

Santa Ana Sucker Habitat Monitoring and Management Plan

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Provided for:

Sterling Natural Resource Center

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CHAPTER 1

Introduction

1.1 Purpose and Need for the Santa Ana Sucker Habitat Monitoring and Management Plan

1.1.1 Background

East Valley Water District (EVWD) is proposing to construct the Sterling Natural Resource Center (SNRC) facility in the City of Highland to treat wastewater generated in EVWD's service area for beneficial reuse in the upper Santa Ana River watershed. EVWD currently conveys its wastewater to the City of San Bernardino for secondary treatment at the San Bernardino Water Reclamation Plant (SBWRP) and tertiary treatment at the Rapid Infiltration and Extraction (RIX) facility which discharges to the Santa Ana River. The proposed project would instead treat, recycle and reuse the wastewater for multiple beneficial uses within the upper Santa Ana River watershed. Once constructed and operational, approximately 6 million gallons per day (MGD) of water previously treated at RIX and discharged to the Santa Ana River would be treated at the SNRC. Following treatment EVWD's wastewater will be conveyed to a series of infiltration basins for groundwater replenishment in the Bunker Hill Groundwater Basin.

1.1.2 Purpose and Need

This Santa Ana Sucker (or SAS) Habitat Monitoring and Management Plan (HMMP) has been prepared to describe how project impacts, the potential operational effects of the Sterling Natural Resource Center (SNRC) project on Santa Ana sucker (SAS), a federally threatened species and its designated critical habitat, will be offset/mitigated. Development of an this HMMP is a requirement of the Biological Opinion and associated amendments issued by the USFWS for the project, Wastewater Change Order WW0095 issued by the State Water Resources Control Board (SWRCB) and facilitates compliance with the project's Final Environmental Impact Report (SCH No. 2015101058) pursuant to California Environmental Quality Act (CEQA). If the Upper Santa Ana River Habitat Conservation Plan (HCP) is adopted prior to or during implementation of this HMMP, the monitoring and reporting identified in this plan will be carried forward into the HCP's monitoring and reporting program. Incidental take of SAS that may occur associated with the implementation of this HMMP has been provided through the section 7 consultation and issuance of the Biological Opinion, and addenda thereto.

1.2 Summary of Santa Ana Sucker Status and Ecology

The SAS was designated as a federally threatened species on April 12, 2000. Critical habitat was designated for this species on December 14, 2010.

1.2.1 Status and Critical Habitat

In 2010, an area of 9,331 acres in portions of rivers and creeks within San Bernardino, Los Angeles, Orange, and Riverside counties were designated as critical habitat for SAS (50 CFR Part 17) (USFWS 2010). The reduction in discharge to the Santa Ana River is located within Unit 1 (Santa Ana River) designated critical habitat for SAS, which comprises 7,097 acres (USFWS 2010). A majority of the proposed mitigation also occurs within Unit 1.

Status and Distribution

Santa Ana sucker was historically documented throughout the upper and lower portions of the Santa Ana River watershed, including the mainstem from near the current location of Seven Oaks Dam to approximately 14 miles below Prado Dam and multiple tributaries including City Creek, Warm Creek, Lytle Creek, Rialto Channel, Evans Lake drain, Tequesquite Arroyo, Sunnyslope Creek, Anza Park drain, and Chino Creek. In contrast to the species' range in the Los Angeles and San Gabriel Rivers, where the extant populations are in the upper portions of the watershed, the species is confined to the lowlands of the Santa Ana River watershed. Barriers to migration restrict the range of the SAS to approximately 21 miles from South La Cadena Drive in San Bernardino County to Prado Dam. The extent of habitat suitable for spawning in the mainstem is limited to the reach of the Santa Ana River upstream of River Road. Spawning is not currently known to occur below Prado Dam (USFWS 2017). The species is also known to occupy tributaries within this range, including Rialto Channel, Tequesquite Arroyo, Sunnyslope Creek, and Anza Park drain.

Currently the species occurs only within portions of the Santa Ana, Los Angeles, Santa Clara and San Gabriel River watersheds. Over 80 percent of the SAS's historical range has been lost in the Los Angeles River watershed, 75 percent within the San Gabriel River watershed and 70 percent in the Santa Ana River watershed (USFWS 2017). The Santa Clara River population was thought to have been transplanted from the Los Angeles Basin and was not protected when the species was listed.

Status and Distribution in the Vicinity of the Mitigation Areas

Mitigation is proposed within the mainstem Santa Ana River and in two mountain tributaries. As previously discussed within the upper Santa Ana River watershed, the species is primarily restricted to an approximate 21-mile stretch between La Cadena crossing of the Santa Ana River and Prado Dam. The species is no longer found within mountain tributaries to the Santa Ana River.

Annual SAS surveys within the Santa Ana River have documented significant fluctuations in estimated population size, ranging from 501 to 35,541 (Figure 1-1 and **Table 1-1**).

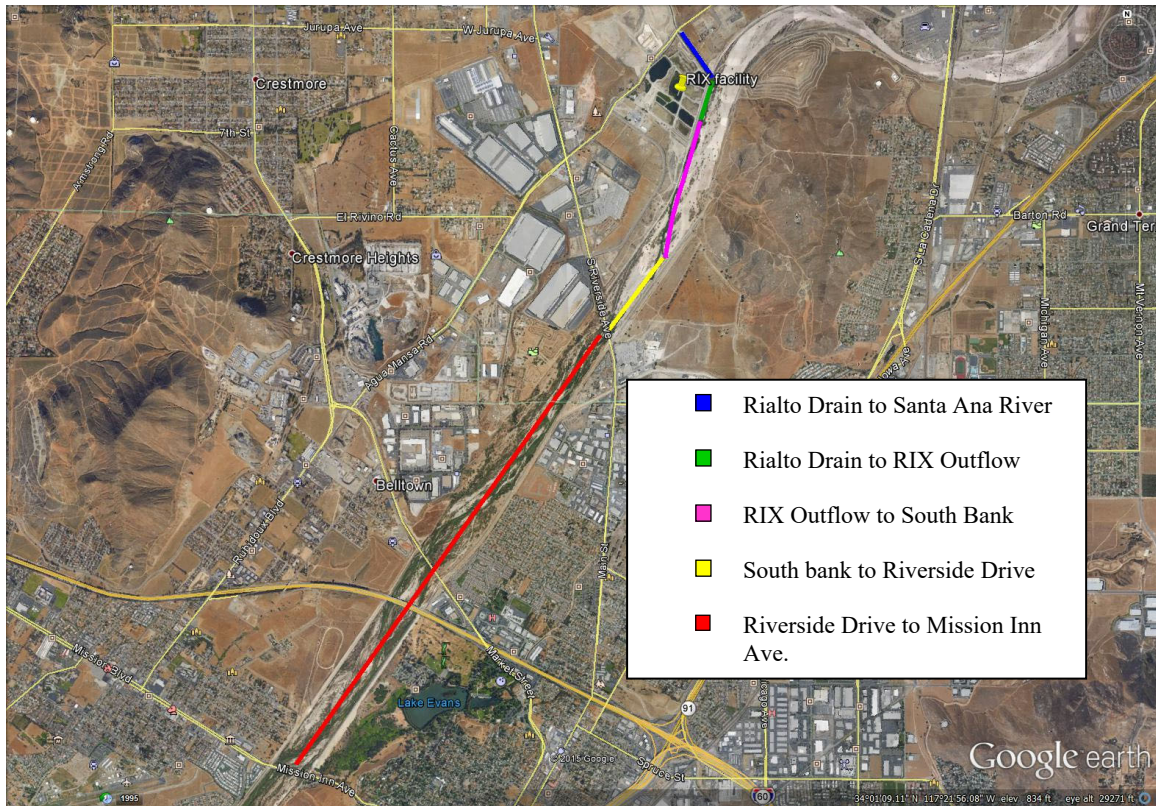


Figure 1-1
USGS Santa Ana Sucker Survey Locations, 2015 to 2020

TABLE 1-1
SANTA ANA SUCKER POPULATION ESTIMATES IN SANTA ANA RIVER

Year	Santa Ana Sucker Population Estimate ¹
2015	26,597
2016	35,541
2017	16,036
2018	5,584
2019	14,733
2020	501
2021	4,891 ²
2022	16,999 ²

¹ SOURCE: United States Geological Survey. 2023. Unpublished data.

² Survey area increased from approximately 4.4 miles (Rialto Channel to Mission Avenue, years 2015-20) to approximately 9 miles (Rialto Channel to Van Buren Avenue, years 2021-22) due to an observed shift in native fishes downstream. In 2021, 18 miles (Rialto Channel to River Road Bridge) were surveyed but native fish were only observed upstream of Van Buren Boulevard.

Threats to the Species

Main threats to the species include habitat destruction, natural and human-induced changes in stream-flow, urban development and related land-use practices, intensive recreation, introduction of nonnative competitors and predators, and demographics associated with small population size (USFWS 2017).

Threats to the Species in the Vicinity of the Mitigation Areas

Within the mainstem Santa Ana River downstream of the RIX facility, threats include nonnative aquatic predators, off-highway vehicle (OHV) traffic through spawning habitat, homeless encampments, and elevated water temperatures. The primary threat to SAS within the proposed mountain tributary stream mitigation sites include nonnative aquatic predators and habitat disturbance caused by stochastic events, including fire and flood.

1.2.2 Ecology and Habitat Needs

Habitat Affinities

The SAS occurs in watersheds associated with draining the San Gabriel and San Bernardino Mountains of southern California. Historically, this species extended from the uppermost watershed areas to the Pacific Ocean and have been known to occur both within steep mountain streams as well as those meandering through alluvial floodplains. This species inhabits perennial streams with water ranging in depth from inches to several feet and in currents ranging from slight to swift. Historically, suitable streams have been subject to periods of severe flooding as well as extended drought conditions typical of southern California weather (USFWS 2017).

The SAS is known to utilize various substrate types throughout each life stage. The presence of coarse substrates (gravel, cobble) with a mixture of sand provides the optimal stream conditions. This species also prefers in-stream and bank-side riparian vegetation that provides shade and cover, particularly for larvae and juveniles. However, such conditions are less important for adults as they utilize deeper, larger pools (USFWS 2017).

Tolerances to water quality variables (temperature, dissolved oxygen and turbidity) have not been determined; however, this species has been found to be most abundant in clear water, with temperatures less than 72 °F (USFWS 2017). Temperatures much above 86 °F are likely to be a limiting factor to movement and distribution of the species (USFWS 2010).

Life History

The SAS is a small, short-lived member of the sucker family (*Catostomidae*). They utilize the downward orientation of their mouthparts to suck up algae, small invertebrates and other organic matter (USFWS 2017).

Spawning of this species typically occurs between mid-February through July with peak activity occurring in April. Fecundity (number of eggs/offspring) is high and increases linearly as body weight increases. Spawning takes place over gravel riffles where fertilized eggs adhere to

substrate and hatch within 360 hours (15 days). Larvae measure approximately 0.28 inches (7 mm) at hatching.

1.2.2.1 Primary Constituent Elements

In 2010, the USFWS adopted a critical habitat designation that encompasses much of the SAR channel and City Creek. The designation published in the Federal Register on December 14, 2010, lists Primary Constituent Elements (PCE, renamed Physical and Biological Features) for the SAS as follows:

1. A functioning hydrological system within the historical geographic range of Santa Ana sucker that experiences peaks and ebbs in the water volume (either naturally or regulated) that encompasses areas that provide or contain sources of water and coarse sediment necessary to maintain all life stages of the species, including adults, juveniles, larvae, and eggs, in the riverine environment;
2. Stream channel substrate consisting of a mosaic of loose sand, gravel, cobble, and boulder substrates in a series of riffles, runs, pools, and shallow sandy stream margins necessary to maintain various life stages of the species, including adults, juveniles, larvae, and eggs, in the riverine environment;
3. Water depths greater than 1.2 in (3 cm) and bottom water velocities greater than 0.01 ft per second (0.03 m per second);
4. Clear or only occasionally turbid water;
5. Water temperatures less than 86° F (30° C);
6. Instream habitat that includes food sources (such as zooplankton, phytoplankton, and aquatic invertebrates), and associated vegetation such as aquatic emergent vegetation and adjacent riparian vegetation to provide: (a) Shading to reduce water temperature when ambient temperatures are high, (b) shelter during periods of high water velocity, and (c) protective cover from predators; and
7. Areas within perennial stream courses that may be periodically dewatered, but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.

Although the PCEs are not definitive habitat suitability criteria, they do provide some indication of target habitat features including for depth and velocity that could be affected by flow reduction. PCE number 3 identifies minimum velocity of 0.01 feet per second. However, other studies have shown that optimal velocity for SAS is likely in the range of 1.2 - 2.4 feet per second (Sakai, 2000), because these higher velocities move sand and silt from the cobble substrate, resulting in more favorable habitat. On behalf of the Upper Santa Ana River Habitat Conservation Plan, additional studies are currently being conducted to better understand habitat requirements of this species. Results from these studies are anticipated to augment our understanding of basic requirements of SAS identified in the PCEs and previous literature.

1.2.3 Recovery Plan for the Santa Ana Sucker

The Recovery Plan for the Santa Ana Sucker was developed to identify reasonable actions that may be necessary, based upon the best scientific and commercial data available, for the conservation and survival of SAS (USFWS 2017).

The goal of the recovery plan is to control or reduce threats to SAS to the extent that the species warrants delisting and no longer needs protection under the Act. The following objectives are identified in the recovery plan:

1. Develop and implement a rangewide monitoring protocol to accurately and consistently document populations, occupied habitat, and threats.
2. Conduct research projects specifically designed to inform management actions and recovery.
3. Increase the abundance and develop a more even distribution of SAS within its current range by reducing threats to the species and its habitat.
4. Expand the range of SAS by restoring habitat (if needed), and reestablishing occurrences within its historical range.

Recovery of a species occurs when threats have been sufficiently ameliorated based on delisting (or recovery) criteria. Delisting will be considered for SAS when the following conditions have been met in each of the recovery units (RUs), including the Santa Ana River.

1. **Present or threatened destruction, modification, or curtailment of habitat or range.** Adequate amounts of suitable habitat are restored, protected, and managed within each recovery unit to support viable populations of all life stages of SAS and provide resiliency and redundancy to protect against catastrophic events throughout the current range of the species.
2. **Predation.** Management is implemented to reduce competition and predation by nonnative species to levels determined to be necessary for the maintenance of viable SAS populations.
3. **Other natural or manmade factors affecting its continued existence.** The current range of the species is expanded through modification or removal of existing barriers, restoration of suitable habitat, and/or reintroduction of the species to areas within its historical range in a configuration that ensures reasonable certainty the remaining genetic makeup of the species has been preserved and can withstand catastrophic events in the watershed.

Appropriate gene flow is maintained between occupied areas of each RU, through natural processes or management, to ensure population viability and genetic exchange.

Stable or increasing population averaged over 15 years within each RU and occupancy including the following areas:

- Santa Ana River Watershed Recovery Unit –
 - Santa Ana River in the Prado Reach and Imperial Reach;
 - Four tributaries in the Prado Reach and/or Imperial Reach (for example Tequesquite Arroyo, Anza Drain, Hole Creek, Evans Drain, Sunnyslope Creek, Day Creek, Aliso Creek); and

- Three tributaries in the La Cadena Reach (for example City Creek, Lytle Creek, Cajon Wash, Alder Creek, Plunge Creek, Santa Ana River above Seven Oaks Dam).

A long-term monitoring and management plan is in place to evaluate the effectiveness of management actions to address ongoing threats and to identify new threats which may require implementation of adaptive management actions.

1.2.3.1 Summary of Recovery Actions

Recovery actions are considered by USFWS to be necessary to bring recovery of SAS and ensure its long-term conservation, and each action is assigned a priority based on what is most important for recovery of the species.

Priority 1: An action that is taken to prevent extinction or to prevent the species from declining irreversibly.

Priority 2: An action that is taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

Priority 3: All other actions necessary to provide for full recovery of the species.

Below is a summary of the recovery actions necessary to achieve SAS recovery.

1. Develop and implement a rangewide monitoring protocol to accurately and consistently document populations, occupied habitat, and threats (Priority 2, 3 for all RUs).
 - a. Develop a rangewide monitoring protocol including metrics related to the status of the Santa Ana sucker population (i.e., abundance, age structure, and distribution); metrics related to habitat suitability for each life stage (i.e., water quality and quantity, substrate, food sources); metrics related to the status of threats (i.e., hydrological modifications and barriers to dispersal, water quality, nonnative vegetation, and OHV use); and standardized data sheets.
2. Conduct biological research to inform management actions and recovery for the SAS.
 - a. Water Quality – Determine the sensitivity of SAS to water quality variables that may be altered by hydrological modification or regulated discharges (i.e., water temperature, dissolved oxygen, turbidity, etc.) (Priority 2 for Santa Ana River RU).
 - b. Hydrology – In areas with modified hydrology, determine hydrological processes necessary to maintain breeding, feeding, and sheltering habitat for the species (Priority 1 for Santa Ana River RU).
 - c. Sediment Transport – In areas with modified hydrology, evaluate sediment sources and transport to determine if sufficient sediment is available to maintain appropriate gradient and substrate composition for the species (Priority 1 in the Santa Ana River RU).
 - d. Suitable Habitat – Determine habitat conditions (i.e., gradient, water quality, water velocity, and substrate) that are conducive to supporting the SAS (Priority 2 for all RUs).
 - e. Nonnative Species – Determine how habitat suitability can be improved through reduction of nonnative aquatic species (Priority 2 in the Santa Ana River RU) and

- nonnative riparian vegetation (i.e., *Arundo donax* and *Tamarix ramosissima*) (Priority 3 for all RUs).
- i. Investigate the extent of impacts to invasive red algae (*Compsopogon caeruleus*) to SAS habitat within the Santa Ana River RU. If impacts are found to be significant, investigate management actions to remove or treat this nonnative to reduce impacts to sucker where it occurs (Priority 1 for Santa Ana River RU).
 - f. Genetics – Ensure the natural genetic diversity across the range of the species is preserved. Determine the genetic variation within and between watersheds where SAS occur (Priority 2 for all RUs).
 - g. Captive Propagation – Captive propagation may be necessary to assist in the recovery of the species due to the limited extent of suitable spawning habitat (Priority 1 for all RUs).
3. Increase the abundance and distribution of the SAS within its current range by reducing threats to the species and its habitat, including ameliorating hydrological modifications resulting from flood control and water conservation operations (Priority 1 for Santa Ana River RU).
 4. Increase the range of the SAS by restoring habitat (as needed), and reestablishing occurrences within its historical range.
 - a. Assess areas within the Santa Ana River RU for potential range expansion, followed by planning and implementation of habitat restoration and reintroductions. Areas to be considered for possible reintroduction include: Aliso Creek, Temescal Creek, Chino Creek, San Antonio Creek, Cucamonga Creek, Day Creek, Alder Creek, Santa Ana River above Seven Oaks Dam, Mill Creek, Lytle Creek, Cajon Wash, City Creek, Plunge Creek, Warm Creek, Mountain Home Creek, Bear Creek, and other potential tributaries (Priority 1).

CHAPTER 2

Summary of Proposed Actions and Santa Ana Sucker Conservation Measures

2.1 Project Area and Components

The proposed project is located within two municipalities, including the City of Highland, and City of San Bernardino. The SNRC has been constructed on approximately 20 acres, located east and west of North Del Rosa Drive between East 5th Street and East 6th Street in the City of Highland.

The SNRC would produce tertiary-treated water for reuse. A conveyance system including a pumping station and pipeline would be constructed to convey treated water from the SNRC to the Weaver Basins (a series of five new infiltration basins) for groundwater recharge, located south of Greenspot Road, north of Abbey way, east of Merris Street, and west of Weaver Channel in the City of Highland (Figure 2-1).

Most of the wastewater reaching the new treatment facility would be conveyed by gravity within the existing collection system. However, some modifications would be necessary to connect the existing collection system with the new treatment plant. Two lift stations and approximately 11,000 linear feet of forcemain would be installed within city streets west of the SNRC, as shown in Figure 2-1.



Figure 2-1
Project Components Overview

2.2 Santa Ana Sucker Conservation Measures

The project EIR stated that construction and operational impacts to biological resources would occur and require mitigation. Measures to reduce potential project-related impacts to avoid, minimize, and compensate for impacts to Santa Ana sucker are identified in mitigation measure BIO-3 of the EIR. BIO-3 requires the preparation and implementation of a HMMP that encompasses seven elements, identified as SAS-1 through SAS-7 (see below).

Conservation measures were also identified in the Biological Opinion (FWS-SB-16B0182-17F0387), issued March 9, 2017, and in amendments to the BO (amendment 1 (FWS-SB-16B0182-17F0387-R001 issued August 11, 2017) and amendment 2 (FWS-SB-16B0182-17F0387-R002 issued January 3, 2022), to avoid and minimize impacts to listed species and designated critical habitat and offset those impacts that would result from the project. The BO included all but one (SAS-4. High Flow Pulse Events) of the mitigation measures identified in the EIR as conservation measures. However, SAS-4 from the EIR was identified as a conservation recommendation in the 2017 BO (#6 RIX Facility – High Flow Pulse Events).

The Santa Ana sucker conservation measures listed below encompass those identified in the EIR and in Wastewater Change Order WW0095 (SAS-1 through SAS-7), and those identified in the

BO (CM.21.b.i through CM.21.b.vi). For some of the measures we are proposing an expanded effort/temporal change in timing of measure implementation based on data and information collected since drafting of the EIR and 2017 BO, and to provide greater flexibility for successful implementation. In combination, the conservation measures will reduce potential project-related impacts to avoid, minimize, and offset impacts to SAS while contributing to the long-term conservation of the species (ESA 2016). Relevant permitting from the USFWS and/or CDFW (e.g., state scientific collection permit, MOU, etc.), as appropriate, will be secured prior to implementation of the conservation measures.

- CM 21.b.i. (SAS-1): Habitat Node Creation (Microhabitat Enhancements). The HMMP will identify microhabitat enhancements within the upstream reach of the affected river segment using natural materials to increase scour and pool formation. This could include placement of large boulders and/or large woody debris (nodes) to increase velocity of flow and gravel bar patches as well as deep pool refugia areas. This measure will enhance stream habitat within at least 1.5 acres of SAS-occupied habitat along approximately 2.5 miles of river, as measured in fall by the areas of pools created, gravel cobble substrates exposed, and other functional habitat features created/enhanced.
 - Flexibility in enhancement area and expanded Effort (identified in the Supplemental BA; proposed for inclusion in CDFW EPIMS-SBR-42496-R6): To provide greater flexibility for implementation (and overcome landowner access permissions) microhabitat enhancements can be created within an area greater than the upstream reach of the affected river segment, i.e., enhancement can be created between RIX outfall and Van Buren Boulevard (or elsewhere along the mainstem Santa Ana River if determined beneficial to the species). Also, an additional 0.5 acre of microhabitat enhancements (total of 2.0 acres) will be maintained temporally during dry rainfall years (≤ 14.7 inches¹) until Upper Watershed Population Establishment has occurred (CM.21.b.v.). Nodes would be reinstalled periodically when needed to maintain effectiveness.
- CM 21.b.ii. (SAS-2): Aquatic Predator Control Program. The HMMP will include an Aquatic Predator Control Program to be implemented between Rialto Channel downstream to Van Buren Boulevard (or elsewhere along the mainstem Santa Ana River if determined beneficial to the species), focusing on areas of highest ecological value to SAS reproduction (currently from Rialto Channel downstream to approximately Mission Boulevard and in mainstem tributaries). The nonnative aquatic predator removal program will be focused on reducing the abundance of nonnative aquatic predators immediately preceding the start of the SAS spawning season (approximately March 1). The control effort will occur a minimum of one time per year outside of the SAS spawning season (August 1 to February 28), using electrofishing or other techniques as approved by the USFWS and CDFW.
 - Expanded Effort (identified in the Supplemental BA; proposed for inclusion in CDFW EPIMS-SBR-42496-R6): Nonnative species will be removed a minimum of two times per year until Upper Watershed Population Establishment has occurred (CM.21.b.v.), at which point the effort will be reduced to a minimum of one time per year. Control will be implemented outside of the SAS spawning season (August 1 to February 28), using electrofishing or other techniques as approved by the USFWS and CDFW.

¹ Measured in San Bernardino, CA.

- CM 21.b.iii. (SAS-3): Exotic Weed Management Program. The HMMP will include an Exotic Weed Management Program targeting the removal of nonnative species such as giant reed, tamarisk, castor bean, tree of heaven, etc. The HMMP will include an annual maintenance and performance goal for nonnative plant removal within the upper reach of the affected river segment. The weed removal efforts will occur within an approximate 4.2-mile stretch of the Santa Ana River (e.g., Rialto Channel to Mission Boulevard Bridge, or, depending on landowner permissions, from Market Street Bridge to Anza Creek).
 - Flexibility in weed management implementation area (identified in Supplemental BA; proposed for inclusion in CDFW EPIMS-SBR-42496-R6): To provide greater flexibility for implementation based on landowner access permissions, the geographic area of implementation can be expanded to include management between Market Street Bridge and Anza Creek.
- SAS-4: High Flow Pulse Events. The HMMP will identify means to create high flow pulse events as needed based on substrate conditions, up to 2 times per year. The high flow pulse events would be designed to flush out fine sediment from the upstream reach of the affected river segment and would be implemented through a cooperative agreement with the City of San Bernardino Municipal Water Department and/or the City of Rialto.
- CM 21.b.iv (SAS-5): Rialto Channel Water Temperature Management. The HMMP will identify methodology to reduce water temperature in Rialto Channel to tolerable levels (less than 86 degrees Fahrenheit) during summer months.
 - Flexibility in location and timing of water temperature amelioration (identified in Supplemental BA; proposed for inclusion in CDFW EPIMS-SBR-42496-R6): Rialto Channel/Santa Ana River Water Temperature Amelioration Project. The HMMP will identify funding to be committed by EVWD to contribute towards implementation of a proposed measure(s) to ameliorate Rialto Channel and/or Santa Ana River water temperatures to <86 degrees Fahrenheit. Proposed measures/strategies to reduce water temperature will be developed following completion of a larger-scale water temperature monitoring study (to be completed by the Upper Santa Ana River Habitat Conservation Plan applicants).
- CM 21.b.v. (SAS-6): Upper Watershed SAS Population Establishment. The HMMP will outline a plan for establishing two new locations of Santa Ana sucker within City Creek and Hemlock Creek, or other suitable watershed tributary, in coordination with the Wildlife Agencies. The HMMP will identify measures to directly increase the number of Santa Ana sucker in the SAR population, increase the amount of suitable and occupied habitat in this watershed, and distribute the risk of a catastrophic event between multiple locations. At least one translocation of SAS will have occurred with data provided to the USFWS and CDFW indicating that the nascent population is healthy, reproducing, and appears to be successfully establishing. The HMMP will also identify the amount of financial assistance to be provided by EVWD for the regionally-beneficial population establishment program. Success criteria shall include, but not be limited to, a stable or increasing population averaged over 5 years within City Creek or other suitable tributary within the upper Santa Ana River watershed.
 - Flexibility in implementation timing (identified in Supplemental BA; proposed for inclusion in CDFW EPIMS-SBR-42496-R6): Flexibility in timing of translocation is needed to address downstream landowner concerns. A financial security is also proposed to provide assurances that the translocations will be implemented as soon as possible.

- CM 21.b.vi. (SAS-7): Hydrology Monitoring. The HMMP will outline a monitoring program to collect hydrology data in the segment of river between the RIX discharge and Mission Boulevard. The data will include flow velocity, temperature and depth.
 - Flexibility in monitoring area requested to overcome landowner access permissions. Monitoring area will be coterminous with areas covered by SAS 1-5.

2.3 Mitigation Areas and Population Establishment

In order to offset operational project impacts associated with the proposed diversion of 6 MGD from the RIX Tertiary Treatment Facility discharge, implementation of the conservation measures identified in Section 2.3 are proposed within the Santa Ana River between RIX and River Road and within two mountain tributaries to the Santa Ana River (collectively referred to as the mitigation areas) (**Figure 2-2**).



Figure 2-2
Mitigation Areas

CHAPTER 3

Framework for Implementation

3.1 Responsible Parties and Roles

3.1.1 Project Sponsor

East Valley Water District (EVWD) is responsible for implementation of all mitigation measures identified in the EIR and Biological Opinion, as amended. The EVWD contact for the project is:

East Valley Water District
31111 Greenspot Road
Highland, CA 92346

Contact: Jeff Nolte, Director of Engineering & Operations
jnoelte@eastvalley.org
(909) 888-8986

3.1.2 Implementation and Agency Coordination

This HMMP will be reviewed and approved by the USFWS under their authority to enforce the federal Endangered Species Acts, and by the California Department of Fish and Wildlife (CDFW). The proposed diversion of 6 MGD from the RIX Tertiary Treatment Facility discharge will not occur until this HMMP has been approved by USFWS and CDFW. This HMMP will be implemented by a contracted, qualified and permitted entity such as the Riverside-Corona Resource Conservation District (RCRCD), qualified hydrologists, as well as other staff or contractors as needed, in coordination with the USFWS and CDFW.

3.2 Implementation Process

3.2.1 Plan Development

This HMMP outlines a monitoring framework to evaluate the effectiveness of mitigating the potential operational effects of the SNRC project on SAS and guide adaptive management. The HMMP describes project objectives, defines expected or desired outcomes, and describes monitoring activities to track progress toward objectives and compliance with regulatory permits during the initial implementation phase.

If monitoring reveals issues that require more in-depth study to reduce uncertainty for management, then the Project Sponsor, with input from experts, will identify and prioritize key questions for further monitoring or study. Focused investigations would be developed and implemented separately, based on priority and availability of funding and expertise.

3.2.1.1 Relationship to Recovery Actions

The HMMP has been prepared in consideration of the recovery actions identified in the recovery plan, and plan implementation will aid in species recovery, as shown in **Table 3-1**.

TABLE 3-1
RELATIONSHIP TO RECOVERY ACTIONS

Conservation Measure ID	Habitat Improvement Action	Relationship to Recovery Actions
CM 21.b.i. (SAS-1)	Microhabitat Enhancements	This measure will result in the creation of suitable habitat features within the Santa Ana River (Recovery Actions #1, 2d, and 3).
CM 21.b.ii. (SAS-2)	Aquatic Predator Control Program	This measure conducts biological research to inform management actions and recovery for the SAS through the removal of aquatic predators (Recovery Actions #2e and 3).
CM 21.b.iii. (SAS-3)	Exotic Weed Management Program	This measure conducts biological research to inform management actions and recovery for the SAS through the removal of exotic weeds within the riparian corridor (Recovery Actions #2e and 3).
SAS-4	High Flow Pulse Events	This measure will result in high flow pulse events based on substrate conditions (Recovery Actions #2c, 3).
CM.21.b.iv (SAS 5)	Rialto Channel/ Santa Ana River Water Temperature Amelioration Project	This measure will involve monitoring water temperature conditions within Rialto Channel and the Santa Ana River to identify potential locations and seasonal timing implementing a strategy to ameliorate water temperatures to less than 86 degrees in Rialto Channel only during summer months. The revised effort in the Supplemental BA proposes funding to be committed by EVWD to contribute towards implementation of a proposed measure(s) to ameliorate Rialto Channel/Santa Ana River water temperatures to <86 degrees Fahrenheit. Potential measures/strategies to reduce water temperature will be developed following completion of a larger-scale water temperature monitoring study (to be completed by others) (Recovery Actions #2a, 2b, and 3).
CM 21.b.v. (SAS-6)	Upper Watershed SAS Population Establishment	This measure increases the current range of the SAS by re-establishing SAS populations within its historical range of City Creek (Recovery Actions #3 and 4).
CM 21.b.vi. (SAS-7)	Hydrology Monitoring	This measure will involve monitoring hydrology and water quality for conditions optimal for SAS (Recovery Actions #2a, 2b and 3).

3.2.2 Monitoring and Adaptive Management

Monitoring and adaptive management is an iterative approach that uses regular monitoring and assessments to evaluate progress towards project objectives. Adaptive management acknowledges that uncertainties exist in predicting how project implementation affects important resources and provides a scientific and institutional framework for adjusting future management decisions as understanding of the ecosystem improves (Williams et al. 2009). The SNRC project follows the steps of the adaptive management cycle:

- (1) Plan – Identify goals and objectives and identify uncertainties and key questions for assessment.
- (2) Design – Summarize designs and operational scenarios for optimal habitat parameters.
- (3) Implement –Construct and/or implement conservation measures.

- (4) Monitor – Describe monitoring methods for measuring indicators of desired outcomes and triggers of management actions.
- (5) Evaluate – Analyze, synthesize, and manage data to document project outcomes, assess progress toward objectives, detect any negative outcomes, and reduce uncertainty.
- (6) Adapt and Learn – Communicate findings to decision-makers and managers to determine if and when to adjust management actions and/or monitoring to improve project performance and inform future actions.

The effectiveness of actions will be assessed by measuring physical and biological indicators of expected or desired project outcomes. Status and trends of these indicators will be measured to evaluate progress toward objectives and to detect potential issues that may trigger a management response. An adaptive approach will be used to prioritize and phase monitoring elements for efficiency and cost-effectiveness.

The scientists and managers responsible for implementation of the HMMP will annually synthesize and analyze the monitoring data. An overall review will be conducted annually to evaluate project performance. A decision-making framework will guide recommendations for maintaining or adjusting operations.

The HMMP is a living document, flexible enough to respond to unanticipated events and to accommodate lessons learned. Each year, the field sampling program will be evaluated and updated, if necessary, in annual reports to be prepared by the Project Sponsor or qualified contractors on behalf of the Project Sponsor.

3.2.2.2 Relationship to Primary Constituent Elements

The design, implementation, monitoring and maintenance of habitat improvements within the mitigation areas are geared towards improving the PCEs for the SAS identified in Section 1.2.2.1.

Table 3-2 identifies the PCEs that would be improved as it relates to each habitat improvement action.

**TABLE 3-2
RELATIONSHIP TO PRIMARY CONSTITUENT ELEMENTS**

Conservation Measure ID	Habitat Improvement Action	Relationship to Primary Constituent Elements (aka: Physical and Biological Features)
CM 21.b.i. (SAS-1)	Microhabitat Enhancements	PCE #1, 2, 3, 6
CM 21.b.ii. (SAS-2)	Aquatic Predator Control Program	PCE #1
CM 21.b.iii. (SAS-3)	Exotic Weed Management Program	PCE #1, 3, 6
SAS-4	High Flow Pulse Events	PCE #1, 2,
CM 21.b.iv (SAS-5)	Rialto Channel/ Santa Ana River Water Temperature Amelioration Project	PCE #1, 5
CM 21.b.v. (SAS-6)	Upper Watershed SAS Population Establishment	PCE #1, 2, 3, 4, 5, 6, 7
CM 21.b.vi. (SAS-7)	Hydrology Monitoring	PCE #1, 3, 4, 5

3.2.3 Evaluation and Reporting

Monitoring procedures, approach, and schedule may be assessed following each monitoring event. Adjustments to the monitoring program may be recommended due to changing site conditions, newly available research data, ability to combine efforts with other related research, or if monitoring methods are determined too difficult or impractical to implement. Minor adjustments are expected to occur over the monitoring period to maintain completeness and feasibility of the monitoring program.

3.2.4 Anticipated Schedule

The anticipated schedule for implementation, monitoring and adaptive management of the SAS habitat improvements are summarized in **Table 3-3** below, and also discussed in further detail in subsequent chapters.

**TABLE 3-3
MONITORING AND ADAPTIVE MANAGEMENT SCHEDULE**

Metric	Frequency	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Microhabitat Enhancements													
Construct habitat features	Variable								●	●	●	●	
Habitat assessment	Annual									●			
Maintenance of habitat features	When Necessary		●						●		●		●
Aquatic Predator Control													
Predator removal	Semi-annual (Oct-Feb) (at minimum)	●									●		

Metric	Frequency	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Exotic Weed Management													
Exotic weed removal (Years 1 - 5)	Three times per year (minimum)		●							●			●
Exotic weed removal (Years 6+)	Semi-annual (minimum)		●								●		
(High Flow) Pulse Events													
Implementation	Up to two times per year (timing will be adaptive to minimize impacts and maximize benefits)			●				●					
Monitoring (Year 1)	Annual (pre/post pulse)			●	●								
Monitoring (Years 2+)	Annual (up to 2)			●				●					
Rialto Channel/Santa Ana River Amelioration Project													
Project Implementation	Once												
Project Monitoring	Continuous	●	●	●	●	●	●	●	●	●	●	●	●
Project Maintenance	As-needed												
Upper Watershed SAS Population Establishment													
Implementation	Once					●							
Population Establishment	Monitoring	●			●						●		●
Population Management	Quarterly (at minimum)		●			●			●			●	
Hydrology Monitoring													
Monitoring (Year 1)	Monthly	●	●	●	●	●	●	●	●	●	●	●	●
Monitoring (Years 2+)	Quarterly		●			●			●			●	
Management Decisions													
Annual Report	Annual												●
Management Review	Annual, or more often as needed	●											
Workplan Adjustments	Annual, or more often as needed		●	●									

CHAPTER 4

Microhabitat Enhancements (CM 21.b.i., SAS-1)

The goal of this Conservation Measure is to increase the amount of SAS-suitable microhabitat within the occupied reach of the Santa Ana River. The goal will be achieved through installation of natural structures in the river to create/enhance suitable substrate/in-stream conditions for the benefit of Santa Ana sucker. A minimum of 1.5 acres of habitat will be enhanced along approximately 2.5 miles of the SAS-occupied reach of the Santa Ana River. To provide greater flexibility for implementation based on landowner access permissions, the area to be enhanced is expanded to include between the RIX outfall and Hidden Valley Wildlife Area (or as approved by USFWS and CDFW).

The Supplemental BA proposes an additional 0.5 acre of microhabitat enhancements (total of 2.0 acres) to be maintained temporally during dry rainfall years (<14.7 inches²) until Upper Watershed Santa Ana Sucker Population Establishment has occurred (see CM 21.b.v). Enhancement of a minimum of 1.5 acres of microhabitat will be implemented in perpetuity.

4.1 Location, Timing, and Implementation Materials and Methods

Santa Ana sucker are currently threatened by water diversions; alteration of stream channels; changes in the watershed that result in erosion and debris flows; pollution; habitat fragmentation and predation by nonnative fishes (USFWS 2010). The physical stabilization of riverbanks associated with urbanization increases river flow velocities, exacerbating downstream bank erosion, and leading to channel narrowing and bed degradation (EDAW and SMEA 2009). Narrowing results in loss of shallow-water riverine habitat and floodplain connections, eliminating variation in water depth, stream flow velocity, temperature regimes, and sediment size necessary to maintain habitat complexity required for different SAS size classes (Even and Baskin 2010).

Santa Ana sucker have a wide range of life stage specific habitat requirements needed to sustain SAS populations in good health. Habitat needs range from shallow, sandy edgewater habitat for larval rearing, to medium-depth mid-channel habitat with gravel substrate for spawning, to deepwater habitat for adult holding. Habitat suitability parameters in **Table 4-1** were developed by Aspen (2016) from a habitat suitability assessment of the Big Tujunga Wash SAS population (Appendix A), in addition to a literature review of previous SAS habitat suitability studies.

² Measured in San Bernardino, CA.

TABLE 4-1
SANTA ANA SUCKER HABITAT SUITABILITY CRITERIA

Microhabitat Type	Life Stage	Use	Substrate Type	Depth (cm.)
Shallow edge water	Larval	Rearing/holding	Silt/Sand	0.2–5.0
Mid channel	Juv/Adult	Rearing/feeding	Gravel/Cobble	11.0 to 65.0
Scout Pools	Juv/Adult	Holding	Sand/Gravel/Cobble	31.0-71.0

Annual habitat assessment monitoring will be conducted in the SAS-occupied reach of the Santa Ana River to assess the quality of habitat available to support all life stages of SAS (See Monitoring and Adaptive Management section below). Stream reaches lacking suitable habitat for one or more life stages of SAS will be targeted for habitat enhancement (contingent on access permissions from landowners). This could include placement of wooden stake arrays, and/or large boulders/large woody debris (nodes) to increase velocity of flow, placement of gravel bar patches to provide substrate for spawning and food production, as well as creation of deeper water areas. A minimum of six (6) nodes would be installed along approximately 2.5 miles of the SAS-occupied reach of the mainstem Santa Ana River downstream of the RIX discharge (location of nodes will be subject to landowner access permissions). The nodes would create a minimum of 1.5 acres of habitat, as measured in fall. The Supplemental BA identifies an additional 0.5 acre of microhabitat enhancements (total of 2.0 acres) to be maintained temporally during dry rainfall years (≤ 14.7 inches) until Upper Watershed Population Establishment has occurred (CM 21.b.v). Nodes would be reinstalled on an as-needed basis to maintain habitat enhancement target acreages.

Based on fish-habitat relationships observed in the Big Tujunga Wash SAS population, along with habitat suitability relationships from previous SAS studies, Aspen (2016) provided target parameters for microhabitat enhancements in the SNRC project area. **Table 4-2** details the primary habitat components recommended for microhabitat enhancements, modified from Aspen (2016) Table 2. Occupied reaches within the mainstem Santa Ana River lacking these key target physical parameters would be prioritized for microhabitat enhancements (subject to landowner access permissions).

TABLE 4-2
TARGET PHYSICAL PARAMETERS AND SUCCESS CRITERIA FOR MICROHABITAT ENHANCEMENTS

Habitat Component	Habitat Description	Success Criteria
Riffle/Scour Pool	Swift and/or turbulent flows (1.2 to 2.4 ft/sec).	Present (flow velocity able to transport sand)
Coarse Substrate	Gravel/Cobble/Boulder	1.5 acres minimum. Substrate cover: minimum 10% gravel/cobble Additional 0.5 acre (for a total of 2.0 acres minimum) (during dry years, until implementation of CM 21.b.v)

The location of microhabitat enhancements within the SNRC project area would be informed by habitat assessments that identify reaches lacking one or more key target physical parameters detailed in **Table 4-3**. Nodes would be sited within the mainstem river or side channels to create “stepping stones” or patches of habitat to link tributary restoration projects proposed under the HCP. An example of a stepping stone habitat patch includes the creation of an island or gravel bar in a streambed composed primarily of sand.

In early 2022 a pilot microhabitat enhancement study was initiated along the Santa Ana River using rounded wooden stakes (SBVMWD 2022; Appendix A). The stakes provided the opportunity to study a low-cost, low-impact, and timely strategy to manipulate velocity to enhance microhabitat conditions for SAS. Based on preliminary results from this effort an expanded project was initiated. To support the expanded effort a Section 401 Water Quality Certification for Small Habitat Restoration Projects was received from the Santa Ana Regional Water Quality Control Board on April 4, 2022 (Appendix A), with concurrence received from the California Department of Fish and Wildlife under the Habitat Restoration and Enhancement Act on May 25, 2022 (Appendix A).

Stake arrays were installed in two project locations along the Santa Ana River between October and December 2022. The arrays were monitored weekly from October through December 2022. Substrate data (gravel cover) was collected during each site visit, and water quality data was collected at three time points. Data from this study indicated that the stake arrays can have a beneficial effect on enhancing stream habitat for native fishes. Though results were observed to vary between features, all stake arrays produced an increase in gravel cover (see SBVMWD 2022; Appendix A).

Based on success of the 2022 pilot microhabitat enhancement, the project was expanded in 2023. Six microhabitat nodes were established in the Santa Ana River, between the Riverside County line and Hidden Valley Wildlife Area, with each node comprised of multiple stake arrays. To date 22 stake arrays are installed across the six habitat node locations. Data were collected monthly throughout 2023. As of mid-October 2023, 1.5 acres of microhabitat enhancement for the benefit of Santa Ana sucker have been created, with sucker observed occupying the enhancement areas (SBVMWD 2023).

TABLE 4-3
MICROHABITATS ENHANCEMENT SCHEDULE

Monitoring Year	Timing
Year 1	<p>Late Summer through late Winter (August - February).</p> <p>Installation of a minimum of six node areas, or sufficient quantity to create a minimum of 1.5 acres of microhabitat enhancement. Installation of large projects will be conducted during the summer-winter to avoid the spawning season and high flow events during construction. Small projects may be constructed year-round to achieve acreage targets but will minimize impacts to SAS to the greatest extent practicable.</p> <p>Additional 0.5 acre of microhabitat enhancement (for a total of 2.0 acres minimum) during dry years, until implementation of CM 21.b.v.</p>

Years 2+	Year-round (depending on severity of potential impacts) Maintenance of enhancement sites or creation of additional enhancement sites to achieve acreage targets may be conducted year-round but will minimize impacts to SAS to the greatest extent practicable.
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4.2 Monitoring and Adaptive Management

Habitat assessment monitoring will be conducted throughout the year to track the suitability of habitat for SAS before, during, and following microhabitat enhancements. Quantification to demonstrate achievement of acreage targets will be measured in the fall by area of pools created, gravel/cobble substrates exposed, and other functional SAS habitat features created/enhanced.

Annual monitoring will include water quality, visual estimates of substrate cover, and fish surveys.

Ongoing monitoring and adaptive management will be employed to ensure successful creation and maintenance of suitable habitat for SAS. **Table 4-4** summarizes the timing of the microhabitat enhancement monitoring schedule.

**TABLE 4-4
MICROHABITATS ENHANCEMENT MONITORING SCHEDULE**

Year	Timing
Years 1	Monthly or more frequently to detect development of suitable habitat. Fall (September) metrics will provide data for success criteria.
Years 2+	Fall (September) surveys will track suitability of habitat. Adaptive management measures will be implemented should acreage targets not be achieved/maintained.

4.3 Maintenance

Ongoing surveys may trigger additional maintenance of microhabitat enhancement sites. If microhabitat enhancement sites are observed to not provide suitable habitat as expected during annual habitat assessment surveys, or if SAS are not observed using habitat enhancement areas created by the nodes, maintenance of enhancement sites will be conducted to further modify the habitat to better support SAS (**Table 4-5**). Ongoing surveys will trigger adaptive management as needed.

**TABLE 4-5
MICROHABITATS ENHANCEMENT MAINTENANCE SCHEDULE**

Maintenance	Interval
All Years (1+) – Site maintenance	Ongoing maintenance, as needed.

4.4 Performance Criteria and Reporting

The goal of the microhabitat enhancement work is to enhance perennial stream habitat within the occupied reach of the mainstem Santa Ana River. At least 1.5 acres of habitat will be enhanced and maintained in-perpetuity. The Supplemental BA identifies an additional 0.5 acres of enhancement (total of 2.0 acres) to be created and maintained during dry rainfall years (<14.7 inches) temporally until Upper Watershed Population Establishment has occurred (see Chapter 9). Quantification of acreage enhanced will be measured in the fall, by area of pools created, gravel/cobble substrates exposed (minimum of 10% gravel/cobble coverage), and other functional SAS habitat features created/enhanced. Enhanced habitat is anticipated to provide suitable habitat for all life stages of SAS, in perpetuity. Successful enhancement will be demonstrated through achievement of acreage goals and presence of SAS, as shown in **Table 4-6**.

TABLE 4-6
MICROHABITATS ENHANCEMENT SUCCESS CRITERIA

Milestone	Success Criteria	Remedial Measures
All years	Habitat nodes installed/constructed as designed.	Modify installation/construction to meet initial design criteria.
	Microhabitat enhancement areas support SAS physical parameters (see Table 4-2) and encompass a minimum of 1.5 acres.	Modify enhancement sites to provide SAS target physical parameters.
	An additional 0.5 acres (total of 2.0 acres) will be maintained during dry rainfall years until Upper Watershed Population Establishment has occurred.	Modify enhancement sites to provide SAS target physical parameters.
	Documented presence of SAS utilizing or within the vicinity of enhanced habitat.	

The HMMP annual monitoring report will include field notes and datasheets from individual monitoring visits throughout the year. The annual report will include summaries of the project area habitat assessments, documented occurrences of SAS, detailed habitat characteristics of each microhabitat enhancement site, a review of progress of attainment of the performance criteria, and any recommended remedial measures.

4.5 In-Perpetuity Monitoring and Management

Once the monitoring associated with the microhabitat enhancements has met the Year 1 performance criteria, and concurrence of achievement of success criteria has been received from the USFWS and CDFW, monitoring associated with this conservation measure will continue in perpetuity. If the HCP is adopted prior to or during implementation of this HMMP, the monitoring and reporting associated with this measure will be carried forward into the HCP's monitoring and reporting program.

CHAPTER 5

Aquatic Predator Control Program (CM 21.b.ii., SAS-2)

The goal of this Conservation Measure is to reduce the abundance of nonnative aquatic predators within the Santa Ana River, thereby increasing the amount of suitable habitat for SAS. The goal will be achieved through the implementation of field methodology to reduce the abundance and distribution of SAS aquatic predators. A minimum of one control effort, focusing on areas identified during native fish surveys as needing aquatic predator control along the Santa Ana River will be implemented immediately preceding the start of the SAS spawning season.

The Supplemental BA proposes a minimum of two control efforts per year, to be implemented temporally until Upper Watershed Santa Ana Sucker Population Establishment has occurred (Chapter 9), at which point the effort will be reduced to a minimum of one time per year. Control will be implemented in-perpetuity. Relevant permitting from the USFWS and/or CDFW (e.g., state scientific collection permit, MOU, etc.), as appropriate, will be secured prior to implementation of the Aquatic Predator Control Program.

5.1 Location, Timing, and Target Exotic Species

The SAS recovery plan identifies predation by nonnative species as a threat to SAS population recovery (USFWS 2017). Therefore, an aquatic predator control program will be implemented to target and remove concentrated densities of potential nonnative predator species, including exotic fish, amphibians, and reptiles. Targeted removal efforts and targeted species shall be based on the most recent native fish survey data.

Annual native fish surveys conducted since 2015 in the Santa Ana River have identified multiple nonnative aquatic predators of SAS (USGS 2023). The four most abundant nonnative aquatic predators observed were mosquito fish (*Gambusia affinis*), American bullfrog (*Lithobates catesbeianus*), largemouth bass (*Micropterus salmoides*), and yellow bullhead catfish (*Ameiurus natalis*).

If predator hotspots are identified, nonnative aquatic predators will be removed at least one time per year, occurring immediately preceding the spawning season using electrofishing or other techniques identified in the Nonnative Aquatic Species Control Plan (ICF 2023; Appendix B). The Supplemental BA proposes to temporally increase the number of control efforts to a minimum of two times per year until implementation of the Upper Watershed Santa Ana Sucker Population Establishment has occurred (Chapter 9). See below for a proposed schedule for conducting nonnative aquatic control (**Table 5-1**).

**TABLE 5-1
NONNATIVE AQUATIC PREDATOR CONTROL SCHEDULE**

Monitoring Year	Timing
Year 1	August 1 to February 14 Control efforts will occur outside of the SAS spawning season focusing on areas of highest ecological value to SAS or areas that may provide source populations of predators.
Years 2+	Same as above, or expanded effort as warranted, in perpetuity.

Aquatic predator control efforts were initiated in 2015 and have occurred on an annual basis coincident with annual native fish surveys. Table 5-2 provides a summary of aquatic predator control efforts.

**TABLE 5-2
ANNUAL COUNT OF NONNATIVE AQUATIC PREDATORS REMOVED FROM THE SANTA ANA RIVER**

Species	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
African Clawed Frog	0	0	13	0	1	2	0	2	2	20
Black Bullhead	0	0	0	0	12	18	1	0	0	31
Bluegill Sunfish	0	0	0	0	0	0	1	1	0	2
Bullfrog	0	182	15	1	1	4	30	36	0	269
Channel Catfish	0	0	0	0	0	3	12	479	50	544
Common Carp	0	0	0	0	16	12	3	8	5	44
Fathead Minnow	0	0	0	1	1	0	16	0	0	18
Green Sunfish	0	16	1	0	35	0	48	7	12	119
Largemouth Bass	0	1	0	9	497	237	206	101	22	1073
Prickly Sculpin	0	0	1	0	3	0	0	0	1	5
Red Swamp Crayfish	3	45	39	0	2	8	89	339	0	525
Red-Eared Slider	0	0	0	0	1	0	0	2	0	3
Softshell Turtle	0	0	1	0	1	0	1	0	0	3
Tilapia	0	0	1	0	0	0	0	0	0	1
Western Mosquitofish	414	4154	1236	34	376	58	280	2533	210	9295
Yellow Bullhead	496	1254	121	39	620	1006	525	2328	91	6480
Total	913	5652	1428	84	1566	1348	1212	5836	393	18432

5.2 Control Methods

See the Nonnative Aquatic Species Control Plan (ICF 2023; Appendix B) for various methods to control predator species. Relevant permitting from the USFWS and/or CDFW (e.g., state scientific collection permit, MOU, etc.), as appropriate, will be secured prior to implementation of control measures.

5.3 Monitoring and Adaptive Management

As shown in the monitoring schedule in **Table 5-3**, at minimum, annual surveys will be conducted as part of juvenile and/or adult native fish surveys to identify the species, distribution, and density of nonnative aquatic predators. The identification of predator hotspots will trigger the planning for removal efforts following surveys.

Survey monitoring may also identify habitat features supporting the presence of nonnative aquatic predators, such as deep pools. Habitat features supporting predator hotspots may be recommended for modification to reduce the threat to SAS. Subsequent surveys following modifications can monitor the effectiveness of habitat modification efforts.

TABLE 5-3
NONNATIVE AQUATIC PREDATOR CONTROL MONITORING SCHEDULE

Year	Timing
Year 1+	Minimum annual survey to identify potential nonnative aquatic predator hotspots(fall), and minimum of one control effort annually. Supplemental BA proposes temporal increase in control effort to two times per year until the Upper Watershed Santa Ana Sucker Population Establishment has occurred).

5.4 Performance Criteria and Reporting

The SAS recovery plan calls for implementation of management to reduce competition and predation by nonnative species to levels determined to be necessary for the maintenance of viable SAS populations. See **Table 5-4** for success criteria associated with nonnative aquatic species management.

TABLE 5-4
NONNATIVE AQUATIC PREDATOR CONTROL SUCCESS CRITERIA

Milestone	Success Criteria	Remedial Measures
Year 1	Densities of aquatic predators are low and not causing localized extirpation of native fishes within the mainstem river	Conduct targeted removal efforts at locations with high densities of aquatic predators. Potential habitat manipulation if habitat features are identified that support high predator densities.

Milestone	Success Criteria	Remedial Measures
Year 2+	Same as above but will also include mainstem tributary streams.	Same as above, as necessary. Tributary streams will be sequentially enhanced through targeted removal efforts.

The HMMP annual monitoring report will include field notes and datasheets from individual monitoring visits throughout the year. The annual report will include the list of detected nonnative aquatic predators, their relative abundance and distribution, a review of progress of attainment of the performance criteria and recommended remedial measures, where relevant.

5.5 In-Perpetuity Monitoring and Management

Monitoring and control of nonnative aquatic predators within the Santa Ana River will continue in-perpetuity. Monitoring and management activities will be summarized in the HMMP annual report submitted to the USFWS and CDFW. If the HCP is adopted prior to or during implementation of this HMMP, the monitoring and reporting associated with this measure will be carried forward into the HCP's monitoring and reporting program.

CHAPTER 6

Exotic Weed Management Program (CM 21.b.iii., SAS-3)

The goal of this Conservation Measure is to reduce competitive stress to native vegetation by decreasing nonnative plant cover along approximately 4.2 miles of the Santa Ana River between Rialto Channel and the Mission Boulevard Bridge. The goal will be achieved through the implementation of field methodology to reduce the abundance and distribution of perennial, targeted nonnative plant species, with a focus on giant reed (*Arundo donax*), tamarisk (*Tamarix* spp.), and castor bean (*Ricinus communis*). Total cover of nonnative perennial riparian vegetation will total less than 25 percent and total cover of giant reed, tamarisk, and castor bean, of which these three species make up a portion of the total nonnative vegetation cover, will total less than 5 percent.

To provide greater flexibility for implementation based on landowner access permissions, the area to be managed has been revised to encompass between Market Street Bridge and Anza Creek, in Riverside County.

6.1 Location, Timing, and Implementation Methods

Nonnative plant removal efforts will occur within a 4.2-mile stretch of the Santa Ana River between Rialto Channel and the Mission Boulevard Bridge, or, depending on landowner permissions, along a similar length of river downstream of the Riverside County-San Bernardino County line (e.g., Market Street downstream to Anza Creek) (see Figure 2-2). Predominant habitats within this area of the Santa Ana River are willow-cottonwood woodland and riparian scrub (dominated by mulefat and willow), along with sandy un-vegetated areas, patches of freshwater emergent and marsh habitat, and seasonal open water. The majority of the plant canopy and cover is from native species including black willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), and mule fat (*Baccharis salicifolia*), however Nonnative plant species are also present.

The exotic weed management program will be implemented in-perpetuity. During the first three years, management efforts will occur within approximately one-third of the total 4.2-mile stretch (approximately 1.4 miles) each year, to achieve management along the entire length after three years. These initial focused management efforts will be followed by regularly timed maintenance and monitoring visits to verify target exotic plants are kept under control. This is discussed further later in this section.

For the purposes of this plan, invasive exotic species are defined as species listed by the California Invasive Plant Council (Cal-IPC 2006) as High or Moderate threats to California

wildlands, and species considered to be potentially problematic within this stretch of the river (e.g., castor-bean [*Ricinus communis*]). Problematic perennial exotic species previously detected along the Santa Ana River within this stretch of the river include tamarisk (*Tamarix* sp.), castor-bean, tree of heaven (*Ailanthus altissima*), tree tobacco (*Nicotiana glauca*), and African fountain grass (*Pennisetum setaceum*).

Table 6-1 reviews nonnative plant species (i.e., ‘target’ species) that have been detected or have the potential to occur along the Santa Ana River, along with potential control methods. Information on life form, growth habitat, and removal/eradication methods are provided from *Invasive Plants of California’s Wildlands* (Bossard et al. 2000) and the California Invasive Plant Council (Cal-IPC). Potential control methods are presented to help illustrate possible methods within this plan. Specific management methods applied will consider best available science and may be modified over time. Use of herbicides would be limited to those approved for aquatic settings (e.g., Rodeo® and Garlon® 3A, etc.). This list will be verified on an annual basis to ensure the plan only utilizes approved products. Because of the sensitivity of aquatic organisms, physical removal of target species with hand tools will be prioritized to the extent feasible. However, selective use of herbicides is considered necessary to conduct effective control due to the ecology of the target species. All herbicide use shall be conducted and in accordance with product label instructions and applicable County of San Bernardino/County of Riverside and state laws and requirements. Herbicides shall only be applied by personnel with a qualified applicator license (QAL) and care shall be taken to avoid accidental over-spray on non-target (i.e., native) species.

TABLE 6-1
PERENNIAL EXOTIC WEED SPECIES DETECTED OR POTENTIALLY OCCURRING
IN THE HMMP TREATMENT AREA

Scientific Name ¹	Common Name	Life Form	General Treatment Approach	Cal-IPC Rating ²
<i>Ailanthus altissima</i>	Tree of heaven	Perennial tree	Hand-pull seedlings if the root system can be removed, foliar spray of smaller sprouts in spring with glyphosate, direct application of triclopyr to bark of young stems, or cut larger stems and direct application of glyphosate	Moderate
<i>Arundo donax</i>	Giant reed	Perennial grass	Foliar spray of leaves or direct application of glyphosate to cut stems between late spring and fall	High
<i>Coraderia</i> sp.	Pampas grass	Perennial grass	Physically remove ensuring the entire crown and top section of roots are removed, or apply postemergent glyphosate	High
<i>Eucalyptus</i> sp.	Eucalyptus	Perennial tree	Stump cut and grind, or direct application of triclopyr or glyphosate to outer portion of cut stump (best results in fall). Foliar application of triclopyr or glyphosate to resprouts when 3 to 5 feet tall.	Moderate
<i>Lepidium latifolium</i>	Perennial pepperweed	Perennial	Foliar application of glyphosate, triclopyr or chlorsulfuron (Telar®)	High

<i>Nicotiana glauca</i>	Tree tobacco	Perennial tree	Hand-pull if the root system can be removed, or cut stem and apply triclopyr or glyphosate	Moderate
<i>Myoporum laetum</i>	Myoporum (Ngaio)	Perennial tree	Hand-pull seedlings, or cut mature specimens at ground level and saturate cut stem surface with glyphosate	Moderate
<i>Pennisetum setaceum</i>	African fountain grass	Perennial grass	Foliar or direct application of postemergent glyphosate	Moderate
<i>Phoenix canariensis</i>	Canary island palm	Perennial tree	Hand-pull seedlings, cut mature specimens at stem base, or apply triclopyr	Limited
<i>Ricinus communis</i>	Castor-bean	Perennial scrub	Hand-pull if the root system can be removed, or cut stem and apply glyphosate	Limited
<i>Schinus molle</i>	Peruvian pepper tree	Perennial tree	Frill cuts (ax or hatchet cuts on downward angle through the bark into the sapwood) and apply triclopyr in cuts, or cut stem and apply triclopyr	Limited
<i>Schinus terebinthifolius</i>	Brazilian pepper tree	Perennial tree	Frill cuts (hatchet or ax cuts on downward angle through the bark into the sapwood) and apply triclopyr in cuts, or cut stem and apply triclopyr	Limited
<i>Tamarix</i> spp.	Tamarisk	Perennial tree	Very small specimens can be hand-pulled if the entire root system can be removed, or cut the stem close to the ground and apply triclopyr	High

1. If additional problematic nonnative plant species not included in this table are detected, they will be addressed and controlled in accordance with the project performance standards.

2. California Invasive Plant Council (Cal-IPC 2006) lists nonnative species that are High, Moderate, or Limited threats to California wildlands.

A qualified biologist (botanist or restoration ecologist with at least five years of experience) and landscape contractor (with successful experience on at least five projects involving exotic plant treatment and native habitat restoration) will be retained to implement the exotic plant treatment program. The initial exotic plant removal effort will be conducted outside the bird nesting season (i.e., September 16 to March 14), or the project biologist will conduct pre-activity surveys (within three days of treatments) to verify nesting birds will not be disturbed by the work. The contractor may carry equipment (e.g., chainsaw) and hand tools into the treatment area but no vehicles will enter the riverbed. Prior to the commencement of work, the biologist and contractor will coordinate and review health and safety protocols, project goals and performance criteria, staging areas and access routes, treatment methods for different target species, and measures to protect native plants, wildlife and water quality.

Some target species will be killed in place and allowed to decompose. Additionally, some nonnative plant debris may be left as beneficial organic matter and larger cut stems (e.g., logs and branches; large woody debris [LWD]) may be used to improve in-stream micro-habitat structure and function. Any nonnative plant debris with seed and/or live vegetative material (i.e., stolons and rhizomes) will be removed and properly disposed offsite. Once the initial exotic plant

removal effort is complete, as documented by the project biologist, the project will enter the maintenance phase.

The exotic plant treatment program is scheduled to commence in 2023 and will continue in perpetuity. Methodology will follow those outlined herein, and in Exotic Weed Management Plan (IERCD 2023; Appendix C).

6.2 Maintenance

Maintenance will encompass ongoing treatment and removal of nonnative plant species on an as needed basis in perpetuity. If other problematic perennial nonnative plant species (other than those listed in Table 6-1) are detected, they will be treated and controlled in accordance with the goals of this plan. Due to the prevalence of native plant species in the treatment area, it is expected that native plants will readily volunteer in locations where exotic plants are removed.

TABLE 6-2
EXOTIC PLANT CONTROL MAINTENANCE SCHEDULE

Maintenance	Interval
Years 1-3 – Site maintenance	Three times per year (minimum)
Years 4+ – Site maintenance	Twice per year, or more frequently, as required

As a guideline, nonnative plant species management actions will occur approximately three times during Years 1, 2, and 3, and bi-annually (twice a year) in perpetuity. The general framework maintenance schedule is provided in Table 6-2; however it is anticipated that frequency may vary based on monitoring results, presence of nonnative plant species, and continuing attainment of success criteria. An important component of the maintenance phase is consistent monitoring on the presence of nonnatives plant species, appropriate methods and timing of control, and addressing issues in a timely manner. It is anticipated that maintenance will occur in the late winter and early fall outside of the bird nesting season (March 15 to September 1) to maximize the effectiveness of treatments. Follow-up treatments of re-sprouts and new volunteers are expected to create minimal disturbance (i.e., hand-pulling and direct/spot application of herbicide).

Consistent with the initial nonnative plant removal phase, some nonnative plant debris may be killed and left in place as beneficial organic matter/structure. However, any nonnative plant debris with seed and/or live vegetative material (i.e., stolons and rhizomes) will be removed and properly disposed offsite.

6.3 Monitoring and Adaptive Management

Prior to initial treatment all habitat areas that may be managed and monitored through this HMMP will be assessed for the baseline ground cover of perennial nonnative vegetation. Aerial imagery will be used, followed by field-verification using a global positioning system to

document patch location and size (area), to quantify the approximate area occupied by each nonnative plant species of interest. Methods to quantify vegetation cover using transects (line/belt) or releve will not be used. Success will be determined when comparing the overall ground cover of perennial nonnative vegetation within the management area to that of the baseline condition, not to a non-managed control site. A control site will not provide a meaningful comparison, nor will a non-managed site be protected in a degraded state. Aerial imagery will also be used to document the overall amount of native habitat found with treatment areas. The amount of native vegetation will not be used to determine success.

Following initial treatment efforts and attainment of success criteria, monitoring and adaptive management will continue in-perpetuity. On going monitoring will document the presence and location of nonnative plant species for implementation of management actions. A list of nonnative plant species detected, relative abundance, location, treatment methodology and treatment effectiveness will be maintained.

Monitoring will support an adaptive management approach. Adaptive management (AM), also known as adaptive resource management (ARM), is a structured, iterative process of optimal decision making in the face of uncertainty, with an aim of reducing uncertainty over time via site monitoring. As part of this process, it is important to anticipate potential (unforeseen or unpredictable) problems and utilize formal and informal monitoring information to learn and adapt in order to tailor maintenance (remedial measures) and management decisions to address specific site conditions. This form of management will allow for response to unforeseen or unpredictable problems early and maintain progress toward the performance criteria and project goals. For example, an anticipated solution to a problem in Years 1 through 3 of the nonnative plant management program may be adjusted or replaced with another solution in Year 4 as monitoring results provide new insight to understanding/addressing management strategies. Examples of potential problems and solutions that may be implemented during the post-implementation maintenance and monitoring phase are provided below. Although potential solutions are listed these may evolve over time based on monitoring and adaptive management. The actual problems encountered, when relevant, and the adaptive management approach taken will be discussed in each annual monitoring report.

- *Potential Problem:* Nonnative plant treatment deemed ineffective for one or more species.
Potential Solutions: Identify and implement one or more alternative treatment methods and monitor effectiveness.
- *Potential Problem:* Cover of one or more nonnative plant species exceeds performance criteria.
Potential Solutions: Implement alternative treatment method(s), increase frequency of maintenance visits, installation of native plant cuttings (e.g., willow, cottonwood, and/or mule fat) to occupy space that may be otherwise occupied by nonnative plant species.
- *Potential Problem:* Offsite (e.g., upstream) uncontrolled population of nonnative plant species causing significant adverse establishment of nonnative plant species in project treatment area.
Potential Solutions: Confirm property ownership of location(s) where uncontrolled population of nonnative plant species occurs and determine if the property owner is required

or willing to treat the population, or would provide access permissions to other entities for treatment (contingent on right-of-entry permission).

If nonnative plant species performance criteria are not met, remedial measures will be implemented, as necessary. The specific approach for remedial measures would be determined by site conditions, progress toward attainment of performance criteria, and recommendations collaboratively developed by the biologist, maintenance contractor, and the Project Sponsor.

6.4 Performance Criteria and Reporting

Performance criteria are provided to verify the exotic plant management program successfully achieves appropriate standards for this mitigation conservation measure. Success criteria established in the Biological Opinion states that total cover of nonnative riparian plant species will total less than 25 percent, and total cover of giant reed, tamarisk, and castor bean will total less than 5 percent (**Table 6-3**).

TABLE 6-3
EXOTIC PLANT MANAGEMENT PROGRAM SUCCESS CRITERIA¹

Milestone	Success Criteria	Remedial Measures
Years 1-3 (Initial treatment phase)	Treatment of target species (see Table 6-2) within approximately one-third of the total 4.2-mile stretch (approximately 1.4 miles) each year to achieve management along entire length after three years. Total cover of targeted, perennial nonnative riparian plant species will total <25% and total cover of giant reed, tamarisk, and castor bean will total <5%.	Increase frequency of treatment. Revise management actions that are ineffective.
Year 4+	Maintain success criteria along 4.2 mile stretch: total targeted, perennial nonnative riparian plant cover <25%, total cover of giant reed, tamarisk, and castor bean <5%.	Intensify treatment and control (i.e., man hours and/or frequency of maintenance visits) as needed. Revise management actions that are ineffective. Remain current on best available science on treatment methodologies.

¹. For this project perennial exotics are defined as species listed as “Moderate” or “High” threats to California wildlands by the California Invasive Plant Council (Cal-IPC 2006) and species considered to be potentially problematic within this stretch of the river (e.g., castor-bean [*Ricinus communis*]).

Observations of nonnative plant species will be recorded incidentally in the entire treatment area during annual survey efforts occurring along the Santa Ana River (native fish surveys, microhabitat enhancement, avian surveys, Riverwalk, etc.). The HMMP annual monitoring report will include field notes and datasheets from individual monitoring visits throughout the year. The annual summary will include a list of nonnative plants documented within the project area, estimates of cover, the type and location of management treatments applied, a review of progress of attainment of the performance criteria, any recommended remedial measures, and representative photographs. Aerial imagery will be taken at minimum once every 5-years to assess progress across the landscape. Changes to the landscape (e.g., fire, flood, etc.) may confer a need to take additional aerial imagery.

6.5 In-Perpetuity Monitoring and Management

Monitoring and management of nonnative riparian plant species within the 4.2-mile stretch of the Santa Ana River will continue in-perpetuity. Monitoring and management activities will be summarized in the annual HMMP report submitted to the USFWS and CDFW. If the HCP is adopted prior to or during implementation of this HMMP, the monitoring and reporting associated with this measure will be carried forward into the HCP's monitoring and reporting program.

CHAPTER 7

High Flow Pulse Events (SAS-4)

The goal of mitigation measure SAS-4 from the SNRC EIR is to create high flow pulse events to flush fine sediment from within the SAS occupied reach of the Santa Ana River. The EIR anticipated that specific methodology to achieve this goal would be identified in the HMMP:

SAS-4: High Flow Pulse Events. The HMMP will identify means to create high flow pulse events as needed based on substrate conditions, up to 2 times per year. These augmented flow events would be designed to flush out fine sediment from the upstream reach of the affected river segment, and could be implemented through a cooperative agreement with the City of San Bernardino Municipal Water Department or another method.

Based on recent field efforts in the Santa Ana River, smaller, discretely timed pulse events³, and small-scale manipulation of velocity, have been observed to achieve the intent of this measure: flushing fine sediment from within the SAS occupied reach of the Santa Ana River, thereby increasing the surface area of foraging and spawning habitat by exposing gravels and cobbles that were previously covered by silts and sands. These alternate strategies (explained in more detail below) have the benefit of being readily implementable and can achieve results in targeted locations. Consequently, for the remainder of this chapter the use of “high flow” has been omitted, instead the focus is on pulse events.

7.1 Location, Timing, and Implementation Methods

In natural channels, periodic flow pulse events are essential to SAS recovery because they deliver new, coarse (gravel and cobble) substrate and scour encroaching vegetation and fine sediment from occupied habitat. Substrate complexity is necessary to support a viable population, as habitat requirements often change depending on life stage. Optimal stream conditions consist of coarse substrates, with a mixture of gravel or cobble and sand, and a combination of shallow riffle and deeper run and pool habitat (USFWS 2017). Shallow riffles with gravel are necessary for spawning, as fertilized eggs often adhere to the gravel substrate (Greenfield et al. 1970). Riffles are also often utilized as rearing habitat by early life stage SAS, especially in areas with adequate riparian cover, however as individuals mature into adulthood there is strong selection for larger, deeper pool habitat (Moyle and Yoshiyama 1992; Moyle 2002). Regardless of habitat preference (riffle, pool, run) substrate complexity is crucial for the success of SAS populations.

A discharge study conducted by Environmental Science Associates (ESA) concluded that a diversion of 6-10 MGD (9.3-15.5cfs) from the Santa Ana River at the RIX discharge would

³ Sourced from RIX/Rialto Treatment Plants. During nonnative aquatic predator control efforts in Rialto Channel and in the vicinity of the confluence of Rialto Channel and the Santa Ana River, and the RIX outfall location, a request is made to Rialto/RIX to cease discharge for the duration of the predator control effort (typically no more than several hours in duration). Ceasing discharge allows for increased efficiency in capturing nonnative predators and removing them from the system. When the treatment plants resume discharge, this creates the referenced pulsed event.

reduce total instream flow by 18-21 percent (ESA 2015). The results also suggest that while flow reductions up to around 12 MGD (18.5cfs) at RIX would not markedly change the velocity and sediment patterns in the Santa Ana River, reductions of more than 12 MGD would begin to make significant changes in the swifter, coarser substrate upper reaches that would change them to resemble the slower, sandier lower reaches. Additionally, incremental effects of sand deposition resulting from a reduction in velocity could reduce egg development/survival, increase egg predation, or reduce the fitness of adults as they expend greater energy in search of suitable spawning habitat. As such, conservation measures *SAS-1 Microhabitat Enhancements* (**Chapter 1**) and *SAS-4* were developed to offset these potential impacts.

As mentioned above, flow pulse events will be generated as needed (up to two times per year), based on substrate conditions, to flush out fine sand/sediment and supply or uncover coarser gravel and cobble within the mitigation site. Pulsed flows may be facilitated through a cooperative agreement between EVWD and a local HCP partner such as the City of Rialto, through the use of local groundwater wells, and/or potential manipulation of discharge from the Rialto and/or RIX treatment plants. Valley District, on behalf of EVWD is investigating alternative sources of water (e.g., wells) that could be sited adjacent to Rialto Channel and/or along the Santa Ana River to serve as a source of supplemental water supply for various habitat improvement projects. The alternative source(s) could be used for multiple purposes including reducing water temperature in Rialto Channel and the Santa Ana River during summer months, or artificially creating pulse flow events to refresh substrate conditions. Though this EIR mitigation measure references “high” flow pulse events, should manipulation of discharge from the RIX/Rialto Treatment Plants or supplemental flow from other sources, achieve desired beneficial substrate condition outcomes using lower flow volumes (compared to a high flow event), this option may be pursued.

Timing of flow pulses will consider the SAS reproductive season to facilitate improvements to spawning substrate (**Table 7-1**). SAS spawn over gravel beds in flowing water where females deposit eggs in the fine gravel substrate. Eggs typically hatch within 360 hours (15 days) (Greenfield et al. 1970) and larval hatchlings congregate in the shallow, slow-moving water along the stream margin (Moyle 2002).

This measure will initially be implemented using pulsed flows from the Rialto and/or RIX Treatment Plants. Three representative reaches, each 100 meters (m) long, downstream of the RIX outfall, will be selected to measure substrate conditions prior to and after the pulsed event. Substrate conditions will be documented prior to and immediately following the pulsed event to determine potential changes to percent coverage of sand, gravel, and cobble. Based on observations, changes to the timing and intensity of the pulses may be recommended. As other sources of supplemental flow become available, releases from these sources will also be tested to determine methodology that produces the greatest desired effect. Pulse events occurred in fall 2019 and fall 2022, associated with nonnative aquatic predator removal events.

**TABLE 7-1
FLOW PULSE SCHEDULE**

Monitoring Year	Timing
Year 1	Prior to February 15 and/or after June 15 (depending on storm season and presence of larval native fishes)
Years 2+	Same as in Year 1 – If the monitoring program determines appropriate substrate and/or flow conditions are not being met under the current flow pulse program, future timing and intensity of pulses will be modified. Alternate sources of supplemental flow to create pulsed flow events will be tested as they become available.

7.2 Monitoring and Adaptive Management

Substrate conditions within each 100m reach will be measured prior to and following each flow pulse event. Monitoring will consist of measuring (estimating) percent cover of sand, gravel, and cobble. As mentioned, pulsed events will initially rely on manipulation of discharge from the Rialto and/or RIX Treatment Plants. Other sources of supplemental flow to create pulsed events will be investigated as they become available. Implementation of pulsed events up to two times per year will initially fulfill performance criteria; however as alternative sources of supplemental water become available to create pulsed events, data collected from monitoring tested strategies will be used to inform the implementation of methodology that produces the greatest benefit to SAS substrate conditions (as measured by highest percent increase in gravel and cobble cover following the implementation of pulsed flow event) (**Table 7-2**).

**TABLE 7-2
HYDROLOGY MONITORING SCHEDULE**

Monitoring Year	Timing
Year 1	At least 2 monitoring surveys (pre- /post-monitoring per pulse event)
Years 2+	Annually (post-pulse event)

7.3 Performance Criteria and Reporting

Performance criteria during initial years will largely be based on implementation of up to two pulsed events per year using manipulation of discharge from the Rialto and/or RIX Treatment Plants. During these initial years, different strategies will be employed to effect the greatest habitat uplift. Data collected following implementation of these different pulsed flows will be used to direct future/ongoing implementation.

If performance criteria are not met, implementation of remedial measures will be investigated. The specific approach to remedial measures will be determined by site conditions, progress toward attainment of performance criteria, and recommendations collaboratively developed between the Project Sponsor, the USFWS and CDFW.

TABLE 7-3
FLOW PULSE PERFORMANCE CRITERIA

Milestone	Success Criteria	Remedial Measures
Year 1	Mean gravel cover >10% upstream of Riverside Avenue Bridge	Modify flow pulse timing and/or intensity to facilitate appropriate substrate conditions.
Year 2+	Same as above	Same as above, as necessary

The HMMP annual monitoring report will include field notes and datasheets from individual monitoring visits throughout the year. The annual report will include a description of hydrologic monitoring methods and collected data, a review of progress of attainment of the performance criteria, any recommended remedial measures related to flow pulses, and representative photographs.

7.4 In-Perpetuity Monitoring and Management

Monitoring and management of pulsed flow events will continue in-perpetuity. Monitoring and management activities will be summarized in the annual HMMP report submitted to the USFWS and CDFW. If the HCP is adopted prior to or during implementation of this HMMP, the monitoring and reporting associated with this measure will be carried forward into the HCP's monitoring and reporting program.

CHAPTER 8

Rialto Channel / Santa Ana River Water Temperature Amelioration Project (CM 21.b.iv, SAS-5)

The biological opinion calls for the installation of groundwater wells/storage tank adjacent to Rialto Channel to provide supplemental cool water to reduce water temperatures in Rialto Channel to tolerable levels (less than 86 degrees Fahrenheit) during summer months. Significant effort was employed to determine an appropriate location for wells/tank(s); however, a number of constraints impeded a final solution: lack of willing landowners to sell or lease property; the presence of Delhi Sands flower-loving fly habitat adjacent to Rialto Channel; close proximity to the City of San Bernardino's wastewater treatment plant and the potential for a well to interfere with operations. A temporal solution was also investigated: the use of water-cooling towers sited within the Rialto Treatment Plant to cool the effluent prior to its discharge into Rialto Channel. However, this proposal was not financially viable, and would require significant consumption of power. New data received from the City of Rialto also highlighted that a new approach to this measure may be warranted: comparison of influent and effluent water temperature from the City of Rialto's treatment plant identified that wastewater is entering the treatment plant at high temperatures. This discovery raised the question of whether it might be better to identify locations within Rialto's wastewater pipeline system where mitigation measures could be implemented to reduce temperatures prior to reaching the treatment plant.

As a result of the aforementioned constraints, and as required in the opinion, we have submitted a Supplemental BA with a revised Conservation Measure that will achieve the biological objectives analyzed in the opinion. The revised Conservation Measure proposes funding to be committed by EVWD to contribute towards implementation of a measure(s) (project) to ameliorate Rialto Channel and/or Santa Ana River water temperatures to <86 degrees Fahrenheit. Proposed measures/strategies to reduce water temperature will be developed following completion of a larger-scale water temperature monitoring study (described below, but to be completed by the Upper Santa Ana River HCP applicants).

8.1 Location, Timing, and Implementation Methods

8.1.1

Water temperature monitoring will be implemented along Rialto Channel, from the Rialto Treatment Plant outlet to the confluence of Rialto Channel and the Santa Ana River, and downstream along the Santa Ana River to River Road (Figure 8-1). Temperature data loggers (e.g., HOBO Pendant Temp/Light 64K) will be deployed and will record on 1-hr interval

frequency. The loggers will remain in place year-round but may be temporarily removed during storm events to prevent loss of equipment. Lost/stolen data loggers will be replaced as necessary. Data will be downloaded monthly. The goal is to generate a continuous water temperature dataset for Rialto Channel and the Santa Ana River which will be used to develop management actions.

Water temperature data will be used to create a heat map to identify locations, seasonality, timing, and duration of water temperatures >86 degrees Fahrenheit (water temperatures above 86 °F are likely a limiting factor to movement and distribution of SAS (USFWS 2010)). The heat map will be reviewed to investigate potential locations where water temperature amelioration actions may be undertaken. Modeling will also be completed to determine locations, seasonality, timing, and volumes of cool water input needed to reduce water temperatures to <86 degrees Fahrenheit. Potential measures to cool water may include installation of a liner and/or shading along Rialto Channel, and installation of new wells/refurbishment of existing wells along the Santa Ana River to provide cool water environmental flow releases. The proposed implementation schedule for the study is provided in **Table 8-1**.

TABLE 8-1
WATER TEMPERATURE STUDY, AMELIORATION PLAN DEVELOPMENT, AND AMELIORATION MEASURE
IMPLEMENTATION SCHEDULE

Monitoring Year	Timing
Year 1	Deploy data loggers within Rialto Channel, and along the Santa Ana River from Rialto Channel downstream to River Road Bridge.
Year 1, 2	Analyze water temperature data and create a spatial and temporal heat map of Rialto Channel and the Santa Ana River. Model potential locations, timing, and volume of cool water input needed to ameliorate water temperatures to <86 degrees Fahrenheit. Investigate and recommend other potential strategies/measures that can be implemented to ameliorate water temperatures to <86 degrees Fahrenheit. Implement Same as in Year 1 – If the monitoring program determines appropriate temperature conditions are not being met under the current supplemental water program, future timing, water supply, and temperature requirements may be modified. Continue water temperature monitoring, replace lost/damaged data loggers on an as-needed basis.
Year 3+	Implement at least one water temperature amelioration measure/action/project prior to the end of Year 3. Ongoing collection and analysis of water temperature data to develop a better understanding of spatial and temporal trends in water temperature along the Santa Ana River and ensure that implementation of water temperature amelioration methodology continues to be deployed at appropriate locations.

Success criteria are identified below, EVWD will contribute \$1,000,000⁴ towards the implementation of at least one water temperature amelioration measure (Table 8-2).

8.2 Monitoring and Adaptive Management

Water temperature monitoring within Rialto Channel and the Santa Ana River will occur in-perpetuity. As previously described, data will be used to generate a spatial and temporal heatmap of Rialto Channel and the Santa Ana River to identify locations and seasonality of water

⁴ Cost estimate is based on approximate costs to install a new well.

temperatures ≥ 86 °F. Following development of the heatmap, modeling will be conducted to determine potential locations, timing, and volumes of cool water input needed to reduce water temperatures to < 86 °F. Other strategies will also be investigated. This work will culminate in the development of a Water Temperature Amelioration and Implementation Plan. Recommended measures would then be constructed/implemented.

8.3 Performance Criteria and Reporting

Performance criteria are provided to ensure ongoing water temperature monitoring, and implementation of water temperature amelioration strategies continue in perpetuity (**Table 8-2**). At least one water temperature amelioration strategy will be implemented within two (2) years of completion of the Water Temperature Amelioration and Management Plan. This strategy will ameliorate water temperature to ≤ 86 °F within an area of no less than 0.5 acres within the SAS-occupied portion of the Santa Ana River.

If annual performance criteria are not met, the Project Sponsor will coordinate with the USFWS and CDFW to develop remedial measures, as appropriate. The specific approach to remedial measures will be determined by site conditions, progress toward attainment of performance criteria, and recommendations collaboratively developed by the Project Sponsor, the USFWS and CDFW.

TABLE 8-2
WATER TEMPERATURE STUDY AND AMELIORATION PLAN PERFORMANCE CRITERIA

Milestone	Success Criteria	Remedial Measures
Year 1	Development of a preliminary water temperature heat map of Rialto Channel and the Santa Ana River	
Year 2	Completion of Water Temperature Amelioration and Implementation Plan	
Year 3	Water temperature reduced to ≤ 86 °F within a minimum of 0.5 acres within SAS-occupied Santa Ana River.	If the monitoring program determines appropriate temperature requirements are not being met following deployment of the amelioration measure, increased effort, or other strategies will be implemented.
Year 4+	Maintain water temperature at ≤ 86 °F within a minimum of 0.5 acres of SAS-occupied Santa Ana River in-perpetuity.	Increase effort/implement additional measures.

Reporting will consist of annual technical memorandums summarizing water temperatures in Rialto Channel and Santa Ana River for the 12-month reporting period, generated heatmaps, results of modeling, and results from implementation of water temperature amelioration strategies. An annual summary of monitoring activities will be incorporated into the HMMP annual monitoring report.

8.4 In-perpetuity Monitoring and Management

Water temperature monitoring within Rialto Channel and the Santa Ana River will continue in-perpetuity. The maintenance of water temperature to ≤ 86 °F within a minimum of 0.5 acres of SAS-occupied Santa Ana River will also continue in-perpetuity. Once the water temperature amelioration has met the Year 3 performance criteria, as documented in the annual monitoring report and approved by the Project Sponsor, the USFWS and CDFW, monitoring and management associated with this conservation measure will continue in perpetuity. If the HCP is adopted prior to or during implementation of this HMMP, the monitoring and reporting associated with this measure will be carried forward into the HCP's monitoring and reporting program.

CHAPTER 9

Upper Watershed Santa Ana Sucker Population Establishment (CM 21.b.v., SAS-6)

The goal of this Conservation Measure is to increase the abundance, distribution, and resilience of Santa Ana sucker in the Santa Ana River Watershed by establishing redundant populations in upper watershed tributaries. The biological opinion identifies the establishment of two new locations of SAS within City Creek and Hemlock Creek, or other suitable watershed tributary, with at least one translocation occurring and data indicating that the nascent population is healthy, reproducing, and appears to be successfully establishing prior to diversion of flow. However, because of a number of constraints, translocation has not yet occurred. As required in the biological opinion, we have submitted a Supplemental BA with a revised Conservation Measure that will achieve the biological objectives analyzed in the opinion. The revised Conservation Measure proposes that translocation occur as soon as possible and identifies a financial security to provide assurances to the USFWS that the translocations will occur.

Though not yet implemented, significant progress has been made in preparation of the translocations: the Santa Ana sucker Translocation Plan has been prepared and approved by the USFWS and CDFW, multiple translocation streams have been assessed to verify their suitability for receipt of Santa Ana sucker, and two fish raceways have been constructed at the Riverside-Corona Resource Conservation District's Greenbelt Facility. Relevant permitting from the USFWS and/or CDFW (e.g., state scientific collection permit, MOU, etc.), as appropriate, will be secured prior to implementation of Upper Watershed Santa Ana Sucker Population Establishment.

9.1 Location, Timing, and Implementation Methods

One of the four SAS recovery plan objectives involves expanding the range of the species by restoring habitat and reestablishing occurrences within its historical range (USFWS 2017). In addition to the recovery plan, the Upper Santa Ana River Habitat Conservation Plan (HCP) will be implementing the translocation of SAS into formerly occupied mountain tributaries of the Santa Ana River (Appendix D; Dudek 2022). A key goal of the SAS Recovery Plan is to expand the current range of the species through modification or removal of existing barriers, restoration of suitable habitat, and/or reintroduction of the species to areas within its historical range in a configuration that ensures reasonable certainty the remaining genetic makeup of the species has been preserved and can withstand catastrophic events in the watershed.

This HMMP outlines the translocation and establishment of two populations of SAS within City Creek and Hemlock Creek, or other suitable unoccupied location within the historic range of the species within the Santa Ana River watershed as approved by the USFWS and CDFW. City Creek is expected to be the first tributary to receive translocated SAS. Goals and success criteria of the establishment plan are identified below, along with the amount of financial assistance to be provided by EVWD to contribute towards a regionally beneficial SAS population translocation and establishment program.

9.1.1 Native Fish Raceway Facility

The RCRC Native Fish Stream and Raceway Facility provides recovery and research opportunities for Inland Empire native fish populations and supports restoration and recovery projects in local streams (Dudek 2022). Three native fish species are being studied at the facility: Santa Ana speckled dace (*Rhinichthys osculus* ssp.), arroyo chub (*Gila orcutti*), and Santa Ana sucker (Dudek 2022). A second facility has also been constructed, the Greenbelt Off-site Aquatic Facility (Greenbelt Facility), to help facilitate, augment, and sustain the continued survival and recovery of SAS (Dudek 2022). The Greenbelt Facility is proposed to be used as a SAS headstart / “grow out” facility: young-of-year will be captured from the Santa Ana River, transferred to the Greenbelt Facility, and temporarily held for no more than 24 months (*i.e.*, no more than one spawning season) prior to translocation to proposed mountain tributary receiver site(s).

The Greenbelt Facility currently has two 300-foot, 30,000-gallon raceways, a chilled 1,500-gallon emergency unit, and two sources of water from both city supply and groundwater well sources (Dudek 2022). The site has the capacity to accommodate four additional raceways (six in total). The Facility is protected by perimeter fencing, cross fencing of the runs, and security cameras. Back-up generator units have been installed to maintain pump function. Back-up generator units will operate on propane so power outages, natural disasters, or equipment failure can be ameliorated through mechanical offset. The units are tested monthly to ensure proper operation. Back-up fish units will also be used to hold fish if there is ever a failure or equipment issue.

9.1.3 Source of Santa Ana Sucker for Relocation

SAS should be sourced from multiple areas along the mainstem river to maximize genetic diversity of the receiver population. Details regarding the source and capture methods of SAS broodstock for the translocation program are provided in Dudek (2022; Appendix D).

9.1.4 Translocation Site Background and Description

A single CNDDDB record of Santa Ana sucker occurs in City Creek from 1982. It was recorded approximately 0.5 mile upstream of the Forest Service Road 1N22 crossing by Hoover F. Currently there is a large rock pool on the West Fork of City Creek at this approximate location.

Site investigations conducted based on the Santa Ana Sucker Translocation Plan Phase 1 evaluation and Phase 2 field assessments for City Creek indicate that suitable habitat for SAS is present within the evaluated stream reaches and likely throughout much of the City Creek drainage. Based on the results of the spring and fall biological assessments, suitable habitat for spawning, larval and juvenile rearing, adult holding, and refugia are all present (to varying

degrees) within the evaluated reaches. The hydrology of City Creek is sufficient to support all SAS life stages. The presence of Santa Ana speckled dace within City Creek attests to the maintenance of sufficient hydrology for native fish.

Water quality parameters in the spring and fall were within the range of values documented in streams occupied by SAS, with the exception of lower pH values, typical of Santa Ana River tributary streams. Based on a comparison of food resources utilized by SAS and documented in Big Tujunga Creek, suitable food resources (primarily diatoms) are present and abundant in both the spring and fall in City Creek. Additionally, autecological information on the four most abundant algal species (83% of the community) in the spring and fall Surface Water Ambient Monitoring Program (SWAMP) samples indicates that all of these diatoms are sensitive to nutrient and organic enrichment and are less tolerant of pollution and degraded conditions. Benthic Macroinvertebrates (BMI) community data also indicates good stream conditions, especially the large percentage of Ephemeroptera, Plecoptera and Trichoptera taxa (49.7% in the spring and 23.0% in the fall), which are associated with good water quality and habitat conditions.

Based on site assessment performed at City Creek, this tributary appears to contain relatively high-quality stream habitat capable of supporting a translocated population of SAS. Additionally, the presence of speckled dace (which have similar habitat requirements) at the SWAMP and supplemental reach stations also indicates appropriate habitat conditions for SAS. Finally, historical flow data indicates that outflows during the late summer and fall in most years (although very low) is likely sufficient to maintain water quality and suitable habitat to support the species.

9.1.5 Capture, Hold, and Release Strategy

Santa Ana sucker will be collected from the Santa Ana River and transferred to native fish raceways at the Greenbelt Facility or translocated directly to receiver sites. Capture will focus primarily on young-of-year, however other age classes may also be collected. Number of individuals captured and transferred to the Greenbelt Facility will be consistent with approved permits issued by the USFWS and CDFW. Fish will be held at the Greenbelt Facility for no more than 24 months (no more than one spawning season) prior to translocation to mountain tributary receiver sites. The entire cohort within each raceway will be translocated. Release strategy methods for translocated SAS are briefly described below. Full details on the release strategy are provided in the Santa Ana Sucker Translocation Plan (Dudek 2022; Appendix D).

Depending on the temporary holding time, and age classes of fish captured from the Santa Ana River, it is likely that each translocated cohort will consist of multiple age classes. Total number of individuals translocated will be dependent on multiple factors, including temporary hold duration at the Greenbelt Facility, and reproductive rate and survival while in captivity. Both breeding age adults (1+ years old) and young-of-the-year (YOY) SAS will be released together. Cohorts to be released together will be raised in the same raceway. YOY fish will make up a majority of the translocation population (up to 80%) due to the high fecundity of the species. The number of fish needed to establish and sustain a new population will vary based on location, stream outflow, water velocity, food sources, and substrate composition, but we are assuming at

least 400 fish will constitute the size of the founding population. Serial translocations will be used to enhance population genetics. The timing of fish release will be based on the number and size of fish to be released, and streamflow (e.g., too little or too much flow will delay fish release). In general, translocations will occur following the end of high-flow/flood events in winter and early spring, but preferably before the winter/spring spawning period. Depending on the timing of rainfall events, snowmelt runoff, and SAS spawning, this window could be very short in wet years or protracted in drier years. In existing low elevation populations spawning can begin in January and continue through July, depending on the rainfall year. At higher elevations, spawning usually occurs from March through May.

In the event that fish cannot be released prior to the spawning period, fish should be released as soon as possible on the declining arm of the hydrograph in that specific watershed. A third release period will occur September through November dependent on weather conditions. Young-of-the-year SAS will be large enough by September to manage winter storms and runoff in upper tributary streams. The success of these release windows will be compared to determine if there is an optimal period. A proposed schedule for translocation is shown in **Table 9-1**.

9.1.6 Population Establishment Schedule

TABLE 9-1
POPULATION ESTABLISHMENT SCHEDULE

Monitoring Year	Timing
Year 1	Dependent on climate and site conditions. Preferred: February and March. Alternative: June-November (One or more serial translocations). ¹
Years 2+	Same as above. Additional translocations will be performed as needed based on results of Population Establishment Monitoring (Table 9-3).

¹ Timing of release will be compared to determine if there is an optimal period for release.

9.2 Monitoring and Adaptive Management

Below is a summary of monitoring and adaptive management plan for translocated SAS. Full details on post-translocation monitoring are provided in the Santa Ana Sucker Translocation Plan (Dudek 2022; Appendix D).

Monitoring requirements were determined for multiple demographic elements to evaluate SAS translocation goals and objectives (Dudek 2022). **Table 9-2** provides SAS monitoring elements, data required, and data collection methods, and **Table 9-3** provides a monitoring schedule. See Dudek (2022; Appendix D) for monitoring details for each element.

TABLE 9-2
POPULATION ESTABLISHMENT MONITORING OBJECTIVES AND METHODS¹

Element	Data Needed	Method
Reproduction and recruitment (larvae and juveniles)	Abundance and age class/presence of YOY	Snorkel survey/bank observation
Fish condition	Fish body shape observations or weight and length data	Snorkel survey/bank observation or electrofishing sample

Element	Data Needed	Method
Relative abundance	Catch per unit effort	Snorkel survey or electrofishing ²
Density	Population estimate	Snorkel survey or electrofishing ²
Distribution	Presence-absence data	Snorkel survey or electrofishing ²
Genetics	Genetic variation	Fin clip

¹ Table modified from Table 1 in section 7.2 from Dudek (2022). Data needs and sampling methods are proposed and may change based upon sampling constraints.

² Snorkeling will be the preferred methodology to reduce impacts on fish when handling is not needed. Electrofishing would be used when appropriate.

TABLE 9-3
POPULATION ESTABLISHMENT MONITORING SCHEDULE

Year	Timing
Year 1+	Semi-annual (late-spring and fall): fish, water quality, habitat surveys
Every 5 years	Same as above and genetic sampling

Adaptive management, in the context of this translocation plan, is intended to facilitate decision making and resolving uncertainties associated with translocating SAS into currently unoccupied streams (Dudek 2022). The key to effective adaptive decision making is the identification of alternative hypotheses about resource dynamics for SAS when translocation objectives are not being met, assessment of these hypotheses with monitoring data, and then implementing new management actions at the translocation stream/reach. The goal of the adaptive management process is ultimately to improve management of translocated SAS populations and inform future translocation efforts. An adaptive management decision tree is provided in Figure 5 of Dudek (2022) that is designed to assist translocation project managers in determining an appropriate course of action when monitoring data suggests a translocation effort is not resulting in the expected outcome (i.e., no recruitment).

Southern California streams within the historical range of SAS are flashy in nature and are subject to periodic severe flooding or high flow events, which can displace fish and alter habitat through substrate and vegetative scouring, channel rearrangement, and sediment deposition (Dudek 2022). Because SAS translocation sites are currently primarily isolated from downstream reaches, they may not support sufficient refugia to provide an opportunity for recolonization. As a result, emergency fish rescues (which are expected to be very rare) may need to be considered for translocated populations⁵. Fish rescue efforts would be dependent on climate and translocation site conditions. Climate and translocation site conditions will be monitored to determine if an emergency rescue effort is warranted. Rescue efforts will be coordinated with USFWS, CDFW,

⁵ For example, where fish are washed downstream of barriers or where they are washed into areas subject to emergency activities (e.g., areas requiring the movement of streambed/basin materials to restore facility function) and would likely expire if not relocated back upstream.

and the land managers of the watershed. Fish rescues for streams typically involve netting and electrofishing of fish out of the stream and placement into transport vessels with suitable water quality. Prior to conducting a rescue, the release destination for rescued fish must be determined. Release locations could include other potential or current translocation streams within the same watershed as the RCRC facilities, or currently occupied habitat in the watershed.

9.3 Performance Criteria and Reporting

A successful translocation program will expand the range of the Santa Ana sucker by reestablishing occurrences within its historical range and preserving the genetic makeup of the species to withstand catastrophic events in the watershed (Dudek 2022). The SAS Recovery Plan calls for “persistent occurrences of healthy fish” with one delisting criteria of “stable or increasing population averaged over 15 years in multiple tributaries of the Santa Ana River, including City Creek (USFWS 2017).

The Santa Ana Sucker Translocation Plan provides a set of objectives for individual translocations of SAS into Santa Ana River tributaries (See section 7.1.2. of Dudek 2022). Below in **Table 9-4**, the translocation objectives have been modified into success criteria for establishment of a SAS population in City Creek.

If annual performance criteria are not met, the Project Sponsor and/or a qualified biologist will coordinate to determine if remedial measures are necessary. The specific approach to remedial measures will be determined by site conditions, progress toward attainment of performance criteria, and recommendations collaboratively developed by the biologist, Project Sponsor, the USFWS and CDFW.

The biologist will prepare succinct memoranda after each monitoring visit for submittal to the maintenance contractor and Project Sponsor, and an annual report of activities which will be incorporated into the HMMP annual monitoring report. The annual report will include summaries of all fish surveys and habitat assessments.

TABLE 9-4
POPULATION ESTABLISHMENT SUCCESS CRITERIA

Milestone	Success Criteria	Remedial Measures
Year 1	SAS present Distributed along >10% of the occupiable stream	Additional translocation(s) of SAS
Years 2-4	SAS present Distributed along >25% of the occupiable stream or 2 or more age classes present Body index similar to that of San Gabriel fish Occupiable habitat available for SAS beyond occupied range (species is able to expand range)	Additional translocation(s) of SAS Examine threats to species success Same as above.
Every 5 Years	Same as above Genetic diversity is the same or contains greater diversity than founding population	Same as above. As needed, conduct additional translocations to increase genetic diversity.

9.3.1 Translocation Cost and Financial Assurances

To provide assurances that the translocations will be implemented, and progress made towards achievement of success criteria, the Supplemental BA proposes the funding of a financial security to be held on deposit until the translocations are complete. The estimated cost to implement the translocations and five years of monitoring and management is identified in Appendix D. For the purposes of the cost estimate it was assumed that EVWD would fund a one-quarter-time position with CDFW for a period of five years. Appendix D also includes approximate costs for field equipment and vehicle use.

EVWD will provide Consumer Price Index (CPI) adjustments/adjustments for changes in CDFW salaries, to the financial security on an annual basis to ensure that sufficient funding is secured should the security need to be drawn on by CDFW.

EVWD will fully fund the financial security prior to diversion.

9.4 In-Perpetuity Monitoring and Management

Monitoring associated with this conservation measure will continue for the duration of diversion (anticipated to be in perpetuity). If the HCP is adopted prior to or during implementation of this HMMP, the monitoring and reporting associated with this measure will be carried forward into the HCP's monitoring and reporting program.

The estimated costs associated with implementation of a regional population establishment program are identified in Appendix D. Many of the costs associated with this breakdown will be assumed by the Upper SAR HCP once finalized; consequently, the estimate represents the maximum. EVWD's maximum contribution to the regional population establishment program is estimated at \$360,509.

CHAPTER 10

Annual Monitoring of Santa Ana River (CM 21.b.vi., SAS-7)

The goal of this measure is to report on the hydrological and biological conditions and activities completed under this HMMP.

10.1 Location, Timing and Monitoring Methods

This measure will provide reporting on all of the long-term monitoring and management activities completed under this HMMP. The annual reporting will include a summary of all activities completed over the previous 12 months. The report will summarize all activities implemented, methodology employed, timing of implementation, success/failure of monitoring/management actions, and recommendations for adjustments to future monitoring/management actions.

10.2 Analysis and Reporting

The HMMP annual monitoring report will provide an annual summary of hydrologic monitoring methods, a comprehensive analysis of collected data, a review of progress of attainment of the performance criteria, and any recommended remedial measures needed to achieve performance criteria. The report will also include representative photographs.

10.3 In-Perpetuity Monitoring and Management

Monitoring and management presented in this HMMP will occur in-perpetuity. If the HCP is adopted prior to or during implementation of this HMMP, the monitoring and reporting associated with this measure will be carried forward into the HCP's monitoring and reporting program.

CHAPTER 12

Summary of Reporting and Agency Coordination

12.1 Compilation of Reporting for All Measures

EVWD will be responsible for implementation and report compilation of the requirements contained in this HMMP.

12.2 Resource Agency Coordination

12.2.1 Reporting

An annual progress report, as described in Chapter 10 will be prepared by the Project Sponsor or qualified contractors and submitted to USFWS and CDFW. The annual report will summarize the monitoring program and data collected for that calendar year, update prior reports in a cumulative fashion, and include raw data as well as data analysis and comparison with compliance and performance criteria, as applicable. The annual report will describe operations, GIS maps of sampling locations, data for each monitoring action, habitat conditions and environmental data during monitoring, and any recommendations for improvement of monitoring methods or actions. Monitoring results that prompt consideration of immediate adaptive management or maintenance actions will be communicated in a timely manner, in advance of annual report preparation.

12.2.2 Review and Feedback

Monitoring results will be reviewed by the Project Sponsor, USFWS, CDFW and SAS experts to determine whether project objectives and/or success criteria are being met. If project objectives and/or success criteria are not being met, possible actions may include: more detailed diagnostic monitoring; corrective actions if known, necessary and feasible; adjustment of short-term operations or long-term management plans; and/or further study if necessary to reduce uncertainties.

12.3 In-Perpetuity Monitoring and Management

Monitoring, adaptive management and reporting requirements identified in this HMMP will continue in perpetuity. If the HCP is adopted prior to or during implementation of this HMMP, the requirements outlined in this document will be carried forward into the HCP's monitoring and reporting program.

CHAPTER 13

References

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APPENDIX A FILES

Habitat Parameters for Various Life History
Stages of Santa Ana Sucker – Sterling
Natural Resources Center

Permitting for Microhabitat Enhancement
along the Santa Ana River

Annual Report: Santa Ana River Stream
Habitat Improvement Pilot Project
(SBVMWD 2022)

APPENDIX B

Nonnative Aquatic Predator Control Plan (ICF 2023)

APPENDIX C

Exotic Weed Management Plan (IERCD 2023)

APPENDIX D

Rialto Channel/Santa Ana River Water Temperature Amelioration Project Cost Estimate

APPENDIX E FILES

Santa Ana Sucker Translocation Plan (Dudek
2022)

EVWD Translocation Financial Security

Santa Ana Sucker Regional Population
Establishment Program Endowment Estimate