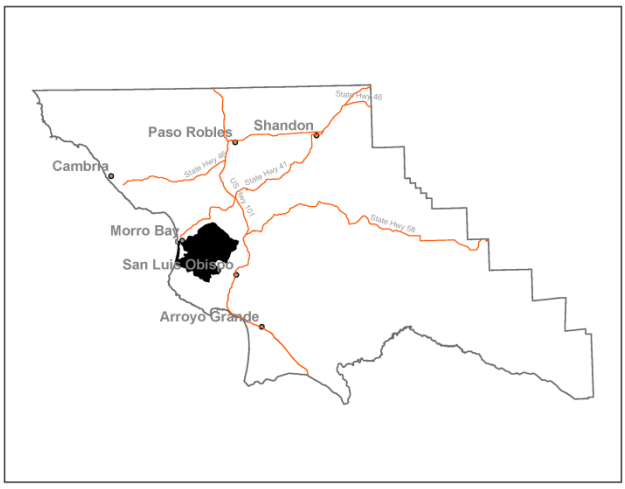
Morro Bay Watershed

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.

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. The Chorro Creek sub watershed consists of steep pre-Quaternary non-infiltrative headwaters and a flat Franciscan low infiltrative valley (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) Coastal salt marsh in this watershed supports specially adapted plant species, including pickleweed. Coastal salt marsh and estuarine communities in this watershed provides unique habitat for plants and wildlife. This habitat is important for many species of waterfowl and shorebirds. Willow riparian vegetation is common along several creeks in this watershed (Althouse and Meade, Inc. 2013). 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:* 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.

Morro Bay Watershed

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
California black rail	**ST; Fully Protected**			**x**	
California clapper rail	**FE; SE; Fully Protected**			**x**	
California horned lark	SSC (Nesting)				x
California linderiella	Special Animal				x
California red-legged frog	**FT**			**x**	**x**
coast horned lizard	SSC			x	x
Cooper's hawk	Special Animal (Nesting)			x	
globose dune beetle	Special Animal			x	
mimic tryonia (=California brackishwater snail)	Special Animal			x	
monarch butterfly	Special Animal			x	
Morro Bay blue butterfly	Special Animal		x	x	
Morro Bay kangaroo rat	**FE; SE; Fully Protected**			**x**	

Morro Bay Watershed

Common Name	**Status**	**ATASCADERO**	**MORRO BAY NORTH**	**MORRO BAY SOUTH**	**SAN LUIS OBISPO**
Morro shoulderband (=banded dune) snail	**FE**			**x**	
pallid bat	SSC		x	x	x
San Diego desert woodrat	SSC			x	
San Luis Obispo pyrg	Special Animal				x
sandy beach tiger beetle	Special Animal		x	x	
silvery legless lizard	SSC			x	x
steelhead - south/central California coast DPS	**FT**		**x**	**x**	**x**
tidewater goby	**FE**			**x**	
Townsend's big-eared bat	SSC				x
tricolored blackbird	SSC (Nesting)				x
western pond turtle	SSC				x
white-tailed kite	**Fully Protected**				**x**
Plants/ Lichen					
adobe sanicle	**SR**				**x**
Arroyo de la Cruz manzanita	CRPR 1B.2			x	x
beach spectaclepod	**ST**			**x**	
Betty's dudleya	CRPR 1B.2		x	x	x

Morro Bay Watershed

Common Name	**Status**	**ATASCADERO**	**MORRO BAY NORTH**	**MORRO BAY SOUTH**	**SAN LUIS OBISPO**
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	x	x
California seablite	**FE**			**x**	
Cambria morning-glory	CRPR 4.2			x	x
Carmel Valley bush-mallow	CRPR 1B.2	x			
chaparral ragwort	CRPR 2B.2				x
Chorro Creek bog thistle	**FE; SE**	**x**	**x**	**x**	**x**
coast woolly-heads	CRPR 1B.2			x	
coastal goosefoot	CRPR 1B.2			x	
Congdon's tarplant	CRPR 1B.1				x
Coulter's goldfields	CRPR 1B.1			x	
Cuesta Pass checkerbloom	**SR**	**x**			**x**
Cuesta Ridge thistle	CRPR 1B.2	x	x		x
dacite manzanita	CRPR 1B.1			x	
Diablo Canyon blue grass	CRPR 1B.2			x	
dwarf soaproot	CRPR 1B.2				x
Eastwood's larkspur	CRPR 1B.2			x	x

Common Name	Status	ATASCADERO	MORRO BAY NORTH	MORRO BAY SOUTH	SAN LUIS OBISPO
Hardham's evening-primrose	CRPR 1B.2			x	
Indian Knob mountain-balm	**FE; SE**			**x**	
Jones' layia	CRPR 1B.2		x	x	x
marsh sandwort	**FE; SE**			**x**	
mesa horkelia	CRPR 1B.1				x
Miles' milk-vetch	CRPR 1B.2	x	x	x	
Morro manzanita	**FT**			**x**	**x**
most beautiful jewel-flower	CRPR 1B.2	x	x	x	x
mouse-gray dudleya	CRPR 1B.3			x	x
Oso manzanita	CRPR 1B.2			x	
Palmer's monardella	CRPR 1B.2	x	x	x	x
Pecho manzanita	CRPR 1B.2			x	
salt marsh bird's-beak	**FE; SE**			**x**	
San Benito fritillary	CRPR 1B.2				x
San Joaquin spearscale	CRPR 1B.2		x	x	
San Luis mariposa-lily	CRPR 1B.2	x		x	x
San Luis Obispo owl's-clover	CRPR 1B.2		x	x	x
San Luis Obispo sedge	CRPR 1B.2	x		x	x

Morro Bay Watershed

		Common Name	**Status**	**ATASCADERO**	**MORRO BAY NORTH**	**MORRO BAY SOUTH**	**SAN LUIS OBISPO**
		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;				

Morro Bay Watershed

		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)

Morro Bay Watershed

	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; 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)
	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)

Morro Bay Watershed

	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

Morro Bay Watershed

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
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.	Agriculture, Agricultural Storm Runoff, Channel Erosion, Channelization,	Table 3 of Instream Flow Assessment (Stillwater Sciences, 2013)

Morro Bay Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
		Approved USEPA TMDL for Pathogens and Sediment in 2004 and for Nutrients in 2005. (SWRCB, 2010)	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)	
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)	No source identified.
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)	No source identified.
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)	No source identified.

Morro Bay Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
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)	Table 3 of Instream Flow Assessment (Stillwater Sciences, 2013)
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)	Table 3 of Instream Flow Assessment (Stillwater Sciences, 2013)
Los Osos Creek	Ephemeral (Sanford, personal communication, 2013)	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, Nutrients in 2005. (SWRCB, 2010) TMDL for estimated date of completion 2021. (SWRCB, 2010)	Agriculture, Agricultural Storm Runoff, Channel Erosion, Channelization, 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)	Table 3 of Instream Flow Assessment (Stillwater Sciences, 2013)
Warden Creek	Ephemeral (Sanford, personal communication, 2013)	Yes on 303d list for Fecal Coliform, Low Dissolved Oxygen, Nitrate. Approved USEPA TMDL for Fecal	Agriculture, Grazing Related, Unknown (SWRCB, 2010)	No source identified.

Morro Bay Watershed

Tributary Name	Ephemeral / Perennial	303d Listed/ TMDLs	Pollution Sources NP (non-point) MP (Major Point)	Environmental Flows
		Coliform in 2004 and for Nitrate in 2005. TMDL estimated date of completion 2021. (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, Nutrients in 2005. TMDL for estimated date of completion 2021. (SWRCB, 2010)		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
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)

Morro Bay Watershed

Groundwater Basin	Estimated Safe Yield	Water Availability Constraints	Drinking Water Standard Exceedance	Water Quality Objective Exceedance
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)

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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 quality	MBNEP, 2012
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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