

SANTA ANA SUCKER HABITAT RESTORATION AND POPULATION REINTRODUCTION RECONNAISSANCE STUDY

PREPARED BY

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1.0 INTRODUCTION

1.1 Background

The Orange County Water District (OCWD) is the manager of the Orange County Groundwater Basin. The groundwater basin provides underground water supplies to 23 cities and over 2.3 million persons in northern Orange County. One of the roles of OCWD is to replenish the groundwater basin to ensure adequate supplies are available for the future. OCWD maintains and operates 17 major recharge facilities that receive flows directed from the Santa Ana River (Santa Ana River), including the 365 Prado Wetlands in Riverside County. Because OCWD water management activities affect other resources, OCWD provides stewardship of natural resources as a component of its water management activities. One such resource is a native fish species to the Santa Ana River, the Santa Ana sucker (*Catostomus santaanae*), a threatened species on the federal list of threatened and endangered species. Because of its listing and concern for the continuing decline in the population of the sucker, OCWD and a group of local, regional, state, and federal agencies in 1998 formed the Ad-Hoc Santa Ana Sucker Discussion Team, now known as The Santa Ana Sucker Conservation Team (Sucker Conservation Team). The Sucker Conservation Team is comprised of the Orange County Water District (OCWD), Orange County Sanitation District (OCS), City of Riverside, Riverside County Transportation and Land Development Department, Riverside County Flood Control and Water Conservation District, San Bernardino County Flood Control District, the Orange County Resources and Development Management Department, Santa Ana watershed Project Authority and the Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Facility. The objective of the Sucker Conservation Team is to establish a conservation program that would contribute to the survival and recovery of the sucker within the Santa Ana River watershed.

Through a coordinated effort undertaken by the Sucker Conservation Team, three separate studies have been prepared examining the ecology of the sucker. The first study examined the effects of physiochemical variables such as stream discharge and water quality on the sucker. A second study examined migration patterns, predatory fish relationships, and the use and importance of tributaries for the sucker. The final study focused on developing conservation strategies for the recovery in the Santa Ana River. At this time the Sucker Conservation Team is focusing its efforts on sucker habitation restoration and sucker population reintroduction to help provide for the recovery and conservation of the sucker.

1.2 Purpose

The purpose of this reconnaissance study is to meet conditions from the California Department of Fish and Game (CDFG) that were imposed on OCWD water rights application along the Santa Ana River. Additionally, the study would provide focus to the Sucker Conservation Team on the identification and evaluation of potential project areas within the watershed of the Santa Ana River

that would provide the most viable opportunities for sucker habitat restoration and sucker reintroduction.

2.0 BIOLOGICAL OVERVIEW

2.1 Introduction

The Santa Ana sucker is a small, short-lived member of the Catostomidae family of suckers that is endemic to the Los Angeles River, San Gabriel River and Santa Ana River. The Santa Ana sucker (sucker) is silvery below and darker along the back with irregular blotches. Adult suckers are relatively small and commonly less than 110 mm (4 inches). At six months of age suckers average 44 mm (1.5 inches). As they mature during the second summer they usually measure about 75 to 110 mm (2.5 to 4 inches). Both the male and females typically grow at the same rate.

Suckers inhabit perennial streams that are generally small and shallow, typically 5 to 8 meters (16 to 26 feet) wide and about 15 cm to 1 m (6 inches to 3 feet) deep. Surface water flows must be present within the stream but it can vary from slight to swift. The sucker prefers cool and clear streams with rocky substrate with riffles and pools. The riffles and pools provide refuge from high velocity flows, provide sites for spawning fish and provide attachment sites for benthic invertebrates and plants. Many of the streams where suckers are found have vegetation overhangs along the banks that provide cover and shade from extreme temperatures.

The sucker is primarily a bottom feeder. The lower lip of the sucker contains cartilaginous ridges that allows the suckers to scrape algae, diatoms and detritus from the surface of rocks and other hard substrates. Typically detritus, algae and diatoms constituted 98% of sucker diet and the remaining 2% included aquatic insect larvae, fish scales and fish eggs (Greenfield 1970). Larger suckers have a higher percentage of insect material in their diets, while younger suckers less than one year feed primarily on algae, diatoms and detritus. After the first year aquatic insects become a significant part of their diet (Greenfield 1970). The growth of river populations of suckers tends to be slower than populations in ponds. This can be attributed to higher amounts of algae, diatoms and detritus being available in pond environments (Greenfield 1970).

By the first year, suckers become reproductively mature and begin spawning during the first and second years, lay anywhere between 4,400 and 16,000 eggs at one time (Greenfield 1970). Spawning peaks between late May through early June, but is known to occur as early as March and as late as July (Moyle 1976). Suckers are adapted to living in unpredictable environments and their short generation period and prolonged spawning period allows them to repopulate rivers and streams following population-reducing flood events. Most suckers do not survive beyond the second year, although a few have been known to live three and even four years.

2.2 Species Range

The Santa Ana sucker appears to be native to the larger streams of the Los Angeles Basin; the Los Angeles, San Gabriel, and Santa Ana River drainage systems in Los Angeles, Orange, Riverside, and San Bernardino Counties (Smith 1966). Although historic records are scarce, Santa Ana suckers presumably ranged from near the Pacific Ocean to the uplands of the Los Angeles and San Gabriel river systems, and to at least the Pump House inside the San Bernardino National Forest in the San Bernardino Mountains (USFWS). The species has experienced declines throughout most of its range (Swift 1993), and is now restricted to three noncontiguous populations along the Lower and middle Santa Ana River, along the East, West, and North Forks of the San Gabriel River and along Lower Big Tujunga Creek (USFWS 2002).

In response to its declining population, the United States Fish and Wildlife Service (USFWS) in 2004 listed the sucker as a Federally Threatened Species. The California Department of Fish and Game has listed the sucker as a Species of Special Concern. To facilitate the conservation of the sucker and its habitat, USFWS designated a total 5,765 acres of habitat along the San Gabriel River and 3,655 acres of habitat along Big Tujunga Creek as critical habitat.

2.3 Threats

The physical alterations of rivers, streams and creeks have directly contributed to the population decline of the sucker. The construction of barriers has prevented the upstream and downstream movement of suckers and has increased the potential for predation from exotic fish that prey upon suckers. Additionally, the urbanization of watersheds has degraded water quality, and increased sedimentation impacts that have resulted in changes to the hydrologic regime and fluvial processes of water systems which have resulted in the fragmentation of sucker populations and their habitat. The high degree of fragmentation of remaining populations has made the sucker especially vulnerable to random events, and environmental factors. Additionally, the changes to the altered fluvial processes and barrier restrictions to movement have fragmented the historic range of the sucker such that remaining reaches of occupied habitat now function independently of each other. Isolated populations become more susceptible to extirpation by accidental or natural catastrophes because their recolonization has been precluded. Additionally, the remaining fragmented habitat is often degraded which can contribute to reduced growth, fecundity and survivability of suckers.

3.0 GENERAL DISTRIBUTION OF SANTA ANA SUCKER

3.1 Introduction

The Santa Ana River is the largest river in southern California. Its headwaters are high in the San Bernardino Mountains and it flows over 100 miles southwesterly to the Pacific Ocean. The watershed covers over 3,200 square miles of widely varying urban, rural and forested terrain and includes portions of Orange, Riverside and San Bernardino Counties. The amount, type and quality of sucker habitat varies throughout the watershed.

3.2 Upper Santa Ana Watershed

The Upper Santa Ana River Watershed extends from the headwaters of the Santa Ana River in the San Bernardino Mountains generally to the Riverside Avenue Bridge Crossing. Within the San Bernardino Mountains there are a number of natural creeks that contain preferred habitat elements to support suckers. These creeks include, Mill Creek, Plunge Creek, Mountain Home Creek and City Creek, as well as number of smaller creeks and streams. Of these creeks, City Creek is the only one that is known to historically contain suckers. However, given the suitable habitat that occurs in the mountain creeks it is more than likely that at one time all of these creeks contained suckers.

Presently, storm water flows of the Santa Ana River are impounded behind the Seven Oaks Dam for flood control purposes. Except for the storm flow and the periodic releases of flows from Seven Oaks, the reach of the Santa Ana River between Seven Oaks Dam and the Rialto Channel is usually dry. Along this reach the Santa Ana River channel is a braided, dry channel consisting of sand and gravel washes. Riparian habitat along this reach is uncommon and is limited to a few patches of vegetation. While the area lacks perennial water to support suckers, it does provide a source of sediment to help replenish gravel starved areas in the middle reaches of the river. Within the upper watershed there are several tributary drainages to the Santa Ana River, including Mission Channel, San Timoteo Channel, Twin Creek, and Reche Canyon. The surface water flows within these tributaries are seasonal.

The Rialto Channel is the only perennial tributary in the upper watershed, except for mountain creeks in the San Bernardino Mountains. The perennial flows along the Rialto Channel are effluent from the Rialto and RIX Wastewater Treatment Plants. The channel is considered to contain high value sucker habitat and has historically supported high numbers of suckers (Baskin 2006).

3.3 Middle Santa Ana River Watershed

Downstream of the Rialto Channel, the surface water flows of the Santa Ana River become more prevalent, and the river picks up enough urban discharge to support perennial flows. Portions of the Santa Ana River floodplain maintains productive riparian habitat that is dominated by willows. The substrate of the river consists of a mixture of sand, gravel, and cobble. Downstream through the

river consists of a mixture of sand, gravel, and cobble. Downstream through the City of Riverside, the Santa Ana River is relatively constrained and is sometimes referred to as the Riverside Narrows. Surface flows are perennial throughout most of the year. Along this reach, the river generally has a sandy bottom that is relatively flat and broad. The perennial flows support extensive riparian growth, including mature native trees and understory. Waters are relatively warm, in part because of the broad and shallow river morphology. Historically, within the middle watershed, the reach of the Santa Ana River between the Rialto Channel and Mission Boulevard have contained the greatest number of suckers (Baskin 2006). Within the middle watershed there are several tributary drainages that contain perennial water and essential habitat elements for the sucker.

The downstream end of the middle watershed is referred to as the Prado Basin. The Santa Ana River flows along this reach are perennial, broad and flat with dense thickets of native and non-native vegetation along the banks. The substrate consists mostly of shifting sands resulting from the lack of sediment transport through Prado Dam. This reach also contains large numbers of exotic fish that prey on suckers and compete with them for food and shelter. Based on lack of preferred habitat elements, the Prado Basin is not considered to have high sucker habitat value. However, even though the Prado Basin contains minimal habitat value, suckers have been historically reported between Prado Dam and Hamner Avenue (Chadwick 1991, Chadwick 1996, Swift 1998, Swift 1999, Swift 2000, OCWD 2002, OCWD 2003, Baskin 2008, Swift 2009).

3.4 Lower Santa Ana River Watershed

The Lower Santa Ana River Watershed extends from the Prado Dam through Orange County to the Pacific Ocean. Downstream from the Prado Dam, the Santa Ana River meanders through the Green River Golf and the Santa Ana Mountain Canyon. Along this reach, the Santa Ana River tends to be narrower and deeper. The floodplain becomes more open and the river largely exists in a natural condition. The flows along the river are very swift and the river bottom consists of bedrock like material as a result of scouring and lack of sediment transported through Prado Dam. Along this reach of the Santa Ana River there is good riparian habitat. Downstream of Weir Canyon, the riparian vegetations along the river transitions into non-native weedy marsh vegetation. The bottom of the river is soft. However, the embankments of the river have been improved with rip rap and several drop structures occur along the bottom of the channel. The drop structures are about six feet in height and act as a barrier to upstream movement along the river. Below Chapman Avenue to 17th Street the river bottom has been converted to a public golf course and downstream of 17th Street the river is completely concreted lined along the bottom and embankments. The water flows along the most downstream segment are seasonal or consisting of urban runoff. Ocean tides reach about 1.5 miles inland.

Despite the physical constraints and less than ideal sucker habitat along the reach of the Santa Ana River below Prado Dam, historically, high numbers of

suckers have been reported (Swift 1987, Chadwick 1991, Chadwick 1992, Chadwick 1996, Giusti 1996, Swift 1998, Swift 1999, Swift 2000, Baskin 2009).

It is anticipated that because of the lack of preferred habitat, the populations of suckers found below Prado dam are not self sustaining, but are sustained by immigration from upstream populations and from the recent re-stocking of captive fish (Russell 2007). Suckers are probably rare below Prado Dam. The abundance of deep pools that house predators, turbid water, and fast flows make it difficult to sample for suckers. It is anticipated that very low numbers of suckers survive after being reintroduced in the lower reaches of the Santa Ana River.

4.0 POTENTIAL PROJECT AREAS

4.1 Essential Elements of Sucker Habitat

The essential habitat elements for the sucker were identified through the review of several scientific studies that examined the habitat requirements and ecology of the sucker in the Santa Ana River (Saiki 2000), (Haglund, Baskin, Swift 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008). The essential habitat elements provide the needed physical and biological features to maintain self-sustaining populations of suckers. Based on the best available information, the following essential habitat elements are needed to support viable sucker populations.

- A functioning perennial hydrological system during both storm and non-storm seasons that provides upstream and/or downstream hydrological connectivity to another hydrological system or water body.
- A channel substrate consisting of a mosaic of loose sand, gravel, cobble, and boulder substrates.
- Water depths between 6 inches 3 feet with riffles, runs, pools, shallow stream margins and deeper pools.
- Moderate surface water flow velocities where there is a steady current with no surface water waves or chop.
- High water quality with non-turbid water or only seasonally or intermittently turbid water.
- Bank or emergent vegetation that provides covering or shading to maintain water temperatures less than 30 degree centigrade (86 F).
- In-stream habitat that supports algae, aquatic emergent vegetation, and macroinvertebrates
- Abundant riparian vegetation that overhangs along the banks, of which the majority is native vegetation.

In addition to evaluating the presence of essential environmental habitat elements, the following other relevant factors were considered in the selection of potential project areas.

- Historic and/or currently known occupied habitat
- Potential for predation threats

- Property ownership constraints
- Recreation pressure and potential anthropogenic impacts

4.2 Potential Project Areas

A total of 15 potential project areas were investigated for sucker habitat restoration and/or sucker reintroduction. The potential project areas were selected based on the quantity and quality of essential habitat elements needed to sustain sucker populations. The assumption is that those project areas that contain the highest amount and highest value of essential habitat elements would have a higher success rate for sucker habitat restoration and sucker population reintroduction, compared to project areas that lack or contain low quality habitat. As shown below, two candidate project areas are located along the main stem of the Santa Ana River and thirteen are located along tributaries to the Santa Ana River. Below is a listing of the potential project areas that were selected for evaluation.

TABLE 1: POTENTIAL PROJECT AREAS

Candidate Site	Location
Lower Santa Ana River	Between Weir Canyon Road and Gypsum Canyon Bridge
Aliso Creek	Upper and Lower Aliso Creek Canyon, Chino Hills
Chino Creek	Between Central Avenue and Euclid Street
Temescal Creek	Between Lincoln Bridge and Prado Basin.
Santa Ana River Upstream River Road	Between River Road and Hamner Avenue.
Hidden Valley Outfall Channel	Between Hidden Valley Wetlands and Santa Ana River
Sunnyslope Creek	Between Rubidoux Nature Center and Santa Ana River
Gooseberry Creek	Between Martha Mclean Park and Santa Ana River
Evans Lake Channel	Between Evans Lake and Santa Ana River
Anza Drain	Between treatment plant effluent channel and Santa Ana River
Rialto Channel	Between Agua Mansa Road and Santa Ana River
Mill Creek	San Bernardino Mountains
Mountain Home Creek	San Bernardino Mountains
Plunge Creek	San Bernardino Mountains
City Creek	San Bernardino Mountains.

4.3 Methods

For each potential project area a profile has been prepared that documents the quantity and quality of the essential habitat elements present. A combination of documented research, aerial photography interpretation, site assessments, GIS mapping, photo documentation, interviews and communications with outside agencies was used in the preparation of the project area profiles. The data was recorded in January through March of 2009. During this period some rainfall did occur. However, for most part the flows along the river and the tributaries were more typical to the base flows occurring in the summer. Based on the essential habitat condition, potential opportunities for sucker habitat restoration and/or sucker reintroduction are identified. The project areas that provide the most viable opportunities for habitat restoration or population reintroduction would be advanced for further analysis and implementation.

5.0 PROJECT AREA PROFILES

5.1 Lower Santa Ana River

Location: The Lower Santa Ana River project area encompasses a 2.5 mile reach of the Santa Ana River located between the Gypsum Canyon Bridge and the Weir Canyon crossing. The project area is located on USGS Quadrangle for Black Star Canyon, Township 3 S, Range 8 W Section 28.

Topography: The project area reach of the Santa Ana River is a natural river system with a soft bottom and well defined banks. The width of the river ranges from approximately 10 to 40 feet. The substrate consists of a rocky hard surface with intermittent pockets of sand. Some small cobbles to medium sized rocks occur throughout the project area.

Downstream of the project area, the river becomes gradually more improved with drop structures and concrete rip rap lining. Some of the river low flow is diverted to groundwater recharge basins managed by the Orange County Water District. Below Chapman Avenue the flows along the river are reduced to a very shallow low flow consisting mostly of urban run-off that ultimately drains into the Pacific Ocean.

Hydrology: The water source within the project area reach of the Santa Ana River is perennial. During the summer months the majority of the flow is effluent discharged from upstream water treatment plants. Even during the summer months the flows along the project area are very swift and deep. The average water depth is about 5 feet with several deeper pools. Because of the velocity of the flows, the water is turbid at most times.

Vegetation: The project area extends through a riparian forest consisting mostly of native vegetation. Extensive riparian overhangs occur along the banks of the river providing cover and shade. The project area does contain some stands of *Arundo*. However, most of it was burned in the 2008 fire.

Occupied Habitat: The project area has historically contained occupied sucker habitat. However, at this time the occurrence of suckers within the project area would be considered rare.

Predation: The primary predation concern is the large numbers of exotic fish that occupy the deep holes in this reach of the Santa Ana River.

Land Use: The project area is situated within an open setting and there are no urbanized land uses within the immediate area. Even though easy access is available, recreation pressure and anthropogenic impacts to the project area should be low.

Approvals: The project area is maintained by the Orange County Flood Control District. Any proposed activities in the river would require coordination with the County of Orange. Additionally, approval from CDFG, Corps, USFWS and the Regional Water Quality Control Board would be needed.

5.1.1. Habitat Restoration Opportunities

The project area contains many of the habitat elements needed to sustain sucker populations, such as rocky substrate, perennial water and riparian lined banks. However, the surface water flows through the project area very fast and most likely would wash away any restored habitat. Because suckers are now considered rare in the lower Santa Ana River, after following several years of sucker re-stocking, proposed habitat restoration activities are not expected to increase the survivability or expand existing populations of suckers, and therefore are not recommended.

5.1.2. Population Reintroduction Opportunities

The project area has a number of constraints that would significantly affect the success of any proposed sucker reintroduction activities. The surface water flows through the project area are very fast and turbid making it very difficult for the suckers to find food and shelter. Additionally, the high velocity flows could wash suckers downstream, ultimately to reaches of the river that are improved with a concrete lined bottom that provide limited food and shelter. The drop structures located long the river would prevent upstream movement to areas of the river where shelter and food exist. Additionally, the high amount of exotic fish downstream and upstream of the project area would pose a significant predation threat. The habitat constraints in the project area have significantly affected the survival rate of suckers reintroduced into this reach of the Santa Ana River, and therefore further population reintroductions is not recommended.



 Project Area



0 750 1,500 3,000
Feet

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Lower Santa Ana River Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Lower SAR north of Gypsum Bridge, high velocity flows with deep river bottom. Extensive riparian overhangs occur along both banks.



Lower SAR north of Weir Canyon, similar conditions to Gypsum Bridge area.

5.2 Aliso Creek

Location: Aliso Creek is a natural creek located within Chino Hills State Park in the Chino Hills. The creek extends along Aliso Canyon through the Green River Golf Course to its confluence with the Santa Ana River. Aliso Creek is generally located USGS Quadrangle for Prado Dam, Township 3 S, Range 8 W, Section 4,3,10, 15 and 25.

Topography: Aliso Creek is a soft bottom natural drainage. The upper portion of the creek is confined within a deeply incised drainage ranging in width from 5 to 25 feet. The lower portions of the creek are more wide open. The creek meanders slowly through the Chino Hills and is mostly absent of any riffles, drops or waterfalls. Along the creek there are a number of isolated pools. The majority of the substrate along Aliso Creek consists of gravel and small cobbles. Within the isolated pools, the substrate consists largely of silt and vegetation.

Hydrology: Along the upper portion of Aliso Creek the water source is perennial from rising groundwater. The creek flow lacks sufficient head and is confined to isolated pools. There are several segments along the upper portion of the creek that are dry. The isolated pools along the creek range anywhere from five to 50 feet and the water depth ranges from a couple of inches to about two feet. The surface water along the creek is mostly stagnant exhibiting high levels of turbidity from the silt and vegetation along the pool bottoms. Along the lower portion of Aliso Creek the water source is seasonal. The surface flows from the upper portion of the creek dissipate before reaching the Santa Ana River.

During the storm season surface water flows occur throughout the upper and lower portions of Aliso Creek. Based on the amount of erosion occurring along the creek, it is anticipated that during the storm season the flows along Aliso Creek are very fast and provide hydrologic connectivity between the creek and the Santa Ana River.

Vegetation: Along the upper portion of Aliso Creek there are dense clusters of sycamore trees along the banks and within the creek channel providing cover and shade. Most of vegetation along the creek has been recently burned. Along the portion

of the creek, the terrain is more wide and the vegetation is less dense.

Occupied Habitat: Aliso Creek is not known historically or currently to contain occupied sucker habitat. However, suckers have been reported along the Santa Ana River near its confluence with Aliso Creek.

Predation: Because most of the water along the creek in the upper canyon occurs in isolated in shallow pools, it is anticipated that little aquatic life exists in the creek that would be a predation threat to suckers. Therefore, the predation threat would be considered low.

Land Use: Aliso creek can be accessed by driving or by hiking. Even though the creek is within Chino Hills State Park, recreation pressure and anthropological impacts should be low.

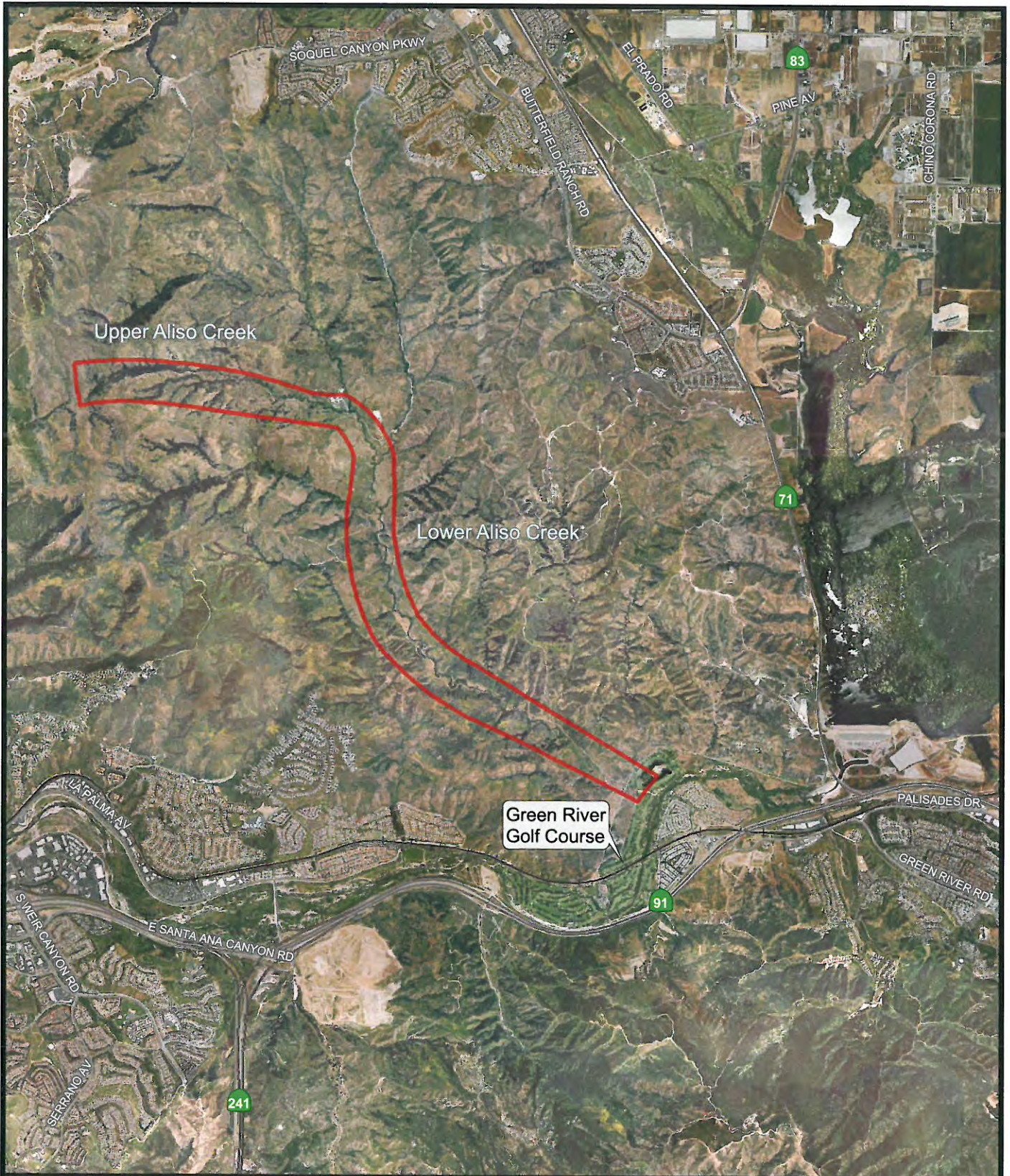
Approvals: Aliso Creek is maintained by the California Department of State Parks. Any proposed activities in the creek would require coordination with State Parks. Additionally, approval from CDFG, Corps USFWS and the Regional Water Quality Control Board would be needed.

5.2.1. Habitat Restoration Opportunities

The Aliso Creek project area lacks several of the essential habitat elements needed to support suckers. A considerable amount of the upper portion of the creek does not contain perennial water. Those waters that are perennial occur in isolated pools and exhibit high levels of turbidity. Along the lower portion of the creek, surface water flows are seasonal only. The lack of perennial water would significantly affect the success of any habitat restoration activities. Unless a reliable source of water can be provided, habitat restoration activities are not recommended.

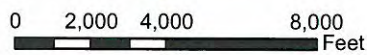
5.2.2. Population Reintroduction Opportunities

Due to the lack of perennial surface water flows and reduced water quality concerns, Aliso Creek is not recommended for sucker reintroduction.



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 Project Area



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Aliso Creek Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Lower Aliso Creek, upstream view of creek, just below Lower Aliso Creek Lookout.



Lower Aliso Creek, meandering creek alignment with rock and cobble substrate.



**Lower Aliso Creek, most downstream segment of creek.
Green River Golf Course in background.**



**Lower Aliso Creek, more wide open with less dense
Vegetation.**



Upper Aliso Creek, perennial flows are confined in isolated pools along the creek.



Upper Aliso Creek, isolated pools with silt and vegetation along the substrate.



Upper Aliso Creek, riparian overhangs occurring along isolated pools.



Upper Aliso Creek, without surface water.

5.3 Lower Chino Creek

Location: The Lower Chino Creek project area is an approximate three mile reach of Chino Creek located between Central Avenue and Euclid Avenue within the City of Chino Hills. The project area is generally located on the USGS Quadrangle for Prado Dam, Township 2 S and 3 S, Range 7 W and 8 W, Sections 6 and 36.

Topography: Chino Creek is a portion of the drainage system that provides drainage from the Mt. Baldy watershed. The flows along Chino Creek extend through the Chino Hill Golf Course into Prado Basin where they join the Santa Ana River and are impounded in a pool behind the Prado Dam during the wet season. Upstream of Central Avenue, Chino Creek is channelized with a concrete bottom. Downstream of Central Avenue, Chino Creek transitions into a natural soft bottom channel. The width of the creek within the project area ranges from approximately 20 feet to 30 feet and the surface water flows are confined in a deeply incised channel. The substrate along the creek consists predominantly of gravel with a scattering of larger boulders. Downstream of the project area, near Euclid Street, the substrate transitions to a mostly sandy to silt bottom with some intermittent gravel.

Hydrology: The water source in Chino Creek is perennial and consists of effluent discharged from upstream water treatment plants and urban runoff. The water depth along lower Chino Creek ranges from 1 to 3 ½ feet. However, near the Euclid Street crossing the creek forms a deep pool before transitioning back to its 1.5 to 3 feet depth range. The flow of the creek is moderate to swift with intermittent riffles. The water quality is fair with some turbidity. Water temperatures are cool in the winter and warm in the summer. The creek exhibits significant undercutting and bank erosion indicating the occurrence of high flows at times.

Vegetation: The project area contains dense native vegetation consisting of willow trees and mulefat. Over-hangs occur along both banks providing cover and shade during the hot summer months. Less than 20 percent of the site consists of non-native vegetation.

-
- Occupied Habitat:** The project area historically and currently is not known to contain occupied sucker habitat. However, there are small patches of habitat that appear to be suitable for sucker.
- Predation:** The deep pool formed at Euclid Street is known to contain a large concentration of exotic fish that would pose a significant predation threat to suckers.
- Land Use:** The site is situated within an urbanized setting and is highly disturbed with trash and debris. The project area is surrounded by commercial and industrial land uses and there are water quality concerns from urban runoff draining into the creek. Because of easy access to the project area there is concern for public access conflicts and anthropogenic impacts.
- Approval:** The project area reach of Chino Creek is maintained by the San Bernardino County Flood Control District and the City of Chino Hills. Any proposed activities in the creek would require coordination with the City of Chino Hills and the County of San Bernardino. Additionally, approval from CDFG, Corps, USFWS and the Regional Water Quality Control Board would be needed.

5.3.1. Habitat Restoration Opportunities

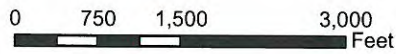
The Chino Creek project area contains many of the essential habitat elements needed to support suckers. Additionally, the creek provides hydrologic connectivity to the Santa Ana River that would allow the suckers to have upstream and downstream movement between the creek and the river. However, there are significant concerns regarding the distressed condition of the site and degraded water quality. There is easy public access to the creek and there is also concern that continued anthropogenic disturbances could occur potentially resulting in adverse impacts to sucker habitat and/or suckers in the creek. Additionally, the large population of exotic fish at the deep pool near the Euclid Street crossing would be a significant source of potential predatory fish. Given the disturbed condition of the site, reduced water quality, and the threat of predation from exotic fish, the project area is not recommended for habitat restoration.

5.3.2. Population Reintroduction Opportunities

Because of the disturbed condition of the project area, reduced water quality and need for ongoing exotic fish removal, the Lower Chino Creek project area is not recommended for sucker reintroduction.



 Project Area



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Lower Chino Creek Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Lower Chino Creek, creek confined in deep incised Drainage with dense vegetation.



Rocky and cobble substrate with some larger rocks.



Lower Chino Creek, deep pool formed near Euclid Street Crossing.



Lower Chino Creek, exhibiting turbid water within channel and debris along the banks.

5.4 Lower Temescal Creek

- Location:** The Lower Temescal Creek project area is an approximate 1.2 mile reach of the lower portion of Temescal Creek between the Lincoln Bridge and the Prado Basin within the City of Corona. The project area is generally located on USGS Quadrangle Corona North, Township 3 S, Range 7 W, Section 17.
- Topography:** Temescal Creek is a portion of the Temescal Watershed that provides drainage for the eastern face of the Santa Ana Mountains. Additionally Temescal Creek receives the overflow from Lake Elsinore. Upstream of Lincoln Avenue, Temescal is completely channelized with a concrete bottom. Downstream of Lincoln Street to the Prado Basin, Temescal Creek transitions from a fully channelized flood control facility to a soft bottom natural drainage. The reach of Temescal Creek within the project area consists of a series of narrow braided streams and wide pools. The bottom of the creek has a low gradient as it drains into the Prado Basin. The substrate of the creek bottom consists predominantly of sand and silts with some intermittent pockets of cobbles and boulders.
- Hydrology:** The water source within Temescal Creek is seasonal consisting of urban runoff and rising groundwater during the summer and wastewater flows discharged from upstream water treatment plants during the winter. During the low flow periods, the flows along this reach of Temescal Creek are very slow and typically dissipate into the Prado Basin before reaching the Santa Ana River. There are significant periods of time during the summer when segments of Temescal Creek within the project area are dry. During the winter the flows along the creek are swift and are strong enough to reach the Santa Ana River to maintain hydrologic connectivity between the creek and the river. Water temperatures are cool in the winter and warm in the summer months.
- The depth of the water in Temescal Creek ranges from about one to three feet along the narrow segments and about 1 foot in the wider pools. During the summer months, the flows along the creek are very slow and stagnant and exhibit high turbidity, especially within the wider pool areas.

-
- Vegetation:** The project area contains approximately 50 percent native vegetation comprised of willows trees and mulefat and 50 percent vegetation comprised of non-native weeds/arundo. Minimal amounts of vegetation overhang occurs along the creek.
- Occupied Habitat:** The project area historically and currently is not known to contain occupied sucker habitat.
- Predation:** Because of the seasonal flows that occur within the project area reach of Temescal Creek, it is expected that there is minimal amount of aquatic life. Predation threats would be considered low.
- Land Use:** The project area is situated within an urbanized setting and is disturbed with trash and debris. The project area is bounded by residential uses to the north and vacant undeveloped land to the west. Given the pattern of development in the area, it is anticipated that the vacant land would be developed and urban runoff impacts into the creek could increase. Because of easy access to the project area, there is also concern for public access conflicts and anthropogenic impacts.
- Approvals:** The project area is maintained by the Riverside County Flood Control District and the City of Corona. Any proposed activities in the creek would require coordination with the City of Corona and Riverside County. Additionally, approval from CDFG, Corps and the Regional Water Quality Control Board would be needed.

5.4.1. Habitat Restoration Opportunities

Due to the lack of perennial water, degraded water quality and the distressed condition of the creek, the project area reach of Temescal Creek is not considered a viable location for sucker habitat restoration.

5.4.2. Population Reintroduction Opportunities

Due to the lack of perennial water, degraded water quality and the distressed condition of the creek, the project area reach of Temescal Creek is not considered a viable location for sucker population reintroduction.

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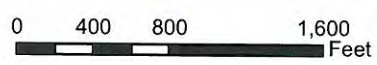
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N SMITH AV

RAILROAD ST



 Project Area



Lower Temescal Creek Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study

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Temescal Creek, narrow reach of creek draining into wide shallow pool.



Temescal Creek, sand and silt bottom along wider pools. Litter and debris scattered along the banks of the creek.



Temescal Creek, concrete lined flood control facility upstream of Lincoln Avenue crossing.



Temescal Creek, immediately downstream of Lincoln Avenue crossing. Heavy debris in creek.

5.5 Santa Ana River Upstream of River Road Bridge

- Location:** The Santa Ana River Upstream of River Road project area encompasses a 2 mile reach of the Santa Ana River located between the River Bridge and the Hamner Avenue crossing within unincorporated Riverside County. The project area is located on USGS Quadrangle for Corona North, Township 3 S, Range 7 W Sections 10, 11, 2 and 1.
- Topography:** The project area reach of the Santa Ana River exists in a natural condition with a soft bottom and well defined banks. The width of the low flow of the river is approximately 40 feet from bank to bank. The river has a low gradient bottom as it enters the Prado Basin. The substrate of the river consists predominantly of shifting sands with some intermittent small gravel bars.
- Hydrology:** The water source is perennial and consists mostly of effluent discharged from upstream water treatment plants. During the summer the flows along the river are moderate. The water depths range from about one to three feet. The project area reach of the Santa Ana River is generally calm and does not contain any riffles, waterfalls or pools. The water quality has good clarity with minimal turbidity. Water temperatures are typical to the region reaching and can get as high as 86 degrees on summer days.
- Vegetation:** The banks of the river contain dense riparian vegetation consisting of large stands of arundo with willow/cottonwood and mulefat patches. Vegetation overhangs occur on both banks of the river providing shade and cover during hot summer days.
- Occupied Habitat:** The project area historically and currently contains occupied sucker habitat.
- Predation:** The primary predation concern is the high numbers of exotic fish that occur throughout the project area.
- Land Use:** The project area is surrounded by open space. The closest urbanized land uses are residential uses located approximately ¼ mile to the west. Even though easy public access is present, the project area is largely undisturbed. It is anticipated that public recreation pressure and anthropogenic impacts should be low.

Approvals: The project area is owned by the Orange County Water District and the Corps. Approvals would still be needed from CDFG, USFWS, Corps, and the Regional Water Quality Control Board.

5.5.1. Habitat Restoration Opportunities

The River Road project area presents opportunities for sucker habitat restoration through a combination of different restoration activities. Along the project area reach of the Santa Ana River, deposits of stones and gravel and a series of stone filled wire mesh baskets, called gabions could be placed along the bottom of the river. Unlike deposits of gravel and stones, surface water would flow around the gabions without washing the stones and gravel downstream. The flow conditions created by the use of gabions could improve gravel beds to facilitate sucker spawning as well as provide a place for refuge from exotic fish. A pilot project involving the use of gabions to help create sucker habitat was conducted by OCWD. The results of the pilot program indicated that the placement of the gabions along the bottom of the river did help create gravel beds. Additionally, concurrent with the depositing of gravel and stones and the placement of gabions, existing gravel deposits along the river could be exposed through the use of a small suction dredge. Specific locations along the river would be identified for gravel deposits, the placement of gabions and the dredging of the river bottom. Because of the seasonal high flows and the risk of the gabions or gravel deposits being washed away, or being covered with sediment, ongoing monitoring, maintenance and replacement should occur as needed.

5.5.2. Population Reintroduction Opportunities

Because of the limited amount of existing habitat and the predation threats from exotic fish, sucker population reintroduction is not recommended until a time when suitable habitat can be created to provide shelter from exotic fish.



 Project Area



0 1,000 2,000 4,000
Feet

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Upstream River Road Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



SAR Upstream River Road, moderately flowing water with riparian overhangs along banks.



SAR Upstream River Road, low gradient, sandy bottom with intermittent gravel bars.

5.6 Hidden Valley Outfall Channel

- Location:** The Hidden Valley Outfall Channel project area is a 1.2 mile earthen channel that extends from the western pond of the Hidden Valley Wetlands to the Santa Ana River. When in operation the channel directs flows from the Hidden Valley Wetland ponds to the Santa Ana River. The project area is located on USGS Quadrangle Corona North, Township 2 S, Range 6 W, Section 28.
- Topography:** The Hidden Valley Outfall Channel is a natural earthen channel with a soft bottom. The channel has slight gradient and the substrate consists largely of sand and gravel with some small rocks and cobbles. The width of the channel ranges from 25 feet in the upstream segment to as little two feet near the confluence with the Santa Ana River.
- Hydrology:** The Hidden Valley Wetlands are currently not in operation and no flows are being diverted from the Santa Ana River to the wetland ponds. Therefore, at this time there are no perennial flows along the outfall channel. Presently, a small amount of urban runoff flows along the outfall channel to the Santa Ana River. The depth of the flow ranges from a few inches to about one foot. Because of the lack of head and dense thickets of vegetation within the channel, the surface water flows along some reaches of the channel are so slow that they have become stagnant and degraded. Once the Hidden Valley Wetlands are operational, higher velocity perennial flows would occur along the channel. It is anticipated that the flows from the ponds would have good water quality.
- Vegetation:** The vegetation along the channel consists of dense thickets of arundo along with some native vegetation. At some points the arundo is so dense along the channel, that the flows have become stagnant. There are some riparian overhangs along segments of the channel that would provide cover and shade.
- Occupied Habitat:** The project area historically and currently is not known to contain occupied sucker habitat.
- Predation:** At this time because of the minimal amount of surface water, predation from aquatic species is anticipated to be low. However, if the wetland ponds become operational, it is

Land Use:

likely exotic fish would occur in the outfall channel from the wetland ponds.

The Hidden Valley Channel is within the vicinity of residential development and provides easily public access. It appears that segments of the channel have been dammed by the public to create swimming holes. During the summer the project area experiences high recreation pressure and anthropogenic impacts are anticipated to continue.

Approvals:

The Hidden Valley Outfall Channel is maintained by the City of Riverside and Riverside County Park and Recreation District. Any proposed activities in the channel would need to be coordinated with the City of Riverside. Additionally, approvals from CDFG, Corps, USFWS and the Regional Water Quality Control Board would be needed.

5.6.1. Habitat Restoration Opportunities

The viability of using Hidden Valley Outfall Channel for sucker habitat restoration depends on the operation of the Hidden Valley Wetlands and the conveyance of perennial flows along the outfall channel from the wetland ponds. With perennial flows, the Hidden Valley Outfall Channel presents opportunities for sucker habitat restoration. There is the potential that suckers would swim from the Santa Ana River to the outfall channel seeking areas for refuge or to spawn. Because the channel would maintain hydrologic connectivity to the Santa Ana River, sucker populations would have the ability to find their way back to the river. Suckers could be enticed to swim into the outfall channel by expanding the amount of gravel and cobble substrate near the confluence of the channel and along segments of the channel that contain sand and silt. Additionally, the existing arundo patches within the channel should be removed to ensure that there are adequate flows. The outfall channel would have to be configured to prevent the suckers from entering the wetland ponds and the exotic fish from entering the outflow channel. An ongoing exotic fish management program and/or exclusionary devices would need to be implemented or installed concurrent with any restoration activities to ensure that there are no exotic fish in the outfall channel. Most importantly, prior to implementing any restoration activities within the outfall channel there should be assurances that Hidden Valley Wetlands would again become and remain operational.

5.6.2 Population Reintroduction Opportunities

Until habitat restoration activities occur and prove to be successful, sucker population reintroduction is not recommended.

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 Project Area



0 500 1,000 2,000 Feet

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Hidden Valley Outfall Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Hidden Valley, standing pool of urban runoff overgrown with marshy vegetation.



Hidden Valley, confluence of outfall channel and SAR.

5.7 Sunnyslope Creek

- Location:** The Sunnyslope Creek project area is a .20 mile creek that extends south from the Louis Rubidoux Nature Center to its confluence with the Santa Ana River. The project area is located on USGS Quadrangle Riverside West, Township 2 S, Range 5 W, Section 20.
- Topography:** Sunny Slope Creek is a soft bottom natural drainage. The site is situated within an open space area with mildly undulating terrain. The creek consists of a series of narrow braided channels and small pools that flow into the Santa Ana River. Presently, there is minimal hydrologic connectivity between Sunnyslope Creek and the Santa Ana River, as result of dense vegetation blockage located along 165 feet of the Santa Ana River to the confluence of Sunnyslope Creek and the Santa Ana River. The width of Sunnyslope Creek ranges from a few feet along the narrow segments of the creek to about five feet along the wider pools. The substrate along the upstream portion of the creek consists of gravel and small cobbles. The substrate in the downstream portion of the creek near the confluence with the Santa Ana River is predominantly silt.
- Hydrology:** The water source for Sunnyslope creek is perennial and consists of a combination of rising groundwater and urban runoff. The water depth at the upstream reach of the creek ranges from one to three feet. The water depth at the downstream end is approximately one foot. Many of the pools formed along the creek are deeper than three feet. The flows along the creek are mild and become quite stagnant where the vegetation blockage occurs. The water quality at the upstream end of the creek is clear, but the water becomes more turbid near the vegetation blockage toward the confluence of the creek and Santa Ana River.
- Vegetation:** Riparian vegetation occurs in the channel and along the banks with overhangs along the channel providing shade and cover. The vegetation consists approximately of 50 percent native negation and 50 percent non-native vegetation. At the confluence of the creek and the Santa Ana River is a concentration of cattails, arundo and silt.

Occupied Habitat: The project area historically is known to contain occupied sucker habitat. Recently, within the last year no suckers have been reported.

Predation: The larger pools at the bottom of the creek are known to contain exotic fish, such as carp and bass that would prey upon suckers.

Land Use: The Sunnyslope Creek project area is situated within a park setting and is easy accessible to the public. During summer months the project area experiences high recreation pressure. It is anticipated that during the summer the project area would experience high level of anthropogenic impacts.

Approvals: Sunnyslope Creek is maintained by the Riverside County Flood Control District and Riverside County Park and Recreation District. Any activities proposed in Sunnyslope Creek would need to be coordinated with Riverside County Flood Control District and Riverside County Parks and Recreation District. Additionally, approval would be needed from CDFG, Corps USFWS and the Regional Water Quality Control Board.

5.7.1. Habitat Restoration Opportunities

Sunnyslope Creek contains good sucker habitat and has historically contained suckers. However, recently, suckers have not been reported in Sunnyslope Creek. It is anticipated that in prior years the suckers would swim upstream along the Santa Ana River to Sunnyslope Creek to feed and/or spawn. At this time the existing vegetation blockage at the confluence of the creek and river now restricts the upstream movement of suckers into Sunnyslope Creek. Those suckers who find their way to Sunnyslope run the risk of predation from exotic fish in the deeper pools.

The site presents opportunities to expand the availability of sucker habitat by rerouting the low flow to the Santa Ana River and creating a sufficient amount of head to ensure there are adequate flows occurring between the creek and the Santa Ana River. Additionally, the concentration of vegetation near the confluence of the creek with the Santa Ana River should be removed and gravel and cobbles should be deposited along the creek where silt has build up. A gravel bed should be created at the confluence of the creek and river to entice suckers to swim upstream into Sunnyslope Creek. Once adequate hydrological connectivity is maintained, it is anticipated that the suckers would return. To minimize potential predation threats, an exotic fish removal program should be implemented within Sunnyslope Creek concurrent with any restoration activities.

5.7.2. Population Reintroduction Opportunities

Until the time habitat restoration activities occur and prove to be successful, sucker population reintroduction is not recommended.



 Project Area



0 150 300 600 Feet

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Sunnyslope Creek Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Sunnyslope Creek, gravel and cobble substrate with riparian overhangs along banks.



Sunnyslope Creek, deeper pools formed along creek.



Sunnyslope Creek, moderately flowing clear water along creek.



Sunnyslope Creek, heavy vegetation blockage near confluence of creek and SAR.

5.8 Gooseberry Creek

- Location:** The Gooseberry Creek project area is a .62 segment of Gooseberry Creek that extends along the bottom of an earthen slope that forms the northeast boundary of Martha McLean Park. The creek joins the Santa Ana River near the west end of the park. The project area is located on USGS Quadrangle Riverside West, 2 S, Range 5 W, Section 29.
- Topography:** Gooseberry Creek is a soft bottom natural drainage. The width of the creek ranges from approximately 10 to 15 feet. Along the south side of the creek, the bank is defined by a steep earthen slope. The north bank is undefined within a mass of vegetation. The substrate of Gooseberry Creek consists of mixture of sand, silt, gravel, cobbles and some larger rocks. The substrate at the confluence of the creek and the Santa Ana River is mostly sandy. Upstream of the Santa Ana River, the substrate consists of a more rocky and cobble substrate. At the deeper portions of the creek the substrate consist mostly of sand and silt.
- Hydrology:** The water source for Gooseberry Creek is perennial and consists of rising groundwater and urban runoff. The depth of the water ranges from 1 foot near the Santa Ana River to approximately 5 feet at the upstream end of the project area. Upstream along the creek are dense patches of vegetation that created a bottle neck, restricting the flow of water to a point where it is almost stagnant. Once the water flows through the vegetation bottleneck, the flows become more moderate. The water clarity is good in areas where the flows are moderate. However, in the areas of dense patches of vegetation, the water is still and the water clarity is turbid.
- Vegetation:** Riparian vegetation occurs in the channel and along the banks with overhangs along both banks providing shade and cover. The majority of vegetation is native. However, there are dense patches of non-native vegetation in the upstream segment of the channel.
- Occupied Habitat:** The project area historically and currently is not known to contain occupied sucker habitat. However, some patches of suitable habitat are present.

-
- Predation:** It is anticipated that the deeper pools areas along Gooseberry Creek contain exotic fish that would prey upon suckers.
- Land Use:** The project area is situated within a park setting and is largely undisturbed. Access to the creek from the park is difficult due to the deep slope and fencing between the creek and the park. Recreation pressure and anthropogenic impacts from the public should be low.
- Approvals:** Gooseberry Creek is maintained by the Riverside County Parks and Recreation District. Any activities proposed in Gooseberry Creek would need to be coordinated with Riverside County Parks. Additionally, approval would be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

5.8.1. Habitat Restoration Opportunities

The confluence of Gooseberry Creek and the Santa Ana River is located downstream of Sunnyslope Creek, an area known to contain historically occupied sucker habitat. There is the potential that suckers could be present in the area where Gooseberry Creek joins the Santa Ana River. However, because of the sandy substrate at the confluence of the Gooseberry Creek and Santa Ana River, suckers could be discouraged from swimming upstream into Gooseberry Creek. Any suckers that do find their way to Gooseberry Creek would face the potential threat of predation from exotic fish in the deeper areas where the water flow is restricted by the vegetation in the creek.

The site presents opportunity to increase sucker habitat by depositing gravel and rocks along segments of Gooseberry Creek that contain sand and silt. Additionally, a gravel bed could be created at the confluence of the creek and the Santa Ana River to entice suckers into Gooseberry Creek. Concurrent with depositing gravel and rocks, the dense patches of vegetation within the channel should be removed to increase the flow of water through the creek. Additionally, an ongoing exotic fish removal program should be implemented to remove exotic fish from the creek. Because of the good hydrological connectivity to segments of the Santa Ana River that historically contain occupied sucker habitat, it would be anticipated that suckers would find the creek once it is restored.

5.8.2. Population Reintroduction Opportunities

Until the time habitat restoration activities occur and prove to be successful, sucker population reintroduction is not recommended.



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 Project Area



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Gooseberry Creek Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Gooseberry Creek, confluence of creek and SAR.



Gooseberry Creek, upstream of confluence of creek and SAR.



Gooseberry Creek, upstream creek flows restricted by vegetation.



Gooseberry Creek- upstream segment of creek deeper with sandy bottom.

5.9 Evans Lake Channel

Location: The Evans Lake Channel project area is a .70 mile drainage channel that extends between Evans Lake and the Santa Ana River. The project area is located on USGS Quadrangle Riverside West, Township 2 S, Range 5 W, Section 22.

Topography: The Evans Lake Channel is a soft bottom earthen drainage, ranging in width from 6 to 12 feet. The channel has a low gradient and the substrate consists predominantly of decomposing vegetation and silt.

Hydrology: The water source within the Evans Lake Channel is perennial, consisting of overflow from Evans Lake and urban runoff. The depth of the water ranges from one to three feet. Surface water flows are conveyed along the channel to a culvert extending through the Santa Ana River levee where they join up with the Santa Ana River. At the confluence of the creek is an approximate one foot drop structure. During non-storm periods the flow of water is very slow. The channel exhibits a high level of turbidity as a result of silt and the urban runoff draining into the channel.

Vegetation: Riparian vegetation occurs in the channel and along the banks with overhangs along both banks providing shade and cover. The vegetation is predominantly native comprised of willows trees and mulefat.

Occupied Habitat: The project area historically and currently is not known to contain occupied sucker habitat.

Predation: Evans Lake is stocked with exotic fish. It is anticipated that exotic fish would also be found in the Evans Lake Channel and would be a significant predation threat.

Land Use: The project area is situated within a public park and experiences high recreation pressure. Additionally, the project area is disturbed and serves as an encampment for a homeless population. It is anticipated that the project area would continue to experience high anthropogenic impacts.

Approvals: The Evans Lake Channel is maintained and operated by the Riverside County Flood Control District and Riverside County Park and Recreation District. Any activities proposed in the Evans Lake Channel would need to be

coordinated with Riverside County Flood Control and Riverside County Parks and Recreation. Additionally, approval would be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

5.9.1. Habitat Restoration Opportunities

The project area presents very limited opportunities for sucker habitat restoration. The majority of the channel bottom consists of silts and contains poor water quality. An existing drop structure located at the confluence of Santa Ana River and the Evans Lake Channel would prevent the upstream movement of suckers into the channel. Finally, the exotic fish stocked in Evans Lake would pose a significant predation threat. Therefore, the project area is not recommended for sucker habitat restoration.

5.9.2. Population Reintroduction Opportunities

Because of the lack of adequate sucker habitat, the project area is not recommended for sucker population reintroduction.



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 Project Area



0 400 800 1,600 Feet

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Evans Lake Drainage Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Evans Lake Channel, silt and sand bottom with slow moving turbid water.



Evans Lake Channel, surface flows conveyed through culvert to SAR.



Evans Lake Channel, confluence of channel and SAR.



Evans Lake Channel, view of culvert and drop structure just below confluence of channel and SAR.

5.10 Anza Drain

- Location:** The Anza Drain project area is .25 mile reach of the Anza Drain located between the City of Riverside Water Treatment Plant effluent outlet channel and the Santa Ana River. The project area is located on USGS Quadrangle Riverside West, Township 2 S, Range 6 W, Section 25.
- Topography:** The project area reach of the Anza Drain is a soft bottom natural drainage. The width of the drainage is approximately 10 feet. The drainage has a low gradient and the substrate consists of a mix of sand and silt and a scattering of large boulders. Upstream of the project area, Anza drain consists of a combination of narrow deep reaches with rocky cobble substrate and wide shallow pools with a sand substrate.
- Hydrology:** Along the project area reach of the Anza Drain, the water source is perennial consisting of effluent generated from the wastewater treatment plant and from urban runoff. The depth of the water ranges from three to six feet. The surface water flows along the project area reach of the Anza drain are slow to moderate and the water clarity is generally good. Upstream of the effluent outlet channel, the surface water flows are seasonal, consisting entirely of urban runoff. The velocity of the flows are slow to stagnant and the water quality is poor.
- Vegetation:** Dense vegetation overhangs occur throughout the project area providing shade and cover. The majority of the vegetation along the drainage is non-native.
- Occupied Habitat:** The project area historically and currently is not known to contain occupied sucker habitat. Historically, suckers have been reported in the Santa Ana River near the confluence of the Santa Ana River and the Anza Drain.
- Predation:** The project area contains exotic fish and bull frogs which would prey upon suckers.
- Land Use:** The project area is located within an urbanized area and is largely disturbed and exhibits a high amount of anthropogenic impacts. During the summer months the project area experiences high recreation pressure.

Approvals: Anza Drain is maintained by the Riverside County Flood Control District and Riverside County Park and Recreation District. Any activities proposed in the Anza Drain would need to be coordinated with Riverside County. Additionally, approval would be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

5.10.1. Habitat Restoration Opportunities

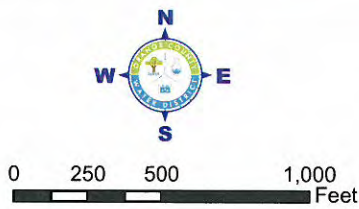
The project area reach of Anza Drain contains many of the essential habitat elements needed to support suckers and the drainage does present some opportunities for habitat restoration. However, upstream of the project area, the Anza Drain project area is highly distressed, surface water flows are seasonal with poor water quality and the substrate consists mostly of sand and silt. Any restoration activities within the project area should also be extended to the upstream portions of the drainage. A combination of rock and gravel should be deposited where sand and silt exist. Additionally, a gravel bed could be created at the confluence of Anza Drain and Santa Ana River to help entice suckers into the drainage. Concurrent with any habitat restoration activities, the trash and debris and non-native vegetation along the channel should be removed and an exotic fish and bull frog removal program should be implemented. Based on the current condition of the Anza Drain, the extensive efforts that would be needed to establish and maintain adequate sucker habitat, and the high level of recreation pressure the project area experiences, the Anza Drain is not highly recommended for sucker habitat restoration.

5.10.2. Population Reintroduction Opportunities

At this time, based on the lack of adequate sucker habitat, the project area is not recommended for sucker population reintroduction.



 Project Area



**Anza Drain
Santa Ana Sucker
Habitat Restoration/
Population Reintroduction Study**

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Anza Drain, upstream of segment with more moderate flow of water. High recreation pressure and impacts.



Anza Drain, wide and shallow pools with gravel and cobble substrate. Slow flowing water with high turbidity.



Anza Drain, confluence of drainage and effluent channel.



Anza Drain, downstream of effluent channel.

5.11 Rialto Channel

- Location:** The Rialto Channel project area is a .32 mile segment of the Rialto Channel located between Agua Mansa Road and the Santa Ana River within the City of Colton. The project area is generally located USGS Quadrangle San Bernardino South, Township 1 S, Range 4 W, Section 24.
- Topography:** Between Agua Mansa Road and the Santa Ana River, the Rialto Channel is soft bottom drainage that is bounded by soil and concrete rip rap along its embankments. The top of the slope to the channel bottom is approximately 20-feet. The width of channel is approximately 15-feet. The substrate of the channel consists predominantly of gravel and small cobbles with small amounts of sand with rocks along the edges where the rip rap borders the channel. The RIX Wastewater Treatment Plant Outlet joins the Rialto Channel, approximately 50 yards upstream of the confluence of the Rialto Channel with the Santa Ana River. The bottom of the RIX Outlet consists mostly of gravel, cobbles and rocks.
- Hydrology:** The water source along the Rialto Channel is perennial and consists of effluent discharged from the Rialto Water Treatment Plant and the RIX Treatment Plant. The effluent from the Rialto Treatment Plant is discharged into a concrete lined reach of the Rialto Channel and is conveyed through an underground culvert to a soft bottom reach of the Rialto Channel. Effluent from the RIX Treatment Plant is discharged to the Rialto Channel from the RIX Outlet. Both effluent flows drain along the Rialto Channel into the Santa Ana River. The water depth within the Rialto Channel ranges from 1 to 2 feet with some deeper pools. Along the northern segment of the channel near Agua Mansa Road, the channel flows are swift and gradually begin to slow down near the confluence with the Santa Ana River. The water clarity is very good with minimal turbidity.
- Vegetation:** Riparian vegetation occurs in the channel and along both banks forming a dense canopy of vegetation over the channel providing cover from extreme temperatures. The vegetation is predominantly native comprised of willow trees and mulefat.
- Occupied Habitat:** The project area historically and currently is known to contain occupied sucker habitat.

-
- Predation:** Exotic fish, mostly mosquito fish occur throughout the channel. Additionally, in the Santa Ana River, higher numbers of larger exotic fish are known to occur. The threat of predation is considered high.
- Land Use:** The project area is situated between the Colton Landfill, Rialto Treatment Plant and the RIX Treatment Plant, in a generally rural area within the City of Colton. The project area provides easy public access. During the summer the project area experiences high recreation pressure and high anthropogenic impacts.
- Approvals:** The Rialto Chanel is owned and operated by the City of San Bernardino Municipal Water District. Any activities proposed in the Rialto Channel would need to be coordinated with City of San Bernardino Municipal Water District. Additionally, approval would be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

5.11.1. Habitat Restoration Opportunities

The Rialto Chanel contains high quality sucker habitat and has been one of the sites most consistently reporting the presence of suckers. It is anticipated that the suckers would swim upstream along the Santa Ana River to the Rialto Channel where they are attracted to the habitat along the channel bottom for refuge or to spawn. Because of the high quality sucker habitat available along the Rialto Channel, minimal habitat restoration activities would be needed. However, activities could be conducted to maintain or enhance the existing habitat. These activities could include ensuring adequate gravel and rock deposits are at the confluence of the channel and the river, the removal of non-native vegetation, general clean up of the area, implementation of exotic fish removal program and the monitoring and removal of man-made barriers that prevent the movement of suckers.

5.11.2. Population Reintroduction Opportunities

Because suckers are consistently reported in the project area, it is not recommended for population reintroduction. However, if a location was needed to relocate suckers, the Rialto Channel would be considered a suitable and preferred location.



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 Project Area



0 175 350 700 Feet

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Rialto Channel Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Rialto Channel, moderately flowing water with extensive riparian overhangs along channel.



Rialto Channel, gravel and small cobble substrate. Clear water with minimal turbidity.



Rialto Channel, downstream segment near confluence with SAR.



Rialto Channel, segments of channel exhibiting high recreation pressure and anthropogenic impacts.

5.12 Mill Creek

- Location:** Mill Creek is located on the southern face of the San Bernardino Mountains. The creek extends from upper portions of the San Bernardino Mountains to its confluence with the Santa Ana River. The confluence of Mill Creek with the Santa Ana River is located on USGS Quadrangle for Yucaipa, Township 1 S, Range 1 W, Section 17.
- Topography:** Mill Creek is a soft bottom natural drainage. The creek ranges from a few feet in width along the upper reaches to approximately 15 feet along the lower reaches. The creek traverses the San Bernardino Mountain and there are several drops, waterfalls and small pools that are formed along its reaches. The substrate along Mill Creek consists of sand and gravel with large boulders along the bottom of the creek and both banks. The pools that are formed along the creek generally have sandy bottoms.
- Hydrology:** The water source along Mill Creek is perennial and consists of rising groundwater from the San Bernardino Mountains. In 2002, a FERC licensing agreement was reached with the Edison Company which allowed Mountain Home Creek and Mill Creek to flow freely without diversion until it reaches the Highway 38 Bridge. During the winter months the surface water flows along Mill Creek are perennial and strong enough to reach the Santa Ana River. However, during the summer months the flows along Mill Creek are only perennial until they reach the Highway 38 Bridge. At the Highway 38 Bridge the surface water flows disappear before reaching the Santa Ana River.
- Along Mill Creek the depth of the water ranges from one to three feet with some deeper pools. During the winter, the flows along the creek are very fast. During the summer months the flows are moderate. The water temperature for most of the year is cool and the water clarity is very good.
- Vegetation:** The riparian vegetation along the creek is patchy with limited overhangs along the banks providing some shade and cover. The majority of the vegetation within the project area is native.
- Occupied Habitat:** There is no documentation of any reaches of Mill Creek being occupied by Santa Ana Suckers. However, it is

anticipated that the creek was historically occupied by suckers, based upon the hydrological connectivity that existed before flows were diverted from Mill Creek for hydrologic power.

Predation: The potential for predation is considered low. The most abundant species in the creek is rainbow trout which would coexist with suckers.

Land Use: The creek is situated within a natural open space setting and can be easily accessed from Highway 38. Because of its easy access, Mill Creek experiences high recreation pressure from the public.

Approvals: The majority of Mill Creek is located on land owned by US Forest Service. Additionally, a small amount of the reach of the creek is on land owned by the Edison Company. Any activities proposed in Mill Creek would need to be coordinated with US Forest Service and the Edison Company. The San Bernardino National Forest has indicated that they are interested in helping to provide protection for the sucker and would be supportive of pursuing sucker population reintroduction into Mill Creek. Coordination would need to occur with the Edison Company to hold them harmless for suckers who swim downstream to Mill Creek and accidentally get into the diversion at the Highway 38 Bridge. Approvals would also be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

5.12.1. Habitat Restoration Opportunities

Mill Creek contains high quality sucker habitat. Therefore, habitat restoration is not needed or recommended.

5.12.2. Population Reintroduction Opportunities

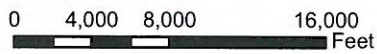
Mill Creek presents opportunities for the reintroduction of suckers into the upper reaches of the creek. Along the upper reaches, plenty of high quality sucker habitat would be available for shelter, feeding and spawning. It is more than likely that the suckers introduced into the upper reaches of the creek would swim downstream to the lower reaches. Because of natural barriers such as drops or waterfalls or man-made barriers such as dams to create swimming holes, it is likely that the suckers would not be able to swim upstream, except during high flows. During the winter, suckers would be able to swim to the Santa Ana River. However, during the summer when there is no hydrologic connectivity between

Mill Creek and the Santa Ana River, the introduced sucker populations would be stranded at the lower reaches of Mill Creek, exposing the population to competition for food, predation and potential anthropogenic impacts. Any sucker population reintroduction activities along Mill Creek would need to be implemented concurrently with a sucker management and monitoring program that would relocate suckers from the lower reaches of Mill Creek back to the upper reaches of the creek.



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 Project Area



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**Mill Creek
Santa Ana Sucker
Habitat Restoration/
Population Reintroduction Study**



Mill Creek, downstream view, near Thurman Flats picnic area.



Mill Creek, upstream view, near Thurman Flats picnic area.

5.13 Mountain Home Creek

Location: Mountain Home Creek is a small creek located along the southern face of the San Bernardino Mountains. The creek extends from the upper portions of the San Bernardino Mountains to its confluence with Mill Creek, before ultimately draining into the Santa Ana River. Mountain Home Creek is generally located on USGS Quadrangle for Yucaipa, Township 1 S, Range 1 W, Section 8.

Topography: Mountain Home Creek is a soft bottom natural drainage. The average width of the creek is approximately 10 feet. The creek traverses steeply through the San Bernardino Mountains and there are several drops, waterfalls and small pools formed along its reaches. The majority of the substrate along Mountain Home Creek consists of sand and gravel with large boulders within the creek bottom and along both banks.

Hydrology: The water source along Mountain Home Creek is perennial consisting of rising groundwater from the San Bernardino Mountains. In 2002, a FERC licensing agreement was reached with the Edison Company which allowed all of the flow from Mountain Creek to flow freely without diversion into Mill Creek, until the flows reach Highway 38 Bridge. As a result, Mountain Home Creek is now perennial from its headwaters to Mill Creek. During the winter months the surface water flows along Mill Creek are strong enough to reach the Santa Ana River providing hydrological connectivity between Mountain Home Creek and the Santa Ana River. However, during the summer months the flows along Mill Creek are only perennial until they reach the Highway 38 Bridge. At the Highway 38 Bridge the flows disappear before reaching the Santa Ana River.

The water depth within Mountain Home Creek ranges from one to two feet with some deeper holes. The fall of the creek is quite steep and supporting a good number of drops and waterfalls along the creek. During the winter the flows along Mountain Home Creek are very swift. During the summer months the flows are moderate. The water temperature for most of the year is cool and the water clarity is very good.

-
- Vegetation:** The vegetation along the creek ranges from intermittent patches of riparian vegetation along both banks to dense canopies overhanging the entire creek.
- Occupied Habitat:** There is no documentation of any reaches of Mountain Home Creek being occupied by suckers. However, it is anticipated that Mountain Home Creek was historically occupied by suckers prior to the diversion of the creeks flows for hydrological power.
- Predation:** The potential for predation is considered low. The most abundant species in the creek is rainbow trout which would coexist with suckers.
- Land Use:** The creek is located in a natural open space setting. Because of its easy access, Mountain Home Creek experiences high recreation pressure from the public.
- Approvals:** Mountain Home Creek is located on land owned by US Forest Service. Any activities proposed in Mountain Creek would need to be coordinated with US Forest Service. The San Bernardino National Forest has indicated that they are interested in helping to provide protection for the sucker and would be supportive of pursuing sucker reintroduction into Mountain Home Creek. Coordination would need to occur with the Edison Company to hold them harmless for suckers who swim downstream to Mill Creek and accidentally get into the diversion at the Highway 38 Bridge. Approval would also be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

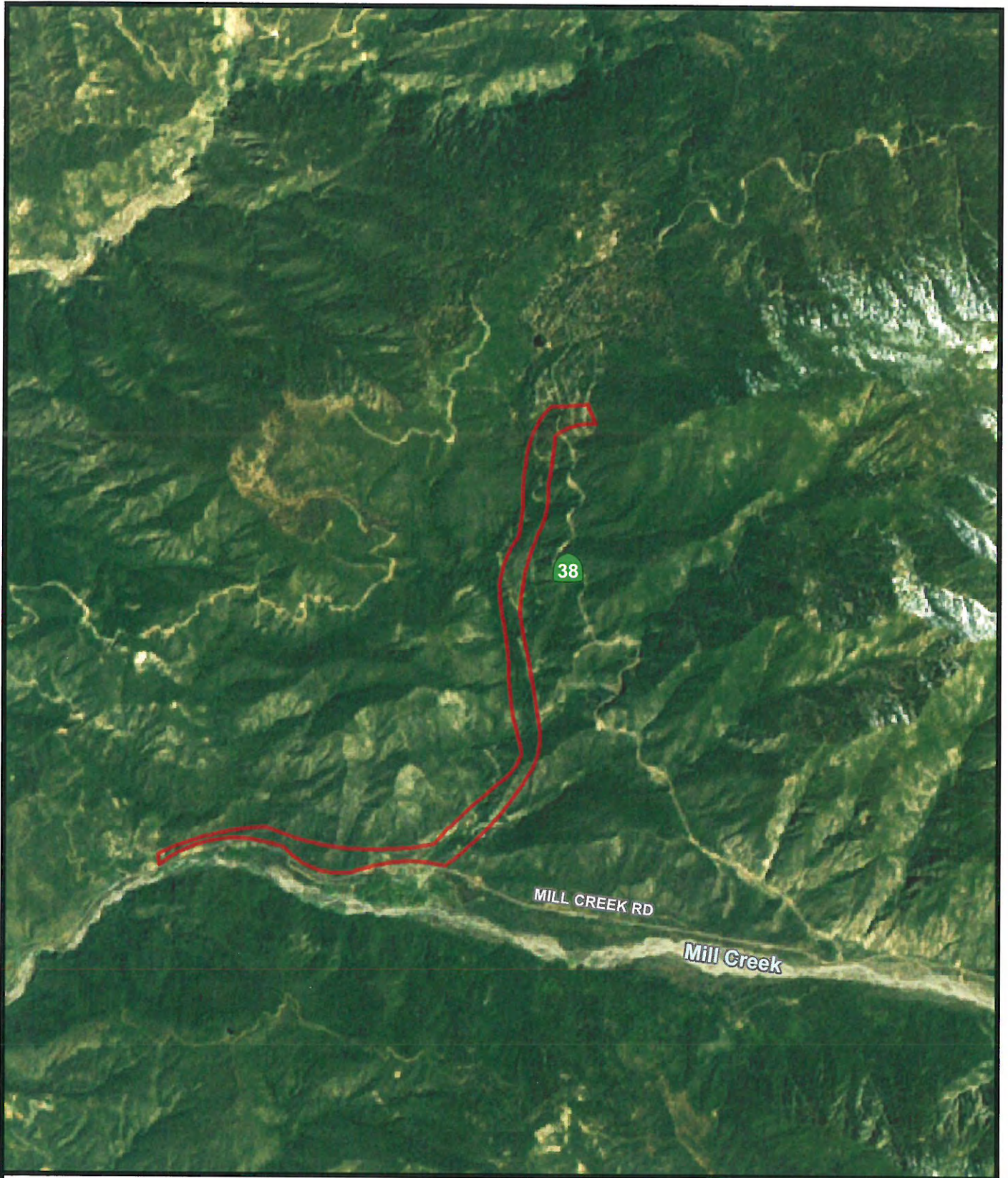
5.13.1. Habitat Restoration Opportunities

Mountain Home Creek contains high quality sucker habitat. Therefore, habitat restoration is not needed or recommended.

5.13.2. Population Reintroduction Opportunities

Mountain Home Creek presents opportunities for the reintroduction of sucker populations into the upper reaches of the creek. Along the upper reaches, plenty of high quality sucker habitat would be available for shelter, feeding and spawning. It is more than likely that the suckers introduced into the upper reaches of the creek would swim downstream to Mill Creek. Because of natural barriers such as waterfalls or man-made dams to create swimming holes it is likely that the suckers would not be able to swim upstream. Due to the lack of hydrologic connectivity between Mill Creek and Santa Ana River during the

summer months, it is anticipated that the introduced populations would be stranded at the lower reaches of Mountain Home Creek or Mill Creek, exposing populations to competition for food and shelter, predation and potential anthropogenic impacts. Any sucker reintroduction activities along Mountain Home Creek would need to be implemented concurrently with a sucker management and monitoring program that would relocate suckers from the lower reaches of Mountain Home Creek and/or Mill Creek back to the upper reaches of Mountain Home Creek.



 Project Area



0 1,500 3,000 6,000 Feet

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Mountain Home Creek Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



**Mountain Home Creek,
upstream of Mountain Home
Village.**



**Mountain Home Creek, ustream
of Mountain Home Village.**

5.14 Plunge Creek

- Location:** Plunge Creek is located on the southern face of the San Bernardino Mountains. The creek extends from the upper portions of the San Bernardino Mountains to its confluence with the Santa Ana River. The confluence of Plunge Creek with the Santa Ana River is located on USGS Quadrangle for Redlands, Township 2 S, Range 3 W, Section 1.
- Topography:** Plunge Creek is a soft bottom natural drainage. The average width of the creek is about six feet. The creek traverses steeply through the San Bernardino Mountains. The fall of the creek is steep and there are a number of natural drops and waterfalls and small pools formed along its reaches.
- Hydrology:** The water source along Plunge Creek is perennial and consists of rising groundwater from the San Bernardino Mountains. Plunge Creek is perennial from its headwaters to an existing sand and gravel operation located near the confluence of the creek and the Santa Ana River. During the winter the flows within Plunge Creek are very fast and provide hydrologic connectivity to the Santa Ana River. During the summer months the flows are slow to moderate and dissipate prior to joining the Santa Ana River. The depth of the water ranges from one to three feet in the deeper pools. The water temperature for most of the year is cool and the water clarity is very good.
- Substrate:** The substrate along Plunge Creek is mostly sand with large boulders along both banks and along the bottom of the creek.
- Vegetation:** Along the creek are dense overhangs of riparian vegetation providing shade and cover. The majority of the vegetation is native.
- Occupied Habitat:** There is no documentation that reaches of Plunge Creek have been historically occupied by Santa Ana Suckers. However, it is anticipated that the creek was historically connected to the Santa Ana River and occupied by suckers.
- Predation:** The potential for predation is considered low. The most abundant species in the creek is rainbow trout and speckled dace which both coexist with suckers.

Land Use: The creek is situated within a natural open space setting. There is no immediate vehicle access to the creek. Therefore, it is anticipated recreation pressure and anthropogenic impacts should be low.

Approvals: Plunge Creek is located on land owned by US Forest Service. Any activities proposed in Plunge Creek would need to be coordinated with US Forest Service. The San Bernardino National Forest has indicated that they are interested in helping to provide protection for the sucker and would be supportive of pursuing sucker population reintroduction into Plunge Creek. Additionally, coordination would need to occur with the sand and gravel operation located downstream of Plunge Creek to hold them harmless for suckers who swim downstream and accidentally get into their operation. Approvals would also be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

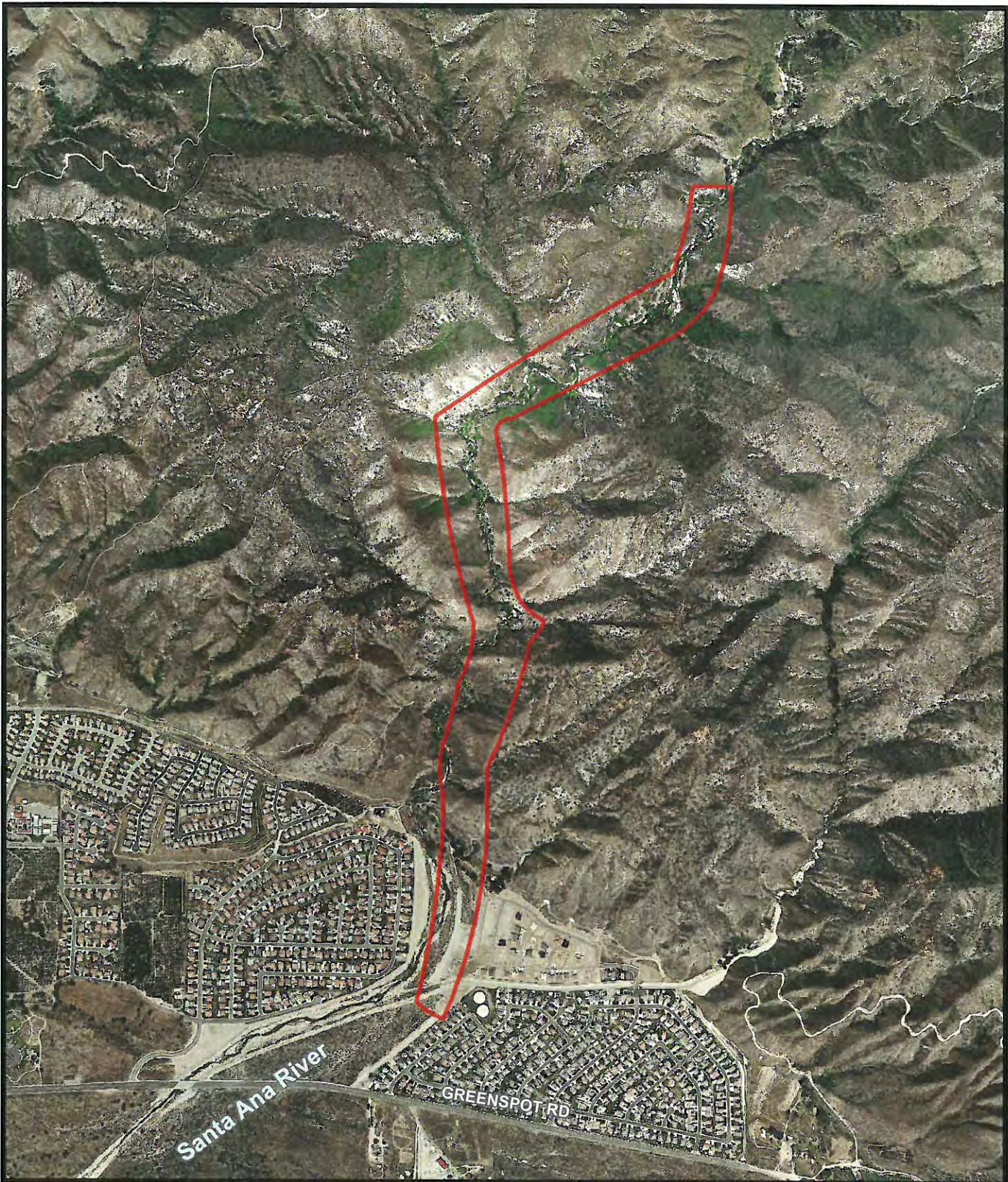
5.14.1. Habitat Restoration Opportunities

Plunge Creek contains high quality sucker habitat. Therefore, habitat restoration is not needed or recommended.

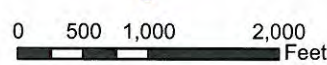
5.14.2. Population Reintroduction Opportunities

Plunge Creek presents opportunities for the reintroduction of sucker populations into the upper reaches of the creek. Along the upper reaches, plenty of high quality sucker habitat would be available for shelter, feeding and spawning. It is more than likely that the suckers introduced into the upper reaches of the creek would swim downstream. Because of natural barriers such as waterfalls or man-made dams to create swimming holes it is unlikely that the suckers would be able to swim upstream. Due to the lack of hydrologic connectivity between Plunge Creek and Santa Ana River during the summer months, it is anticipated that the introduced populations would congregate at the lower reaches of Plunge Creek, exposing populations to competition for food and shelter. Any sucker population reintroduction activities along Plunge Creek would need to be implemented concurrently with a sucker management and monitoring program that would relocate suckers from the lower reaches of Plunge Creek back to the upper reaches of the creek when hydrological connectivity to the Santa Ana River is not maintained.

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 Project Area



**Plunge Creek
Santa Ana Sucker
Habitat Restoration/
Population Reintroduction Study**

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Plunge Creek, upstream view, above East Highlands Road.



Plunge Creek, downstream view, above East Highlands Road.

5.15 City Creek

- Location:** City Creek is located along the southern face of the San Bernardino Mountains. The creek extends from the upper portions of the San Bernardino Mountains to its confluence with the Santa Ana River. The confluence of City Creek with the Santa Ana River is located on USGS Quadrangle for Harrison Mountain, Township 1 N, Range 3 W, Section 34.
- Topography:** City Creek is a soft bottom natural drainage. The creek varies in width from less than one foot to about six feet. The creek traverses steeply through the San Bernardino Mountains and several steep drops, waterfalls and small pools formed along its reaches. The substrate of City Creek is mostly sandy with large boulders along both banks and along the bottom of the creek.
- Hydrology:** The water along City Creek is perennial and consists of rising groundwater from the San Bernardino Mountains. City Creek is perennial from its headwaters to a sand and gravel operation located near the confluence of the creek and the Santa Ana River. During the summer months the flows along City Creek are slow and disappear prior to joining the Santa Ana River. During the winter the flows within the creek are very fast and provide hydrologic connectivity to the Santa Ana River. The depth of the water ranges from less than one to three 3 feet within some of the deeper pools. The water temperature for most of the year is cool and the water clarity is very good.
- Vegetation:** The riparian vegetation along the creek is patchy with limited overhangs along the bank. The majority of the vegetation is native.
- Occupied Habitat:** There is documentation from CDFG that reaches of City Creek have been historically occupied by Santa Ana Suckers in the last 25 years. City Creek was considered an important location for suckers during the initial listing of Critical Habitat for the sucker.
- Predation:** The potential for predation is considered low. The most abundant specie in the creek is Speckled Dace which coexists with suckers. City Creek is also occupied by the CDFG Special Status Yellow Legged Frog and there would be some concern of water borne virus being transmitted to

the Yellow Legged Frog from suckers reintroduced into City Creek. Presently, the US Forest Service is actively managing the Speckled Dace and the Yellow Legged Frog. According to the US Forest Service potential conflicts with reintroduced suckers could be avoided by screening the suckers for viruses before they are introduced into City Creek.

Land Use: City Creek is situated within a natural open space setting and can be easily access from Highway 330. Because of its easy access, the lower reaches of City Creek experiences high recreation pressure from the public.

Approvals: The majority of City Creek is located on land owned by US Forest Service. A small amount of the reach of the creek is also on land owned by Caltrans. Any activities proposed in City Creek would need to be coordinated with US Forest Service and Caltrans. Additionally, coordination would need to occur with the sand and gravel operation located downstream of City Creek to hold them harmless for suckers who swim downstream and accidentally get into their operation. Approvals would also be needed from CDFG, Corps, USFWS and the Regional Water Quality Control Board.

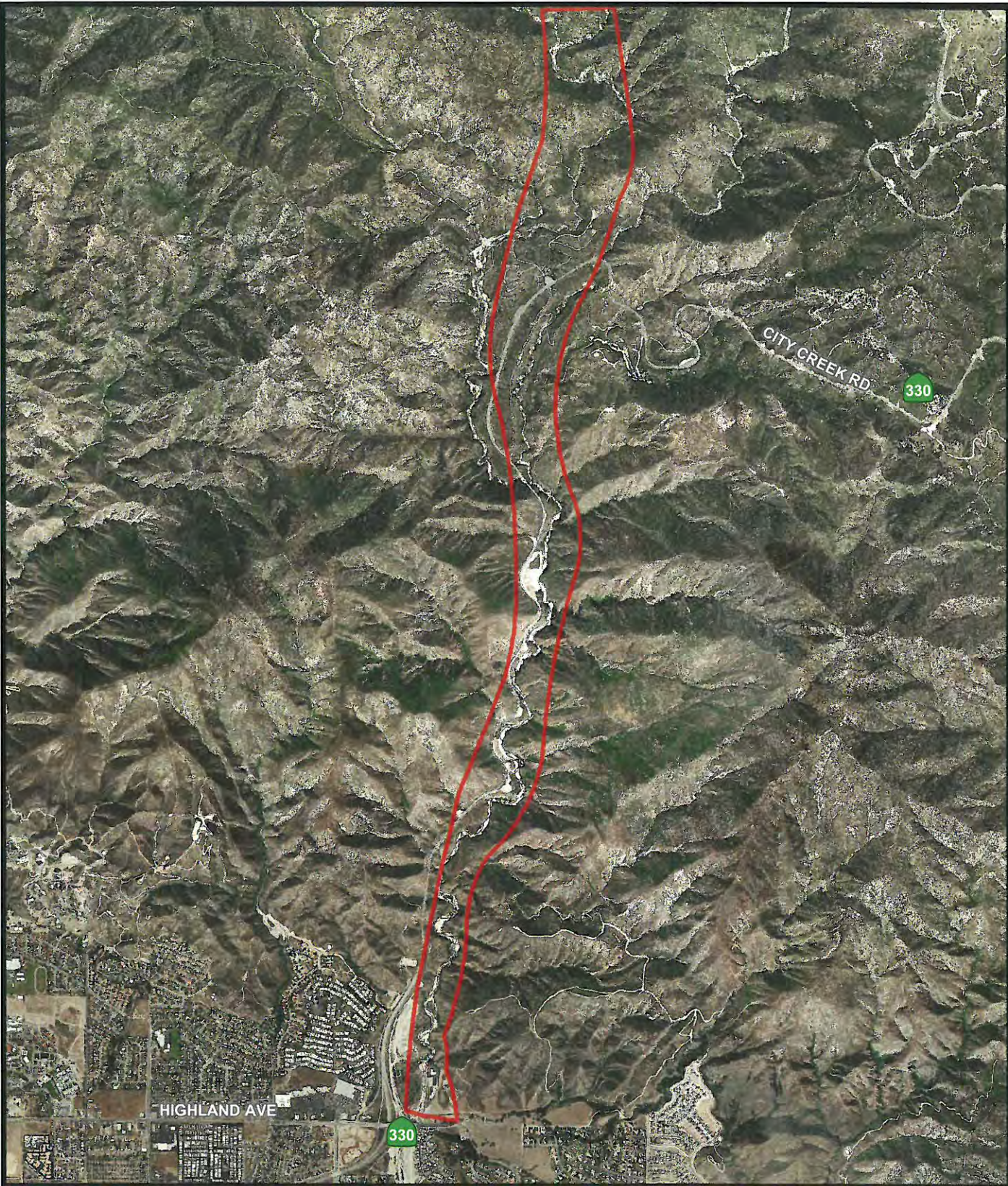
5.15.1. Habitat Restoration Opportunities

City Creek contains high quality sucker habitat. Therefore, habitat restoration is not needed or recommended.

5.15.2. Population Reintroduction Opportunities

City Creek contains all of the needed essential habitat elements to support suckers and it historically has been reported as occupied sucker habitat. However, the value of some of the habitat elements are not as high as some of the other mountain creeks. Along some segments of the creek the width is reduced to less than one foot with only a few inches of water. There is some concern that suckers could get stranded in the narrow reaches. Additionally, many segments of the City Creek experience high recreation pressure, especially in those segments where the creek is very narrow, increasing the potential for anthropogenic impacts. City Creek is occupied by the CDFG Special Status Yellow Legged Frog and there would be some concern of water borne virus being transmitted to the Yellow Legged Frog from suckers reintroduced into City Creek. Prior to the introduction of suckers into City Creek, the suckers would need to be screened for water borne viruses. Given the constraints at City Creek

compared to other mountain creeks, City Creek is not highly recommended for population reintroduction.



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 Project Area



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City Creek Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



City Creek, upstream view, above Highway 38 and Highway 330.



City Creek, downstream view, above Highway 38 and Highway 330.

5.16 Upper Santa Ana River

- Location:** The Upper Santa Ana River project area is located along the southern face of the San Bernardino Mountains. The project area extends from the confluence of the Santa Ana River and Bear Creek to Powerhouse No. 1 above Seven Oaks Dam. The Upper Santa Ana River project area is generally located on USGS Quadrangle for Yucaipa, Township 1 N, Range 3 W, Section 34.
- Topography:** The Upper Santa Ana River is a soft bottom natural drainage. The creek varies in width from 2 to about 12 feet. The creek traverses steeply through the San Bernardino Mountains and several steep drops, waterfalls and small pools formed along its reaches. The substrate of the Upper Santa Ana River is mostly sandy with large boulders along both banks.
- Hydrology:** The water along the Upper Santa Ana River project area is perennial and consists of rising groundwater from the San Bernardino Mountains. During the summer the flows along the Upper Santa Ana River are moderate slow and during the winter the flows are very fast. The depth of the water ranges from one to three feet within some deeper pools. The water temperature for most of the year is cool and the water clarity is very good.
- Vegetation:** There is dense vegetation along the creek with overhangs along the banks. The majority of the vegetation is native.
- Occupied Habitat:** The project area historically and currently is not known to contain occupied sucker habitat. However, it is very likely at one time the Upper Santa Ana River contained occupied sucker habitat.
- Predation:** The potential for predation is considered moderate. The most abundant specie in the creek is rainbow trout which coexist with suckers. However, brown trout are known to occur along the upper Santa Ana River which would pose a predation threat to suckers.
- Land Use:** The Upper Santa Ana River project area is situated within a natural open space setting. Access to the upper reaches is limited and experiences moderate recreation pressure from the public.

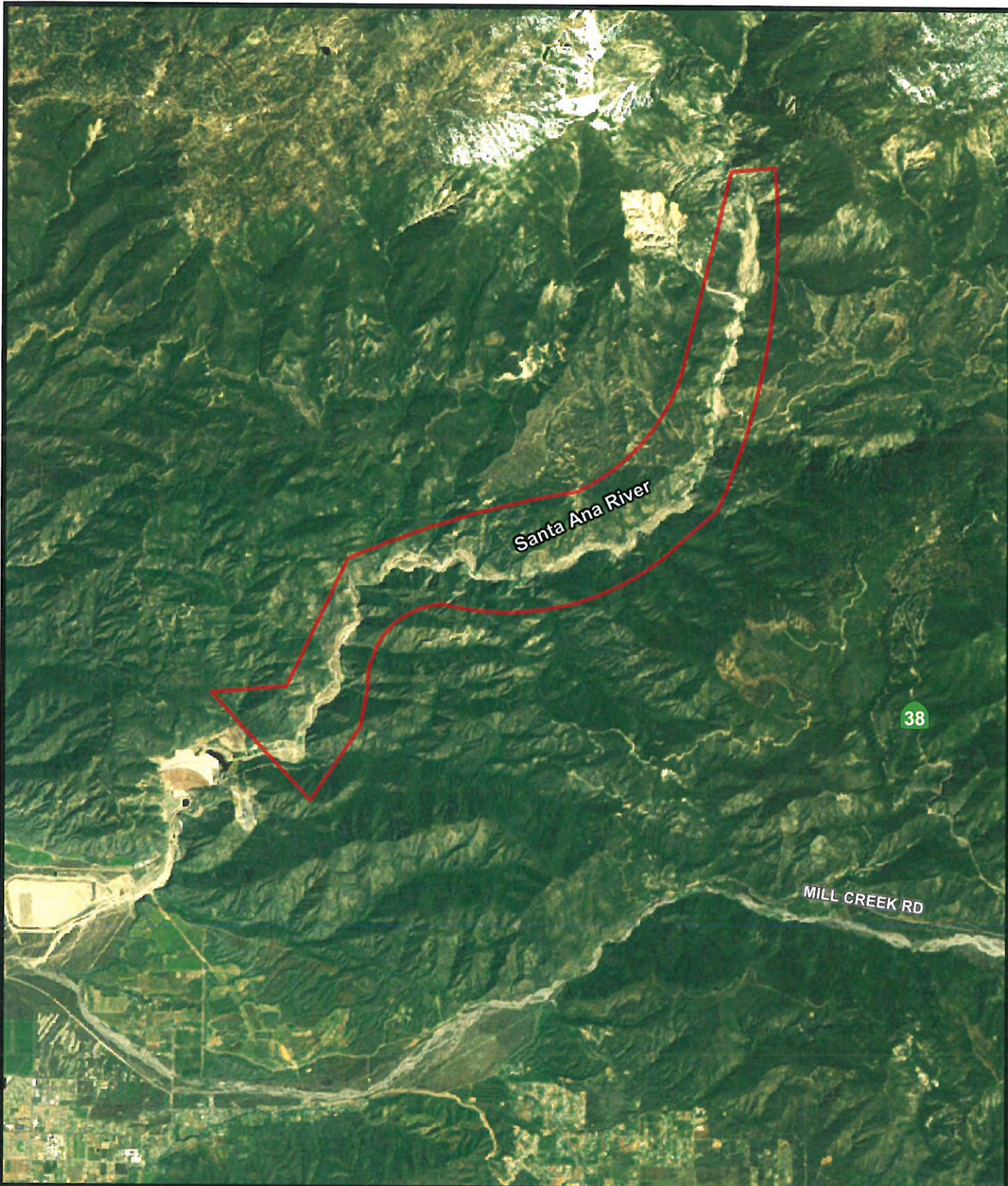
Approvals: The majority of City Creek is located on land owned by US Forest Service. Any activities proposed in along the Upper Santa Ana River would need to be coordinated with US Forest Service. Additionally, coordination would need to occur with CDFG, Corps, USFWS and the Regional Water Quality Control Board.

5.16.1. Habitat Restoration Opportunities

The Upper Santa Ana River contains high quality sucker habitat. Therefore, habitat restoration is not needed or recommended.

5.16.2. Population Reintroduction Opportunities

The upper Santa Ana River presents opportunities for the reintroduction of suckers. Along the upper reaches of the Santa Ana River plenty of high quality sucker habitat would be available for shelter, feeding and spawning. It is more than likely that the suckers introduced into the upper reaches of the creek would swim downstream to the lower reaches. Because of natural barriers such as drops or waterfalls or man-made barriers such as dams to create swimming holes, it is likely that the suckers would not be able to swim upstream, except during high flows. During the winter, suckers would be able to swim to the lower reaches of the Santa Ana River. However, during the summer introduced sucker populations would be stranded at the lower reaches of the Santa Ana River, exposing the population to competition for food, predation and potential anthropogenic impacts. Any sucker population reintroduction activities along Upper Santa Ana River would need to be implemented concurrently with a sucker management and monitoring program that would relocate suckers from the lower reaches of the Santa Ana River back to the upper reaches of the Santa Ana River.



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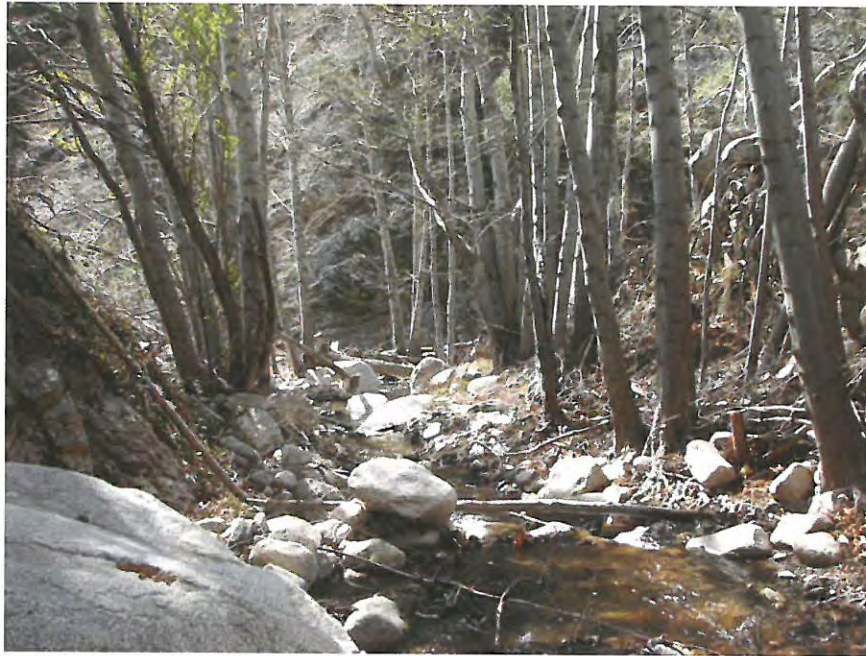
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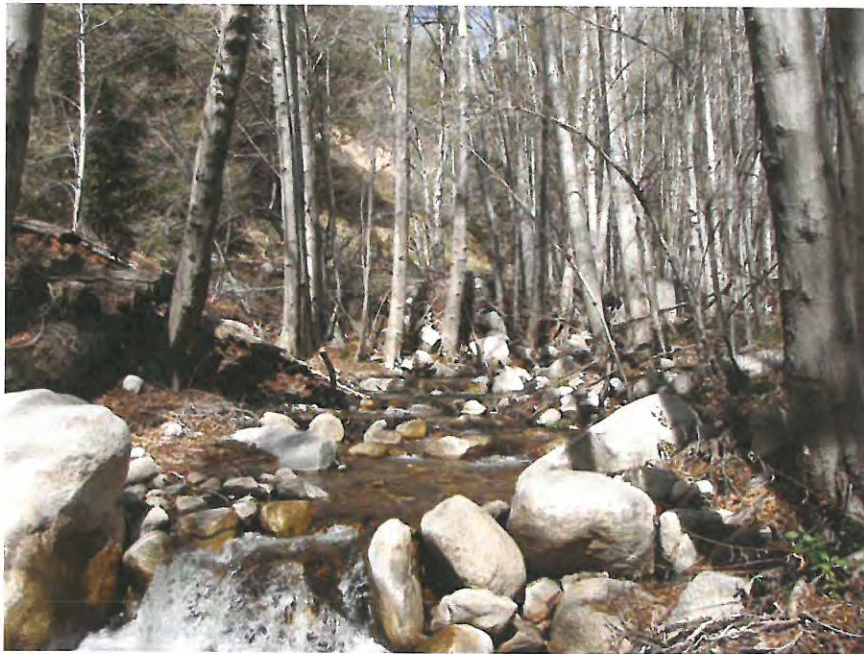
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Upper Santa Ana River Santa Ana Sucker Habitat Restoration/ Population Reintroduction Study



Upper Santa Ana River, downstream view.



Upper Santa Ana River, upstream view.

6.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

6.1 Habitat Element Rankings

To assist in identifying which potential project areas would provide the most viable opportunities for sucker habitat restoration and population reintroduction, the quantity and quality of existing essential habitat elements at each of the potential project areas was evaluated. A numerical value of 1, 2 or 3 has been assigned to identify the quality of each habitat element.

- A numerical value of 1 indicates that the habitat element is absent or has low habitat value.
- A numerical value of 2 indicates that the habitat element has moderate value.
- A numerical value of 3 indicates that the habitat element has high habitat value.

6.2 Summary of Findings

A summary of the ranking of the essential habitat elements at potential project area is presented in Table 2. The potential project areas with the highest scores indicate those areas that contain highest quality essential habitat for suckers. Conversely, those project areas with lower scores indicate that the essential habitat elements have less value or are not present. The assumption is that the project areas with highest habitat values would offer the greatest potential to successfully implement sucker habitat restoration and sucker reintroduction projects. Below is a discussion of the potential project areas that have been recommended for habitat restoration and population reintroduction projects.

TABLE 2: SUMMARY OF CANDIDATE PROJECT AREA HABITAT ELEMENTS

Project Area	Water Source	Substrate	Water Depth	Flow Velocity	Water Quality	Water Temp Controls	Native Riparian Vegetation	Known Occupied Habitat	Low Predation Threats	Low Recreation Pressure	Total Score
Lower SAR	3	3	1	1	2	3	2	2	1	2	20
Aliso Cree/k	1	2	2	1	2	3	2	1	3	3	20
Chino Creek	3	2	3	3	1	3	2	1	1	1	20
Temescal Creek	1	2	3	2	1	2	2	1	3	1	18
River Road	3	2	2	3	3	3	2	2	1	1	22
Hidden Valley	1	3	1	1	1	2	2	1	2	1	15
Sunnyslope Creek	3	3	3	2	2	3	2	2	1	1	22
Gooseberry Creek	3	3	2	2	2	3	2	1	1	2	21
Evans Lake	2	1	2	1	1	3	2	1	1	1	15
Anza Drain	3	2	2	2	2	3	2	1	1	1	19
Rialto/RIX	3	3	3	3	3	3	2	3	2	1	26
Mill Creek	3	3	3	3	3	2	2	1	3	1	24
Mountain Creek	3	3	3	3	3	2	2	1	3	1	24
Plunge Creek	3	3	3	3	2	3	2	1	3	2	25
City Creek	3	3	3	2	3	2	2	2	3	1	24
Upper SAR	3	3	3	2	3	3	3	1	2	2	25

6.3 Recommendations

The following is a discussion of project areas that have been recommended for sucker habitat restoration and population reintroduction.

Santa Ana River Upstream of River Road

The reach of the Santa Ana River between River Road and Hamner Avenue has been recommended for habitat restoration. The project area contains several high quality essential habitat elements and historically and recently has reported occupied sucker habitat. The focus of the habitat restoration would be to restore those habitat values that are deficient or lacking. Both river substrate and adjacent riparian habitat were identified as having moderate value. These two habitat elements would be restored through a habitat restoration project. A combination of deposits of large stones and/or stone filled gabions of about .25 ton would be placed in five to ten locations near the banks of the Santa Ana River to help create gravel beds for the suckers. The sites would be located on segments of the river owned by the Orange County Water District. Additionally, in the segments of the river where the stones and gabions would be placed, non-native riparian vegetation along the banks of the river would be removed. The project would be constructed, maintained and monitored by the Orange County Water District. Because of lack of ownership conflicts, lack of complexity and the previous success achieved with an earlier gabion pilot program, it is anticipated that a habitat restoration project at the River Road site could be implemented in a timely manner. Therefore, it is the first project that is recommended for implementation. Prior to implementation of the project, a habitat restoration implementation plan would be prepared and submitted to CDFG, Corps, USFWS and the RWQCB. The implementation plan would include the following:

- Description of the proposed project.
- Specific GPS locations and maps indicating where the gravel, stones and/or gabions would be deposited, where vegetation would be removed and/or dredging would be tried.
- The identification of the quantity, size and type of materials that would be deposited in the river and used in the gabions.
- A description of needed construction activities and equipment
- A listing of best management practices that would be followed.
- A discussion of maintenance activities.
- A description of the monitoring and reporting procedures to measure the success of the project.

Sunnyslope Creek and Gooseberry Creek

Both Sunnyslope Creek and Goose Creek are recommended for habitat restoration. The confluences of the Santa Ana River with Sunnyslope Creek and with Gooseberry Creek are located in the same general vicinity. Both creeks exhibit high quality essential habitat and share the same type of essential habitat deficiencies. Because of the close proximity of the creeks, and similar essential habitat characteristics a comprehensive habitat restoration project should be done for both creeks. By focusing on both creeks concurrently, the habitat value at the segment of the Santa Ana River near both creeks would greatly increase.

The proposed habitat restoration project at Sunnyslope Creek and Gooseberry Creek would involve the following activities;

- If feasible relocate the Sunnyslope outlet channel where it would have more direct alignment to the Santa Ana River and remove the vegetation blockages along both Sunnyslope Creek and Gooseberry Creek that currently prevents the flows of the Santa Ana River from entering into and out of both creeks.
- Establish gravel beds at the confluence of Sunnyslope Creek and Gooseberry with the Santa Ana River.
- Deposit gravel and rocks along segments of Sunnyslope Creek and Gooseberry Creek that contain sand and silt.
- Remove non-native vegetation along the banks of Sunnyslope Creek and Gooseberry Creek
- Implement exotic fish removal program and sucker monitoring program.

Both Sunnyslope Creek and Gooseberry Creeks are owned and maintained by the Riverside County Flood Control and Water Conservation District. Any activities in both creeks would require issuance of an encroachment permit and CEQA approval from Riverside County and permit approvals from CDFG, Corps, USFWS and RWQCB. Given the ownership issues to be addressed and the complexity of implementing the project, the restoration of Sunnyslope Creek and Gooseberry Creek is recommended to be implemented after the implementation of the River Road Restoration Project. Prior to implementation of the project, a habitat restoration implementation plan would be prepared and submitted to CDFG, Corps, USFWS and the RWQCB. The implementation plan would include the following:

- Description of the proposed project.

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- Specific GPS locations and maps indicating where the gravel, stones and/or gabions would be deposited and where vegetation would be removed.
 - The identification of the quantity, size and type of materials that would be deposited in the river and used in the gabions.
 - A description of needed construction activities and equipment
 - A listing of best management practices that would be followed during construction.
 - Description of exotic fish removal program
 - Discussion of maintenance activities.
 - A description of the monitoring and reporting procedures to measure the success of the project.

Rialto Channel

The Rialto Channel exhibited the highest quality essential habitat elements of all potential project areas evaluated. Because the area consistently supports suckers, it is important that the quality of the existing habitat be maintained. A habitat maintenance plan should be prepared and implemented to provide for the maintenance and upkeep of the Rialto Channel. Such maintenance should include: ensuring adequate gravel and rock deposits are at the confluence of the channel and the river; the removal of non-native vegetation along the banks; general clean up of the area; implementation of exotic fish removal program; and the monitoring and removal of man made barriers that prevent the movement of suckers.

Sucker Reintroduction

The selection criterion for potential project areas for sucker introduction is based on the value of existing sucker habitat and not the potential to restore habitat. The assumption is that those creeks that contain high value existing sucker habitat would provide the best opportunity to ensure the survivability of suckers that are reintroduced. Except for the Rialto Channel and the San Bernardino Mountain Creeks, all of the potential candidate project areas exhibit constraints that could have a significant effect on the survivability of suckers and therefore were rejected for reintroduction. After the successful implementation of habitat restoration plans some of these project areas could become suitable for sucker population reintroduction.

None of the project areas that historically or currently contain occupied sucker habitat were recommended for population reintroduction, as there would be net gain in occupied sucker habitat if the populations already existed herein.

All of the mountain creeks in the San Bernardino Mountains contain high value sucker habitat. However, City Creek is considered to have less habitat value and increased risks associated with the survivability of sucker populations. Therefore, upper reaches of Plunge Creek, Mill Creek and Mountain Creek are recommended for the initial sucker reintroductions. During the summer months there is no hydrologic connectivity between the Santa Ana River and Mill Creek, Mountain Home Creek and Plunge Creek. Suckers reintroduced into these creeks would run the risk of being stranded, exposing sucker populations to competition for food, predation and potential anthropogenic impacts. Any sucker reintroduction activities in the river and along Plunge Creek, Mill Creek or Mountain Home Creek need to be implemented concurrently with a sucker management and monitoring program that would relocate suckers from the lower reaches back to the upper reaches of the creek when hydrological connectivity to the Santa Ana River is not maintained.

The concept of reintroducing sucker populations into Plunge Creek, Mill Creek and Mountain Home Creek is supported by certain resource agency staff. Additional support and coordination would also be needed from USFS, CDFG, USFWS, Corps, RWQCB and from stakeholders in the area. Prior to preparation of a population reintroduction implementation plan, coordination meetings would need to take place to identify and resolve issues of concern among the different resource agencies and stakeholders. The Orange County Water District will assist with leadership on the coordination of the meetings and the resolution of issues of concern. However, ultimately proactive support and actions would be needed by the resource agencies to implement the program.

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