

## Environmental Education for Public Outreach

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The Sacramento-San Joaquin Delta and Suisun Marsh (Delta) is a vital natural resource as the largest estuary on the Pacific Coast, and an important supply of water for California. Given the local and statewide significance of the Delta, it is important that members of the public are aware of issues such as climate change which are impacting this natural resource. Over the last three years, the Sacramento-San Joaquin Delta Conservancy, in coordination with the Water Education Foundation, have coordinated multiple environmental education events for public outreach in the Delta. These events have covered a wide range of topics, from a symposium on the science behind climate change impacts to the Delta, to an event where agencies and the public came together in a forum on flow. Complex Delta issues, such as water conservation, take place at the individual as well as at the policy level. Therefore providing information and engagement on an individual level to the public is key for addressing the critical natural resource management issues of our time.

**Keywords:** environmental education, outreach

**Poster Topic:** Community Outreach

## Living Arroyos Program: Forging New Community Partnerships

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Living Arroyos was initiated in July 2013 as a partnership of the City of Livermore, Urban Creeks Council, and Zone 7 Water Agency. The “Living Arroyos Program” increases opportunities for local residents to engage in hands-on stewardship and establish relationships to the streams in their community as ‘apprentices’ or volunteers. Local college students are engaged as ‘apprentices’ who learn real-world stream management techniques that complement their in-class learning. Apprentices are given real time, hands-on responsibility for implementing environmental improvement projects for agency partners.

In the first two years of the program, apprentices and volunteers contributed 3,338 hours planting acorns (6,894 acorns in 2,298 planting sites), installing riparian trees (3,389 native trees), seeding native grassed (150 lbs), and removing invasive weeds (470 cubic feet), and other trash and debris (25 cubic feet). The number of unique volunteers increased from 388 in the first year to 533 in year 2 and the response to the program has been phenomenal. A survey of Living Arroyos volunteers revealed that 88% of volunteers felt more knowledgeable about streams and streamside habitats, and 91% expressed interest in preserving urban streams. 98% of survey respondents said they would volunteer with Living Arroyos again.

In the first two years, this program has demonstrated that communities and local agencies can collaborate on stream projects that meet maintenance and permitting objectives. Further, the overwhelming community response implies that there is a thirst for opportunities to connect with nature, and a dedication to being part of and bringing about positive change in their environment. In this way, Living Arroyos has made significant strides toward achieving its goal of enhancing urban streams in the Livermore Valley and educating the public by re-establishing the connection between people and the arroyos in their own backyards.

**Keywords:** volunteer, partnership, community, habitat enhancement, stream maintenance

**Poster Topic:** Community Outreach

## **Citizen Science at the Don Edwards San Francisco Bay National Wildlife Refuge**

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The Don Edwards San Francisco Bay National Wildlife Refuge, the SF Bay Wildlife Society, and the SF Bay Bird Observatory were interested in engaging the public through volunteer monitoring of plant and bird species. To do this the Refuge joined the national phenology network and Cornell's eBird database. The eBird.org and Natures Notebook websites offer a place for citizen scientists to catalogue their data which can then be used by scientists worldwide.

The DESFBNWR is a hotspot for spotting shorebirds, including many seasonal migrants. In order to encourage visitors to contribute to eBird, interpretive signs about the eBird project were installed at several entrances to popular birding trails. The sign points were stocked with flyers for birders to record their bird sightings and provided instructions on how to create an account. Five sighting points were established along a pathway for birders to compare which species they observed at different locations. This will give the Refuge a better idea if the plant restoration efforts are creating the appropriate habitat for native bird species.

This sparked an interest in monitoring several plant species in the same restoration area as the eBird trail. Since two individuals of each species were chosen to monitor staff has learned that many of the plants seemed to be having a tough time with the drought. One of the live oaks had a moderate show of acorns, but another, located slightly uphill from the first, did not show any fruit at all this year. Likewise, the California wildrose had trouble getting fruits reach full ripeness. The project has proven to be a fun way for volunteers to engage with the refuge's ecosystem and the staff look forward to learning more about the natural ebb and flow of the plants as they continue to monitor through the seasons.

**Keywords:** Citizen Science, Phenology, eBird, Monitoring, Volunteers,

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## Learning by Doing Science: Oakland High School Students Help in Salt Marsh Restoration Research at Lake Merritt

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Over 95% of tidal wetlands in San Francisco, including salt marsh, have been lost since the Gold Rush. A tidal lagoon extending from the Bay, Lake Merritt has suffered from heavy urbanization of its watershed causing pollution, sedimentation and poor water quality. Flood control measures replaced natural shorelines with concrete seawalls and landscaped banks. Measure DD, passed in 2002, aimed to return Lake Merritt to a more natural condition to improve water quality, and create a more natural habitat for wildlife and people to enjoy.

A demonstration salt marsh was constructed on the Lake Merritt Channel downstream from Lake Merritt Boulevard and upstream from 10th Street. Retired Measure DD Project Manager Joel Peter and Kristin Hopper of the Oaktown Native Plant Nursery invited Oakland High's Environmental Science Academy students to learn by doing real restoration work and citizen science at the site. Besides planting and weeding, students collected monitoring data from project experiments investigating the important question: What factors determine the survival of species added to the restoration site?

Pickleweed (*Salicornia pacifica*), marsh jaumea (*Jaumea carnosa*) and marsh rosemary (*Limonium californicum*) were planted at three different elevations (tidal zones) on the shore protected in wire exclosures from geese and other herbivores. Some pickleweeds had rocks at the base, while others did not. The survival of the plants was monitored by the students from December 2014 (planting) to April 26, 2015. Their observations suggest that 1) protection from herbivores is essential, 2) pickleweed survives best in the low intertidal zone and near rocks 3) jaumea survives slightly better in the upland than in midzone, and 4) marsh rosemary survives better in the upland, although other factors of location may be important. The results are preliminary, but they suggest that an experimental approach to plant survival may be useful in the future.

**Keywords:** environmental education, citizen science, habitat, community, exclosures, elevation, biotic, abiotic,

**Poster Topic:** Community Outreach

## Adopt a Drain - Oakland Volunteers Prevent Flooding and Improve Water Quality by Keeping Storm Drains Clean and Clear

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Seventeen City of Oakland staff are responsible for maintaining the City's storm drain system and its more than 10,000 storm drains, 370 miles of drain pipe, seven pump stations and 40 miles of creeks.

To supplement staff servicing the storm drain system, Oakland has enlisted volunteers to "adopt" storm drains and provide basic maintenance on their inlets.

A small amount of volunteer help goes a long way. Keeping inlets clear helps keep water flowing and ensure "only rain down the drain." This is especially helpful during storm events when blocked storm drains can back up and cause flooding. Year round storm drain maintenance helps intercept trash before it enters the storm drains and connecting creeks and water bodies. Removing litter before it enters the storm drains keeps our waterways cleaner and is required by the San Francisco Bay Regional Water Quality Control Board, which has imposed limits on the amount of trash entering our waterways. Cities are required to prevent all trash from entering their storm drain system by 2022. *Adopt a Drain* volunteers are critical for helping Oakland meet this requirement and reduce flooding and improve water quality.

Over 550 Oakland *Adopt a Drain* volunteers participate in the program. Program growth has been spurred by an easy to use online interface ([www.AdoptaDrainOakland.com](http://www.AdoptaDrainOakland.com)), social media and word of mouth, and timely news coverage during storm events. The City provides volunteers instruction, tools and supplies, assistance with debris pickups, and notification of impending storm events.

The [www.AdoptaDrainOakland.com](http://www.AdoptaDrainOakland.com) interface was created in partnership with Open Oakland, a group of civic minded volunteer computer programmers. The map can be updated in real time to show storm drain system changes and adoptions. The software is open source and can and is being adapted freely by other municipalities.

For more information visit [www.oaklandadoptaspot.org](http://www.oaklandadoptaspot.org) and [www.AdoptaDrainOakland.com](http://www.AdoptaDrainOakland.com).

**Keywords:** storm drain, volunteer, trash, water quality, social media, flooding, [www.oaklandadoptaspot.org](http://www.oaklandadoptaspot.org)

**Poster Topic:** Community Outreach