



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
California Water Science Center
6000 J Street
Sacramento, CA 95819

August 1, 2024

Mr. Kai Palenscar
Project Manager II
San Bernardino Valley Municipal Water District
380 E Vanderbilt Way
San Bernadino, CA 92408

Dear Mr. Palenscar:

Enclosed is our standard joint-funding agreement 24ZGJFA11000085 between the U.S. Geological Survey California Water Science Center and San Bernardino Valley Municipal Water District for our Santa Ana Agreement during the period July 1, 2024 through June 30, 2025 in the amount of \$172,332 from your agency. U.S. Geological Survey contributions for this agreement are \$39,195 for a combined total of \$211,527. Please sign and return one fully-executed original to Jonathan Esposito at Jesposito@usgs.gov or mail to the address above.

Federal law requires that we have a signed agreement before we start or continue work. If, for any reason, the agreement cannot be signed and returned by the date shown above, please contact Brock Huntsman at (916) 278-3117 or email bhuntsman@usgs.gov to make alternative arrangements.

This is a fixed cost agreement to be billed quarterly via Down Payment Request (automated Form DI-1040). Please allow 30-days from the end of the billing period for issuance of the bill. If you experience any problems with your invoice(s), please contact Carmen Diaz-Pensler at phone number (571) 545-1998 or cdiaz-pensler@usgs.gov.

The results of all work performed under this agreement will be available for publication by the U.S. Geological Survey. We look forward to continuing this and future cooperative efforts in these mutually beneficial water resources studies.

Sincerely,

ANKE MUELLER-
SOLGER

Digitally signed by ANKE
MUELLER-SOLGER
Date: 2024.08.09
13:02:26 -07'00'

Anke Mueller-Solger
Director, USGS California Water Science Center

Enclosure
Scope of Work

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 6000000809
Agreement #: 24ZGJFA11000085
Project #:
TIN #: 95-6005196

Fixed Cost Agreement YES[X] NO[]

THIS AGREEMENT is entered into as of the July 1, 2024, by the U.S. GEOLOGICAL SURVEY, California Water Science Center, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the San Bernardino Valley Municipal Water District party of the second part.

1. The parties hereto agree that subject to the availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation for negotiated deliverables (see attached), herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50, and 43 USC 50b.

2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) include In-Kind-Services in the amount of \$0.00

- (a) \$39,195 by the party of the first part during the period
July 1, 2024 to June 30, 2025
- (b) \$172,332 by the party of the second part during the period
July 1, 2024 to June 30, 2025
- (c) Contributions are provided by the party of the first part through other USGS regional or national programs, in the amount of: \$0

Description of the USGS regional/national program:

- (d) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
- (e) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.

4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.

5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.

6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.

7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.

8. The maps, records or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program, and if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at cost, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records or reports published by either party shall contain a statement of the cooperative relations between the parties. The Parties acknowledge that scientific information and data developed as a result of the Scope of Work (SOW) are subject to applicable USGS review, approval, and release requirements, which are available on the USGS Fundamental Science Practices website (<https://www.usgs.gov/office-of-science-quality-and-integrity/fundamental-science-practices>).

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 6000000809
Agreement #: 24ZGJFA11000085
Project #:
TIN #: 95-6005196

9. Billing for this agreement will be rendered quarterly. Invoices not paid within 60 days from the billing date will bear Interest, Penalties, and Administrative cost at the annual rate pursuant the Debt Collection Act of 1982, (codified at 31 U.S.C. § 3717) established by the U.S. Treasury.

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U.S. Geological Survey
United States
Department of Interior

San Bernardino Valley Municipal Water District

Signature
ANKE MUELLER-SOLGER
Date: 2024.08.09 13:03:04 -07'00'
By _____ Date: _____
Name: Anke Mueller-Solger
Title: Director, USGS California Water Science Center

Signatures
By Heather Dyer Date: 9/6/24
Name: Heather Dyer
Title: CEO / GM

By _____ Date: _____
Name:
Title:

By _____ Date: _____
Name:
Title:

PROPOSAL 2024-22 SUMMARY

Title: Fish Community Dynamics within the Santa Ana River

Cooperator(s): San Bernardino Valley Municipal Water District

Author(s): Brock M. Huntsman

Statement of Problem:

The Santa Ana sucker (*Pantosteus santaanae*, SAS) is one of few extant native freshwater fishes in southern California. There are numerous threats hypothesized responsible for the poor condition of SAS populations in the Santa Ana River. Consequently, SAS are part of the Upper Santa Ana Habitat Conservation Plan (HCP), which was developed as a comprehensive program to assist in the development of conservation activities to protect, enhance, and restore habitat for covered species in the watershed. Developing an HCP requires sufficient knowledge of the populations of interest to develop plans for their protection and management. Initial assessment of the available data within the HCP suggested to the concerned parties that additional data that extends spatially and temporally are needed on population density and availability of suitable habitat to support development of the HCP.

Objectives:

The ability to monitor population abundance and habitat availability with some level of confidence is important when developing plans such as the HCP and making management decisions. The objectives of this study are to:

1. Continue population surveys to estimate native and non-native fish abundances from the Santa Ana River in 2024 using methods established during previous surveys between 2015 and 2023.
2. Develop a water temperature model to predict stream temperatures for critical SAS habitat within the Santa Ana River.

Relevance and Impact:

The goal of the Upper Santa Ana HCP is to achieve conservation objectives that adhere to the federal Endangered Species Act while streamlining planning and permitting for water resource management projects designed to fulfill the water resource needs of the public. The monitoring and analyses proposed as part of this study have been designed to fill the information gaps needed to achieve the goals of the Upper Santa Ana HCP, which also align with the goals and mission of the USGS.

Strategy and Approach:

A stratified random sampling design will be used within designated critical SAS habitat of the Santa Ana River. Approximately 15% of the known occupied river will be sampled by backpack electrofishing to estimate true population size throughout the Santa Ana River. Habitat surveys will also be conducted using National Water-Quality Assessment Program protocols (NAWQA) to identify habitat associations with native fish distributions. These data will be used to develop a population estimate for native and non-native fish populations inhabiting the Santa Ana River. Lastly, water temperature data collected by cooperators will be used to develop a predictive water temperature model for critical SAS habitat within the Santa Ana River.

Keywords: Community Structure, Fish Ecology, Invasive Species

Title: Fish Community Dynamics within the Santa Ana River
California Water Science Center, Southwest Region
Proposal # 2024-22 (for reference of previous work, see proposals [2023-15](#), [2018-11](#),
[2017-18](#), & [2015-19](#))
Cooperator(s) San Bernardino Valley Municipal Water District
Author(s) Brock M. Huntsman

BACKGROUND/INTRODUCTION

The Santa Ana sucker (*Pantosteus santaanae*, SAS) is one of few extant native freshwater fishes in southern California. SAS was federally listed as threatened in 2000 due to habitat fragmentation and degradation in watersheds of southern California (U.S. Fish and Wildlife Service [USFWS] 2017). This federally listed species is endemic to the Santa Ana, San Gabriel, and Los Angeles Rivers (Big Tujunga Creek), where it has been extirpated from greater than 70% of its native range (USFWS 2017).

The SAS population of the Santa Ana River is distributed downstream of the Seven Oaks Dam, where greater than 65% of flow is treated wastewater (Mendez and Belitz 2002). Flow regulation and an insufficient sediment supply below the dam, elevated water temperatures, and an expanding population of non-native predators (e.g., Largemouth Bass, *Micropterus salmoides*) are hypothesized as a few of many reasons for the poor condition of SAS within the Santa Ana River (Saiki et al. 2007, USFWS 2017, Wright and Minear 2019, Huntsman et al. 2022, 2023, *in press*). Consequently, SAS are part of the Upper Santa Ana Habitat Conservation Plan (HCP), which was developed as a comprehensive program to assist in the development of conservation activities to protect, enhance, and restore habitat for covered species in the watershed. Developing an HCP requires sufficient knowledge of the populations of interest to develop plans for their protection and management.

PROBLEM

Multiple agencies have been working to establish an HCP for the Santa Ana River watershed. The data currently available for two native fishes in the HCP area, SAS and arroyo chub (*Gila orcuttii*), are not sufficient to support the next step of the HCP planning and implementation process, which is the development of a robust monitoring program to inform future habitat and population management decisions; therefore, additional data on these two species are needed from the Santa Ana River. Initial assessment of the available data within the HCP suggested to the concerned parties that additional data that extends spatially and temporally are needed on population density and availability of suitable habitat to support development of the HCP. The overall objective of this proposed work is to address those needs.

OBJECTIVES and SCOPE

The ability to monitor population abundance and habitat availability with some level of confidence is important when developing plans such as the HCP and making management decisions. The objectives of this study are to:

1. Continue population surveys to estimate native and non-native fish abundances from the Santa Ana River in 2024 using methods established during previous survey between 2015 and 2023 (see Huntsman et al. 2022, *in press*).
2. Develop a water temperature model to predict stream temperatures for critical SAS habitat within the Santa Ana River.

RELEVANCE and BENEFITS

The USGS mission and vision as stated in the U.S. Geological Survey's 21st-Century Science Strategy 2020-2030 (U.S. Geological Survey 2021) is "to monitor, analyze, and predict current and evolving dynamics of complex human and natural Earth system interactions and to deliver actionable intelligence at scales and timeframes relevant to decision makers." Furthermore, the second goal of the USGS Water Science Strategy (Evenson et al. 2013) is to "Advance Understanding of Processes that Determine Water Availability." The goal of the Upper Santa Ana HCP is to achieve conservation objectives that adhere to the federal Endangered Species Act while streamlining planning and permitting for water resource management projects designed to fulfill the water resource needs of the public. The monitoring and analyses proposed as part of this study have been designed to fill the information gaps needed to achieve the goals of the Upper Santa Ana HCP, which also align with the goals and mission of the USGS as previously described.

The second goal of the USGS Water Science Strategy (Evenson et al. 2013) is to "Advance Understanding of Processes that Determine Water Availability". This study will be particularly relevant to this second goal because unbiased interpretation of catch data is needed for wastewater operations of the Santa Ana River, which constitutes greater than 60% of surface flows. The Water Science Strategy specifically states that areas of research include "Science that examines the effects of water contamination and pollution on the functioning of ecosystems. Science that improves our understanding of adaptation strategies to assist in the conservation of plants and animals in ecosystems that experience change in water supplies in response to climate variability. Science that supports the ability to restore and conserve aquatic ecosystems."

APPROACH

The Santa Ana River basin is the largest coastal basin in southern California, draining an area of approximately 6,900 km² (Figure 1). The drainage is greater than 70% urban and is divided between two ecoregions, the Southern California Mountains and the Southern California/Northern Baja Coast (Griffith et al. 2016). The river is highly braided with the potential to shift or create and disengage braids after large storm events. Surveys for this study will occur in September within the middle Santa Ana River currently designated as critical SAS habitat (USFWS 2017), from above the Prado Dam to the Rialto channel (Figure 1).

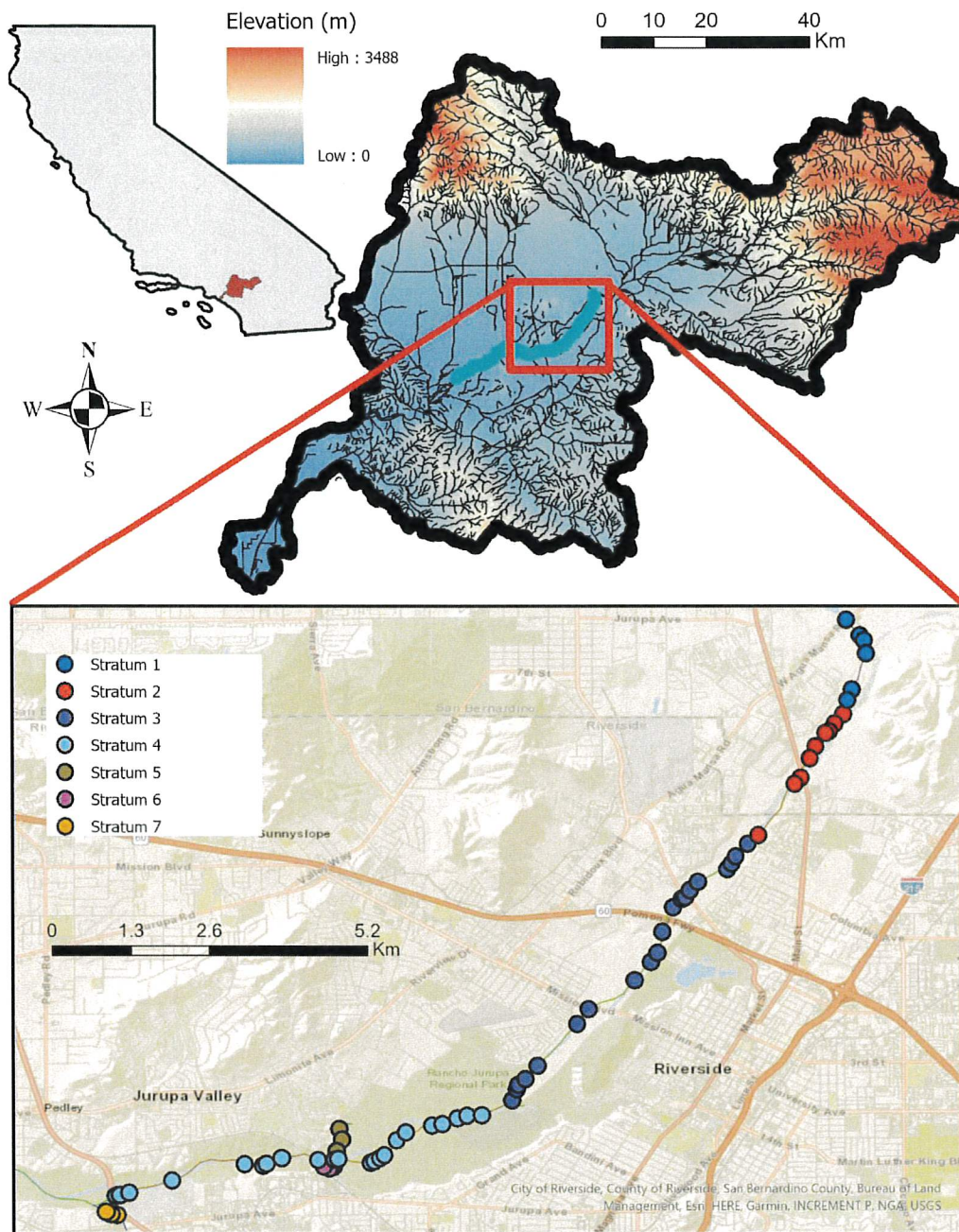


Figure 1. Sampling locations planned for native fish surveys to be conducted by the USGS in 2024 in the Santa Ana River, California. The highlighted light blue stream layer represents known critical SAS habitat in the Santa Ana River.

Objective 1: Native Fish Surveys

A stratified random sampling design will be used within designated critical SAS habitat of the Santa Ana River (Figure 1, ~ 16km of stream). Four main stem strata, and three tributaries if time permits (Sunnyslope Channel-Stratum 5, Anza Ditch-Stratum 6, and Hole Creek-Stratum 7), within the critical SAS habitat have been selected based on current knowledge about mechanisms affecting fish distributions within the river (Figure 1). A total of 57 50-m stream reaches have been randomly selected within the main stem of the Santa Ana River (an additional 9 tributary sites from strata 5-7), because preliminary sensitivity

analyses suggested at least 15% of the sampling area needs to be sampled to get adequate population estimates ((50 m*57 reaches)/16,000m=18% of the currently known occupied river to be sampled). Additionally, simulations suggest that at least 10% of the samples must include 3-pass removal sampling methods to adjust catch data for imperfect detection efficiency, which will require six sampling reaches to be randomly selected for closed removal sampling (see below). Prior to fish sampling, each 50-m sampling reach will be delineated using georeferenced coordinates, flagging tape, and a measuring tape. The upper and lower ends of the sampling reach will be measured with a measuring tape, and flagging will be used to identify the start and end.

Within each sampling reach, backpack electrofishing surveys using tandem electrofishing units (2 - 4 people) will progress from the downstream end to the upstream end of the sampling reach. In addition to individuals using electrofishing units, a netter will be assigned to each electrofisher and three or more people will deploy a seine just downstream of the electrofishing units. During electrofishing, units will push fish downstream into the seine if not captured by the associated netter. At least two removal passes per sampling reach will be conducted for all sampling reaches and each fish captured will be identified and measured for weight (± 0.1 g) and fork length (± 1 mm). Block nets at the upper and lower end of a sampling reach will only be used for closed removal sampling reaches ($n = 6$), because use of block nets for all 57 sampling reaches is not logistically possible with currently available resources. Preliminary analyses indicated that block-nets explained little variability in detection efficiency of SAS when not used (see SAS survey data with and without removal sampling from Wulff et al. 2020, 2021, 2022), suggesting few fishes moved into or out of the sampling reach when block nets have not been used. However, including a subset of samples with block-nets allows for addressing closure assumption violations when fitting abundance models following methods described in Perry et al. (2016), if sampling without block-nets in fact violates the closure assumption.

Habitat surveys will be conducted within each stream reach surveyed for fishes using USGS stream habitat survey protocols for the National Water-Quality Assessment Program (NAWQA; Fitzpatrick et al. 1998). Six transects per reach will be surveyed within a reach, and 10 habitat measurements will be made at equal distances across the transect. Measurements will include wetted channel width at each transect, which will be used to estimate sampling intervals for the remaining habitat variables to be collected. Stream depth (± 1 cm), stream velocity (± 0.1 m/s) and dominant substrate (i.e., silt, sand, gravel, cobble, boulder, bedrock) will be measured using a wading staff and flow meter (Marsh-McBirney 2000 or HACH HS 950.1 digital flow meter). Canopy cover will be measured with a concaved spherical densiometer, and potential fish habitat(?) cover will be classified (e.g., overhanging vegetation, undercut bank) at each interval along the transect.

Objective 2: Water Temperature Analysis

As part of habitat monitoring efforts in support of the HCP, San Bernardino Valley Municipal Water District and the Riverside-Corona Resource Conservation District (RCD) have deployed continuous water temperature loggers (Onset HOBO Pro V2, Onset HOBO 64K Pendant) throughout critical SAS habitat of the Santa Ana River (Figure 2). Additionally, point measurements of water temperature have been collected during native fish surveys (Objective 1) from each sampling site since 2022 using a YSI EXO2 sonde (YSI Incorporated, Yellow Spring, Ohio; Figure 2).

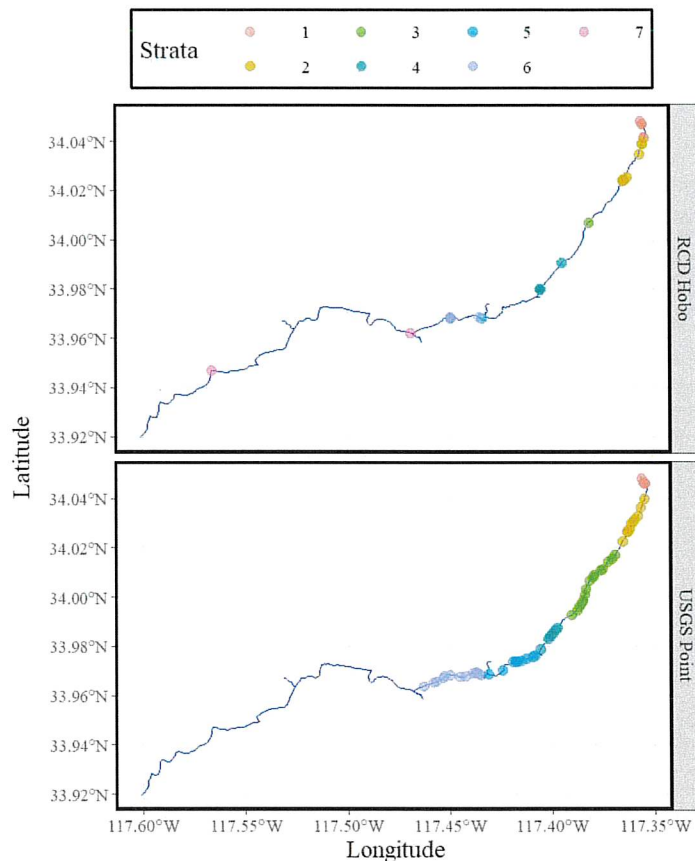


Figure 2. Location of continuous water temperature loggers collected by the RCD and point measurements of water temperature collected by the USGS during native fish surveys in critical SAS habitat of the Santa Ana River, California. Strata are defined based on known stream features believed to have an impact on water temperature.

All water temperature data will be compiled and used to build a predictive water temperature model based on known factors shown to affect stream water temperature (e.g., discharge, air temperature). Water temperature will be predicted for discrete strata, established based on known riverscape features believed to influence stream temperatures. Strata include the following: Stratum 1 = A concrete lined wastewater outflow channel, Stratum 2 = downstream of a tertiary treated wastewater outflow, Stratum 3 = downstream of a groundwater upwelling source, Stratum 4 = downstream of a wide and shallow stream channel believed to be relatively warm, Stratum 5 = downstream of a second source of groundwater upwelling, Stratum 6 = downstream of two major tributaries, and Stratum 7 = downstream of the currently known SAS occupied regions of the Santa Ana River. The water temperature model will be built using analyses such as generalized additive models to account for temporal and spatial autocorrelation in daily water temperature monitoring throughout the river (Siegel et al. 2023). Daily water temperature predictions will be made using the final predictive model to describe the thermal regime of the Santa Ana River over space and time in reference to SAS physiological limitations.

QUALITY ASSURANCE/QUALITY CONTROL

Field data collection QAQC procedures established by the California Water Science Center Aquatic Ecology Group (AEG) will be followed for this study. All product development

(reports and manuscripts) will be subject to established USGS Fundamental Science Practices.

LABORATORY EVALUATION PLAN

NA

PRODUCTS

Results of the population estimate survey and temperature model will be presented annually, or more frequently by request, to the SBVMWD as well as to other interested parties. We will continue to refine and develop draft manuscripts describing the results of the population abundance and habitat use results collected to date and water temperature model with the goal of having one or more draft manuscripts submitted to journal by the winter/spring of 2024-2025. We will participate in workshops and symposia as requested by SBVMWD to support monitoring and management of Santa Ana River fishes. All data collected during surveys will be made publicly available as USGS Data Releases linked from and grouped under the “Native Fish Population and Habitat Studies, Santa Ana River, California” project/collection landing page in ScienceBase (<https://www.sciencebase.gov/catalog/item/63360a12d34e900e86c8e611>).

MAP OF STUDY AREA

See Figure 1

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TIMELINE

All surveys will be completed by the end of September in FY24 by the project chief and a fish biologist (GS 9/10), to be consistent with timing of surveys in previous years (Objective 1). Data associated with surveys will be QAQC'd and published in ScienceBase on the current project landing page ([Native Fish Population and Habitat Studies, Santa Ana River, California - ScienceBase-Catalog](#)) by March of 2025 by a GS 9/10 fish biologist. The project chief will analyze 2024 survey data and provide cooperators an estimate of native fish abundance within the Santa Ana River by June 2025. The project chief will provide a draft temperature model to cooperators (Objective 2) by June 2025.

Task or Element	FY 2024				FY 2025			
	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep
Objective 1				X				
Objective 2				X	X	X		
Data Analysis					X	X		
Data Entry and Release					X	X		
Report review and publication				X	X	X	X	

PERSONNEL

Project Chief: Brock Huntsman, GS-13 Fish Biologist, bhuntsman@usgs.gov
Fish Biologist GS 9/10

BUDGET SUMMARY

Budget Item	FY 2024	FY 2025
Salary (GS-13 Fish Biologist)	\$36,932.93	\$62,100.08
Salary (GS-9/10 Fish Biologist)	\$21,413.76	\$42,552.17
Travel	\$29,921.62	\$9,239.35
Equipment	\$9,367.85	\$--,---.00
Other	\$--,---.00	\$--,---.00
Total Direct Costs (Net)	\$54,234.17	\$63,732.52
Total Indirect and Distributed Facilities Costs (Gross)	\$43,401.99	\$50,159.08
Total (Gross)	\$97,636.16	\$113,891.60

DATA MANAGEMENT AND INFRASTRUCTURE PLANNING QUESTIONNAIRE

See original proposal below (Proposal # 2023-15)

JOB HAZARD ANALYSIS

See original proposal below (Proposal # 2023-15)

ORIGINAL PROPOSAL (Proposal # 2023-15)

Title: Native Fish Surveys within the Santa Ana River
California Water Science Center, Southwest Region
Proposal 2023-15 Summary
Cooperator(s): San Bernardino Valley Municipal Water District
Author(s): Brock M. Huntsman

Statement of Problem:

The Santa Ana sucker (*Pantosteus santaanae*, SAS) is one of few extant native freshwater fishes in southern California. There are numerous threats hypothesized responsible for the poor condition of SAS in the Santa Ana River. Consequently, SAS are part of the Upper Santa Ana Habitat Conservation Plan (HCP), which was developed as a comprehensive program to assist in the development of conservation activities to protect, enhance, and restore habitat for covered

species in the watershed. Developing an HCP requires sufficient knowledge of the populations of interest to develop plans for their protection and management. Initial assessment of the available data within the HCP suggested to the concerned parties that additional data that extends spatially and temporally are needed on population density and availability of suitable habitat to support development of the HCP.

Objectives:

The ability to monitor population abundance and habitat availability with some level of confidence is important when developing plans such as the HCP and making management decisions. The objectives of this study are to:

3. Conduct population surveys to estimate native and non-native fish abundances from the Santa Ana River in 2023 using methods established during previous surveys between 2015 and 2022.
4. Develop a population viability analysis from available native fish abundance estimates for the Santa Ana River.

Relevance and Impact:

The goal of the Upper Santa Ana HCP is to achieve conservation objectives that adhere to the federal Endangered Species Act while streamlining planning and permitting for water resource management projects designed to fulfill the water resource needs of the public. The monitoring and analyses proposed as part of this study have been designed to fill the information gaps needed to achieve the goals of the Upper Santa Ana HCP, which also align with the goals and mission of the USGS.

Strategy and Approach:

A stratified random sampling design will be used within designated critical SAS habitat of the Santa Ana River. Approximately 15% of the known occupied river will be sampled by backpack electrofishing to estimate true population size throughout the Santa Ana River. Habitat surveys will also be conducted using National Water-Quality Assessment Program protocols (NAWQA) to identify habitat associations with native fish distributions. Lastly, these data along with other published information will be used to develop a population viability analysis for further investigation of extirpation risk in the native fish population inhabiting the Santa Ana River.

Keywords: Community Structure, Fish Ecology, Invasive Species

Title: Fish Community Dynamics within the Santa Ana River
California Water Science Center, Southwest Region

Proposal # 2023-15 (for reference of previous work, see proposals [2018-11](#), 2017-18, & 2015-19)

Cooperator(s) San Bernardino Valley Municipal Water District

Author(s) Brock M. Huntsman

BACKGROUND/INTRODUCTION

The Santa Ana sucker (*Pantosteus santaanae*, SAS) is one of few extant native freshwater fishes in southern California. SAS was federally listed as threatened in 2000 due to habitat fragmentation and degradation in watersheds of southern California (U.S. Fish and Wildlife Service [USFWS] 2017). This federally listed species is endemic to the Santa Ana, San Gabriel, and Los Angeles Rivers (Big Tujunga Creek), where it has been extirpated from greater than 70% of its native range (USFWS 2017).

The SAS population of the Santa Ana River is distributed downstream of the Seven Oaks Dam, where greater than 65% of flow is treated wastewater (Mendez and Belitz 2002). Flow regulation and an insufficient sediment supply below the dam, elevated water temperatures, and an expanding population of non-native predators (e.g., Largemouth Bass, *Micropterus salmoides*) are hypothesized as a few of many reasons for the poor condition of SAS within the Santa Ana River (Saiki et al. 2007, USFWS 2017, Wright and Minear 2019, Huntsman et al. 2022). Consequently, SAS are part of the Upper Santa Ana Habitat Conservation Plan (HCP), which was developed as a comprehensive program to assist in the development of conservation activities to protect, enhance, and restore habitat for covered species in the watershed. Developing an HCP requires sufficient knowledge of the populations of interest to develop plans for their protection and management.

PROBLEM

Multiple agencies have been working to establish an HCP for the Santa Ana River watershed. The data currently available for two native fishes in the HCP area, SAS and arroyo chub (*Gila orcuttii*), are not sufficient to support the next step of the HCP planning and implementation process, which is the development of a robust monitoring program to inform future habitat and population management decisions; therefore, additional data on these two species are needed from the Santa Ana River. Initial assessment of the available data within the HCP suggested to the concerned parties that additional data that extends spatially and temporally are needed on population density and availability of suitable habitat to support development of the HCP. The overall objective of this proposed work is to address those needs.

OBJECTIVES and SCOPE

The ability to monitor population abundance and habitat availability with some level of confidence is important when developing plans such as the HCP and making management decisions. The objectives of this study are to:

1. Conduct population surveys to estimate native and non-native fish abundances from the Santa Ana River in 2023 using methods established during previous survey between 2015 and 2022 (see Huntsman et al. 2022).
2. Develop a population viability analysis from available native fish abundance estimates for the Santa Ana River.

RELEVANCE and BENEFITS

The USGS mission and vision as stated in the U.S. Geological Survey's 21st-Century Science Strategy 2020-2030 (U.S. Geological Survey 2021) is "to monitor, analyze, and predict current and evolving dynamics of complex human and natural Earth system interactions and to deliver actionable intelligence at scales and timeframes relevant to decision makers." Furthermore, the second goal of the USGS Water Science Strategy (Evenson et al. 2013) is to "Advance Understanding of Processes that Determine Water Availability." The goal of the Upper Santa Ana HCP is to achieve conservation objectives that adhere to the federal Endangered Species Act while streamlining planning and permitting for water resource management projects designed to fulfill the water resource needs of the public. The monitoring and analyses proposed as part of this study have been designed to fill the information gaps needed to achieve the goals of the Upper Santa Ana HCP, which also align with the goals and mission of the USGS as previously described.

The second goal of the USGS Water Science Strategy (Evenson et al. 2013) is to "Advance Understanding of Processes that Determine Water Availability". This study will be particularly relevant to this second goal because unbiased interpretation of catch data is needed for wastewater operations of the Santa Ana River, which constitutes greater than 60% of surface flows. The Water Science Strategy

specifically states that areas of research include “Science that examines the effects of water contamination and pollution on the functioning of ecosystems. Science that improves our understanding of adaptation strategies to assist in the conservation of plants and animals in ecosystems that experience change in water supplies in response to climate variability. Science that supports the ability to restore and conserve aquatic ecosystems.”

APPROACH

The Santa Ana River basin is the largest coastal basin in southern California, draining an area of approximately 6,900 km² (Figure 1). The drainage is greater than 70% urban and is divided between two ecoregions, the Southern California Mountains and the Southern California/Northern Baja Coast (Griffith et al. 2016). The river is a highly braided with the potential to shift or create and disengage braids after large storm events. Surveys for this study will occur in September within the middle Santa Ana River currently designated as critical SAS habitat (USFWS 2017), from above the Prado Dam to the Rialto channel (Figure 1).

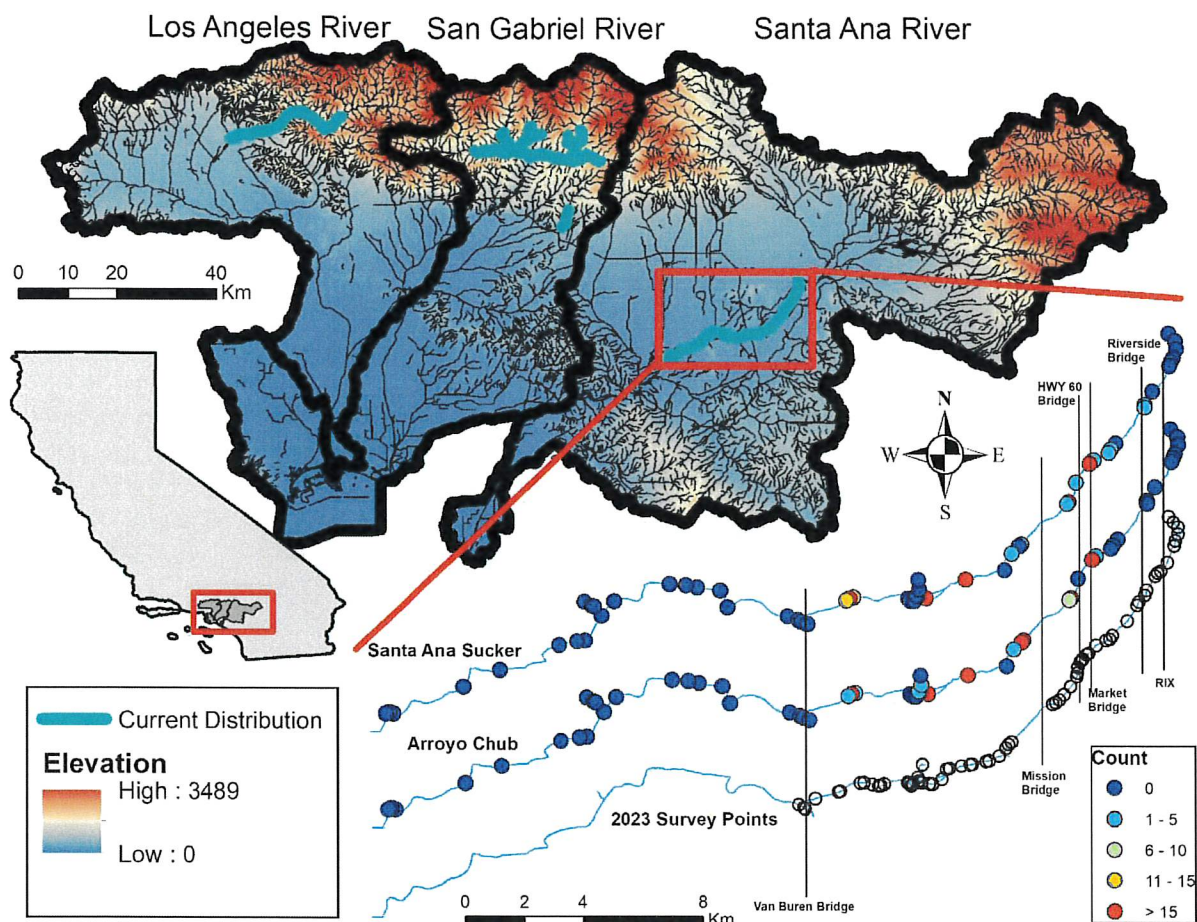


Figure 1. Sampling locations for native fish surveys conducted by the USGS in 2021 and planned for 2023 in the Santa Ana River, California. Counts are the total number of native fish captured within each reach in 2021.

Objective 1: Native Fish Surveys

A stratified random sampling design will be used within designated critical SAS habitat of the Santa Ana River (Figure 1, ~ 16km of stream). Four main stem strata and three tributaries (Anza Ditch, Sunnyslope Channel, and Hole Creek) within the critical SAS habitat were selected based on current knowledge about mechanisms affecting fish distributions within the river and results from previous surveys indicating native fishes were not found downstream of the Van Buren Bridge (Figure 1). A total of 57 50-m stream reaches have been randomly selected (48 main stem and 9 tributary), because preliminary sensitivity analyses

suggested at least 15% of the sampling area needs to be sampled to get adequate population estimates ((50 m*57 reaches)/16,000m=18% of the currently known occupied river to be sampled). Additionally, simulations suggest that at least 10% of the samples must include 3-pass removal sampling methods to adjust catch data for imperfect detection efficiency, which will require six sampling reaches to be randomly selected for closed removal sampling (see below). Prior to fish sampling, each 50-m sampling reach will be delineated using georeferenced coordinates, flagging tape, and a measuring tape. The upper and lower ends of the sampling reach will be measured with a measuring tape, and flagging will be used to identify the start and end.

Within each sampling reach, backpack electrofishing surveys using tandem electrofishing units (2 or 3 people) will progress from the downstream end to the upstream end of the sampling reach. In addition to individuals using electrofishing units, a netter will be assigned to each electrofisher and three or more people will deploy a seine just downstream of the electrofishing units. During electrofishing, units will push fish downstream into the seine if not captured by the associated netter. A total of three removal passes per sampling reach will be conducted for all sampling reaches and each fish captured will be identified and measured for weight (± 0.1 g) and fork length (± 1 mm). Block nets at the upper and lower end of a sampling reach will only be used for closed removal sampling reaches ($n = 6$), because use of block nets for all 57 sampling reaches is not logistically possible with currently available resources. Preliminary analyses indicated that block-nets explained little variability in detection efficiency of SAS when not used (see SAS survey data with and without removal sampling from Wulff et al. 2020, 2021, 2022), suggesting few fishes moved into or out of the sampling reach when block nets have not been used. However, including a subset of samples with block-nets allows for addressing closure assumption violations when fitting abundance models following methods described in Perry et al. (2016), if sampling without block-nets in fact violates the closure assumption.

Habitat surveys will be conducted within each stream reach surveyed for fishes using USGS stream habitat survey protocols for the National Water-Quality Assessment Program (NAWQA; Fitzpatrick et al. 1998). Six transects per reach will be surveyed within a reach, and 10 habitat measurements will be made at equal distances across the transect. Measurements will include wetted channel width at each transect, which will be used to estimate sampling intervals for the remaining habitat variables to be collected. Stream depth (± 1 cm), stream velocity (± 0.1 m/s) and dominant substrate (i.e., silt, sand, gravel, cobble, boulder, bedrock) will be measured using a wading staff and flow meter (Marsh-McBirney 2000 or HACH HS 950.1 digital flow meter). Canopy cover will be measured with a concaved spherical densiometer, and potential fish cover will be classified (e.g., overhanging vegetation, undercut bank) at each interval along the transect.

Objective 2: Population Viability Analysis

We will continue development of a population viability analysis of SAS and arroyo chub using native fish survey data collected during this study (Objective 1), previous USGS surveys (Huntsman et al. 2022), and other non-USGS published data (Haglund et al. 2001, 2003, 2010). Compiled data sets will be fit to a hierarchical multi-population viability analysis (PVA) with similar structure proposed by Leasure et al. (2019). An N -mixture modeling framework will be used to fit the PVA and estimate abundance from fish-survey data using the following general hierarchical model structure (Equations 1-3):

$$\begin{array}{ll} \text{Eqn. 1} & [N_t | N_{t-1}, R] \\ \text{Eqn. 2} & [\mu | \gamma, N_t] \\ \text{Eqn. 3} & [\gamma | p, \mu] \end{array}$$

where “[]” represents a probability mass or density function, “|” represents a conditional distribution. Observed fish counts (γ) are conditional on the sampling efficiency of the gear used (p) and the latent state abundance within each sampling reach (μ). The abundance for the entire sampling area (from Rialto to Van

Buren, see Figure 1), whether a sampling reach was sampled or not, (N_t) is conditional on the abundance the previous year (N_{t-1}) and a rate of population change (R). The abundance for the entire area (N_t) is linked to data collected at the reach scale (y) based on the sampling model (Equation 2), which indicates the true abundance of a fish species within a 50-m sampling reach (μ) is conditional on the abundance of the entire sampling area (N_t) and the probability that a fish is captured given it is located within a sampling reach (γ). Model output will then be used to extrapolate population size into the future and estimate the probability that the native fishes within the Santa Ana River could go extinct given current conditions and under different remediation scenarios (e.g., non-native fish removal).

QUALITY ASSURANCE/QUALITY CONTROL

Field data collection QAQC procedures established by the California Water Science Center Aquatic Ecology



AEG_QAQC_SOP.docx

Group (AEG) will be followed for this study. All product development (reports and manuscripts) will be subject to established USGS Fundamental Science Practices.

LABORATORY EVALUATION PLAN

NA

PRODUCTS

Results of the population estimate survey, population dynamics modeling, and the PVA analysis will be presented annually, or more frequently by request, to the SBVMWD as well as to other interested parties. We will continue to refine and develop draft manuscripts describing the results of the population abundance and habitat use results collected to date with the goal of having one or more draft manuscripts submitted to journal by the winter/spring of 2023-2024. We will participate in workshops and symposia as requested by SBVMWD to support monitoring and management of Santa Ana River fishes. All data collected during surveys will be made publicly available on the "Native Fish Population and Habitat Studies, Santa Ana River, California" landing page in ScienceBase (<https://www.sciencebase.gov/catalog/item/63360a12d34e900e86c8e611>).

MAP OF STUDY AREA

See Figure 1

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TIMELINE

All surveys will be completed by the end of September in FY23 by the project chief and a fish biologist (GS 9/10), to be consistent with timing of surveys in previous years (Objective 1). Data associated with surveys will be QAQC'd and published in ScienceBase on the current project landing page ([Native Fish Population](#)

[and Habitat Studies, Santa Ana River, California - ScienceBase-Catalog](#)) by March of 2024 by a GS 9/10 fish biologist. The project chief will analyze 2023 survey data and provide cooperators an estimate of native fish abundance within the Santa Ana River by June 2024. The project chief will provide a draft manuscript to cooperators detailing the results of the population viability analysis (Objective 2) by June 2024.

Task or Element	FY 2023				FY 2024				FY 20--			
	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-June	July-Sept
Objective 1				X								
Objective 2				X	X	X						
Data Analysis					X	X						
Data Entry and Release					X	X						
Report review and publication				X	X	X	X					

PERSONNEL

Project Chief: Brock Huntsman, GS-12 Fish Biologist, bhuntsman@usgs.gov
Fish Biologist GS 9/10

BUDGET SUMMARY

Budget Item	FY 2023	FY 2024
Salary (GS-12 Fish Biologist)	\$23,258.00	\$67,447.00
Salary (GS-9/10 Fish Biologist)	\$17,965.00	\$44,913.00
Travel	\$24,153.00	\$5,938.00
Equipment	\$3,749.00	\$--,---.00
Other	\$--,---.00	\$5,905.00
Total Direct Costs (Net)	\$38,415.00	\$69,311.00
Total Indirect and Distributed Facilities Costs (Gross)	\$30,710.00	\$54,892.00
Total (Gross)	\$69,125.00	\$124,203.00

DATA MANAGEMENT PLANNING QUESTIONNAIRE

1. Project Name *

Native Fish Surveys within the Santa Ana River

2. Please categorize your project as it relates to 'Source Agencies Providing the Data and the Roles of USGS Scientists'. See: https://www2.usgs.gov/fsp/guide_to_datareleases.asp#obligations *

- ☐ USGS funded data, USGS scientist is first author or principal investigator (PI) – USGS data release is REQUIRED
- ☐ USGS funded data, USGS scientist is not PI but a co-author – USGS data release is REQUIRED, but not necessarily by the USGS co-author. Please consult with your USGS project partners to clearly determine who will release the data.
- ☐ Federally (not USGS) funded data, USGS scientist is PI or first author – Federal funding agency has the primarily responsibility for releasing data unless an alternative release path is explicitly agreed to by your Federal partners.
- ☐ Federally (not USGS) funded data, USGS scientist is not PI but a co-author – Federal funding agency has the primarily responsibility for releasing data unless an alternative release path is explicitly agreed to by your Federal partners.
- ☒ State/local/non-governmental organization (NGO)/private sector (PS) funded data, USGS scientist is PI or first author – State/local/NGO/PS has the primarily responsibility for releasing data unless an alternative release path is explicitly agreed to by the project partners.
- ☐ State/local/NGO/PS funded data, USGS scientist is not PI but a co-author – State/local/NGO/PS has the primarily responsibility for releasing the data.

3. Do you plan to do a USGS data release for this project? *

- ☒ Yes
- ☐ No

4. What is the name of the project lead / chief / principal investigator? *

Brock Huntsman

5. Who will be responsible for managing the data?

Please provide a name as a contact for data management for this project.

Note: that this needs to be someone closely associated with the data collection, and processing *

Brock Huntsman

6. Would you characterize the proposed work as: *

- ☐ ROUTINE (will use previously established methods AND a previously established study design)
- ☐ NON-ROUTINE (will use previously established methods AND a new study design)
- ☒ RESEARCH (will use new methods AND a new study design)

7. Will this project involve modeling? *

- ☐ Yes
- ☒ No

Groundwater Data

8. Do you plan to collect groundwater data? *

- ☐ Yes
- ☒ No

Surface Water Data

9. Do you plan to collect surface water data? *

☐ Yes

☒ No

NWIS

10. Do you expect to archive data from this project in NWIS? *

☐ Yes

☒ No

If data are not destined for NWIS...

11. Why won't the data be archived in NWIS? *

Data is biological survey data that will be published in ScienceBase

12. What is the network address where your data will be stored while the project is ongoing?

eg, \\igswcawwfsnas\ *

The data will be stored on the Aquatic Ecology Z drive (\\igswcawwfsnas.wr.usgs.gov)

13. Please describe your plan for storing backups of the data in multiple places and on different media types to protect against data loss from a single-point failure. *

Data will be stored on an external harddrive, a work computer, and on the Aquatic Ecology Z drive(\\igswcawwfsnas.wr.usgs.gov)

14. Who will routinely check to ensure that backups are being done according to that backup plan you just described?

Note: that this needs to be someone closely associated with actual storage and management of your project data while the project is ongoing. *

Brock Huntsman

15. Where will these data be made accessible to the public? *

- ☒ USGS's sciencebase.gov
- ☐ aquatic.biodata.usgs.gov (biological community and physical habitat data)
- ☐ cmgds.marine.usgs.gov (Coastal and Marine Geoscience Data System)
- ☐ bison.usgs.ornl.gov (Biodiversity Information Serving our Nation - U.S. species occurrence data & maps)
- ☐ A CAWSC Web site
- ☐ Other

Questions about data quality management

16. Who will manage data quality throughout the project? *

Brock Huntsman

17. The quality of this project's data will be assured by following: *

☐ CAWSC Quality-Assurance Plan for Groundwater ☐

CAWSC Quality-Assurance Plan for Surface Water ☐

CAWSC Quality-Assurance Plan for Water-Quality

☒ in a separate quality assurance plan tailored for this particular project

☐ Other

Data Release Web Page

18. What is the Web address (URL) of the CAWSC Web page that you intend to release data to? *

<https://www.sciencebase.gov/catalog/item/63360a12d34e900e86c8e611>

Final Data Management Questions

19. For data that won't fit within NWIS: What is the name of the person responsible for creating and updating metadata compliant with metadata standards endorsed by the Federal Geographic Data Committee?

In other words who will make metadata compliant with ISO-19115 and ISO-19139, or the FGDC's Content Standard for Geospatial Metadata. See this page for more detail:

<https://www.usgs.gov/products/data-and-tools/data-management/describe-metadatadocumentation>

Note: This needs to be someone closely associated with the data collection, and processing *

NA

20. For data that won't fit within NWIS: Do you anticipate the need for training for yourself or your project staff on how to create metadata?

*If your data will be stored in NWIS, then you won't need to create metadata for it. Metadata is required for data releases via ScienceBase. *

☒ No

☐ Yes, please!

21. Please describe any access restrictions for the data to be collected and how those restrictions may impact the [1] storage and protection of the data and [2] public access to the data.

NA

22. Please use this space to let DMS know anything else about your project that was not covered previously and that might help us better support your project. *

NA

Job Hazard Analysis For New Projects

- Check the numbered box(s) for all significant safety concerns this project should address. Significant safety concerns are commonly those that require training, purchase of safety equipment, or specialized preparation to address potentially hazardous conditions.
- Identify any unlisted safety concerns at bottom of the page.
- Provide details on the back of this page.

Proposal Number: 2023-15

Project Title (Short): Native Fish Survey

Project Chief or Proposal Author: Brock Huntsman

√	Safety Concerns
1. √	Wading, bridge, boat, or cableway measurements or sampling
2.	Working on ice covered rivers or lakes
3.	Measuring or sampling during floods
4.	Well drilling; borehole logging
5. √	Electrical hazards in the work area
6.	Construction
7.	Working in remote areas, communication, office call in procedures
8. √	Ergonomics, carpal tunnel syndrome
9. √	Field Vehicles appropriate for task? - safety screens, equipment restraints
10.	All terrain vehicles, snowmobiles
11.	Helicopter or fixed wing aircraft usage

12. √	Site access
13. √	Hypothermia or heat stroke
14. √	Hantavirus, Lyme Disease, Histoplasmosis, Pfiesteria, West Nile Virus, Others?
15. √	Contaminated water with sanitary, biological, or chemical concerns
16. √	Immunizations
17.	<p>Laboratory:</p> <ul style="list-style-type: none"> • Chemical Hygiene Plan (CHP) must be read and signed by lab users and their supervisors. Any additions to the CHP must be communicated to the Lab Safety Officer and the CAWSC Safety Coordinator. • Describe any project activities planned for CAWSC laboratory facilities that use new or non-standard procedures and methods employed in the labs. • List any chemicals to be used in the project activities planned for CAWSC laboratory facilities planned laboratory facilities that are currently NOT in the Lab's chemical inventory.
18.	Hazardous waste disposal
19.	Hazardous waste site operations
20.	Confined space
21.	Radioactivity
22.	Respiratory protection
23.	Scuba Diving
24. √	Electrofishing
25.	Fall Protection
26.	Defense Against Wild Animals

27.	Breath-Holding, Snorkeling, and Free Diving
28.	Trailerling
29. √	Sun Protection
30.	Sample Prep Areas (primarily field offices) and Mobile Water Quality Sampling Vehicles
31. √	Exposure to toxic algae
32. √	Pandemic
33.	Hydrogen Sulfide Gas
34. √	Personal Safety Through Awareness

<p>Box no.</p>	<p>For each numbered box checked on the previous page, briefly:</p> <p>A. Describe the safety concern as it relates to this project.</p> <p>B. Describe how this safety concern will be addressed. Include training, safety equipment and other actions that will be required.</p> <p>C. Estimate costs.</p>
<p>1</p>	<p>To ensure safe working conditions, the following approaches will be followed: sampling teams will include two or more people; PFDs (personal floatation devices) will be used when working around, over, or in water bodies; rescue throw bags will be available; cell phones or satellite communication devices (e.g. inReach or SPOT) will be available to summon emergency assistance if needed; strobe lights will be attached to personnel if sampling in low light conditions; and tailgate safety talks will be given prior to sampling to discuss current site safety conditions.</p> <p>TRAINING:</p> <p>All personnel working on, over, or near water are required to take over-the-water training every three years.</p> <p>PFDs:</p> <p>Personal Floatation Devices (PFDs) will be provided to field personnel and must be worn when working near, on, or over a water body. In rare instances where an exemption or variance is needed due to the employee being subject to a greater hazard by wearing the PFD, controls that are at least as protective as the PFD shall be instituted in place of the PFD and documented in the Job Hazard Analysis (JHA). An exemption request, inclusive of the JHA, should be submitted in memorandum form to the Regional Safety Manager and Center Director for concurrence and then to the Chief, Occupational Safety and Health Management Branch for approval. Inflatable PFDs will be orally inflated at least twice per year to ensure these devices remain inflated for at least 24 hours. PFDs that fail this check will be immediately removed from service, quarantined, and destroyed. Hydrostatic inflatable PFDs will be auto-inflated and re-armed every four years or as indicated by the inflation device's expiration date. Wafer inflatable PFDs will be auto-inflated and re-armed annually or as indicated by the inflation device's expiration date. Results of all checks will be filed locally.</p>
<p>5</p>	<p>Electrical hazards in the work area:</p> <p>All personnel will be informed of the DOI Talent course titled, "Electrical Safety 2.0 – Cal/OSHA" and encouraged to complete this course if they are not familiar with electrical hazards.</p>

8	<p>A. This project will require data analysis and report preparation.</p> <p>B. Ergonomic assessments of employee workstations are available upon request to the CAWSC Field Safety Coordinator, Ayelet Delascagigas. The CAWSC has developed an SOP for procuring approved ergonomic equipment.</p> <p>Field:</p> <p>Performing work duties requiring moving or lifting heavy objects, long periods of sampling operation, or other repetitive activities can result in injury. Employees will team lift if a load is too heavy or awkward for one person to handle. When lifting, employees will bend at the knees (not stoop), keep their backs straight, and lift with strong leg muscles (not weaker back muscles). When possible, mechanical equipment will be used to move heavy items.</p>
9	<p>Field vehicles appropriate for task? – safety screens, equipment restraints:</p> <p>The California Water Science Center uses vehicles for data collection activities, supply runs, and travel to and from meetings and conferences. Vehicle operators will not exceed 10 consecutive hours of driving during a 16-hour duty period. This 10-hour period included rest and meal breaks. A driver shall drive only if they have had at least 8 consecutive hours off duty before beginning a shift. Drivers shall stop and take a break or let an approved vehicle operator take their place if they feel drowsy. Management may place further limitations on the above hours of duty and/or driving time due to safety factors (example, fatigue, weather, distance, and illness).</p> <p>Vehicle Safety Maintenance and Inspection:</p> <p>Vehicle maintenance resides with the person primarily responsible for upkeep of that vehicle. This person is to complete the USGS Vehicle Safety Inspection Checklist annually and file locally (i.e. in the location where the vehicle is stored). The checklist form can be accessed from the Center's Safety webpage.</p> <p>Cargo Barriers:</p> <p>Vehicles shall contain appropriate safety barriers to protect occupants from potential cargo projectiles. This pertains to vehicles in which the passenger and cargo compartments are not separate. Note: any modification to GSA vehicles (G-vehicles) must first be approved by GSA Fleet Service. Contact the CAWSC Vehicle Coordinator for information.</p>

	<p>Training:</p> <p>All employees who use any vehicles, including personal vehicles, while working for the USGS will complete an approved driver safety training course every three years. This requirement can be satisfied by successfully completing the 4-hour DOI Talent training compliance module titled "Defensive Driving 2.0". Alternatively, employees can take the following free online course, https://ddt.dgs.ca.gov/ *. The Certificate of Completion should be filed at the employee's duty station. *In order for the employee's training to be recorded in DOI Talent the employee should click on the link below and self-certify: https://doitalent.ibc.doi.gov/enrol/index.php?id=573</p> <p>Additional training is available for employees who drive utility trucks, especially off-road.</p>
12	<p>Site access:</p> <p>Rough terrain requires special consideration for risk of injury from slips, trips and falls. Personnel should be equipped with proper safety apparel and equipment for hiking safely over this terrain.</p>
13	<p>Hypothermia or heat stroke:</p> <p>CAWSC employees may be required to work in climates that differ from that of their work duty station. Acclimatization is the physiological adaptation of humans to changes in climate or environment, such as light, temperature, and/or altitude. Time for this process to occur should be taken into consideration when planning strenuous activity in a new climate.</p> <p>Heat stress, from exertion or hot environments, places workers at risk for illnesses such as heat stroke, heat exhaustion, or heat cramps.</p> <ul style="list-style-type: none"> • Symptoms include: <ul style="list-style-type: none"> ○ rapid pulse ○ heavy sweating ○ fatigue ○ dizziness ○ nausea ○ irritability ○ muscle cramps. • Treatment/First aid includes: <ul style="list-style-type: none"> ○ stopping work activities ○ moving to a cool ○ shaded area ○ removing excess clothes ○ applying cool water to body ○ increasing fluid intake (water or Sports drink)

	<ul style="list-style-type: none"> ○ seeking medical attention if symptoms are severe or do not improve. ● Prevention includes: <ul style="list-style-type: none"> ○ monitoring the physical condition of yourself and coworkers ○ wearing light-colored, loose-fitting ○ breathable clothing ○ scheduling heavy work for the coolest parts of day ○ taking frequent breaks in shaded areas, and frequent water intake <p>Field personnel are required to have first aid training and be provided adequate water, Sports drinks, sunscreen (for body and lips), and shade (umbrella or canopy cover).</p> <p>To guard against hypothermia resulting from cold exposure, employees are instructed to minimize heat loss by any or all of the following: wear proper clothing, dress in layers including appropriate outerwear/survival suits, eat high energy foods, seek shelter from wind/waves, stay as dry as possible, and know the signs of hypothermia (shivering, clumsiness, lack of coordination, slurred speech, mumbling, confusion, drowsiness, apathy, weak pulse, and slow, shallow breathing). In the case of hypothermia, take appropriate action/seek medical attention immediately.</p>
14	<p>Hantavirus, Lyme Disease, Histoplasmosis, Pfiesteria, Others?:</p> <p>Protection from vector-borne diseases, including <u>Lyme disease (ticks)</u>, <u>West Nile Virus (mosquitos)</u> and <u>Encephalitis (mosquitos)</u>, involves use of mosquito and tick repellents, wearing special clothing (arthropod-resistant shirts and pants), and tucking pant cuffs into socks to increase the chance of finding crawling ticks before they attach. The clothing and bodies of individuals should be checked as soon as possible for any ticks during and after field work activities. Lyme disease symptoms include a bulls-eye rash (~75% of cases) that rapidly expands to about 1 to 8 inches in diameter and flu-like symptoms (headache, fever, joint pain, swollen glands). Most people infected with West Nile Virus will have no symptoms. One in five will develop fever, and less than 1% will develop a neurological illness that can be fatal. Encephalitis disease symptoms include nonspecific illnesses (fever, headache, musculoskeletal pain) to severe illness of the central nervous system. Seek medical treatment if infection is suspected.</p> <p><u>Histoplasmosis</u> is a fungal disease associated with animal feces including that of <u>birds</u>. Protective respirators (rated P-100) will be worn whenever there is potential employee exposure. Respirators restrict breathing, therefore it is important to have a medical exam prior to being fit-tested to wear this type of personal protection equipment.</p>

	Project employees will arrange to meet with Ayelet Delascagigas, the CAWSC Field Safety Coordinator, to discuss the CAWSC Respirator Protection Program.
15	<p>A. This project may involve working in the Santa Ana River, near sources of tertiary treated wastewater outflow.</p> <p>Surface water in some areas may have low to moderate levels of contamination from sewage or agricultural runoff. Although contaminant concentrations are likely to be not so high as to pose an immediate danger to workers on-site, USGS activities will conform to site access and hygiene requirements at those sites. Field personnel will be advised of the contamination risk and will be provided onsite with protective equipment and supplies (e.g. impermeable gloves, splash resistant safety glasses, clean water supply, and antibacterial soap). Field personnel will be informed that they are entitled to no-cost Hepatitis-A, Hepatitis-B, and Tetanus vaccinations. Appropriate dust masks will be supplied if needed.</p>
16	<p>Immunizations:</p> <p>USGS employees are entitled to influenza (flu), hepatitis-A, hepatitis-B, and Tdap [Tetanus (Lockjaw), Diphtheria, Pertussis (Whooping Cough)] vaccinations at no-cost. Also available, but less typical, are vaccinations for rabies (animal collection activities) and typhoid (for work in some locations outside of the US). Employees should discuss which vaccinations are appropriate for them with their health care providers.</p> <p>Immunizations are available at the Federal Occupation Health facilities in Sacramento and San Diego and from employee health care providers. Appointments are required to ensure medical facilities have vaccines in stock.</p> <p>Federal Occupation Health</p> <p>501 I Street</p> <p>Floor 7, Rm 300 (AKA 7-300)</p> <p>Sacramento, CA 95814</p> <p>Nurses: Lada Petova, Patricia Morris, Jenny Middlebrook, Jan Sloan</p> <p>(916) 930-2290</p>

	<p>Call to schedule vaccinations M-F 8:00 AM – 4:00 PM and bring vaccination records including types and dates if available.</p> <p>For possible free parking go to the loading dock area off 6th street between H and I street, show government ID, and ask security guard for short term parking.</p> <p>Federal Occupation Health</p> <p>880 Front Street</p> <p>Room B217</p> <p>San Diego, CA 92101</p> <p>(619) 557-5038</p> <p>Vaccines administered by appointment Monday – Friday, 8 AM – 3:30 PM.</p> <p>Employees outside of the Sacramento and San Diego areas should contact Ayelet Delascagigas (916.823.1793) or Jeanette Rainey (916.709.5995) for guidance using their government credit cards as payment for vaccinations from an approved health care providers.</p> <p>Note: cardiac risk profiles (lipid and glucose screening) and medical clearance for respirator use are other services provided to the CAWSC by Federal Occupation Health.</p>
24	<p>A. Backpack electrofishing surveys may be required to collect sufficient numbers of fishes from the Santa Ana River to use in mesocosm experiments.</p> <p>B. At least one researcher will have electrofishing certification during fish collection. Fish collection can only occur when permitted biologists from the Riverside-Corona Resource Conservation District are present, who are also certified to operate electrofishing equipment. All researchers will wear wading equipment that insulates the researcher from the electrofishing equipment.</p> <p>USGS employees will take the two-hour DOI Talent course titled, “<u>Electrofishing Safety</u>” prior to engaging in electrofishing activities.</p> <p>Responsibilities:</p>

	<p>1. Ensuring that employees have and utilize the proper safety equipment.</p> <p>2. Identifying hazardous conditions associated with proposed electrofishing operations, determining measures to protect electrofishing team members, and appropriately briefing team member.</p> <p>3. Ensuring adequate warning is provided to the public to avoid public exposure to the potential hazards of electrofishing operations.</p> <p>4. Ensuring precautions are taken to avoid harm to nets, domestic animals, or wildlife.</p> <p>5. The crew chief will advise the project office of the location and time the electrofishing will be performed. The crew chief will advise the project office as soon as practical after the electrofishing has been performed that the job has been completed.</p> <p>Training:</p> <p>6. Training and Education Requirements.</p> <p>A. The Team Leader in each electrofishing field crew must initially complete the National Conservation Training Center Electrofishing Course (CSP2201) or the Electrofishing by Correspondence Course (CSP2C01) to satisfy certification competency for factors (1-5) below:</p> <p>(1) Basic principles of electricity and the generation of electrical fields in water.</p> <p>(2) Basic concept and design guidelines for electrofishing equipment.</p> <p>(3) Capabilities, limitations, and safety features of electrofishing equipment.</p> <p>(4) Safety precautions to employ while using electrofishing equipment.</p> <p>(5) Awareness of methods to reduce fish trauma due to electrofishing.</p> <p>B. Team Leader refresher training is required every 5 years and can be met via completion of any one of the courses listed below:</p> <p>(1) The National Conservation Training Center Electrofishing Course (CSP2201).</p> <p>(2) The National Conservation Training Center Electrofishing by Correspondence Course (CSP2C01).</p>
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Personal Protective Equipment (PPE):

1. Rubber hip boots will be worn.
2. Rubber chest waders may also be worn, when necessary, in order to remain dry as protection against electrical shock.
3. Rubber gloves that are rated above the voltage being used will be worn. These will be inspected before each use and replaced at adequate intervals.
4. Personal Flotation Devices. All occupants will wear U.S. Coast Guard approved personal flotation devices at all times. Life vests that meet the requirements of Type II are designed to turn an unconscious person in the water from a face downward position to a vertical or slightly backward position. Float coats or Type five coveralls may provide some protection against the loss of body heat if the person were to accidentally fall into the cold water.
5. First Aid Kit – watertight and well-equipped.

Noise:

Noise levels will be maintained within the acceptable exposure of 85 dba for 8-hour exposure. Personal protective measures, such as earplugs or muffs may be required. Sound powered headphones may be necessary, this type of headphone shuts out generator and motor noise and provides clear communication between the netter and the equipment operator.

Immunizations:

All field personnel working on an electrofishing crew will have an update of their tetanus immunization and hepatitis B shots including administration of gamma globulin.

Weather:

Ensuring that all electrofishing operations cease and all crewmembers go ashore in the event of a thunderstorm (boating and wading).

	<p>Portable Electrical Power Source:</p> <ol style="list-style-type: none"> 1. Batteries used as an electrical power source for backpack shockers will be of the gel type that will not leak when tipped or overturned. 2. Backpacks will be equipped with a quick release belt (hip) and shoulder straps. <p>Electrodes:</p> <ol style="list-style-type: none"> 1. Electrode handles will be constructed of a nonconductive material and be long enough to avoid hand contact with the water. 2. The positive electrode (anode) used with portable electroshockers will be equipped with a pressure switch that breaks the electric current upon release. 3. Netters will work beside or behind the individual with the electrofishing equipment to ensure the electrical field is well in front of both workers <p>Electrofishing Boats:</p> <p>Design - Electrofishing boats will provide adequate flotation and freeboard clearance consistent with equipment, cargo, and passenger weight when being operated. The boat will be equipped to meet U.S. Coast Guard, USGS and State boating regulations. The boat deck will be painted with a non-slip or skid resistant coating.</p> <p>Inspection - The boat and equipment will be visually inspected for safety by the supervisor or operator in charge, prior to each use. Significant deficiencies, which could result in employee injury, will be corrected prior to operation or use of the equipment.</p> <p>Pre-Launch Briefing</p> <ol style="list-style-type: none"> 1. Hazards involved in electrofishing. 2. Safe operation of electrofishing equipment. 3. Basic emergency procedures for drowning, unconsciousness, and electrical shock. <p>Grounding/Bonding:</p> <p>All metal surfaces within a metal boat will be electrically connected, grounded, and bonded to the boat hull to eliminate differences in electrical potential that may result in electric shock. The metal boat hull may also be used as a cathode. To avoid possible</p>
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	<p>electrolysis problems when the metal hull is being used as a cathode, zinc strips should be attached to the hull as "sacrificial anodes." The electrolysis will occur on the zinc strips that will preserve the integrity of the hull.</p> <p>Conductor Type:</p> <p>Conductors will be of the stranded type for flexibility and will be suitable for use in dampness. All conductors in the boat will be enclosed in conduits or liquid-tight flexible conduits; however, appropriate heavy-duty rubber cord can be used where flexibility is desired. Connectors used in association with flexible cords will be of the locking, waterproof type.</p> <p>Electrical Equipment Controls:</p> <ol style="list-style-type: none"> 1. Electrical amp-volt meters will be installed to provide adequate monitoring of boat electrical power equipment. 2. The boat operator should be able to operate an electrical control or switch to cut the power in case of an accident. 3. The netter will have a deadman switch connected to the power control circuit from the pulsator or generator source. This allows the current between the electrodes to be broken in case of an accident. 4. Power control circuits will not exceed 24 volts. <p>Exhaust from Power Source:</p> <p>The exhaust from gasoline powered engines and generator alternators will be directed away from the equipment operator. Exposed hot pipes will be enclosed in protective screening to reduce the potential of burn exposure to crewmembers. The use of galvanized pipe for exhaust is discouraged due to the potential release of toxic gases that are produced under extreme heating conditions.</p> <p>Fuel Storage:</p> <p>Gasoline will be stored and transported in approved metal containers. Such containers, when used for storage on metal hull boats, will be grounded.</p>
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	<p>Refueling:</p> <p>To refuel the generator/alternator, all equipment will be turned off. Hot surfaces will be allowed to cool. It is recommended that all tanks be filled prior to each operation to avoid the potential for explosion or fire while refueling hot gasoline engines.</p>
29	<p>A. Work will involve working in outdoor mesocosms in southern California during summer months.</p> <p>B. Researchers will wear UV protective clothing, and/or sunscreen when working in mesocosms.</p> <p>Many CAWSC employees deal with sun exposure when working outdoors. UV radiation from this exposure can lead to sunburn, premature skin aging, and skin cancer.</p> <p>Sunscreen and sunblock with Sun Protection Factor (SPF) ratings of 30+ will be provided to employees that have fieldwork as a required component of their assigned duties to mitigate the hazards associated with UV exposure. If collecting water quality samples, then employees should check with the project leader to avoid products that could result in sample contamination. Efforts will be made to procure sunblock without oxybenzone and octinoxate; chemicals which have proven harmful to aquatic life.</p> <p>Clothing also protects against UV exposure. Employees should consider wearing light-colored, loose-fitting, breathable long-sleeved shirts, long pants, neck gaiters, sun gloves, full-brimmed hats, and sunglasses.</p>
31	<p>The toxins found in blue-green algae may cause skin irritations or rashes, inflammation of mucous membranes and allergic reactions including respiratory difficulties. Wear appropriate clothing, safety goggles, and rubber or latex gloves. Prevent water from contacting your skin. If you come in contact with contaminated water, wash immediately with fresh water. If there is a strong odor associated with the bloom, do not attempt the sample collection. If employee experiences respiratory difficulties or other symptoms, cease sample collection and leave the area immediately. Contact your supervisor immediately for further instructions.</p> <p>Any exposure must be reported to the USGS SMIS website (www.smis.doi.gov)</p>

