



ACTERRA  
STEWARDSHIP

*Citizen Science for the  
Stevens and Permanente Creek  
Watersheds 2013*



Funded by

ASSOCIATION OF BAY AREA GOVERNMENTS

SAN FRANCISCO ESTUARY PARTNERSHIP

SMALL AND MICRO GRANTS PROGRAM



ACTION FOR A  
HEALTHY PLANET



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***Our mission is to bring people together to create  
local solutions for a healthy planet.***

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## Citizen Science for the Stevens and Permanente Creeks Watershed 2013

Acterra is most grateful for the receipt of funds from the Small and Micro Grants Program which allowed us to carry out our ongoing Citizen Science activities for the period of May—August 2013. In addition to collecting needed water chemistry and aquatic habitat data, our volunteers gained important knowledge about how watersheds work and a sense of empowerment to contribute to healthy creeks, both through our programs and their personal activities.



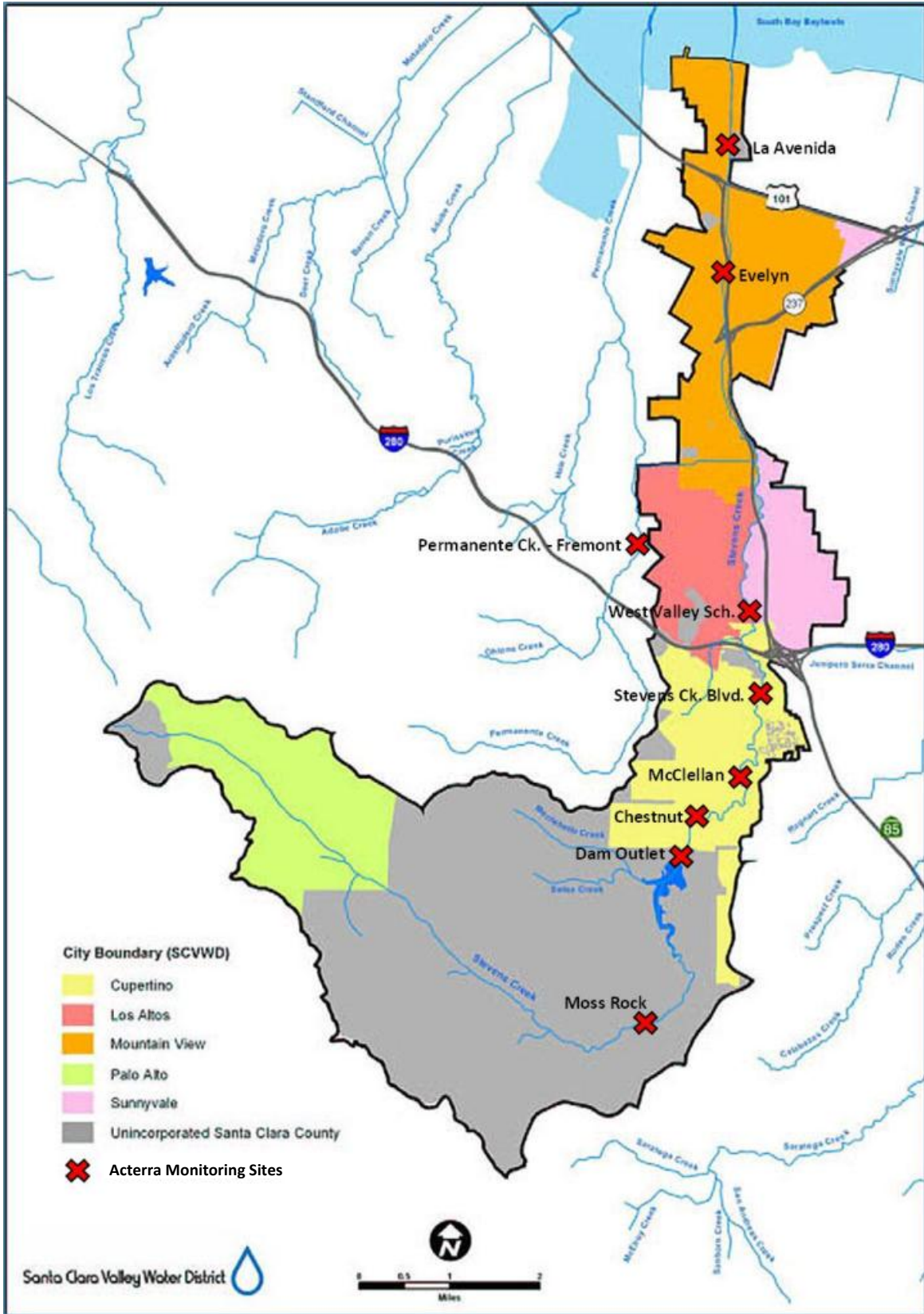
Acterra has met or exceeded all commitments contracted under this grant:

	Contractual Commitment	Actual Delivered
Monthly water quality monitoring events at nine sites on Stevens/Permanente Creeks	4	4
Sessions of "Bug Club" to sort and identify benthic macroinvertebrates	6	8
Field trips and/or nature walks	2	3
Adults and youth engaged in citizen science programs	100	197
Data management, including preparation for CEDEN	Yes	Yes

### Monthly Water Quality Monitoring



From May through August, Acterra led volunteers in visiting nine sites (see Figure 1) on Stevens and Permanente Creeks to collect data on water chemistry - temperature, specific conductance, dissolved oxygen, pH and turbidity. Field protocol was based on that of the Surface Water Ambient Monitoring Program (SWAMP). Three of the sites coincide with previous SWAMP sites to provide a continuity of data over time. The other six sites were chosen on the basis of their accessibility and their potential to reflect water quality



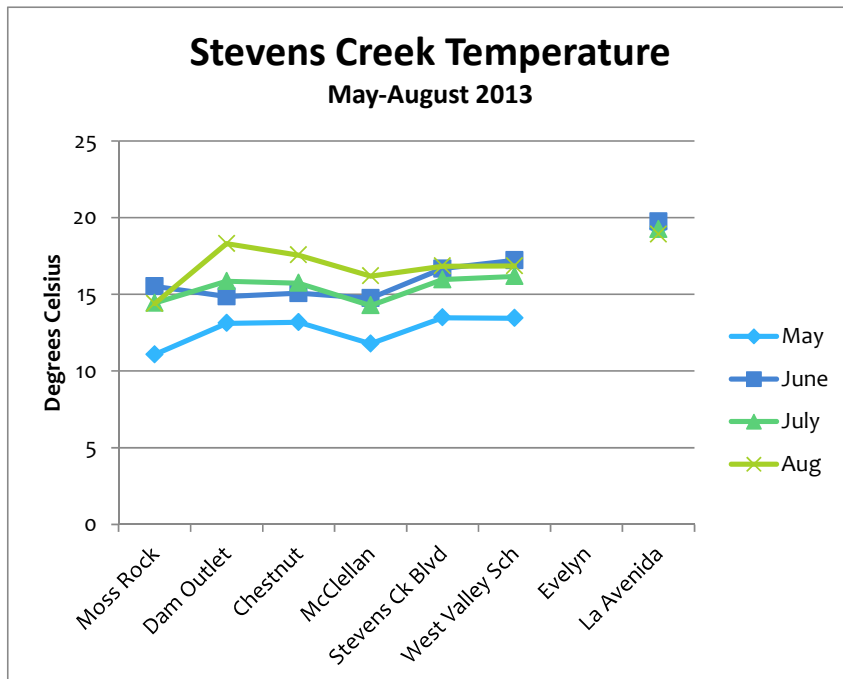
**FIGURE 1: 2013 ACTERRA WATER QUALITY MONITORING SITES**

changes due to urban runoff. Community members from young families to senior citizens participated in the monitoring. Along the way, our volunteers discovered that the creek is a beautiful place to be, often taking the opportunity to turn over a few rocks to look at creek bugs, do a little bird-watching, and appreciate the wildflowers.

Stevens Creek has a dam, which as can be seen in Figures 2 -6, has a noticeable impact on the water chemistry parameters measured. The first four miles below the dam have been designated as prime steelhead spawning and rearing habitat. Sites noted in the graphs are in order, left to right, from the upper watershed to the lower watershed. Moss Rock is in the canyon some miles above the dam. La Avenida is by the bay and has a tidal influence. When looking at the data, it should be kept in mind that we had two dry years in the row and at the beginning of the current warm season the reservoir was already pretty low. Both the Evelyn site and our one site on Permanente Creek were dry during the whole of the grant period. One should also keep in mind that it takes us about four hours, 9:00 am to 1:00 pm, to collect data from the various sites. We go to McClellan first, then up to Moss Rock and work our way down.



Usually during the warm season, the water coming out of the dam outlet is cooler than the creek water above the reservoir since it retains coolness from the winter. We see in Figure 2 that that was true for May and June, but beginning in July, and increasing in August, the water coming out of the reservoir was warmer than above. We do not usually see that temperature spike until September, but with the reservoir level so low, it warmed quickly this year. Water temperature does drop a bit with the influx



of spring water as the creek travels into the valley. However, as the summer wears on, the temperature spike will worsen and steelhead trout, which are thought not to fare well in temperatures above 19 °C, may suffer.

Specific conductance, see Figure 3, dropped at the dam outlet, an expected occurrence as the reservoir mostly contains storm water runoff and the creek above is only fed by springs at this time of year. Specific conductance rose as the creek flowed

**FIGURE 2—TEMPERATURES AT STEVENS CREEK SITES.**

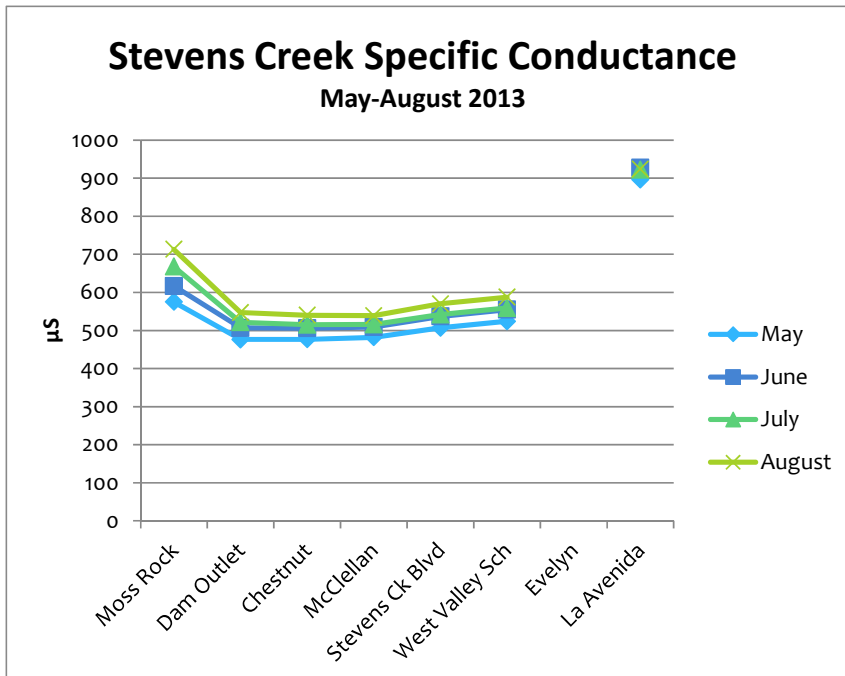


FIGURE 3—SPECIFIC CONDUCTANCE AT STEVENS CREEK SITES.

through the valley as it almost always does due to residential use of fertilizers and other pollutants entering the creek. Our lowermost site at La Avenida always has high specific conductance, presumably due to tidal influence.

Dissolved oxygen levels, see Figure 4, drop precipitously at the dam outlet. The water is still deep enough in the reservoir that photosynthesis, and hence oxygen production, is not taking place to any marked degree near the bottom. And it is the bottom of reservoir from which the

dam outlet draws. Our noses told us that significant amounts of hydrogen sulfide were present, indicating that decomposition processes were taking place in the absence of oxygen. Usually we see that dissolved oxygen levels have come up to a healthy level by the time the creek reaches our next site at Chestnut. In August, however, dissolved oxygen levels were below 8 mg/L, the amount some biologists recommend as a lower limit for sensitive species such as steelhead trout. While dissolved oxygen levels at La Avenida were still in the healthy range in July and August, we have not seen them that low during the summer months and have reported the anomaly to the City of Mountain View.

The pH of the creek, see figure 5, drops at the dam outlet. This is expected since rainwater tends to be close to neutral and the reservoir contains mostly storm runoff. The pH rises as the creek flows through the valley presumably due to pollutants entering the creek. The

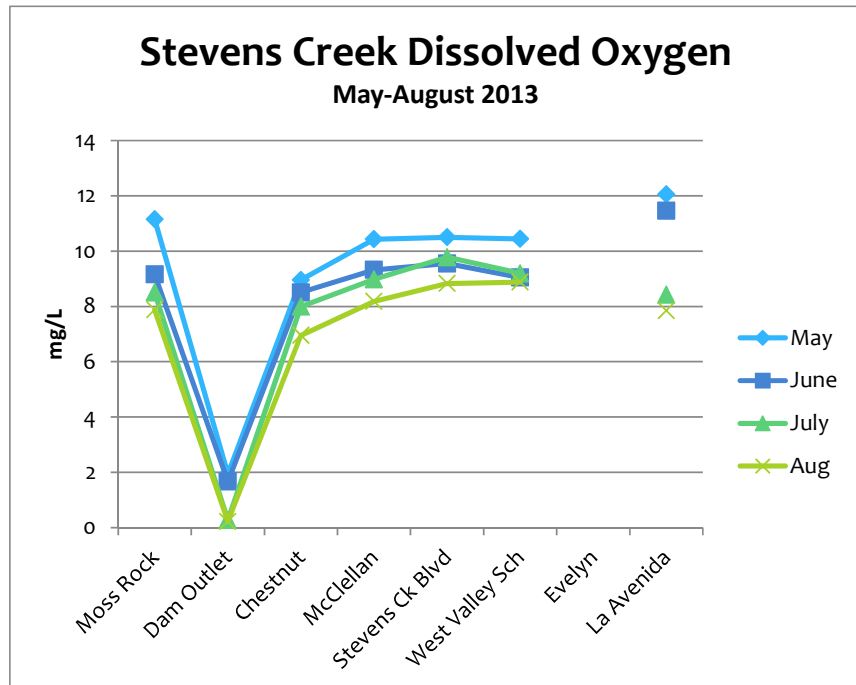


FIGURE 4—DISSOLVED OXYGEN AT STEVENS CREEK SITES.

anomaly at McClellan is typically seen and we do not have an explanation.

As can be seen in Figure 6, turbidity is a serious issue in Stevens Creek. In a creek without a dam, one would ordinarily expect to see high turbidity either during or in the days immediately following a storm event when much fine sediment had washed into the creek. With a dam, however, the silt-filled water that flows from the surrounding hills is captured in the reservoir. The fine sediment settles to the bottom and it is from this bottom layer that

the dam outlet draws. High turbidity in the creek below the dam is always a problem which in most years peaks in September or October when the reservoir is low and the change in ambient temperatures conspire to make the water quite muddy. This year turbidity spiked early in the summer, dropped

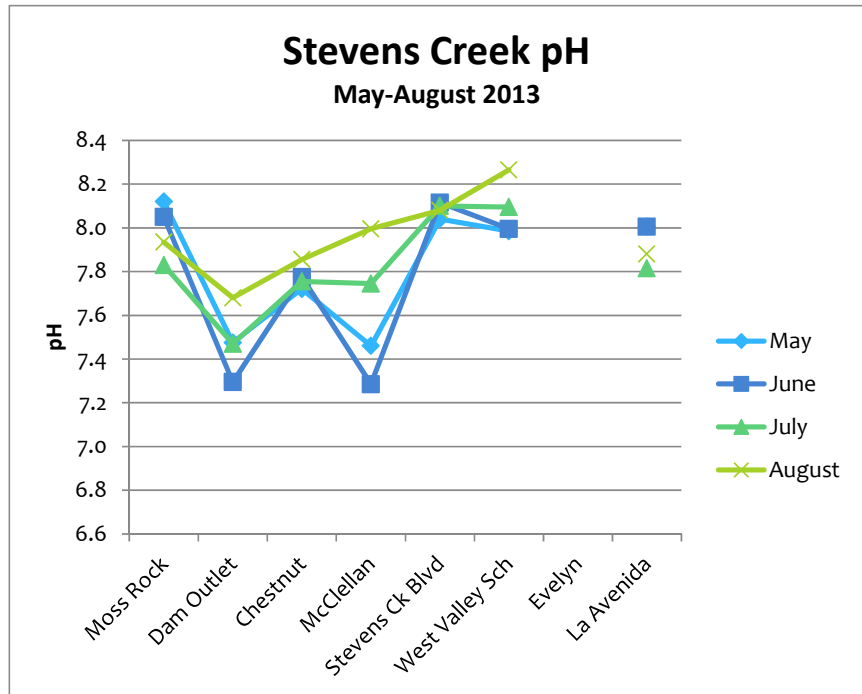


FIGURE 5—PH AT STEVENS CREEK SITES.

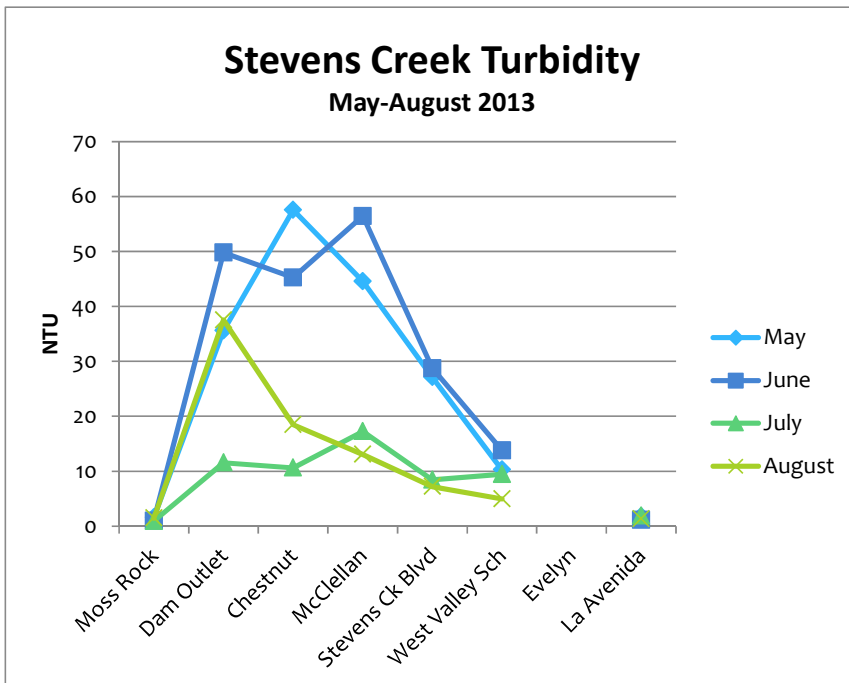


FIGURE 6—TURBIDITY AT STEVENS CREEK SITES.

in July and then began to rise again in August. The Santa Clara Valley Water District said the early turbidity problems were due to the low water levels in the reservoir. This does not explain why turbidity fell and then rose again in July and August, but water movements in the reservoir can be complex.

During June and July there was an anomalous spike in turbidity at the McClellan site. This happened last summer as well. We notified the City of Cupertino who obligingly sent out a team to investigate the

situation with us late in July. Starting at our Chestnut site in Stevens Creek County Park we tested the creek as it flowed through the park and found turbidity to be rising within the park. No particular source was visible. Two parcels of private property, one of which is a golf course, lie between the park and our next testing site at McClellan. We did no testing on the private property. When we tested at McClellan that day, though, we found that turbidity there was lower than at the Chestnut site. Our regular monthly monitoring in August indicated no special problems in the area at that time. We have no idea what is causing intermittent localized turbidity, but will continue to investigate.



As to the overall effect of increased turbidity this summer in the creek below the dam, we have only the somewhat anecdotal evidence of the streamside assessment we have conducted with students on fieldtrips this summer. The benthic macroinvertebrates, or “bugs”, look bad, very bad. We thought last year was bad, but this is worse. We are seeing low numbers, low diversity, and no sensitive species. As an aside, it is interesting to note that when biologists from the Santa Clara Valley Water District attempted to conduct a survey of Steelhead redds in Stevens Creek this spring, they were thwarted by not being able to see the bottom of the creek in many places due to the high turbidity.



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## Bug Clubs

While regular monitoring of water chemistry provides important information on water quality, it provides only a snapshot picture with which to evaluate water quality. Biomonitoring of the organisms that can live at a site, such as benthic macroinvertebrates which have differing tolerances to pollution and other stressors, gives a more complete picture. The relative abundance or scarcity of certain benthic macroinvertebrates at the time of collection can tell us much about what water and aquatic habitat quality has been at that site for weeks or even months prior to collection.



Acterra volunteers have been meeting twice monthly at the “Bug Club” to sort and identify the bugs, from the sampling conducted in fall of 2012. Steve Fend, U.S. Geological Survey stream ecologist and entomologist, is usually on hand

to assist volunteers in identifying our bugs down to the family level using dichotomous keys, pictures, and written descriptions. Although some of the volunteers have a background in biology, many do not.





Before long, however, all of the volunteers become adept at scrutinizing such esoteric things as anal claws and abdominal humps as aids to identification.

We have not yet finished processing all of our bugs and data from last falls' sampling, but expect to do so by the end of September. While we have no hard bug numbers to share yet, the sites below the dam appear to show an even less hospitable habitat than in previous years. Overall diversity appears to have declined and some sensitive bugs

which had been on the increase in recent years have decreased in number or are absent altogether. While the 2011-12 rainfall season was a bit disappointing, there may be other factors at work.

## Field Trips

Acterra takes a hands-on approach to environmental education when leading groups of students from local colleges and schools into the field. First, the students participate in a non-point source pollution exercise which results in a satisfyingly big mess and demonstrates how their individual actions collectively contribute to significant water pollution. Students then conduct water quality monitoring and a streamside habitat assessment using benthic macroinvertebrates. When there is time, students do this at two sites, one above the dam and one below, so they can make a comparison.



## Data Management, including CEDEN



Ecological studies, volunteer or otherwise, entail the management of prodigious amounts of data. Acterra now manages data from its citizen water quality monitoring program both so that it will be useful to local cities and agencies, and so that it can be uploaded to the state's CEDEN database. We have recently learned that data from our benthic macroinvertebrate study will not likewise be admitted to the CEDEN in the foreseeable future. This study, begun in 2006 in partnership with the US Geological Survey, follows field protocols which are no longer considered standard in the state. We have seven years of solid data from this study which provide a unique and valuable picture of the health of Stevens Creek over time. We will continue to follow the original protocols in future years to maximize the benefits this study provides to the understanding of Stevens Creek.

Scientists from the State Water Resources Control Board have in recent months asked us for our data so that it can inform the design of state studies of our local creeks.