US Army Corps
of Engineers®
Los Angeles District

Prado Basin Ecosystem Restoration and Water Conservation Study

APPENDIX G

Biological Assessment

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Prado Basin, California
Ecosystem Restoration and Water Conservation Integrated Feasibility Report

Biological Assessment

Prepared By

United States Army Corps of Engineers
With Technical Assistance by
Orange County Water District

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SECTION 1 INTRODUCTION

1.1 Proposal

The Prado Basin, California Ecosystem Restoration and Water Conservation Integrated Feasibility Report (IFR) proposes a combination water conservation and ecosystem restoration measures within the Prado Basin and along the Santa River both downstream and upstream of Prado Dam. The proposed ecosystem restoration measures would be implemented within four different focal areas referred to as the Upstream Santa Ana River Upstream Focal Area (SARM Upstream), Santa Ana River Downstream Focal Area (SARM Downstream), Chino Creek Focal Area and the Mill Creek Focal Area. The measures would be implemented beginning in the year 2021 and would extend for at least 50 years through 2071. This timeline reflects the economic life of the project based on assumptions made for the feasibility analysis; water conservation and restoration elements are expected to remain in place, functioning and continuing to provide benefits beyond this period of analysis. Implementation of the ecosystem restoration measures would take up to 5 years for construction, plant establishment and to achieve initial success criteria with regular operation and maintenance occurring thereafter for 45 years or beyond. Water conservation would commence soon after the Record of Decision for the project is signed, while final design and construction continues on the ecosystem restoration measures. The ecosystem restoration measures include; Sediment Management, Chino Creek Restoration Improvements, Native Plantings, Invasive Plant Management, Riparian Edge Treatment, In-Stream Habitat Features, and Non-Native Aquatic Species Management. While water conservation is not considered a restoration measure, it does have some incidental beneficial effects to riparian habitat and wildlife species.

The project description also includes monitoring to document or ensure successful implementation of restoration measures and to monitor and if necessary mitigate the effects of water conservation and the sediment management measure. The monitoring activities would include; monitoring the health of riparian habitat between the elevations of 498 ft. and 505 ft. to help evaluate any potential effects from water conservation on habitat within the Prado Basin, monitoring potential water effects from sediment re-entrainment into lower Santa Ana River and sediment movement monitoring to determine sediment profile changes in the Prado Basin and along segments of the lower Santa Ana River from the excavation and dredging activities occurring within the Prado Basin. Further refinement of the monitoring activities may occur as part of the coordination with resource permitting agencies.

1.2 Need and Purpose

The need and purpose for the IFR addresses two primary water resource issues; Ecosystem Restoration and Water Conservation.

Ecosystem Restoration

Need: The need for restoration of habitats and wildlife movement corridors associated with the Prado Basin and the Santa Ana River and its tributaries has come about due to changes in ecological processes and reduction of habitat extent and quality. These losses of habitat and ecological function have been caused by flood risk management practices, agricultural conversion and changes in land use throughout the watershed. These trends have been driven by population growth and development throughout the region that intensified and accelerated throughout the 20th Century and which are still underway today. The increased sedimentation behind Prado Dam that has been caused by these trends has led to a change in river bed degradation affecting the quality of aquatic habitat. Therefore, sediment management is needed to restore the quality of habitat. Historically, the Santa Ana River and its tributaries traversed unobstructed floodplains. These floodplains and tributaries hosted diverse and complex system of riparian corridors and freshwater marsh habitat. These aquatic systems supported a large variety of wildlife ranging from large predatory mammals to native fish that occupied habitats and ecological niches along the drainages throughout the Santa Ana River watershed. Only a small percentage of these habitats now remain, as a result of the above-mentioned development and proliferation of invasive vegetation and non-native species throughout the Santa Ana River watershed. Opportunities for wildlife movement have also become far more constrained for the same reasons.

Purpose: The ecosystem restoration measures proposed in the IFR have been developed and evaluated to restore the quality and function of aquatic and riparian habitats within the Action Area, and to address constraints to regional wildlife movement for both terrestrial and aquatic species. Native species that would benefit from this restoration include the threatened Santa Ana Sucker (*Catostomus santaanae*), the Coastal California gnatcatcher (*poliptila californica californica*), Western Yellow Billed Cuckoo (Coccyzus americanus occidentals), and the endangered Least Bell's Vireo (*Vireo bellii pusillus*) and Southwestern Willow Flycatcher (*Empidonax traillii extimus*), as determined by the U.S. Fish and Wildlife Service under the requirements of the Federal Endangered Species Act.

Water Conservation

Need: Water conservation is needed to provide a reliable source of water to the Orange County Water District (OCWD) service area given the vulnerability of supplies from the State Water Project and Colorado River due to extensive, multi-year droughts that have affected the western U.S. over the last four decades, and the potential for earthquakes or other catastrophic events to disrupt the supply of imported water from distant sources to supply growing demands in Orange County.

Purpose: The purpose of the Water Conservation Measure is to increase water retention behind Prado Dam and increase groundwater recharge within the Santa Ana

River Watershed downstream of Prado Dam by changing operation of the dam to impound more water and then release stored water in a controlled manner to optimize recharge of aquifers associated with downstream reaches of the Santa Ana River. Water conservation measures would also allow OCWD to adjust the timing and flow rate of releases to increase the quantity of water provided to downstream intake structures.

SECTION 2 ACTION AREA

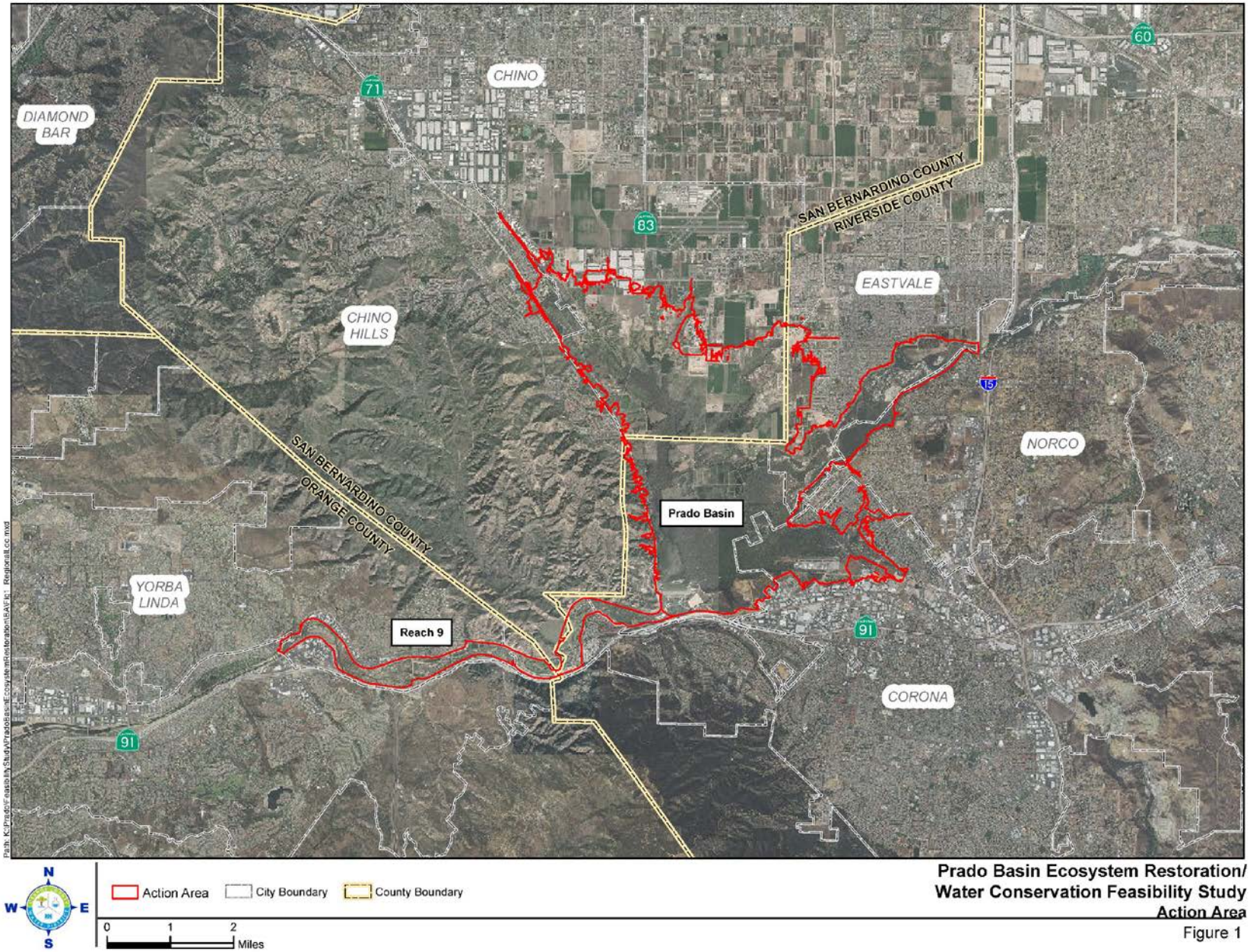
The Action Area is defined as all areas that would be directly or indirectly affected by the Proposed Action. As shown in Figure 1, the Action Area is regionally located within western Riverside County and Orange County. The upstream extent of the Action Area within Prado Basin was determined to be the Santa Ana River/Hamner Bridge crossing. This location was selected because it fully encompasses the extent of the expected area of influence that would be directly affected by the proposed Upstream SARM ecosystem restoration measures. This upstream boundary also encompasses the area where modifications to the OCWD wetlands diversion structure would occur as an element of the sediment management feature.

The downstream extent of the Action Area below Prado Dam differs according to species. For Santa Ana Sucker, the downstream extent is the ocean outlet of the Santa Ana River. For all other listed species, the Action Area extends to the downstream extent of Reach 9 at Weir Canyon Rd. Bridge. Downstream impacts below Weir Canyon Bridge will be indirect, and predominantly aquatic impacts, associated with changes in flow and sediment transport. These changes will not result in impacts to habitat for other listed species below Reach 9 other than Santa Ana Sucker. .

The Action Area also extends along Chino Creek from Prado Dam to area north of Pine Avenue and along Mill Creek from the confluence of Mill Creek and Chino Creek to Chino Corona Road. These areas would be directly affected by the implementation of ecosystem restoration measures proposed along Chino Creek and Mill Creek.

2.1 Prado Basin

Prado Basin is located within the Santa Ana River Watershed. There are four major tributaries that drain into the Prado Basin; Santa Ana River, Chino Creek, Cucamonga Creek (which flows into Mill Creek) and Temescal Wash. All of these water bodies converge upstream of Prado Dam. The biological setting in the Prado Basin is significantly influenced by the presence of Prado Dam. As a result of a combination of high groundwater, storm flow accumulation held in the reservoir, ongoing sewage treatment plant effluent and irrigation runoff, perennial flows occur throughout much of the Prado Basin. During the winter months the river maintains flow throughout Prado Basin. In the summer months the surface flow is substantially reduced, but is typically still present. Prado Basin consists of a wide mixture of biological resources and habitats, including; cottonwood/willow riparian forest, riparian scrub, herbaceous riparian, freshwater ponds, freshwater marsh, and riverine. Riparian forest is the most dominant wetland habitat in the Prado Basin. The dominant plant species within the riparian forest are black willow, (*Salix goodingii*), arroyo willow (*Salix lasiolepis*), Freemont cottonwood, (*Populus fremontii*) eucalyptus, sycamore (*Platanus recemosa)*, and mulefat (*Baccharis salicifolia*).



N
W E
S

Action Area
City Boundary
County Boundary

0 1 2
Miles

Prado Basin Ecosystem Restoration/ Water Conservation Feasibility Study
Action Area
Figure 1

The riparian habitat within Prado Basin is a dynamic community that is dependent upon periodic flooding. Winter flows create areas of scour and sedimentation that cycle portions of the community back to earlier successional stages. Periodic floods of large magnitude and migration of the river channel lay down fresh alluvial deposits where seeds can germinate and plant roots can take hold. The basin contains an expansive riparian forest. At lower elevations in the basin, the riparian forest coverage is nearly complete with an over story of trees reaching as high as 50 feet and an understory of both native vegetation and non-native vegetation. At the higher elevations in the basin the forest is patchier and the understory consists of more non-native vegetation.

The riparian forest in the Prado Basin contains an abundance and diversity of bird species. Neotropical migrants depend on deciduous trees and shrubs for foraging during migration. The mature trees provide numerous cavities for cavity dependent wildlife and the taller trees are used by nesting raptors. The emergent vegetation at the water's edge provides escape cover, shade and a source of food for fish. The basin supports a wide variety of mammal, amphibian and reptile species, several of which are biologically significant. Additionally, the Prado Basin functions as a wildlife movement corridor between core habitats in the Chino Hills, the Santa Ana Mountains and Prado Basin and the undeveloped Santa Ana River Floodplain.

2.2 Santa Ana River Prado Dam to River Road

The segment of the Santa Ana River (SAR) extending from the River Road Bridge/Santa Ana River crossing downstream into Prado Basin can be divided into two sub-segments. The upper segment, extending from River Road Bridge downstream to the south and west is approximately 10,000 feet, and is typically a well-defined channel composed of primarily sand channel slopes and a sand river bed. The river bed gradation ranges from very fine sand to coarse sand with occasional, brief and intermittent gravel deposits. This segment of the Santa Ana River receives high amounts of sediment deposition and can often move laterally during large flow events. The slope of the river in this location typically ranges from 0.003 to 0.0001, depending on sedimentation and river flow conditions.

The segment of the Santa Ana River extending from 10,000 feet below River Road Bridge, south and west 7,000 feet to the Prado Dam embankment is indiscernible as a single river channel and can be defined as a series of braided streams meandering towards the Prado Dam outlet works. The braided stream beds and stream bank gradations are composed of a higher silt and clay content than what is present in the upper segment. The slope of the braided streams in this location of the basin can vary dramatically depending on their location in the basin and annual sedimentation deposition, but typically range from 0.01 to 0.0001.

2.3 Santa Ana River Reach 9

The stretch of the Santa Ana River occurring downstream of Prado Dam to Weir Canyon Road, referred to as Reach 9, runs through Santa Ana Canyon and has several distinctive characteristics. At the Prado Dam outlet structure to the Green River Golf Course the river has a relatively flat slope. Within this reach the river flow is perennial and the floodplain is covered with riparian vegetation. The banks are moderately incised with vegetated islands that dot the main channel. Near the Green River Golf Course the slope increases and the river becomes more incised. Between the Green River Golf Course and Imperial Highway, the flood plain becomes much more expansive with several flow splits forming natural islands. Riparian vegetation is mostly concentrated near the river bank. Except for a drop structure located downstream of Weir Canyon, this reach does not contain any other water control structures.

The bed material in Reach 9 is much coarser than the sandy bed material of the river above Prado Dam. Reach 9 bed material generally consists of gravels and cobbles compared to the predominantly sand substrate characteristic of the river upstream of Prado Dam. The dominant bed form in this reach is pool-riffle, where high gradient high velocity riffles flow into low gradient low velocity pools. Additionally, there are several stretches where the river has a plane bed, where the gradient and velocity are constant and the river bottom material is dominated by gravel and cobble.

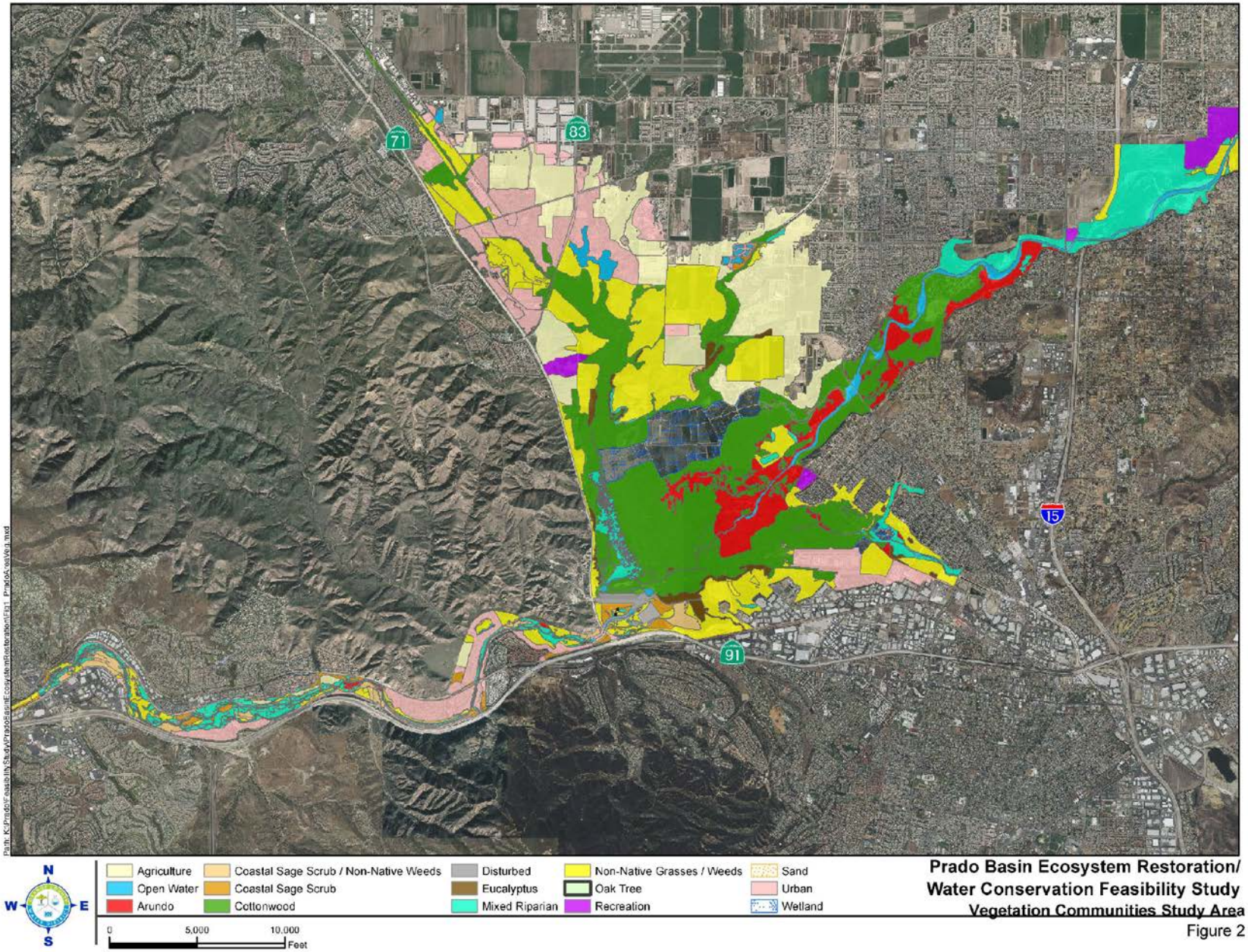
The Corps is currently implementing major improvements and associated mitigation for the Santa Ana River Mainstem Project, which includes flood risk reduction measures within Prado Basin and along the Santa Ana River downstream to the Pacific Ocean. Also included in Reach 9 is the Corps Santa Ana Sucker Perennial Stream Restoration Project.

2.4 Vegetation Communities

The study area contains a diverse assemblage of vegetation communities. For mapping purposes similar vegetation types were grouped together under one classification. Figure 2 provides an overview of vegetation communities within the study area. The descriptions of each vegetation classification and a listing of the plant species that can be found in each vegetation community is presented below.

Cottonwood/Willow/Mulefat: The Cottonwood/Willow/Mulefat classification has been designated on lands that consist predominately of Fremont Cottonwood (*Populus fremontii),* Black Willow (*Salix gooddingii),* Arroyo Willow (S*alix lasiolepis*), Narrow-leaf Willow (*Salix exigua),* Mulefat *(Baccharis salicifolia)* with minor components of Western Sycamore (*Platanus racemosa).*

Mixed Riparian: The Riparian Mixed classification has been applied to lands that consist of 50% native riparian vegetation and 50% non-native riparian vegetation. Mixed Riparian vegetation within the project area includes; Fremont Cottonwood (*Populus fremontii),* Black Willow (*Salix gooddingii),* Arroyo Willow (S*alix lasiolepis*), Narrow-leaf



Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
Vegetation Communities Study Area
Figure 2

Willow (*Salix exigua),* Mulefat *(Baccharis salicifolia),* Elderberry (*Sambucus mexicana*), Cocklebur (*Xanthium*), Caster Bean (*Ricinus communis*), Tree Tobacco (*Nicotiana glauca)*, Tamarisk ((*Tamarix aphylla)*.

Coastal Sage Scrub: The Coastal Sage Scrub classification has been applied to areas that consist of 90% cover or greater of coastal sage scrub vegetation. The Coastal Sage Scrub Series includes California Sagebrush (*Artemisia californica*), California Bush Sunflower (*Encelia californica*), California Buckwheat (*erigonum fasciculatum*), Black Sage (*Salvia mellifera*) and White Sage (*Salvia apiana*).

Mixed Coastal Sage Scrub /Non-Native Grasses/Weeds: The Mixed Coastal Sage Scrub /Non-Native Grasses/Weeds classification has been applied to areas that consist of approximately 50% cover of Coastal Sage Scrub and 50% cover of non-native grasses and weeds. The Coastal Sage Scrub Series includes California Sagebrush *(Artemisia californica*), California Bush Sunflower (*Encelia californica),* California Buckwheat (*erigonum fasciculatum*), Black Sage (*Salvia mellifera*) and White Sage (*Salvia apiana).* Non-native grasses and non-native weeds present include; Black Mustard (*Brassica nigra*), Poison Hemlock (*Conium maculatum*), Starthistle (*Centaurea spp.).* Summer Cypress *(Kochia Scoparia)*, Five Hook Bassia (*Bassia hyssopifolia)*, Russian Thistle (*Salsolce traqusl*), Ripgut *(Bromus diandrus).*

Non-Native Grasses/Weeds: The Non-native grasslands and weeds classification has been designated on lands that consist of 90% cover or more of non-native grasses and non-native weeds. Non-native grasses and non-native weeds present include; Black Mustard (*Brassica nigra*), Poison Hemlock (*Conium maculatum*), Starthistle (*Centaurea spp*.), Summer Cypress *(Kochia Scoparia)*, Five Hook Bassia (*Bassia hyssopifolia)*, Russian Thistle (*Salsolce traqusl*), Ripgut *(Bromus diandrus).*

Eucalyptus: The Eucalyptus classification has been applied to lands that consist predominantly of Eucalyptus Trees, with less than 10% cover of other vegetation.

Arundo: The Arundo (*Arundo donax*) classification has been applied to lands that consist predominantly of Arundo, with less than 10 % cover of other vegetation.

Oak Tree: The Oak Tree classification has been to lands that contain clusters of Oak Trees.

Wetlands: The Wetland classification has been to lands that operate as constructed wetlands.

Open Water: The Open Water classification represents portion of the project area that consists of water bodies, including stream systems, pools and ponds.

Agriculture: The Agriculture classification has been applied to lands that are in agriculture production.

Recreation: The Recreation classification has been applied to lands that provide recreation, including but not limited to parks, shooting ranges and golf courses.

Urban: The Urban classification has been applied to lands that are developed with developed urbanized land uses.

Disturbed: The Disturbed classification has been applied to lands that have been disturbed by human presence, such as compacted and frequently disturbed soils.

A statistical summary of vegetation communities in the Prado Basin along Reach 9 between elevations 470 ft. to 498 ft., 498 ft. to 505 ft. and 505 ft. to 566 ft. is shown in Table 1.

Table 1 Prado Basin Vegetation Communities

Vegetation Community	Acres Between 470 ft. and.498 ft.	Acres Between 498 ft. and 505 ft.	Acres Between 505 ft. and 566 ft.
Cottonwood/Willow	852.5	431.9	1887.9
Mixed Riparian	98.8	.17	198.3
Coastal Sage Scrub	0.0	0.0	23.2
Coastal Sage Scrub/Non-Native Weeds	0.0	0.0	46.3
Open Water	34.2	.52	236.8
Non-Native Weeds/Grasses	50.4	54.7	1893.9
Arundo	0.0	8.3	608.0
Disturbed	0.7	1.3	30.8
Eucalyptus	23.6	17.5	113.7
Constructed Wetlands	91.8	166.7	235.6
Agriculture	0.0	1.7	1797.9
Recreation	4.03	11.9	31.6
Urban	0.0	0.0	1225.4
Total	1,156.03	694.6	8329.4

Source Orange County Water District, United States Army Corps of Engineers

A statistical summary of vegetation communities along Reach 9 of the Santa Ana River is shown in Table 2.

Table 2 Santa Ana River Reach 9 Vegetation Communities (Acres)

Vegetation Community	Acres
Mixed Riparian	321.6
Open Water	54.8
Coastal Sage Scrub	77.2
Non-Native Weeds/Grasses	172.9
Mix Coastal Sage Scrub/Non-Native Weeds	105.5
Arundo	11.3
Eucalyptus	1.1
Agriculture	41.1
Oak	.54
Urban	436.5
Wetlands	2.7
Total	1225.2
Source: Orange County Water District and Untied States Army Corps Engineers	

2.5 Wildlife Movement Corridors

The Santa Ana River is a major drainage that connects coastal regions of Orange County with interior regions of Riverside and San Bernardino counties. The riparian and upland plant communities that occur in and adjacent to the Santa Ana River provide habitat for a variety of resident and migratory wildlife species including several special-status species. The river provides an important regional corridor linking riparian ecosystems from the immediate coastal plain with the interior plains and valleys of the region. The Prado Basin with its extensive riparian woodland provides a wealth of biological resources and serves as a major link within the regional corridor.

The stretch of the Santa Ana River and corresponding floodplain within the vicinity of Reach 9 study area is surrounded by a variety of developed land uses. As a result the floodplain is the primary habitat area in the study area. The river and corresponding undeveloped floodplain provide a corridor for wildlife to move up and down the river and allows access to linkages to additional core habitat areas, such as the Santa Ana Mountains, Prado Basin, and Chino Hills. Wildlife dispersion becomes further restricted to the southwest due to channelization of the streambed and adjacent development.

The Chino Hills State Park and Cleveland National Forest in the Santa Ana Mountains are separated by the Santa Ana River Canyon near Prado Basin. The linkage between core habitats in the Santa Ana Mountains, the Prado Basin, and the Puente-Chino Hills was once several miles wide. It is now extremely limited, due in large part to SR-91, the Corona Expressway (SR-71), and urban development. The only passageways remaining for wildlife to utilize to safely traverse SR-91 and SR-71 are freeway under crossings. There are nine under crossings run beneath SR-91 that can provide connections for wildlife moving. These passageways can provide connections for wildlife moving between remaining patches of quality habitat. The culverts under SR-91 are used extensively by small mammals as well as by mountain lions. In particular,

undercrossing 91-09, known as the “Coal Canyon” underpass, is an important wildlife movement corridor for numerous wildlife species. Additionally, under crossing 91-17, near the BNSF Railroad Bridge, is an important crossing for wildlife as it consists as a 12-foot by 12-foot cement box culvert, which occurs beneath SR-91 and Green River Road and opens up to a small drainage. This culvert provides a relatively safe passage for wildlife beneath SR-91, between the Santa Ana Mountains to the south and the Chino Hills to the north. Bobcat, grey fox, coyotes, and several other mammalian species, have been documented using this culvert on a regular basis.

SECTION 3 SPECIAL STATUS SPECIES/CRITICAL HABITAT

3.1 Federal Listed Special Status Plants

To determine the potential for Federal Listed special status plant species to occur within the Action Area a review of the U.S. Department of Interior Information Planning and Conservation System Database and the California Department of Fish and Wildlife California Natural Diversity Data Base was conducted. A listing of Federal Listed special status plant species that could have potential to occur within the Action Area is shown in Table 3. The determination on the potential for the species to occur within the Action Area was based on the criteria shown below. Based on existing habitat conditions there are no Federal Listed special status plant species that have a moderate or high potential to occur within the Action Area.

Present: The species is commonly observed or observed within the Action Area within the last year.

High: The Action Area supports suitable habitat and the species has been observed within last 2 years.

Moderate: The Action Area supports suitable habitat and the species has not been observed within last 2 years.

Low: The Action Area lacks suitable habitat for the species.

Table 3 List of Federal Special Status Plant Species

	Federal	State	CNPS	General Habitat Requirement	Action Area Habitat Suitability	Potential Occurrence in Action Area
Plants						
Slender Horned Spineflower (*Dodecahema leptoceras)*	E	E	1B.2	Sandy places Coastal Sage Scrub, Chaparral, cismontane woodlands, stream banks and washes. Flowering period April to June.	The Action Area does not support adequate amount habitat.	Low
Santa Ana River Woollystar *(Eriastrum densifolium ssp. Sanctorum)*	E	E	1B.1	Sandy gravelly Soils on River Floodplain. Flowering period May to September.	The Action Area does not support adequate amount suitable habitat.	Low
Brauntons milk-	E	NL	1B.1	Dry open areas	The Action Area	Low

vetch (Astragalus brauntonii)				in chaparral with sandstone and rocky clay soils and c Coastal Sage Foothills. Flowering period February to July.	does not support adequate amount suitable habitat.	
San Fernando Valley spineflower (Chorizanthe parryi var. Fernandina)	C	NL	1B.1	Sandy coastal scrub and desert scrub. Flowering period April to June.	The Action Area does not support adequate amount suitable habitat.	Low
Legend **Federal** E- Endangered T-Threatened SSC- Special Species of Concern C-Candidate for Listing NL-Not Listed **State Listing (California Endangered Species Act, CDFG** FP-Fully Protected E-Endangered T-Threatened S-Sensitive SSC-Special Species of Concern WL-Watch List NL-Not Listed			**California Native Plant Society CNPS** 1A-Plants presumed extinct in California 1B- Plants rare, threatened, or endangered in California and elsewhere 2-Plants rare, threatened, or endangered in California but more common elsewhere 3-Plants about which we need more review 4-Plants of limited distribution **CNPS Threat Rank** .1 Seriously Endangered .2 Fairly Endangered .3 Not Very Endangered			

3.2 Federal Listed Special Status Wildlife Species

To determine the potential for Federal Listed special status wildlife species to occur within the Action Area a review of the U.S. Department of Interior Information Planning and Conservation System Database and the California Department of Fish and Wildlife California Natural Diversity Data Base was conducted. A listing of Federal Listed special status wildlife species with the potential to occur within the Action Area is shown in Table 4. The determination on the potential for the species to occur within the Action Area was based on the following criteria.

Present: The species is commonly observed or observed within the Action Area within the last year.

High: The Action Area supports suitable habitat and the species has been observed within last 2 years.

Moderate: The Action Area supports suitable habitat and the species has not been observed within last 2 years.

Low: The Action Area lacks suitable habitat for the species

Table 4 List of Federal Special Status Wildlife Species

	Federal	State	General Habitat Requirement	Action Area Habitat Suitability	Potential Occurrence in Action Area
Birds					
Least Bell's vireo *(Vireo bellii pusillus)*	E	E	Summer resident of southern California in low riparian habitats in vicinity of water or dry river bottoms, nests placed along margins of bushes or on twigs landing on pathways, usually willow, mesquite or mulefat.	The Action Area supports suitable habitat and species is annually reported in the Prado Basin.	Present
Western yellow billed cuckoo (*Coccyzus americanus occidentalis)*	T	E	Riparian Woodlands with thick stands of Cottonwoods and Willows	Species typically require a minimum of 25 acres of area and forage predominantly in cottonwood tree stands. Within the last 15 years 2 sightings have been reported in the Prado Basin, 1 in 2000 and 1 in 2011.	Moderate
Southwestern willow flycatcher (*Empidonax traillii extimus)*	E	E	Breeds in willow riparian forest and shrub ands	The Action Area supports suitable habitat. Species has intermittently been reported in the Prado Basin, most recently in 2015.	High
Coastal California gnatcatcher (*Polioptila californica californica*)	T	SSC	Obligate, permanent resident of coast sage scrub below 2,500 feet in southern California. Inhabits low coastal sage scrub in arid washes, on mesas, and slopes.	The Action Area supports suitable habitat and the species is present. The species has been documented on terraces in Reach 9 that are higher in elevation than would be expected to be affected by the Proposed Action.	Present
Aquatics					
Santa Ana sucker (*Catostomus santaanae*)	T	SSC	Cool, clear streams, rivers, rocky bottom in riparian woodlands	The Prado Basin Action Area does not contain adequate amounts of suitable habitat. The Reach 9 Action Area contains marginally suitable habitat.	Moderate
E- Endangered T-Threatened SSC- Special Species of Concern					

C-Candidate for Listing **California Endangered Species Act/California Department Fish Game** E-Endangered FP-Fully Protected S-Sensitive SSC-Special Species of Concern T-Threatened WL-Watch List	

3.3 Federal Listed Special Status Species Habitat Affinities and Critical Habitat

Least Bell's vireo (vireo)

Status

The vireo was listed as a Federal Endangered Species in 1986.

Species Description

The vireo is a small migratory songbird that historically was common in lowland riparian habitat, ranging from coastal southern California through Sacramento and San Joaquin Valleys with scattered populations in Coast Ranges of the Sierra Nevada, Mojave Desert and Death Valley. Presently, the species only occurs in riparian woodlands in southern California. Until about 1986 when only 300 pairs were documented throughout the U. S. range. The enactment of protective measures and subsequent management led to steadily increasing vireo numbers and, by 2005, there were nearly 3000 territorial male vireos (USFWS 2006).

Critical Habitat

As shown in Figure 3, the Action Area includes lands that are designated critical habitat for the vireo. The primary constituent elements for the vireo include riparian woodland vegetation that generally contains both canopy and shrub layers and includes some associated upland habitats. Vireos typically occupy low riparian growth either in vicinity of water or in dry parts or river bottoms. The center of activity is within a few feet of the ground, in the fairly-open twigs canopied above by the foliage of willows and cottonwoods. Most typical plants frequented by vireos are willows, mulefat, and wild blackberry. As shown in Table 5, there is approximately 3,349.36 acres of critical habitat for the vireo within the Action Area.

Table 5 Action Area Critical Habitat

Critical Habitat	Acres 470 ft.to 498 ft.	Acres 498 ft. to 505 ft.	Acres Above 505 ft.to 566	Acres Reach 9	Total
Least Bell's vireo	961.7	507.5	1880.1	0.0	3349.36
Southwestern willow flycatcher	0.0	0.77	1492.5	0.0	1493.29
*Western yellow billed cuckoo	1004.9	614.0	2686.1	0.0	4,305.0
Coastal California gnatcatcher	0.0	0.0	0.0	313.21	313.2

Santa Ana sucker	0.0	0.0	377.50	613.8	991.3
*Final Ruling Expected 2018 (USFWS) Source: Orange County Water District and United States Army Corps of Engineers, 2016					

Action Area Occurrence: As shown on Figure 4, surveys conducted in the last year have identified numerous vireos territories within the Prado Basin and along the Santa Ana River Reach 9.

Southwestern willow flycatcher (flycatcher)

Status

The flycatcher was listed as a Federal Endangered Species in 1995.

Species Description

The flycatcher is a small, insect-eating generalist, neo-tropical migrant bird. It grows to about 15 centimeters in length. It eats a wide range of invertebrate prey including flying and ground and vegetation dwelling insect species of terrestrial and aquatic origins. The flycatcher spends the winter in locations such as southern Mexico, Central America and South America. Flycatchers are often present and singing in territories around mid-May. They have been documented in southern California in April in exceptional circumstances (USFWS 2001).

Critical Habitat

As shown in Figure 3, the Action Area includes lands that are designated critical habitat for the flycatcher. The primary constituent elements for the flycatcher are thickets of riparian shrubs and small trees with adjacent surface water such as willows, cottonwoods, mulefat, and other wetland plants. The surface water must be available from May to September during breeding season. As shown in Table 5, there are approximately 1,493 acres of critical habitat for the flycatcher within the Action Area.

Action Area Occurrence: As shown on Figure 5, a total of 27 flycatchers have been reported in the Prado Basin between 2003 and 2016. The majority of sightings were reported above elevation 505 ft. The most recent observed flycatcher was a male reported in 2015 and 2016 between elevation 498 ft. and 505 ft.

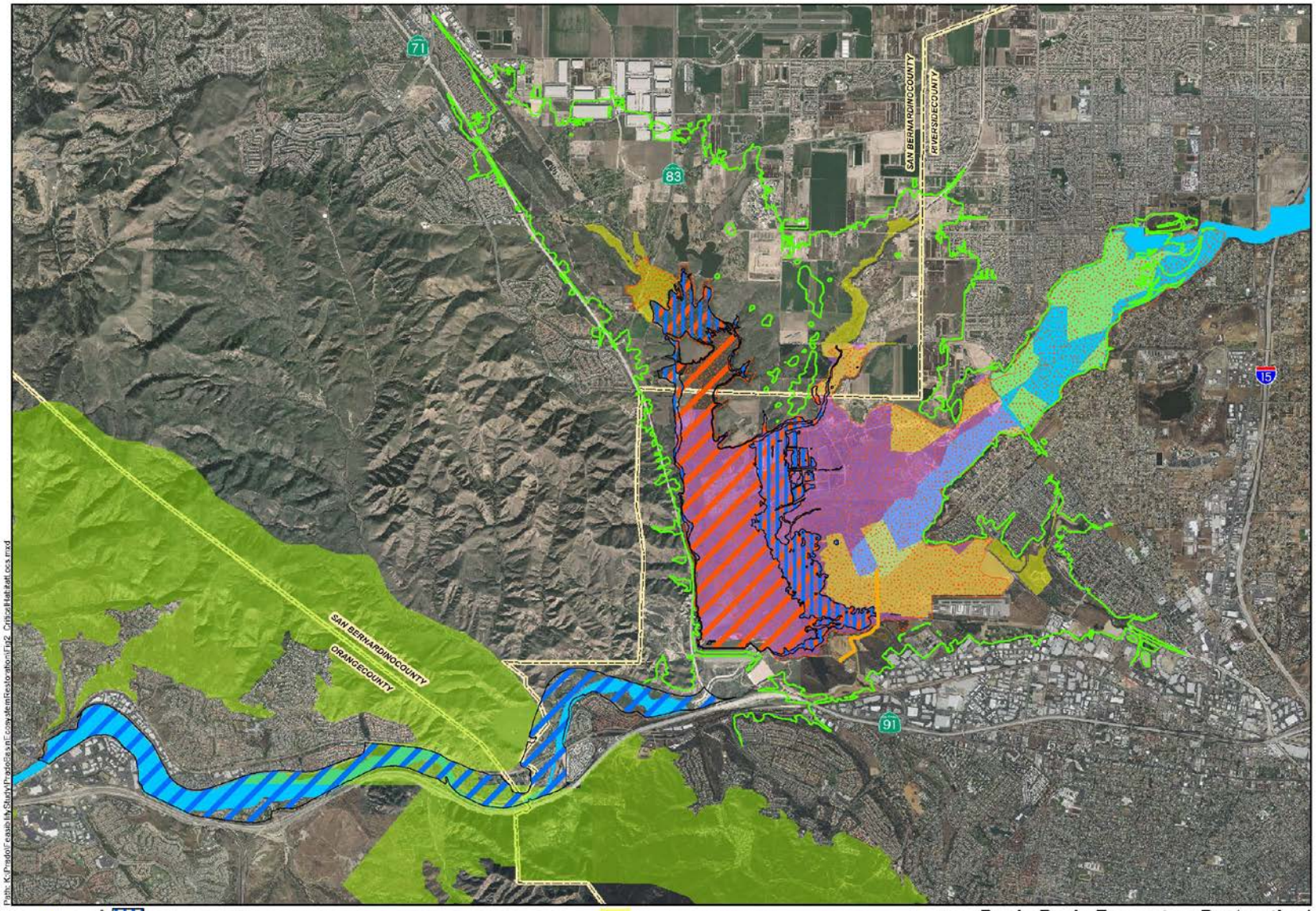
Western yellow-billed cuckoo (cuckoo)

Status

The cuckoo is a Federal Threatened Species.

Species Description

The cuckoo was once widespread and common throughout lowland California. Because of habitat loss their population numbers have declined significantly. Presently, the species is considered uncommon to rare. The cuckoo is typically found in understory foliage adjacent to slow moving watercourses, backwaters or seeps. Each pair of



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498 to 505 Elevation Planned Deviation
Prado Basin 470 to 505 Elevation
Reach 9
Prado Basin Boundary
Yellow Billed Cuckoo Critical Habitat
Santa Ana Sucker Critical Habitat
Southwestern Willow Flycatcher Critical Habitat
Least Bell's Vireo Critical Habitat
California Gnat Catcher Critical Habitat

0 5,000 10,000 Feet

Prado Basin Ecosystem Restoration/ Water Conservation Feasibility Study

Critical Habitat

Figure 3

cuckoos require a minimum 25 acres in which to forage predominantly in Freemont Cottonwood stands. Nesting requires an area of dense understory near water or at least with adequate humidity. Typically, their nests are in willows, small cottonwoods or mesquite trees with well protected overhead.

Critical Habitat

Critical habitat for the western yellow-billed cuckoo was proposed in 2014. Presently, the current ruling is being revised by USFWS. The final ruling is expected sometime in 2018. Based on the ruling it appears that approximately 4,305 acres of critical habitat for the cuckoo would be proposed within the Action Area.

Action Area Occurrence: As shown in Figure 5, the most recent sighting of the cuckoo was in 2011 between elevations 498 ft. and 505 ft. Prior to 2011 the last reported sighting in the Prado Basin was in 2000.

Critical Habitat

Coastal California gnatcatcher (gnatcatcher)

Status

The gnatcatcher was listed as Federally Threatened in 1993.

Species Description

The gnatcatcher is primarily restricted to coastal sage scrub habitats of coastal southern California and northern Baja California. The species sometimes occurs in other types of habitats adjacent to coastal sage scrub, including grasslands, chaparral, and riparian habitat. Although breeding territories have been reported in non-sage scrub habitats, these habitats are most commonly used for foraging or dispersal in the non-breeding season (Atwood, 1980; Campbell et al., 1998; Rotenberry and Scott, 1998). In California, the gnatcatcher species is a year-round resident of scrub dominated plant communities from southern Ventura County southward through Los Angeles, Orange, San Bernardino, Riverside, and San Diego counties (Atwood, 1980).

Critical Habitat

As shown in Figure 3, critical habitat for the gnatcatcher is designated on the terraces along Reach 9 of the Santa Ana River. Critical habitat for the coastal California gnatcatcher includes approximately 197,303 acres in San Diego, Riverside, San Bernardino, Los Angeles, and Ventura Counties. Gnatcatcher critical habitat occurs in the Reach 9 portion of the Action Area only. Its main purpose is to provide connectivity and genetic interchange between populations of the species in the Santa Ana Mountains and Chino/Puente Hills (USFWS 2010). As shown in Table 5, Reach 9 contains approximately 313 acres of critical habitat.

Action Area Occurrence: Gnatcatchers were reported in Reach 9 as early as 2014 when they were detected during SARI Line construction, just east of the Coal Canyon Wildlife Corridor (CDFW, 2014a). Around the same time gnatcatchers were also detected downstream near Phase 5B and south of SR-91 in Gypsum Canyon and Weir Canyon (CDFW, 2014a). Since that time gnatcatchers have regularly nested in Reach 9 on terraces along the floodplain extending north toward the Santa Ana River adjacent to the Coal Canyon Wildlife Corridor (Leatherman BioConsulting, Inc. 2017). They were also recently detected in the Santa Ana River floodplain, near Phase 5A where as many as four pairs may be present (Leatherman BioConsulting, Inc. 201). According to Chino Hills State park, gnatcatchers have also been detected on the north side of SR-91 near the east end of the Reach 9, Phase 5B temporary construction easement.

In 2018, Leatherman BioConsulting, Inc. began conducting protocol-level surveys for gnatcatchers throughout Reach 9 and the southwestern portion of Prado Basin. To date, as many as twenty pairs of gnatcatchers have been detected in the area and range geographically from west of Phase 5B near Weir Canyon Road to east of the Prado Dam Spillway. Approximately six of these most recent detections have been made just above and below Prado Dam in sage scrub habitat that was restored following temporary impacts resulting from the Santa Ana River Mainstem Project. Gnatcatcher populations in Reach 9 and the southwestern Prado Basin have been expanded considerably in the past five years and are expected to continue into similar sage scrub habitats.

Santa Ana sucker (sucker)

Status

The sucker was listed a Federal Threatened Species in 2000.

Species Description

The sucker is a short-lived member of the Catostomidae family of suckers that historically is endemic to the Los Angeles River, San Gabriel River and the Santa Ana River. Currently, the sucker is restricted to three noncontiguous populations occurring in the lower Big Tujunga Creek, the East and North Forks of the San Gabriel River and the lower and middle Santa Ana River. 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 and provide attachment sites for benthic invertebrates and plants for suckers to feed on. Spawning takes place in March to early June, peaking in May through early June. Sucker populations in the Santa Ana River have declined significantly in recent years. The decline in population is attributed to diminished habitat conditions and predation from exotic fish introduced into the river.

Critical Habitat

As shown in Figure 3, designated critical habitat for the sucker extends along the Santa Ana River from above the Seven Oaks Dam in the San Bernardino Mountains into a portion of Prado Basin and along the Santa Ana River downstream from Prado Dam to Imperial Highway in Orange County. The primary constituent elements that have been recognized as essential critical habitat for the sucker include; a functioning hydrological system that experiences peaks and ebbs in the water column reflecting seasonal variation in precipitation throughout the year; a mosaic of loose sand, gravel, cobble and boulder substrates in a series of riffles, runs, pools and shallow sandy margins, water depths greater than 1.2 inches, non-turbid water or only seasonally turbid water, water temperatures less than 86 degree and stream habitat that includes algae, aquatic emergent vegetation, macro invertebrates and riparian vegetation.

As shown in Table 5 there are approximately 377.5 acres of designated critical habitat above elevation 505 ft. Even though this area is designated critical habitat, this reach of the Santa Ana River lacks the required primary constituent elements to support spawning or long-term occupancy of the species, such as a cobble and boulder substrate, series of riffles and pools, shallow sandy margins and perennial water depths greater than 1.2 inches.

Along Reach 9 there are approximately 613.8 acres of designated critical habitat. This reach of the river does contain several of the required primary constituent elements. However, because of high populations on non-native fish it would be unlikely that populations of suckers would persist.

Action Area Occurrence: Between 2008 and 2013 surveys for suckers were conducted along the Santa Ana River both downstream and upstream of the Prado Dam. During this period twenty suckers were reported in 2008 at the Prado Outlet/Inlet Channel and one sucker was reported near the Green River Golf Course.

SECTION 4 PROPOSED ACTION

The Prado Basin IFR proposes a combination of ecosystem restoration measures within the Prado Basin and along the Santa River both downstream and upstream of Prado Dam. As shown in Figure 1, the Action Area is regionally located within western Riverside County and Orange County. Regional access to the study area would be provided by State Route 91 and State Route 71. As shown in Figure 6 the proposed ecosystem restoration measures would be implemented within four different focal areas referred to as the Santa Ana River Mainstem-Upstream Focal Area (SARM Upstream), Santa Ana River Mainstem-Downstream Focal Area (SARM Downstream), Chino Creek Focal Area and the Mill Creek Focal Area. Proposed water conservation would be implemented up to elevation 505 ft. within the Prado Basin, with a modified release potentially influencing flow and velocity in Reach 9. The measures would be implemented beginning in the year 2021 and would extend for 50 years through 2071. Initial implementation of the ecosystem restoration measures would take approximately 5 years with regular operation and maintenance occurring for 45 years thereafter.

The proposed ecosystem restoration measures include; Sediment Management, Chino Creek Channel Restoration Improvements, Native Plantings, Invasive Plant Management, Riparian Edge Management, In-Stream Habitat Features, Non-Native Aquatic Control and Cowbird Management. The Proposed Action including water conservation and restoration activities within each focal area is shown in Table 6 and described below.

Table 6 Proposed Action Plan Ecosystem Restoration and Water Conservation Measures

SARM Upstream Prado Dam	SARM Downstream Prado Dam	Chino Creek	Mill Creek Habitat
Water Conservation	Invasive Plant Management	Chino Creek Channel Restoration	Invasive Plant Management
Sediment Management	Sediment Management	Invasive Plant Management	Native Plantings
Invasive Plant Management	In-Stream Habitat Features	Native Plantings	Cowbird Management
Native Plantings		Cowbird Management	
Riparian Edge Management			
Cowbird Management			
Non-Native			

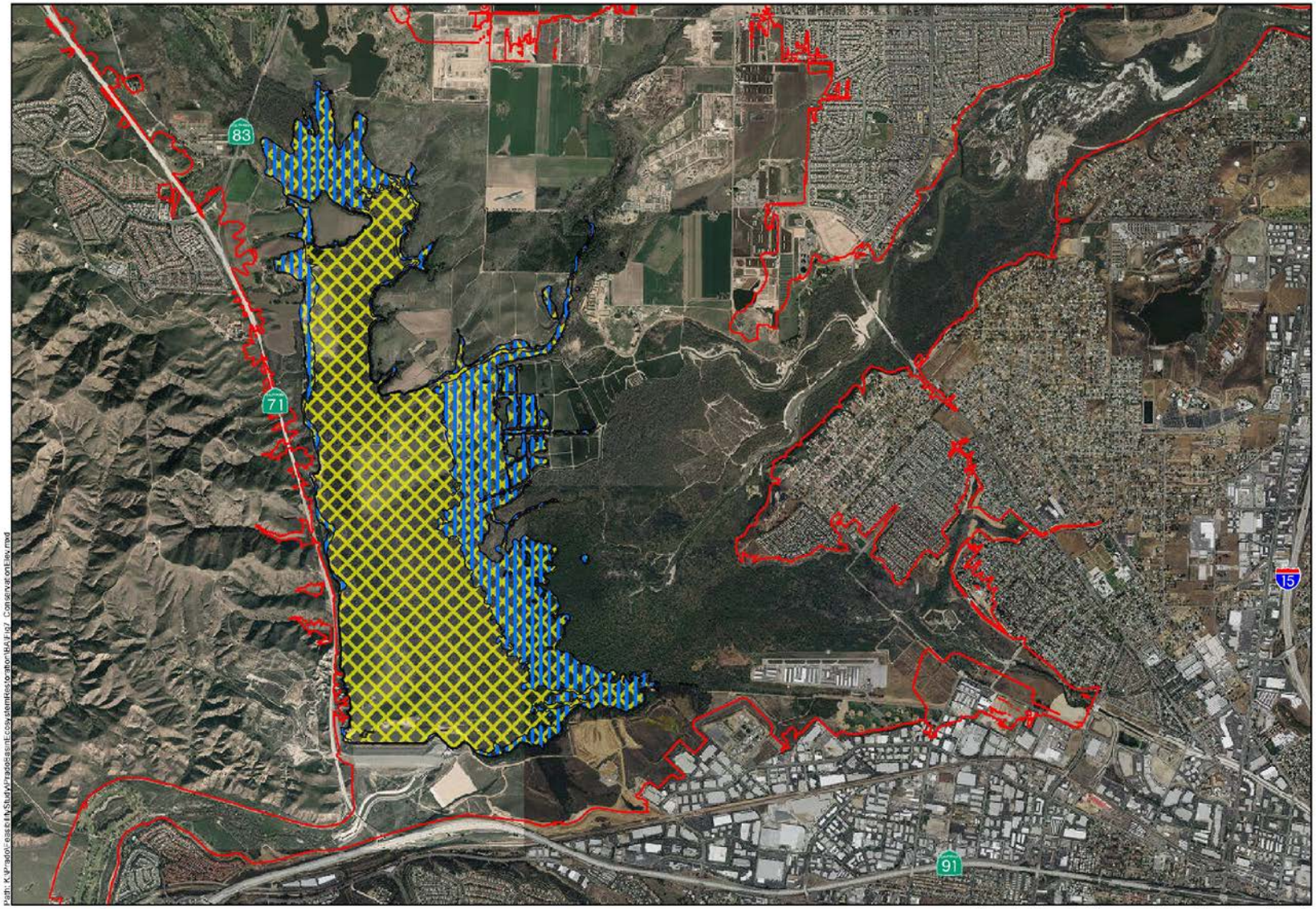
Aquatic Management			

4.1 SARM Upstream Focal Area

4.1.1 Water Conservation

The purpose of the Water Conservation Measure is to allow water to be stored at Prado Dam at elevation 505 ft. year-round and where possible maintain a release rate of 350 cfs on average to increase groundwater supplies for the Orange County Ground Water basin. The Water Conservation Measure would amend the current Prado Dam Water Control Plan by allowing a permanent increase in the water surface elevation of the buffer pool during the flood season, (October 1st to February 28) from 498 ft. up to 505 ft. During the non-flood season, the buffer pool would continue to operate at a maximum water elevation of 505 ft., as it does currently. Additionally, the Water Conservation Measure includes a permanent reduction on the average non-storm outflow release rate from Prado Dam from March 1 to August 30 from 500 cfs to 350 cfs to maximize groundwater recharge potential. The increase in the buffer pool during the flood season would provide up to approximately 10,000 acre-feet of additional temporary storm water capture capacity. Based on modeling conducted by the USACE for the Feasibility Study, increasing the buffer pool to water elevation 505 ft. would on average result in approximately 6,000 acre-feet of additional water per year for conservation and groundwater recharge.

Implementation of the Water Conservation Measure would have the potential to result in higher elevation pooling and additional days of inundation in the Prado Basin. To estimate the additional days of inundation Michael Baker International Company evaluated results from HEC-5 computer model used by the Corps in its analysis of different water conservation levels at the Prado Dam. For the economic analysis in the IFR and for purposes of environmental impact analysis, an inflow scenario was developed for project initial Year 2021 through future Year 2071. The Supplemental Water Conservation Analysis is presented in its entirety in Appendix A of this BA. . The average additional days of inundation from the implementation of the Water Conservation Measure that are estimated to occur in the Prado Basin by each month of the year are shown in red text in Table 7. The areas within the Prado Basin that are bounded by the contours of 498 ft. and 505 ft. are shown in Figure 4. During the flood season from October 1 to February 28/29 the top elevation of the buffer pool would be increased to water elevation 505 ft. from 498 ft. This change in the operation plan would make the buffer pool elevation 505 ft. during the non-flood season and flood season.



Prado Basin 498 to 505 Elevation
Action Area
Prado Basin 470 to 505 Elevation

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0 2,000 4,000 Feet

Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
498' & 505' Prado Basin Water Conservation Elevations

Figure 4

Table 7 Flood Season and Non-Flood Season Days Prado Dam Surface Water Elevation 505 ft.

Time Period		days of inundation above selected pool elevations {increase from existing water conservation shown in red}										
		470'	480'	490'	494'	498'	500'	505'	510'	520'	530'	540'
Average Monthly Range	October	2 - 3	1 - 3	1 - 2	0 - 1	0	0	0	0	0	0	0
		0 - 1	0 - 1	0 - 1	0	0	0	0	0	0	0	0
	November	8 - 12	6 - 10	5 - 8	2 - 4	1	0 - 1	0	0	0	0	0
		0	0	0	0	0 - 1	0 - 1	0	0	0	0	0
	December	12 - 16	11 - 15	10 - 14	7 - 11	4 - 8	3 - 6	0 - 1	0	0	0	0
		0 - 1	0 - 1	1	2	4 - 7	3 - 6	0	0	0	0	0
	January	19 - 25	18 - 24	16 - 22	13 - 20	10 - 17	8 - 14	1 - 2	0	0	0	0
		1 - 3	2 - 4	3 - 4	4 - 6	8 - 15	7 - 13	1	0	0	0	0
	February	19 - 26	18 - 26	17 - 25	15 - 23	11 - 19	10 - 17	2	1	0	0	0
		3 - 4	4 - 5	5 - 6	6 - 8	9 - 16	9 - 16	1	0	0	0	0
	March 1-14	7 - 12	6 - 12	5 - 12	4 - 11	3 - 9	2 - 8	0 - 1	0	0	0	0
		2	2 - 3	1 - 3	1 - 5	1 - 5	1 - 5	0 - 1	0	0	0	0
	March 15-31	12 - 14	11 - 14	11 - 13	10 - 12	9 - 10	8 - 9	1	0	0	0	0
		1 - 3	1 - 3	1 - 3	2 - 4	2 - 4	2 - 3	1	0	0	0	0
	April	13 - 21	12 - 20	11 - 19	9 - 17	7 - 13	5 - 11	0	0	0	0	0
		0 - 4	0 - 4	0 - 4	0 - 4	0 - 2	0 - 1	0	0	0	0	0
	May	5 - 13	5 - 12	4 - 11	3 - 8	3 - 6	2 - 4	0	0	0	0	0
		0 - 1	0 - 1	0 - 1	0	0	0	0	0	0	0	0
	June	1 - 3	1 - 3	1 - 3	1 - 2	1 - 2	0 - 1	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
	July	0 - 1	0 - 1	0 - 1	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
	August	1	1	1	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
	September	1 - 2	1	1	0 - 1	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
annual average range		98 - 149	91 - 141	82 - 131	65 - 109	49 - 86	41 - 71	6 - 7	2	0	0	0
		10 - 16	11 - 18	13 - 22	17 - 29	25 - 51	22 - 45	3 - 5	0	0	0	0

Note: range in days of inundation values is based on estimated OCWD recharge rate ranging from 350 to 500 cfs

In 2018 the USFWS issued Biological Opinion (BO) FWS-WRIV-09B0192-18F0101for r
a Five Year Planned Deviation to the Prado Dam Water Control Plan to store water to

505 ft. during the flood season and a reduced outflow release rate from 500 cfs to 350 cfs on average from Prado Dam. The reduced outflow rate was approved in response to clogging that occurs to OCWD's recharge facilities, when fine-grained sediment conveyed with Santa Ana River water to OCWD's recharge facilities settles onto the bottom of the recharge facilities. The accumulated fine-grained sediment has a lower permeability than the native sediment in the recharge basin, and the accumulated fine-grained sediment reduces the percolation or infiltration rate of the basin. Over the last twenty years streambed conditions in the SAR downstream of Prado Dam have changed. A decrease in sand and armoring of the channel has reduced the capacity of water to infiltrate to the aquifer. A sustained release rate of 500 cfs from Prado Dam can no longer be recharged by OCWD recharge facilities in the period from March through August. Because of the reduced ability to percolate water in the streambed, OCWD would be able to accommodate flows of no greater than 350 cfs between March 1 and August 30. The 350 cfs recharge capacity is typically the limit of the recharge facilities. The actual release rates to achieve flood risk management objectives in the buffer pool would be at the sole discretion of the Corps and would be determined based on judgment informed by precipitation and inflow forecasts as well as real time measurements of rainfall and stream flow data.

4.1.2 Sediment Management Measure

The purpose of the sediment management measure is to restore a more natural gradient and sediment gradation within river upstream and downstream of Prado Dam, counteracting any flattening of the slope that may be occurring upstream as well as bed degradation and channel incision occurring downstream. This would enhance native fish habitat and expand riparian habitats downstream of Prado Dam. The measure includes removal of sediment from Prado basin with re-entrainment into the Santa Ana River immediately downstream. An incidental benefit of sediment removal is to maintain water conservation capacity.

Prado Dam acts as a barrier to the natural transport of sediment to the Lower Santa Ana River. Data collection between 1941 and 2008 suggests that at least 25,000-acre feet of storage has been lost below the 505 ft. elevation due to sediment accumulation behind Prado Dam. If the storage loss continues at this rate of about 373- acre feet per year, then ultimately all water conservation would be lost in as little as 45 years (starting from 2018). In addition to reduced storage in the Prado Basin, the lack of sediment transported downstream of the dam would continue the trend of bank erosion, channel invert incision, reduction of riparian habitat along the banks of the river, armoring of the river bed and lower groundwater recharge infiltration rates. A sediment management program implemented within Prado Basin and along the Lower Santa Ana River would help to maintain water conservation, enhance native fish habitat and slow, halt and potentially reverse the negative effects of interrupted sediment transport in this area of the watershed. Restoring sediment transport processes to the Lower Santa Ana River

would result in benefits to both ecosystem restoration and water conservation objectives upstream and downstream of Prado Dam.

The proposed action includes a Sediment Management Measure that would remove a portion of the incoming sediment into the Prado Basin and re-entrain it into the Santa Ana River downstream of Prado Dam. The primary physical features that would be required to make the sediment management system function properly include; a forebay entrainment groin, bio-engineered entrainment groin transition channel, fill placement to direct flows into the transition channel, floodplain widening along the transition channel f OCWD wetlands pilot channel, sediment trap, sediment trap outlet channel, sediment storage site, sediment re-entrainment system, maintenance roads and a bike trail flyover for the proposed Santa Ana River Trail, that would be constructed in the future as a separate project. The components of the sediment management measure are shown in Figure 5 and temporary and permanent impacts associated with implementation of the measure are shown in Table 8. Note that this table is focused on the construction footprint and does not include all of the additional habitat or the full extent of the beneficial effect that would be anticipated as a result of this measure.

Table 8 Sediment Management Measure Temporary and Permanent Impacts

Component	Construction Footprint Temporary Impact	Native Vegetation Temporary Impact	Construction Footprint Permanent Impact	Native Vegetation Permanent Impact
Forebay Entrainment Groin	0.0	0.0	21.90	16.75
Bio-engineered Entrainment Groin	5.29	3.67	0.0	0.0
Transition Channel	0.0	0.0	65.53	27.24
Fill Placement	51.41	14.58	0.0	0.0
Floodplain Widening	41.0	7.11	0.0	0.0
OCWD Wetlands Pilot Channel	0.0	0.0	16.30	5.28
Sediment Trap	0.0	0.0	57.93	14.80
Sediment Trap Outlet Channel	0.0	0.0	9.0	4.66
Sediment Storage Site	46.27	0.0	177.37	37.24
Sediment Re-entrainment System	0.0	0.0	4.80	1.53
Maintenance Roads	0.0	0.0	47.78	21.06
Bike Trail Flyover	0.0	0.0	.77	0.0
Total	143.97	35.06	414.49	129.77

Forebay Entrainment Groin

The forebay entrainment groin would act as a transition area from the existing grade of the Santa Ana River to the bio-engineered entrainment groin. The forebay area would be kept relatively free of vegetation and would be regularly re-graded to help split flow between the transition channel and the OCWD wetlands channel. The entrainment groin would be situated across the Santa Ana River located approximately 5,500 ft. upstream of River Road Bridge/Santa Ana River Crossing. The entrainment groin would 300 ft. in width and 3,300 ft. in length.

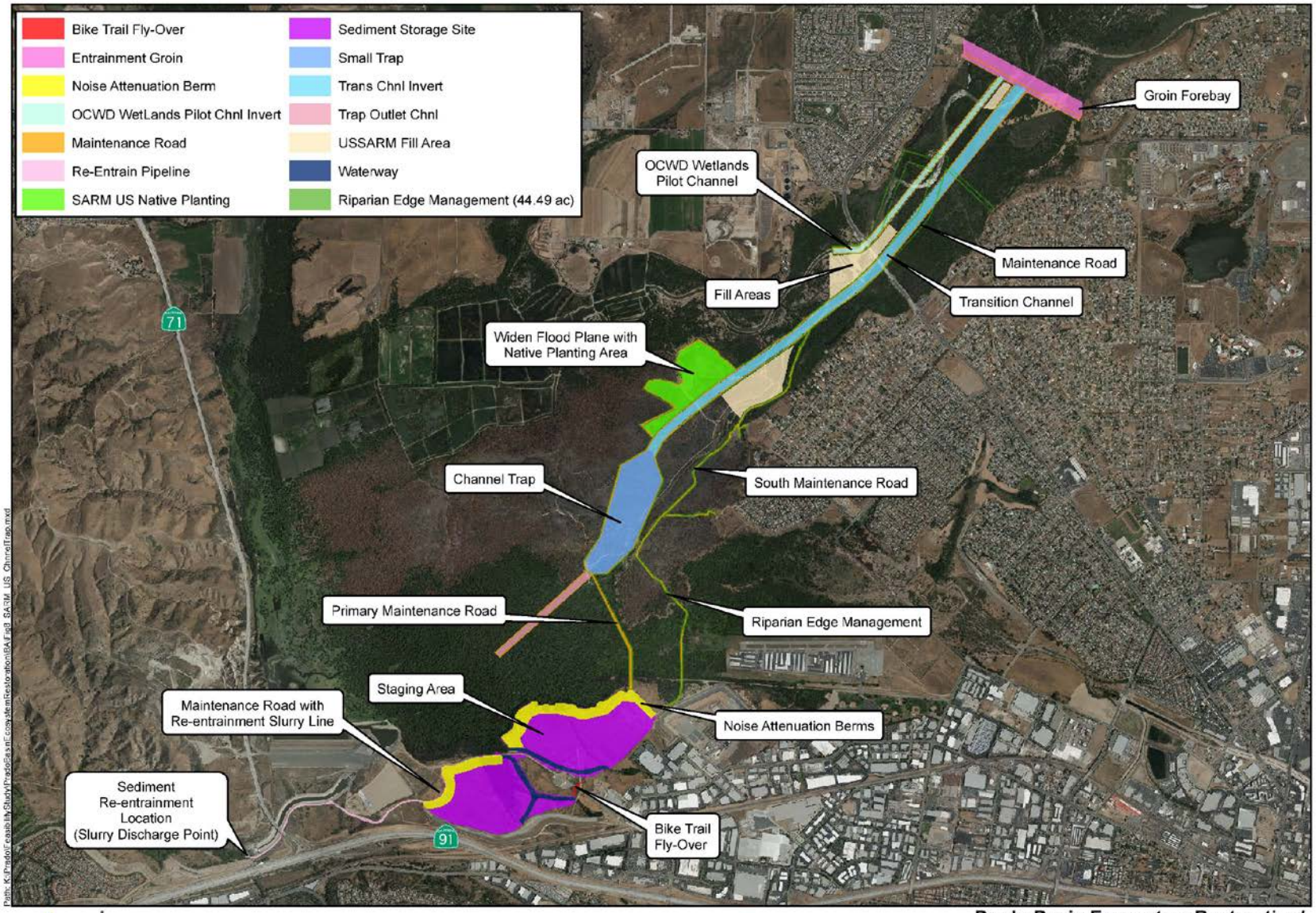
Bio-Engineered Entrainment Groin

The entrainment groin is a low-profile rock structure that would control the lateral movement of the Santa Ana River as it enters the transition channel. The entrainment groin would be located approximately 5,470 feet upstream of the River Road/Santa Ana River Crossing. The groin would be approximately 75 ft. wide at its base and would span the entire width of the Santa Ana River, approximately 3,160 ft. and would include a low flow section that would act as the entrance point for flows into the transition channel. The entrainment groin would also include the OCWD Wetlands Pilot Channel inlet structure. The groin would be inter-bedded with native sand material and native plantings to promote riparian growth in the groin. The rock structure of the groin would be constructed over a sheet pile cutoff wall. The sheet pile cutoff wall would be covered by the rock groin and would help to anchor the rock and prevent seepage and erosion through and under the groin.

The low flow section would be constructed of rock and stone to allow for reconfiguration to provide adaptive management of the inlet elevation. The OCWD Wetlands Pilot Channel inlet structure would be incorporated into the groin near the transition channel. The pilot channel inlet would be constructed of reinforced concrete and would include 3 pipes and flow control gates. A forebay area above the groin would be kept free of vegetation to allow maintenance personnel to reconfigure and/or remove sediment from the groin forebay area.

Transition Channel

The purpose of the transition channel would be to direct and convey water and sediment to the sediment collection trap and help control the rate and extent of changes to the river gradient upstream of the transition channel. The transition channel would start at the upstream end of the sediment trap and would extend to the north and east approximately 12,600 feet, parallel to the Santa Ana River. The transition channel would have a maximum top width of 300 feet and would vary in depth from approximately 4 ft. to 24 ft. with 3:1 side slopes. The total excavation volume of the transition channel would be approximately 924,000 cubic yards of cut, and 122,000 cubic yards of fill. Three fill areas would be constructed along the transition channel to help re-direct the existing Santa Ana River path into the transition channel. Ten in-stream habitat/grade



Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
Sediment Management Channel Trap Overview and Access

Figure 5

stabilizing features would be required within the transition channel and where the diversion channel crosses underneath River Road Bridge. These features would partially stabilize the gradient of the channel to prevent catastrophic head cutting and protect the bridge foundations from excessive erosion/scour, while still promoting flushing of sand from existing gravel beds to expand and/or reduce further loss and degradation of upstream sucker habitat. The stabilizers themselves would also be bio-engineered to provide native fish habitat value.

Fill Areas

Three fill areas would be constructed along the transition channel to help re-direct the existing alignment of the Santa Ana River into the transition channel. The locations of the fill area would include the floodplain adjacent to the Santa Ana low flow channel, OCWD wetland channel and the transition channel. The total area of the three fill areas would be approximately 69 acres, with 4:1 side slopes and depth ranging from 6 to 12 feet deep. The total fill volume for all three locations would be 727,840 cubic yards. Material for the three fill areas could come out of the cut volume of the OCWD wetland channel or transition channel

Widen Floodplain

The widened floodplain would be constructed in an area along the northern edge of the transition channel, approximately 4,300 ft. downstream of the River Road Bridge Crossing. The widened floodplain footprint would be excavated down approximately 4 ft. to allow storm flows to inundate the area more frequently and to help create higher value riparian habitat in an area that has traditionally been lower value. The new widened floodplain would have 4:1 side slopes up to the existing grade and would require that approximately 209,700 cubic yards of sediment be removed. Approximately 52,870 cubic yards of the material would be used as fill onsite and the remaining 156,830 cubic yards would be moved to the sediment storage site for re-entrainment or permanent storage. The area between the widened floodplain and transition channel would remain elevated and would include a maintenance road separating the two features except for two lowered areas at the northern and southern ends of the widened floodplain. Flows would enter and exit at these two locations to limit the amount of sediment and debris entering the widening floodplain area. Earthen plugs could be temporarily graded into the transition channel to promote more frequent wetting of the widen floodplain area and to help sustain higher groundwater levels in the vicinity of the transition channel. Once the construction of the widen floodplain is completed the area would be planted with native vegetation.

OCWD Wetlands Pilot Channel

The proposed transition channel would lower the grade at the existing OCWD wetlands Diversion Channel thereby making it non-operable. Therefore, the OCWD Wetlands diversion point would be moved upstream and adjacent to the transition channel inlet.

The OCWD Wetlands Pilot Channel would be a trapezoidal earthen channel and would be positioned to the north of the transition channel alignment. The pilot channel would extend from the entrainment groin to the south and west approximately 5,980 ft. and would connect to the existing OCWD Wetlands Diversion Channel. A portion of the fill required to construct the pilot channel would come from the excavation of the new pilot channel invert. A second flow control structure (concrete and gated) and earthen overflow spillway would be constructed at the junction of the existing OCWD Wetlands Diversion Channel and OCWD Wetlands Pilot Channel. This structure would provide a means to isolate the OCWD Wetlands Diversion Channel from very large flow events that have the potential to damage the OCWD Wetlands. The diversion channel isolation structure would be constructed of reinforced concrete and would include 3 pipes and flow control gates.

Sediment Trap

The purpose of sediment trap is to provide a central location to collect (trap) sediment flowing into Prado Basin. The trap location has been selected to provide the highest quality sediment (sand), minimize impacts to native habitat and maximize the capture volume potential of sediment entering Prado Basin. The trap would be positioned at the downstream end of the transition channel in an area approximately 7,100 feet south west of the River Road Bridge crossing. The trap would have an extension of the transition channel down the center of the trap with an average depth of 18 ft. with 3:1 side slopes. The floodplain on either side of the transition channel extension would be lowered an average of 8 ft. to provide trap volume during very high inflow events. A total of 610,000 cubic yards would be removed from the trap to construct its initial geometry. The sediment trap would be constructed over a 3 year period.

New incoming sediment would be collected in a sediment trap basin and would be removed by a combination of dry excavation using heavy construction equipment and in-the wet removal using hydraulic dredging. The initial excavation of the upper sediments would be removed by dry excavation and subsequent excavations would be by a combination of dry excavation and hydraulic dredging. The portion of the sediment removed by dredging operations would be conveyed in slurry through an above ground pipeline(s) to a sediment processing/storage site.

Dry excavation involves the use of heavy equipment to remove sediment from the sediment trap alignment under a dry (or mostly dry) condition. The collected sediment would be picked up directly by scrapers or placed in off-road haul trucks and/or scrappers with hydraulic excavators and hauled to the sediment storage site for stockpiling. Dry excavation methods would be used until such time that excessive groundwater was encountered or surface water inflow result in the trap site becoming inundated with water. Once the trap becomes filled with water the operations would shift to a hydraulic dredging method.

Hydraulic dredging involves removal of sediment from the trap in a wetted condition. A dredging barge would travel down the sediment trap alignment by anchoring spuds and using the cutter head motion to move the dredge. As the dredge operates, one of the spuds is lifted while the other remains anchored. The barge then pivots around the anchored spud causing the barge to rotate. This process is known as walking and is repeated along the entire sediment trap alignment while drawing in slurry. As the barge walks along the sediment removal channel, a discharge pipeline trails behind the hydraulic dredge while floating on top of the water surface. The collected sediment slurry would be conveyed to a sediment storage site though a temporary discharge pipeline and booster pumps system. Multiple dredges could be used to meet production goals. The hydraulic dredges and booster pumps would be sound attenuated to reduce noise impacts to wildlife and allow for extended operations in the Basin. Dredged sediment would be stored and/or processed (dewatered) in a series of dewatering basins until adequate flows are available for re-entrainment. A portion of the dewatered sediment would be stockpiled along with the sediment that has been hauled to the storage site by dry excavation methods. The sediment storage sites would be required to hold the sediment until such time that the outflow from Prado Dam is sufficient for re-entrainment.

Trap Outlet Channel

The trap outlet channel is a further extension of the transition channel beyond the trap footprint and graded out to daylight. The outlet channel would be plugged with sediment during the storm season to prevent sediment from flowing to lower elevations in the Prado Basin. During maintenance activities, the plug would be removed to allow the trap to drain and allow majority of the newly deposited sediment to be dry excavated from the trap during the O&M years. Once the trap has been cleaned, then the plug would be re-installed during the O&M years. The trap outlet would have an excavation volume of 72,800 cubic yards.

Sediment Storage Site

Construction of the sediment storage site would include clearing, grubbing and rough grading of two storage sites within the southern area of Prado Basin. There is a total of approximately 14,830,000 cubic yards of storage volume available at the two sites. The sediment storage sites are situated near the Prado Basin's southernmost Auxiliary Embankment and near the Corps Prado Field Office.

The west site (Site A) would be used for slurry dewatering, dry sediment stockpiling, re-entrainment mixing and pumping. The method of removal would depend on the surface and subsurface site conditions each year and could vary from year to year. If low groundwater conditions occur, dry excavation would be performed to transport sediment from the trap to the temporary storage site. Dry excavation would be performed as long as groundwater and surface water conditions allow, and during periods outside of peak

nesting season. Dredging operations would be performed during periods when standing water is present in the trap, or during peak nesting season. Nesting season noise impacts would be mitigated by providing sound attenuation measures around the dredges and booster pump stations. The initial sediment removed from the transition channel and trap would be used to construct noise attenuation berms along the west, north and east sides of sediment storage Sites A and B. The berm would reduce construction noise in Prado Basin and would allow around-the clock re-entrainment operations with minimal noise impacts to nesting birds.

The slurry produced from hydraulic dredging removal operations would be processed at the sediment storage site for dewatering, sorting, stockpiling and preparation for re-entrainment back into the Santa Ana River when conditions are favorable. Multiple dewatering basins could be constructed at the Site A location. Slurry would be pumped into one of the dewatering basins to begin the dewatering process. Once the sediment is dewatered it could be relocated and temporarily stockpiled in an area adjacent to the dewatering basins and wait for re-entrainment. As one dewatering basin is drying, another would be filled by the dredging operations, and the basins would be cycled through filling and dewatering phases.

The storage sites would be constructed to accommodate wet or dry storage of the sediment. A combination of both sediment types could be processed at the same time on Site A. The annual re-entrainment volume would fluctuate with available flows and the Lower Santa Ana River response to re-entrainment. Sediment removed from the trap, which is not re-entrained would be stockpiled on Site A or B for future re-entrainment or placed in long-term storage and made available for fill material for local construction projects, subject to local government requirements and environmental reviews.

To construct sediment management system and maintenance roads all vegetation within the construction footprints and maintenance roads would be removed. All clearing and grubbing activities would occur outside of peak nesting season and would be performed under the supervision of biologists. The sediment trap and maintenance road alignments would be adjusted to target areas that predominantly contain arundo or other non-native vegetation. The above-ground vegetation would be cleared, followed by removal of the vegetation root system for larger plants and trees. The removed vegetation, whenever feasible, would be processed and converted into mulch to re-surface project access roads. Excess biomass or non-native vegetation that has a high probability of re-seeding/regrowth would be disposed of offsite. Vegetation/biomass processing and loading would occur from within the footprints of the sediment storage sites or from within the footprint of the trap and transition channel.

Sediment Re-Entrainment System

The sediment re-entrainment system would deliver sediment from the sediment storage site over the auxiliary embankment near the Prado Dam spillway and into the Lower Santa Ana River. Sediment removed from the sediment trap by dry excavation would be stockpiled at the sediment storage site and sediment removed by dredging would be conveyed to settling basins for dewatering. Both storage conditions would require that additional water be added to the sediment to achieve a sediment concentration that would be pumped-able/flow-able through a four-pipeline system. The additional water required to make the slurry mix would be pumped from Prado Basin during re-entrainment operations. The slurry concentration would range from approximately 5 to 20 percent depending on re-entrainment objectives, slurry velocities and pipeline size. Once the slurry is mixed it would be pumped from the storage site through an above ground pipeline around the south-eastern side of the Prado Dam spillway, along the levee of the outlet channel to a re-entrainment point at the downstream end of the concrete lined outlet channel. A series of booster pumps would be required to maintain slurry velocities and to overcome the elevation change to lift the slurry from the storage site over the auxiliary embankment to the discharge point. The alignment of the slurry pipeline(s) would be positioned within a new maintenance road and parallel existing maintenance roads and buried at locations where crossings are required. As many as 4 booster pumps per pipeline could be required (16 total). Each booster pump or grouping of booster pumps would be enclosed by sound attenuation walls to limit noise impacts to wildlife.

A crane would be positioned on the levee at the re-entrainment point to secure the discharge end of the re-entrainment pipeline and provide a means to move the pipeline around at the re-entrainment location to ensure even dispersion of the slurry into the Lower Santa Ana River. Sediment re-entrainment activities could occur at any rate if demonstration releases show that it is feasible to do so. However, most re-entrainment activities would occur at dam release rates greater than 250 cfs at a 1% concentration by weight. Since 2000, the annual average number of days with flows greater than 250 cfs is approximately 140 days. Therefore, it has been assumed that on average, re-entrainment operations would occur for 140 days per year 24 hours per day, 7 days per week for a total of 3,360 hours of operation per year. In general, re-entrainment operations would occur during months that generally receive higher amounts of precipitation. Once sediment has been re-entrained in the lower Santa Ana River it would be distributed downstream by flows in the river. The total annual volume of sediment re-entrained would vary depending on the amount of rainfall in any given year. A sample of likely re-entrainment scenarios with the sediment trap is shown in Table 9.

Table 9 Sediment Management Summary

Activity	Amount Cubic Yards Dry Year	Amount Cubic Yards Medium Rainfall Year	Amount Cubic Yards Heavy Rainfall Year
Total Construction Footprint	558.0	558.0	558.0
Construction Sediment Export	0.0	0.0	0.0
Annual Volume Removed from Basin	325,000	750,000	750,000
Annual Volume Re-Entrained	200,000	350,000	750,00

Excessive deposition along Reach 9 of the Santa Ana River would be avoided by reducing or temporarily halting re-entrainment operations and allowing flushing flows to re-distribute the sediment downstream. Excessive sedimentation in OCWD's recharge reach of the river downstream of Reach 9 would be mechanically dispersed or removed from the channel by OCWD as a part of their regular operation and maintenance activities for the River channel. Excessive sedimentation in the concrete lined section of the lower Santa Ana River would be exported off site by trucking. It has been estimated that approximately 10,000 cubic yards of sediment would be re-handled below the 405 Freeway in the concrete lined section of the lower Santa Ana River in a dry year, 17,500 cubic yards in a medium wet year and 37,500 cubic yards in a wet year. Based on historical maintenance records it is believed that most of the sediment that deposits in the concrete lined section of the lower Santa Ana River would deposit downstream of the 405 Freeway crossing. This would require approximately 588 truck trips annually in a dry year, 1,029 truck trips in a medium wet year and 2,206 trips in a wet year to remove excess sediment from the channel during years 3 through 50 of the project. Dredging could also be used to remove sediment from the concrete lined section of the Lower Santa Ana River near the ocean.

During re-entrainment of sediment, water quality sampling would be conducted at below Prado Dam (upstream of the re-entrainment site) and at a location immediately down gradient of the re-entrainment site. Comparison of the water quality data from these two sites would be used to assess water quality changes during re-entrainment activities. If significant differences between upstream and downstream samples are observed during sediment re-entrainment activities, the rate of sediment re-entrainment would be adjusted to ensure they are within acceptable threshold ranges that are provided in the Regional Water Quality Control Board's Basin Plan.

Maintenance Roads

The entrainment groin, transition channel, OCWD wetlands pilot channel and the sediment trap would have maintenance roads around their perimeters to allow for regular maintenance and habitat management. In addition to the primary maintenance roads, a secondary maintenance road would be constructed along the southeast side of

the sediment management system to provide access to the various features when the primary road is inundated, covered by debris or damaged by storm flows. The roads would be approximately 25 ft. wide with exception of the primary maintenance road from the trap to the sediment storage site, which would be 50 ft. wide to accommodate two-way scraper traffic. All maintenance road surfaces would be made of native materials except for the south maintenance road and the primary trap to storage site road. The trap to storage site road and the primary maintenance road would have decomposed granite (DG) surfaces and 2.5 ft. shoulders to provide all-weather access.

Bike trail Flyover

A trail fly-over for the proposed Santa Ana River Bike Trail would also be constructed as part of the sediment management system. A bike trail does not currently exist in this part of Prado Basin, although trail proponents have requested permission from the Corps for its construction and operation. This trail or approval for a trail is not part of the Water Conservation and Ecosystem Restoration Study. A trail flyover is proposed as part of this study to ensure accessibility for a possible future trail is not diminished from implementation of the sediment management measure. The flyover would cross the haul route in an area to the south, east of the Corp's Prado Field office. The bike trail fly-over would provide safe passage for trail users should a trail through Prado Basin eventually be approved by the Corps and implemented separately from this project, and would not impede sediment management operations. The fly-over would be a reinforced concrete bridge with a height of approximately 20 ft. and would have a clear span of approximately 75 ft. the approach's to the bridge would be earthen fill constructed with sediment from the trap excavation.

Access

Access to and from the sediment management site would occur from State Highway 91, with primary access utilizing the Auto Center Drive access ramps. Construction traffic would use Auto Center Drive to the project site. Once on-site, the footprint of the features and maintenance roads built for the project would be used to access all areas of the site.

Staging

All worker parking and construction activities would be staged from within the footprint of Sediment Storage Site B or at the Corps Prado Field Office. Long-term maintenance activities would be staged from these same two locations.

Phasing

Construction activities would start in September of 2021 after peak nesting season. The implementation of the sediment management program would occur in phases over approximately 3 years. The storage sites would be constructed in year 1, the outlet channel and trap in year 2 and the transition channel, OCWD pilot Channel and

entrainment groin in year 3. Sediment re-entrainment would start in year 3 and continue through year 50.

Operations & Maintenance

Maintenance

Maintenance activities would occur annually after the initial construction period would be completed, during low flow periods in the river and during periods outside of peak nesting season. Biologists would inspect the work areas prior to maintenance activities to avoid impacts to wildlife. The schedule of the maintenance activities would be driven by environmental and climatological conditions and would vary from year-to-year as conditions change. The primary maintenance activities would include vegetation/debris and sediment removal from all of features. The maintenance roads around the features would be used to provide access to remove sediment and debris. Annual trimming and mowing of vegetation would provide access to the areas in need of maintenance. The maintenance activities would be performed under the direction and supervision of a biologist to insure maintenance activities do not diminish the habitat value of the areas affected.

The amount of sediment re-entrained would be adaptively managed. Regular inspections/surveys of the Lower Santa Ana River would be performed throughout the life of the project. The rate of aggradation (or degradation) would be evaluated and re-entrainment operations would be adjusted to either increase or decrease the re-entrainment rate to best meet Lower Santa Ana River objectives.

Vegetation & Debris Removal

An operational item consistent across all project features includes the removal and disposal of vegetation and biomass imported to the project area by storm flows. Heavy equipment would be used each year to collect and transport vegetation to Sediment Storage Site B. Once at the storage site the vegetation would be processed and trucked off-site for disposal. Some vegetation could be processed and used as mulch on-site.

Additional Sediment Removal Activities

Additional sediment removal operations beyond dredging/excavation the sediment trap would include reconfiguring and/or removing sediment from the project features. Maintenance roads around each of the features would provide access for equipment to perform sediment management operations. In general, sediment management operations would occur outside of nesting season with exception of trap removal operations. Sediment removal from the trap area could occur during nesting season with the use of sound attenuation devices and/or under the supervision of a biologist.

Sediment accumulation from around the entrainment groin could be loaded and scraper hauled to the storage site or it could be re-graded in-place to encourage it to travel down the transition channel and into the trap area for collection and removal.

Sediment accumulated in the OCWD Wetlands Pilot Channel and the Transition Channel would be scraper hauled directly to the storage site. Channel slopes would be re-graded regularly to fix erosion and maintain the hydraulic capacity of the channels.

4.1.3 Invasive Plant Management

The purpose of the invasive plant management measure is to remove invasive plants from the Upstream SARM Focal Area to encourage the growth of new native vegetation communities and to increase the biological values of existing native vegetation.

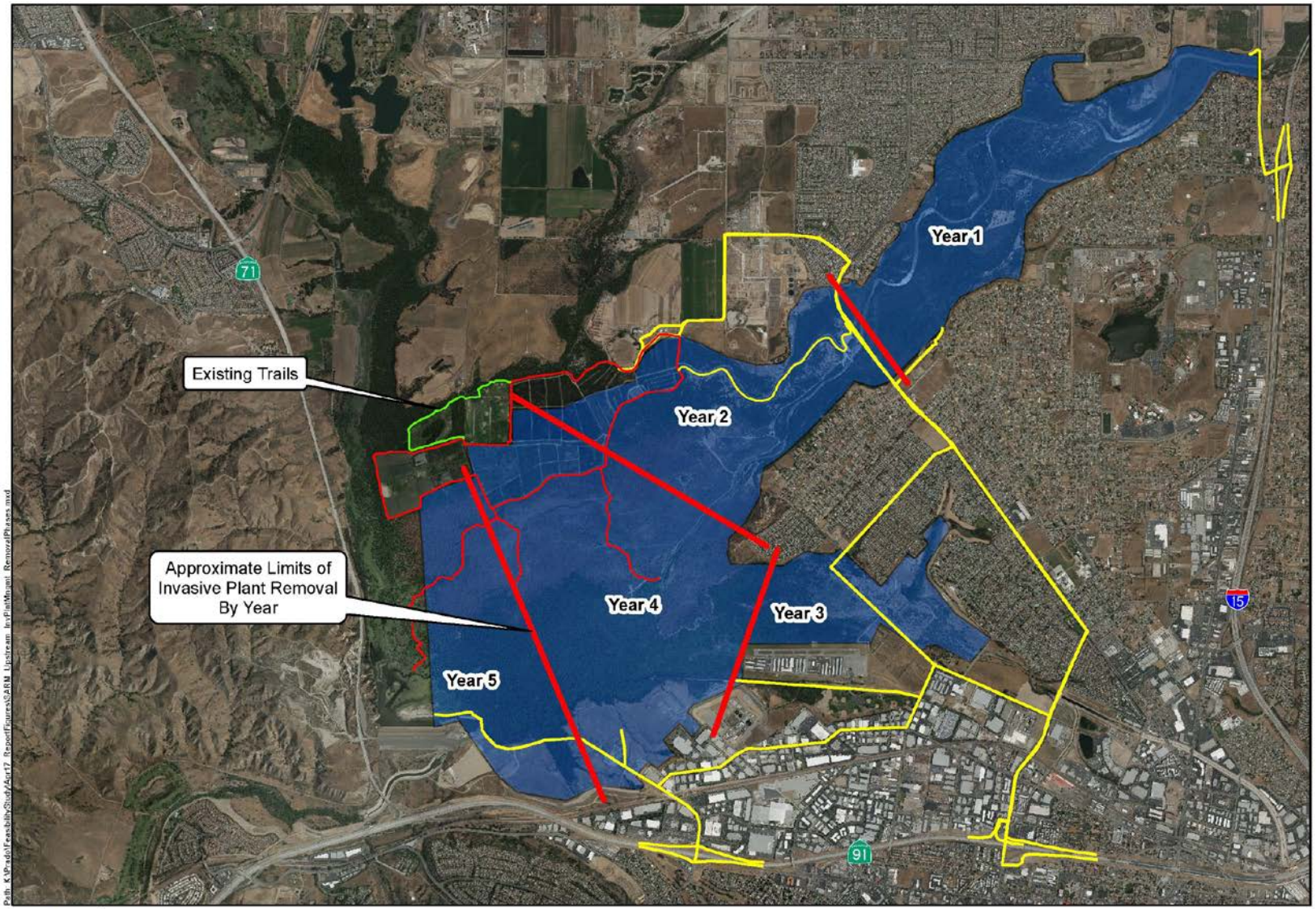
The Invasive Plant Management Measure initially involves the removal of biomass of invasive plant species from the Upstream SARM focal area and the planting and management of native vegetation. Once the initial biomass has been removed, five years of herbicide treatment would occur to promote re-establishment of native riparian vegetation. Regular inspection and maintenance of the focal area would be required for the life of the project to ensure invasive plant species do not re-establish within the area. The Upstream SARM focal area is approximately 3,920 acres in size and based on existing vegetation mapping, invasive plant species covers approximately 248 acres that are targeted for removal. As shown in Figure 6 the initial removal would start at the upstream extent of the focal area and progress to the south and west. Removal activities would be performed on small scale by hand operations and large scale with heavy construction equipment. Invasive plants cut in the focal area would be chipped and processed as needed for re-use onsite or removal and disposal from the focal area. Invasive plants that can be effectively processed to avoid regrowth would be re-used onsite as mulch. Excess biomass or invasive plant types that present a high probability of re-seeding/re-growth would be disposed of offsite.

Access

Access to and from the invasive plant removal sites would occur from Interstate Highway 15 and State Highway 91, with primary access occurring from State Highway 91 utilizing the Serfas Club/Auto Center Drive access ramps. Auto Center Drive would be used to access the site and once on-site, existing maintenance roads and trails would be used for access to invasive plant removal areas.

Staging

All worker parking, biomass processing and ongoing maintenance activities would be staged from within the footprints of the removal areas, at Sediment Storage Site B or at the OCWD Prado Field office and Corps Prado Field Office.



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Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
Invasive Plant Management SARM Upstream - Removal Phases
Figure 6

Phasing

Invasive Plant Management activities would start in September of 2021 in the SARM Upstream Focal Area near Hamner Avenue. During year 1, initial biomass removal activities would proceed to the south and west to approximately River Road Bridge. Year 2 removal activities would begin at River Road Bridge and end near the top of the proposed sediment trap alignment. Year 3 removal activities would begin at the upper end of the Temescal Creek area and proceed to the west approximately 7,000 feet. Year 4 removal activities would occur within the sediment trap zone extending from the OCWD wetlands in the north to the sediment storage site in the south. Year 5 removal activities would include the area below the proposed sediment trap and extend to Prado Dam. Five years of herbicide treatment would occur after each year of biomass removal.

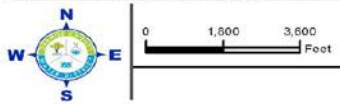
Operations & Maintenance

During Years 6 – 50 regular inspections and maintenance, including targeted herbicide treatments would occur to ensure that invasive plant vegetation communities do not re-establish.

4.1.4 Native Planting

The purpose of the Native Planting Measure is to create new native habitat and to enhance existing native habitat area in an open field, referred to as the Pheasant Field. This area is located to the north of the Santa Ana River in Prado Basin and south of the OCWD Wetlands Diversion Channel. As shown in Figure 7, a 41.1-acre site would be cleared, grubbed and re-graded to achieve proper drainage. Native and invasive plants cleared from the measure area would be processed and chipped as needed for re-use onsite or removal and disposal from the focal area. Invasive plants that can be effectively processed to avoid regrowth could be reused onsite. A portion of the site would be re-planted, with a combination of seeding, pole staking, and container plants at select locations across the site.

Excess biomass or invasive plants that are present that have a high probability for re-seeding/regrowth would be disposed of offsite. The final construction activities for this measure would include those required to finish grade the native planting area over the 41.1-acre site and restoring portions of the site disturbed by the construction activities. A portion of the site would be replanted with a combination of seeding, pole staking, and container plants at selected locations across the site. After restoration is completed five years of herbicide treatment and maintenance would occur to ensure that native vegetation is established.



Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
Native Plantings SARM Upstream - Overview and Access
Figure 7

Access

Access to and from the native planting site would occur from State Highways 91, with primary access utilizing the North Lincoln Avenue access ramps. Construction traffic would use Lincoln Avenue to River Road and then to Hellman Ave. Once on-site, the footprint of the native planting area would be used to access all areas of the site.

Staging

All worker parking, construction deliveries and long-term maintenance activities would be staged from within the footprint of the native planting area and from the OCWD Prado Field Office.

Phasing

Native Planting Measure activities would start in September of 2021 (Year 1) in the SARM Upstream Focal Area. Construction of the native planting area would take approximately 3 months. Study years 2 through 6 would include five years of herbicide treatment and regular monitoring/inspection and maintenance of the native planting area.

Monitoring/Maintenance

Long-term maintenance of the measure would occur annually from year 7 through year 50. Maintenance activities include those required to encourage the development of native vegetation. New growth of invasive plants would be removed from the site annually. Extensive use of mechanized equipment would be avoided during peak nesting season and hand labor could be used at times to avoid negative impacts to nesting birds and to avoid damage to higher value habitat. Maintenance activities would occur annually after the initial construction period is complete, during low flow periods in the Santa Ana River and during periods outside of peak nesting season. The schedule of the maintenance activities would be driven by environmental and climatological conditions and would vary from year to year as conditions change.

4.1.5 Riparian Edge Treatment Management Measure

The purpose of the Riparian Edge Treatment Management Measure within the SARM Upstream Focal Area is to enhance and manage riparian edge habitat around other proposed ecosystem restoration measures. As shown in Figure 8 riparian edge management would occur around the perimeters of all of sediment management features. The total area of the riparian edge would be 44.49 acres. For the purposes of impact analysis, it has been assumed that the entire area would be cleared, grubbed and re-graded to eliminate invasive vegetation and provide a smooth grade transition from the sediment management features to the riparian edge, which would provide access for future management of the riparian edge habitat. A portion of the site would

be re-planted which would include a combination of seeding, pole staking, and container plants at select locations across the site.

The initial construction of the Riparian Edge Treatment Management Measure at the SARM Upstream would be implemented every March and September during the first 3 years. Five years of adaptive management consisting of herbicide treatment, regular monitoring/inspection and maintenance of the management area would occur following construction.

The construction phase of the measure involves invasive plant removal, clearing/grubbing and rough grading activities to create the edges along the sediment management features. Native and invasive plants cleared from the measure area would be processed and chipped as needed for re-use onsite or removal and disposal from the focal area. The final construction activities for this measure include those required to finish grade and re-planting and restoring portions of the site disturbed by the construction activities.

Access

Access to and from the native planting site would occur from State Highways 91, with primary access utilizing the Auto Center Drive access ramps. Construction traffic would use Auto Center Drive to get to the west sediment storage site. Once on-site, the prosed maintenance roads would be used to access all areas of the site

Staging

All worker parking and long-term maintenance activities would be staged from the west sediment storage site located near the Corps Prado Dam Field Office.

Phasing

The Riparian Edge Management Measure activities would start in March of 2022 (Year 1) in the SARM Upstream Focal Area. Construction of the Riparian Edge Management Measure would occur every September and March thereafter for a total of 3 years.

Monitoring/Maintenance

Long-term Maintenance of the measure would begin following the five years of adaptive management and would occur every September and march annually through year 50. This would include targeted herbicide treatment and regular monitoring/inspection. Biologists would inspect the work areas prior to maintenance activities to avoid impacts to wildlife. The schedule of the maintenance activities would be driven by environmental and climatological conditions and would vary from year to year as conditions change. Maintenance activities would include those required to encourage the development of riparian vegetation. New growth of invasive plants would also be removed from the site annually. Extensive use of mechanized equipment would be avoided during peak nesting season and hand labor could be used at times to avoid

negative impacts to nesting birds and to avoid damage to higher value habitat. Maintenance activities would occur annually after the initial construction period is complete, during low flow periods in the Santa Ana River and during periods outside of peak nesting season.

4.1.6 Non-Native Aquatic Species Management

The purpose of the Non-Native Aquatic Species Management Measure is remove invasive aquatic species that prey on native fish to help increase populations of native fish. As shown in Figure 8, Non-Native Aquatic Species Management Measure would occur in the Prado Dam Pool, OCWD Wetlands and the Santa Ana River upstream of River Road Bridge. The Non-Native Aquatic Species Management Measure would include activities to control and/or remove invasive aquatic species from the SARM Upstream Focal Area. Based on aerial photography there is approximately 328 acres of open water year-round in the focal area. Non-Native Aquatic Species Management activities would involve a combination of seining, trapping, electroshocking, or other approved methods to remove non-native aquatic species. These activities would likely occur after flushing flows have pushed a portion of the non-native species downstream. Non-Native Aquatic Species Management activities would focus on large predatory fish species, such as carp, bass, and several catfish species that prey on the smaller native fish like the Santa Ana sucker and Arroyo chub. Non-Native Aquatic Species Management activities could occur year-round and would be performed under the supervision of certified biologist to ensure disturbance of native aquatic species, nesting birds and other wildlife would be avoided.

Access

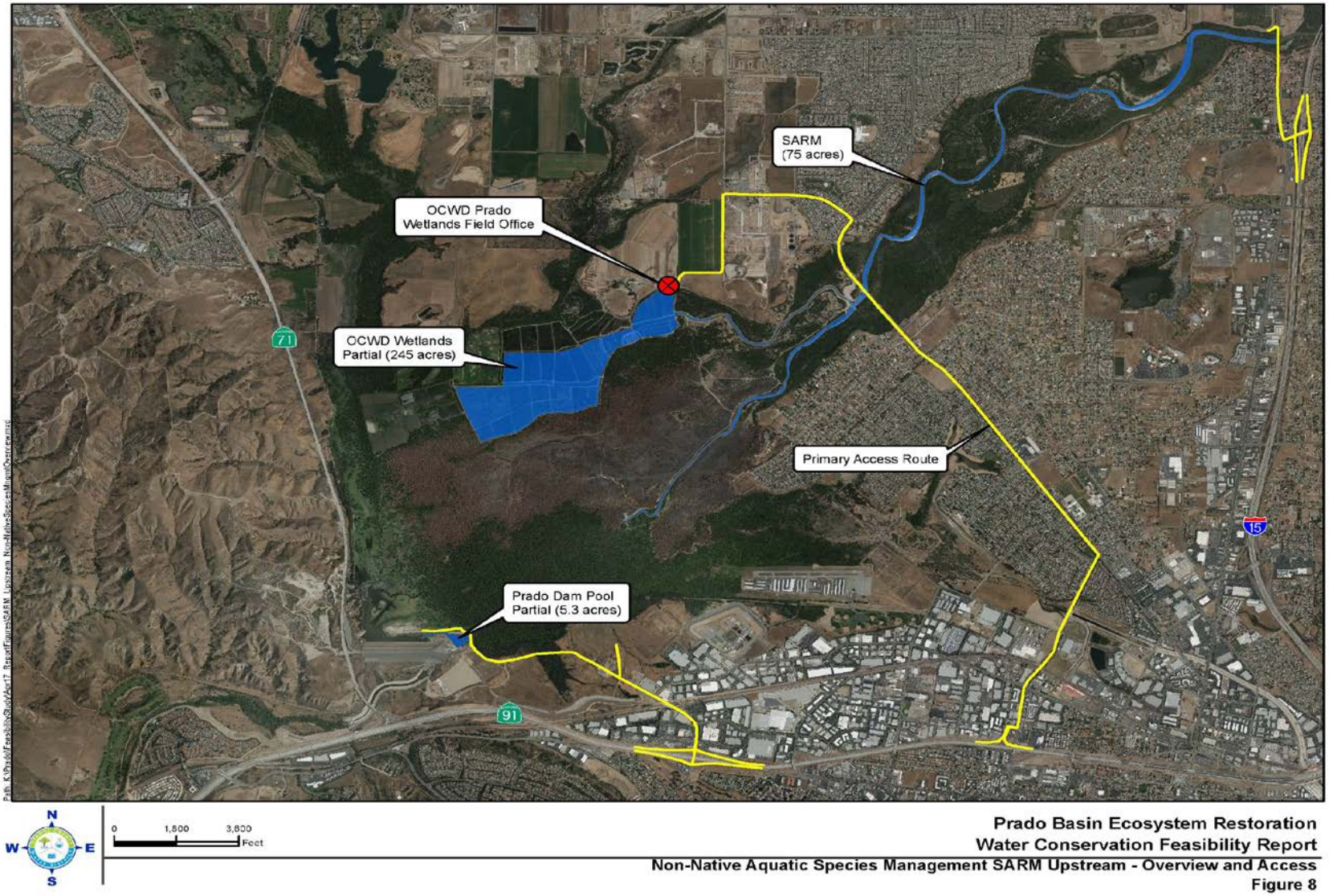
Access to and from the project area would occur from Interstate 15 and State Highway 91. Primary access to the staging area would occur off State Highway 91 to North Lincoln Avenue to River Road to Hellman Avenue. Once at the staging area, access would occur along existing trails, newly constructed trails associated with other ecosystem restoration measures, across footprints of invasive plant stands or from temporary trails.

Staging

The staging area for this measure would be located at the OCWD Prado Wetlands Field office. All worker, worker traffic and disposal transfer operations would be based out of this location.

Phasing

Non-Native Aquatic Species Management would start in November of 2021 in the SARM Upstream Focal Area and would continue for the first 5 years. Management activities would be focused within areas that contain flowing or standing water year-round. These areas are primarily the low-flow channel of the Santa Ana River, OCWD



Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
Non-Native Aquatic Species Management SARM Upstream - Overview and Access
Figure 8

wetlands, and localized pools throughout the focal area and near Prado Dam. Years 6-50 would include activities to perform regular inspection and maintenance of the focal area. Management efforts would fluctuate during the operation and maintenance period as environmental conditions change and new non-native aquatic populations develop.

Monitoring/Maintenance

Once the initial populations of non-native species have been removed, regular inspection and maintenance of the focal area would be performed for the 50-year life of the project to ensure non-native species do not re-populate the focal area.

4.1.7 Cowbird Management

The purpose of the Cowbird Management Measure is to remove parasitic birds to increase the overall biological functions of the Prado Basin riparian forest. The Cowbird Management Measure activities include trapping and removal of cowbirds from SARM Upstream, Chino Creek and Mill Creek Focal Areas. As shown in Figure 9, the three focal areas upstream of Prado Dam have a combined area of approximately 5,742 acres. Cowbird trapping activities include placing traps throughout the focal areas and regularly checking and maintaining traps. The number of traps and their placement would change over time, as needed, to control the species. Regular monitoring across the focal areas would help identify which locations would benefit the most from cowbird trapping.

Access

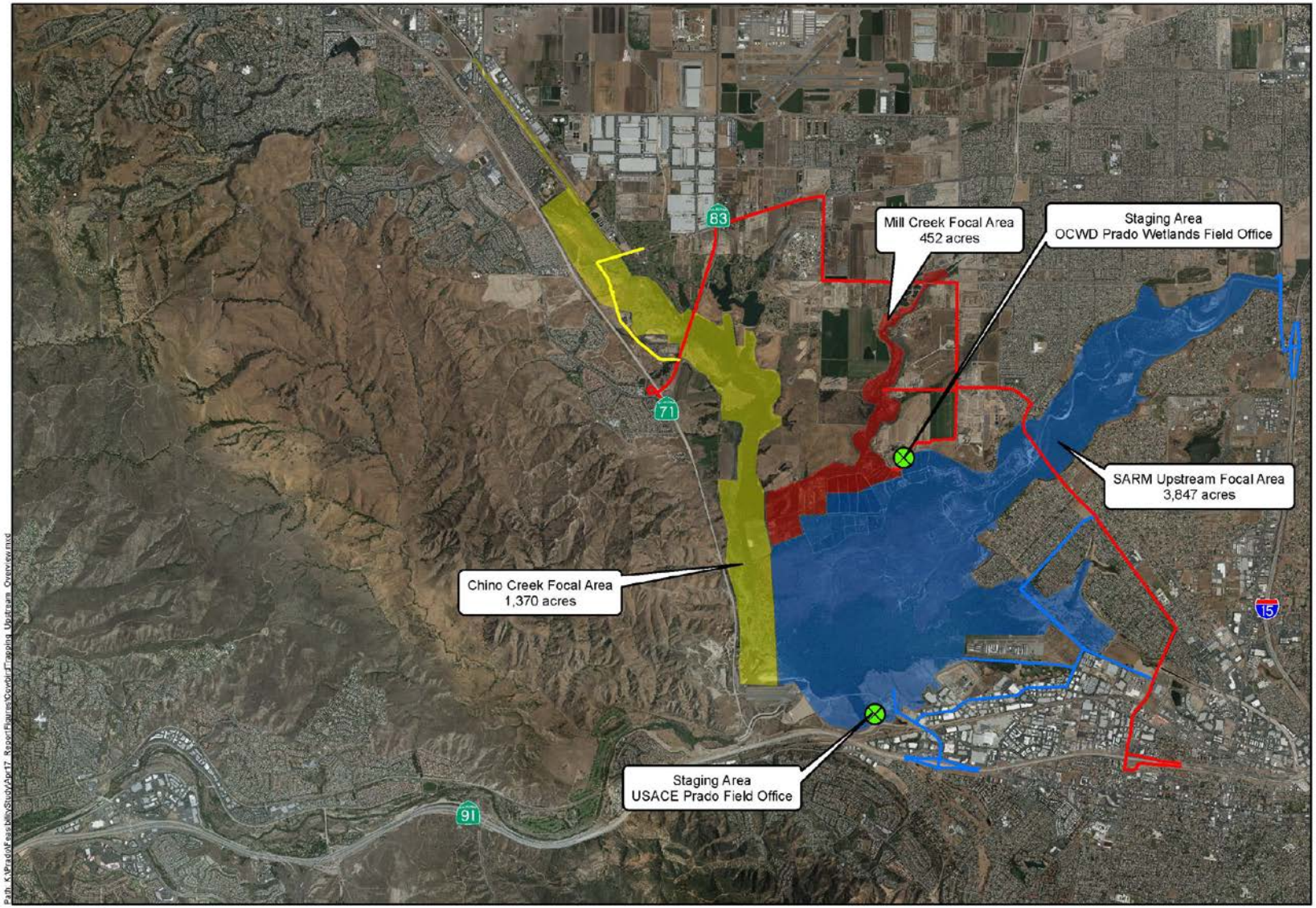
Access to and from the project area would occur from Interstate 15, State Highway 91 and State Highway 71. Primary access to the staging areas would occur off of State Highway 91 to Auto Center Drive. Once at the staging areas, access would occur along existing trails, newly constructed maintenance roads associated with other measures, across footprints of invasive plant stands or along temporary trails

Staging

The staging areas for this measure would be located at the OCWD Prado Wetlands Field office and the Corps Prado Field Office. All worker, worker traffic and disposal transfer operations would be based out of these 2 locations.

Phasing

Cowbird trapping would start in September of 2021 (Year 1) in the upstream focal areas and continue for the first 5 years. Management activities areas would move around within the focal areas as needed to respond to cowbird population movements. Years 6 – 50 would include activities to perform regular inspection, trap maintenance and cowbird removal from the focal areas. Management efforts would fluctuate during the operation and maintenance period as environmental conditions change and as cowbird populations move and adapt.



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Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
Cowbird Trapping All Focal Areas Upstream of Prado Dam - Overview and Access
Figure 9

Monitoring Maintenance

Once the initial population of cowbirds has been removed, regular inspection and maintenance of the focal area would be performed for the 50-year life of the project to ensure cowbirds do not re-populate the focal areas.

4.2 SARM Downstream Focal Area

4.2.1 Invasive Plant Management Measure

The purpose this measure is to remove invasive plants from the SARM Downstream Focal Area to encourage the growth of new native vegetation communities and increase the biological values of existing native vegetation communities. The initial biomass of invasive plant species would be removed and then would be followed with five years of herbicide treatment to ensure invasive plant communities do not re-establish within the focal area. The area targeted for invasive plant management would be limited to zones within the Riverside Country portion of the focal area (394 acres). As shown in Figure 10, based on existing vegetation mapping, invasive plant species cover 14 acres which would be targeted for removal. The initial removal would generally start at the upstream extent of the focal area and progress to the west along the lower Santa Ana River. Removal activities would be performed on small and large scales with varying levels of effort and equipment mixes.

Access

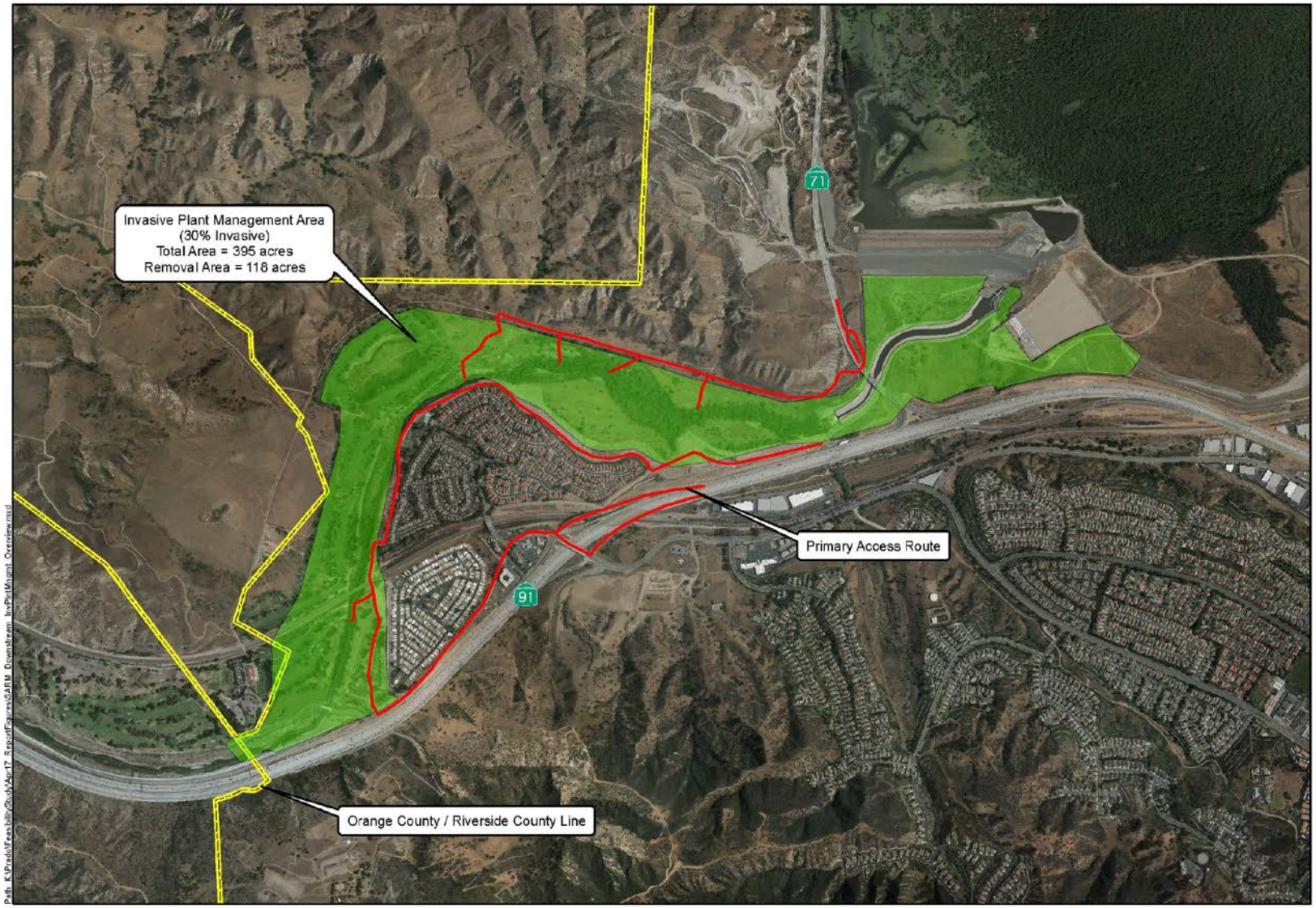
Access to and from the invasive plant removal sites would occur from State Highways 71 and 91 with primary access occurring from the State Highway 91, utilizing the Green River Road access ramps. Green River Road would be used to access the site and once on-site, existing maintenance roads and trails would be used for access to invasive plant removal areas. Some invasive plant zones would be accessed across previously cleared areas prior to native plant regrowth or new plantings.

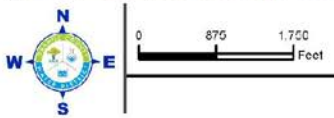
Staging

All worker parking, biomass processing and ongoing maintenance activities would be staged from within the footprints of the removal areas and maintenance roads/access trails.

Phasing

Invasive Plant Management activities would start in September of 2025 near Prado Dam. During Study year 5, removal activities would proceed to the west to approximately the Orange County / Riverside County line. After each year of biomass removal five years of herbicide treatment would occur to ensure that invasive plant communities do not re-establish.





Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
Invasive Plant Management SARM Downstream - Overview and Access
Figure 10

Operations and Maintenance

During Years 6-50 regular inspection and maintenance of the measure, including targeted herbicide treatments would occur to ensure that invasive plant communities do not re-establish.

4.2.2 Instream Habitat Feature Measure

The purpose of the in-stream habitat features is to create localized erosion to expose existing begs of gravel and cobble to enhance habitat for native fish along the Lower Santa Ana River through Reach 9. The in-stream habitat features would be located in the low flow channel in select locations from Prado Dam, extending downstream to the Weir Canyon/Santa Ana River Crossing. The placement of the habitat features would be in the wetted channel and would require minor clearing and excavation to construct the features. As shown in Figure 11, there would be approximately 20 in-stream habitat features constructed in the invert of river channel. Each feature would be constructed of derrick stone, riprap and other rock materials. The features could include the placement of individual rocks and groupings of rock to help sequester sediment upstream of the features and raise the channel invert. Construction of the measure would occur during low flow periods in the Lower Santa Ana River. Sediment cut from the subgrade of each feature footprint would be re-distributed above and below each feature to help initiate the benefits of the measure.

Access

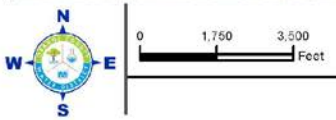
Access to and from the upper in-stream habitat sites would occur from State Highway 91 and State Highway 71, with primary access utilizing the Green River Road access ramps. Construction traffic would use Green River Road to get to the trails leading to the in-stream habitat sites. Existing trails would be used to access the in-stream habitat work areas. Vehicle access to and from the lower in-stream habitat sites would occur from State Highway 91, with primary access utilizing the Gypsum Canyon Road access ramps. Once on-site the existing trails would be used to access in-stream habitat work areas.

Staging

All worker parking and construction activities would be staged from within the footprints of each site-specific staging area.

Phasing

The In-Stream Habitat Measure construction activities would start in September of 2022 (Year 2) in the SARM Downstream Focal Area. Construction of the features would take approximately 3 months. Long-term monitoring of the measure would begin immediately after construction and occur regularly (daily or weekly) during sediment re-entrainment.



Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
In-Stream Habitat SARM Downstream - Overview and Access
Figure 11

Monitoring/Maintenance

Performance monitoring activities would occur annually after the initial construction period is complete. Biologists would inspect the sites to assess the effectiveness of the measure. The rate and extent of aggradation near each feature would be controlled by adaptively managing the sediment re-entrainment activities upstream.

4.3 Chino Creek Focal Area

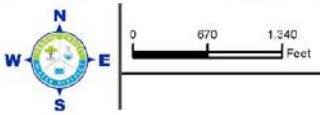
4.3.1 Chino Creek Channel Restoration Measure

The purpose of the Chino Creek Channel Restoration Measure is to restore and expand native streambed habitat and to promote riparian growth over areas that currently do not receive enough water to support riparian habitat within the Chino Creek Focal Area. Existing flows from Chino Creek would be re-routed through a new channel along the west side of the creek that would support increased acreage of native vegetation communities. Non-native vegetation communities would be removed followed by five years of herbicide treatment to ensure that non-native vegetation communities do not re-establish.

As shown in Figure 12, the inflow at the north end of the focal area would be split to provide flows to the new cut channel and to maintain adequate flow into the existing Chino Creek alignment to support existing aquatic and riparian habitats. The construction activities would include grading to create a new channel and perimeter berms. A portion of the Chino Creek channel invert at the northern end would be filled in order to force water into the new cut channel. To prevent channel erosion and to help control the hydraulic grade of the new cut channel, a grouted stone drop structure would be constructed in Chino Creek, a pool and riffle structure would be constructed at the outlet of the proposed diversion pipe and a bio-engineered invert stabilizer would be installed at the downstream end of the new channel.

Wildlife fencing would also be a part of this measure along Pine and Euclid Avenues. A total of approximately 16,897 linear feet of fence would be constructed along Pine and Euclid to help direct wildlife to corridor entrances. The fence alignments would be initially be 30 feet wide to facilitate construction. However, once construction is complete, approximately ½ of the fence buffer zone footprints (15 feet wide) would be kept free of vegetation to provide access to the fences and culverts for maintenance.

Construction of this measure would occur in multiple phases over approximately 4 months during year 3 of the project. The initial activities would include clearing and grubbing the footprints of the new cut channel, berms, maintenance road, drop structure, outlet, invert stabilizer and Chino Creek fill area. Vegetation removed would be mulched and re-used as groundcover in the project area or elsewhere within Prado Basin. Excess biomass or invasive plants that present a high probability of re-seeding/regrowth would be disposed of offsite. All vegetation processing activities



Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
Raise Invert & New Cut Channel Chino Creek
Figure 12

would take place within the footprints of the new cut channel area or the creek fill area. The clearing and grubbing phase of the project would start in the fall to avoid the peak of the nesting season and to avoid storm flows in Chino Creek.

The placement of fill material would be required to construct the perimeter berms, fill the existing creek section, and install the invert stabilizers and new diversion pipe. A balanced cut and fill excavation approach would be used to rough grade the site. The total volume of earthwork would be approximately 74,752 cubic yards. The soil excavated from the new cut channel alignment would be used to fill a portion of the existing creek, construct the berms and grade/level the adjacent habitat areas. The perimeter berms would be short (approx. 3 feet high) and wide (28 feet wide at the base with 3:1 side slopes) to avoid wildlife movement constraints.

The section of Chino Creek that would be filled includes 2 sections. The upstream most section would receive partial fill to increase the Chino Creek invert. This section would continue to receive creek flows and remain wetted. The downstream section of the creek near the new division pipe would be completely filled and no longer receive water. This section is approximately 500 ft. long by 35 ft. wide. This would result in a loss of open water surface area of approximate 0.40 acres. The approximate area of new open water surface created by the spreading of water in the new cut channel would 4,700 ft. long by 30 ft. wide, (3.24 acres), resulting in a net gain of approximately 2.84 acres of open water surface area.

The final phase of construction would include activities required to finish grade the new cut channel, maintenance roads, creek fill area and restore portions of the site disturbed by the construction activities. Site restoration would include removal of all equipment from the project site and finish grading of the roads used to access the site. Native plantings would be a part of the final phase to help accelerate the development of native habitat types.

As shown in Table 10, implementation of the Chino Creek Channel Restoration Measure would require the removal of 8.68 acres of willow/cottonwood vegetation communities and .07 acres of mixed riparian vegetation communities. Once the reconfiguration of Chino Creek channel is completed, the footprint of the Chino Creek Chanel Restoration Measure would be planted with native vegetation which would provide an additional 112 acres of native vegetation communities.

Table 10 Summary of Impacts

Vegetation Community	Acres
Aquatic	1.66
Willow/Cottonwood	5.27
Mixed Riparian	.07

Non-Native Weeds	111.49
Eucalyptus	.37
Urban	1.47
Total	120.29

Access

Access to and from the Chino Creek site would occur from State Highway 71, with primary access utilizing the Euclid Avenue access ramps. Construction traffic would use Euclid Avenue to Pomona Rincon Road to the project site. Once on-site, the footprint of the Raise Invert and Cut New Channel Measure area would be used to access all areas of the site.

Staging

All worker parking and construction activities would be staged from within the footprint of the Raise Invert and New Cut Channel Measure area. Long-term maintenance activities would be staged from the maintenance road within the footprint of the measure area.

Phasing

Construction activities would start in September of 2023 (Year 3) in the Chino Creek Focal Area. Construction of the measure features would take approximately 4 months. Long-term maintenance of the measure would begin in September of 2024 and occur annually from year 5 through year 50.

Monitoring/Maintenance

Maintenance activities would occur annually after the initial construction period would be completed, during low flow periods in the creek and during periods outside of peak nesting season. Biologists would inspect the work areas prior to maintenance activities to avoid impacts to wildlife. The schedule of the maintenance activities would be driven by environmental and climatological conditions and would vary from year-to-year as conditions change.

Biomass and debris generated form storm flows would be removed as needed from the channel annually, if needed. The maintenance road and seasonal/temporary trails through the braided channel area would be used to provide access to remove sediment and debris. Annual trimming and mowing of vegetation would provide access to areas in need of maintenance. The maintenance activities would be performed under the direction and supervision of biologists to insure maintenance activities do not diminish the habitat value of the channel and creek areas.

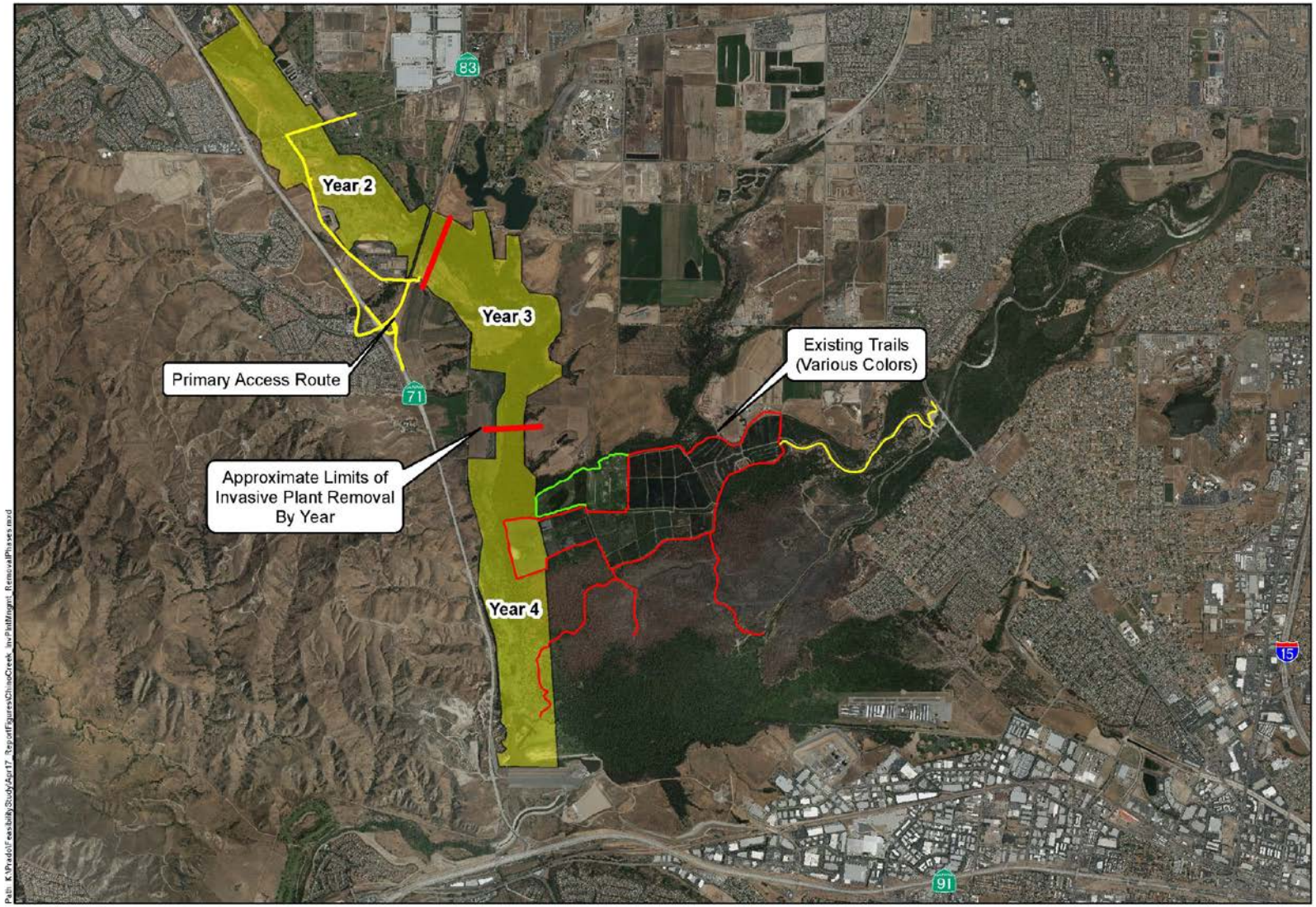
Habitat maintenance activities include those required to trim and maintain vegetation around the channel, maintenance road, berms and in-channel structures. Invasive plants would also be removed from the area on an annual basis. These activities would be performed at various times throughout the year as conditions allow and the work would be done under the direction and supervision of a biologists to insure no wildlife are disturbed and to insure the activities result in a positive habitat impact. Native vegetation would be managed, and if necessary re-planted, in areas significantly damaged by storm flows or in areas where significant disturbance to native plants occur.

4.3.2 Invasive Plant Management Measure

The purpose this measure is to remove invasive plants from the Chino Creek Focal Area to encourage the growth of new native vegetation communities and to increase the biological values of existing native vegetation communities. The Chino Creek Focal Area is approximately 1,370 acres in size and based on existing vegetation mapping, invasive plant species cover approximately 69.0 acres which would be targeted for removal. As shown in Figure 13, the initial removal would generally start at the upstream extent of the focal area and progress to the south east along Chino Creek. Removal of invasive plants from the Chino Creek Focal Area would occur during years 2, 3 and 4 with an average removal of 23 acres per year. After each year of removal five years of herbicide treatment would occur to ensure that non-native plant communities do not reestablish. Removal activities would be performed on small and large scales with varying levels of effort and equipment mixes. Small stands of invasive plants intermingled with native plant species could be removed by hand operations with small equipment and hand tools. Large expansive stands of invasive plants would be removed with heavy equipment and large labor forces. Invasive plants cut in the focal area would be chipped and processed as needed for re-use onsite or removal and disposal from the focal area. Invasive plants that can be effectively being processed to avoid regrowth could be re-used onsite as mulch. Excess biomass or invasive plant types that present a high probability of re-seeding/re-growth would be disposed of offsite. As each area is cleared it would be evaluated by biologists to determine how to best manage that area.

Access

Access to and from the invasive plant removal sites would occur from State Highways 71 and 91, with primary access occurring from State Highway 71, utilizing the Euclid Avenue access ramps. Pomona Rincon Road would be used to access the site and once on-site, existing maintenance roads and trails would be used for access to invasive plant removal areas. Some invasive plant zones would be accessed across previously cleared areas prior to native plant regrowth or new plantings.



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Prado Basin Ecosystem
Water Conservation Feasibility Report
Invasive Plant Management Chino Creek - Overview and Access
Figure 13

Staging

All worker parking, biomass processing and ongoing maintenance activities would be staged from within the footprints of the removal areas, at the Chino Creek Native Planting Area or at the OCWD Prado Field office.

Phasing

Invasive Plant Management activities would start in September of 2022 in the Chino Creek Focal Area near Central Avenue. During year 2, removal activities would proceed to the south and east to approximately Euclid. Year 3 removal activities would begin at Euclid Avenue and end near Chino Creek/Mill Creek confluence. Year 4 removal activities would begin at the Chino Creek/Mill Creek confluence and proceed to the south east to Prado Dam. After each year of removal five years of herbicide treatment would occur to ensure that non-native plant communities do not reestablish.

Operations and Maintenance

During Years 5 – 50 regular inspections and maintenance, including targeted herbicide treatments would occur to ensure invasive plant vegetation communities do not re-establish.

4.3.3 Native Plantings Measure

The purpose of the Native Planting Measure is to enhance habitat area in an existing open field located east of Euclid Avenue and immediately north of Pomona Rincon Road. As shown in Figure 14, the 43.28-acre site would be cleared, grubbed and re-graded to achieve proper drainage and to construct a new maintenance road, of which 43.22 acres are non-native vegetation. The initial construction and planting activities associated with the Native Planting Measure at Chino Creek would be implemented in 2 phases over a period of approximately 3 months during year 2 of study implementation. Phase 1 involves invasive plant removal, clearing/grubbing and rough grading activities to clear the field and construct the maintenance trail and staging area. For impact analysis purposes it has been assumed that the entire 43.28-acre site would be cleared and re-graded. Native and invasive plants cleared from the measure area would be processed and chipped as needed for re-use onsite or removal and disposal from the focal area. Invasive plants that can be effectively processed to avoid regrowth could be reused onsite. The staging/parking area would be approximately 40 ft. x 200 ft. Of the 42.87 acres of area that would be disturbed, a total of 0.73 acres would be a permanent impact. The all-weather maintenance road driving surface would be approximately 10 ft. wide with an additional 2.5 ft. wide shoulder along each edge. The road shoulders would be kept clear and maintained to allow for drainage and allow for maintenance equipment to pass. Phase 2 activities include those required to finish grade the native planting area, road, and staging area and restore portions of the site disturbed by the construction activities. Site restoration would include removal of all equipment from the

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Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
Chino Creek Native Plantings - Overview and Access
Figure 14

project site. After site restoration is completed five years of herbicide treatment would occur to ensure that non-native vegetation is not established.

Access

Access to and from the native planting site would occur from State Highways 71, with primary access utilizing the Euclid Avenue access ramps. Once on-site, the footprint of the native planting area would be used to access all areas of the site.

Staging

All worker parking, construction deliveries and long-term maintenance activities would be staged from within the footprint of the native planting area, the maintenance road and/or the staging area.

Phasing

Native Planting Measure activities would start in September of 2022 (Year 2) in the Chino Creek Focal Area. Construction of the native planting area, maintenance roads and storage area would take approximately 3 months. Long-term maintenance of the measure would begin in February of 2024 and occur annually from year 3 through year 50.

Monitoring/Maintenance

Maintenance activities would occur annually after the initial construction period would be completed, during low flow periods in the creek and during periods outside of peak nesting season. Maintenance activities could be performed in 2 separate phases.

Phase 1 maintenance activities include those required to trim and maintain vegetation along the maintenance road, staging/parking area and within the native planting area. Any new growth of invasive plants would also be removed from the site. Phase 2 maintenance activities would include grading to reshape or restore the maintenance road and staging/parking area. Debris from storm events would be removed from the road and minor grading would occur to reshape the road where damage has occurred from storm flows or normal wear-and-tear. Minor amounts (approximately 17 C.Y.) of DG would be imported annually to re-dress the top of the road and staging/parking area.
Cowbird Management Measure

Cowbird management activities proposed in Chino Creek would involve the same activities and methods proposed in the SARM Upstream Focal Area and Mill Creek Focal Area. A total of 1,370 acres within Chino Creek Focal Area has been identified for cowbird management.

4.4 Mill Creek Focal Area

4.4.1 Invasive Plant Management Measure

The purpose this measure is to remove invasive plants from the Mill Creek Focal Area to encourage the development of new native vegetation communities and to increase the biological values of existing native vegetation communities. The Invasive Plant Management Measure includes activities to remove the initial biomass of invasive plant species in the Mill Creek Focal Area followed up with five years of herbicide treatment. This measure also includes the planting and management of native species to encourage the development of native vegetation communities. The Mill Creek focal area is approximately 452 acres in size and based on existing vegetation mapping, invasive plant species cover approximately 59.22 acres that are targeted for removal. As shown in Figure 15, the initial removal would generally start at the upstream extent of the focal area and progress to the south along Mill Creek. Removal of invasive plants from the Mill Creek Focal Area would occur during years 2, 3 and 4 with an average removal of 19.7 acres per year. After each year of removal five years of herbicide treatment would occur to ensure that invasive plant communities do not re-establish.

Removal activities would be performed on small and large scales with varying levels of effort and equipment mixes. Invasive plants cut in the focal area would be chipped and processed as needed for re-use onsite or removal and disposal from the focal area. Invasive plants that can be effectively processed to avoid regrowth could be re-used onsite as mulch. Excess biomass or invasive plant types that present a high probability of re-seeding/re-growth would be disposed of offsite.

A new maintenance road would also be constructed to provide access to remote zones within the focal area for long-term management/maintenance of the measure. The maintenance road would be approximately 10 ft. wide and would have an all-weather driving surface made of decomposed granite. A 10 ft. wide zone along each side of the maintenance road would be actively managed to promote riparian growth.

Monitoring/Maintenance

After the initial biomass has been removed, regular inspections and maintenance would occur over the life of the project to ensure invasive plants do not re-establish themselves in the focal area. As each area is cleared it would be evaluated by biologists to determine how to best manage that area.

Access

Access to and from the invasive plant removal sites would occur from State Highways 71 and 91, with primary access occurring from State Highway 71, utilizing the Euclid Avenue access ramps. Chino Corona Road would be used to access the site and once on-site, the new maintenance road, existing maintenance roads and trails would be used for access to invasive plant removal areas.

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Prado Basin Ecosystem restoration
Water Conservation Feasibility Report
Invasive Plant Management Mill Creek - Removal Phases
Figure 15

Staging

All worker parking, biomass processing and ongoing maintenance activities would be staged from within the footprints of the removal areas, at the Mill Creek Native Planting Area or at the OCWD Prado Field office.

Phasing

Invasive Plant Management activities would start in September of 2022 in the Mill Creek Focal Area near Chino Corona Road. During year 2, removal activities would proceed to the south to approximately McCarty Road. Year 3 removal activities would begin at McCarty Road and end near the Chino Creek Native Planting area. Year 4 removal activities would begin at the Mill Creek Native Planting area and would proceed to the south west to Chino Creek/Mill Creek confluence.

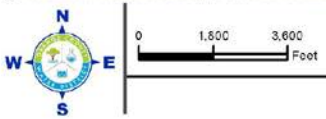
Operations and Maintenance

During years 6-50 regular inspections and maintenance, including targeted herbicide treatments, would occur to ensure that invasive plant vegetation communities do not re-establish.

4.4.2 Native Plantings Measure

The purpose of the Native Planting Measure is to convert an OCWD non-operation constructed wetland pond to riparian woodland habitat. As shown in Figure 16, the 17.21-acre site would be cleared, grubbed and partially filled to achieve the desired elevations, of which .04 acres are cottonwood/willow vegetation and 17.17 acres are freshwater marsh. The vegetation removals would be temporary and would replant with native vegetation communities, increasing the overall amount of native vegetation. Where feasible, hand removals would occur to minimize the temporary removal of native vegetation.

The initial construction phase of the measure would involve invasive plant removal, clearing/grubbing and rough grading and fill activities to clear the field and re-grading of the site, followed by five years of herbicide treatment. Fill material would be imported from the sediment trap in the SARM Upstream Focal Area. For impact analysis purposes it has been assumed that the entire 17.21 site would be cleared and re-graded. Native and invasive plants cleared from the measure area would be processed and chipped as needed for re-use onsite or removal and disposal from the focal area. Invasive plants that can be effectively processed to avoid regrowth could be reused onsite. Excess biomass or invasive plants that present a high probability of re-seeding/regrowth would be disposed of offsite. All construction staging and vegetation processing activities would take place within the footprint of the native planting area. This phase of the project would start in the fall as to avoid peak nesting season.



Prado Basin Ecosystem Restoration Water Conservation Feasibility Report

Native Plantings Mill Creek - Overview and Access

Figure 16

Wildlife monitoring would occur during clearing and grubbing to avoid impacts to late nesting birds and other wildlife. The final construction activities for this measure include those required to finish grade the native planting area and restore portions of the site disturbed by the construction activities.

Access

Access to and from the native planting site would occur from State Highways 91, with primary access utilizing the North Lincoln Avenue access ramps. Construction traffic would use Lincoln Avenue to River Road and then to Hellman Ave. Once on-site, the footprint of the native planting area would be used to access all areas of the site.

Staging

All worker parking and construction activities would be staged from within the footprint of the native planting area and from the OCWD Prado Field Office. Long-term maintenance activities would be staged from the OCWD Prado Field Office.

Phasing

Native Planting Measure activities would start in September of 2022 (Year 2) in the Mill Creek Focal Area. Construction of the native planting area would take approximately 3 months. Long-term maintenance of the measure would begin in February of 2024 and occur annually from year 3 through year 50.

Monitoring/Maintenance

Maintenance activities would occur annually after the initial construction period is complete and during periods outside of peak nesting season. Maintenance activities include those required to encourage the development of native vegetation. New growth of invasive plants would also be removed from the site annually. The schedule of the maintenance activities would be driven by environmental and climatological conditions and would vary from year to year as conditions change.

4.4.3 Cowbird Management

Cowbird Management activities proposed in Mill Creek would involve the same activities and methods proposed and proposed in the SARM Upstream Focal Area and Chino Creek Focal Area. A total of 452 acres within Chino Creek Focal Area has been identified for cowbird management.

4.5 Monitoring Programs

A combination of Monitoring Programs would be implemented to monitor the effects the associated with the implementation of the IFR water conservation and ecosystem restoration activities. The Monitoring Programs include;

- Sediment Movement Monitoring Program (Related to Sediment Management)

- Habitat Monitoring Program (Related to Water Conservation)
- Water Quality Monitoring Program (Related to Sediment Management)

All restoration measures will be monitored and adaptively managed as needed to ensure that success criteria are met. The full Monitoring and Adaptive Management Plan (MAMP) will be an appendix to the IFR.

Habitat Monitoring Program

OCWD has an ongoing Habitat Monitoring Program (Effects of Reduced Outflow from Prado Dam Water Conservation) that tracks the health of habitat in the Prado Basin. As part of the ongoing 5-Year Deviation, the monitoring program is being expanded to monitor the health of riparian habitat between the elevations of 498 ft. and 505 ft. to help evaluate any potential effects of Deviation on habitat within the Prado Basin. A combination of visual observations, photo monitoring and Corps inundation data would be used to observe and display any habitat degradation potentially caused from increased inundation due to Deviation. If a permanent change in water conservation is approved, OCWD would continue the expanded monitoring program to identify any long-term effects to native habitat and to determine if steps need to be taken to mitigate those effects.

Operations data from the Corps would continue to be utilized to segregate the effects of flood risk management from water conservation. Based on observation from OCWD's ongoing habitat monitoring program, inundation duration of more than 10 days within a two-week period could adversely affect mulefat and other understory. Whenever water levels exceed 498 ft. for more than 10 days within a two-week period during the flood season, OCWD would work with the Corps Reservoir Regulation to calculate how long the water level would have remained above 498 ft. in the absence of water conservation operations. To the extent that habitat would have been inundated at least 10 days within a two-week period due to flood control operations alone, it would be assumed that any resulting habitat degradation would not be due to water conservation. However, if the pool would have been drained below 498 ft. earlier than 10 days if not for water conservation operations, then OCWD would monitor and if necessary mitigate impacts. Regardless of whether the water elevation exceeds 498 ft. in the flood season due to flood control operations or from water conservation, OCWD would monitor vegetation below 505 ft. to assess potential impacts due to the water level exceeding 498 ft. in the flood season. However, OCWD would only be required to mitigate for impacts between 498 ft. and 505 ft.

Photo stations would be located based upon two criteria, elevation and habitat type. Most of the monitoring stations would be situated at elevations overlooking habitat that would be inundated due to water conservation, but adjacent land would also be included in the photos. Habitat conditions would be documented photographically during wet and dry periods and compared among subsequent seasons and years. The stations would

yield visual documentation of conditions over time relative to pool size as it pertains to water conservation and flood control. Thirteen photo stations have been identified in the Prado Basin to document habitat conditions. Stakes would be planted to mark each station, and GPS readings would be taken to map and document each site. Panoramic photos would be taken while standing directly in front of the stake. Three visits to the photo stations would occur during the year. The first rounds of photos would be taken during January-February to document inundation events, if any. In addition, pending approval from Federal Aviation Administration (FAA), photographs from a drone would be incorporated for a more penetrating, aerial view and, if possible photos would be taken during all inundation events where water levels exceed elevation 498 ft. to document exactly what habitat would be completely or partially submerged at various water surface elevations. The second visit would occur in spring when temperatures have risen and the willows are coming out of dormancy and leafing out. A third visit would occur in late summer when individual plants and stands could display lasting adverse effects from the previous winter season or show signs of drought related stress**.**

Visual comparisons would be made of habitat conditions above and below elevations of prolonged inundation (one week or more) to qualitatively assess signs of reduced vigor in the habitat, stands, and of individual trees. On the ground inspections, counts, and measurements would follow to quantify observed degradation, if any. Quantitative assessments would be done in areas of observed loss of vigor and would incorporate data recorded along belt transects above and below the water conservation inundation zone to quantify differences in tree count and understory composition, particularly any mulefat loss. A transect would be flown along the 505 ft. contour or high-water contour and three perpendicular transects would also be flown between elevations 505 ft. and 498 ft. to track habitat variation through time. This would be repeated twice annually during inundation and following leaf out. Dramatic changes in understory such as vegetation die back would be reported to the Corps and USFWS and habitat would be restored, if triggers are met. The habitat would be given a minimum of 2 years to come back on its own, prior to active planting. To determine if habitat needs to be replaced, a threshold of 30% loss of cover over a two-season period without any signs of recovery would be the threshold to replace the vegetation. This would provide sufficient time to determine if the habitat is showing signs of recovery or degrading. In addition, appropriate in-field analysis, such as CRAM would be conducted to determine the health of the habitat, which information could be used to further track long-term changes and success of natural recovery and/or re-vegetation. The data collected from the habitat monitoring program would be used to evaluate potential cumulative effects to habitat from the multiple year deviation. The recorded data would be provided in an annual monitoring report to the Corps and USFWS. In the event the monitoring program shows that there has been a 30% or higher loss of cover after two seasons without signs of recovery, the habitat would be restored on OCWD property.

Sediment Movement Monitoring Program

Sediment Movement Monitoring Program would be implemented to evaluate changes in sediment transport that could occur from the removal of sediment from the Santa Ana River. The monitoring program would include collecting and analyzing field data to document the baseline condition of the removal alignment and the upstream Santa Ana River (from the alignment to above River Road Bridge). A minimum of three cross section surveys would be established. Baseline riverbed material samples would also be collected and analyzed for grain size distribution. Suspended sediment samples and bed load samples in river flow would also be collected and analyzed. Stream flow measurements would be collected during two low flow events. Gradient monitoring stations would be established along the Santa Ana River to track gradient changes during and after construction. The baseline condition of River Road Bridge would also be documented.

After sediment removal is completed, field measurements, observations and analyses would be conducted to assess the effectiveness and performance of the project. Additional riverbed material samples would be collected and analyzed for grain size distribution, along with suspended sediment samples and bed load samples. At the gradient stations along the Santa Ana River, gradient changes would be measured, and any head cutting would be documented. Photographs would be collected to document the post-construction conditions as they change in the Santa Ana River and removal alignment. Post construction monitoring of River Road Bridge would also be completed.

Results from the monitoring program would be utilized to develop an area-specific sediment transport model of the pre-project and post-project conditions. The model would be calibrated to data collected during the pre-construction phase and also post-construction. The results of the monitoring program and the area-specific sediment transport model would be used to provide recommendations for future sediment removal projects. Before and after topographic map of the study area would be generated to document changes in slope and elevations.

Water Quality Monitoring Program

Water Quality Monitoring program would be implemented to monitor the chemical analysis of sediments extracted from Prado Basin and to measure the water quality of the effluent generated from the removed sediment. Chemical analysis of the sediments in Prado Basin shows no detected organic chemicals, no pesticides, no PCBs, no PAHs, and no hydrocarbons. There were some total dissolved solids, and some inorganic nitrogen, and small quantities of metals, which appear to be within the ranges expected for background soils in California (Kearney Study, 1996).

In order to evaluate the sediment removed from the Prado Basin, the following monitoring program would be implemented: Sediment samples would be collected prior to dredging or excavation from the alignment along which the sediment removal would

occur. Samples would be collected from bores that are advanced to the anticipated bottom of the dredge or as deep as feasible given access constraints. Twenty bores would be attempted. Where bores would not provide sufficient sample material, test pits would be attempted to as deep as feasible. Samples from each bore/test pit would be composited to reflect the mixed state that sediments would be in after dredging, de-silting, and stockpiling. Aliquots from the compounded bulk sediments would be analyzed for the following parameters:

- Grain size distribution.
- Metals, including boron
- Pesticides
- Ammonia-N, Nitrate-N, Nitrite-N, Total Kjeldahl N
- Higher molecular weight (diesel or jet fuel range) petroleum hydrocarbons by EPA method 8015 or an equivalent method that has few or no interferences from naturally occurring organic matter.
- Semi Volatile Organic Compounds (SVOCs)
- Poly-Chlorinated Biphenyls (PCBs) differentiated by Aroclor

The Toxicity Characteristic Leaching Procedure (TCLP) and Water Extraction Test (WET) are leachate tests specified under Title 40 CFR Part 261 and Title 22 CCR Chapter 11, Article 3, to elevate whether a material is a hazardous waste. The TCLP and WET tests would be conducted if bulk sediment concentrations exceed 20 times the TCLP regulatory values and 10 times the Soluble Threshold Limit Concentrations (STLC). If conducted, results of TCLP tests would be compared with USEPA regulatory values of 40 CFR Part 261. Results of the WET should be compared with STLCs of Title 22 CCR Chapter 11, Article 3. If no analytes exceed these criteria, the material would be suitable for upland disposal.

Previous boring samples collected in the location where the sediment removal activities would occur, showed no detected organic chemicals, no pesticides, no PCBs, no PAHs, and no hydrocarbons. Therefore, it is anticipated that the sediment removed from the basin would not contain elevated contaminants or other constituents that would reduce water quality or conflict with the Basin Plan water quality standards. In the event elevated levels of contaminants or elevated levels of other constituents that could conflict with the Basin Plan are identified, the excavation activities would not proceed and a new location for the sediment removal activities would be identified and evaluated. Additionally, prior to discharging the effluent water generated from the dried out sediment into the basin, the effluent water would be analyzed for contaminants or other constituents that could conflict with the Basin Plan. In the event the effluent does contain contaminants or other constituents that could conflict with the Basin Plan Beneficial uses, the effluent water would be placed in container and haul offsite.

Additionally, during re-entrainment of sediment, water quality sampling would be conducted at below Prado Dam (upstream of the re-entrainment site) and at a location immediately down gradient of the re-entrainment site. Comparison of the water quality data from these two sites would be used to assess water quality changes during re-entrainment activities. If significant differences between upstream and downstream samples are observed during sediment re-entrainment activities, the rate of sediment re-entrainment would be adjusted to ensure they are within acceptable threshold ranges that are provided in the Regional Water Quality Control Board's Basin Plan. However, because sediment re-entrainment would occur under high flow with elevated levels turbidity, there could be a temporary increase over the turbidity threshold level. The water quality sampling methodologies, sample frequency, and locations would be coordinated with and approved by Regional Water Quality Control Board prior to the start of any construction activity.

4.6 Avoidance and Minimization Measures

EC-BIO-1: To measure effects associated with the Planned Deviation a Habitat Monitoring Program will be prepared and implemented. The Habitat Monitoring Plan will be prepared by OCWD in coordination with the Corps, USGS and the Service and will include a statistically robust sampling method to measure and analyze effects of inundation on riparian vegetation. The vegetation will be monitored annually for signs of degradation. If the habitat monitoring program indicates substantial changes (>30 percent loss of foliage) and prolonged degradation of vegetation between 498 and 505 feet, the degraded habitat will be restored within the same area if possible, within two years after the 30 percent degradation trigger is detected. Restoration can either occur through natural recruitment, non-native removal, active planting or some combination. If the degraded habitat does not recover within that 2-year timeframe, OCWD will plant and/or restore the same amount of vegetation (equal in size to the degraded area) on OCWD property that has been identified and is currently being treated to prevent the re-establishment of Arundo, and they will continue to maintain this area for a 5-year period. A 10-acre treatment area has been identified for any off-site mitigation that may be required.

EC-BIO-2: All vegetation removing and clearing activities and the operation of heavy construction equipment will be conducted between September 16 and February 28, outside of bird nesting season. Vegetation removal and the operation of heavy-equipment may begin in the month of August provided the area is surveyed by a qualified biologist in advance of vegetation removals and the qualified biologist determines that no nesting birds are present within 500 feet of the activities.

EC-BIO-3: To ensure that significant noise impacts do not occur to active nests, a construction noise mitigation program will be implemented. The noise program will include the following measures.

- Construction of an earthen berm around the sediment storage site.
- During the nesting season portable acoustical panels will be placed along perimeter of the sediment removal channel where the floating dredge and/or heavy equipment is operating to minimize construction noise.
- If needed during the nesting season portable acoustical panels will be placed along the earthen berm around the perimeter of the sediment storage site and around the sediment re-entrainment work area to further reduce construction noise.
- All construction equipment will be equipped with noise reduction features, such as mufflers and engine shrouds.
- Onsite generators and booster pumps will be enclosed entirely.

EC-BIO- 4: Prior to the start of grading activities in the stockpile area and portion of the haul route that is outside of riparian vegetation, focused gnatcatcher surveys will be conducted beginning to determine the presence of California Gnatcatcher territories.

- Surveys will include the identification of nearby habitat that gnatcatchers may move to or utilize once construction activities start. The qualified biologist will report on whether this nearby habitat is already occupied by gnatcatchers.
- Surveys shall also be conducted three days before the start of grading to determine if individual foraging gnatcatchers are present.
- Additional nesting season surveys will be conducted annually through the duration of sediment removal activities.
- Results of pre-construction, nesting, and pre-grading surveys will be reported to the Service in a quarterly report.

EC-BIO-5: To avoid impacts to wildlife species, a qualified biologist approved by USFWS will conduct a biological resource sweep of the work area prior to any ground disturbing activities, during project operation and during demobilization of construction equipment. The biological resource sweep will include the following activities;

- Inspect the work area for any wildlife species and prepare a list of species observed and record their activity during construction and operation of the project.
- Ensure that habitats within the construction activity impact area are not occupied by wildlife species and that the quality of that habitat is maintained.
- In the event wildlife species are present, determine if the activity would cause adverse impacts. If it is determined that the activity could have the potential to adversely affect wildlife species, the activity will cease until the species is no longer in harm’s way or is relocated outside of the construction activity impact area.

EC-BIO-6: During vegetation removal activities, vegetation planned for removal will be inspected to determine if nests are present. If nests are present, the biologist will evaluate the nest site for activity, and if possible, determine species, and will propose avoidance measures and/or buffers, as appropriate.

EC-BIO-7: Sediment management and Ecosystem restoration activities conducted within Santa Ana River, Chino Creek and Mill Creek would occur between August 1 and January 15, outside of the spawning season.

EC-BIO- 8: During construction and operation of the sediment removal channel a qualified biologist will be present to monitor the activities. A qualified biologist is defined as an individual that holds a current 10(a) (1) (A) recovery permit for the Santa Ana Sucker. This individual or any other project biologist can stop dredging activities at any time if impacts to native aquatic species are observed. If impacts to Santa Ana Sucker occur, the Service will be contacted immediately to determine if additional measures to further minimize project impacts are needed or if re-initiation of consultation is necessary. Suction dredging will not proceed until the Service is contacted and a determination is made on how to proceed. The qualified biologist will prepare weekly reports describing the sediment removal activities. These reports will

- Document any sucker that is observed in the sediment removal channel.
- Document behavior of any fish observed in the project area, not only sucker, before and during sediment removal activities.
- Record the circumstances and numbers of any fish observed to be wounded or killed during sediment removal activities. Any sucker killed or found dead will be preserved in 95 percent ethanol and submitted to an approved depository.

EC-BIO-9: Floating dredge equipment and heavy construction equipment operating in the wetted channel shall warm up (run idle) for a minimum of 10 minutes before initiating the suction dredge to begin removing sediment from the river. During this time the qualified biologist will record observations of any fish in the work area and when complete, but not less than 10 minutes after initiating startup noise, will signal the dredge operator to initiate suction dredging activities.

EC-BIO-10: Prior to and during operation of floating dredge equipment and heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid and incidental leak or spill, including identification of materials necessary for containment and clean up.

EC-BIO-11: Vehicles and other equipment will be fueled, cleaned and maintained in designated areas, located away from the Santa Ana River, Chino Creek and Mill Creek to eliminate risk of pollution from spills and contamination.

EC-BIO-12: Construction personnel will utilize designated access roads or previously disturbed areas for vehicle access and staging of construction equipment.

EC-BIO-13: Prior to removal of vegetation access routes in and out of the project area will be flagged.

EC-BIO-14: Unpaved areas will be watered as needed to control dust on a continual basis.

EC-BIO-15: All construction, site disturbance and vegetation removal will be located within the delineated construction boundaries. The storage of equipment and materials, temporary stockpiling of soil would be located within designated areas outside of habitat areas.

EC-BIO-16: Areas to remain undisturbed will be clearly flagged or otherwise delineated prior to construction activities and would be monitored to ensure that all activities do not encroach into the delineated protected areas. Onsite Biologist will have the authority to halt the Sediment Management Demonstration Project activities if occurring inside delineated areas.

EC-BIO-17: The configuration of the work area of the sediment trap, conveyance channels and the sediment storage site will be designed so when it is not in operation it will allow for wildlife movement.

EC-BIO-18: A litter control program will be implemented during construction to eliminate the accumulation of trash. Trash will be removed from trash receptacles at the end of each work day to discourage wildlife movement into work areas.

EC-BIO-19: Speed limits of 15 miles per hour or less will be required at all times to avoid potential injury to wildlife in the area.

EC-BIO-20: A qualified biologist approved by the USACE will monitor access roads to ensure wildlife is not impacted by construction equipment.

EC-BIO-21: Construction lighting at the sediment re-entrainment area will be directed onto the work site to prevent spill-over lighting impacts to wildlife. Construction lighting fixtures will be shielded by providing a side flap on the lights or providing temporary drape/wall so that illumination is confined to the work area.

EC-HWQ-1: The Sediment Management Measure will be implement an ongoing water quality monitoring program that would monitor for organic chemicals, including pesticides, PCBs, PAHs hydrocarbons, metals, total dissolved solids, indicator bacteria and dissolved oxygen upstream in the Prado Basin reservoir pool and downstream within waters where sediment re-entrainment would occur. The monitoring program would be implemented before construction, during sediment re-entrainment and after sediment re-entrainment. If significant differences between upstream and downstream samples are observed during sediment re-entrainment, the rate of sediment re-entrainment will be adjusted to ensure that they are within acceptable thresholds of the Regional Water Control Board Basin Plan.

SECTION 5 EFFECTS OF ACTION

5.1 Water Conservation Measure

Inundation of Occupied Nests or Spawning Grounds

Least bell's Vireo (Vireo), Southwestern Willow Flycatcher (Flycatcher), Western yellow-billed cuckoo (Cuckoo)

As shown on Figure 17, surveys conducted in the last year and in prior years have identified several hundred vireo territories within the Prado Basin and along the Santa Ana River Reach 9. There would be high probability for vireos to occur within the study area.

As shown in Figure 18, a total of 27 flycatchers have been reported in the Prado Basin between 2003 and 2017. The majority sightings were reported above elevation 505 ft. The most recent observed flycatcher was a male reported in 2015 and 2016 between elevation 498 ft. and elevation 505 ft.

The cuckoo is a migratory bird species that is rarely reported in the Prado Basin. The most recent sighting was in 2011. As shown in Figure 18, the most recent sighting of the cuckoo was in 2011 between elevation 498 ft. and 505 ft.

Because the Water Conservation Measure would be limited to the non-nesting season, implementation of the Water Conservation Measure would not affect active or occupied nests.

<u>Conclusion</u>

No Effect

Coastal California gnatcatcher (gnatcatcher)

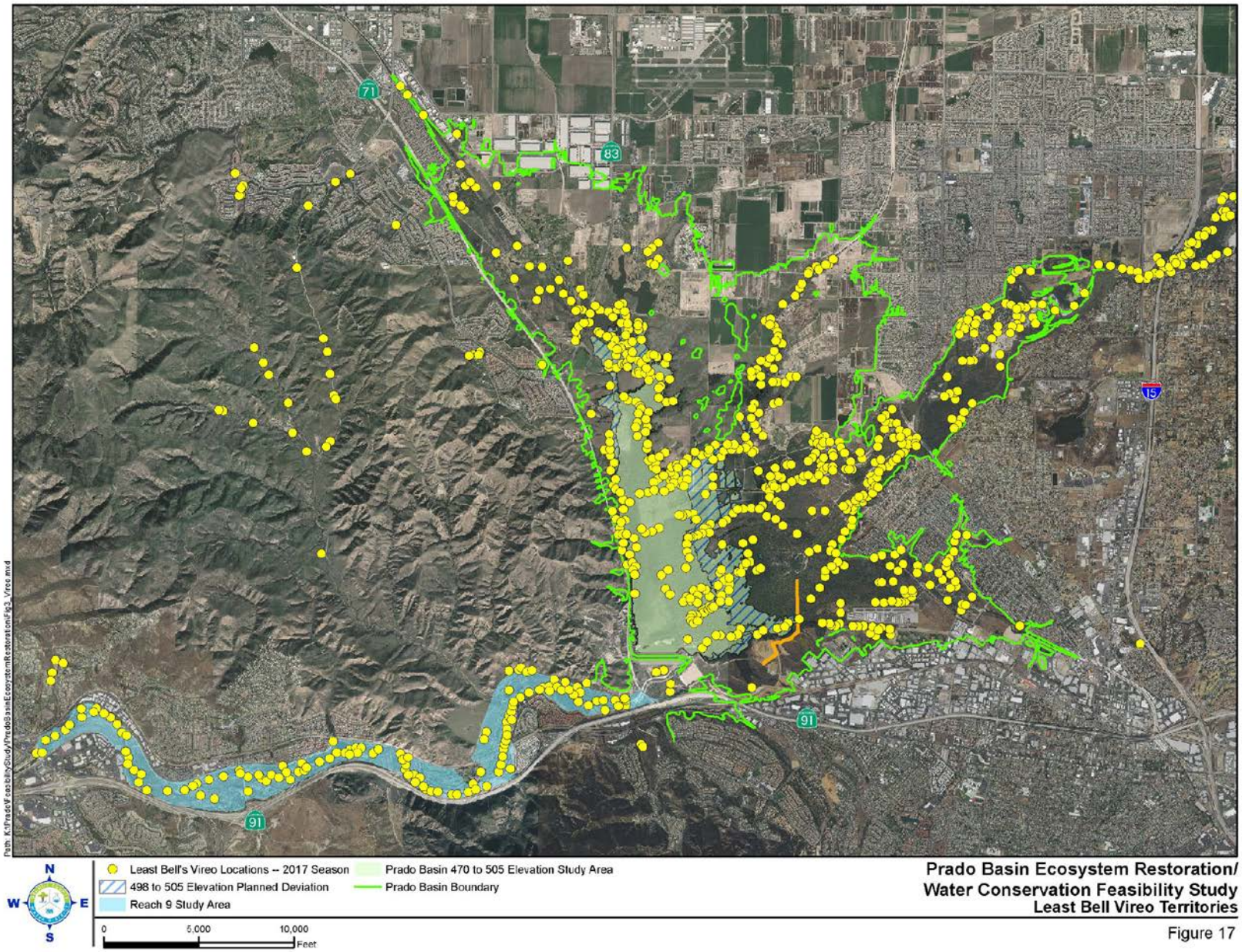
As identified in the California Fish and Wildlife Natural Diversity Database gnatcatchers occur in higher upland areas that contain coastal sage habitat. The species would not expected be affected by any pooled water, additional days of inundation or release rates from Prado Dam associated with the Water Conservation Measure. Therefore, the Water Conservation Measure would not be expected to have any direct effects or indirect effects to the gnatcatcher.

<u>Conclusion</u>

No Effect

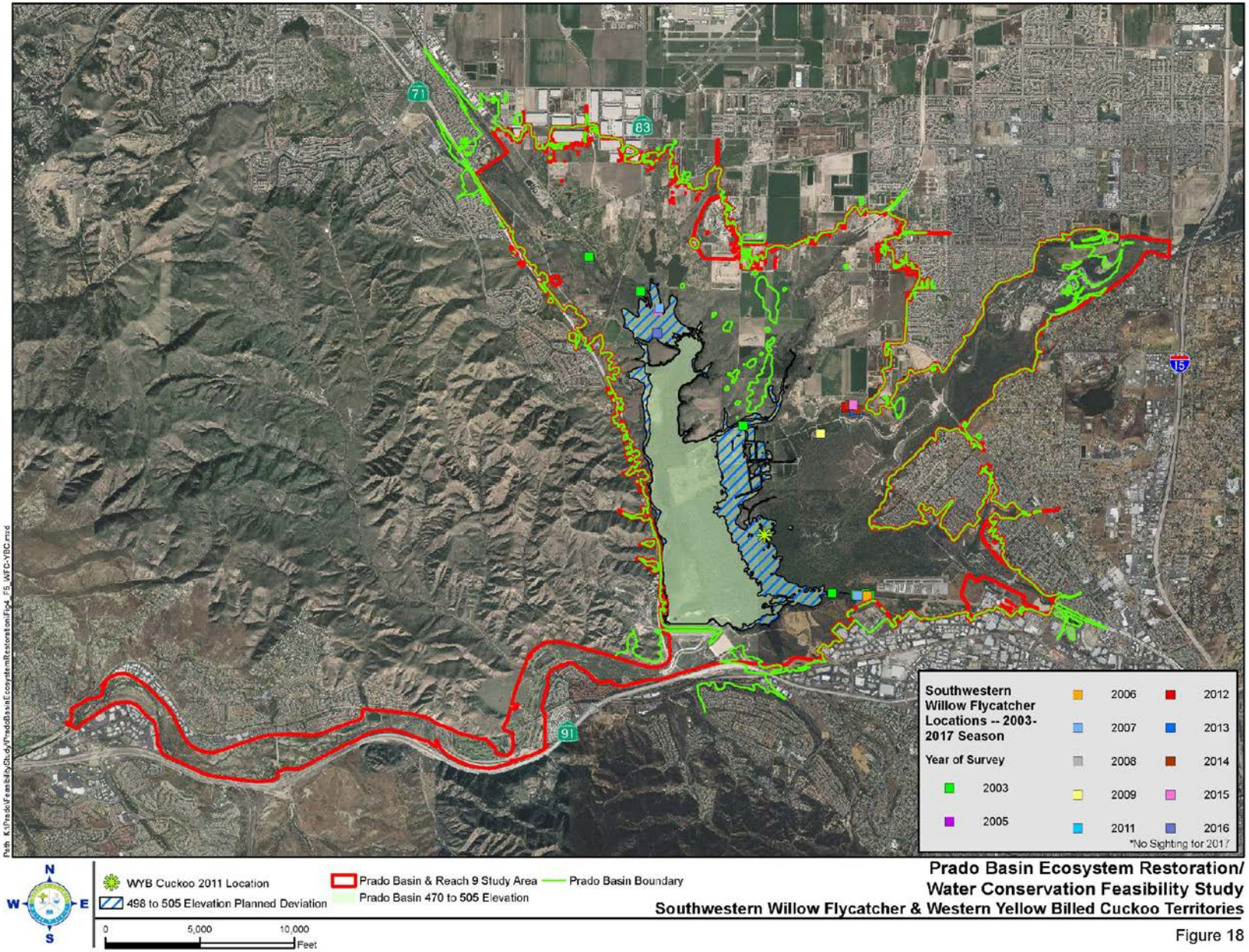
Santa Ana Sucker

As the Water Conservation measure would occur outside of the spawning season, and no suitable spawning habitat occurs between 498 ft. and 505 ft., no effect to this species would occur.



Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
Least Bell Vireo Territories

Figure 17



Prado Basin Ecosystem Restoration/ Water Conservation Feasibility Study

Southwestern Willow Flycatcher & Western Yellow Billed Cuckoo Territories

Figure 18

Conclusion

No Effect

Effects from Increased Days of Inundation During Nesting Season

Vireo

In the event of a wet year and the water is stored between elevation 498 ft. and elevation 505 ft. the Action Area would likely already be inundated before the nesting season begins, with or without the proposed Water Conservation Measure. Implementation of the Water Conservation Measure would increase the level of pooling and number of days of inundation at the Prado Basin. There could be the potential that pooled water could overlap into the beginning of nesting season inundating previous year's nesting territories, which could discourage or prevent vireos from nesting in those same areas. However, as shown in Table 11, previous surveys conducted in the Prado Basin during wet years where a buffer pool was present, have shown no substantial overall reduction in the number of vireo territories reported. In fact, during years of above average rainfall in 2004, 2005, 2010 and 2017, the amount of vireo territories reported were the four highest reporting years since 2000.

Table 11 Total Vireo Territories Reported Within Prado Basin 2000 to 2017

Year	**2000**	**01**	**02**	**03***	**04***	**05***	**06***	**07**	**08**
Vireos Reported	357	432	440	409	584	589	392	418	463
Year	**09**	**10***	**11***	**12**	**13**	**14**	**15**	**16**	**2017***
Vireos Reported	543	569	515	449	560	520	530	511	549

Notes:
*Years when Prado water elevation exceeded 498 feet during nesting season
Vireo counts about River Road are excluded.
Data sources: OCWD vireo data (2000-2017); Army Corps Prado dam water elevation data (2000-2017)

The data in Table 11 suggests that the presence of a buffer pool did not deter vireos from nesting within the Prado Basin, which indicates they were nesting in areas outside of where inundation would be occurring. The elevation distribution of vireo territories with the Prado Basin from 2001 to 2015 is shown in Table 12. The table shows that an overwhelming majority of vireo territories occur above elevation 505 ft. Additionally, Table 12 shows that when the buffer pool was present the vireos tended to re-distribute to higher elevations. In 2003 when the buffer pool was up to elevation 494 ft. for most of March, there was increase in the amounts of vireos reported between elevations 498 ft. and 505 ft. compared to 2001 and 2002 when the buffer pool was not present. Additionally, from 2003 to 2006 during periods of above average rainfall there was decrease amount of nesting territories in the lower elevations and increase in nesting

territories above 505 ft. In March of 2010 when the buffer pool was as high elevation 498 ft. there was increase in the vireos reported between elevation 498 ft. and elevation 505 ft. and above elevation 505 ft. In 2017 there was increase nesting territories above 505 ft. compared to the previous five years when there was no buffer pool. These results indicate that when a buffer pool was present it did not discourage vireos from nesting within the Prado Basin, but did cause them to re-distribute to higher elevations. The potential for the pooled water to overlap and cause vireos to redistribute into higher elevations would be considered a temporary adverse effect. However, because the re-distribution of vireos to higher elevations would not cause a substantial reduction in the overall numbers of territories occurring in the Prado Basin, the temporary adverse effect would not be considered substantial.

Table 12: Elevation Distribution Vireos Prado Basin between 490 ft. and 505 ft.

Calendar Year	466 to 490 ft. elevation range	490 to 494 ft. elevation range	494 to 498 ft. elevation range	498 to 505 ft. elevation range	505 to 566 ft. elevation range	Total vireo (within 566 ft., excluding above River Road)	Number of days Prado water elevation exceeded 498 feet in vireo nesting season
2001	6.25%	8.80%	8.80%	15.51%	60.65%	432	0
2002	12.27%	11.82%	9.55%	14.09%	52.27%	440	0
2003*	4.16%	5.87%	11.00%	17.36%	61.61%	409	44
2004*	7.71%	6.68%	8.39%	14.73%	62.50%	584	9
2005*	4.41%	5.94%	8.66%	11.71%	69.27%	589	125
2006*	0.77%	0.51%	7.91%	16.33%	74.49%	392	78
2007	1.67%	0.96%	10.53%	14.35%	72.49%	418	0
2008	3.24%	1.73%	8.42%	17.71%	68.90%	463	0
2009	2.58%	1.84%	12.15%	16.76%	66.67%	543	0
2010*	0.88%	1.58%	11.60%	18.10%	67.84%	569	18
2011*	0.97%	0.78%	8.54%	19.81%	69.90%	515	74
2012	1.34%	1.34%	11.36%	22.94%	63.03%	449	0
2013	3.57%	2.32%	12.68%	20.71%	60.71%	560	0
2014	6.54%	2.12%	13.27%	19.23%	58.85%	520	0
2015	6.42%	3.58%	10.75%	19.43%	59.81%	530	0
2016	7.63%	3.13%	14.29%	17.22%	57.73%	511	0
2017*	4.55%	2.19%	13.11%	17.12%	63.02%	549	17

Notes:
Percentages of vireo in topographic ranges from 2001 to 2005 were calculated based on 1989 topographic survey;

Percentages of vireo data from 2006 to 2017 were calculated based on 2008 topographic survey

(all calculations using State Plane NAD83, Vertical Datum NGVD 29).
Note: vireo counts above River Road are excluded.
Data sources: OCWD vireo data (2001-2017); Army Corps Prado dam water elevation data (2001-2017)

Conclusion

May Effect

Flycatcher

There would be the potential for the pooled water to overlap and cause flycatchers to redistribute into higher elevations. Because of the infrequency of the species occurring between elevation 498 ft. and 505 ft. the Water Conservation Measure may affect, but not likely to adversely affect the flycatcher.

Conclusion

May Effect, Not Likely to Adversely Affect

Cuckoo

There would be the potential for the pooled water to overlap and cause cuckoos to redistribute into higher elevations. Because of the infrequency of the species occurring between elevation 498 ft. and 505 ft. the Water Conservation Measure may affect, but not likely to adversely affect the cuckoo.

Conclusion

May Effect, Not Likely to Adversely Affect

Gnatcatcher

There is very limited suitable nesting habitat below 505 ft. Implementation of the Water Conservation Measure would have no effect on the gnatcatcher.

Conclusion

No Effect

Santa Ana Sucker (sucker)

Since 2008 no suckers have been reported in the Prado Basin and only a few individuals have been reported in the Santa Ana River Reach 9 area. The fish spawns from late March to early July, peaking in late May and June. The Water Conservation Measured would not be expected to directly affect spawning fish since it would be complete well before spawning season begins. Given the lack of presence of this species within the study area in recent history along with the marginal habitat conditions and high populations of exotic predatory fish, the potential for populations of suckers to occur in the study area would be low. In the unlikely event individual suckers find their way into the study area, the increased pooling would temporarily increase the habitable area, this would not benefit or adversely affect the species.

Conclusion

No Effect

Critical Habitat

The following analysis evaluates potential impacts to critical habitat for the Least Bell's Vireo, Southwestern Willow Flycatcher, Western Yellow-Billed Cuckoo, Coastal California Gnatcatcher and the Santa Ana Sucker associated with implementation of the Water Conservation Measure.

Effects to Critical Habitat from Increased Pooling

Vireo Critical Habitat

The Water Conservation Measure would allow water to be stored up to 505 ft. during the flood season, which means there could be higher elevation pooling and additional days of inundation in the Prado Basin over the current condition. As shown in Table 13, between 470 ft. and 505 ft. there are approximately 1,469 acres of vireo critical habitat within the Prado Basin, of which 1,384 acres are primary constituent elements. Presently, the vireo critical habitat areas between elevation 470 ft. and elevation 505 ft. are inundated during the non-flood season as part of the existing water conservation activities at Prado Dam, and have the potential to be inundated year-round for flood control operations. Therefore, the implementation of the Water Conservation Measure would not increase the amount of critical habitat lands that could be potentially inundated.

Table 13 Vireo and Flycatcher Critical Habitat 470 ft. to 505 ft. (acres)

Vegetation Community	Vireo Critical Habitat	Flycatcher Critical Habitat	Cuckoo Critical Habitat
Open Water	25.71	0	17.4
Primary Constituent Habitat Elements	1,384.1	.77	342.3
Other Vegetation Communities	59.3	0	1258.9
Total	1,469.1	.77	1618.6

The growing season within Prado Basin for the most part begins in March and extends through the summer. Presently, water can be stored up to 505 ft. during the non-flood season, which overlaps into the growing season. The data in Table 14 identifies the existing average days of inundation at various elevations in the Prado Basin during the growing season and the number of additional days of inundation that would occur from the implementation of the Water Conservation Measure. As shown in Table 14, implementation of the Water Conservation Measure would not substantially increase the average number of days that the habitat is currently inundated during the growing season.

Table 14 Days of Inundation Occurring During Growing Season

Elevation	470	480	490	494	498	500	505	510	520	530	540
Existing Average Annual Days of Inundation During Growing Season	36 to 58	34 to 54	32 to 49	52 to 37	19 to 29	14 to 24	0	0	0	0	0

Additional Average Days of Inundation During Growing Season with Water Conservation Measure	3 to 10	3 to 11	2 to 11	3 to 13	3 to 11	3 to 9	2	0	0	0	0
Low Range Based on 500 cfs Release Rate High Range Based on 350 cfs Release Rate Source: Supplemental Water Conservation Analysis, Michael Baker International Company, 2015											

The most common primary constituent elements of critical habitat for the vireo within the Prado Basin are mulefat and black willow. Mulefat is a perennial evergreen that would not defoliate unless under stress. Willow species are known to have high inundation tolerances and black willows are known to have especially high inundation tolerances when they are in a period of dormancy, which correlates with winter or the flood season. As part of the OCWD's ongoing habitat restoration monitoring program conducted at Prado Basin, habitat conditions are documented photographically during unusually wet periods to help evaluate the effects that extended periods of inundation has on the health of habitat in the basin. The habitat monitoring program showed that after the habitat was completely submerged and by early as next year the habitat began to recover from the inundation and became healthier each subsequent year. The monitoring of the habitat showed that periodic inundation did not result in permanent damage to the habitat.

Another measurement to determine the health and biological values of habitat areas would be wildlife usage. As shown in Table 12, in 2003 to 2006 after back to back wet years, there was an increase in nesting territories at the higher elevations. The reduced wildlife usage in the lower elevations suggests that the habitat in that area experienced reduced biological values, most likely from the wetted conditions occurring in the Prado Basin after back to back wet years. However, in subsequent years during drier periods a steady increase in the amount of vireo territories was reported at lower elevations in the Prado Basin. These increases in wildlife usage at the lower elevations suggest that the biological values of the habitat recovered with the dryer conditions. These reporting levels indicate that the increased pooling and additional days of inundation occurring during the flood season did not result in long term damage to the habitat where it was no longer considered suitable habitat for wildlife usage.

The increased pooling and additional days of inundation may affect critical habitat areas. However, because previous surveys have shown no long-term damage to habitat or substantial reductions in wildlife usage of the habitat when the buffer pool has extended into the growing season, the temporary effect to critical habitat would not be considered adverse. To ensure that the Water Conservation Measure would not substantially degrade the value of primary constituent elements within critical habitat areas, OCWD would continue to monitor the health of critical primary constituent elements between 498 ft. and 505 ft. before and after inundation occurs. Quantitative assessments would be done in areas of observed loss of vigor and would

incorporate data recorded along belt transects above and below the water conservation inundation zone to quantify differences in tree count and understory composition, particularly any mulefat loss. A transect would be flown along 505 ft. contour or high-water contour and three perpendicular transects would also be flown between elevations 505 ft. and 498 ft. to track habitat variation through time. This would be repeated twice annually during inundation and following leaf out. Dramatic changes in understory such as vegetation die back would be discussed with the Corps and USFWS and habitat would be restored, if determined necessary. The habitat would be given a minimum of 2 years to recover on its own, prior to active planting**.** To determine if habitat needs to be replaced, a 30% loss of cover over a two-season period without any signs of recovery would be the threshold to replace the vegetation. If it is determined that the degraded habitat is no longer suitable for supporting riparian habitat, then the habitat would be replaced at a 1:1 ratio on OCWD property. With the implementation of Conservation Measure BIO-1 there would be no potential loss of critical habitat.

Conclusion

May Affect, Not Likely to Adversely Affect

Flycatcher Critical Habitat

There is a total 1,502 acres of area in the Prado Basin that are designated critical habitat for the flycatcher. As shown in Table 5, there are approximately .77 acres of flycatcher critical habitat between 498 ft. and 505 ft., which all is considered primary constituent elements for the flycatcher. The amount of flycatcher critical habitat between elevation 470 ft. and elevation 505 ft. is minimal compared to the overall amount of flycatcher critical habitat within the Prado Basin. Presently, the flycatcher critical habitat in areas between elevation 498 ft. and 505 ft. elevation would be subject to inundation year-round as necessary for flood control operations, and during the non-flood season as part of the existing water conservation activities at Prado Dam. Due to the intermittent occurrence of the flycatcher, it is difficult to evaluate flycatcher usage during periods when the critical habitat would be inundated. Because the primary constituent elements that manifest themselves in flycatcher critical habitat and vireo critical habitat are similar, it would be reasonable to assume that vireo usage would be a good indicator to determine the heath of flycatcher critical habitat after periods of inundation. The vireo wildlife usage reporting levels within similar primary constituent elements indicates that the increased pooling and additional days of inundation occurring during the flood season did not result in long term damage to the habitat. Because previous surveys in similar primary constituent elements have shown no long-term reductions in wildlife usage of the habitat when the buffer pool has overlapped into the growing season, it is reasonable to conclude that the potential effects to flycatcher critical habitat associated with additional days of inundation due to the Water Conservation Measure

would not be adverse. No long-term or permanent degradation to flycatcher critical habitat would occur. To ensure that the Water Conservation Measure would not substantially degrade the value of primary constituent elements within critical habitat areas, OCWD would continue to monitor the health of the riparian habitat between elevation 498 ft. and elevation 505 ft. before and after inundation occurs. If it is determined that the degraded habitat is no longer suitable for supporting riparian habitat, the habitat would be replaced at a 1:1 ratio on OCWD property. With the implementation of Conservation Measure BIO-1 there would be no potential loss of critical habitat.

Conclusion

May Affect, Not Likely to Adversely Affect

Cuckoo Critical Habitat

Critical habitat for the Western yellow-billed cuckoo was proposed in 2014. Presently, the current ruling is being revised by USFWS. The final ruling is expected sometime in 2018. Based on the proposed critical habitat area within the Prado Basin, there is approximately 614 acres of cuckoo critical habitat between 498 ft. and 505 ft. of which 579 acres are primary constituent elements. Similar, to the critical habitat for the vireo and flycatcher, the increased pooling may affect, but not adversely affect critical habitat. OCWD would continue to monitor the health of the riparian habitat between elevation 498 ft. and elevation 505 ft. before and after inundation occurs. If it is determined that the degraded habitat is no longer suitable for supporting riparian habitat, the habitat would be replaced at a 1:1 ratio on OCWD property. With the implementation of Conservation Measure BIO-1 there would be no potential loss of critical habitat.

Conclusion

May Affect, Not Likely to Adversely Affect

Gnatcatcher Critical Habitat

The gnatcatcher critical habitat occurs on the terraces along Reach 9. Implementation of the Water Conservation Measure would not trigger large, erosive discharges that would affect critical habitat along the terraces of Reach 9. The increased pooling within the Prado Basin would have no effect on critical habitat for the gnatcatcher.

Conclusion-

No Effect

Sucker Critical Habitat

Upstream: Critical habitat in the Prado Basin is designated above 505 ft. The increased pooling between 498 ft. and 505 ft. would have no effect on designated sucker critical habitat.

Downstream: Critical habitat in Reach 9 would not be affected as the Water Conservation Measure would not trigger large, erosive discharges. Modeling demonstrates that reducing the running average release rate from 500 cfs to 350 cfs would slightly reduce the depth of the low flow channel but would still maintain bank to bank connectivity. Furthermore, discharge rates fluctuate greatly depending on flood stage, inflow, water surface elevation, downstream construction activities, and other factors. There is not a steady state flow of 500 cfs that creates sustained habitat conditions in the margins for larvae or fry. Moreover, the release rate (weather it is 350 or 500 cfs average) would further decrease as the pool is emptied.

Conclusion

No Effect

Effects to Critical Habitat from Increased Sedimentation Due to Water Conservation Measure

Vireo Critical Habitat, Flycatcher Critical Habitat, Proposed Cuckoo Critical Habitat

The following analysis is based on the Prado Dam Planned Deviation, Santa Ana River Upstream Effects Due to Water Conservation, prepared by Scheevel Engineering in June of 2015. The report is presented in Appendix B of this BA.

To quantify the additional sediment deposition that could potentially occur in the Prado Basin from the Water Conservation Measure, and the resulting effects to critical habitat, the following facts or assumptions were considered.

- Under existing conditions, there is approximately 0.5 to 0.7 ft. of sediment deposition annually along the Santa Ana River in the Prado Basin from approximately 2,000 feet upstream of Prado Dam to 15,000 feet upstream of the dam. (Note: This is an average roughly based on calculating changes in topographic data over several decades. In dry years, very little deposition would occur, whereas rare large storm events or very wet seasons may bring a large influx of sediment.)
- Currently, nearly all of the sediment that enters into the Prado Basin deposits and settles in the Prado Basin regardless of water conservation water surface elevations.
- The additional 10,500 acre feet of water in the Prado Basin would be held for a duration that allows silt and clay particles to settle out of the water column.
- Assumed that the TSS of the Prado storm water inflow is 2,000 mg/L. Historical data shows average Prado inflow storm water TSS to range between 500 to 2,000 mg/L.

- Assume that the silt and clay portion of the TSS is 20%.
- The silt and clay would deposit across 1,890- acre area below 505 ft.

On average it is expected that the Prado Basin water surface elevation would reach or exceed, 505 ft. one time per year. An additional volume of 10,500-acre feet of water could be impounded by the Water Conservation Measure. Taking into the account the above assumptions it was calculated that, on average an additional 3,500 cubic yards of silt and clay sediments could deposit in Prado Basin each year due to the Water Conservation Measure. The estimated annual increase of 3,500 cubic yards resulting from the Water Conservation Measure represents a 0.3 percent increase in the annual sedimentation volume. Once into the Prado Basin, the silt and clay sediments would disperse over large areas due to their ability to stay suspended more easily than sand, gravel and cobbles. The approximate surface area of the Prado Basin below the 505 ft. contour is 1,890 acres. Due to turbulence in the Prado Basin created by wind action and tributary inflow it is anticipated that suspended clay and silt sediments would distribute evenly over the 1,890-acre pool area below 505 ft. If the silt and clay was distributed evenly across the 1,890 acres, there would be an average of 0.001 ft. per year of sediment deposition. The 0.001 ft. per year additional silt and clay sedimentation from the Water Conservation Measure would be considered negligible compared to existing baseline sedimentation rate between 0.5 and 0.7 feet occurring per year. The additional 0.001 of sediment would not reduce biological values of critical habitat. Additionally, the amount of sediment deposited in the basin would be removed from the proposed Sediment Management Measure, would be substantially more than the increased sediment occurring from the Water Conservation Measure. To ensure that the Water Conservation would not substantially degrade the value of primary constituent elements within vireo and flycatcher critical habitat areas, OCWD would continue to monitor the health of the riparian habitat between 498 ft. and 505 ft. before and after inundation occurs. In the event the monitoring program indicates that the primary constituent elements were substantially degraded, it is proposed that the degraded habitat would be replaced at a 1:1 ratio on OCWD property. With the implementation of Conservation Measure BIO-1 no effects to critical habitat would occur.

<u>Conclusion</u>

No Effect

Gnatcatcher Critical Habitat

The gnatcatcher critical habitat occurs on the terraces along Reach 9. The potential increased sedimentation occurring within the Prado Basin would have no effect on critical habitat for the gnatcatcher along Reach 9.

<u>Conclusion</u>

No Effect

Sucker Critical Habitat

As shown in in Table 5 there is no designated sucker critical habitat between elevations 470 ft. to 505 ft. within Prado Basin. The increased pooling would have no effect on sucker critical habitat.

Sucker Critical Habitat Upstream

The following analysis is based on a report that evaluates Prado Basin and Upstream Santa Ana River morphology trends between 498 ft. and 505 ft. the report is presented in Appendix C of this BA. The analysis evaluates potential effects to existing riparian and native fish habitats along the Santa Ana River between Prado Dam and the Hamner Avenue crossing associated with the implementation of the Water Conservation Measure. A combination of historical topographic surveys, aerial imagery, recent sediment transport models, and historical data was used to estimate long-term changes to river morphology and habitats along the Santa Ana River and in the Prado Basin between Prado Dam and the Santa River/Hamner Avenue crossing.

Presently, the substrate of the Santa Ana River between Prado Dam and the Hamner Avenue crossing consists of a large percentage of sand with clays and silts. Historical imagery from 1929 through 1967 shows that the reach of the Santa Ana River between Prado dam and Hamner Avenue crossing was largely composed of a large percentage of sand. This condition has not changed. The present-day substrate conditions along the Santa Ana River between Prado Dam and the Hamner Avenue crossing are primarily influenced by inflows into Prado Basin, sediment transport interruption, and the presence and proliferation of non-native vegetation and non-native aquatic species.

On Average it is expected that the Prado Basin water surface elevation would reach or exceed 505 ft. one time per year. Over the 50-year period it is estimated that approximately 175,000 cubic yards (3,500 cubic yards per year) of additional sediment would deposit in the Prado Basin. The annual average volume of all sediment types deposited in the Prado basin would be 1,200,000 cubic yards. The estimated increase of 3,500 cubic yards from the Water Conservation Measure would represent a 0.3 percent increase in the annual sedimentation volume. The potential effect to habitat along the Santa Ana River from the sedimentation would be limited to a 1,890 acre area within a 4,000 ft. long stretch of the river below elevation 505 ft. There is not any designated critical habitat for the sucker along the reach of the Santa Ana River in Prado Basin below elevation 505 ft. therefore, no effect to critical habitat would occur. Moreover, with implementation of the Sediment Management Measure which is also an element of the proposed project, there would not be any net increase in sediment deposition due to the Water Conservation Measure.

Analysis of Potential Effects to Santa Ana Santa Ana River Gradient

The potential upstream effects to the Santa Ana River gradient due to increases in water surface elevation were evaluated in a one-dimensional sediment transport analysis conducted by Golder Associates, Inc. The Technical Report is presented in Appendix D of this BA.

The sediment transport model extended from the Riverside/San Bernardino County line, downstream, to the discernible end of the Santa Ana River in the Prado Basin. Two scenarios were modeled to compare the effects of increasing the flood season water surface elevation from 498 ft. to 505 ft., an increase of seven feet. The two scenarios are the current operating condition of maintaining the buffer pool at 498 ft. during the flood season and 505 ft. during the non-flood season and under the Water Conservation Measure of maintaining the buffer pool at 505 ft. during flood seasons, which then eliminates the variation in operation for a seasonal buffer pool.

The results of the sediment transport model for the existing condition (flood season water surface elevation of 498.0 ft.) indicated that there would be a general trend of aggradation from above the I-15 Freeway crossing, extending downstream into Prado Basin. Aggregation over a 10-year time period would be expected to range from 1 foot to 9 feet in depth. Based on the model results, the river bed around River Road Bridge would be expected to experience the most aggradation which would be consistent with what has been observed historically.

The model for the increased water surface elevation scenario (flood season water surface elevation of 505. ft.) exhibits nearly identical aggradation trends as the existing condition model. The only expected difference in the sediment deposition trends between the two scenarios would be a slight increase in deposition within Prado Basin between the 498 ft. and 505 ft. elevation contours. Based on historical topographic surveys there is approximately 1,000 to 2,000 linear feet of area between the 498 ft. and 505 ft. contours. If the flood season water surface elevation is increased to elevation 505 ft., then transient periods of increased aggradation could occur between elevation 498 ft. and 505 ft., as high flow events coincide with periods of increased water surface elevation. During periods where high flow events coincide with relatively low water surface elevation, the aggradation trends would tend to revert back to historically observed conditions. A portion of the sediment deposited between elevations 498 ft. and 505 ft. would be transported below elevation 498 ft. when high flow events coincide with relatively low water surface elevation. It is important to note that once the water conservation pool is filled to the maximum water surface elevation it is then drained as quickly as possible to create storage volume for subsequent storms. This mode of operation reduces the frequency of occurrence when the maximum water conservation water surface elevation coincides with high flow events.

The sediment transport model results also show that there would be no appreciable change to the river bed gradation due to the increased water surface elevation. The general trend for both scenarios is that there would be deposition of primarily fine to medium sand from above the I-15 Freeway crossing, extending downstream into Prado Basin. The overall quantity of sediment and sediment particle size distribution entering Prado Basin would be the same for both water surface elevation scenarios. The alteration to the Santa Ana River morphology caused by the proposed flood season increase to the water surface would likely be limited to the spatial distribution sediments between elevations 498 ft. and 505 ft. and would have little no effect on the gradient of the river upstream of 505 ft. and no effect to Santa Ana sucker critical habitat upstream of the water conservation limits.

Effects to Sucker Critical Habitat Downstream of Prado Basin

The following analysis is based on information provided in Prado Dam Planned Deviation, Santa Ana River-Downstream Effects Due to Planned Deviation prepared by Scheevel Engineering, June of 2015. The report is presented in Appendix E of this BA.

Downstream of Prado Dam designated critical habitat for the sucker extends along Reach 9 of the Santa Ana River from Prado Dam to Imperial Highway. At the Prado Dam outlet structure to the Green River Golf Course the river has a relatively flat slope. Within this reach the river flow is perennial and the floodplain is covered with riparian vegetation. The banks are moderately incised with vegetated islands that dot the main channel. Near the Green River Golf Course the slope increases and the river becomes more incised. The Corps Santa Ana Sucker Perennial Stream Restoration Project is located in this reach.

Between the Green River Golf Course and Imperial Highway, the flood plain becomes much more expansive with several flow splits forming natural islands. Riparian vegetation is mostly concentrated near the river bank. The bed material along Reach 9 is much coarser consisting of gravels and cobbles compared to the sandy bed material of the river above Prado Dam. The dominant bed form in this reach is pool-riffle, where high gradient high velocity riffles flow into low gradient low velocity pools. Additionally, there are several stretches where the river has a plane bed, where the gradient and velocity are constant and the river bottom material is dominated by gravel and cobble. This reach contains some primary constituent elements that define critical habitat for suckers.

The implementation of the Water Conservation Measure could increase pooling within the Prado Dam during the flood season. Flood risk management operations would dictate the release rate from the Prado Dam. In general, the Corps uses forecasting to determine the resultant water surface elevation of a given storm/storm system, then adjusts the release rate from Prado Dam as needed, before during and after a given storm event. Once the Prado Basin water surface elevations are within the buffer pool

elevations, the release rates are typically reduced to help facilitate groundwater recharge operations downstream. The exception to this mode of operations is when a significant storm event is forecasted the Corps may release water at higher rates to evacuate the buffer pool to create storage volume for forecasted inflows. In general, the Corps uses forecast inflow data provided by the NWS River Forecast Center to determine the resultant water surface elevation of a given storm/storm system, then adjusts the release rate from Prado Dam, as needed, to achieve certain water surface elevation before, during and after a given storm event. The Corps would be able to determine the anticipated pool impoundment at Prado Dam a few days prior to the start of the storm event and to determine the discharge rate required to adequately drain the buffer pool at rates up to 5,000 cfs. The duration required to drain the buffer pool is based on the beginning storage volume, Prado Basin inflow and Prado Basin outflow. Each storm event is different, but in general the Prado Basin inflow after the storm system has passed (and after the peak of the inflow hydrograph occurs) inflow would settle back down to the normal base flow which could range between 200 to 400 cfs. In order to calculate the average time to evacuate the buffer pool an inflow of 300 cfs has been used as the Prado Basin inflow rate. Two Basin outflow release rates have been analyzed to provide a range of buffer pool evacuation durations, at 2,500 cfs and 5,000 cfs. The analysis showed at both release rates the pool could be drained in a few days and the additional water that could be stored under the Water Conservation Measure would not require significantly higher water release rates to adequately drain the pool in advance of pending storm events.

Downstream erosion effects along the lower Santa Ana River have been analyzed and modeled multiple times for various studies and projects. This analysis utilizes past efforts to estimate the effects that the water release rates from the Water Conservation Measure could have on the sucker habitat along the lower Santa Ana River. Two independent studies have been identified that evaluated how flow velocities can create erosion of coarse sediments (gravel and cobbles), and potential damage to fish habitat along the Santa Ana River Reach 9 between Prado Dam and Weir Canyon.

In a 2001 Biological Opinion (FWS-SB-909.6) prepared for the Prado Mainstem and Santa Ana River Reach 9 Project, it was noted that the Corps determined through fixed bed modeling that flow velocities greater than 6 feet per second (ft./sec) along Reach 9 could have a damaging effect on riparian and fish habitat. Furthermore, it was determined that flow releases from Prado Dam of 5,000 cfs or less were generally not capable of creating velocities greater than 6 ft./sec in Reach 9 (USFWS BO 2001).

In 2014 OCWD employed Golder Associates to perform a sediment transport model of the lower Santa Ana River in conjunction with the Prado Basin Sediment Management Demonstration Project. The Reach 9 portion of the analysis revealed that flow velocities greater than 4 ft. /sec could cause gravel to mobilize and flows greater than 10 ft. /sec may cause cobbles to mobilize.

Given the above analysis it has been assumed that any flow velocities greater than 5 ft. /sec could cause erosion and habitat damage through Reach 9. A HEC-RAS hydraulic model was developed for the Planned Deviation to determine the worst-case scenarios for a Prado Dam release rate of 2,500 cfs and 5,000 cfs. The average velocity in Reach 9 at a flow rate of 2,500 cfs would be 3.7 ft. /sec and the average velocity in Reach 9 at a flow rate of 5,000 cfs would be 4.2 ft. /sec.

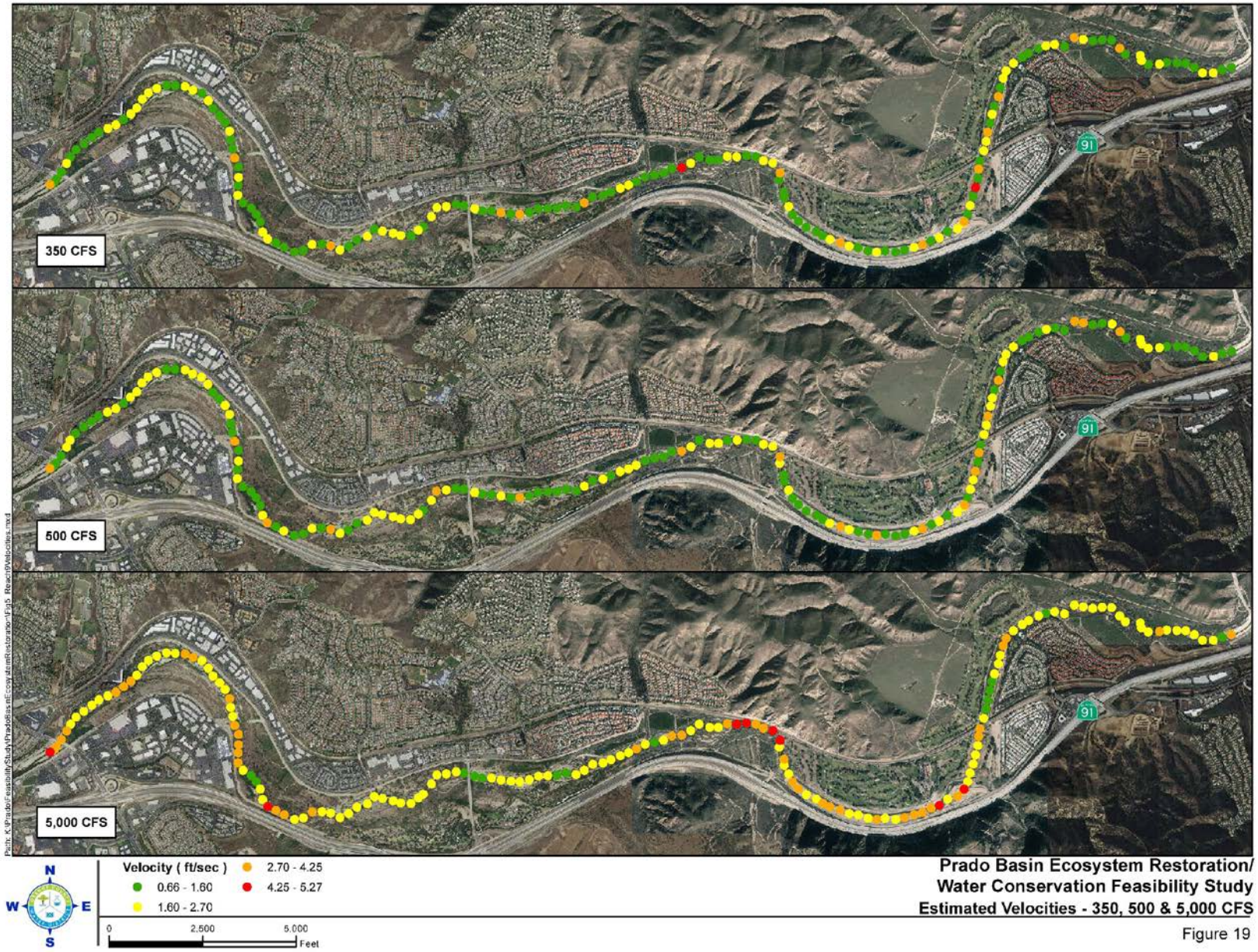
Figure 19 shows the model-estimated velocities in Reach 9 at various release rate scenarios. As shown in Figure 19, the velocities are 4.2 feet per second or lower throughout most of SAR Reach 9. At the most up gradient point in the model, just below the dam outlet, the estimated velocity is 2.8 feet per second. There are isolated areas near the bridge to the golf course clubhouse and in narrower portions of the channel where the velocities range up to 5.27 feet per second. The calculated velocities are not anticipated to effect sucker critical habitat.

At 5,000 cfs existing sands and silt would mobilize and would be conveyed to downstream reaches of the river and existing rocks and gravel would redeposit within the Santa Ana Canyon. Given the current coarse gradation of the Reach 9 riverbed, the recent Reach 9 improvements, the recurrence interval of rapid buffer pool evacuation events, and the anticipated current and future release rates and durations required to evacuate the buffer pool elevation, no substantial changes to Santa Ana sucker critical habitat primary constituent elements are expected to occur from the Water Conservation Measure. Additionally, the Corps Santa Ana Sucker Perennial Stream has been designed to withstand flows up to 6,000 cfs. Therefore, Santa Ana sucker perennial stream habitat would not be expected to sustain damage in the event of a release rate of 5,000 cfs occurs. Water conservation activities would not result in increased sediment deposition above the 505 ft. elevation, no increased deposition would occur in designated critical habitat upstream of Prado Basin, and no increased erosion or large erosive discharges would occur in designated critical habitat downstream of Prado Basin.

<u>Changes in Reach 9 Wetted Area from Reducing Release Flow from 500 cfs to 350 cfs</u>

Suckers utilize different substrate types as they develop through each life stage. The presence of coarse substrate with a mixture of gravel or cobble with sand and a combination of shallow riffles and deeper runs and pools provides optimal stream conditions. The species also prefers habitat containing in-stream or bank site riparian vegetation that provides shade and cover especially for larval and juveniles. The shallow waters along the margin of the river also provides refuge for larvae and fry from larger predatory fish and also acts as a refuge for juvenile and adult suckers during storms.

The change in wetted area and change in water depth associated with reducing the release rate from 500 cfs to 350 cfs would be relatively small.



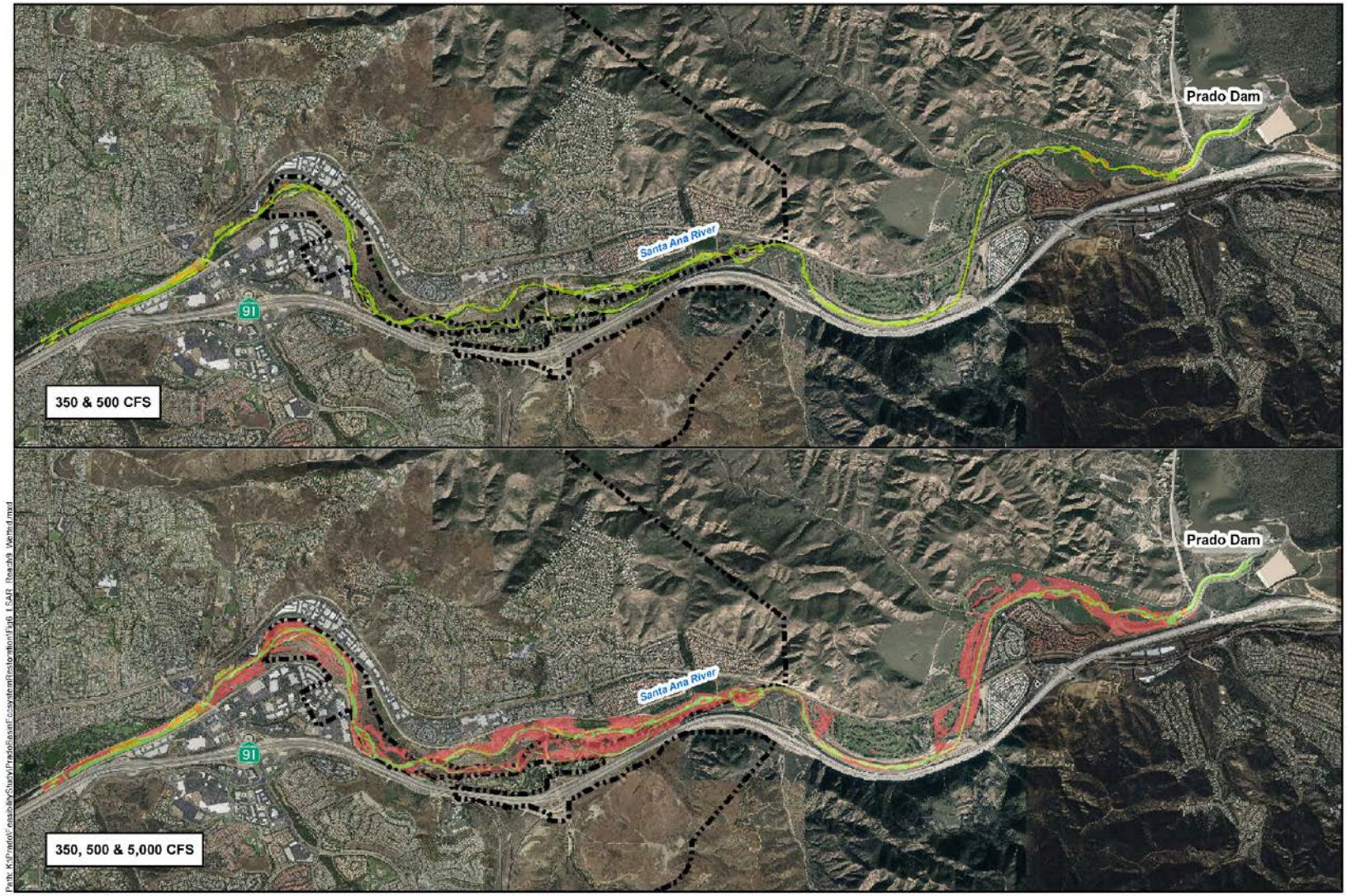
Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
Estimated Velocities - 350, 500 & 5,000 CFS

Figure 19

Both flow rates would result in sufficient hydrologic connectivity and depth to support suckers. An existing HEC-RAS model of SAR Reach 9 was updated by Scheevel Engineering by incorporating more recent (2015) topographic data along Reach 9. Figure 20 shows the wetted areas for 350, 500 cfs and 5,000 cfs release. For both the 500 cfs and 350 cfs release, the flow remains in the low flow channel and does not flow into the overbank area, except in very isolated areas. To show the change at selected reaches, three cross section views were identified. The location of the three sample cross sections from the model is shown in Figure 21 and cross section views at each location is shown in Figures 22 to 24. These cross sections illustrate the water depth for 350, 500 and 5,000 cfs release rates. Two figures (A and B) are shown for each cross section, with the second figure zoomed into the low flow channel. These cross sections illustrate that the low flow channel is deeply incised in Reach 9

Figure 25 shows maximum water depths for 500 cfs and 350 cfs releases based on the HEC-RAS model. The water depths are shown at each point where there is a cross section in the model. Water depths vary along each cross section and the value plotted is the maximum (deepest) water depth. Along the model in Reach 9, the deepest or maximum model-estimated water depth in Reach 9 range from a minimum of 1.2 feet to a maximum 7.7 feet for a 500 cfs release from Prado Dam. The model estimated deepest or maximum water depth in Reach 9 from a minimum of 1.1 feet to a maximum 7.0 feet for a 350 cfs release from Prado Dam. The wetted area in SAR Reach 9 with a 500 cfs release is 132 acres based on the updated HEC-RAS model. The wetted area in SAR Reach 9 with a 350 cfs release is 104 acres, or a decrease of 28 acres. However, the model does not predict the formation of isolated pools within the smaller wetted area. The number of days to drain 10,000 acre-feet from Prado, which is the maximum amount of increased storm water capture for the proposed action, is 14 days for a 500 cfs release rate and 25 days for a 350 cfs release rate (assuming an inflow rate of 150 cfs). The longer duration of the 350 cfs release provides additional days of sustained outflow even after the storm passes and inflow is reduced.

Under a 350 cfs or 500 cfs release rate bank to bank hydrological connectivity would be maintained in the low flow channel. Because the low flow channel is deeply incised a reduction in the release rate from 500 cfs to 350 cfs would slightly reduce the depth of the water along the margins of the river but would still maintain bank to bank connectivity. The slightly reduced depth of the water along the margins of the river would still provide adequate refuge for larvae and fry. Furthermore, discharge rates fluctuate greatly depending on flood stage, inflow, water surface elevation, downstream construction activities, and other factors. There is not a steady state flow of 500 cfs that creates sustained habitat conditions in the margins for larvae or fry. Moreover, the release rate (whether it is 350 or 500 cfs average) will further decrease as the pool is emptied. No effect to critical habitat would occur from reducing the release rate from 500 cfs to 350 cfs.



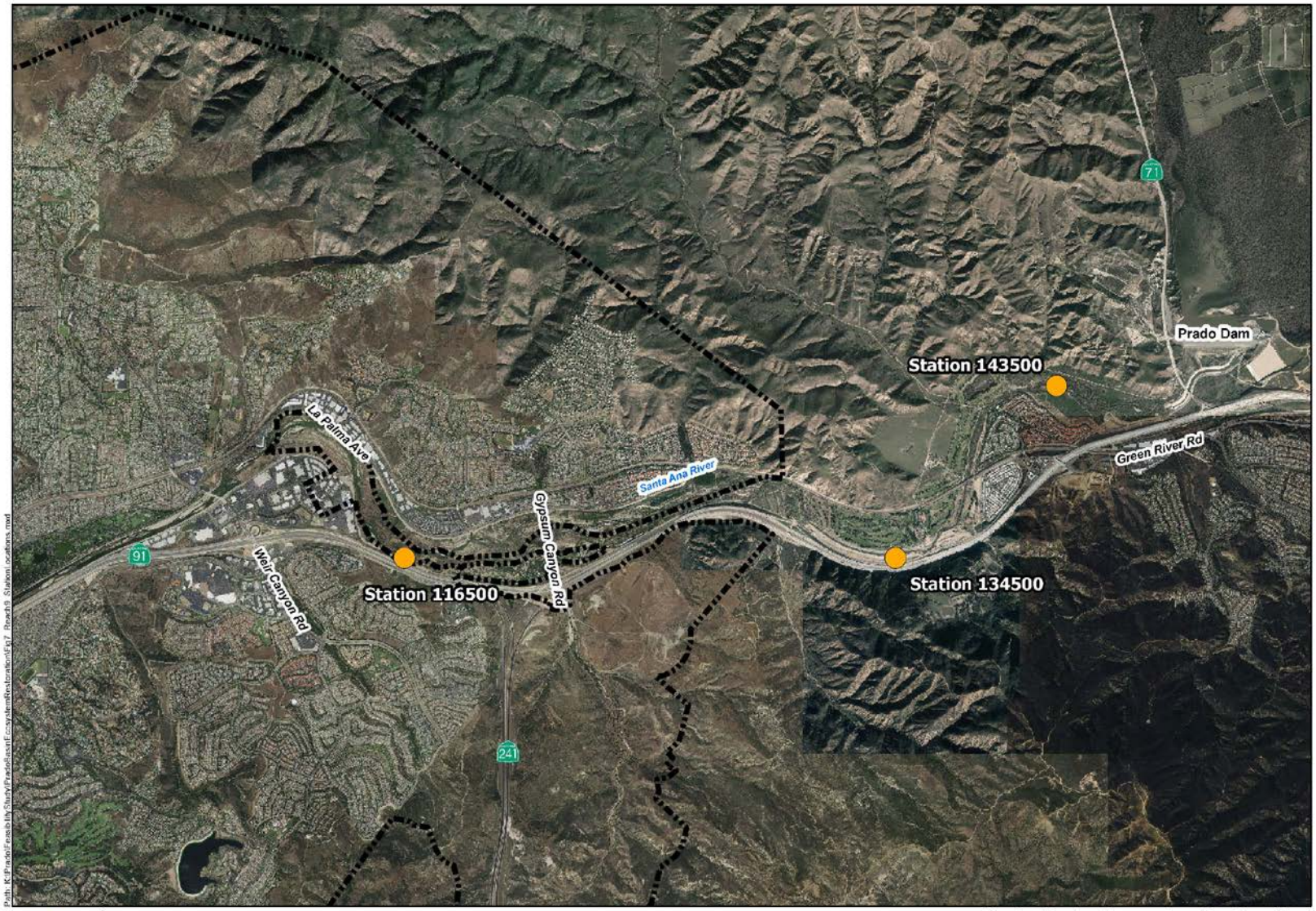
N
W E
S

LSAR Reach 9 350 cfs
LSAR Reach 9 500 cfs
LSAR Reach 9 5,000 cfs

0 2,500 5,000 Feet

Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
350, 500 & 5,000 CFS Wetted Areas

Figure 20



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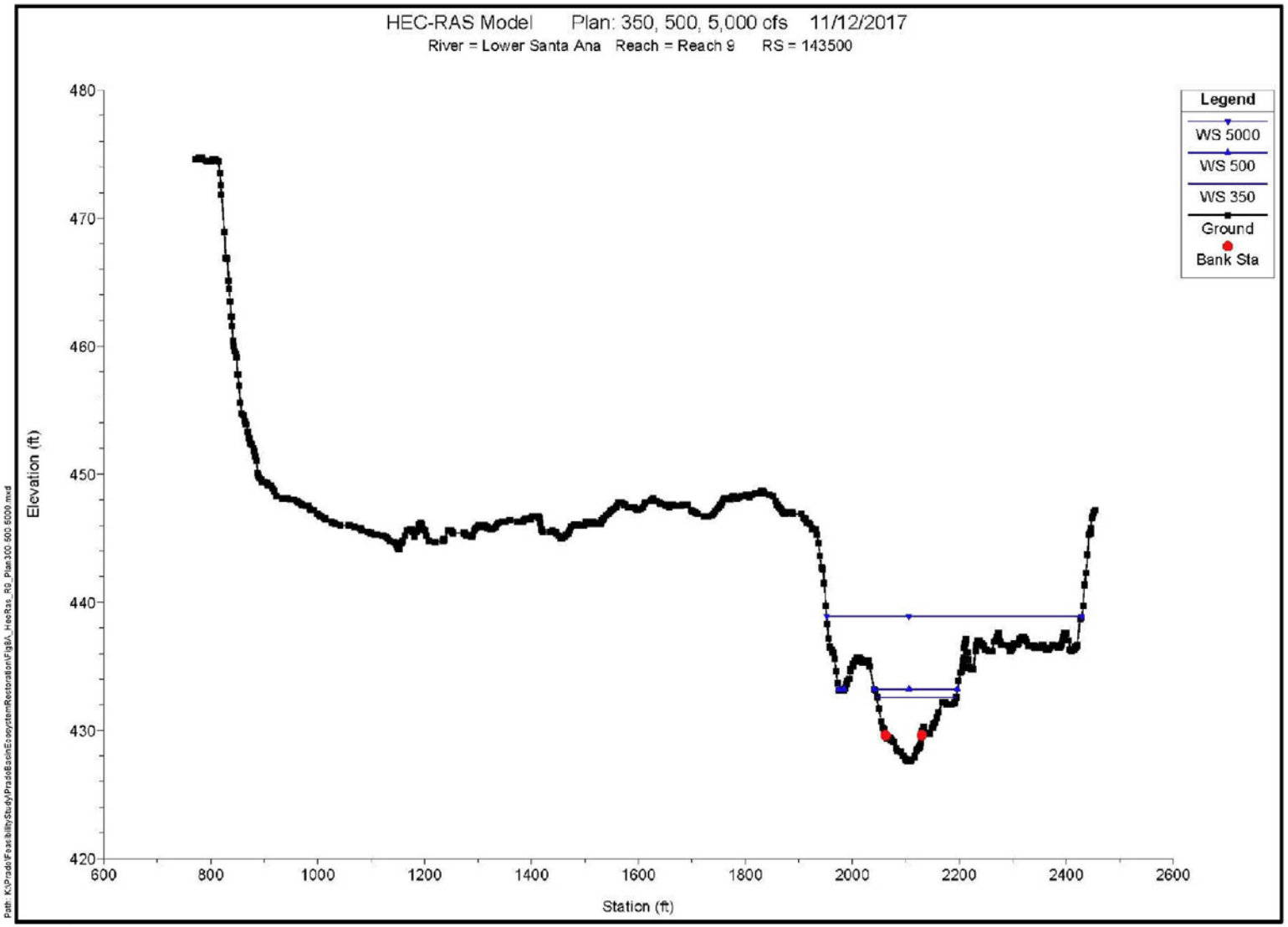
N
W E
S

0 2,500 5,000 Feet

Reach 9 Station

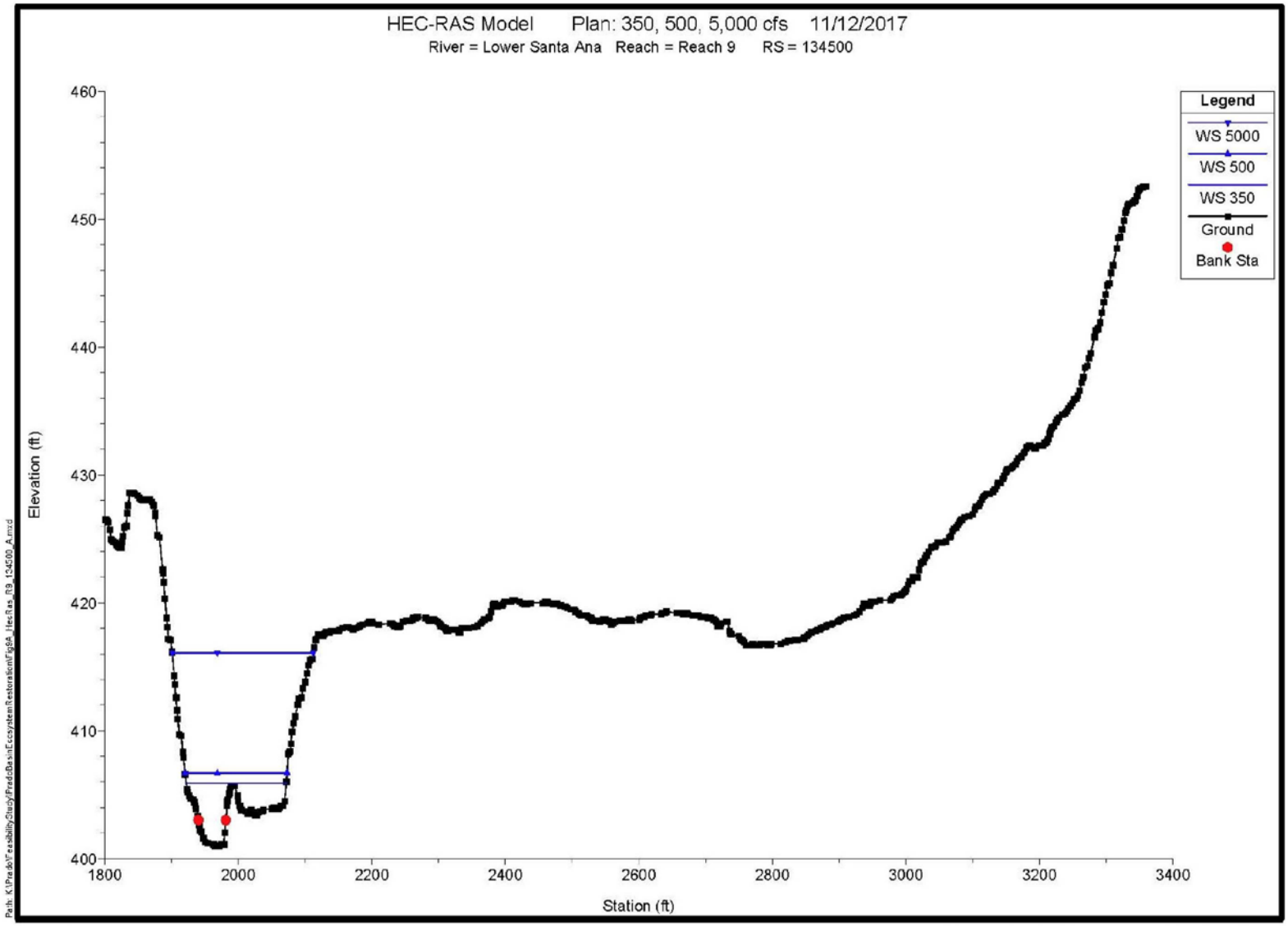
Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
Station Location Map

Figure 21



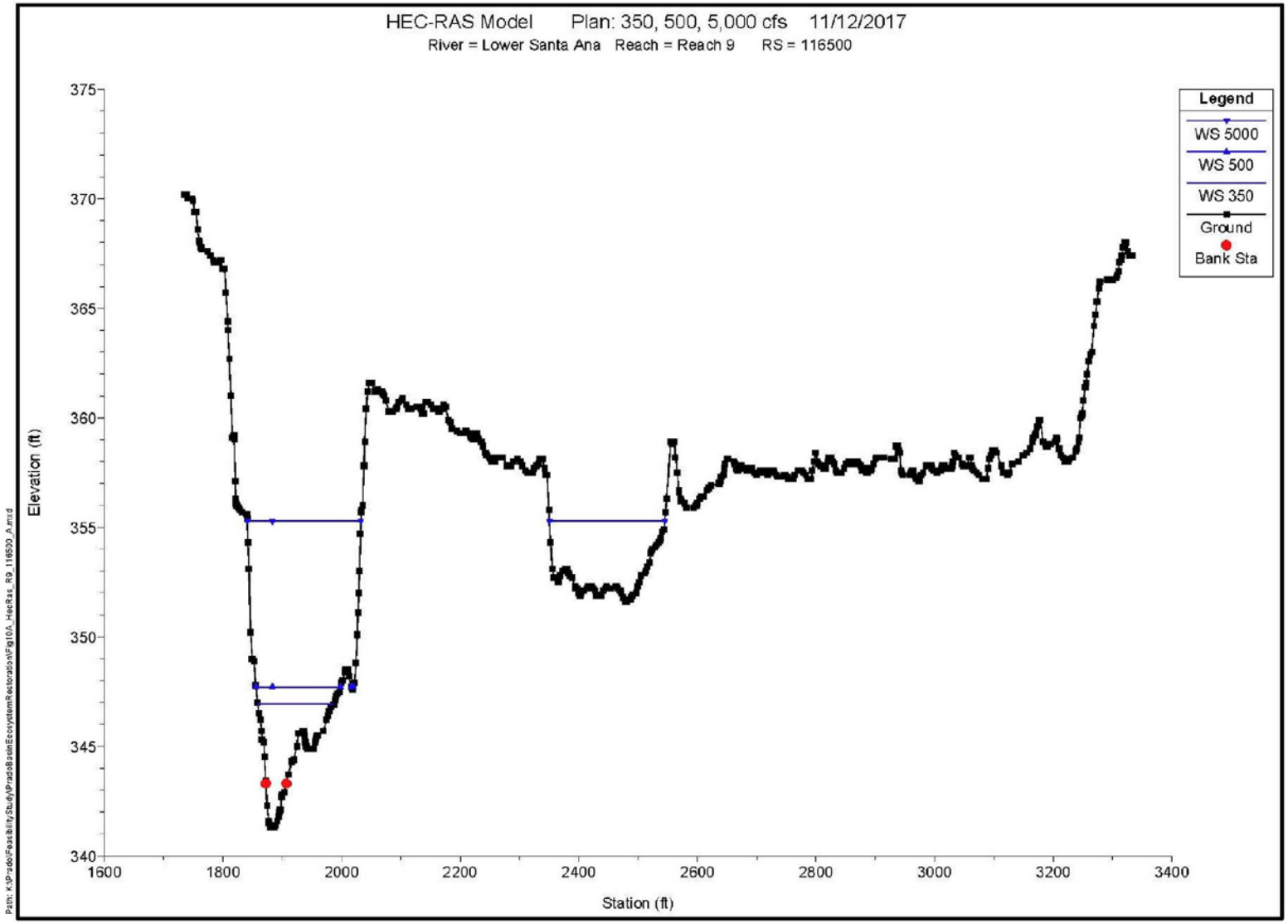
Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
HEC-RAS Model RS 143500 - 350, 500 & 5,000 CFS

Figure 22 - A

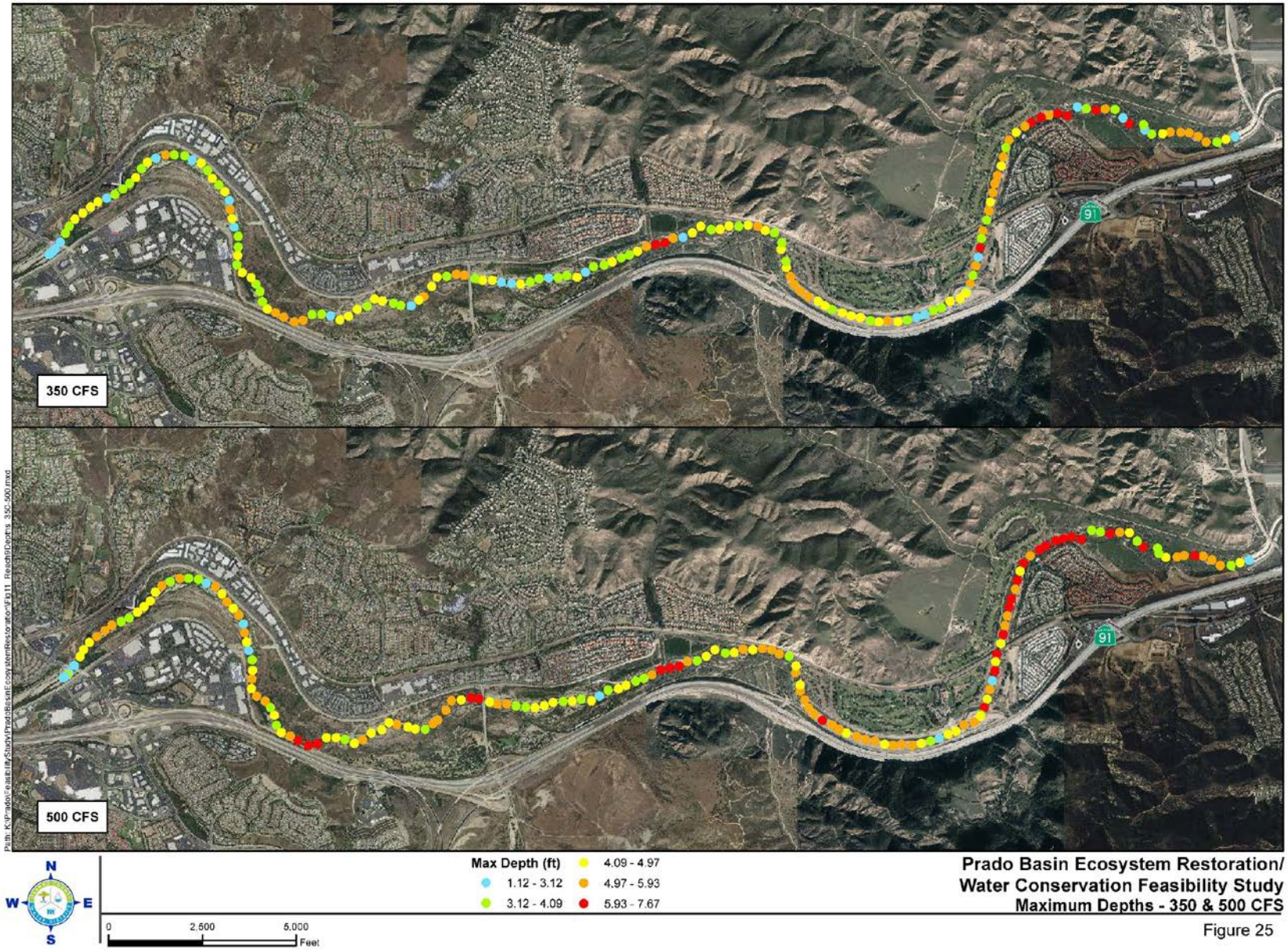


Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
HEC-RAS Model RS 134500 - 350, 500 & 5,000 CFS

Figure 23- A



Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
HEC-RAS Model RS 116500 - 350, 500 & 5,000 CFS
Figure 124- A



Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
Maximum Depths - 350 & 500 CFS

Figure 25

Turbidity Effects

The additional days of storage of storm water at Prado Dam associated with the Water Conservation Measure could reduce the total suspended solids and the turbidity of the water released from Prado Dam, since the greater days of storage allows additional sediment deposition to occur in Prado Basin. However, it is unlikely that there would be a measurable difference that would affect critical habitat in Reach 9. The change in release rate from 500 cfs to 350 cfs would not significantly change the velocity of the water in the channel in Reach 9 and therefore no effect would be anticipated to occur to sucker critical habitat from minimal changes in turbidity levels in Reach 9.

Reduction in Wetted Area of Reach 9 Before/After Storm Events from Prado Releases Reduced from 5,000 to 350 cfs, and Potential to Create Isolated Puddles Outside Main Channel

It is very unlikely that Santa Ana Sucker would be trapped in isolated puddles when a 5,000 cfs release rate is reduced to a lower flow rate, because the Corps follows a release rate change guideline to avoid sudden changes in flow, whether ramping up or ramping down. As flow is reduced, suckers have ability to detect and react to changes in depth and velocity and swim back to the low flow channel. The Corps uses the following information in Table 15 as a guide when changing the rate of release from Prado Dam:

Table 15 Maximum Release Rate

Maximum Rate of Release Change at Prado Dam	
Current Rate of Release (cfs)	Maximum Rate of Change per ½ house (cfs)
0-300	100
300-1,000	250
1,000-2,500	400
2,500-5,000	625

Table 16 provides a guide on the estimated ramp down from a 5,000 cfs release to a 350 cfs release.

Table 16 Flow Rate/Cumulative Time

Flow Rate (cfs)	Cumulative Time (min)
5,000	0
4,375	30
3,750	60
3,125	90
2,500	120
2,100	150
1,700	180
1,300	210
900	240
650	270

	400	300
350		330 minutes (5 ½ hours)

As shown in Table 17, there is a 5 1/2 hour transition period to decrease the flow from 5,000 cfs to 350 cfs. This information illustrates that the Corps' existing protocols to avoid sudden and drastic changes in flow rates that could strand fish. As the water flow rate decreases and depths decrease, water flows back to the low flow channel since the low flow channel is deeply incised. This reduces the likelihood that fish would be stranded, since fish can move back to the low flow channel as the wetted area declines. No effects to sucker critical habitat would occur.

Conclusion

No Effect would occur to Santa Ana Critical Habitat upstream or downstream of the Prado Dam either as a result increased sedimentation or from the proposed change in average non-storm release rate during the spring/summer months.

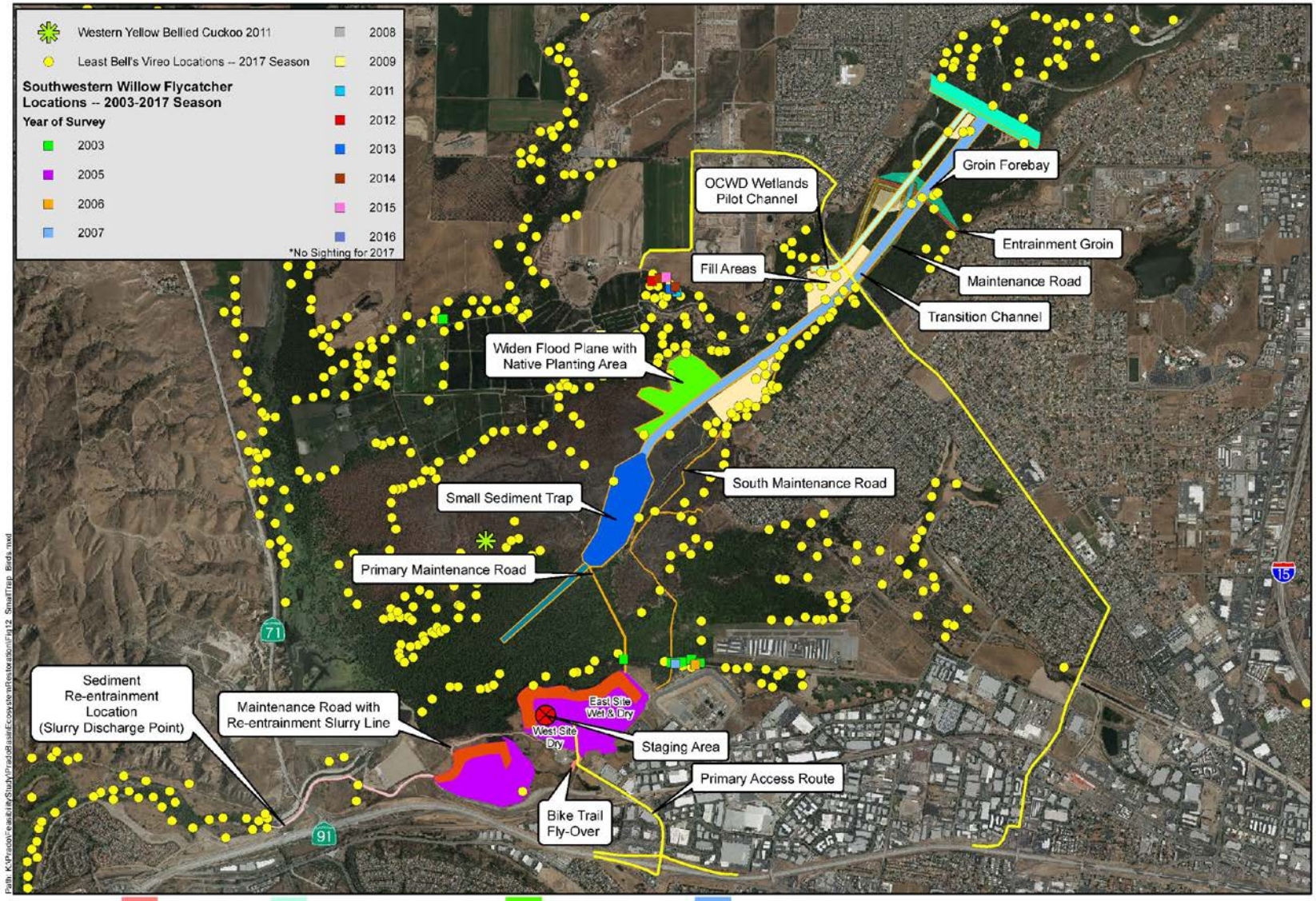
5.2 Sediment Management Measure

Vireo, Flycatcher, Cuckoo

Construction of Sediment Trap, Transition Channel and Access Road

The vireo and flycatcher and cuckoo all occur in riparian habitats along watercourses where dense growth of willow trees, cottonwood trees, mulefat and other dense riparian plants are present. Even though there is low potential for flycatcher and cuckoos to occur, the study area contains suitable habitat for all three species. The construction of the sediment trap, transition channel and access road would require the removal of all vegetation within these areas and these areas would be kept clear of vegetation for the 50-year duration of the Sediment Management Measure. To avoid direct effects to nesting birds, all of the vegetation removal activities would occur outside of the nesting season. With the implementation of Conservation Measure BIO-2 no effects to nesting birds would occur.

As shown Figure 26, the construction footprint of the sediment trap, transition channel and project access roads would displace 61 known vireo territories and 7 flycatcher territories. No known cuckoo territories would be displaced. However, the vegetation habitat where sediment trap, transition channel and project access roads would be constructed does provides suitable habitat. Construction, operation and maintenance activities occurring in the sediment trap and transition channel would prohibit the vireos and flycatchers and potentially cuckoos from using the existing territories, requiring them to seek alternative nesting locations within the Prado Basin, until the sediment removal activities cease. The loss of the nesting territories would be an adverse effect. However, because there would be sufficient remaining nesting locations in the Prado Basin the adverse effect would not be substantial.



Bike Trail Fly-Over
Entrain Groin
Noise Atten Berm
OCWD WetLands Pilot Chnl Invert
Maint Road
Re-Entrain Pipeline
SARM US Native Planting
Sediment Storage Site
Small Trap
Trans Chnl Invert
Trap Outlet Chnl
USSARM Fill Area

N W E S

0 2,500 5,000 Feet

Prado Basin Ecosystem Restoration/ Water Conservation Feasibility Study
Small Trap - Sensitive Bird Species Locations

Figure 26

As shown in Table 17 the construction of the sediment trap, transition channel and project access roads would require the removal of approximately 116 acres of riparian vegetation that would be suitable nesting riparian habitat for the vireo, flycatcher, and cuckoo. The removal of 118 acres of riparian vegetation would be an adverse impact. The amount of riparian habitat that would be removed would be minimal compared to the overall amount of suitable riparian nesting habitat that currently exists within the Prado Basin, and therefore any adverse effects to these species related to habitat removal would not be substantial. Additionally, under the Proposed Action implementation the proposed ecosystem restoration measures would provide approximately 620 acres of additional native habitat within the study area, which would substantially increase habitat for the vireo, flycatcher and cuckoo.

Table 17 Sediment Management Measure Summary Vegetation Community Effects

	Sediment Removal/Sediment Re-Entrainment System.	Sediment Storage Site
Aquatic	46.50	0.0
Willow/Cottonwood	102.7	.01
Mixed Riparian	16.0	2.1
Coastal Sage Scrub	2.37	.77
Coastal sage Scrub/Non-native Weeds	9.51	34.3
Non-Native Weeds	85.1	121.9
Eucalyptus	9.9	18.0
Arundo	110.1	0.0
Disturbed	1.9	.19
Urban	.37	0.0
Total	381.6	177.3

Conclusion-Construction of the sediment trap, transition channel and access road (and other associated features) may affect vireo, flycatcher and cuckoo.

<u>Conclusion</u>

May Affect

Sediment Removal Activities

The sediment would be removed from the sediment trap by a combination of dry excavation and floating dredge. The sediment removal operations would begin in late winter and would extend into the nesting season. The sediment removal operations would be confined to the sediment trap. Therefore, direct impacts to nesting birds would be avoided. The dredging operations would begin in the winter and would extend into the nesting season. The noise emitted from the dredging operations could discourage individual species from nesting within the vicinity of the sediment trap and transition channel during nesting season. The USFWS recommends a noise level of 60 dBA as

the threshold that would impair the normal behavior of nesting birds. The 60 dBA construction noise level generated from the sediment removal activities would extend approximately 600 feet from around the sediment trap and transition channel. The construction activity noise impact area along the sediment trap and transition channel would extend into existing vireo and flycatcher territories. Additionally, this area contains suitable habitat for the cuckoo. Depending on noise tolerances, some individuals could continue to nest within the construction activity noise impact area and others could seek other suitable locations to nest in the Prado Basin. To reduce potential construction noise levels to an acceptable level, a construction noise mitigation program would be implemented that would include the construction of earthen berms, the use of acoustical panels around the work areas, the use of heavy equipment with noise reducing mufflers and the operation of generators and booster pumps enclosed in sound proof enclosures. There would be potential that small numbers of birds could nest within the construction activity noise impact area during periods when heavy equipment would not be in operation, such as over a weekend. Even though there would be low potential for small numbers of birds to nest within the construction activity noise impact area when sediment removal activities are occurring, the potential that the construction noise impacts could disrupt breeding patterns of nesting birds would be an adverse effect. Because only low numbers of birds are anticipated to seek nesting locations when sediment removal activities are occurring and that there would be plenty of alternative nesting sites available in the Prado Basin, the adverse effect would not be substantial. With the implementation of Conservation Measure BIO-3 potential adverse construction noise effects would be minimized.

Conclusion

Sediment removal activities May Affect vireo, flycatcher and cuckoo

Construction and Processing Green Waste and Sediment at Sediment Storage Site

To create suitable conditions for processing and storing of the sediment, the sediment storage site location would be graded and re-contoured. The grading activities would occur outside of nesting season. Therefore, no direct or indirect noise effects to nesting birds would occur. The grading activities would remove 2.1 acres of mixed riparian vegetation which would be suitable nesting for the vireo, flycatcher and cuckoo and would displace one known vireo territory. The removal of 2.1 acres of suitable habitat would be minimal compared to the overall amount of habitat in the Prado Basin and would have no adverse on the species.

The sediment handling and processing activities at the sediment storage site would occur during nesting season. Sediment removed from the sediment trap would be hauled to the sediment storage site. The hauling activities would be confined to project access roads that would be constructed before nesting season. No direct impacts would

occur. However, the vegetation removal activities would remove one known vireo territory. The removal of 1 known vireo territory would be an adverse effect.

Noise emitted from the hauling activity could disrupt breeding patterns of nesting birds, if nesting occurs near the project access roads. To minimize noise effects at the sediment storage site an earthen berm would be constructed around the sediment storage site and if required temporary noise panels would be installed around areas where heavy construction equipment would be operating to minimize noise levels. Because sediment hauling activities could potentially disrupt nesting birds, the sediment processing activities may likely to adversely affect the vireo, flycatcher and cuckoo. Because the implementation of Conservation Measure BIO-3 would minimize potential construction noise effects, the adverse effect would not be substantial.

Conclusion

This activity May Affect vireo, and May Affect but is not likely to adversely Affect flycatcher and cuckoo

Sediment Re-entrainment

The sediment re-entrainment activities would occur along the levee of the Prado Dam outlet structure. Along the Prado Dam outlet channel there is no suitable nesting habitat. However, downstream of the re-entrainment area there is riparian vegetation which could provide suitable nesting habitat. The re-entrainment activities would be confined to the levee and would not result in any direct effects to the riparian vegetation in the river. Additionally, the sediment re-entrainment activities would occur outside of nesting season. Therefore, no effects to vireos, flycatchers or cuckoos would occur.

The vireo is known to occur along Reach 9. The proposed sediment re-entrainment activities are expected to reduce degradation of the river bed along Reach 9. The reversing of the incision trend would be expected to reconnect the river to its floodplain and consequently enable the widening of the riparian corridor, which would increase habitat for the vireo. The increased habitat resulting from the sediment re-entrainment activities would have a beneficial effect on the vireo.

Conclusion-

Sediment re-entrainment would have No Effect on vireo, flycatcher or cuckoo, but over the long-term the resulting floodplain changes could benefit these species.

Gnatcatcher

Construction of Sediment Trap, Transition Channel Removal Channel and Sediment Removal Activities

The location where the sediment trap and transition channel would be constructed does not contain suitable habitat for the gnatcatcher. No effects to the gnatcatcher would occur.

Conclusion

No Effect

Construction and Processing Green Waste and Sediment at Sediment Storage

The coastal sage scrub vegetation and to a lesser extent the mixed coastal sage vegetation at the sediment storage site provides suitable habitat for the gnatcatcher. A gnatcatcher survey was conducted by the Santa Ana Watershed Association (SAWA) in November of 2017. As shown in Figure 27 one pair of gnatcatchers was identified at Sediment Storage Site B and an individual gnatcatcher was detected along the northern edge of the site. Another gnatcatcher was detected approximately 150 meters to the east. However, the SAWA survey was unable to verify that gnatcatchers were two different individuals and not one individual gnatcatcher dispersing through the area.

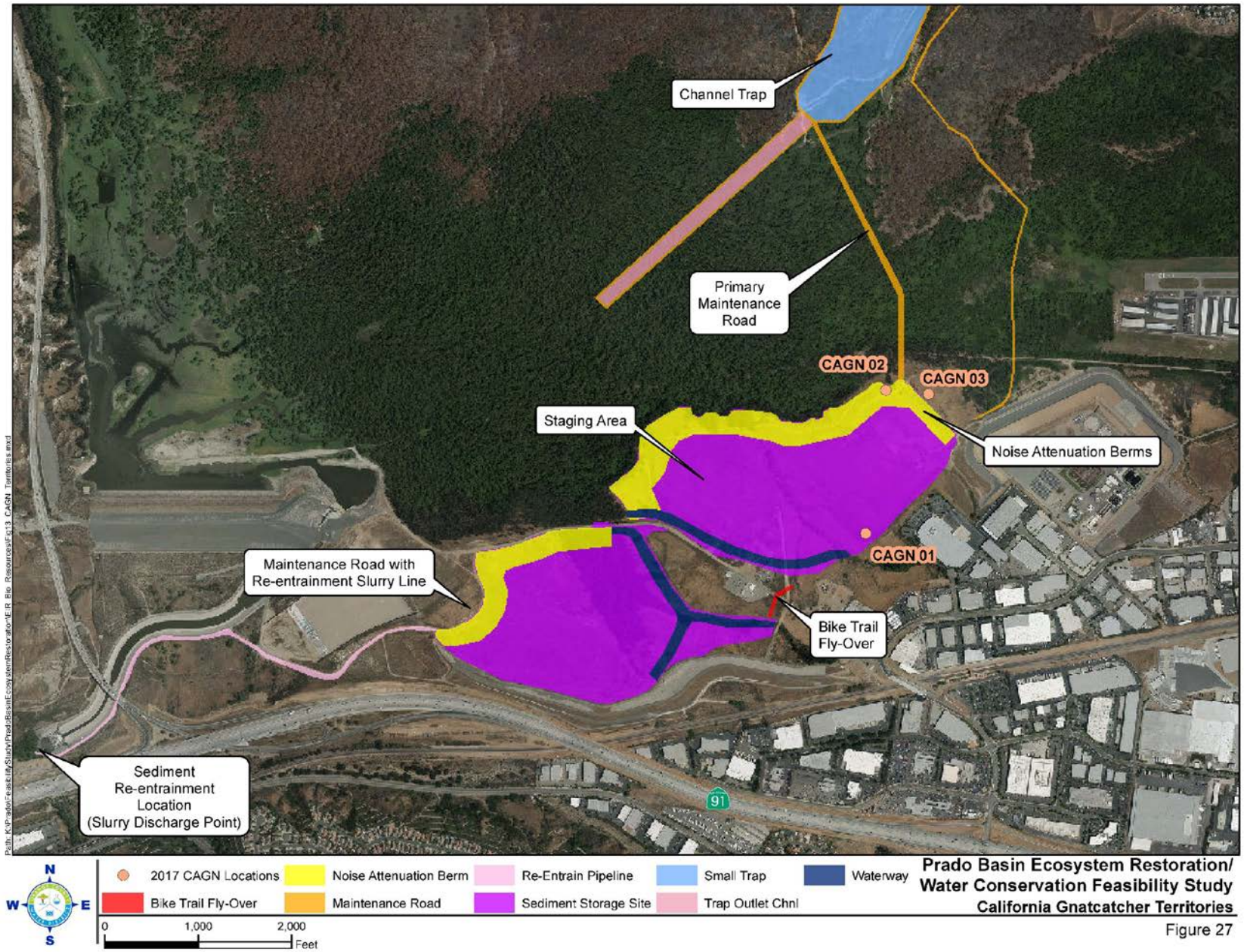
The grading activities to create the sediment storage site would temporarily impact 2.3 acres of coastal sage scrub and 43.8 acres of mixed coastal sage scrub/non-native weeds. The construction of the sediment storage site would occur outside of the nesting season. Therefore, direct impacts and indirect construction noise effects to nesting gnatcatchers would be avoided. There would still be the potential that gnatcatchers could be dispersing through the area outside of nesting season and noise generated from sediment hauling activities and sediment processing could cause them to flush and relocate. The potential that gnatcatchers could have to relocate because of construction activities would be adverse effect. Prior to construction activities surveys would be conducted to determine if gnatcatchers are dispersing through area. In the event gnatcatchers are identified measures would be taken to the maximum extent practicable to minimize adverse effects to gnatcatchers.

Sediment processing activities would occur during nesting season. Because all vegetation would be removed from the site, it would be unlikely that gnatcatchers would nest at the sediment storage site when sediment processing activities are occurring. As part of the construction activities, sound attenuation berm would be constructed around the perimeter of the sediment storage site to minimize construction noise impacts to the surrounding area.

The loss of coastal sage scrub and the potential that construction activity could cause gnatcatchers to relocate would be an adverse effect. Because implementation of Conservation Measures BIO-2, BIO-3, and BIO-4 would minimize effects to the gnatcatcher, the adverse effects would not be substantial.

Conclusion

May Affect



Prado Basin Ecosystem Restoration/ Water Conservation Feasibility Study

California Gnatcatcher Territories

Figure 27

Sediment Re-entrainment Activities

The sediment re-entrainment activities would occur along the levee of the Prado Dam outlet structure. Along the Prado Dam outlet channel there is no suitable nesting habitat. Additionally, the sediment re-entrainment activities would occur outside of nesting season. No effects to the gnatcatcher would occur.

The gnatcatcher vireo is known to occur along Reach 9. The proposed sediment re-entrainment activities are expected to reduce the incision of the Santa Ana River downstream of Prado Dam. A reduction in the incision would be expected to help reconnect the river to its floodplain. Overbank would then be expected to occur with more frequency. This would be expected to create sandy wash situations within Reach 9 over a greater area that currently occurs, Alluvial fan sage scrub habitats are typically, associated with these sand wash situations. This effect would increase the amount of and quality of habitat considered suitable for the gnatcatcher. The increased habitat for the gnatcatcher would be a beneficial effect.

Conclusion

Sediment re-entrainment would have No Effect on gnatcatcher, but over the long-term the resulting floodplain changes could benefit this species.

Sucker

Construction of Sediment Removal Sediment Trap/Transition Channel and Sediment Removal Activities

The sediment removal activities would occur within the wetted channel of the Santa Ana River. Based on the lack of occurrence of suckers in the Prado Basin, poor habitat conditions within and upstream of Prado Basin and high populations of exotic predatory fish, the potential for populations of suckers to occur at the sediment trap or transition channel would be very low. In the event isolated suckers wash or swim into the transition channel it would be likely they would swim away from where the sediment removal activities are occurring due to elevated levels of suspended sediment and other factors. The potential that individual isolated suckers could find their way into the sediment transition channel where turbidity levels would be higher would be considered an adverse effect. To minimize adverse effects to the sucker mitigation measures would be implemented when sediment removal activities are occurring. Additionally, to prevent even the slightest chance of affecting spawning fish, sediment removal activities would be conducted outside of the spawning season. With the implementation of Conservation Measure BIO-7 BIO-8, BIO-9, BIO-10 and BIO-11 potential adverse effects to suckers from sediment removal activities would not be substantial.

Conclusion

May Affect

Sediment Re-Entrainment Activities

The sediment re-entrainment activities will occur at the terminus of the Prado Dam outlet channel, downstream of the Highway 71 crossing. This segment of the river contains some primary constituent habitat elements for the sucker. However, because of frequent high turbidity and high populations of predatory fish species the habitat is considered marginal. Surveys conducted along the Santa Ana River within the last five years identified a single male sucker near the Green River Golf Course. Therefore, it is assumed that it is possible that individual fish could swim their way through the outlet channel to downstream areas. If suckers are present in the segment of the river where sediment re-entrainment would occur, it is more than likely that the fish would swim away from where re-entrainment activity is occurring and would not be adversely affected. Additionally, the sediment would be re-entrained during high flows and it is more than likely fish would be seeking refuge in downstream areas where more opportunities exist for refuge. During these periods of high flow, the river would experience higher levels of turbidly over the existing high levels of turbidly that currently occurs through this reach of the river. The re-entrained sediment would consist of 1 percent solids and should dilute quickly under high flows where it would not be adverse, to aquatic life.

In the event elevated levels of turbidity occur adaptive management practices could be implemented such as spacing the re-entrainment in a manner to recreate natural conditions to the extent practicable. This would be done by pulsing re-entrainment of sediments to reflect a typical storm cycle. Typical storm cycles in California occur over a 24 to 72- hour periods with 24 hours or greater periods between storm systems. Sediment re-entrainment would take place in a 72- hour entrainment cycle, assuming adequate flows are available, with 24 hours of no re-entrainment cycle to recreate a natural storm driven sediment suspension cycles as close possible. By pulsing sediment re-entrainment it allows for dilution of the sediment in the water column which would help minimize turbidity impacts. Additionally, the sediment would be re-entrained outside of spawning season. Therefore, the re-entrained sediment would not be expected to significantly increase the levels of turbidly at downstream areas.

As part of environmental planning for the project boring samples were taken along the sediment transition channel to characterize sediment in the project area that would be re-entrained. Chemical analysis of the sediments in the Prado Basin showed no detected organic chemicals, pesticides, PCbs, PAhs, or hydrocarbons. It would be unlikely that sediment extracted from the basin and re-entrained into the river would cause increased concentrations of organic chemicals, pesticides, PCbs, PAhs, or hydrocarbons in the Santa Ana River due to sediment-re-entrainment. Prior to discharging the sediment into the river, a water quality monitoring program would be implemented to monitor the sediment material dredged from the sediment removal channel for a wide range of constituents, including; organic chemicals, pesticides,

PCbs, PAhs, and hydrocarbons. In the event the sediment exhibits detectable levels of organic substances, pesticides, PCbs, PAhs, or hydrocarbons that would cause an exceedance of the water quality objectives in the RWQCB Basin Plan, the sediment would not be used for re-entrainment. The re-entrained sediment would be transported to segments of the lower Santa Ana River that are sediment starved and armored which help to restore habitat for the sucker. Additionally, the re-entrained sediment which would help to fill deeper pools and reduce predation and would also to help reverse the current incising of the river to create more shallow water habitat along the banks and to allow more riparian growth along the banks of the river to provide shade and refuge.

Conclusion

May Affect, but not Likely to Adversely Affect during active re-entrainment, long-term Beneficial Effect

Critical Habitat

The following analysis evaluates potential impacts to Least Bell's Vireo, Southwestern Willow Flycatcher, Western Yellow Billed Cuckoo and Santa Ana Sucker Designated or Proposed Critical Habitat associated with implementation of the Sediment Management Measure.

Effects from Construction and Operation of Sediment Trap and Transition Channel

Vireo Critical Habitat, Flycatcher Critical Habitat, Proposed Cuckoo Critical Habitat

The sediment removal activities would directly impact 116.0 acres of designated critical habitat for the vireo, 93.0 acres designated acres critical habitat for the flycatcher and 338.7 acres of proposed critical habitat for the cuckoo. The removal of the critical habitat would be an adverse effect. To avoid potential adverse indirect construction effects to adjacent critical habitat areas not directly impacted by the Sediment Management Measure, Conservation Measures BIO-12 BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented.

The construction of the sediment trap and transition channel would remove critical habitat primary constituent elements. Therefore, the sediment removal activities occurring in the sediment trap and transition channel would have an adverse effect on designated or proposed critical habitat for all three species. However, this management measure also includes sediment re-entrainment and provides an opportunity for associated measures such as riparian plantings and edge management that would result in overall positive effects to critical habitat in the long-term.

Conclusion

May Affect

Gnatcatcher Critical Habitat

There is not designated critical habitat where the sediment trap and the transition channel would be constructed. Therefore, no effects to critical habitat for the gnatcatcher would occur.

Conclusion

No Effect

Santa Ana Sucker Critical Habitat

Effects from Construction and Operation of Sediment removal trap and Transition Channel

Upstream of Prado Dam

Sucker critical habitat is designated along the segment of the Santa Ana River where the sediment transition channel would be constructed. This segment of the river lacks primary constituent elements to support suckers. Therefore, there would be no effects to critical habitat primary constituent elements.

The operation of the sediment removal channel could increase bed shear stress and velocity within the reservoir area when sediment removal activities are occurring. An increase in flow velocity and sediment transport capacity at the upstream end of the dredged channel would have the potential to create change the gradient of the river to encourage sediments to migrate into the Prado Basin and expose more existing gravel and cobble deposits along the upper reaches of the river. The exposing of more gravel and cobbles along the river would have a long term beneficial effect on critical habitat for the sucker.

Downstream of Prado Dam

The construction and operation of the sediment trap and transition channel would increase turbidity and suspended sediments in the sediment trap and transition channel pool of water. There could be the potential that the turbid water and suspended sediments could be conveyed downstream through Prado Dam into Reach 9. To avoid the downstream conveyance of turbid waters, a series of earthen plugs would be installed at the lower end of the sediment trap and throughout the outlet channel. The plugs would also create stilling basins which would help to reduce the suspended sediment concentration and turbidity of the water leaving Prado Basin. The potential increased in turbidity may affect, but not likely to adversely affect critical habitat downstream of Prado Dam.

Effects from Sediment Re-entrainment

The objective of the Sediment Management Measure is to move sediment around Prado Dam and re-entrain it into the lower Santa Anan River, downstream of Prado

Dam. To naturally disperse the sediments downstream, re-entrainment activities would be targeted during high flows (flows greater than 500 cfs) in the lower Santa Ana River. A sediment transport model was developed to help predict the movement of the re-entrained sediments. As shown in Figure 28 there would be no significant deposition of clays or silts that would adversely affect the existing substrate of the Santa Ana Canyon Reach where more favorable habitat conditions for native fish exist. Only pebbles and gravels would be likely to deposit in the Santa Ana Canyon Reach, which would help enhance sucker critical habitat in this reach of the river. The increase in pebbles and gravels would have a beneficial effect on sucker critical habitat downstream of Prado Dam.

Conclusion-

Construction of the transitional channel and operation of the sediment trap and transition channel, May Affect, but are Not Likely to Adversely Affect sucker critical habitat upstream and downstream of Prado Dam. In the long-term, operation of the sediment trap and re-entrainment activities would have a beneficial effect on critical habitat for this species.

5.3 Chino Creek Channel Restoration Measure

Vireos

As shown in Figure 29, implementation of the Chino Creek Channel Restoration Measure would temporarily displace 12 known vireo territories, which would be an adverse effect. To avoid direct impacts to nesting birds and indirect construction noise impacts, vegetation clearing, grading operations and long-term maintenance activities involving the use of heavy construction equipment would occur outside of the nesting season. With the implementation of Conservation Measure BIO-2 potential direct effects and indirect construction noise effects would be avoided.

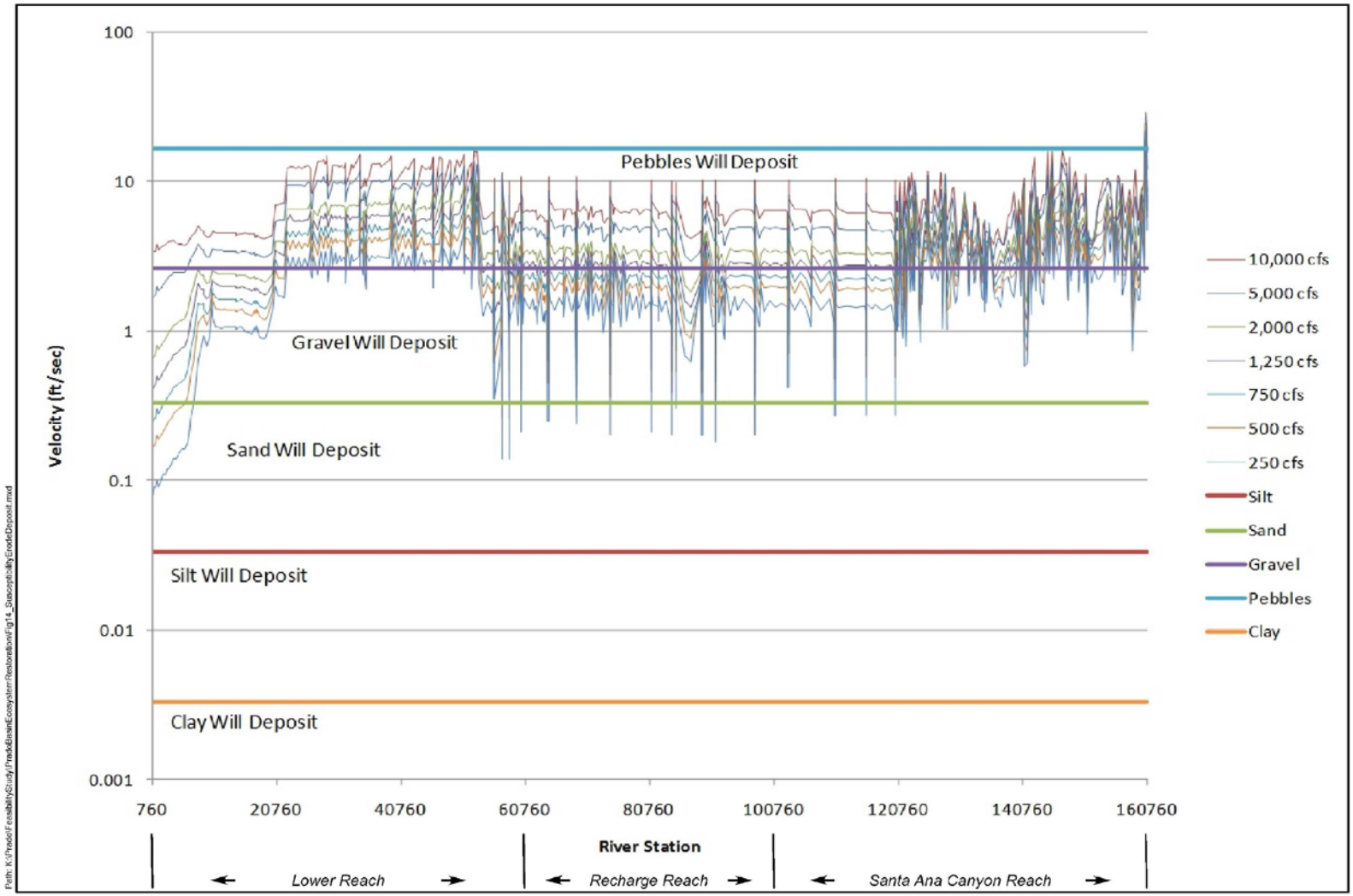
Construction activities would temporarily remove 5.37 acres of suitable habitat for the vireo. The temporary removal of habitat may affect, but would not adversely affect the vireo. Once ecosystem restoration measure is completed approximately 112 acres of additional habitat would be provided. The long-term increase in habitat would be a beneficial effect.

Conclusion

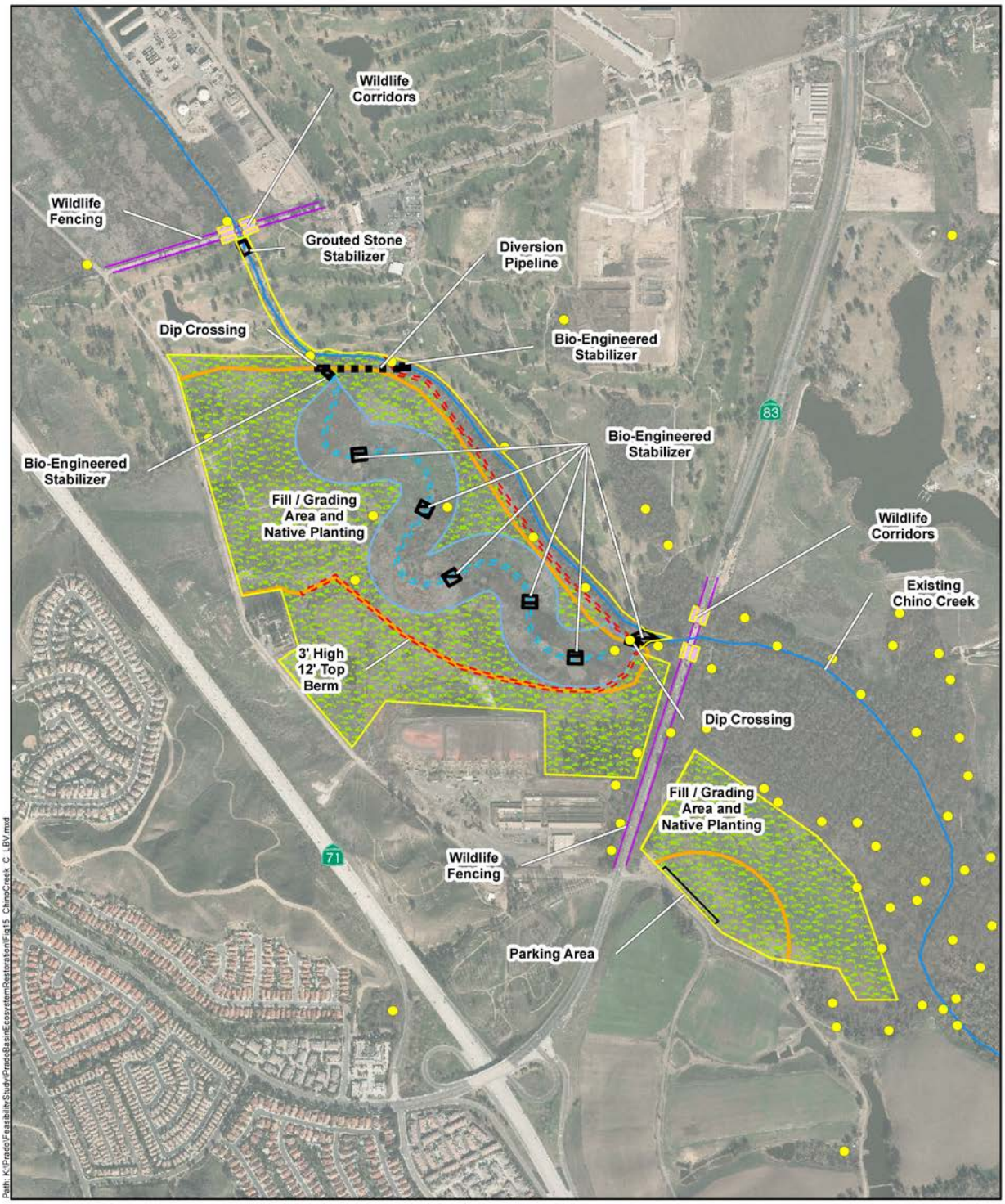
May Affect

Cuckoos, Flycatchers,

There would be low potential for the cuckoo or flycatcher to occur where the Chino Creek Channel Restoration Measure would be implemented. No known cuckoo or flycatcher territories would be affected. Once the restoration activities are completed,



Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study
Susceptibility to Sediment Deposition
Figure 28



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N
W E
S

Least Bell's Vireo Locations -- 2017 Season
Passive Recreation Trail
Extent of Braided Channel
Limits of Grading
Native Planting

0 500 1,000 Feet

Prado Basin Ecosystem Restoration/ Water Conservation Feasibility Study
Chino Creek Channel Restoration
Least Bell Vireo 2017 Locations

Figure 29

approximately 112 acres of additional riparian habitat would be restored, which would be a beneficial effect to both species.

Conclusion

No Effect during construction, potential beneficial effect after restoration

Gnatcatchers

There would be low potential for the gnatcatcher to occur where the Chino Creek Channel Restoration Measure would be implemented. The species would not be affected by construction activities. The proposed restoration activities would include the planting of upland native habitat which would be suitable habitat for the gnatcatcher. The additional habitat would be a long term beneficial effect.

Conclusion

No Effect during construction, potential Beneficial Effect after restoration

Sucker

The species is not known to occur in the area. However, some segments of the creek do contain some of the required primary constituent elements to support suckers and the creek provides hydrologic connectivity to the Santa Ana River that would allow suckers to have upstream and downstream movement between the creek and the Santa Ana River. With the Implementation of Conservation Measure BIO-7 the construction activities would be required to occur outside of spawning season. No effects to spawning fish would occur. The construction activities would temporarily disrupt the habitat in the creek. Because of the low potential of the sucker occurring, the construction activities at Chino Creek may affect, but not likely to adversely affect suckers. Once the ecosystem restoration measure is completed approximately 2.8 acres of additional open water habitat would be provided. The increase in open water habitat would a long term beneficial effect.

Conclusion-May Affect, Not Likely to Adversely Affect during construction, potential Beneficial Effect after restoration

Critical Habitat

Vireo Critical Habitat,

There is no lands designated critical habitat within the area where the Chino Creek Channel Restoration Measure would be implemented. No effects to critical habitat would occur.

Conclusion

No Effect

Flycatcher Critical Habitat, Proposed Cuckoo Critical Habitat

Implementation of the Chino Creek Channel Restoration Measure would temporarily remove .22 acres of flycatcher critical habitat, of which approximately .20 acres are primary constituent elements and 17.9 acres of proposed cuckoo critical habitat of which 5.2 acres are primary constituent elements. To avoid potential adverse indirect construction effects to adjacent critical habitat areas Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented. The temporary loss of critical habitat may affect but would not likely to adversely affect critical habitat for both species. Once the ecosystem restoration measure is completed approximately 112 acres of additional primary constituent elements would be provided for both species. The increase in primary constituent elements would be a long term beneficial effect.

Conclusion

May Affect, Not Likely to Adversely Affect during construction, potential Beneficial Effect after restoration.

Gnatcatcher Critical Habitat

There is not designated critical habitat where the Chino Creek Channel Restoration Measure would be implemented. No effects to critical habitat would occur.

Conclusion

No Effect

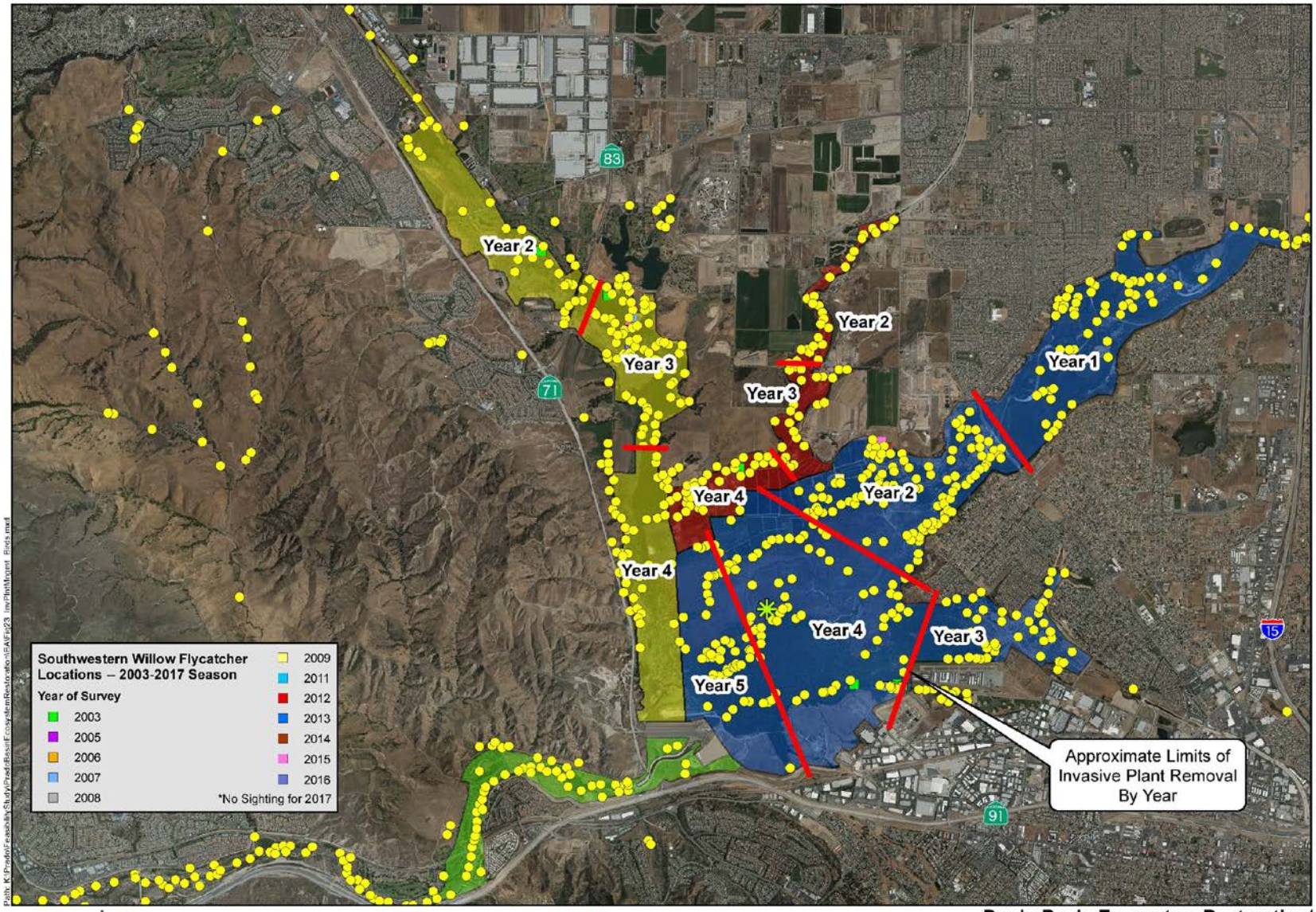
Sucker Critical Habitat

There are not designated as critical habitat where the Chino Creek Channel Restoration Measure would be implemented. No effects to critical habitat would occur.

5.4 Invasive Plant Management Measure

Vireo, Flycatcher

As shown in Figure 30 vireos have been reported and flycatchers have been intermittently reported in all four acres where invasive plant management activities would be implemented. To avoid direct effects and adverse indirect construction noise effects to nesting birds, invasive vegetation removal activities would occur outside of nesting season. However, all focal areas where invasive plant removals would occur are scattered with several known vireo territories and few known (historic) flycatcher territories. While the Invasive Plant Measure would focus on the removal of invasive vegetation there is the potential that vegetation containing vireo or territories could be displaced or affected so that it may not be suitable for nesting until native habitat is restored. The displacement of the vireo and flycatcher territories would be an adverse effect.



Western Yellow Bellied Cuckoo 2011

Least Bell's Vireo Locations – 2017 Season

Chino Creek Focal Area

Mill Creek Focal Area

SARM Down Stream Focal Area

SARM Up Stream Focal Area

N S E W

0 2,500 5,000 Feet

Prado Basin Ecosystem Restoration/ Water Conservation Feasibility Study

Invasive Plant Management - Sensitive Bird Species Locations

Figure 30

Implementation of the Invasive Plant Management Measure would remove 390 acres of non-native vegetation. The area would be managed to ensure establishment of native vegetation and habitat within the same area. There would be the potential that the vegetation removal activities could indirectly affect adjacent native habitat areas making them less suitable for nesting. Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented to minimize indirect construction effects to adjacent habitat. The potential degradation of adjacent suitable nesting habitat may affect, but would not likely adversely affect the vireo and flycatcher.

Implementation of the Invasive Plant Management Measure would remove 390 acres of non-native vegetation and replace it with 390 acres of native vegetation, increasing habitat for the vireo and flycatcher. The increase in habitat for the vireo and flycatcher would be a beneficial effect.

Conclusion

May Affect during construction, Beneficial Effect after restoration.

Gnatcatcher, Cuckoo

There would be low potential for the gnatcatcher and cuckoo to occur where invasive plant management activities would occur. No effects to both species would occur. Both species would not be affected. Cuckoo could benefit from restoration of riparian habitat.

Conclusion

No Effect during construction, potential Beneficial Effect to cuckoo after restoration.

Sucker

The invasive plant management activities would occur on upland areas and would not have an effect on the sucker.

Conclusion

No Effect

Critical Habitat

Vireo Critical Habitat, Flycatcher Critical Habitat, Cuckoo Proposed Critical Habitat, Gnatcatcher Critical Habitat

Implementation of the Invasive Plant Management Measure would temporarily remove 390 acres of non-native vegetation from areas within or adjacent to lands designated or proposed as critical habitat for the vireo, flycatcher, cuckoo and gnatcatcher. There would be the potential that the vegetation removal activities could indirectly affect quality of existing critical habitat. Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15, and BIO-16 would be implemented to minimize indirect construction effects to critical

habitat. The potential degradation of critical habitat may affect but would not likely adversely affect designated or proposed critical habitat.

Implementation of the Invasive Plant Management Measure would remove 390 acres of non-native vegetation and replace it with 390 acres of critical habitat primary constituent elements. The increase in primary constituent elements would be a beneficial effect.

Conclusion

May Affect, Not Likely to Adversely Affect during construction, Beneficial effect after restoration.

Sucker Critical Habitat

The invasive plant management activities would not occur on lands designated critical habitat for the sucker. No effects to critical habitat would occur.

Conclusion

No Effect

5.5 Native Plantings

Vireo

As shown in Figure 31 vireos have been reported in the locations where Native Plantings Measure would be implemented occur. Implementation of the measure would temporarily displace 9 known vireo territories, which would be an adverse effect. To avoid direct and indirect construction noise effects vegetation to actives nest vegetation removal activities would occur outside of nesting season. With the implementation of Mitigation Measure BIO- 2 potential direct effects and indirect construction noise effects would not occur.

Implementation of the Native Plantings Measure would temporarily remove 25 acres of native vegetation. Additionally, there could be the potential that adjacent native vegetation could be indirectly affected by construction activities. Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented to minimize indirect construction effects to adjacent native habitat. The temporary loss of native habitat may affect but would not likely to adversely affect the vireo.

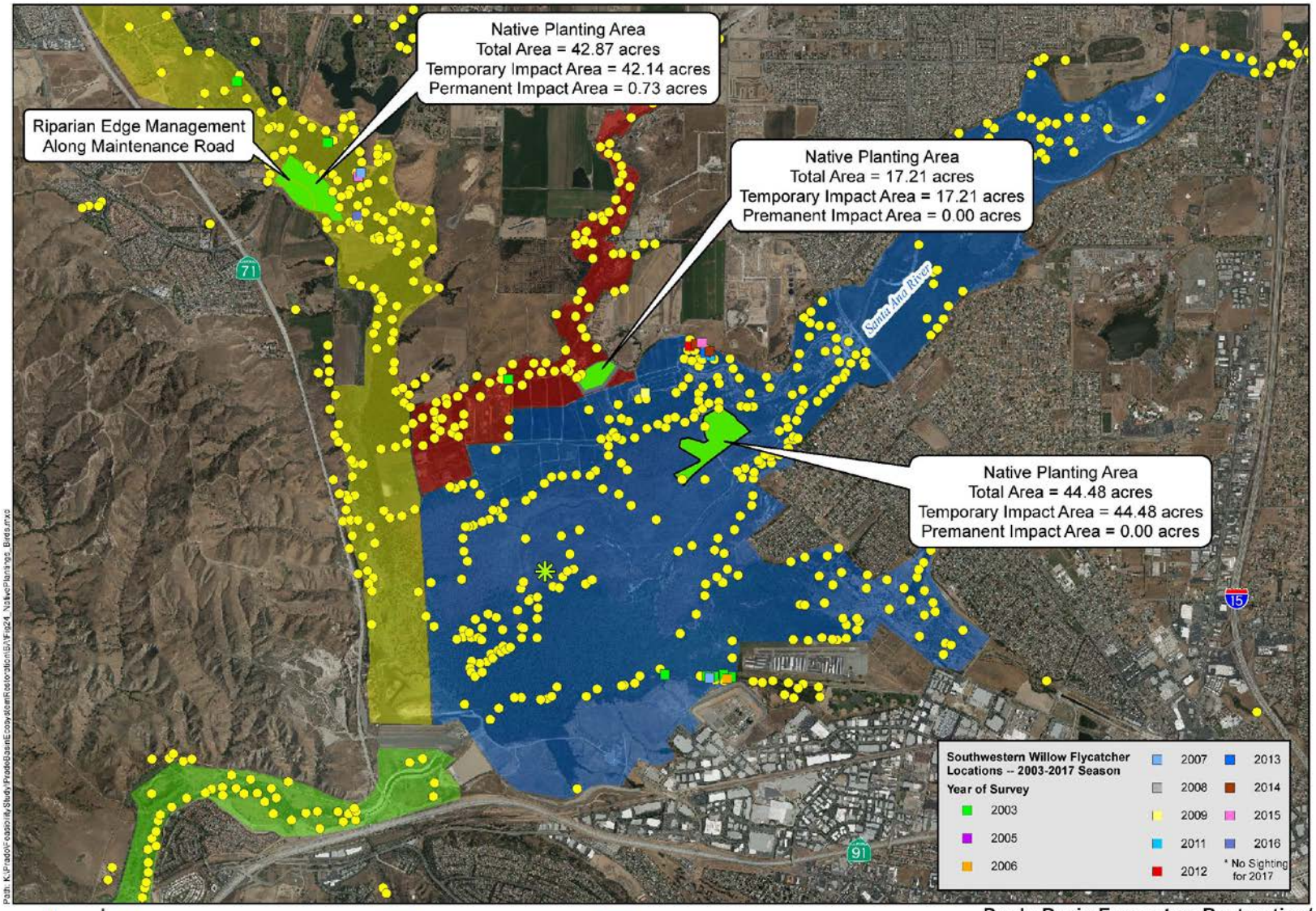
Implementation of the Native Plantings Measure would provide an additional 83 acres of native habitat for vireo. The additional habitat would be a beneficial affect for the vireo.

Conclusion

May Affect during construction, Beneficial Effect after restoration.

Flycatcher, Cuckoo

As shown in Figure 17 no known flycatchers or cuckoo territories have been reported in the locations where Native Plantings Measure would be implemented occur.



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Western Yellow Bellied Cuckoo 2011

Least Bell's Vireo Locations -- 2017 Season

Chino Creek Focal Area

Down Stream SARM Focal Area

Mill Creek Focal Area

Up Stream SARM Focal Area

0 2,500 5,000 Feet

Prado Basin Ecosystem Restoration/
Water Conservation Feasibility Study

Native Plantings Areas - Sensitive Bird Species Locations

Figure 31

Implementation of the measure would temporarily remove 25 acres of suitable habitat and there would also be the potential that habitat adjacent to the work area could be affected by vegetation removal activities. To avoid direct effects to active nests and indirect construction noise effects, vegetation removal activities would occur outside of the nesting season. With the implementation of Conservation Measure BIO- 2 potential direct effects and indirect construction noise effects would not occur. Additionally, Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented to minimize indirect construction effects to adjacent native habitat. The removal of native habitat and the potential that native habitat could be indirectly affected by native plantings construction activities may affect but would not likely would adversely affect the flycatcher and cuckoo.

Implementation of the Native Plantings Measure would provide an additional 76 acres of native habitat for both species. The additional habitat would be a beneficial effect.

Conclusion

May Affect, but Not likely to Adversely Affect during construction, Beneficial Effect after restoration

Gnatcatcher

There would be low potential for the gnatcatcher to occur where the Native Plantings Measure would occur. No effects to the gnatcatcher would occur.

Conclusion-

No Effect.

Sucker

Implementation of the Native Plantings Measure would be implemented on upland areas and would have no effect on the sucker.

Conclusion

No Effect.

Critical Habitat

Vireo Critical Habitat, Flycatcher Critical Habitat, Proposed Cuckoo Critical Habitat

Implementation of the Native Plantings Measure would remove vegetation within approximately 58.1 acres of vireo critical habitat (25 acres of which are primary constituent elements), 18.18 acres of flycatcher critical habitat (all non-native vegetation, and 73 acres of proposed cuckoo critical habitat (of which 42.2 acres are non-native habitat). The removed critical habitat would be replaced with native vegetation ensuring that no net loss of critical habitat would occur. Conservation

Measures BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented to minimize indirect construction effects to adjacent native habitat. The temporary removal critical habitat and the potential that adjacent critical habitat may affect but would not likely adversely affect designated or proposed critical habitat for the vireo, flycatcher or cuckoo.

Implementation of the Native Plantings Measure would provide an additional 83 acres of critical habitat primary constituent elements for vireo, flycatcher and cuckoo. The additional habitat would be a beneficial affect for the vireo, flycatcher and cuckoo.

Conclusion

May Affect, Not Likely to Adversely during construction, Beneficial Effect after restoration.

Gnatcatcher Critical Habitat

The Native Plantings Measure would not occur on lands designated critical habitat for the gnatcatcher. No effect to critical habitat would occur.

Conclusion

No Effect

Sucker Critical Habitat

The Native Plantings Measure would not occur on lands designated critical habitat for the sucker. No effect to critical habitat would occur.

Conclusion

No Effect

5.6 Riparian Edge Treatment Management Measure

Vireo, Flycatcher, Cuckoo

Native vegetation in the area where the Riparian Edge Management Measure would be implemented would be removed as part of the construction of the sediment trap, transition channel and project access roads. Implementation of the Riparian Edge Management Measure would not remove any additional vegetation. Additionally, the measure would be implemented occur outside of nesting season. No effects to the vireo, flycatcher or cuckoo would occur.

Once the Riparian Edge Management Measure is completed over 30 acres of additional native habitat would be provided for the vireo, flycatcher and cuckoo. The additional native habitat would be a beneficial effect.

Conclusion

No Effect

Gnatcatcher

There locations where the Riparian Edge Management Measure would be implemented does not contain suitable habitat for the gnatcatcher. No affects to the gnatcatcher would occur.

Conclusion

No Effect

Sucker

The Riparian Edge Management Measure would occur on the edges of the sediment trap, transition channel, diversion berms and project access roads. No effects to the sucker would occur.

Conclusion

No Effect

Critical Habitat

Vireo Critical Habitat, Flycatcher Critical Habitat, Cuckoo Critical Habitat

To implement Riparian Edge treatment Measure, critical habitat primary constituent elements would be removed as part of the construction of the sediment trap, transition channel and project access roads. Implementation of the measure would not remove any additional primary constituent elements. Implementation of the measure would have no effect on critical habitat for vireo, flycatcher or cuckoo.

Once the Riparian Edge Management Measure is completed over 30 acres of additional critical habitat primary constituent elements would be provided for the vireo, flycatcher and cuckoo. The additional critical habitat primary constituent elements would be a beneficial effect.

Conclusion

No Effect from construction, Beneficial Effect after restoration

Gnatcatcher Critical Habitat

The Riparian Edge Management Measure would not occur on lands designated critical habitat for the gnatcatcher. No effect to critical habitat would occur.

Conclusion

No Effect

Sucker Critical Habitat

The Riparian Edge Management Measure would occur on the edges of the sediment trap, transition channel, diversion berms and project access roads. No effects to the critical habitat primary constituent elements for the sucker would occur.

Conclusion

No Effect from construction, Beneficial Effect after restoration

5.7 In-Stream Habitat Features Downstream

Vireo

The vireo is known to occur in the Reach 9 area. Implementation of the In-Stream Habitat Features would occur in the wetted channel of the Santa Ana River and outside of nesting season. Therefore, no direct impacts to nesting birds would occur. However, as shown in Figure 32 there several known vireo territories scattered throughout Reach 9. While most the access would occur along existing roads avoiding vireo territories, it is estimated that construction of staging areas and additional access could potentially displace 9 known vireo territories, which would be an adverse effect.

Construction of the access roads and construction staging areas would temporarily remove 3.1 acres of riparian vegetation. The amount of riparian vegetation temporarily removed would be minimal compared to the overall amount of riparian vegetation in the Reach 9 area. Disturbed areas would be restored with native habitat at the completion of construction. Additionally, to avoid indirect construction impacts to adjacent riparian vegetation Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented. The temporary removal of habitat may affect, but not likely to adversely the vireo. The presence of the In-Stream Habitat Features would contribute to reversing the incision trend along the river and would be expected to reconnect the river to its floodplain, at least in localized areas where the in-stream features would occur, which would enable the widening of riparian habitat for the vireo. The long-term increase in habitat would be a beneficial effect.

Conclusion

May Affect during Construction, potential long-term Beneficial Effect

Flycatcher, Cuckoo

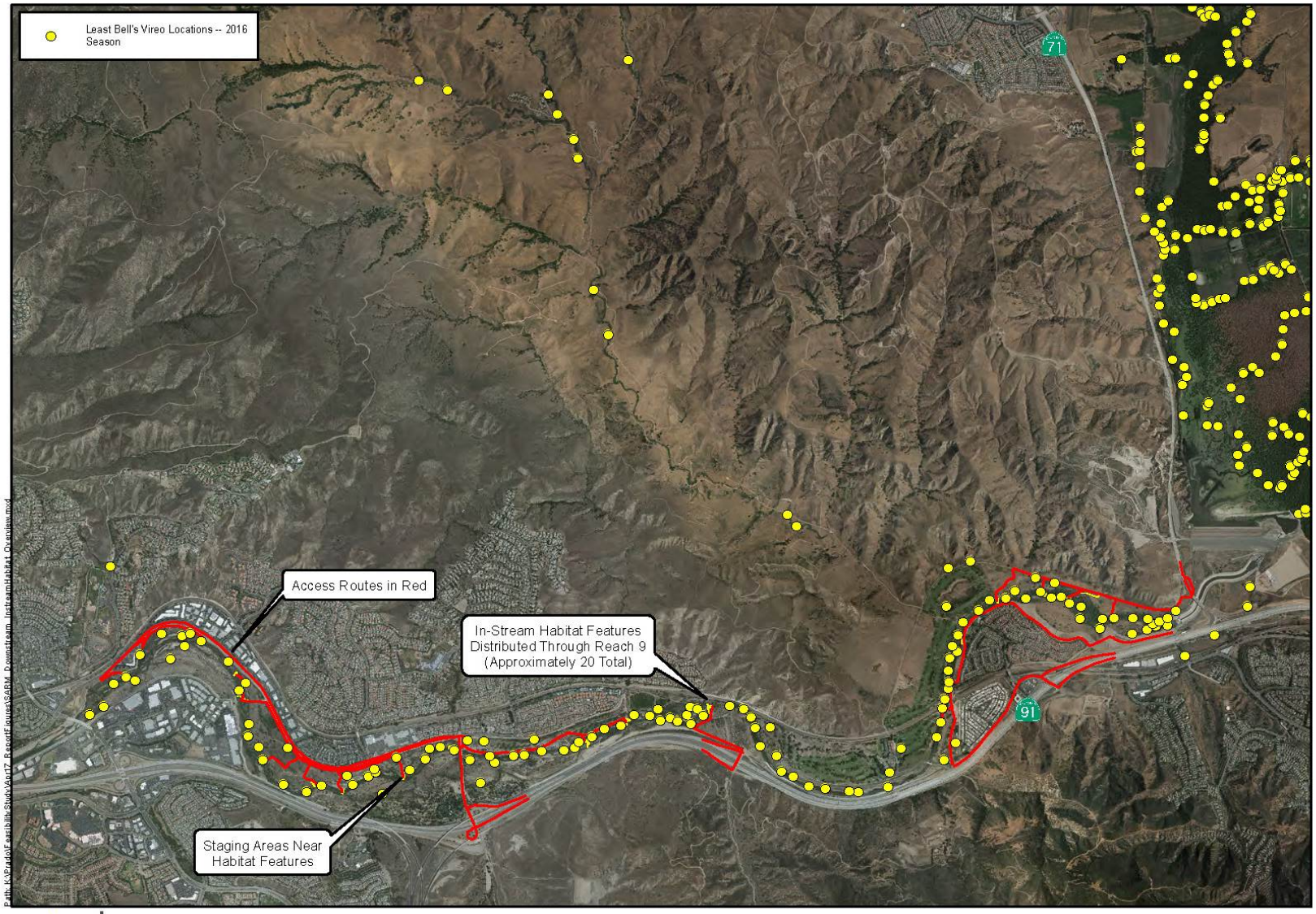
Neither species is known to occur along Reach 9. No effects to either species would occur.

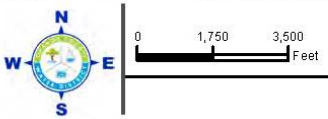
Conclusion

No Effect

Gnatcatcher

The species is known to occur along the terraces above Reach 9. Implementation of the In-Stream Habitat Features would occur in the wetted channel of the Santa Ana River





Prado Basin Ecosystem Restoration
Water Conservation Feasibility Report
In-Stream Habitat SARM Downstream - Sensitive Bird Species Locations
Figure 32

and outside of nesting season. Therefore, no direct impacts to nesting birds would occur. Construction of the access roads and construction staging areas would temporarily remove.19 acres of suitable upland habitat for the gnatcatcher. The amount of upland habitat temporarily removed would be minimal compared to the overall amount of upland habitat in the Reach 9 area. Disturbed areas would be restored with native habitat at the completion of construction. Additionally, to avoid indirect construction impacts to adjacent upland habitat Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented. The temporary removal of habitat may affect but would not likely to adversely affect the critical habitat for the gnatcatcher.

Conclusion

May Affect, Not Likely to Adversely Affect

Santa Ana Sucker

Based on the lack of occurrence, marginal habitat conditions and high populations of exotic predatory fish, there would be low potential for suckers to occur in the area where the In-Stream Habitat Features Measure would be implemented. Heavy equipment would be operating in the wetted channel to position the habitat features. With the implementation of Conservation Measures BIO-7 and BIO-11 construction activities would be required to occur outside of spawning season and adverse water quality impacts would be avoided. Potential direct effects to spawning fish would be avoided. In the event individual suckers are present it is highly likely they would disperse from the construction activity and continue downstream. The potential that suckers could be present where the construction activity would occur may affect but would not likely to adversely affect the sucker.

The presence of the In-Stream Habitat Features would create localized erosion around the feature helping to uncover existing gravel beds and cobles which would enhance habitat for the sucker. The long-term enhancement of habitat for the sucker would be a beneficial effect.

Conclusion

May Affect, Not Likely to Adversely Affect during construction, Beneficial Effect after restoration.

Critical Habitat

Vireo Critical Habitat, Flycatcher Critical Habitat, Proposed Cuckoo Critical Habitat

The In-stream Habitat Features Measure would not be implemented on lands designated critical habitat for the vireo, flycatcher or cuckoo. No effects to critical habitat would occur.

Conclusion

No Effect.

Gnatcatcher Critical Habitat

Critical habitat for the gnatcatcher is designated along the terraces above Reach 9. Construction of the access roads and construction staging areas for In-Stream Habitat Features Measure would temporarily remove .19 acres of critical habitat primary constituent elements. The amount of primary constituent elements removed would be minimal compared to the overall amount of primary constituent elements in the Reach 9 area. Disturbed areas would be restored with native habitat at the completion of construction. Additionally, to avoid indirect construction impacts to adjacent critical habitat areas Conservation Measures BIO-12, BIO-13, BIO-14, BIO-15 and BIO-16 would be implemented. The temporary removal of primary constituent elements may affect but would not likely to adversely the gnatcatcher.

Conclusion

May Affect, Not Likely to Adversely Affect.

Sucker Critical Habitat

The construction of the In-Stream Habitat Features Measure would require the operation of heavy construction equipment in waters designated critical habitat for the sucker. Implementation of the measure would not modify or reduce critical habitat primary constituent elements. The construction activity would may affect, but not adversely affect critical habitat for the sucker.

The presence of the In-Stream Habitat Features would create localized erosion around the feature helping to uncover existing gravel beds and cobles which would enhance critical habitat primary constituent elements for the sucker. The long-term enhancement of primary constituent element for the sucker would be a beneficial effect.

Conclusion-

May Affect, Not Likely to Adversely Affect during construction, Beneficial Effect after restoration

5.8 Non-Native Aquatic Species Management Measure

Vireo, Flycatcher, Cuckoo, Gnatcatcher

The Non-Native Aquatic Species Management Measure would be conducted in the wetted channel of the Santa Ana River, Chino Creek and Mill Creek. Therefore, no effects to vireos, flycatchers, cuckoos or gnatcatcher would occur.

Conclusion

No Effect

Sucker

The Non-Native Aquatic Management Measure would target species that prey upon suckers. Approved removal methods would be utilized by qualified biologist to ensure that no adverse effects to suckers would occur. To avoid direct effects to spawning fish the measure would implemented outside of spawning season. With the implementation of Conservation Measure BIO-7 no effects to spawning fish would occur. Implementation of the Non-Native Aquatic Management Measure would focus on species that prey upon suckers and would result in beneficial effects to the sucker.

Conclusion

Beneficial Effect

Critical Habitat

Vireo Critical Habitat, Flycatcher Critical Habitat, Proposed Cuckoo Critical Habitat, Gnatcatcher Critical Habitat

The Non-Native Aquatic Management Measure would not occur on lands designated critical habitat for the vireo, flycatcher or cuckoo. No effects to critical habitat would occur.

Conclusion

No Effect

Sucker Critical Habitat

The Non-Native Aquatic Species Management Measure would be implemented in critical habitat areas and would reduce predation and increase species populations. Implementation of the measure would have a beneficial effect.

Conclusion

Beneficial Effect to critical habitat functions

5.9 Cowbird Management Measure

Federal Listed Species

Vireo, Flycatcher, Cuckoo, Gnatcatchers

Implementation of the Cowbird Management Measure would focus on a species that prey upon all of the species and would result in beneficial effects to all species.

Conclusion

Beneficial Effect

Sucker

The Cowbird Management Measure would be implemented on upland lands and would have no effect on the sucker.

Conclusion

No Effect

Critical Habitat

Vireo Critical Habitat, Flycatcher Critical Habitat, Proposed Cuckoo Critical Habitat, Gnatcatcher Critical Habitat

The Cowbird Management Measure would be implemented in critical habitat areas and would reduce predation and increase species populations. Implementation of the measure would have a beneficial effect.

Conclusion

Beneficial Effect

Sucker

Implementation of the Cow Bird Management Measure would not occur on lands designated critical habitat for the sucker. No effects to critical habitat would occur.

Conclusion

No Effect

SECTION 6 CUMULATIVE EFFECTS

A cumulative effect is an “effect” on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions taking place over time (CFR 1508.7).

This section evaluates the potential for cumulative effects to listed species of the water conservation measure and ecosystem restoration measures proposed in the IFR implemented concurrently and in conjunction (around the same time fame) with other ongoing or planned activities that are reasonably expected to occur within the Action Area.

Past Actions

Since 1941 when Prado Dam was constructed there have been a number of operation changes and improvements to the dam and to Reach 9. These improvements have been analyzed in numerous environmental documents and biological opinions. Potential effects to federally listed species and designated critical habitat have been consulted on and have been adequately mitigated through the implementation of habitat restoration activities and wildlife management programs. These previous habitat restoration efforts and wildlife management activities have resulted in substantial increases in Least Bell’s Vireo populations in the Prado Basin, and general improvement of riparian habitat in and around the basin and have not result in adverse cumulative impacts to the environment.

Present Actions

Presently, and for the next five years Prado Dam operations would allow the buffer pool to be held up to 505 ft. elevation during the flood season and non-flood season to allow for increased water conservation to help replenish the Orange County ground water basin. Flood risk management improvements to Prado Dam and along Reach 9 are currently occurring and are expected to continue for the next several years. Additionally, ongoing monitoring and restoration activities within the Prado Basin and along Reach 9 are currently occurring to conserve and expand native habitat. Implementation of the Proposed Action in-conjunction with these present actions occurring in the study area would not conflict with present actions occurring in the study area and would not result in adverse significant cumulative impacts to the environment.

Future Actions

In the future, the flood risk management improvements to Prado Dam and Reach 9 would be completed. The primary activities occurring at the Prado Dam and Reach 9 would be routine maintenance activities, which would result in short- term localized

effects where the maintenance activities are occurring. Additionally, ongoing habitat restoration, monitoring and maintenance within Prado Basin would also be expected to occur which would further improve the quality of habitat in Prado Basin. Urban development near the Action Area is expected to continue resulting in more anthropogenic impacts to the area, such as reduced air quality, and additional noise and light and glare impacts. Upstream diversion projects along the river are also expected to continue potentially putting more pressure on habitat in Prado Basin. These activities in-conjunction with implementation of the water conservation and ecosystem restoration measures in the IFR could cumulatively affect federal listed species and their critical habitat.

Cumulative Effects Vireo, Flycatcher, Cuckoo

The Water Conservation Measure in conjunction with existing flood management at Prado Basin could cause increased pooling and additional days of inundation on a permanent basis during flood season and non-flood season. Late flood season inundation that persists into the nesting season could prevent vireos, flycatchers and cuckoos from nesting in lower locations in the Prado Basin, causing a greater percentage than usual to nest above 505 ft. If there are back-to-back wet years, this could occur for multiple nesting seasons. Surveys conducted in the Prado Basin have shown that during back–to-back wet years there was not a substantial reduction of vireos reported and that large numbers of vireos redistributed and nested at locations higher than 505 ft. The surveys have shown that the effect of vireos of having to redistribute to higher locations did not result in any cumulative adverse effects or substantially reduced populations within the Prado Basin. In addition, surveys conducted during a nesting season that followed multiple wet years have not shown degraded habitat or reduced wildlife usage. The surveys also show as drier conditions occur the habitat recovers and wildlife usage increases in those areas that were previously inundated, indicating that adverse effects are temporary and would not contribute to cumulative adverse effects.

An additional 3,500 cubic yards of silt and clay sediments could be deposited annually in Prado Basin from the Water Conservation Measure. The estimated increase of 3,500 cubic yards resulting from the Water Conservation would represent a 0.3 percent increase in the annual sedimentation volume. The approximate surface area of the Prado Basin below 505 ft. elevation contour is 1,890 acres. If the silt and clay would be distributed evenly across the 1,890 acres, there would be an average of 0.001 ft. per year of sediment deposition. The additional silt and clay sedimentation from the Water Conservation Measure would have no effect on the habitat. However, over time the depth of the sedimentation could cumulatively increase, potentially degrading habitat. The IFR proposes Sediment Management Measure that would remove substantially more sediment that would result from implementation of the Water Conservation

Measure, ensuring that there would be no net cumulative increase in sediment deposition in the Prado Basin and no adverse cumulative effects regards to the potential loss of nesting habitat.

Water Conservation effects to habitat would not be worsened or magnified by ongoing flood control activities. Neither one of these activities would substantially reduce the amount of available nesting habitat above 505 ft. that vireo and other riparian obligate species could inhabit during periods of inundation, and any habitat effects from other projects would be or have been fully mitigated.

In-conjunction with water conservation, the IFR includes a series of ecosystems restoration measures that includes; sediment management, non-native vegetation removal, native planting, Chino Creek restoration, Instream habitat features and non-native wildlife management. Cumulatively, these measures would provide 620 acres of additional native habitat within the Action Area. Additionally, implementation of non-native wildlife management measures would reduce nest parasitism increasing the biological values and functions of restored habitat and existing habitat in the Action Area. The construction activities for many of these measures would occur outside of the nesting season. No direct effects to nesting vireos, flycatchers or cuckoos would occur. The construction activities for most of the ecosystem restoration activities would temporarily displace known vireo, flycatcher and cuckoo territories for a relatively short period of time, until native habitat establishes. In the case of sediment management, the territories within the footprint of the sediment trap and transition channel would be displaced from these areas for the life of the project, although the measure and associated plantings and edge management would restore more than a sufficient amount of habitat to support the current population.

Implementation of the ecosystem restoration measures would result in the removal of 116 acres of riparian habitat, suitable nesting habitat for the vireo, flycatcher and cuckoo, and would provide 620 acres of new native riparian habitat. The proposed ecosystem restoration activities would substantially increase the amount of suitable nesting habitat in Prado Basin ensuring that there would be no cumulative loss of native habitat. Additionally, sediment re-entrainment activities within the lower Santa Ana River are expected to reverse the incision trend in the river bed and reconnect the river to its floodplain enabling the widening the riparian corridor and increasing potential habitat for the vireo, flycatcher and cuckoo, which would be a benefit to all species.

During the interim period before the restored habitat is mature, the habitat would not be suitable for nesting. Past surveys have shown that vireos would re-distribute to other locations in the Prado Basin, when existing territories are no longer accessible. It is assumed that the vireos, flycatchers and cuckoos (if present) would re-distribute to

other locations and that no cumulative population losses would occur during the interim period when the ecosystem restoration measures are being implemented.

Cumulative Impacts to Vireo, Flycatcher, Cuckoo Critical Habitat

Implementation of the Water Conservation Measure would not result in the permanent loss of designated or proposed critical habitat for the vireo, flycatcher or cuckoo. To ensure that the Water Conservation would not substantially degrade the value of primary constituent elements within critical habitat areas, OCWD would continue to monitor the health of the riparian habitat between elevation 498 ft. and elevation 505 ft. before and after inundation occurs. In the event the monitoring program indicates that the primary constituent elements are substantially degraded, the degraded habitat would be replaced or restored on OCWD property within the Action Area. With the implementation of the monitoring program there would be no potential loss of critical habitat. Because there would be no loss of critical habitat, the effect would not be contributing cumulative losses of critical habitat within the Action Area.

Implementation of the ecosystem restoration measures would occur in areas that are designated critical habitat for the vireo, flycatcher and cuckoo. Construction activities for the Sediment Management Measure would remove 220 acres vegetation that is within designated critical habitat for the vireo and maintain it clear over a 50-year operation period. However, only 116 acres would be native riparian habitat containing primary constituent elements. During the operation period of the Sediment Management Measure, 620 acres of additional critical habitat primary constituent elements would be provided within the Action Area ensuring that there would be no cumulative loss of critical habitat occurring in-conjunction with implementation of the measure.

Implementation of the Native Plantings Measure, Invasive Plant Management Measure and Chino Creek Restoration Measure would remove primarily non-native vegetation within 534 acres of vireo critical habitat, 241 acres of flycatcher critical habitat and 244 acres of cuckoo proposed critical habitat. However, a minimal amount of the vegetation (30 acres) would be primary constituent elements. All vegetation removed would be replaced with critical habitat primary constituent elements, ensuring that implementation of the ecosystem restoration measures would not incrementally contribute to cumulative loss of critical habitat.

Cumulative Effects to Gnatcatcher

The gnatcatcher occurs in higher upland areas that contain coastal sage scrub habitat. The study area where the Water Conservation Measure would be implemented lacks suitable habitat. The species would not be affected by the Water Conservation Measure and would not contribute to cumulative effects to the species.

The only ecosystem restoration measures that could potentially affect the gnatcatcher would be the Sediment Management Measure. The construction of the sediment storage site would remove 3.3 acres of coastal sage scrub and 61.0 acres of lower quality mixed coastal sage scrub and could potentially cause the redistribution of small numbers of gnatcatchers. The coastal sage habitat removed would be replaced within the Action Area ensuring that there would be no cumulative loss of coastal sage scrub habitat. There would be the potential that small numbers of gnatcatchers could redistribute as result of construction operations. The potential redistribution of gnatcatchers would be an adverse effect. However, because it is anticipated that only small numbers (2-3) would be affected and as there would be sufficient unaffected or restored coastal scrub habitat available to support these individuals, the adverse effect would not be substantial enough to incrementally contribute to cumulative population losses.

Cumulative Effects to Gnatcatcher Critical Habitat

The proposed Water Conservation Measure and ecosystem restoration measures would not occur on lands that are designated critical habitat for the gnatcatcher. The proposed ecosystem restoration measures would beneficially affect gnatcatcher critical habitat in reach 9. No cumulative adverse effects to critical habitat would occur.

Cumulative Effects to Santa Ana Sucker

The potential for populations of suckers to occur in the area where the Water Conservation Measure would be implemented would be very low. In the unlikely event isolated individual suckers occur, the suckers would not be affected by the increased pooling, additional days of inundation, increased silt or target release rates to recover flood storage capacity. Therefore, implementation of the Water Conservation Measure would not incrementally contribute to cumulative adverse effects to the sucker that would reduce population levels.

The ecosystem restoration measures that would have the potential to affect the sucker would be the Sediment Management Measure and the In-Stream Habitat Features Measure. The In-Stream Habitat Features Measure would be implemented in Reach 9 and the Sediment Management Measure would be implemented in the segment of the Santa Ana River located upstream of Prado Dam and along Reach 9. Additionally, it is likely that flood risk management maintenance operations would be occurring in Reach 9, although routine maintenance is not anticipated to affect wetted portions of the channel.

The upstream reach of the Santa Ana River above Prado dam and Reach 9 would have low potential for populations of suckers to occur. The Sediment Management Measure and the In-Stream Habitat Features Measure would be implemented outside of spawning season, which would avoid adverse cumulative effects to spawning fish. It

would be unlikely that suckers would be present when either measure would be implemented. In the event isolated suckers do occur when the In-Stream Habitat Features Measure is implemented it is assumed they would swim away from construction activities and avoid potential adverse effects. The Sediment Management Measure involves sediment removal activities and sediment re-entrainment activities which would have the potential to generate higher levels of water turbidity. The potential that suckers could swim into or be exposed to higher levels of turbidity would be considered an adverse effect. Because it assumed that only a few isolated suckers would be exposed to the higher levels of turbidity and that they would be able to swim away from areas with high levels of suspended sediment, the potential adverse effect would not be substantial enough to incrementally contribute to cumulative effects that could potentially reduce population levels of suckers.

Cumulative Impacts to Santa Ana Sucker Critical Habitat

Although, the study area contains marginal primary constituent elements for the sucker (presence of water with some overhanging vegetation but with unsuitable substrate) the potential for suckers to occur within the Action Area would be very low. The Water Conservation Measure in-conjunction with existing flood risk management activities at Prado Basin could result in additional silt and clay sediment depositing in the Prado Basin each year. The sediment from the Water Conservation Measure would deposit below 505 ft. contour where no sucker critical habitat exists. Therefore, the occurrence of multiple wet years would not cumulatively affect sucker critical habitat in the Prado Basin. Critical habitat for the sucker is located upstream of the Hamner Avenue crossing. Sediment transport modeling reveals that no additional upstream deposition, reduction in slope or bed material alteration would occur from the Water Conservation measure under a single year or multiple year scenarios. The anticipated release rates would not cause any substantial change to sucker critical habitat and would not incrementally contribute to cumulative effects that would reduce or adversely modify critical habitat.

The ecosystem restoration measures that would have the potential to affect critical habitat for the sucker would be the Sediment Management Measure and the In-Stream Habitat Features Measure.

Implementation of the In-Stream Habitat Features would require construction activity within waters that are designated critical habitat. The construction activity would not reduce the amount of critical habitat or adversely modify primary constituent elements that would result in cumulative loss of critical habitat. The instream habitat features would create localized erosion around the structures helping to expose existing gravel beds, which would enhance habitat for the sucker and result in a long-term beneficial effect.

The sediment removal activities and sediment re-entrainment activities would occur on waters designated critical habitat for the sucker. Within the Action Area, critical habitat above Prado Dam lacks the required primary constituent elements Therefore, no effects or cumulative effects would occur from the sediment removal activities. Implementation of the sediment removal activities are expected to slightly steepen the gradient of the river into the Prado basin and create a condition that would allow gravel rocks and cobbles to be transported into the basin which would improve critical habitat for the sucker.

Critical habitat along Reach 9 contains marginal quality sucker habitat. Sediment transport analysis shows that sediment re-entrainment activity would mobilize and re-position cobbles and rocks but would not transport them outside of designated critical habitat waters. Sediment that would be re-entrained would be transported to segments of the river that are sediment starved and armored, which help to restore habitat and improve the overall health of the river for suckers and other native fish.

SECTION 7 CONCLUSIONS AND RECOMMENDATIONS

This section identifies potential effects to Federal Listed Species and critical habitat from the implementation of the IFR. A summary of the issues of concern and recommended effects determination is provided in Table 18.

Table 18: Summary of Potential Effects

ISSUE OF CONCERN	SPECIES	EFFECTS DETERMINATION	BASIS
1. Water Conservation Measure			
1a. Inundation of occupied nests or spawning grounds	Vireo	No Effect	Water Conservation Measure is limited to the non-nesting season.
	Flycatcher	No Effect	Same as above.
	Cuckoo	No Effect	Same as above.
	Gnatcatcher	No Effect	Same as above.
	Sucker	No Effect	Water Conservation Measure would occur outside of the spawning season, and no suitable spawning habitat occurs between 498' and 505'.
1b. Increased days of inundation during the nesting/spawning season resulting in re-distribution of individuals or territories	Vireo	May Affect	There could be potential that pooled water could overlap into the beginning of nesting season inundating previous years nesting territories, which could discourage or prevent vireos from nesting in those same areas. However, prolonged inundation that would extend into the nesting season rarely occurs. When this has occurred in the past, overall vireo populations were stable or increased, despite the presence of a buffer pool. Also, most territories occur above 505'.
	Flycatcher	May Affect, Not Likely to Adversely Affect	Few occurrences in Prado Basin, but in 2015 and 2016, one observed territorial male

			was seen between 498 ft. and 505 ft.
	Cuckoo	May Affect, Not Likely to Adversely Affect	Species last seen in 2011 in the Prado basin between elevations 498 ft. and 505 ft. Only one individual was observed.
	Gnatcatcher	No Effect	No or limited suitable nesting habitat occurs below 505'. Prolonged inundation that would extend into the nesting season rarely occurs.
	Sucker	No Effect	No suitable spawning habitat occurs between 498' and 505'. Presence of additional water within buffer pool zone would not improve or worsen conditions for species.
1c. Effects to critical habitat from increased pooling	Vireo	May Affect, Not Likely to Adversely Affect	Monitoring of vegetation changes and replanting or restoration of affected areas would ensure that the Water Conservation Measure would not degrade the value of primary constituent elements within critical habitat areas located in the Prado Basin. Critical habitat in Reach 9 would not be affected as water conservation would not trigger large, erosive discharges.
	Flycatcher	May Affect, Not Likely to Adversely Affect	Monitoring of vegetation changes and replanting or restoration of affected areas will ensure that the Water Conservation Measure would not degrade the value of primary constituent elements within critical habitat areas. Due to the limited number of flycatcher in the Basin, the species would not be affected by temporary changes in habitat within the buffer pool area.

	Cuckoo	May Affect, Not Likely to Adversely Affect	Monitoring of vegetation changes and replanting or restoration of affected areas would ensure that the Water Conservation Measure would not degrade the value of primary constituent elements within critical habitat areas. Due to the limited number of cuckoo in the Basin, the species would not be affected by temporary changes in habitat within the buffer pool area.
	Gnatcatcher	No Effect	No critical habitat occurs within Prado Basin. Critical habitat in Reach 9 would not be affected as the Water Conservation Measure would not trigger large, erosive discharges.
	Sucker Upstream Prado Dam	No Effect	Critical habitat in the Prado Basin is designated above 505 ft. The increased pooling between 498 ft. and 505 ft. would have no effect on designated sucker critical habitat.
	Sucker Downstream Prado Dam	No Effect	Critical habitat in Reach 9 would not be affected as the Water Conservation Measure would not trigger large, erosive discharges. Modeling demonstrates that reducing the running average release rate from 500 cfs to 350 cfs would slightly reduce the depth of the low flow channel but would still maintain bank to bank connectivity. Furthermore, discharge rates fluctuate greatly depending on flood stage, inflow, water surface elevation, downstream construction activities, and

			other factors. There is not a steady state flow of 500 cfs that creates sustained habitat conditions in the margins for larvae or fry. Moreover, the release rate (weather it is 350 or 500 cfs average) would further decrease as the pool is emptied.
1d. Effects to critical habitat from increased sedimentation due to water conservation.	Vireo	No Effect	Minor amount of increased sedimentation in basin (estimated 3,500 cubic yards/year, spread over basin at a depth of 0.001 ft. /year) would not substantially reduce biological values of critical habitat. Implementation of sediment removal activities would remove increased sediment from Water Conservation to ensure no net increase in sediment. In addition, monitoring of vegetation changes and replanting or restoration of affected areas will ensure that the Water Conservation Measure would not degrade the value of primary constituent elements within critical habitat areas.
	Flycatcher	No Effect	Same as above.
	Cuckoo	No Effect	Same as above.
	Gnatcatcher	No Effect	Minor amount of increased sedimentation in basin would have no effect on critical habitat for gnatcatcher in Reach 9.
	Sucker Upstream Prado Dam	No Effect	Modeling demonstrates that no effect would occur to the gradient of the river upstream of 505', and therefore no effect would occur to Santa Ana sucker critical habitat upstream

			of Prado Basin. Additionally, sediment removal activities would insure no net increase in sediment from water Conservation Measure.
2. Sediment Management Measure			
2a. Effects to species from construction of sediment trap and transition channel	Vireo	May Affect	Activity would occur outside of the nesting season. No effects to active nests would occur. Construction activities would remove approximately 116 acres of suitable habitat and displace 61 known vireo territories. However, the sediment trap would allow for re-entrainment of sand and other substrate within the river below Prado Dam which would reduce channel incision and reconnect the river to its floodplain, potentially increasing the acreage and sustainability of riparian habitat in that area, which along with other restoration measures would be expected to lead to increased suitability for vireo and other riparian obligate species throughout the project area. Additionally, a Riparian Edge Management measure would be implemented along the perimeter of the sediment management measure and maintenance roads, which would create an edge condition suitable for additional nesting.
	Flycatcher	May Affect	Activity would occur outside of the nesting season. No direct effects to active nests would occur. Construction activities would remove approximately 116 acres of suitable habitat and

			could displace 7 historic flycatcher territories. Long-term beneficial effects from sediment management and other restoration measures are summarized above.
	Cuckoo	May Affect	Activity would occur outside of the nesting season. Construction activities would remove approximately 116 acres of suitable habitat. No known cuckoo territories would be displaced. Long-term beneficial effects from sediment management and other restoration measures are summarized above.
	Gnatcatcher	No Effect	The area where construction activity would occur does not contain suitable habitat for the gnatcatcher.
	Sucker	May Affect	Sediment removal activities would occur outside of the spawning season, and suitable spawning habitat is not present within the work area limits. It is expected that adult fish would be able to avoid the work area and therefore avoid entrainment. However, the potential that individual isolated suckers could find their way into the sediment removal channel where turbidity levels would be higher and less suitable for sucker would be considered an adverse effect.
2b. Effects to Species from construction of sediment storage site	Vireo	May Affect	The construction activity would occur outside of the nesting season. No effects to active nests would occur. Construction activities would remove 2.1 acres of mixed

			riparian habitat and would displace one known vireo territory.
	Flycatcher	May Affect, Not Likely to Adversely Affect	Habitat to be removed is not known to support species.
	Cuckoo	May Affect, Not Likely to Adversely Affect	Habitat to be removed is not known to support species.
	Gnatcatcher	May Affect	Activity would occur outside of the nesting season. No effects to active nests would occur. Surveys have identified the presence of small numbers gnatcatchers outside of nesting season. Construction activities could cause birds to flush and seek other locations Construction activity would remove 3.3 acres coastal sage scrub and 43.8 acres lower quality mixed coastal sage scrub, potentially suitable habitat.
	Sucker	No Effect	Construction activity would occur in upland area.
2c Effects to Species from sediment removal operations	Vireo	May Affect	Sediment removal activities would be confined to wetted channel. Sound attenuation program would be implemented to minimize construction noise impacts. There would still be potential that low numbers of birds could be affected by noise in the nearby area when sediment removal activities are occurring, potentially disrupting nesting patterns.
	Flycatcher	May Affect	Same as above

	Cuckoo	May Affect	Sam as above
	Gnatcatcher	No Effect	The area where sediment removal activities would occur does not contain suitable habitat for the gnatcatcher.
	Sucker	May Affect	Sediment removal activities would occur outside of the spawning season, and suitable spawning habitat is not present within the work area limits. It is expected that adult fish would be able to avoid the work area and therefore avoid entrainment. However, the potential that individual isolated suckers could find their way into the sediment removal channel where turbidity levels would be higher and less suitable for sucker would be considered an adverse effect.
2d Effects to Species from sediment hauling and storage operations	Vireo	May Affect	Hauling activities would be confined to the project access roads. No direct effect would occur. Construction noise effects from the hauling of sediment to storage site could disrupt nesting patterns of birds in adjacent areas.
	Flycatcher	May Affect	Same as above
	Cuckoo	May Affect	Same as above
	Gnatcatcher	May Affect	Same as above.
	Sucker	No Effect	Activity would occur in upland area and have no effect on species.
2e Effects to Species from Sediment Re-Entrainment	Vireo	<u>Construction</u> No Effect	Species is known to occur along Reach 9. Construction activities would occur in wetted

		Long Term Beneficial Effect	channel and outside of nesting season. Sediment re-entrainment activities are expected to reduce degradation of the bed of the Santa Ana in Reach 9. The reversing of the incision trend is expected to reconnect the river to its floodplain and consequently enable the widening of the riparian corridor. As the amount of riparian corridor area increases there will be an increase in habitat available to the vireo.
	Flycatcher	Construction No Effect Long Term Beneficial Effect	Species not known to occur along Reach 9 where sediment re-entrainment would occur However, an increase in suitable habitat is anticipated in the long term.
	Cuckoo	Construction No Effect Long Term Beneficial Effect	Species not know to occur along Reach 9 where sediment re-entrainment would occur. However, an increase in suitable habitat would be anticipated to occur. In the long-term.
	Gnatcatcher	Construction No Effect Long Term Beneficial Affect	Species is known to occur along terraces of Reach 9. Construction activity would occur in wetted channel and outside of nesting season. A reduction in the incision of the Santa Ana River downstream of the Prado Dam from the sediment re-entrainment activities is expected to help reconnect the river to its floodplain. Overbank would then be expected to occur with more frequency. This is expected to create sandy wash situations within reach 9 over a greater area

			than currently occurs, in addition to a larger riparian corridor. Alluvial fan sage scrub habitats are typically associated with these sand wash situations in Reach 9. This effectively would increase the amount and quality of habitat considered suitable for the gnatcatcher.
	Sucker	<u>Construction</u> May Affect, Not Likely to Adversely Affect <u>Long Term</u> Beneficial Effect	There would be low potential for species to occur where sediment re-entrainment would occur. If suckers are present, it is likely they swim away from the re-entrainment activity. Additionally, sediment would be re-entrained during high flows and it more than likely fish would seeking refuge in downstream areas where more opportunities for refuge exist. Increased turbidity resulting from sediment re-entrainment is not expected to be at a level where it would unhealthful to aquatic life. Sediment re-entrainment would occur outside of spawning season. Potential impacts to spawning fish would be avoided The re-entrained sediment would be transported to segments of the lower Santa Ana River that are sediment starved and armored, which help to restore habitat and improve the overall health and function of the river for suckers and other native fish.
2f Effects to Critical Habitat from construction of sediment trap and transition channel	Vireo	May Affect	Construction activities would remove 220 acres of vegetation within designated critical habitat. See 2a and 2e for potential beneficial effects to vireo in other areas from re-

			entrainment, creation and management of edge habitat and other related measures.
	Flycatcher	May Affect	Construction activities would remove 93 acres of vegetation within designated critical habitat. See 2a and 2e for potential beneficial effects to flycatcher in other areas from re-entrainment and related measures.
	Cuckoo	May Affect	Construction activities would remove 338 acres of vegetation within proposed critical habitat. See 2a and 2e for potential beneficial effects to cuckoo in other areas from re-entrainment and related measures.
	Gnatcatcher	No Effect	There is no designated critical habitat in the location where the sediment trap and transition channel would be constructed.
	Sucker Upstream Prado Dam	May Affect, Not Likely to Adversely Affect	The sediment transition channel would be constructed in designated critical habitat. However, no primary constituent elements would be removed. Construction activities would occur outside of spawning season.
2g Effects to critical habitat from operation of sediment removal trap and transition channel	Vireo	No Effect	Operation of sediment trap and transition channel would have no additional effects on critical habitat beyond effects related to construction.
	Flycatcher	No Effect	Same as above
	Cuckoo	No Effect	Same as above
	Gnatcatcher	No Effect	Critical habitat for this species is not present.

	Sucker Upstream Prado Dam	Beneficial Effect	The anticipated changes to the gradient of the river from sediment re-entrainment activities may expose gravel beds upstream of the project expanding the area of suitable spawning and foraging area into Prado Basin, and potentially slowing or reversing a flattening of the gradient of the river upstream, which would have a beneficial effect to sucker critical habitat.
	Sucker Downstream Prado Dam	May Affect, Not Likely to Adversely Affect	Potentially turbid surface waters in the transition channel could be conveyed downstream through the dam into designated critical habitat along Reach 9. By the time the flows get to Reach 9 they would be well diluted and would not be unhealthful to aquatic life.
2h Effects to Critical Habitat from Sediment Re-Entrainment	Vireo	No Effect	There is no designated critical habitat where sediment re-entrainment would occur.
	Flycatcher	No Effect	Same as above
	Cuckoo	No Effect	Same as above
	Gnatcatcher	Beneficial Effect	Critical habitat is designated along a segment of Reach 9 where sediment re-entrainment would occur. A reduction in the incision of the Santa Ana River downstream of the Prado Dam is expected to help reconnect the river to its floodplain. Overbank would then be expected to occur with more frequency. This is expected to create sandy wash situations within reach 9 over a greater area than currently occurs, in addition to a larger riparian corridor. Alluvial fan sage

			scrub habitats are typically associated with these sand wash situations in Reach 9. This effectively would increase the amount and quality of critical habitat.
	Sucker Downstream Prado Dam	Beneficial Effect	Re-entrained sediment would enhance and restore sucker habitat in the Santa Ana River by preventing further degradation, incising and armoring of the river bed.
3 Chino Creek Channel Restoration Measure			
3a Effects to Species	Vireo	Construction May Affect Long Term Beneficial Affect	Species is known to occur in area. Construction activities would occur outside of nesting season. Construction activities would temporarily remove 5.3 acres of suitable riparian habitat temporarily displacing 12 known vireo territories. Once restoration measure is completed approximately 112 acres additional riparian habitat would be restored.
	Flycatcher	Construction No Effect Long Term Beneficial Effect	Species is not known to occur in area. Construction activities would temporarily remove 5.3 acres of suitable riparian habitat. Once restoration measure is completed approximately 112 acres additional riparian habitat would be restored. .
	Cuckoo	Construction No Effect Long Term Beneficial Effect	Species is not known to occur in area. Construction activities would temporarily remove 5.3 acres of suitable riparian habitat. Once restoration measure is completed approximately 112 acres additional riparian habitat

			would be restored.
	Gnatcatcher	Construction No Effect Long Term Beneficial Effect	Species not known to occur in area. Restoration activities would include the planting of native upland vegetation in-conjunction with native riparian vegetation. The additional upland habitat would be a beneficial effect.
	Sucker	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Species not known to occur in area. However, segments of creek exhibits required primary constituent elements and the creek provides hydrologic connectivity to the Santa Ana River that would allow suckers to have upstream and downstream movement between the creek and the river. Proposed restoration would expand open water area by create an additional creek path, adjacent to the existing alignment of Chino Creek. The additional open water habitat would be a beneficial effect.
3b Effects to Critical Habitat	Vireo	No Effect	There is no designated critical habitat where the measure would be implemented.
	Flycatcher	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Construction activities would remove .28 acres of vegetation within designated critical habitat, of which .20 acres are primary constituent elements. All of the vegetation would be replaced with native vegetation which would provide an overall increase of critical habitat primary constituent elements within the study area.
	Cuckoo	Construction May Affect, Not Likely to Adversely Affect	Construction activities would remove 17.9 acres of vegetation within proposed critical habitat, of which 5.20 acres are primary constituent

		Long Term Beneficial Effect	elements. All of the vegetation removed would be replaced with native vegetation which would provide an overall increase of critical habitat primary constituent elements within the study area. .
	Gnatcatcher	No Effect	There is no designated critical habitat where the Chino Creek Channel restoration activities would occur.
	Sucker	No Effect	There is no designated critical habitat where the Chino Creek Channel restoration activities would occur.
4 Invasive Plant Management Measure			
4a Effects to Species	Vireo	Construction May Affect Long Term Beneficial Effect	Invasive plant removal activities would occur outside of nesting season. No direct effects would occur to active nests, although some native vegetation may be removed or damaged where it is heavily infested with non-natives or immediately adjacent to work areas and avoidance is not possible. All four focal areas are scattered with vireo territories. While the Invasive Plant Management Measure would focus on the removal of invasive vegetation there is the potential that vireo territories could be displaced until native vegetation establishes in place. Measure would be provided to minimize indirect construction effects. Implementation of the measure would remove a total of 390 acres of non-native habitat within all of the focal areas, allowing native habitat to establish in place. The overall

			increase of native habitat would be beneficial effect.
	Flycatcher	Construction May Affect Long Term Beneficial Effect	Similar to above, invasive plant removal activities would occur outside of nesting season. No effects would occur to active nests. Although the flycatcher occurs intermittently within the Prado Basin, there are still known flycatcher territories, as recent as 2016 that could be affected by non-native plant removal activities. Implementation of the measure would remove 390 acres of non-native habitat in all focal areas, allowing native habitat to establish in its place. The overall increase of native habitat would be a beneficial effect.
	Cuckoo	Construction No Effect Long Term Beneficial Effect	The species was last reported in 2013 and it would be unlikely the species would be present. Additionally, invasive plant removal activities would occur outside of nesting season. Implementation of the measure would remove 390 acres of non-native habitat in all four of the focal areas, allowing native habitat to establish in its place. The overall increase of native habitat would be a beneficial effect.
	Gnatcatcher	No Effect	The locations where Invasive plant removal activities would occur does not contain suitable habitat. Invasive plant removal activities would occur outside of nesting season. No direct or indirect effects would occur to species.

	Sucker	No Effect	The measure would be implemented in an upland location. No direct or indirect effects would occur to species.
4b Effects to Critical Habitat	Vireo	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Designated critical habitat for the vireo occurs in the Upstream SAR Focal Area, Chino Creek Focal Area and the Mill Creek Focal Area. Implementation of the measure would remove non-native vegetation within a total of 374 acres of critical habitat from the three focal areas of which none are primary constituent elements and restore native habitat in its place. There could be potential that adjacent native critical habitat could be indirectly and temporarily affected by removal activities. All of the non-native vegetation removed would be replaced with native habitat which would provide an overall increase of critical habitat primary constituent elements within the study area.
	Flycatcher	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Designated critical habitat for the flycatcher occurs in the Upstream SAR Focal Area. Implementation of the measure would remove non-native vegetation within a total of 248 acres of critical habitat from the focal area of which none are primary constituent elements and restore native habitat in its place. There could be potential that adjacent native critical habitat could be indirectly affected by removal activities. All of the removed vegetation would be replaced with native

			habitat which would provide an overall increase of critical habitat primary constituent elements within the study area.
	Cuckoo	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Proposed critical habitat for the cuckoo occurs in the Upstream SAR Focal Area, Mill Creek Focal Area and Chino Creek Focal Area Implementation of the measure would remove non-native vegetation within a total of 374 acres of proposed critical habitat from the three focal areas of which none are primary constituent elements and restore native habitat in its place. There could be potential that adjacent proposed critical habitat could be indirectly affected by removal activities. All of the non-native vegetation removed would be replaced with native habitat which would provide an overall increase of critical habitat primary constituent elements within the study area.
	Gnatcatcher	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Designated critical habitat for the gnatcatcher occurs in the Downstream SAR Focal Area. Implementation of the measure would remove non-native vegetation within a total of 14 acres of critical habitat from this focal area of which none are primary constituent elements and restore native habitat in its place. There could be potential that adjacent native critical habitat could be indirectly and temporarily affected by removal activities. All of the non-native vegetation removed would be replaced with native habitat which would

			provide an overall increase of critical habitat primary constituent elements within the study area.
	Sucker	No Effect	Designated critical habitat for the sucker occurs in the Downstream SAR and Upstream Focal Areas. The measure would be implemented in upland locations and would affect critical habitat.
5. Native Plantings Measure			
5a Effects to Species	Vireo	Construction May Affect Long Term Beneficial Effect	Native Plantings Measure activities would occur outside of nesting season. No effects to active nests would occur. However, the measure would temporarily remove 25 acres of native habitat and temporarily displace 9 nine vireo territories, until a greater amount of restored habitat establishes. Additionally, there could be potential that adjacent native habitat could be indirectly affected from the operation of heavy equipment. The amount native habitat temporarily removed would be minimal compared to the amount of native habitat that would be established through this measure. Measures, such as flagging adjacent native habitat and restricting vehicles to access roads would be implemented to minimize indirect construction effects. Once the Native Plants Measure is completed an additional 76 acres of native habitat would be provided. The additional habitat would be a beneficial effect.

	Flycatcher	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Native Plantings Measure activities would occur outside of nesting season. No effects to known territories would occur. Construction effects to native habitat and long- term benefits would be the same as above.
	Cuckoo	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Native Plantings Measure activities would occur outside of nesting season. No effects to known territories would occur. Construction effects to native habitat and long-term benefits would be the same as above.
	Gnatcatcher	No Effect	Native Plantings Measure activities would occur outside of nesting season. No direct or indirect effects would occur to species. The locations where Native Plantings Measure activities would occur does not contain suitable habitat. No indirect effects.
	Sucker	No Effect	The measure would be implemented in an upland location. No direct or indirect effects to species would occur.
5b Effects to Critical Habitat	Vireo	Construction May Affect, Not Likely to Adversely Affect Long Term Beneficial Effect	Implementation of the measure would remove 58.1 acres of vegetation within designated critical habitat within the Upstream SAR Focal Area of which 25 acres are primary constituent elements. There could be potential that adjacent critical habitat could be indirectly affected by removal activities associated with native plantings. Measures, such as flagging adjacent

			native habitat and restricting vehicles to access roads would be implemented to minimize indirect construction effects. The proposed restoration would provide an overall increase of critical habitat primary constituent elements within the focal area. The increase in primary constituent elements would be a beneficial effect.
	Flycatcher	<u>Construction</u> May Affect, Not Likely to Adversely Affect <u>Long Term</u> Beneficial Effect	Implementation of the measure would remove 18.18 acres of non-native vegetation within designated critical habitat within the Chino Creek Focal Area. There could be potential that adjacent critical habitat could be indirectly impacted by removal activities associated with native plantings. Measures, such as flagging adjacent native habitat and restricting vehicles to access roads would be implemented to minimize indirect construction effects. The proposed restoration would increase the overall amount of critical habitat primary constituent elements within the focal area.
	Cuckoo	<u>Construction</u> May Affect, Not Likely to Adversely Affect <u>Long Term</u> Beneficial Effect	Implementation of the measure would temporarily remove 73 acres of vegetation within proposed critical habitat within the Upstream SAR Focal Area of which 42.2 acres are non-native habitat. There could be potential that adjacent critical habitat could be indirectly impacted by removal activities associated with native plantings. Measures, such as

			flagging adjacent native habitat and restricting vehicles to access roads would be implemented to minimize indirect construction effects. The proposed restoration would increase the overall amount of critical habitat primary constituent elements within the focal area.
	Gnatcatcher	No Effect	The measure would be implemented in a location that does not contain designated critical habitat.
	Sucker	No Effect	The measure would be implemented in a location that does not contain designated critical habitat.
6 Riparian Edge Management Measure			
6a Effects to Species	Vireo	<u>Construction</u> No additional effect beyond those associated with construction of the sediment management measures. <u>Long Term</u> Beneficial Effect	Native vegetation would be removed and known vireo territories would be displaced as part of the construction of the transition channel, sediment trap, and project access road. Implementation of Riparian Edge management Measure would not remove any additional vegetation. Over 30 acres of additional native habitat for species would be provided. Establishment and management of this additional habitat would be a beneficial effect.
	Flycatcher	<u>Construction</u> No additional effect beyond those associated with construction of the sediment management measures.	Native vegetation would be removed, and historic flycatcher territories would be displaced. Construction and long-term beneficial effects would be the same as above.

		Long Term Beneficial Effect	
	Cuckoo	Construction No additional effect beyond those associated with construction of the sediment management measures. Long Term Beneficial Effect	Native vegetation would be removed. However, no known cuckoo territories would be displaced. Construction and long-term beneficial effects would be the same as above.
	Gnatcatcher	No Effect	The location where the measure would be implemented does not contain suitable habitat. Native Planting activities would occur outside of nesting season. No direct or indirect effects would occur to species.
	Sucker	No Effect	Measure would be focused along edges of sediment trap, transition channel and project access road and would not affect the wetted channel. No direct effect or indirect effects would occur to species.
6b Effects to Critical Habitat	Vireo	Construction No additional effect beyond those associated with construction of the sediment management measures. Long Term Beneficial Effect	Within the Upstream SAR Focal Area primary constituent elements would be removed as part of the construction of the transition channel, sediment trap and project access roads. Implementation of measure would not remove any additional primary constituent elements vegetation. Over 30 acres of additional primary constituent elements would be provided. The additional primary constituent elements would be a beneficial effect.

	Flycatcher	Construction No additional effect beyond those associated with construction of the sediment management measures. Long Term Beneficial Effect	Same as above
	Cuckoo	Construction No additional effect beyond those associated with construction of the sediment management measures. Long Term Beneficial Effect	Same as above
	Gnatcatcher	No Effect	There is no designated critical habitat where the measure would be implemented.
	Sucker Upstream Prado Dam	No Effect	The measure would be focused along edges of sediment trap, transition channel and project access road and would affect the wetted channel. No reductions or modifications to critical habitat would occur.
7 In-Stream Habitat Features Measure Downstream			
7a Effects to Species	Vireo	Construction May Affect	The vireo is known to occur in the Reach 9 area. The measure would be implemented within wetted channel and outside of nesting

		Long Term Possible Beneficial Effect	season. No direct impacts to nesting birds would occur. However, construction activities to implement the measure would temporarily displace 9 known vireo territories. Construction of access roads and staging areas would require the temporary removal of 3.1 acres of native riparian vegetation to gain access to gain access to the wetted channel, which would be restored when construction is completed. The presence of the in-stream features will create hydrologic effects that could result in an increase in the amount of riparian habitat in this area.
	Flycatcher	No Effect	The species is not known to occur along Reach 9.
	Cuckoo	No Effect	The species is not known to occur along Reach 9.
	Gnatcatcher	May Affect, Not Likely to Adversely Affect	Species is known to occur along terraces of Reach 9. The measure would be implemented within wetted channel and outside of nesting season. No direct impacts to nesting birds would occur. Construction of access roads and staging areas would require the removal of .19 acres of mixed coastal sage habitat. The amount removed would be minimal and would not adversely affect the species.
	Sucker	Construction May Affect, Not Likely to Adversely Affect	Heavy equipment would be operating within the wetted channel. There would be low potential for suckers to occur

		Long Term Beneficial Effect	where the measure would be implemented In the event suckers are present, it is likely they would disperse from the construction activity and continue downstream. To avoid direct impacts to spawning fish, construction activities would occur outside of spawning season. The presence of the In-Stream Habitat Features would create localized erosion around the feature helping to uncover existing gravel beds and cobbles, which would enhance habitat for the sucker.
7b Effects to Critical Habitat	Vireo	No Effect	There is no designated critical habitat where the measure would be implemented.
	Flycatcher	No Effect	There is no designated critical habitat where the measure would be implemented.
	Cuckoo	No Effect	There is no designated critical habitat where the measure would be implemented.
	Gnatcatcher	May Affect, Not Likely to Adversely Affect	Critical habitat for the gnatcatcher is designated along the terraces above Reach 9. Construction of access roads and staging areas could require the removal of .19 acres upland vegetation within designated critical habitat to gain access to the wetted channel. The amount removed would be minimal and would not adversely affect the species.
	Sucker	Construction May Affect, Not Likely to Adversely Affect Long Term	Construction of the In-Stream Habitat Feature would require the operation of heavy equipment in waters that are designated critical habitat. The

		Beneficial Effect	presence of the habitat features would create localized erosion to help uncover existing gravel beds and cobbles, as well as pools, riffles and Refugio which would enhance the quality of critical habitat for suckers.
8 Cowbird Management Measure			
8a Effects to Species	Vireo	Beneficial Effect	Cowbird Management Measure would be implemented in the Upstream SAR Focal Area, Chino Creek Focal Area and the Mill Creek Focal Area. Implementation of the measure would not involve any activities that would result in direct or indirect effect to the species. Implementation measure would reduce nest parasitism and would benefit the species. result in direct indirect effects
	Flycatcher	Beneficial Effect	Same as above
	Cuckoo	Beneficial Effect	Same as above
	Gnatcatcher	Beneficial Effect	Same as above
	Sucker	No Effect	Measure would be implemented in upland locations. No effects to species would occur.
8b Effects to Critical Habitat	Vireo	Beneficial Effect	The measure would be implemented in critical habitat areas and would reduce predation and increase species populations within critical habitat areas.
	Flycatcher	Beneficial Effect	Same as above
	Cuckoo	Beneficial Effect	Same as above
	Gnatcatcher	Beneficial Effect	Same as above
	Sucker	No Effect	Measure would be

			implemented in upland locations and would not affect critical habitat.
9 Non-Native Aquatic Control Measure			
9a Effects to Species	Vireo	No Effect	Non-Native Aquatic Control Measure would be implemented in Upstream SARM Focal Area within the Santa Ana River wetted channel. No direct or indirect effects would occur to species.
	Flycatcher	No Effect	Same as above
	Cuckoo	No Effect	Same as above
	Gnatcatcher	No Effect	Same as above
	Sucker	Beneficial Effect	Measure would target predatory species. Approved methods would be utilized to avoid impacts to suckers. To avoid potential effects to spawning fish, measure would be implemented outside of spawning season.
9b Effects to Critical Habitat	Vireo	No Effect	Measure would be implemented in wetted channel and would not remove or modify any critical habitat primary constituent elements
	Flycatcher	No Effect	Same as above
	Cuckoo	No Effect	Same as above
	Gnatcatcher	No Affect	Same as above
	Sucker	Beneficial Effect to critical habitat functions.	The measure would be implemented in critical habitat areas and would reduce predation and increase species populations sg within critical habitat areas.
10 Cumulative effects			
		No additional cumulative effects	

		would occur from implementation of all measures within the Proposed Action combined with other planned projects in the area.	

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