SUNNYSLOPE CREEK
NATIVE FISH
HABITAT RESTORATION PROJECT
MONITORING REPORT

Prepared By

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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 Santa Ana habitat restoration opportunities within the Santa Ana River Watershed. Based on the presence and quality of essential habitat elements and the consideration of other 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 activities.

In 2010 OCWD in conjunction with Santa Ana Watershed Association (SAWA), prepared a feasibility study that identified potential native fish habitat restoration activities for Sunnyslope Creek. In spring of 2011, OCWD and SAWA implemented a series of habitat restoration activities along Sunnyslope Creek. These restoration activities included removal of predatory fish in the lower holes filling holes in the creek bed with rock and gravel removing sediment, trash and marsh blockages moving fine sediment off of the creek bottom, and placing boulders, rocks and gravel along the creek where needed.

In November 2011 OCWD and SAWA resurveyed 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. The 2011 habitat conditions and 2010 pre-restoration baseline condition for Sunnyslope Creek is presented in Appendix B and Appendix C of this report

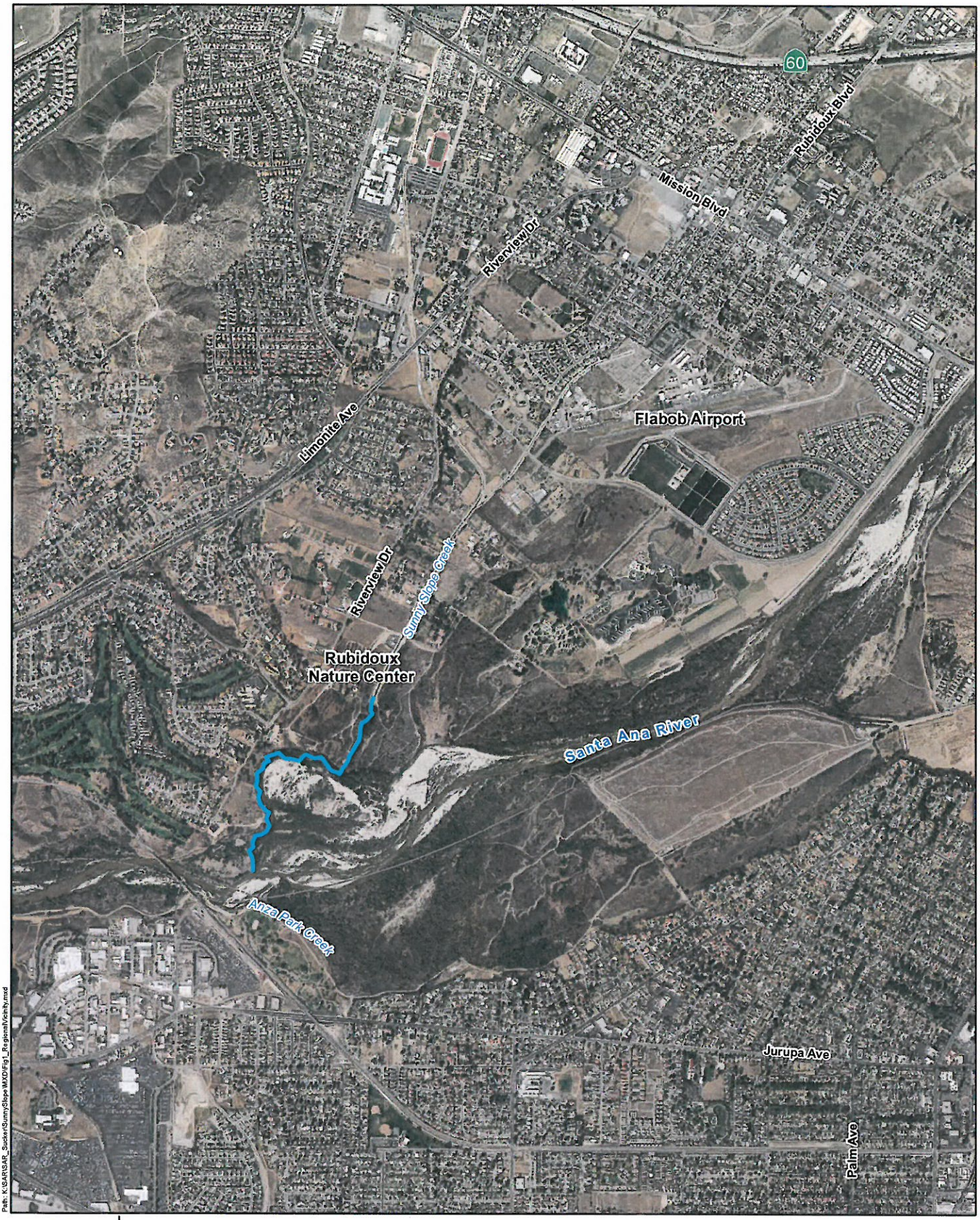
In 2012 OCWD and SAWA continued restoration activities at Sunnyslope Creek. These activities included removal of blockages from the creek channel, removal of exotic plants, and non-native fish control. In October 2012 OCWD and SAWA resurveyed Sunnyslope Creek and prepared the second annual Sunnyslope Creek Native Fish Habitat Restoration Project Monitoring Report. The second annual monitoring report documents the 2012 restoration activities and compares the 2012 habitat conditions with those in 2011 and with 2010 pre-restoration baseline condition.

SECTION 2.0 SUNNYSLOPE CREEK PROJECT AREA SETTING

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 Mount Rubidoux 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, at the river floodplain the elevation is 723 feet and at the creek's confluence with the Santa Ana River the elevation of the creek is 709 feet. Both rising groundwater and local surface water runoff provide perennial flows into the creek.

The Sunnyslope Creek Native Fish Habitat Restoration Project area consists of the 0.95-mile earthen segment between the concrete lining and the river. As shown of 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. Along the Upper Creek Reach there is a 10-foot elevation change. The upper reach is well defined and as shown on Figure 3 the water depth along the upper reach ranges from a high of 150 cm at Station 4 to a low of less then 25 cm at Station 1, with the majority of the upper reach being a depth of less than 75 cm. As shown on Figure 4 extensive riparian vegetation occurs along the banks of the creek. Along the lower and upper segments of the upper reach the vegetation consists of high percentage of native vegetation, while the middle segments of the upper reach between Station 4 and Station 9 consist of a higher percentage of non-native vegetation.

The middle creek reach begins at Station 16 and extends approximately 1,452 feet downstream to Station 30. The middle reach is relatively flat and experiences little elevation change. The middle reach is less well defined and as shown on Figure 3 the water depth along the majority of the middle reach is less than 50 cm, with a considerable amount of the reach being less than 25 cm. The



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N
W E
S

0 1,000 2,000 Feet

Sunnyslope Reach

Aerial Photography Eagle Aerial Spring 2012

Sunnyslope Creek
Native Fish Habitat Restoration Project

Regional Vicinity Map
Figure 1

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N
W E
S

0 300 600
Feet

Aerial Photography Eagle Aerial Spring 2012

Sunnyslope Creek
Native Fish Habitat Restoration Project

Study Area Map
Figure 2

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N
W E
S

0 to 25cm
26 to 50cm
51 to 75cm
76 to 100cm
101 to 150cm
Over 150cm

Aerial Photography Eagle Aerial Spring 2012

0 200 400
Feet

Sunnyslope Creek
Native Fish Habitat Restoration Project

2012 Maximum Water Depth
Figure 3

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N
W E
S

100% to 85%
84% to 70%
69% to 55%
54% to 35%
Under 20%

Aerial Photography Eagle Aerial Winter 2009

0 200 400
Feet

Sunnyslope Creek
Native Fish Habitat Restoration Project

2012 Percentage Native Vegetation Along Banks
Figure 4

riparian vegetation along the banks of the middle creek contains a high percentage of native vegetation except between Station 18 and Station 19 where the vegetation is less than 50 percent native vegetation.

The lower reach of the creek begins at Station 31 and extends approximately 1,914 feet downstream to Station 50 where Sunnyslope Creek joins the Santa Ana River. The lower reach is better defined and has more elevation change compared to the middle reach, but not as much along the upper reach. As shown on Figure 3, the water depth along the majority of the lower reach is less than 25 cm. However, there are few stations where the water depth is greater than 50 cm. The vegetation along the banks of the creek contains a high percentage of native vegetation. However, there are some locations that contain higher percentage of non-native vegetation. Between Stations 46 and 47 the vegetation is less than 50 percent native and between Stations 48 and 49 the vegetation is less than 20 percent native.

SECTION 3.0 RESTORATION ACTIVITY ANALYSIS

Habitat Restoration Activities

During the 2012 survey year the focus of the restoration activities conducted at Sunnyslope included sediment and debris plug management and exotic predator removal. A brief summary of the restoration activities conducted in 2012 is presented below.

Sediment and Debris Plug Management

The sediment and debris plug management restoration activities occurred throughout all of Sunnyslope Creek with special emphasis along the middle reach where flows typically in the past have been very slow or reduced to sheet flow. Similar to 2011 methods, sediment and debris plug management activities were accomplished by hand pulling emergent plants, shoveling out sediment plugs, removing trash, and forcing sheet flow and small side channels into the main channel. The sediment and debris plug management activities were conducted in January, February, March, May and August 2012.

Exotic Predator Removal

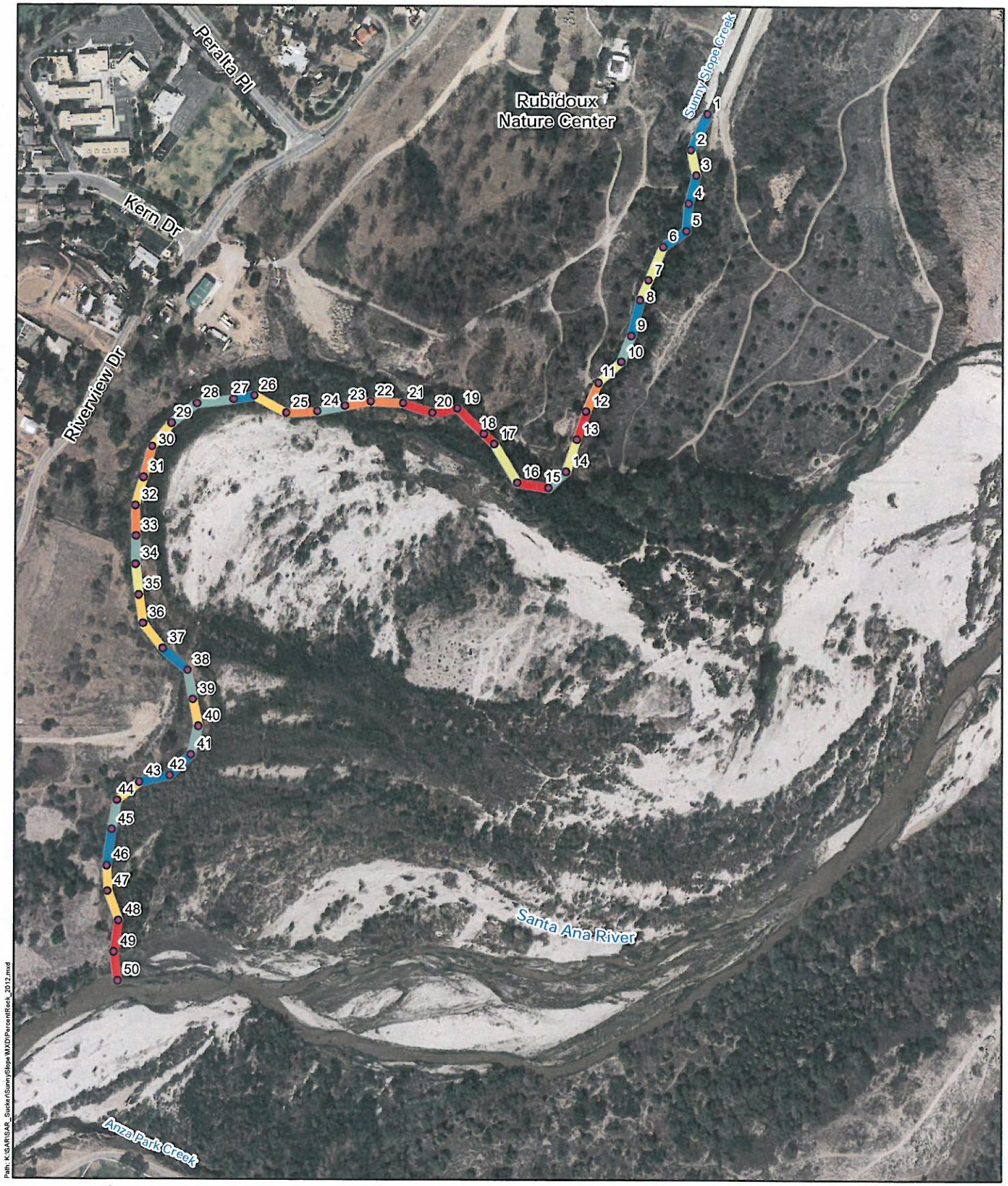
Exotic predators were removed from deep pools and from the undercut banks of Sunnyslope Creek. A combination of seines, dip nets and fish traps were utilized to remove the exotics from the creek. Exotic predator removal was conducted once in January, once in February, five times in March, once in April, three times in May and twice in June.

Habitat Comparative Analysis

In October 2012, OCWD and SAWA resurveyed Sunnyslope Creek. The purpose of the survey was to document the restoration activities that occurred in 2012 and to compare the condition of the habitat to the 2011 condition and to the 2010 pre-restoration baseline condition. Similar to the surveys conducted in 2011, existing condition data were recorded at 30 meter stations along the entire creek and then mapped with GIS software on 2012 aerial photographs. The major focus of the survey was substrate composition, rate of surface water flows, and presence of emerging vegetation in wetted channel. A summary of the data documenting the 2012 condition is presented in Appendix A.

Substrate Composition

To provide a more detailed characterization of the substrate composition, the 2012 substrate condition data was collected and recorded at approximate 1-meter intervals within each 30-meter station. Figure 5 and Figure 6 depict the percentage of rock and sand/silt along the substrate of Sunnyslope Creek.



Sunnyslope Creek
Native Fish Habitat Restoration Project

2012 Percent Rock/Gravel
Figure 5

Path: K:\SAR\SAR_Sucker\SunnySlope\MXD\SandSilt\Concentration_2012.mxd

N
W E
S

Mostly Sand
Mostly Silt
Generally Equal
Below 50%

Aerial Photography Eagle Aerial Spring 2012

0 200 400
Feet

Sunnyslope Creek
Native Fish Habitat Restoration Project

2012 Sand/Silt Concentrations Greater Than 50%
Figure 6

- In 2012, approximately 62 percent of the upper reach exhibited a rock/gravel substrate. In 2011 approximately 53 percent of the upper reach exhibited a rock/gravel substrate and in the 2010 pre-restoration condition approximately 13 percent of the upper reach exhibited a rock/gravel substrate.
- In 2012, approximately 40 percent of the middle reach exhibited a rock/gravel substrate. This percentage compares to 0 percent that was reported in 2011 and 0 percent that was reported in the 2010 pre-restoration condition.
- In 2012, approximately 75 percent of the lower reach exhibited a rock/gravel substrate. In 2011 approximately 14 percent of the lower reach exhibited a rock/gravel substrate and in 2010 pre-restoration condition approximately 12 percent of the lower reach exhibited at rock/gravel substrate.

The 2012 survey provided a higher level of detail characterizing the substrate by focusing on the presence or absence of rock in comparison to previous years when averages of mixtures of rock/gravel, sand and silt were estimated at each station. It is anticipated that the presence/absence survey method is the primary reason why a higher percentage of rock and gravel was reported in all reaches. Increases in rock/gravel in the upper reaches can also be attributed to substrate recontouring restoration activities that were conducted in the upper reach in 2011. Additionally, increases in the middle reaches and lower reaches may have occurred from transportation of rock/gravel downstream from the upper reach during high storm flows. The recommendations for the upcoming 2013 restoration activities should include the implementation of recontouring activities along the middle reach and within deep pools.

Surface Water Flows

During the 2012 survey the methodology was refined and flow rates were classified as low, moderate and fast compared to previous survey years when they were classified as a very low, low, moderate and high. Figure 7 depicts the rates of surface water flows along the upper, middle, and lower reaches of Sunnyslope Creek.

- In 2012 the rate of surface water flow along the upper reach was predominately slow. This compares to the 2011 condition where there was a combination of slow, moderate and high flows throughout the upper reach and to the 2010 pre-restoration condition when the flows were predominately moderate with few areas exhibiting low flows.

N
W E
S

Slow Moderate Fast

Aerial Photography Eagle Aerial Spring 2012

0 200 400
Feet

Sunnyslope Creek
Native Fish Habitat Restoration Project

2012 Rate of Surface Water Flow
Figure 7

- In 2012 the rate of surface water flow along the middle reach was predominately moderate with a few areas exhibiting slow flows. The 2012 rate of surface water flows along the middle reach were generally consistent with the middle reach flows reported in 2011. The surface water flows along the middle reach at the 2010 pre-restoration condition were reported slow almost throughout the entire reach.
- In 2012 the rate of surface water flow along the lower reach was predominately fast with a few areas reporting moderate and slow flows. The 2012 rate of surface water flows along the lower reach were generally consistent with the lower reach flows reported in 2011. The 2010 pre-restoration condition surface water flows along the lower reach were predominately slow with a couple of areas reporting moderate and very slow flows.

The surface water flow analysis shows that surface water flows along the middle reach and lower reach were generally consistent in 2012 and 2011. However, along the upper reach the surface water flows were predominately slow in comparison to the 2011 condition when there was a combination of slow, moderate and high flows occurring throughout the upper reach. The reduced flow along the upper reach can be attributed to choke points created by the accumulation of debris and trash from storm flows and greater focus on removing debris plugs from the middle reach. The recommendations for the upcoming 2013 restoration activities should include increasing the removal of debris and trash along the upper reach especially after high storm events.

Emerging Vegetation

The 2012 survey focused on the presence of emerging vegetation and identification of it as native or non-native in comparison to previous survey years in which the habitat type was characterized. Figure 8 identifies locations along the creek where emerging vegetation was present.

- In 2012 all of the upper reach exhibited an open water condition with no emerging vegetation along the channel bottom. This condition was similar to the condition reported in 2011, but significantly different than the 2010 pre-restoration condition when emerging vegetation was present along the entire upper reach.
- In 2012 almost all of the middle reach exhibited an open water condition, except at a few intermittent locations where emerging native vegetation was present. This condition is similar to the condition reported in 2011, but significantly different from the 2010 pre-restoration condition when

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N
W E
S

Native | Open Water | Non-Native

Aerial Photography Eagle Aerial Spring 2012

0 200 400
Feet

Sunnyslope Creek
Native Fish Habitat Restoration Project

2012 Vegetation in Channel
Figure 8

- emerging vegetation was present in the channel along the entire middle reach.
- In 2012 the majority of the lower reach exhibited an open water condition, except at the most downstream end where there was concentration of emerging native vegetation in the channel. This condition differs from the 2011 condition when the most downstream ends of the lower reach exhibited an open water condition. In the 2010 pre-restoration condition emerging vegetation was present in the channel along the entire reach.

The amount and location of emerging vegetation in the wetted channel was generally consistent in 2012 and 2011, except for a concentration of freshwater marsh vegetation reported at the downstream segments of the lower reach. The 2012 condition is significantly different from the 2010 condition when emerging vegetation was reported throughout the majority of the creek. The concentration of emerging vegetation at the lower reach is not attributed to any particular condition in the creek that facilitates growth, but rather from the lack of vegetation management control at this location. The previous prepared surveys conducted at Sunnyslope Creek have shown that the removal of emerging vegetation from the wetted channel increases the rate of surface water flow, reduces water turbidly and facilitates rock/gravel transport. The recommendations for the upcoming 2013 restoration activities should include continuing the monitoring and removal of emerging vegetation from the wetted channel with special emphasis on the removal of emerging vegetation from the lower reach.

Exotic Predator Removal Program

The upper section of Sunnyslope Creek has historically been the home to many exotic species such as green sunfish, largemouth bass, catfish, carp and crayfish. Controlling these exotic predators is an essential part of the restoration effort at Sunnyslope Creek. In 2011 a wide variety of methods were experimented with to remove exotic species, including passive trapping, gill netting, pole fishing, trot lines, seining, dip netting and electro-shocking. Through trial and error, passive trapping, seining and dip netting were determined to be the most effective. Figure 9 depicts the type of removal methods that were employed to remove exotic predators. The focus of the 2012 exotic predator removal program was to continue to remove exotic predators from deeper pools and from the undercut banks of the creek. As shown in Table 1 a total of 7,685 exotic predator species were removed from Sunnyslope Creek over a 16-day period occurring between January 2012 and September 2012. This number is substantially larger than 1,812 exotics that were removed in 2011 over 27-day period between March of 2011 and December 2011.

Removal of exotic predators with seining method.

Removal of exotic predators with passive trap method.

Table 1: Comparison of Exotic Species Removed

Exotic Species	2012 Removal	2011 Removal
Green Sunfish	42	147
Yellow Bullhead	37	41
Common Carp	0	16
Largemouth Bass	3	14
Black Bullhead Catfish	0	5
Gambusia	7420	1464
Bluegill	1	1
Crayfish	85	84
African Clawed Frog	3	23
Bullfrog	12	4
Red-eared Slider	0	1
Fathead Minnow	82	12
Total	7,685	1,812

The increase in the number of exotic predators removed in 2012 is largely explained by increased efforts to remove gambusia which can be captured and removed in large numbers. Additionally, the refinement of removal methods along with increased knowledge of where concentrations of exotics occur also help to explain the increased number of exotics removed compared to the 2011 exotic removal numbers. Additionally, there was a significant decrease in 2012 on the amount of larger sized fish that were removed, which seems to indicate that most of the larger fish have been removed during previous removal efforts.

As shown in Table 1, in 2012 nine different types of exotic species were removed from Sunnyslope Creek. This number compares to 12 different types of exotic species that were removed in 2011.Those species encountered in 2011, but not encountered in 2012 include carp, black bullhead and red eared slider. The absence of these exotic species does not indicate that they have been eradicated. It is more than likely the species were present and they were not encountered on the days when the other exotic species were removed. Additionally, there were fewer larger exotic specimens removed this year. This is mainly attributed to the previous year efforts when larger specimens were specifically targeted. It is also because the ongoing restoration activities occurring at Sunnyslope Creek have created less favorable habitat conditions for larger exotic specimens.

Table 1 also shows the amounts and types of exotic species that were removed from Sunnyslope Creek in 2011 and 2012. Figures 10 and 11 depict examples of exotic predators removed from Sunnyslope Creek. The amounts and type of exotic species removed in 2012 and 2011 do not correlate to population

Gambusia ***(order Cyprinodontiformes)***

Green Sunfish ***(lepomis cyanellu)***

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Sunnyslope Creek
Native Fish Habitat Restoration Project

Exotic Predators
Figure 10

African Clawed Frog *(Xenopus laevis)*

Crayfish *(Cambarus)*

increases or decreases, but rather represent a random sampling of exotic species that were removed on a given day. The most significant increase in exotic species removed was gambusia which increased from 1,634 removed species in 2011 to 7,420 removed species in 2012. The increase in the amount of gambusia removed has less to do with an increase in population growth of the species, and more with refined removal methods and more focus on the removal of gambusia compared to 2011.

Both years of the exotic predator removal program have yielded high numbers of exotic species removed, especially larger predator fish. The recommendations for the upcoming 2013 restoration activities should include continuing the exotic predator removal program, with emphasis on removing larger predator fish that still might be present.

Native Fish Survey

Sunnyslope Creek was historically occupied by suckers. 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 emerging vegetation. In 2011, winter storms cleared much of the emerging vegetation in the wetted channel and the creek's connectivity to the Santa Ana River was returned. In February 2011 the creek was surveyed and a total of five suckers were identified.

In 2012 Sunnyslope Creek was surveyed 15 times to confirm the presence of native fish. A combination of seining nets and dip nets were used to capture the native fish. All captured native fish were inventoried and returned back to the creek.

Table 2: Native Fish Survey

Date Surveyed	Santa Ana Sucker	Arroyo Chub
1/18/2012	3	6
2/21/2012	8	18
3/1/2012	0	2
3/6/2012	0	2
3/7/2012	0	4
3/9/2012	0	2
3/29/2012	2	0
4/9/2012	3	0
5/14/2012	0	1
5/22/2012	3	2
5/24/2012	2	0
6/6/2012	0	1
6/8/2012	1	0
6/13/2012	0	15
7/19/2012	0	21
Total	22	74

The restoration activities at Sunnyslope Creek have enhanced essential habitat elements for the Santa Ana sucker and arroyo chub and as a result both species have returned to Sunyslope Creek. Figure 12 depicts a sample Santa Ana sucker and arroyo chub surveyed at Sunnyslope Creek. The Second Annual Sunnyslope Creek Monitoring Report provides the first full year of surveying for native fish. As shown in Table 2 there was significantly higher number of arroyo chub reported in Sunnyslope Creek, in comparison to the number of Santa Ana sucker reported. Since both species share the same essential habitat element requirements, it is unlikely that the higher number of arroyo chub reported are result of a particular habitat condition. A more plausible explanation is that at this time there are greater populations of arroyo chub in the watershed in comparison to populations of Santa Ana sucker and therefore there is greater likelihood of encountering them. Future native fish surveys will help to measure if populations of Santa Ana sucker are increasing as a result of ongoing restoration activities being conducted at Sunnyslope Creek.

Santa Ana Sucker *(Catostomus santaanae)*

Arroyo Chub*(Gila orcuttii)*

SECTION 4.0 COSTS ANALYSIS

The tables below reflect the labor hours and associated costs for the restoration activities conducted at Sunnyslope for years 2011 and 2012. As shown below, costs for restoration activities conducted in 2011 were significantly higher compared to 2012. This is largely attributed to the conditions of the creek in 2011. At that time the creek channel contained dense vegetation blockages that not only restricted surfaces water flows and reduced habitat values, but also limited access along the creek. The limited access required several biologists to adequately recon the study area as well as several hours of laborer time for vegetation management activities. Additionally, in 2011, there were significant efforts to remove larger exotic predators and to conduct substrate recontouring. In 2012 the restoration activities at Sunnyslope Creek transitioned to more ongoing maintenance activities to help maintain the restored condition of the creek from previous year restoration activities. The vegetation management activities conducted in 2011 increased access along the creek and substantially reduced the number of hours to conduct reconnaissance and survey reporting activities. Additionally, because of the high amount of exotic predators that were removed in 2011, the exotic predator removals in 2012 largely involved the removal of smaller exotic predators such as gambusia which can removed in large quantities at a lot less time compared to the removal of larger exotic predators. In 2012 native fish surveys were implemented which resulted additional costs compared to 2011, where no native fish surveys were conducted and the emphasis was exotic predator removal. In future years we expect to continue to mainly focus on ongoing maintenance activities. However, in 2013 substrate recontouring activities and increased native fish surveying is planned which could result costs higher than those incurred in 2012.

Table 3: 2012 Restoration Activities Hourly Labor and Costs

Activity	Biologist Hours	Biologist Costs	Laborer Hours	Laborer Cost
Vegetation Management	52.5	$1,575.00	20.0	$750.00
Substrate Recontouring	0.0	0.0	0.0	0.0
Reconnaissance	57.0	$1,710.00	0.0	0.0
Exotic Predator Removal	58.5	$1,755.00	0.0	0.0
Native Fish Survey	41.0	$1,230.00	0.0	0.0
2012 Reporting	24.0	$720.00	0.0	0.0
Total	233.0	$6,990.00	20.0	750.00

Table 4: 2011 Restoration Activities Hourly Labor and Costs

Activity	Biologist Hours	Biologist Costs	Laborer Hours	Laborer Costs
Vegetation Management	76.0	$2,200.00	120	$4,500.00
Substrate Recontouring	80.5	$2,691.00	24	$900.00
Reconnaissance	260.0	$7,524.00	0.0	0.0
Exotic Predator Removal	178.0	$5151.00	0.0	0.0
Native Fish Survey	0.0	0.0	0.0	
2011 Reporting	86.0	$3,561.00	0.0	
Total	913	$21,127.00	144	$5,400.00

SECTION 5.0 RECOMMENDATIONS

Based on the results of the 2011 and 2012 Sunnyslope Creek Native Fish habitat Restoration Project Monitoring Report the following restoration activities are recommended to be implemented in 2013.

1. It is strongly recommended that the ongoing restoration activities and management of Sunnyslope Creek continue and that efforts be made to ensure that future funding will be available for annual creek monitoring and management.
2. Monthly monitoring of the creek conditions should continue. Periodic removal of blockages and other maintenance activities should occur to maintain fish passage to and from the river along the entire creek and that special focus should occur along the middle reach of the creek.
3. The majority of the gravel in Sunnyslope Creek currently occurs in the upper reach. To increase the amount of gravel base in the creek, periodic re-contouring with gravel and rock from the adjacent dry channels should occur with special focus given to the middle and lower reaches where the desired substrate is most needed.
4. Additionally, a number of deep pools still remain in Sunnyslope Creek that should be filled with larger rocks to help increase available habitat for the native fish while reducing habitat for large predatory fishes.
5. Removal of exotics should be an ongoing monthly or bi-monthly activity until the populations of larger predatory fishes have been significantly reduced.
6. Trash is one of the contributors to the reformation of blockages in the creek. A trash boom should be installed where the creek first becomes earthen to see if the trash could be forced to accumulate to one side there, rendering control and pickup much more effective and efficient. After significant storm events Sunnyslope Creek should be monitored to determine whether trash and debris blockages are present and if found they should be removed immediately.
7. "Natural" bottlenecks along the upper creek include large palms and other nonnative trees that should be weeded out and replaced with natives over time.
8. Non-native vegetation should continue to be removed along the banks of the creek to allow room for the natural regrowth of native vegetation with focus at Stations 4 to 9, Stations 18 to 19 and Stations 46 to Station 49.

SECTION 6.0 ACKNOWLEDGEMENTS

We thank Heather Dyer, Chris Medak and Carrie Galst of the U.S. Fish and Wildlife Service for guidance in getting the project off the ground, throughout implementation, and for assistance in the field; Anna Ewing and Jeff Brandt of the California Department of Fish and Wildlife for regulatory guidance and advice; Sherrie Chandler of the Riverside County Parks and Open Space District for logistical support and encouragement and for all her great work on cleanup, education and people management on the creek; the Orange County Sandbaggers, Jason Vos and crew did most of the hand labor and were singularly responsible for the speed, efficiency, and success of the project; Dave Woelfel of the Regional Water Quality Control Board provided regulatory guidance and encouragement; SAWPA through Jeff Beehler provided some of the project funding and much appreciated PR; and we thank Kerwin Russell of the Riverside-Corona Resource Conservation District for assistance with exotic fish control and for recent regulatory insights. We also thank Richard Zembal, Bonnie Johnson and Daniel Bott of the Orange County Water District and Brett Mills of the Santa Ana Watershed Association.

Appendix A
2012 Data Collection

2012 Data Collection
Survey Date October 24, 2012

Station	Max Water Depth (Centimeters)	Emerging Vegetation In Channel	Mix Emerging. Vegetation In Channel	Vegetation Along Banks	Mix Vegetation Along Banks	Rate Surface Water Flow
1	17	No	NA	Yes	100% Native	Moderate
2	99	No	NA	Yes	90% Native 100% Non-Native	Slow
3	175	No	NA	Yes	85% Native 15% Non-Native	Slow
4	110	No	NA	Yes	20% Native 80% Non-Native	Slow
5	47	No	NA	Yes	40% Native 60% Non-Native	Moderate
6	60	No	NA	Yes	0% Native 100% Non-Native	Slow
7	103	No	NA	Yes	0% Native 100% Non-Native	Slow
8	87	No	NA	Yes	20% Native 80% Non-Native	Slow

Station	Max Water Depth (Centimeters)	Emerging Vegetation In Channel	Mix Emerging. Vegetation In Channel	Vegetation Along Banks	Mix Vegetation Along Banks	Rate Surface Water Flow
9	58	No	NA	Yes	70% Native 30% Non-Native	Slow
10	55	No	NA	Yes	100% Native 0% Non-Native	Slow
11	66	No	NA	Yes	50% Native 50% Non-Native	Slow
12	100	No	NA	Yes	95% Native 5% Non-Native	Slow
13	74	No	NA	Yes	90% Native 10% Non-Native	Slow
14	115	No	NA	Yes	40% Native 60% Non-Native	Slow
15	68	No	NA	Yes	60% Native 40% Non-Native	Slow
16	58	No	NA	Yes	90% Native 10% Non-Native	Slow