

CASQA 2015
Awards Program

Nomination for
Outstanding
Sustainable
Stormwater Project
June 5, 2015

Project Photos: Stevens Creek Corridor



Stevens Creek Corridor Park & Restoration Phase 2, **Before Project**



Stevens Creek was in degraded condition. The creek was too narrow, it suffered from scour and incision, and lacked understory vegetation.

It was unable to maintain stable banks except through ongoing additions of bank armoring.

OFFICE OF THE DIRECTOR OF PUBLIC WORKS

Stevens Creek Corridor Park & Restoration, Phase 2



CUPERTINO

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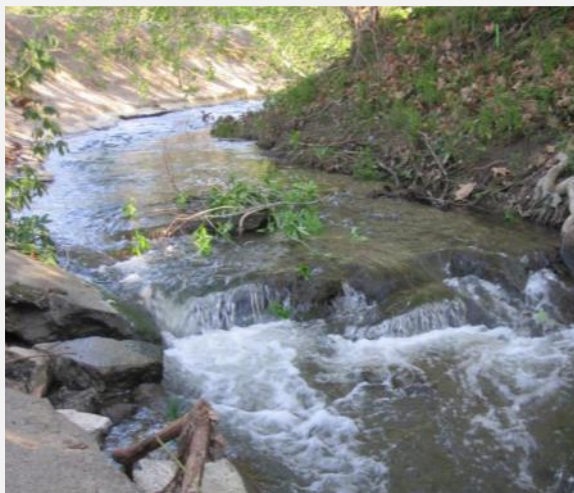
STEVENS CREEK CORRIDOR PHOTOS

Stevens Creek, Before Project

Much of the east creek bank was lined with riprap or smooth concrete. This armoring forced the creek into a narrow, semi-trapezoidal channel.



Concrete lining was failing and falling into the creek.



Fallen concrete slabs were creating waterfalls and impediments to fish passage at low flows, left.

STEVENS CREEK CORRIDOR PHOTOS

Stevens Creek, Before Project



The east side of the creek was compacted and had almost no vegetation.



Dense, nonnative Himalayan blackberry outcompeted the native understory.

Invasive vinca and ivy infested much of the creek corridor on both banks. Ivy climbed many of the trees.



Arundo, an invasive giant reed, had invaded this reach of the creek, photo left. A large stand was removed and excavated to create a new backwater feature.

STEVENS CREEK CORRIDOR PHOTOS

Wildlife and Tree Protections



*P*rior to bird breeding season, nesting boxes were installed outside the work zone to encourage nesting in safe areas beyond the construction. City staff and Audubon Society collaborated on this action.

Presence of abundant wildlife was monitored before and during construction to ensure proper protection. Advance coordination with resource agencies helped address multiple wildlife issues.



*T*owering sycamore and oak trees exist along parts of the west creek bank. They were protected with special measures.



*T*rees in the heritage orchard and throughout the site were protected during construction as well.



STEVENS CREEK CORRIDOR PHOTOS

Fish Relocation at Scoured Undercut Creek Bank



In July 2013, a team of biologists caught native fish in the creek channel and relocated them. Federally-threatened steelhead live in this part of the creek year round. Special requirements were followed to relocate them.

Over 1,360 native fish were successfully moved to designated sites within the watershed.

Note that concrete channel lining was deeply undercut by scour forces from creek flows. Further failures of the lining may have been likely.



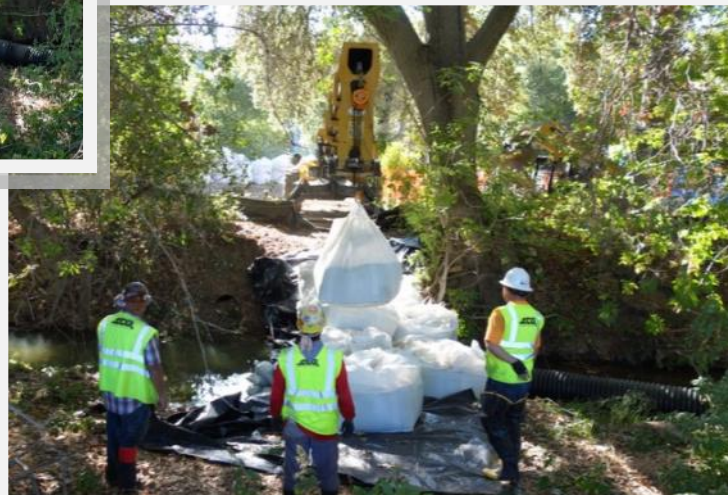
STEVENS CREEK CORRIDOR PHOTOS

Coffer Dam Installation



Large bags filled with gravel were used to build coffer dams needed to dewater the creek in the work area. This design for the dams met permit conditions & allowed efficiency.

The heavy duty bags & gravel can all be re-used.



Fish screens prevented fish from entering the work zone & ensured permit compliance.

STEVENS CREEK CORRIDOR PHOTOS

Flow Diversion



The creek flows were routed around the work site during construction, with a flow diversion system subject to extensive regulatory requirements.

The flow diversion system involved 4 pumps and a control system to divert variable creek flows & maintain downstream conditions.



The flow diversion system had to keep the water cool. Allowable temperature rise was capped at 1.5 degrees Centigrade per permits. Most of piping was buried to help achieve this.



STEVENS CREEK CORRIDOR PHOTOS

Removal of Concrete Creek Channel Lining



Concrete bank lining was removed from the creek channel to allow widening and restoration.

All of the removed concrete was recycled.



STEVENS CREEK CORRIDOR PHOTOS

Channel Restoration: Backwater Areas



Two new backwater areas were created. They provide habitat complexity & important wildlife refuge during high flows. Excavation of a new backwater, photo left.

New backwater, photo right, prior to channel rewatering, & photos below, after rewatering.



Photo right, March 2014.



STEVENS CREEK CORRIDOR PHOTOS



Channel Restoration: Boulder Steps

Six boulder "steps" are a feature of the channel restoration. They are built using very large boulders; no concrete is used.



Boulder steps stabilize the elevations of the channel and maintain gentle slopes for riffle sections. They are designed to facilitate fish passage for steelhead.



Boulder step, photo left, prior to creek rewatering.

STEVENS CREEK CORRIDOR PHOTOS

Channel Restoration: Crib Wall



A log crib wall replaces a concrete bank and stabilizes this area using natural methods.



The crib wall is planted with willows & other riparian plantings to further enhance long-term stability and to improve habitat. P

Photo left, Oct. 2013. Photo below, March 2014.



STEVENS CREEK CORRIDOR PHOTOS

Re-use of Materials for Creek Restoration



*C*obble material was harvested from the creek channel. It was sorted and re-used to create the new channel bed in pool and riffle areas. The cobble also provides spawning habitat for steelhead.



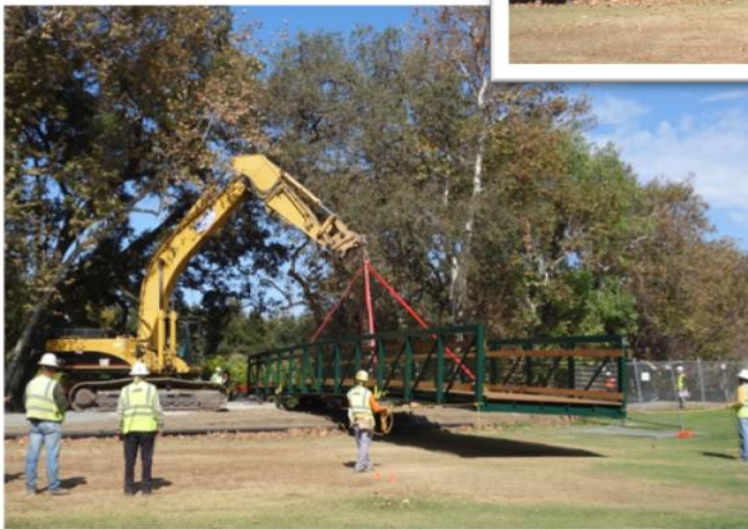
*R*ip rap armor removed from the banks was stockpiled. It was re-used to stabilize the new channel as buried toe protection at the base of the new creek bank.

STEVENS CREEK CORRIDOR PHOTOS

Bridge Installation



A new footbridge was installed. The bridge is a clear span over the creek and is part of the trail alignment.



A site-specific strategy allowed for efficient placement of the span in under an hour and minimized impacts to the creek.

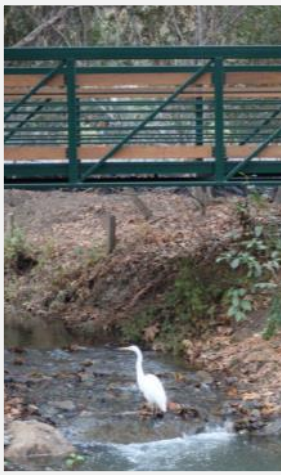
STEVENS CREEK CORRIDOR PHOTOS

Angled Bridge Among Trees Enhances Access & Views



The new bridge had to be carefully “shoehorned” between very large trees on all sides and their canopies.

The bridge links the city-owned 5-acre Stocklmeir home-stead to 60 acres of public open space in the creek corridor.



The bridge span is set at an angle to the creek channel. This design provides gentler turns & is more inviting for cyclists. The angled layout also provides users more varied views of the creek. Excellent wildlife viewing exists here.

Photo left, egret at new bridge.

STEVENS CREEK CORRIDOR PHOTOS

Pervious Trail Paving Installation



*T*rail paving was first installed on the east side of the creek.

The layout took advantage of a maintenance access route.

A special paving and subgrade design was used where the trail had to be built in proximity to trees.

This design better protects tree root systems.



STEVENS CREEK CORRIDOR PHOTOS

New Trail Connects the Corridor



An all-weather trail uses tan-colored pervious concrete paving.

The trail material is fully accessible, allows excellent infiltration, protects creek water quality, meets floodplain standards & is compatible with the creekside wildlife setting.

The trail paving is a durable, long-lasting material that makes low demands on limited public maintenance resources.



The new trail connects to existing trails in Blackberry Farm Park and McClellan Ranch Preserve.



STEVENS CREEK CORRIDOR PHOTOS

Sustainable, Creek-friendly Facilities



The project site lies within a floodplain. The amenities are designed to tolerate occasional flooding without impacting aquatic wildlife or loss of public infrastructure.

A group gathering area, photo left, features flagstone, boulders, and naturally durable redwood for an information kiosk & benches.



Creekside Gathering Area

A smaller creekside gathering area was created near the south trail entry. Its stone, boulders & plantings are "fish-friendly" materials that protect water quality, while allowing park visitors to enjoy the creek setting in a more intimate fashion & supporting local environmental education programs.



STEVENS CREEK CORRIDOR PHOTOS

Bioswales Protect Water Quality



*P*rior to the project, runoff from the golf course and adjacent buildings & paving was piped directly into the creek channel.

Photo left, one of the several drainage pipes that projected into the channel, pre-project.



*T*wo of the new bioswales that now provide infiltration, photos above and right.



*N*ew bioswales along the east side of the creek / west side of the golf course provide infiltration areas for runoff from the golf course and paving. The bioswales capture and filter runoff that previously went directly into the creek, and will protect creek water quality. The swales also help provide natural watering for the "wet-feet" riparian plantings along the adjacent creek banks.

STEVENS CREEK CORRIDOR PHOTOS

Locally-Native Plants for Restoration



Over 1-1/4 acres of new restoration plantings were installed, using over 2,000 native plants grown from locally-collected cuttings and seeds. Six dozen species were selected to restore the sycamore-cottonwood riparian forest and adjacent oak woodland.



Temporary cages protect young plants from wildlife browse during establishment.



Native trees were grown from cuttings collected from the creek. Advance planning allowed several years of growth prior to planting. The alder trees were set along creek edges where they will be naturally "watered."



STEVENS CREEK CORRIDOR PHOTOS

Restoration Plantings Will Stabilize the Creek And Provide Habitat



New plantings are establishing well.
Photo left, Oct. 2013. Photo below, March 2014.

A star marks the same tree in each photo.

Plants installed in areas outside the channel are watered by a temporary drip irrigation system & will soon need no water beyond natural rainfall. The riparian plantings were installed in the fall to maximize establishment success.



Willow stakes were harvested from adjacent sites along the creek. After soaking in water and timely planting, the stakes grow quickly and help stabilize the new creek banks.



STEVENS CREEK CORRIDOR PHOTOS

Progress of Plantings



A star marks the same tree in each pair of photos.



These paired photos show the progress of the native plantings installed on the new creek banks in fall 2013. Photos on left are Oct.-Nov. 2013. Photos on right are March 2014.

STEVENS CREEK CORRIDOR PHOTOS

Creek Restoration Inspired by Natural Processes



The creek restoration design used natural creekbed forms found upstream of the project, & created a stable channel without use of concrete or man-made products.

The new channel was constructed entirely of natural materials, many harvested from the site: boulders, earth, tree trunks and rootballs, cobbles/gravels for the creek bed, and plantings.

Mallard ducks enjoy step pools by the new bridge, photo left.

These photos show newly-widened sections of the creek, 5 months after completion of the channel earthwork.



STEVENS CREEK CORRIDOR PHASE 1 PHOTOS

Additional Photos: Previous Upstream Project Asphalt Parking Lot Removed — Lower Parking Area Became New Creek Channel



*L*ower parking lot, before. The creekside portion of the parking lot shown in photo left was removed, & became part of the new creek channel. This allowed creation of a wider, stable and healthy channel configuration.

Stars mark the same distant trees in each photo.

After: The new wider creek channel, created where parking had existed — Spring 2010, 1 year after project completion.

The new channel allows for desirable in-stream floodplain “benches” and supports greater habitat complexity. 3 drive-through crossings & a former dam were removed. The channel slope is gradual & there are no longer barriers to fish migration.



STEVENS CREEK CORRIDOR PHASE 1 PHOTOS

Additional Photos: Previous Upstream Project

Parking Lot at Adjacent Site (Blackberry Farm Park) Is Made Pervious



Before

The former parking lot, left, was made of impervious asphalt & extended to the edge of the creek channel. Its runoff drained right into the creek. It was removed & replaced by a smaller, “green”, completely pervious parking area.

A star marks the equivalent location in the ‘before’ & ‘after’ views.

The new parking area is set back from the creek & is entirely permeable. Drive aisles are porous concrete. Vegetated parking bays are seeded with native meadow plants, with turf rings to support vehicle weight. Dozens of native trees add shade.



After



This project removed a net 3.4 acres of impervious paving – mostly asphalt – adjacent to the stream.

After: Storm flows now infiltrate into grasses in “meadow” parking bays & permeable paving. During heavy rains, excess water flows to a bioswale & waters its ‘wet-feet’ plantings.

STEVENS CREEK CORRIDOR PHOTOS

Many Thanks to Our Many Contributors

Stevens Creek Corridor Park & Restoration, Phase 2

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