

## STREAM RESTORATION EFFORTS REDUCES IMPACTS OF URBANIZATION

Sycamore Creek is a small stream whose headwaters are in the Sycamore Canyon Open Space Park in the City of Riverside, California. The pressures of urbanization have impacted the water quality of the creek by increasing urban runoff and velocity of flows. Sediment loadings in the creek has increased, as well as increases of excessive pollutants, such as nutrients, to the stream. In addition, urban influences have impacted aquatic and riparian species in the Creek. Degraded water quality and changing supply have led to extirpation of the native fish in the stream, allowed invasive, non-native species to dominant, resulting in an overall reduction in the creek's biological diversity.

The creek flows two miles through the 1500 acre, open-space park that contains rolling hills covered by grasslands and the coastal sage scrub plant community. Outcroppings of granite boulders dot the area. Willows and sycamore trees and other riparian vegetation line the creek in this area. In the lower section of the park, the creek has formed a rather deep canyon. This two mile section of Sycamore Creek is one of the few protected natural streams in the area. The park is very popular for hiking and mountain biking. The area surrounding the Park has recently experienced rapid development, particularly the construction of industrial buildings and residential units.

**Sycamore Creek Riparian Recovery Program**

Sycamore Creek provides an essential source of fresh, clean drinking water for resident and migrating wildlife and scarcely-found habitat for important native plants and animals.

Because the creek and water quality had been degraded, cooperating agencies worked to improve the riparian (streamside and in-stream) habitat:

- A pipeline now augments the water flow during drought.
- Non-native invasive plants and aquatic animals were removed, and native plants were replanted.
- Erosion control measures were installed to reduce channel erosion and the resulting sediment.

Creating a dependable supply of high quality water has allowed for the reintroduction of the native Arroyo Chub.

The Arroyo Chub is a 3-5 inch long, minnow-like fish. It is adapted to survive wide fluctuations in temperatures and is omnivorous, feeding on algae, plants, small crustaceans, and aquatic insects, including immature mosquitoes.

**Why are southern California's fish absent or rare within their native waterways?**

Native fish populations have declined due to human-created impacts to stream habitat including:

- changes in the watershed that result in erosion and debris torrents
- channelization due to land use changes, mainly urbanization
- flood control dams and activities
- introduction of non-native fish
- water diversion
- sand and gravel mining
- water pollution.

**Waterways of Sycamore Canyon Wilderness Park**

The Sycamore Creek Riparian Recovery Program was conducted by the Riverside-Corona Resource Conservation District, supported by 319 Grant funding from the State Regional Water Quality Control Board, with assistance from the Santa Ana Watershed Association, the City of Riverside, and citizen volunteers.



Signs describing the project and providing information about urban wildlife issues were posted near the project site.

From the open space park, Sycamore Creek flows approximately five miles to the central reach (Reach 4) of the Santa Ana River. The Santa Ana River is the largest

river system in southern California and its Reach 4 is on the Clean Water Act 303(d) list for pathogens. The River provides water contact recreation and habitat for endangered species. River flows are also used to recharge groundwater aquifers.

In the Sycamore Creek watershed, urbanization has created more short-term, high velocity flows during rains, reduced groundwater recharge, and increased pollutant loadings, including nutrients such as phosphate. As a result, the creek has experienced more erosion from higher surface flows, while flows from springs and seeps that feed the creek have decreased. In recent years the creek has become more eroded in some areas and in the summer the flows are often intermittent. Invasive, non-native aquatic species such as crayfish, bullfrogs, and mosquito fish, have moved in from adjacent urban areas and have become dominant in the stream. These factors have extirpated the native fish, the speckled dace and arroyo chub (species of special concern to the California Department of Fish and Game) and the federally-listed Santa Ana Sucker, from the stream.

In 2005, the Riverside Corona Resource Conservation District initiated a CWA § 319(h) grant-funded restoration project for the Creek. The water quality goals for the restoration project were to reduce erosion, treat water quality, remove non native evasive species, introduce native fish, and stabilize stream flows.

Project highlights include the reestablishment of freshwater wetlands, riparian restoration and stream bank stabilization, control and removal of invasive aquatic species, introduction of native fish, stabilization of stream flow, and monitoring. These activities began in 2005 and will conclude in December of 2007. Construction of the freshwater wetlands included the placement of a grade stabilizer - large boulders placed across the creek and buried well into the channel - completed by hand by crews of the California Conservation Corps. Native riparian vegetation was propagated and planted in the area of the wetlands. Installation of willow wattles and mulefat (*Baccharis satifolia*, a common native riparian species in the area) cuttings were installed along the lower portion of the stabilization structure and in lower reaches of the creek in order to restore native riparian area and stabilize the stream bank. Crayfish and mosquito fish were intensively trapped and removed to control their numbers. Arroyo chub (*Gila orcutta*) were reintroduced to the creek. Water was purchased and discharged into the



Site of grade stabilizer before installation of keyway. Over 10,000 pounds of rock were placed by hand by crews from the California Conservation Corps to complete the project. Work on the stabilizer began in winter of 2005.

stream to supplement flows during dry periods, to foster establishment of the reintroduced fish. Extensive monitoring was conducted during project activities as well as before and after the project.

The efforts of the project have stabilized the creek, improved water quality and allowed reintroduction of native fish. The grade stabilizer has trapped sediment and slowed flows and allowed the development of a wetland. The wetland has acted to attenuate pollutants. Monitoring conducted from early 2006 to November 2007 has shown a reduction in phosphate and electric conductivity (EC) in the creek below the grade stabilizer. Over the life of the project phosphate levels went from a high of 9 mg/l to 2.5 mg/l and EC levels dropped from 1,000 uS/cm to 800 uS/cm. The installation of willow wattles and mulefat



Grade stabilizer after installation and planting of riparian and wetland plants in spring of 2007.

cuttings has produced thick stands of vegetation along sections of the bank reducing erosion. The Creek in the area of the created wetlands was cleared of clayfish (approximately over 1000 individuals removed). Arroyo chub were released in pools above and below the stabilizer. Larval chub have been observed in the fall of 2007 and it has been estimated that there has been a reproductive success of 80% or higher. The creek has had consistent flows this year, 2007, even though there was record low rainfall for the area. It appears that the restored creek will retain viable flows in the future as a result of increased urban runoff, and, if necessary, the purchase of supplement water.

Three information kiosks have been placed around the restoration project area. A series of signs describing the project and information on improving water quality and habitat on the urban wildland fringe were placed in kiosks.

The project proponent was the Riverside Corona Resource Conservation District who applied for the CWA § 319 grant, planned and supervised the project, in addition to carrying out many activities. Major partners involved in the project included the California Conservation Corps, Metropolitan Water District of Southern California, California Department of Fish and Game, the United States Army Corps of Engineers, the Santa Ana Regional Water Quality Control Board and the Parks Division of the City of Riverside.

The CWA § 319 grant, State Agreement 04-137-558-0, was used to fund almost the entire project. The match for the project was \$10,395.52. The grant will terminate

December 31, 2007. On October 1, 2007, \$143,652.15 of the original \$250,000 awarded in the grant had been expended. It is very likely that a good portion of the remaining grant funds will be not expended.

The project took place in U.S. Congressional District # 44. The Congressman is Ken Calvert.

Contract Information:

Dave Woelfel  
Regional Water Quality Control Board, Santa Ana Region  
951 782-7960  
dwoelfel@waterboards.ca.gov



Arroyo Chub raised by the Riverside Corona Resource Conservation District are ready for release. This minnow sized fish is native to southern California streams and has been found to be reproducing successful in the Creek since their reintroduction.