SUNNYSLOPE CREEK
NATIVE FISH
HABITAT RESTORATION PROJECT
MONITORING REPORT

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SECTION 1.0 BACKGROUND

In 2009, the Orange County Water District (OCWD) prepared the Santa Ana Sucker Habitat Restoration and Population Reintroduction Reconnaissance Study. One of the purposes of the study was to identify potential native fish habitat restoration opportunities within the Santa Ana River Watershed. Based on variables such as known occupied habitat, predation threats, and recreation pressure, Sunnyslope Creek was recommended as a candidate site for potential native fish habitat restoration. This creek was a known spawning site for the threatened Santa Ana Sucker, *Catostomus santaanae,* until 2005 when high flows caused the river to move from the north bank toward center line of the river floodplain. This added 0.7 miles to the creek length, flattening the creek grade and slowing flows. The creek then became clogged with debris, silt and vegetation and suckers were not found in the creek from 2005-2010.

In 2010, OCWD and the Santa Ana Watershed Association (SAWA) prepared a feasibility study that identified potential native fish habitat restoration activities for Sunnyslope Creek. Measurements were taken along the creek to establish a baseline for habitat conditions. The field crew walked the entire unlined portion of the creek, bashing through debris and vegetation blockages noting increased hydrologic connectivity and flows just as a result of our reconnaissance activity. In the spring of 2011, OCWD and SAWA implemented habitat restoration activities along Sunnyslope Creek, including the removal of predatory fish from the deeper pools, filling holes in the creek bed with rock and gravel, removing sediment, trash and marsh blockages, and placing boulders, rocks and gravel along the creek where needed. These activities restored aquatic connectivity between the creek and river thereby greatly improving conditions for native fishes including suckers, which were observed once again in the creek from 2011-2015.

In November 2011, OCWD and SAWA resurveyed habitat conditions in and along Sunnyslope Creek and prepared the first annual Sunnyslope Native Fish Habitat Restoration Project Monitoring Report. The monitoring report documented restoration activities and compared the habitat conditions in the creek to the 2010 pre-restoration baseline condition. Restoration activities continued from 2012-2015 and include non-native vegetation removal, non-native species removal, native fish surveys, substrate and water depth surveys, water flow surveys, recontouring and trash collection. Herein is the summary of the continued activities and results for 2015.

SECTION 2.0 SUNNYSLOPE CREEK SITE DESCRIPTION

As shown in Figure 1, Sunnyslope Creek is located in western Riverside County. The creek originates in the foothills, just north of the 60 freeway, near the community of Sunnyslope. The upper segments of the creek are concrete-lined with two-forks that flow south to southeast and south to southwest until they merge. The east fork of Sunnyslope Creek begins in a vacant field located northwest of the Flabob Landing Strip. The creek extends 0.7 miles to its confluence with the west fork of Sunnyslope Creek. The west fork begins just north of the 60 freeway and extends 1.9 miles south to the east fork confluence. From the confluence of the two forks, the concrete-lined channel segment of Sunnyslope Creek continues 0.7 miles where it becomes earthen in the vicinity of the Louis Robidoux Nature Center. From the nature center, Sunnyslope Creek extends approximately 0.95 miles to its confluence with the Santa Ana River. The approximate elevation at the terminus of the concrete-lined segment of Sunnyslope Creek is 733 feet, 723 feet at the river floodplain and is 709 feet at the confluence with the Santa Ana River. Both rising groundwater and local surface runoff provide perennial flow into the creek.

The Sunnyslope Creek Native Fish Habitat Restoration Project area consists of the 0.95 mile earthen segment between the concrete-lined channel and the river. As shown in Figure 2, the earthen segment of the creek has been divided into three reaches. The upper reach begins at the terminus of the concrete-lined portion of Sunnyslope Creek and extends approximately 1,340 feet downstream to Station 15 (approximate location of the pre-2005 river confluence). Along the upper reach of the creek there is a 10-foot elevation change. Vegetation along the lower and upper segments of the upper reach consists mostly of native plants, while the middle segments of the upper reach between Station 4 and Station 9 consist of a higher percentage of non-native cover.

The middle reach (the bend) begins just after Station 15 and extends approximately 1,452 feet downstream to Station 30. The middle reach is relatively flat with little elevation change. In 2014, the middle reach experienced dry sections for months (from approximately Station 12 to Station 22). Even in a year of continued drought, the middle reach saw fewer dry sections this year. The riparian vegetation along the banks of the middle reach contained a high percentage of native vegetation except between Station 18 and Station 19 where the plant cover is less than 50 percent native.

The lower reach of the creek begins just after Station 30 and extends approximately 1,914 feet downstream to Station 50 at the current confluence of Sunnyslope Creek and the Santa Ana River. The lower reach is better defined and has more fall than

the middle reach. The vegetation along the banks of the lower reach contains a high percentage of native plants.

A non-native plant removal project by SAWA has greatly reduced the occurrence of non-native vegetation along the banks of the creek. Sunnyslope Creek has seen erosion or undercutting of banks along many stations with the few heavy rain events in 2015. Large pools of water have also formed throughout the lower reach during the Fall.

SECTION 3.0 RESTORATION ACTIVITIES

During 2015, the focus of the restoration activities conducted at Sunnyslope included sediment, debris and vegetation plug management, non-native species removal, water flow, recontouring, non-native vegetation removal and native fish surveys. All of these measures were done to enhance and restore the sucker breeding habitat. A summary of the 2015 activities is presented below.

Sediment, Debris and Vegetation Plug Management

The sediment, debris and vegetation plug management carried out in 2015 was similar to past efforts and occurred largely in the flat middle and lower reaches of the creek. Trash was collected from banks and in the creek whenever field crew was on site, but a large cleanup yielding thirty-nine 30-gallon trash bags was done in December (Figure 3). In addition, large items such as a mattress, tires, a car seat and others items were removed from Sunnyslope. Fallen trees that caused debris build up were also removed from the creek. The biggest effort was a large black willow (*Salix gooddingi*), approximately 12m tall, that fell parallel into the creek. High flow events can cause trees to fall and block the creek. These fallen trees force sheet flow and small side channels to form. Once the high flows subside, these debris dams and side flows further reduce the current on the main channel; the lower flows allow more fine particles to drop out of the water thereby burying desirable rockier substrate. Emergent plants were pulled by hand and sediment plugs were shoveled out.

In 2014 and 2015, Riverside County Flood Control removed vegetation in the concrete lined channel just upstream of Sunnyslope. Crews from Flood Control installed check dams downstream of work being done in the channel to prevent sediment and trash entering the creek (Figure 4). Extra precaution was taken by our crew to have a block net in place while they were working within the last 50 meters of the concrete lined channel. This net was checked periodically to ensure no native fish were in the net.

Trash accumulation continues to be a problem in Sunnyslope Creek, especially after storm events (Figure 5). Previous meetings to discuss the feasibility of installing a trash boom have led to additional research on the effectiveness of utilizing this method or an alternate that would reduce trash buildup and sediment plugs in the creek system. Care would be taken to install the trash boom in a way that would not compromise the integrity of the cemented channel or otherwise interfere with the flood control function of the facility.

Non-native Species Removal

A number of non-native species were removed throughout the creek during a multiple day effort in January and October 2015 (Table 1). In January, crayfish traps were deployed for a week and checked daily. A small number of non-natives were removed with these traps; however, we found these traps to be beneficial in capturing African-clawed frogs. Electroshocking was conducted in October starting at the confluence with the Santa Ana River. From here, a team comprised of OCWD, SAWA and Western Riverside County MSHCP Biological Monitoring Program staff moved their way upstream to the cement-lined channel with an electroshocker, dip nets and seine nets. A total of 3,446 non-native individuals comprised of 8 species were removed from the creek. Of these totals, it should be noted that 2,894 individuals were mosquitofish (*Gambusia affinis*). The non-native Sailfin molly (*Poecilia latipinna*), was observed in the creek this year. Sailfin mollies can typically be found in estuaries, stagnant drains and other brackish habitats but are often sold as aquarium fish. Sailfin mollies have been observed in the Santa Ana River for at least the last 22 years, but until this year have never been observed in Sunnyslope.

From 2011-2015, 16,839 individuals comprising 13 species of non-native predators and competitors have been removed from Sunnyslope Creek (Table 1). Figure 6 shows a few of the non-natives removed from the system.

Table 1. Non-native Species Removed from Sunnyslope Creek

	2011	2012	2013	2014	2015
Green Sunfish (*Lepomis cyanellus)*	147	42	52	47	22
Yellow Bullhead (*Ameiurus natalis)*	41	37	5	17	59
Common Carp (*Cyprinus carpio)*	16	0	0	0	0
Largemouth Bass (*Micropterus salmoides)*	14	3	0	0	0
Black Bullhead Catfish (*Ameiurus melas)*	5	0	3	2	2
Mosquitofish (*Gambusia affinis)*	1,464	7,420	103	3,108	2,894
Bluegill (*Lepomis macrochirus)*	1	1	0	3	0
Crayfish (*Cambarus sp.)*	84	85	22	434	384
African Clawed Frog (*Xenopus laevis)*	23	3	4	1	8
Bullfrog (*Rana catesbeiana)*	4	12	3	86	11
Red-eared Slider (*Trachemys scripta)*	1	0	0	0	0
Fathead Minnow (*Pimephales promelas)*	12	82	4	2	0
Sailfin Molly (*Poecilia latipinna*)	0	0	0	0	66
Totals	**1,812**	**7,685**	**196**	**3,700**	**3,446**

Water Flow

Water flow calculations were last performed in 2014. In 2015 the creek was walked quarterly to assess water flow and quantify dry sections. This is the second year since undertaking this project that Sunnyslope Creek had dry sections located between Stations 12 and 22. California is experiencing a drought and it is believed that the drought can be correlated to the decrease in flow and presence of dry sections.

Recontouring

Recommendations from the 2013 report for restoration activities included periodically increasing the amount of gravel base in the creek using gravel and rock from the adjacent dry channel. In 2014, 2.09 y^3 of gravel was added from approximately Station 18 to Station 22, a stretch of 397 ft. Since the addition of the gravel, numerous large storm events have occurred and we have seen success in the efforts. Gravel remains throughout the area but storm events have also allowed some to move downstream into the lower reach, providing renewable gravel for areas that have lost some during rain events. In 2014, bank reinforcement occurred between Station 20 and 21. This site is where previously water has blown out of the creek channel and flooded the surrounding area during storm events. Water in this area does not immediately return to the system due to lack of elevation change. Wild pigs have historically used this area for foraging after a storm event and have caused damage to native vegetation. Since reinforcing the bank we have seen the bank build up with sand and channelization occur, thereby eliminating blowouts of the creek in this area.

Non-native Vegetation Removal

Removal began in 2011 and continued in 2015 with SAWA's Invasive Species Removal Crew (ISR) spraying arundo (*Arundo donax*) and tamarisk (*Tamarix ramosissima*) up to 20 m from the creek. Additionally, in 2015, SAWA's ISR crew sprayed in January and planted 529 mulefat (*Baccharis salicifolia*), 152 willow (*Salix ssp*.) and 17 cottonwood (*Populous fremontii*) pole cuttings in the middle reach.

Late in the 2014 season, a survey of exotic trees in the upper reach of the creek took place. One hundred sixty-two trees were mapped. Palm, ash, mulberry, elm, Brazilian peppertree and fig were documented. It is hoped that a procedure which preserves the shading function of the trees can be implemented which will allow the gradual removal of the exotic trees replacing them with native trees and shrubs.

Native Fish Survey

Sunnyslope Creek was historically occupied by suckers, as confirmed by historic collections and photographs. However, no evidence of occupancy or use by the sucker was documented from 2005 to 2010. In 2010, when the restoration feasibility assessment was conducted, the entire creek was cut off from the river and the wetted creek channel was choked with emergent vegetation, sediment and debris plugs. In early 2011, winter storms brought high enough flows to reestablish the creek's connectivity with the Santa Ana River along the trail established during the reconnaissance study. In February 2011, five suckers were observed and in 2012, fifteen surveys confirmed presence of native fishes, including suckers. A combination of seine and dip nets were used to capture native fish. All captured native fishes were counted and returned immediately to the same location in the creek. In 2013, no formal fish surveys were conducted; however, arroyo chub (*Gila orcutti*) and suckers were observed during flow point data collection and during non-native vegetation removal (Table 2).

Table 2. Native Fish Observations

	2012	2013	2014	2015
Santa Ana Sucker (*Catostomus santaanae*)	22	4	2	31
Arroyo Chub (*Gila orcuttii*)	74	4	46	18

A formal native fish survey was completed in October 2015 that utilized both electroshocking and seining since both were already used for non-native species removal. Starting at the confluence with the Santa Ana River, a team consisting of an electroshocker, dip netters and seiners moved systematically up the creek. As fish were caught they were placed into an aerated bucket, identified, and in the case of native fish, returned immediately to the creek away from the electroshocker and behind the seine net to avoid recapture. The seine net was pulled up every few meters to ensure the release of native fish from the survey area. No suckers were observed or caught during the native fish survey; however, 18 arroyo chub were captured and released (Table 2).

Throughout the year, on visits for vegetation removal, at least 31 suckers were observed in Sunnyslope Creek near the lower reach. This observation was in a highly aerated gravel filled pool that was occupied with sucker throughout the spawning season (Figure 7). A GoPro camera was used throughout the year to get footage of

the fish and approximate abundance (Figure 8). The aeration level in this pool has been greatly reduced due to both summer drought and then later, rain events that resulted in the deposition of sand.

SECTION 4.0 COST ANALYSIS

This year's costs (Table 3) reflect a reduction in Vegetation Management field hours as recommended in 2014. The overall hours in 2015 were significantly less than in 2014; however, costs were comparable due to the way rates were calculated in 2015 to reflect true hourly rates, benefits and overhead.

Some activities have been reclassified within the defined categories. Data costs have been separated out from Administration costs and are now its own activity. Biologist's costs include volunteer hours, which were calculated based upon the accepted volunteer rate for 2015 and does not represent a true monetary cost. However, the importance of volunteer contributions in the efforts to restore and maintain Sunnyslope Creek cannot be understated.

Table 3. 2014-2015 Restoration Activities Hourly Labor and Costs

2014 Restoration Activities Hourly Labor and Costs

Activity	Biologist Hours	Biologist Costs	Laborer Hours	Laborer Costs
Vegetation Management	219.5	$7,682.50	80.5	$2,012.50
Substrate Recontouring	61	$2,135.00	45	$1,125.00
Reconnaissance	78	$2,730.00	0	$0.00
Exotic Predator Removal	35.5	$1,242.50	0	$0.00
Native Fish Survey	35.5	$1,242.50	0	$0.00
Trash Clean-up	84	$2,940.00	8	$200.00
Administration	191.75	$6,711.25	0	$0.00
Total	705.25	$24,683.75	133.5	$3,337.50

2015 Restoration Activities Hourly Labor and Costs

Activity	Biologist Hours	Biologist Costs	Laborer Hours	Laborer Costs
Vegetation Management	105*	$4,466.00**	42	$1,050.00
Exotic Predator Removal	63.75*	$2,826.25**	0	$0.00
Native Fish Survey	59.5*	$2,641.00**	0	$0.00
Trash Clean-up	81*	$3,722.00**	18	$450.00
Data	18	$1,083.00	0	$0.00
Mileage	N/A	$363.00	0	$0.00
Administration	141	$7,945.00	0	$0.00
Total	468.25*	$23,046.25**	60	$1,500.00

*Hours include volunteer time

**Costs includes California volunteer rate

SECTION 5.0 RECOMMENDATIONS

In line with the 2011-2015 management and monitoring of Sunnyslope Creek, the following restoration activities are recommended for 2016.

1. Continue restoration and management of Sunnyslope Creek as well as secure future funding for these efforts.
2. Quarterly monitoring of the creek, or more frequently as needed. Remove blockages as needed to maintain fish passage along the entire creek, with special focus along the middle reach.
3. Increase the amount of gravel base in the creek. Periodically recontour with gravel and rock from the adjacent dry channels with special focus given to the middle and lower reaches where the desired substrate is most needed.
4. Areas that have been undercut in the bank should be reinforced and, in addition, a few deep pools should be shallowed to reduce non-native predator and competitor habitat.
5. Remove non-native predators and competitors in February and October of each year.
6. Explore options that would reduce the trash buildup and increase the removal of debris and trash along the upper reach of the creek.
7. Deepen the creek in the area of the young willow grove located in the lower reach.
8. Remove "natural" bottlenecks along the upper creek including large palms and other non-native trees. This result could be achieved gradually over time so that the loss of cover can be mitigated by planting native cover higher up the bank to avoid future blockage issues and provide replacement cover.
9. Continue non-native vegetation removal/treatment along the banks of the creek to allow for the natural regrowth of natives, with focus at Stations 4 to 9, Stations 18 to 19 and Stations 46 to 49. Castor bean should also be added to the list of non-natives treated along the banks, with focus in the middle reach of the creek.
10. A supplemental water source should be researched to allow for a continuous healthy connected creek system that would be suitable for sucker habitat.
11. Continue native fish surveys and GoPro surveys to determine the presence of sucker and other native fish.

SECTION 6.0 ACKNOWLEDGEMENTS

We thank Chris Medak and staff of the U.S. Fish and Wildlife Service for recommendations; Jeff Brandt and Joanna Gibson of the California Department of Fish and Wildlife for regulatory guidance; Sherrie Chandler of the Riverside County Parks and Open Space District for logistical support and encouragement regarding the creek; the Orange County Sandbaggers, Jason Vos and crew who were singularly responsible for the speed, efficiency, and success of the project; Dave Woelfel of the Regional Water Quality Control Board for providing regulatory guidance and encouragement; Randy Sheppard of the Riverside County Flood Control District and Water Conservation District for the coordination of clearing out debris from the upper concrete-lined channel; SAWPA and OC Sanitation District for providing some of the project funding; Adam Malisch of the Western Riverside County MSHCP Biological Monitoring Program for providing personnel time and guidance; and the OCWD for financial support as well as Bonnie Johnson's and other staff's time and expertise.

APPENDIX: FIGURES

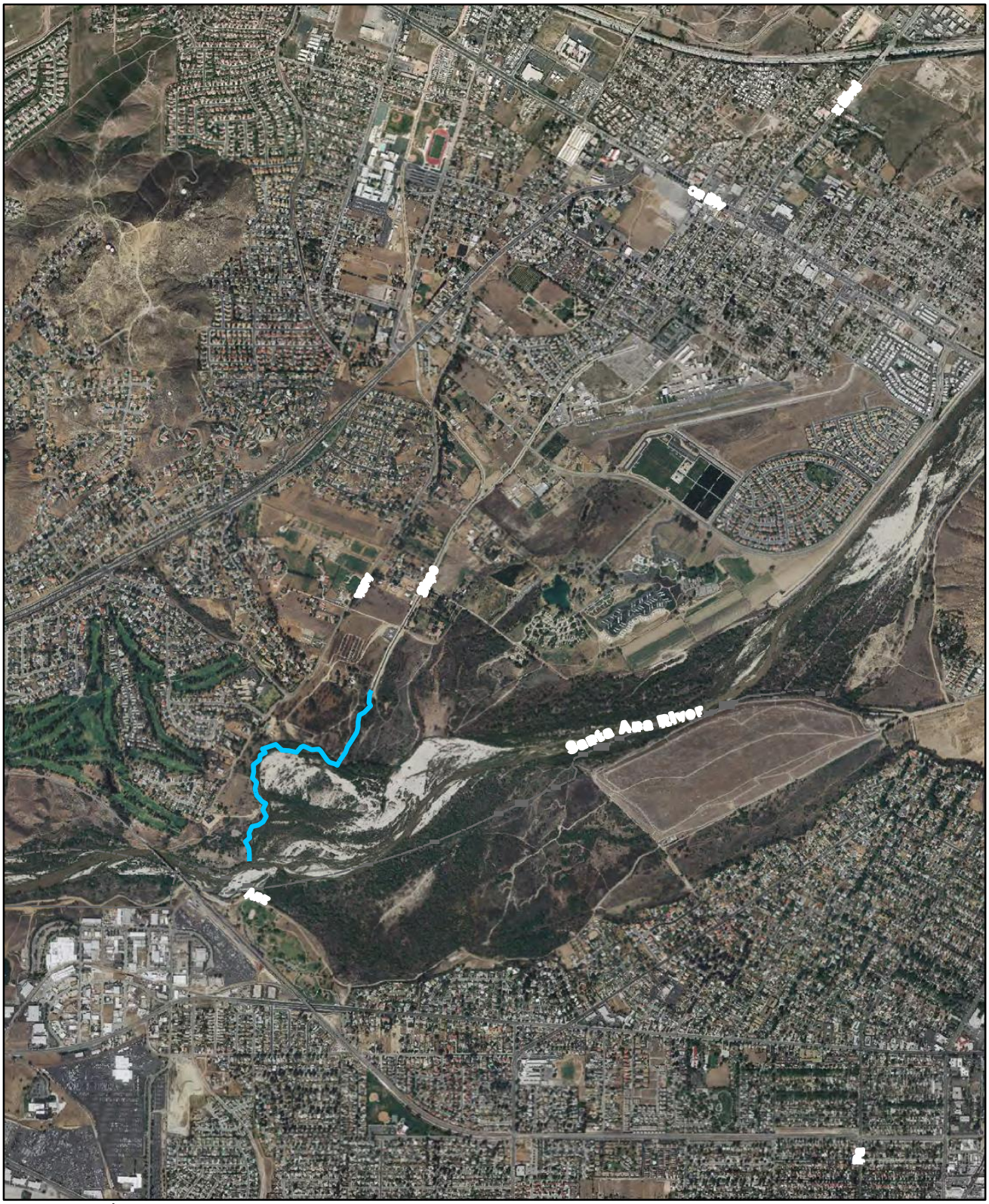

Figure 1: Regional Vicinity Map

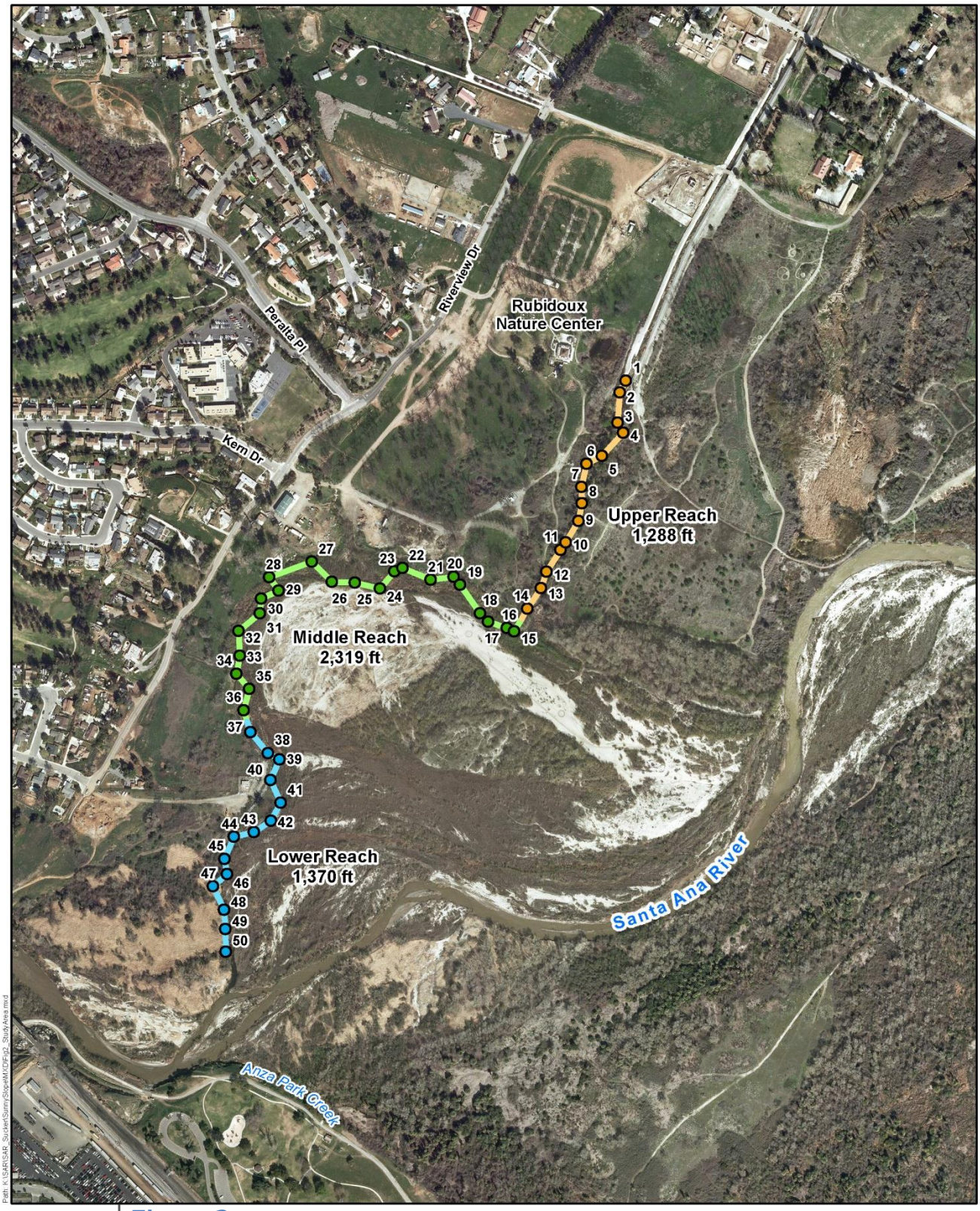

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Figure 2: Study Area Map

0 300 600 Feet

Aerial Photography: Eagle Aerial Spring 2012

Figure 3: Trash clean-up crew.

Figure 4: Riverside County Flood Control check dam set in place to prevent sediment and trash from entering creek while removing vegetation from concrete-lined channel.

Figure 5: Trash debris buildup after a storm event.

Figure 6: Top: Sailfin Molly removed during non-native removal. Below: African-clawed Frog caught in crayfish trap.

Figure 7: Aerated pool where numerous Santa Ana Sucker were observed.

Figure 8: Santa Ana Sucker recorded during GoPro Survey in aerated pool.