

Arroyo de la Laguna Stream Restoration Demonstration Project at Verona Bridge

Project Description

Alameda County Resource Conservation District and the
Natural Resources Conservation Service

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Project Background and Need

The Arroyo de la Laguna drains approximately 400 square miles, in Alameda, Santa Clara and Contra Costa Counties, California. It is the primary tributary to Alameda Creek, which, at 633 square miles, is the second largest watershed that drains to the San Francisco Bay. The Arroyo de la Laguna is an approximately 6 mile stream corridor within this watershed (see Figure 1).

The Arroyo de la Laguna is a highly incised perennial stream. Watershed hydrology and channel function of this segment have been historically impacted by agricultural development and urbanization (including wetland drainage, flood control and channelization), as well as roads, railroads, gravel mining, and the construction of Del Valle Reservoir. Over the course of more than 100 years, this has resulted in channel incision on the order of 20 feet through valley-fill and alluvial deposits.

The Arroyo de la Laguna is currently experiencing bank erosion and channel widening along much of its reach as it adjusts to these alterations and the impacts of major storm events. We estimate that the east bank at this site retreated 10 feet in March 2011 alone. In various reaches public and private land, rangeland and agricultural fields, the riparian forest corridor, back yards, a golf course, bridges and a parallel road are all being lost or adversely affected by the erosion. Downstream stakeholders are concerned with fine sediment, its effects on stream habitat and water quality, and sediment build-up in the Alameda Creek Flood Control Channel (which was designed to carry high storm flows but does not transport sediment well).

The primary concerns that led to the project were: a) a disproportionate sediment impact downstream from the area of concern, b) concern for loss of public infrastructure and private property due to channel widening by bank erosion during high flow events, and c) a desire to demonstrate relatively inexpensive and environmentally friendly stream stabilization and restoration practices, including fish-friendly structures.

Funding

The demonstration project at Verona Bridge was funded by a 2009 federal appropriation from Congressman Jerry McNerney's office that was directed to the Alameda County Resource Conservation District to demonstrate the use of bioengineered stream restoration practices, focusing on the control of stream flow and restoration of the Arroyo de la Laguna. The funding is directed through the Natural Resources Conservation Service PL-566 Small Watershed Improvement Program. Additional funding to support the project was provided as local match from the Alameda County Flood Control and Water Conservation District, the Alameda County Public Works Department and Zone 7 Water Agency.

Project Details

This project consisted of the installation of various bio-technical structures and bio-engineering techniques to demonstrate the use of economical, environmental and socially acceptable stream restoration techniques along the Arroyo de la Laguna. The property, owned and operated by the San Francisco Public Utilities Commission for water supply, was improved through riparian habitat restoration that also benefits habitats for sensitive species (e.g. western pond turtle and migratory birds). The total length of the project site is approximately 700 feet long. See Figure 2 for a map of the project location.

Bed and Bank Restoration

The project utilized in-channel structures (rock cross-vanes) to stabilize the streambed, provide streambed diversity and provide protection to a severely eroded streambank located immediately downstream of the Verona Bridge and the USGS stream gage. The vane structures slow water velocities along the banks, allowing for establishment of aquatic vegetation, both volunteer and planted. The structures tie into floodplain benches constructed along both banks at approximate bank-full elevation. The benches will provide a more stable cross-sectional dimension for the stream and were planted to restore willows and other riparian vegetation (see “planting bench” details below).

The project also includes a living crib wall at a cut bank that was eroding along the west bank of the downstream meander. The log structure is placed on a rock foundation (24-inch-diameter rock) to protect it from scour. Logs were placed Lincoln-log fashion, then the center of the structure and spaces between logs was filled with rocks, gravel and soil, planted with willow cuttings and seeded.

Existing loose concrete rubble beneath the bridge was removed or set at a consistent elevation below the bed of the stream to restore a more uniform hydraulic section at the stream gage. Angular rock was placed to protect the east bridge abutment. The cross- structures will eliminate the steepened streambed beneath the bridge with multiple, lower steps at the cross-vanes that are more conducive to fish passage.

Planting Bench

The project includes a floodplain bench planted with riparian vegetation at the bankfull elevation along the east bank of the stream. Several recently established (since 2003) trees on the point bar were removed or transplanted to the appropriate planting zones on both banks along the length of the planting bench.

Approximately 3,400 CY of soil cut from the east bank (to lay back the bank) was used to construct the bankfull benches along with imported soil.

Vegetation on the planting bench consists of native trees, shrubs and herbaceous species transplanted from selected specimens present on the point bar on the west bank. The plant list is based on native vegetation found at the project site and nearby reference sites. These plants will be supplemented with container plants and native seed as needed to establish vegetation at the

site. The vegetation will be maintained for a minimum two year period following planting and replacement planting will be conducted as needed to establish sufficient vegetation at the site. A list of the plants is shown below:

Scientific Name	Common Name
<i>Artemisia douglasiana</i>	mugwort
<i>Baccharis pilularis</i>	coyote brush
<i>Baccharis salicifolia</i>	mule fat
<i>Euthamia occidentalis</i>	western goldenrod
<i>Platanus racemosa</i>	western sycamore
<i>Populus fremontii</i>	Fremont cottonwood
<i>Quercus agrifolia</i>	coast live oak
<i>Rosa californica</i>	California rose
<i>Salix laevigata</i>	red willow
<i>Salix lasiolepis</i>	arroyo willow
<i>Salix Exigua</i>	sandbar willow
<i>Sambucus mexicana</i>	blue elderberry
<i>Scirpus acutus</i>	hardstem bulrush
<i>Symphoricarpos albus var. laevigatus</i>	common snowberry

All disturbed areas were seeded with native grasses and forbs for erosion control and to establish herbaceous cover.

Environmental Permits and Control of Water

The construction work associated required acquisition of the following permits through the Alameda County Resource Conservation District:

- US Fish and Wildlife Service Biological Opinion for California red-legged frog
 - Append to existing Army Corps of Engineers Programmatic Biological Opinion for Endangered Species Act Consultation on Authorizations under the Nationwide Permit Program for Projects that May Affect the California red-legged frog.
- California Department of Fish and Game 1602 Streambed Alteration Agreement
- Army Corps of Engineers Section 404 Permit
 - Nationwide Permit 27 – Aquatic Habitat Restoration, Establishment and Enhancement
 - Nationwide Permit 33 – Temporary Construction Access and Dewatering
- San Francisco Bay Regional Water Quality Control Board 401 Certification
- California Environmental Quality Act Mitigated Negative Declaration

The Natural Resources Conservation Service, acting as lead agency, completed National Environmental Protection Act compliance through an Environmental Assessment and associated Finding of No Significant Impact.

Dewatering of the stream was required by permits for construction. To isolate the work area, water tight coffer dams were constructed upstream and downstream of the work area and water diverted through a lined diversion channel.

A biologist with all necessary State and Federal permits relocated all fish/amphibians within the work site. Captured fish/amphibians were moved to the nearest appropriate site on the stream. There were no encounters with California red legged frogs, California tiger salamanders or western pond turtles during the dewatering efforts. Several small fish species, non-native carp, crayfish and bass were removed from the dewatered channel and placed downstream of the project site. One Sacramento sucker was captured during the dewatering efforts and placed downstream of the project site. A bullfrog was encountered prior to the dewatering but was never captured and left the site on its own.

Project Timeline

The project was implemented in several separate phases. The bed and bank restoration was implemented between June 15 and October 15, 2011. Installation of salvaged plant material started on August 26, 2011 and was completed on October 4, 2011. Additional planting was started on December 7, 2011 and completed on January 6, 2012. Plant establishment, maintenance and monitoring contracts will continue for several years.