noted that the names used are meant to act a a reference area rather represent an exact scale. Replaced requirements with estimate.
49.	Page 26, Section 3.4-recommend that all qualitative work be deleted. If a BRIEF discussion of this information is listed as "out of the scope of this Study and can be taken up by the District in the future", then perhaps something could be shown, but there is too much non-scientific and analytical information provided herein that will be misused and should not be here.	See response to Comment No. 26. Qualitative work is discussed in context, and is a useful perspective on EWD. Scope was not limited based on recommendations in MWR.
50.	Page 32, Section 3.5, end of the paragraph, change to read"... and agricultural needs may have changed."	Revised.
51.	Page 32, Table 5, multiple comments -delete reference to interactive map (see Comment No. 12) -add column showing Drainage Area (mi^2) -forth row, Arroyo Grande CREEK	See response to Comment No. 12. Added drainage area to Table. Revised Arroyo Grande Creek.

Comment No.	Comment	Response to Comment
52.	Page 33, Section 4, multiple comments -first paragraph, forth line, behind the word "County", add ";however, the natural conditions of most streams in the County is they dry up in the summer." -first paragraph, delete from the words "However, estimates of Environmental…." through to the end of the paragraph. -Second paragraph, fifth line from the bottom, begging from the words "For example, in this study…" delete from there to the end-the language is out of scope for this Study. -Third paragraph, from the words "For those that are not, there may be….", delete from there through to page 37, just above the second paragraph that starts out with "If more intensive…" The reason for such a large deletion is because all of that discussion is either out of scope of the Study, or in the case of Table 6, the data presented therein is based on the worst hydrological year on record, and thus the results are completely skewed and misleading. Much of the discussion within this reach is completely without any stakeholder meetings and involvement, and that is so out of character for a document of this magnitude for this County. The author must remind themselves what the purpose of the study was, and that purpose is stated in the MWR-whereas the dialogue presented within this band is completely out of that scope, and thus must be deleted.	See response to Comment No. 13 Deleted "However, estimates of Environmental…." as suggested. It is now included as a disclaimer in the front of the study. Stillwater Sciences agrees that the observations during 2013 may be misleading, which we note in many locations. It is also the reason we recommend additional monitoring at those locations. These observations and recommendations follow directly from the analysis.
53.	Page 37, the paragraph that begins "If more intensive….", the comments are: - Delete the words "If more intensive evaluations are conducted, and capitalize the word "there" -l<eep the remainder of the paragraph. It is appropriate to suggest for site-specific efforts the tools that are available for such site-specific work to develop an in-stream flow assessment.	Revised.
54.	Page 37, see Comment No. 17 for changes to the list of recommendations.	See response to Comment No.17

Comment No.	Comment	Response to Comment
55.	Concluding remarks: -on page 35, middle of the page, the paragraph that starts off "Based on available data, EWD is not achieved….", even though an earlier comment suggests deleting this entire section, it's important to point out a theme of this paragraph that has much inaccuracy about it. The author should be able to describe what they had in mind by this statement.	No changes made.
	There should be some mention of what good programs have already been done by water managers within the County (e.g., Lopez HCP, live stream agreement on the Salinas River, Arroyo Grande Oilfield, Pismo Creek Discharge permit, SLO City Reclaimed Water Facility studies, etc).	Section 3.5 was revised to list some of these programs.
	Furthermore, the normal hydrology of the County is that the precipitation is low, and the streams just don't have must runoff- period! Especially summertime when there is no precipitation. To state that "the water management is reducing surface flow" is inflammatory, inaccurate, and without justification, and certainly far beyond the scope of work for this Study. Hence, all reasons to delete this from this Study.	We use the word "may" not "is" and recognize that intrinsic watershed characteristics may also be a factor.
	- It is clear why this Study was done for a single species, but what would such a more detailed study cost if more species were considered (and using quantitative efforts, not qualitative}?	Additional studies should be pursued for other species especially for non-steelhead bearing streams as proposed in the Discussion and Recommendations as is prioritized by the community. It is outside the scope of this study to determine associated costs.
	-The Study seems to say that the only thing steelhead need is water, whereas other things such as quiescent pools, shade,	EWD is the most fundamental need, and