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Central Coast Watershed Studies

**CCoWS**

# 2012 Water Quality and Photo Monitoring

## Santa Lucia Preserve, Monterey County, California


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## Preface

This report has been prepared for the Santa Lucia Conservancy and presents the 2012 photo monitoring results of four major streams flowing through Santa Lucia Preserve– Lower Las Garzas, Portrero, San Jose, and San Clemente Creeks. This report also presents the results of biannual water quality monitoring from 2009–2012. The data collected will serve an integral part establishing a long term dataset necessary for future analyses.

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# 1 Introduction

The Santa Lucia Preserve (SLP) is a 20,000 acre low density development in Monterey County, CA. The Santa Lucia Conservancy (SLC) is a non-profit organization established to manage 18,000 undeveloped acres of the SLP. Four streams within the SLP are monitored by the SLC: Las Garzas Creek, San Jose Creek, Potrero Creek and San Clemente Creek (Figure 1). Since the formation of the SLC in 1995, photo monitoring and water quality data have been collected intermittently by various organizations.

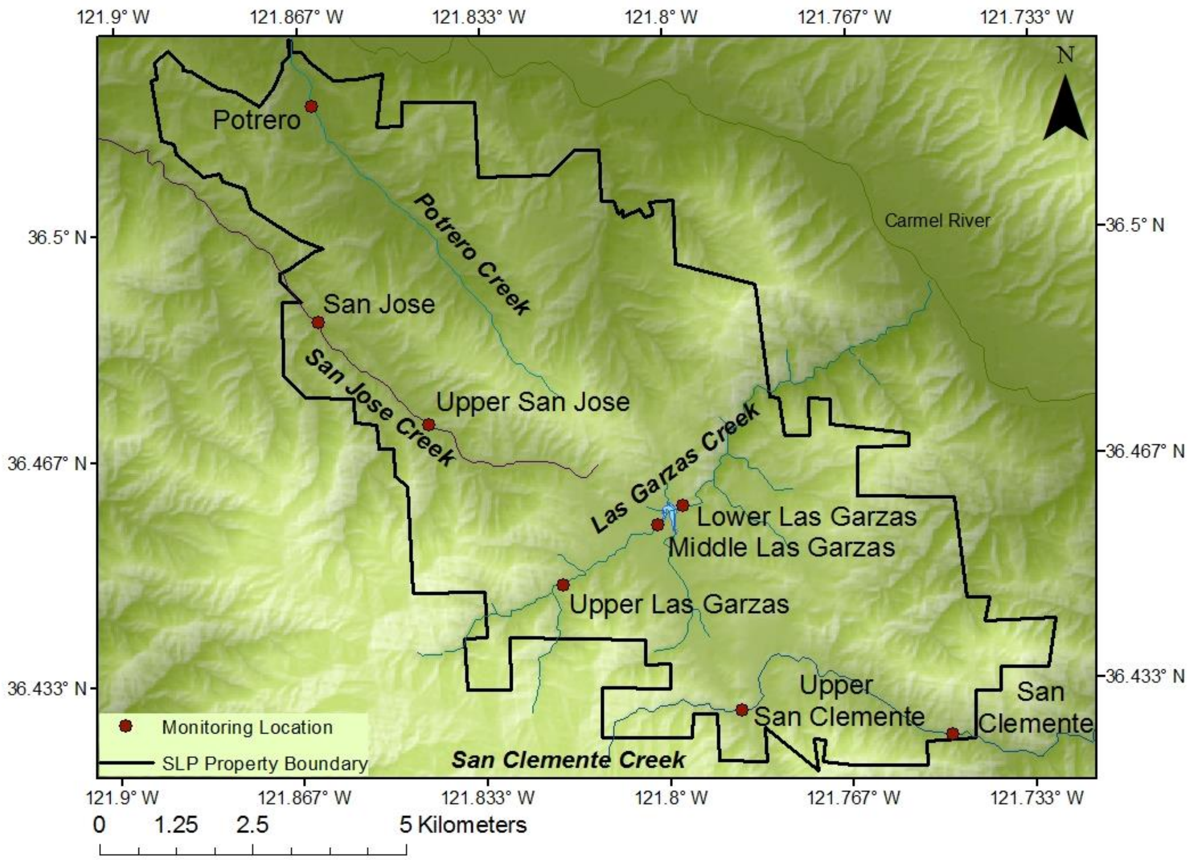


**Figure 1: Map of Santa Lucia Preserve showing eight monitoring sites on four streams within the property boundary.**

This report presents water quality data and photo monitoring images collected from eight monitoring sites (Figure 1). The goal of this report is to continue a baseline data set for suspended sediment concentrations, water nutrient levels, and photo monitoring. The most recent photo monitoring images (taken in August 2012) are compared to the oldest available corresponding images. All additional historical photographs of the SLP beginning in 1998 are available in the SLC office and in Paddock et al. (2011). Biannual water quality data collected since August 2009 are presented and compared.

## Photo Monitoring

Photo monitoring is a method used to record long term qualitative changes in stream channels. Photographs are used to analyze potential changes in channel substrate, channel morphology, and vegetation. Photographs are collected annually in low flow conditions because the channel is more exposed. Positioning of the photographer, distance from an established point, height above ground, inclination angle, bearing, and focal length are all factors that should be held constant (CARCD 2001).

In 1998-2003, several photo monitoring sites were established by installing white PVC pipe vertically in the stream bed. In 2009 and in 2011, two additional sites were included for a total of eight monitoring sites.

## Suspended Sediment and Stream Nutrients

The sediment load in streams is influenced by average and peak precipitation, discharge, geology, anthropogenic impacts, and the size of the drainage basin (Milliman and Syvitski 1992, Walling and Fang 2003). Increased sediment loads might have negative effects on stream habitat for macroinvertebrates, fish spawning and rearing, and other aquatic organisms (EPA 2003, Jha 2003, Smith et al. 2005). Specific levels of suspended sediment concentrations of 500mg/l or higher have shown sublethal stress as well as blood cell count and chemistry changes in Steelhead (Redding and Schreck 1982), and long term concentrations above 1650 mg/L suspended sediment will cause loss of habitat from increased sediment deposition (Coats et al. 1985).

Stream nutrient levels in surface water are naturally influenced by geology, vegetation and climate (Beaulac and Reckhow 1982, Hynes 1983, Clark et al. 2000). Dissolved nitrate plus nitrite as nitrogen (nitrate), dissolved ammonia plus ammonium as nitrogen (ammonia) and dissolved orthophosphate as phosphorus (orthophosphate) are three stream nutrients that are monitored for water quality. Nutrients may be released and levels may increase as a result of development (soil movement) or agriculture (fertilizer application/manure) or from atmospheric deposition (Beaulac and Reckhow 1982, Smith et al. 1999). Forested, undeveloped watersheds mostly have a low and homeostatic nutrient load (Beaulac and Reckhow 1982). In undeveloped watersheds across the United States, Clark et al. (2000) found that the median flow-weighted concentrations were 0.020 mg/L for ammonia as N, 0.26 mg/L for total nitrogen and 0.010 mg/L for orthophosphate as P. The California EPA is in the scoping process to propose nutrient water quality objectives. Nutrients alone do not affect Beneficial Uses protected by the California EPA because various levels of nutrients will cause eutrophication depending on the stream itself ([SWRCB] 2011). Monitoring for nutrient levels and eutrophication in streams will help establish a baseline for the stream in question.

A snapshot of stream suspended sediment load and stream nutrients over years provides a long term measure of watershed conditions for the four streams sampled on the SLP. Precipitation conditions during sampling will affect the magnitude of the resulting sediment and nutrient loads. Biannual sampling in August and Marchprovides one sample during the dry season with low stream discharges and one sample during the wet season with higher stream discharges. Long term monitoring will enable the SLC to detect any negative changes in suspended sediment load or stream nutrients in the future.

## 1.2 Monitoring Locations

This report presents water quality data and photo monitoring images collected from eight monitoring sites (Appendix A, Figure 1). There are two monitoring sites on San Clemente Creek. The site named “San Clemente” is 30 meters upstream from the gage, a half mile upstream from the property line. The site named “Upper San Clemente” is 50 meters downstream from the intersection of Robinson Canyon Road and San Clemente Creek, 5 meters upstream of the footbridge.

There are two monitoring sites on San Jose Creek. The site named “San Jose” is the downstream site located upstream of a cement weir. The site named “Upper San Jose” is located near Lot 19, near Rancho San Carlos Road.

There are three monitoring sites on Las Garzas Creek. The site named “Lower Garzas” is 50 meters downstream from Moore’s Lake. The site named “Middle Garzas” is upstream of Moore’s Lake, upstream of the culvert. The site named “Upper Garzas” is 50 meters upstream of the intersection of Las Garzas Trail Road and Las Garzas Creek.

There is one monitoring site on Potrero Creek. The site is located in the lower reach of the creek, 50 meters downstream of the gage.

There are two monitoring sites that have not been visited. They are located on Upper Hitchcock Creek and on a tributary of Robinson Canyon Creek.

# 2 Methods

## Photo Monitoring

Photographs of eight monitoring sites were taken in August 2012 with a 5-megapixel iSight digital camera. Distance from PVC pipe, height above ground, bearing, and focal length were recorded for each site (Appendix B). A photo was taken downstream of the PVC pipe looking upstream. Another photo was taken upstream of the PVC pipe looking downstream. Photographs from 8 monitoring sites were compared with previous photos taken 1-13 years in the past. If the PVC pipe was dislodged or broken, it was replaced and located as closely as possible to the original location. All references to "left" or "right" bank are from the perspective of the downstream view, independent of the direction of the photograph.

## Suspended Sediment, Stream Discharge and Instantaneous Load Data

A water sample for sediment analysis was taken biannually at each location from March 2009 to August 2012. The suspended sediment concentration (mg/l) was found by filtering the sample and finding the mass of sediment per liter of water. Stream discharge measurements were conducted using standard hydrologic practices. A SonTek Flow Tracker velocity meter was used measure discharge. For low flows, a 3 inch Parshall Flume was used to measure discharge. Instantaneous load concentration (mg/s) was calculated as the product of the stream discharge and suspended sediment concentraiton.

## Stream Nutrients

Water samples were collected biannually from each site from March 2009 to August 2012, and analyzed for nutrients with a Lachat QuickChem flow-injection analyzer. The nutrients analyzed were ammonium, nitrate+nitrite and soluble reactive phosphate (SRP) (orthophosphate). This report provides a snapshot of stream nutrient concentrations (ppm) for future comparison and monitoring.

# 3 Results

## Photo Monitoring

The following descriptions of geomorphic change in the SLP creeks are drawn from cursory analysis of photographic pairs shot from approximately the same position and direction in 2012 as they were in various previous years. While some of the photo pairs represent decadal-scale changes, these changes do not necessarily indicate long-tem continuous "trends." In all photo pairs, the differences might be trends, seasonal changes, or the results of a single geomorphically-important flood event that occurred sometime during the time span.

When comparisons to 2011 conditions are made below, it is in reference to photos in Paddock et al. (2011). In every case, photos from August 2011 show a wetter channel than was present in August 2012. Also, in every case, there have been no significant changes in morphology or large wood accumulations since August 2011.

### San Clemente

San Clemente has more cobbles and boulders visible in the channel and floodplain in 2012 than in 1998 in both upstream and downstream views. There are also fewer patches of smaller gravel and fines. The physical rearrangement of boulders in the photos indicates that large particles have been transported into place as well as being exhumed by the removal of finer sediment deposits. In 1998 there was a woody debris accumulation across the channel that is much smaller in 2012. In the upstream view, the bar on the left bank, at the base of the downed Redwood tree, has stabilized and grown over with grassy vegetation (Figures 2-5).

### Upper San Clemente

The site was established in 2011. There have been no major changes in the channel from 2011 to 2012. There are large boulders in the stream bed, dense vegetation and coarse woody debris (Figure 6-9).

### San Jose

San Jose has had an increase in vegetation in 2012 compared to 1999 in both upstream and downstream views. The increased vegetation has stabilized the channel banks and visible bar. There is large woody debris moving through the system, as old debris visible in 1998 is replaced with new debris in 2012. Local changes include fine particle deposition where there was woody debris in 1999, visible on the left bank in the downstream and upstream photos and fewer cobbles (Figures 10-13).

### Upper San Jose

It is difficult to analyze potential change at Upper San Jose because of the dark nature of the photographs from 2000. There is a new cobble bar near the photo monitoring post visible in 2012. There has been an increase in vegetation from 2000 to 2012. There has also been an accumulation of woody debris on the upstream side of the new cobble bar (Figures 14-17).

### Lower Garzas

Lower Garzas has an increase in riparian forest growth and channel bank vegetation in 2012 compared to 1999. There is an accumulation of woody debris, not shown in the photographs, that has created a pool where there was a riffle in 1999 (Figures 18-21).

### Middle Garzas

The comparison of the photographs of Middle Garzas is difficult because of the dense vegetation that has accumulated along the channel banks. A steep channel bank is visible on the left bank in the upstream photo from 2012, which suggests potential degradation of the stream channel (Figures 22-25).

### Upper Garzas

The oldest photograph available for Upper Garzas is from 2009. There have been no visible changes apparent from photo monitoring in 2009 and 2012 (Figures 26-29).

### Potrero

The Potrero channel has shifted from the right bank to the left bank between 2003 and 2012. The channel change is visible in the downstream photo and the exposed sand bar. There are no other notable visible changes. Vegetation and particle size appear to remain constant (Figures 30-33).

## Suspended Sediment, Stream Discharge and Instantaneous Load

Seven sampling events over three years suggest that streams on the SLP carry very little suspended sediment (Table 1), indicating good aquatic habitat for Steelhead, macroinvertebrates, and other aquatic organisms.

### Stream Nutrient Data

Stream nutrient concentrations (ppm) were very low in all of the samples from the seven sampling events (Table 2).

# 4 Discussion

Photo monitoring results indicate that there have been no deleterious changes in stream morphology for many years in the four streams in this study. Water quality monitoring parameters indicate that there are no impacts at this time, in keeping with previous monitoring results.

# 5 Photo Monitoring Images and Water Quality Data Tables

Figure 2: Downstream view of San Clemente Creek in March 1998

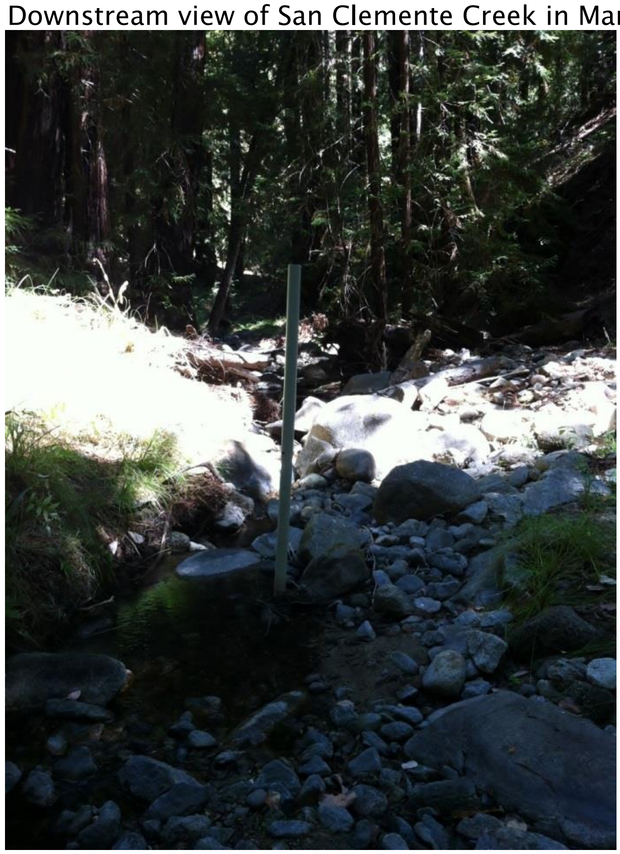

Figure 3: Downstream view of San Clemente Creek in August 2012

Figure 4: Upstream view of San Clemente Creek in March 1998

Figure 5: Upstream view of San Clemente Creek in August 2012

Figure 6: Upstream view of Upper San Clemente August 2011

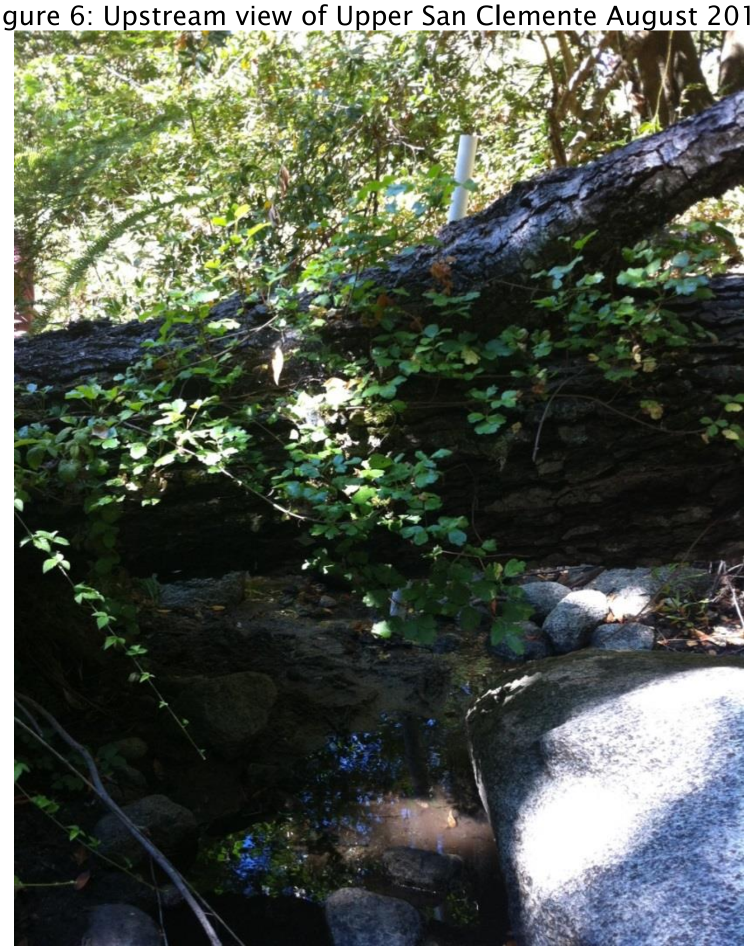

Figure 7: Upstream view of Upper San Clemente August 2012

Figure 8: Downstream view of Upper San Clemente August 2011

Figure 9: Downstream view of Upper San Clemente August 2012

Figure 10: Downstream view of San Jose Creek in August 1999

Figure 11: Downstream view of San Jose Creek in August 2012

Figure 12: Upstream view of San Jose Creek in August 1999

Figure 13: Upstream view of San Jose Creek in August 2012

Figure 14: Downstream view of Upper San Jose Creek in September 2000

Figure 15: Downstream view of Upper San Jose Creek in August 2012


Figure 16: Upstream view of upper San Jose Creek in September 2000

Figure 17: Upstream view of upper San Jose Creek in August 2012

Figure 18: Downstream view of Lower Las Garzas Creek in October 1999

Figure 19: Downstream view of Lower Las Garzas Creek in August 2012

Figure 20: Upstream view of Lower Las Garzas Creek in October 1999

Figure 21: Upstream view of Lower Las Garzas Creek in August 2012


Figure 22: Downstream view of Middle Las Garzas Creek in November 2000

Figure 23: Downstream view of Middle Las Garzas Creek in August 2012

Figure 24: Upstream view of Middle Las Garzas Creek in August 2000 (estimate of date)

Figure 25: Upstream view of Middle Las Garzas Creek in August 2012

Figure 26: Downstream view of Upper Las Garzas Creek in August 2009

Figure 27: Downstream view of Upper Las Garzas Creek in August 2012

Figure 28: Upstream view of Upper Las Garzas Creek in August 2009

Figure 29: Upstream view of Upper Las Garzas Creek in August 2012


Figure 30: Downstream view of Potrero Creek in July 2003

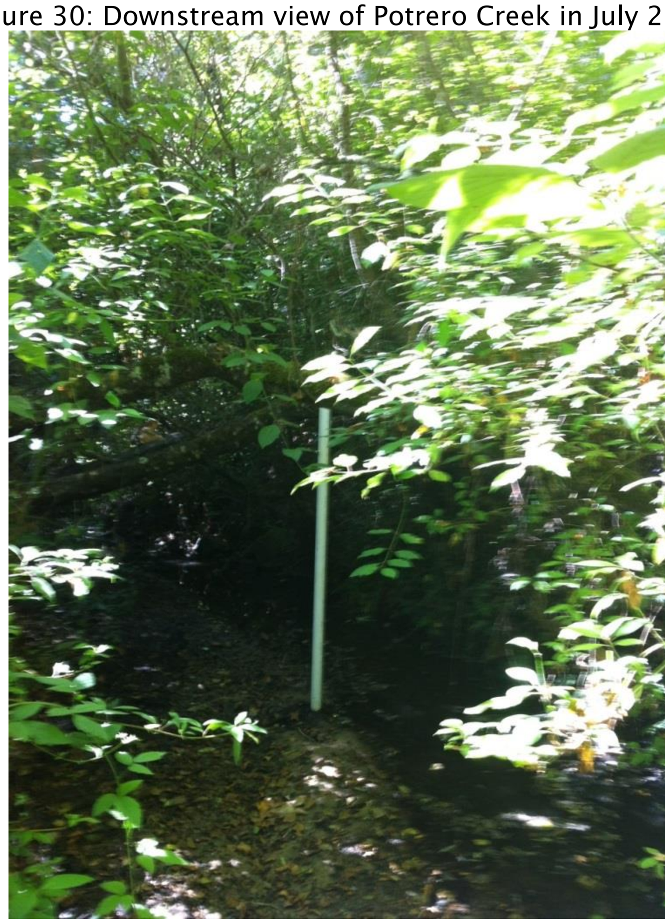

Figure 31: Downstream view of Potrero Creek in August 2012

**Table 1: Suspended sediment concentration (mg/l), water discharge (l/s) and instantaneous load concentration (mg/s) from 8 monitoring sites on 4 creeks of the SLP.**

| Location | Suspended Sediment Concentration (mg/l) | Q (l/s) | Instantaneous Load Concentration (mg/s) |
|---|---|---|---|
| **August 2009** | | | |
| Upper Garzas | NA | dry | NA |
| Mid Garzas | NA | dry | NA |
| Lower Garzas | 0.023 | pool | NA |
| Potrero | 0.208 | 0.8 | 0.16 |
| Upper San Clemente | 0 | 0.1 | 0 |
| San Clemente | 0.027 | 0.7 | 0.018 |
| Upper San Jose | 0 | trace | 0 |
| San Jose | 0 | 3.1 | 0 |
| **March 2010** | | | |
| Upper Garzas | 0 | 132.8 | 0 |
| Mid Garzas | 0 | 239.6 | 0 |
| Lower Garzas | 0 | 333.4 | 0 |
| Potrero | 0.008 | 43.5 | 0.36 |
| Upper San Clemente | 0 | 75.9 | 0 |
| San Clemente | 0 | 196.2 | 0 |
| Upper San Jose | 0.007 | 60.8 | 0.41 |
| San Jose | 0 | 169.2 | 0 |
| **August 2010** | | | |
| Upper Garzas | 0 | 10.4 | 0 |
| Mid Garzas | 0 | 8.4 | 0 |
| Lower Garzas | 0 | 8.0 | 0 |
| Potrero | 0.016 | 2.2 | 0.034 |
| Upper San Clemente | 0 | 4.3 | 0 |
| San Clemente | 0 | 10.8 | 0 |
| Upper San Jose | 0 | 7.7 | 0 |
| San Jose | 0 | 23.7 | 0 |
| **March 2011** | | | |
| Upper Garzas | 0.023 | 639.9 | 14.785 |
| Mid Garzas | 0 | 185.5 | 0 |
| Lower Garzas | 0 | 197.7 | 0 |
| Potrero | 0.083 | 352.8 | 29.351 |
| Upper San Clemente | 0.007 | 31.4 | 0.208 |
| San Clemente | 0 | 102.8 | 0 |
| Upper San Jose | 0.041 | 274.3 | 11.249 |
| San Jose | 0.045 | 828.4 | 37.071 |
| **August 2011** | | | |
| Upper Garzas | 0 | 14.5 | 0 |
| Mid Garzas | 0 | 11.3 | 0 |
| Lower Garzas | 0.008 | 29.0 | 0.232 |
| Potrero | 0.119 | 3.3 | 0.391 |
| Upper San Clemente | 0 | 7.7 | 0 |
| San Clemente | 0 | 10.5 | 0 |
| Upper San Jose | 0 | 3.7 | 0 |
| San Jose | 0.008 | 19.0 | 0.143 |
| **March 2012** | | | |
| Upper Garzas | 0 | 80.9 | 0.202 |
| Mid Garzas | 0 | 108.2 | 0.850 |
| Lower Garzas | 0 | 139.9 | 1.534 |
| Potrero | 0.010 | 9.9 | 0.103 |
| Upper San Clemente | 0.001 | 11.6 | 0 |
| San Clemente | 0 | 57.0 | 0 |
| Upper San Jose | 0 | 29.7 | 0.149 |
| San Jose | 0.010 | 104.1 | 1.054 |
| **August 2012** | | | |
| Upper Garzas | dry | dry | dry |
| Mid Garzas | dry | dry | dry |
| Lower Garzas | 0.016 | 0.0 | 0 |
| Potrero | 0.064 | 1.2 | 0.078 |
| Upper San Clemente | 0.017 | 1.2 | 0.021 |
| San Clemente | 0.040 | 1.1 | 0.044 |
| Upper San Jose | 0.096 | 0.4 | 0.038 |
| San Jose | 0.012 | 7.0 | 0.081 |

Note: 0 indicates sediment measurement below minimum detection limit

**Table 2: Water samples from the monitoring sites were tested for ammonium (ppm), soluble reactive phosphorus (SRP) (orthophosphate) (ppm), and nitrogen as nitrate and nitrite (ppm).**

| Location | Ammonium (ppm) | SRP (ppm) | Nitrate + Nitrite (ppm) |
|---|---|---|---|
| **August 2009** | | | |
| Upper Garzas | dry | dry | dry |
| Mid Garzas | dry | dry | dry |
| Lower Garzas | 0.452 | 0.020 | 0.020 |
| Potrero | 0.030 | 0.089 | 0.039 |
| Upper San Clemente | 0.022 | 0.032 | 0.035 |
| San Clemente | 0.032 | 0.027 | 0.076 |
| Upper San Jose | no data | no data | no data |
| San Jose | 0.022 | 0.045 | 0.020 |
| **March 2010** | | | |
| Upper Garzas | 0.014 | 0.018 | 0.013 |
| Mid Garzas | 0.016 | 0.021 | 0.154 |
| Lower Garzas | 0.025 | 0.016 | 0.015 |
| Potrero | 0.028 | 0.110 | 0.068 |
| Upper San Clemente | 0.017 | 0.026 | 0.010 |
| San Clemente | 0.016 | 0.028 | 0.017 |
| Upper San Jose | 0.021 | 0.078 | 0.018 |
| San Jose | 0.021 | 0.062 | 0.054 |
| **August 2010** | | | |
| Upper Garzas | 0.012 | 0.028 | 0.014 |
| Mid Garzas | 0.012 | 0.035 | 0.014 |
| Lower Garzas | 0.041 | 0.046 | 0.024 |
| Potrero | 0.021 | 0.180 | 0.046 |
| Upper San Clemente | 0.018 | 0.052 | 0.007 |
| San Clemente | 0.010 | 0.054 | 0.032 |
| Upper San Jose | 0.041 | 0.120 | 0.071 |
| San Jose | 0.037 | 0.093 | 0.060 |
| **March 2011** | | | |
| Upper Garzas | 0.016 | 0.000 | 0.052 |
| Mid Garzas | 0.020 | 0.000 | 0.096 |
| Lower Garzas | 0.021 | 0.000 | 0.035 |
| Potrero | lab error | labe error | 0.123 |
| Upper San Clemente | 0.033 | 0.004 | 0.033 |
| San Clemente | 0.034 | 0.007 | 0.041 |
| Upper San Jose | 0.031 | 0.043 | 0.074 |
| San Jose | 0.029 | 0.048 | 0.077 |
| **August 2011** | | | |
| Upper Garzas | 0.019 | 0.012 | 0.009 |
| Mid Garzas | 0.025 | 0.048 | 0.103 |
| Lower Garzas | 0.030 | 0.037 | 0.025 |
| Potrero | 0.017 | 0.129 | 0.022 |
| Upper San Clemente | 0.016 | 0.027 | 0.012 |
| San Clemente | 0.014 | 0.030 | 0.067 |
| Upper San Jose | 0.011 | 0.100 | 0.009 |
| San Jose | 0.014 | 0.092 | 0.011 |
| **March 2012** | | | |
| Upper Garzas | 0.016 | 0.000 | 0.096 |
| Mid Garzas | 0.029 | 0.000 | 0.052 |
| Lower Garzas | 0.021 | 0.000 | 0.035 |
| Potrero | lab error | lab error | 0.123 |
| Upper San Clemente | 0.033 | 0.004 | 0.033 |
| San Clemente | 0.034 | 0.007 | 0.041 |
| Upper San Jose | 0.031 | 0.043 | 0.074 |
| San Jose | 0.029 | 0.048 | 0.077 |
| **August 2012** | | | |
| Upper Garzas | dry | dry | dry |
| Mid Garzas | dry | dry | dry |
| Lower Garzas | 0.031 | 0.023 | 0.050 |
| Potrero | 0.022 | 0.215 | 0.054 |
| Upper San Clemente | 0.029 | 0.030 | 0.047 |
| San Clemente | 0.020 | 0.023 | 0.121 |
| Upper San Jose | 0.016 | 0.071 | 0.028 |
| San Jose | 0.014 | 0.057 | 0.033 |

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# 7 Appendix A

Monitoring Site Locations

Site #1: Potrero Creek
Location: 36.51898°N, -121.86406°W
Directions: This site is located 50 meters downstream of the Potrero streamflow datalogger, approximately a quarter mile upstream of the preserve main gate. Immediately following the main gate, turn left onto Potrero Canyon Road. There will be a small gravel parking pad on the right side. Park here and walk 100 meters south to the site.

Site #2: San Jose Creek
Location: 36.48709°N, -121.86329°W
Directions: From the main gate, follow Rancho San Carlos Road SE. Just past the Canterra Trail intersection, the road descends steeply into San Jose Creek Canyon. Near the bottom of the hill, there is a dirt road to the right. Park on the pavement at the beginning of the dirt road. Walk 300 meters down the road to the creek. The monitoring sit is 50 meters downstream, just upstream of the cement weir.

Site#3: Upper San Jose Creek
Location: 36.47178°N, -121.84326°W
Directions: From site #2, continue heading southeast on Rancho San Carlos Road. The site is located about 2 miles up the canyon near Lot 19, just before the road splits around a group of trees. Park on the side of the road before the bridge of the Lot 19 driveway. Follow the hiking trail to the north side of the driveway, on the east side of the creek, for 50 m to the monitoring site.

Site #6: San Clemente
Location: 30 m upstream from the datalogger that is located at 36.42527°N, 121.74842°WDriving
Directions: From Robinson Canyon Road, drive east on San Clemente Road. At the Dormody Road intersection, take the left turn to continue heading down San Clemente Creek Canyon. The site is located a couple of miles down the road from the Dormody Road, and about a half a mile upstream from the San Clemente Ranch gate. Here you will find a small area off to the side of the road that is suitable for parking. (PVC marker)

Site #11: Lower Garzas Creek
Location: 36.45938°N, -121.79708°W, 100 m downstream from Moore's Lake Outflow datalogger.
Driving Directions: On Robinson Canyon Road, park alongside the road 50m south of the bridge where Moore's lake feeds into Garzas Creek. Climb over the fence and follow the abandoned gravel road to the left for about 150m to the site. (staff plate on tree upstream of crossing)

Site #9: Moore's Lake Inflow (Middle Garzas Creek)
Location: 36.45665°N, -121.80166°W
Driving Directions: From Rancho San Carlos Road heading SE, turn left onto Pronghorn Run at the equestrian center. Then turn left onto Lake Walk Trail. The stables will be on your left and the corrals on your right. The trail curves left into a willow filled wetland where it crosses Garzas Creek. There is parking 25 meters past the culvert. (PVC marker)

Site #4: Upper Garzas Creek
Location: 36.44793°N, -121.81918°W

Driving Directions: Heading SE on Rancho San Carlos Road, turn right onto Garzas Trail just past Chamisal Pass Road. Drive up Garzas Trail to the cul-de-sac loop at the end of the road. Turn left onto a driveway that heads to 9 and 10 Las Garzas Trail immediately before the loop. In ¼ mile there is a bridge that crosses Garzas Creek. The site is about 50 m upstream from the bridge. (PVC marker)

Site #10: Upper San Clemente Creek, 36.428938°N, -121.788800°W
Directions: From the southern terminus of Rancho San Carlos Road, exit the gate and head south on Robinson Canyon Road. After about 1 mile, the road makes a sharp right, crosses a small intermittent creek and then heads back sharply to the left. After this zig zag in Robinson Canyon Road, there will be a gated driveway on the east side of the road to access lots 99 and 100. Park here, go through the gate, head down the driveway about 50 yards, then head to the left to the small stream. The sampling site is directly upstream from the footbridge. Gate combo is 9910.

Site #12: Old Lower Potrero Creek
No longer being monitored according to Bruce Cyr's report

Site #7: Upper Hitchcock Creek, 36.450195°N, -121.758980°W (Has not been recently monitored)

Directions: On Black Mountain Trail, about a half-mile up the hill from the intersection with Touche Trail, the road makes a very broad curve to the left. In the middle of this curve, the road passes a saddle between the Las Garzas Creek watershed and the Hitchcock Creek watershed. From this saddle, walk (or drive if you have 4WD) down the Portugese Spring Trail down the hill to the east. About a mile down the hill, the trail cuts back sharply to the left and ends at the Portugese spring cement trough. About 200 feet south of the spring, from the trail, head down the hill toward the east, hiking down through open grassland. As you head down the hill to the east, you will enter a strip of dense patch dark green rush that cuts west through the oaks. Follow this patch of rush down the hill until the rushes end at the edge of the oaks, and turn to the left (north) into the woods to find the monitoring site.

Site #8: tributary of Robinson Creek, 36.497824°N, -121.813132°W (has not been recently monitored)

Directions: This site is located in the small creek at the bottom of (east of) the homeland of lot 224. From the end of the paved driveway at the entrance to the homeland of lot 224, walk down the hill to the east through the open grassland area. Where the grassland grades into oak woodland, continue heading down the hill to the east into the scattered coast live oaks. The monitoring site is in the small creek in the bottom of the ravine just inside the oak woodland. This creek is NOT on the main branch of Robinson Creek, but rather a small tributary.

# 8 Appendix B

Photo Monitoring Site Parameters

| Creek | View | Distance from post (m) | Height above ground (m) | Magnetic bearing from post(°) | Notes |
|---|---|---|---|---|---|
| Potrero | Upstream | 5.4 | 1.2 | 188 | |
| | Downstream | 6.6 | 1.15 | 344 | |
| Mid Las Garzas | Upstream | 5.2 | 0.9 | 10 | |
| | Downstream | 3.9 | 1.25 | 200 | Near left bank just after left bend |
| Lower Las Garzas | Upstream | 9.8 | 1.25 | 88 | |
| | Downstream | 11.8 | 1.1 | 125 | 4.6m upstream of staff plate, on right bank |
| Upper Las Garzas | Upstream | 2.65 | 1.25 | 110 | |
| | Downstream | 4.05 | 1.06 | 245 | |
| Upper San Clemente | Upstream | NA | NA | NA | Taken from railing of bridge |
| | Downstream | 6.6 | 0.9 | 220 | |
| San Clemente | Upstream | 3.55 | 1 | 300 | Above large boulder in channel |
| | Downstream | 7.0 | 1.2 | 110 | On left bank |
| Upper San Jose | Upstream | 6.0 | 1.25 | 350 | |
| | Downstream | 5.7 | 1.3 | 110 | |
| San Jose | Upstream | 8.4 | 1.2 | 334 | |
| | Downstream | 5.9 | 1.2 | 120 | |

* Constant focal length of 6mm was used for each photograph