UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

April 10, 2019 **Refer to NMFS No:** WCR-2018-9054

Antal J. Szijj
United States Army Corps of Engineers
Ventura Regulatory Field Office
2151 Alessandro Drive, Suite 110
Ventura, California 93001

Re: Endangered Species Act 7(a)(2) Biological Opinion on the Programmatic Individual Permit for implementation of the Ventura County Watershed Protection District Routine Operations and Maintenance Program Reinitiation 2018 (File # SPL-2008-00052-AJS; SPL-2018-00040-AJS)

Dear Mr. Szijj:

Enclosed is NOAA's National Marine Fisheries Service's (NMFS) biological opinion on the United States Army Corps of Engineers' (Corps) 10-year Programmatic Individual Permit for implementation of the Ventura County Watershed Protection District's (District) Routine Operations and Maintenance Program (Program) (File # SPL-2008-00052-AJS). The Corps proposes to reauthorize and extend the duration of authorization for the Program because the existing 5-year Regional General Permit (No. 092) expired. The Program considered in this opinion was updated with new activities proposed by the District. The biological opinion addresses effects of this action on endangered steelhead (*Oncorhynchus mykiss*) and critical habitat designated for this species in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U. S. C. 1531 *et seq*.).

The biological opinion concludes the Corps' action and resulting resumption of the District's Program activities are not likely to jeopardize the continued existence of the endangered Southern California Coast Distinct Population Segment of steelhead or destroy or adversely modify designated critical habitat for this species. NMFS concludes that the proposed action may result in the incidental take of steelhead, therefore, an incidental take statement is included in the biological opinion. The incidental take statement includes reasonable and prudent measures that are necessary and appropriate to minimize the incidental take of steelhead.

Please contact Brittany Struck at (562) 980-3265 or via email at Brittany.Struck@noaa.gov if you have a question or comment concerning the biological opinion or if you would like additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Pam Lindsey, Ventura County Watershed Protection District
Karl Novak, Ventura County Watershed Protection District
Chris Dellith, U.S. Fish and Wildlife Service
Daniel Blankenship, California Department of Fish and Wildlife
Copy to ARN: 151422SWR2008PR00333

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

Issuance of a Programmatic Individual Permit to Ventura County Watershed Protection District for their flood-control related Routine Operations and Maintenance Program for the period of 2018-2028 (File # SPL-2008-00052-AJS; SPL-2018-00040-AJS)

NMFS Consultation Number: WCR-2018-9054

Action Agency: U. S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Southern California Coast steelhead (*Oncorhynchus mykiss*)	Endangered	Yes	No	Yes	No

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: April 10, 2019

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System. A complete record of this consultation is on file at the California Coastal Office in Long Beach.

1.2 Consultation History

In a letter dated February 1, 2018, the United States Army Corps of Engineers (Corps) requested reinitiation of formal consultation for the Ventura County Watershed Protection District's (District) Routine Operations and Maintenance Program (Program). The request regards NMFS' September 7, 2012, biological opinion and effects of the Program on endangered steelhead (*Oncorhynchus mykiss*) and designated critical habitat for this species. The Corps proposes to reauthorize the Program, adding new elements and extending the Program duration five years under a 10-year Programmatic Individual Permit (proposed action). For context, below NMFS summarizes significant events from the prior ESA section 7 consultation with the Corps. For the complete consultation history timeline of the prior consultation, please reference NMFS' September 7, 2012, biological opinion.

NMFS initiated formal consultation with the Corps on January 22, 2010, for the District's Program. NMFS issued a draft biological opinion on June 29, 2011, which concluded that the proposed action was likely to jeopardize the continued existence of endangered steelhead and destroy or adversely modify critical habitat for this species. Rather than adopting the draft reasonable and prudent alternative, the Corps requested by letter of April 17, 2012, that NMFS consider a revised proposed action and subsequently revise the draft biological opinion accordingly. Specifically, the Corps' revision removed levee maintenance and related vegetation management within reaches of the Santa Clara River and Ventura River watersheds from the proposed action. This revision eliminated the aspect of the proposed action that resulted in NMFS' June 29, 2011, draft conclusion. Following this revision and then reanalysis of the available information, NMFS concluded the proposed action (i.e., Regional General Permit No. 092) was not likely to jeopardize the continued existence of endangered steelhead or destroy or adversely modify designated critical habitat for the species.

Information in the Corps' February 1, 2018, consultation package revealed the proposed action may affect endangered steelhead or critical habitat for this species in a manner or to an extent not considered in the previous consultation. Therefore, a new formal consultation and biological opinion are required under section 7 of the ESA. Although we conducted a new consultation, the Corps' April 17, 2012, project revision will be carried forward and remain part of the new proposed action. Consequently, for streams designated as critical habitat for endangered steelhead, the proposed action considered here does not include vegetation management within 15 feet from the toe of levees.

On March 2, 2018, NMFS determined the information provided by the Corps met the requirements for initiating formal consultation, in accordance with 50 CFR §402.14(c). Thus, formal consultation began on February 9, 2018, the date in which NMFS received the Corps' request.

On May 10, 2018, NMFS and the Corps jointly determined the proposed Matilija Dam valve maintenance activity (Corps' February 1, 2018, letter, section 5, page 4) has no nexus with the Corps' authority. NMFS also determined that the valve maintenance was not interrelated or interdependent with the proposed action (see below). Thus this activity is not considered as part of the proposed action in this biological opinion.

On February 8, 2019, NMFS issued a draft biological opinion to the Corps for review and comment. After review of the draft biological opinion, the District submitted comments to the Corps and NMFS on March 8, 2019. To discuss comments from the District, NMFS coordinated and conducted a call with the Corps and the District on March 13, 2019. The District's comments resulted in minor revisions to the draft biological opinion, which are reflected in this biological opinion.

This biological opinion is based on the best scientific and commercial data available, including information included in the Corps' consultation packet, observations of riverine habitat noted by NMFS biologists during on-site meetings with the District, aquatic habitat surveys, and the ecological literature.

1.3 Description of the Federal Action and Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). The Corps proposes to issue a 10-year Programmatic Individual Permit to the District for their Program.

The proposed action involves annual maintenance activities on and within flood-control facilities throughout Ventura County (county). Many of these activities are proposed in streams (hereafter "county streams") within the range of the endangered Southern California Coast (SCC) Distinct Population Segment (DPS) of steelhead and designated critical habitat for this species. The specific activities that are the basis of the proposed action involve:

1. program planning;
2. vegetation management including use of herbicides;

3. flood-control channel and debris basin sediment removal;
4. maintenance and repair of flood-control facilities;
5. temporary water diversion for facility maintenance and repair;;
6. best management practices; and
7. safety inspections.

Each of these activities is described more fully as follows.

Program planning.—Under this element of the proposed action, District personnel conduct surveys of county streams and assessments of District flood-control facilities to determine the annual activities that are warranted. The District owns several hundred flood-control facilities throughout the county, including concrete-lined and earthen-bottom flood-control channels, levees, stabilized banks, debris basins, and stream gauges. After facility assessments are completed, the District would submit an annual work plan for review to the Corps, NMFS, California Department of Fish and Wildlife (CDFW), and the U.S. Fish and Wildlife Service no later than three months (or 90 days) prior to the start of the District's fiscal year (e.g., Fiscal Year 2018- 2019, is from July 1, 2018, to June 30, 2019). The proposed action anticipates that within 30 days of receiving the annual work plan, NMFS will review and, if necessary, provide the District with written comments on the submitted annual work plan. In particular, the District anticipates NMFS' comments when one or more proposed annual-work activities involve designated critical habitat or require dewatering when steelhead may be present.

Under the proposed action, the District would revise the annual work plan to respond to NMFS' comments, or to withhold a project which NMFS determines warrants further review, mitigation, or separate consultation. After District-budgetary approval, the activities set forth in the revised annual work plan will be scheduled and implemented.

Annual work plans will contain information to inform NMFS' understanding of the upcoming activities and their relationship to this programmatic biological opinion. The specific maintenance actions that are implemented on or near District facilities are variable from year to year, as are the specific areas that require maintenance. The type, extent, and frequency of Program activities undertaken by the District during a given year are dependent on several factors, including the condition of flood-control facilities, the degree of flood hazard, the environmental impacts of the maintenance activities, and budgetary constraints. To minimize uncertainty during the year with respect to the proposed action, the District's annual work plan will contain the following information to assist NMFS each year in developing an understanding of how the annual work activities may affect steelhead and designated critical habitat:

- Routine maintenance schedule itemized by month and activity type,
- Activity site photos and identification of facility type (e.g., concrete-lined channel),
- Description of existing site conditions and explanation of how activities qualify as routine,
- Description of proposed work, required habitat (vegetation) mitigation or restoration (including temporary recruitment irrigation, weeding, seeding, planting native stock, and minor grading), and summary of anticipated impacts,
- Type and quantities of materials required for activity,

- Species expected to be present and impacted,
- Area of impact (i.e., project dimensions) and coordinates (latitude and longitude) of activity,
- Necessity for water diversion and length of stream dewatered,
- Disposal site,
- Equipment used,
- Proposed best management practices,
- Duration and timing of activity including start and end dates, and
- Master list of all collective maintenance activities since commencement of Program.

By August 1 of each year, the District will submit an annual-monitoring report to NMFS documenting all maintenance activities in designated critical habitat for steelhead or activities that required the District to dewater a portion of a stream within the action area. The annual monitoring report will describe in detail all of the project and construction activities performed during the previous year and all restoration and mitigation efforts (e.g., non-native plant removal). Specific elements of the report will include the following:

- color photo documentation of the pre- and post-project and mitigation site conditions,
- site coordinates (latitude and longitude) outlining the boundary of the project and mitigation/restoration areas,
- the overall status of project including detailed schedule, and
- water-quality monitoring results for each project that requires installation of a water diversion.

Vegetation management.—Vegetation management is implemented by the District on an as-needed basis when vegetation becomes obstructive, reduces capacity of flood-control channels and debris basins, interferes with stream-gauge operations, or is likely to cause a buildup of sediment within flood-control facilities. At stream-gauge sites (see Table 1), the District proposes to trim vegetation every two years (or as needed prior to winter storms) within the active channel width near the gauge to allow for proper gauge function. Each gauge has a different maintenance footprint based on position or placement of the gauge within designated critical habitat. Generally, the decision to remove vegetation is carried out by the District maintenance supervisor or his designee, who performs a visual inspection of District facilities to determine if vegetation needs to be reduced or removed, thus vegetation removal is conducted on an as-needed basis. The distribution of gauges is widespread throughout the Ventura River Watershed except for the two gauges in close proximity to Foster Park (608 and ME-VR2). Below are the proposed district gauges and respective maintenance footprints in designated critical habitat for SCC steelhead (Table 1).

Table 1. District gauges and respective dimensions that are proposed for annual maintenance in designated critical habitat. Under the proposed action, these sites would be maintained potentially each year of the 10-year permit.

Ventura River Watershed District Gauges	Length (feet)	Width (feet)	Area (acres)
602 Matilija Crk at Matilija Hot Springs Stream gauge	130	100	0.3
604 N. Fork Matilija Crk at Hwy 33 Stream gauge	65	50	0.08
608 Ventura River at Foster Park Stream gauge	100	370	0.85
ME-VR2 gauge at Ventura River at OVSD Facility	150	30	0.10
Total area impacted within designated critical habitat	**445**	**-**	**1.33**

Methodologies for vegetation management include: (1) removal using hand-labor, chain saws, or heavy machinery (i.e., large mowers, disc saws), and (2) the use of herbicides. For manual removal of vegetation, discing and mowing are common methods implemented in the dry season for large areas such as debris basin and flood-control channel bottoms. Hand crews use chainsaws and loppers to clear vegetation adjacent to stream gauges. After being cut, loose vegetation is removed from streams, flood-control channels, and other District facilities, and in some cases, is chipped before transporting for disposal.

For gauges in the Santa Clara River Watershed, each maintenance footprint is oriented slightly different. Gauge 701 has a maintenance footprint that only extends downstream of the Hwy 126 Bridge. Gauge 709 has a maintenance footprint that extends 50 feet upstream of the Mupu Bridge in addition to 50 feet downstream of the bridge; the footprint width overlaps with the active stream channel and the majority of the riparian corridor (entire corridor measures 150 feet). Gauge 723 has a maintenance footprint that extends 100 feet downstream of the bridge for a width that spans the active stream channel (1,300 feet). Below are the proposed district gauges and respective maintenance footprints in designated critical habitat for SCC steelhead (Table 2).

Table 2. District gauges and their respective dimensions that are proposed for annual maintenance in designated critical habitat. Under the proposed action, these sites would be maintained potentially each year of the 10-year permit.

Santa Clara River Watershed District Gauges	Length (feet)	Width (feet)	Area (acres)
701 Hopper Creek at Hwy 126 Bridge	135	130	0.40
709 Santa Paula Creek Mupu Bridge Stream gauge	100	105	0.24
723 Santa Clara River Victoria Avenue Stream gauge	100	1,300	3.00
Total area impacted within designated critical habitat	**335**	**-**	**3.64**

Although proposed maintenance at existing bank groins is grouped with other facilities under the *Flood-control channel sediment removal* section below, this portion of the proposed action is described here because it only involves vegetation removal. Proposed vegetation maintenance will be at six existing bank groins on the north bank of the lower Santa Clara River (see Table 4 under *Flood-control channel sediment removal* section). The footprint of each groin extends from the channel bank for approximately 250 feet encroaching into the mainstem; the mainstem has a total channel width of approximately 1,763 feet at this location. Vegetation will be cleared within 15-ft of each groin. The District will leave vegetation along the toe of the levee. Approximately every 3-5 years, the District proposes to trim tree branches extending over the groins. These six bank groins are concentrated in one area along the Santa Clara River channel and considered as one maintenance site by the District. These are the only groins proposed for ongoing maintenance within the District's Program.

Herbicides are used for vegetation management and invasive vegetation control on or near District facilities. To minimize the need for herbicide use and reduce the amounts of herbicides sprayed, the District will implement strategic pre-emergent and early growth stage spraying to keep undesirable vegetation from becoming established and avoid the need to treat mature plants. Herbicides will occasionally be applied with surfactants or adjuvants to increase their effectiveness.

The District typically uses herbicides for control of vegetation less than 36 inches high during times of active growth, or for treatment of freshly cut vegetation in channel bottoms or debris basins. In areas in or near stream channels, plant foliage will be sprayed using only products approved by the Environmental Protection Agency (EPA) for aquatic use. Herbicides used by the District and its contractors are limited to two types: (1) a glyphosate-based and aquatically-approved herbicide with 53.8% active ingredient of glyphosate, and (2) an imazapyr-based and aquatically-approved herbicide with 28.7% active ingredient of isopropylamine salt of imazapyr. A non-toxic colorant and non-ionic surfactant may also be added to the herbicide solutions. The proposed action includes measures to avoid application of herbicides to the ground, open water, or to non-target vegetation.

Under the proposed action, the timing and frequency of herbicide application is expected to vary from year to year due to weather and other environmental conditions, but typically the District may apply herbicides two to three times per year. The District does not apply herbicides if rain is forecast within 24 hours.

The methods, amounts, and extent of herbicide use are expected to vary under the proposed action, based on site-specific conditions. To treat large accessible areas, herbicides will be applied to flood-control channels, debris basins, and the sides of access roads using a truck with a boom sprayer. If a boom spray cannot be used because of access, space restrictions or the need to avoid flowing water or native vegetation, then District personnel will use hand sprayers connected to trucks or backpack sprayers to treat otherwise inaccessible areas along channels or in debris basins. To implement the cut and daub method of non-native vegetation treatment, all live plant material is cut with hand-held equipment such as chainsaws, loppers and power brush cutters to a maximum of six inches above grade level, or above the surface water for emergent vegetation. For herbaceous or short-target plant species, approved diluted herbicide mixtures are sprayed directly onto leaves and stems, either using backpack sprayers or vehicle-mounted spray tanks. For areas with high cover (75-100 percent) of giant reed, small mechanized equipment may be used to shred the standing giant-reed canes to near ground level as an initial treatment method. Shredded material would remain in place. In areas with high cover, no soil disturbance or road grading would occur; no driving of equipment in flowing water would occur under the proposed action.

Flood-control channel sediment removal.—The District proposes to maintain flood-control channels with drain outlets in the action area (the term "outlet" refers to the terminus of a flood-control channel where it drains into a stream or mainstem of the river). These channels are physically outside of designated critical habitat, but the drain outlets are within designated critical habitat for SCC steelhead (see Table 3 and Table 4). Sediment and organic-debris removal from flood-control channels and drain outlets is performed when the District determines that sediment buildup has caused a reduction in conveyance capacity of the flood-control channel or drain outlet, and there is an increased risk of overbank flooding. Specific triggers for removing this material have not been defined. The District's flood-control channels, which include earthen-bottom and concrete-lined channels, are ephemeral channels (e.g., ditches or gullies that are dry much of the year) that historically carried flow from hillsides and small drainages during rainstorms into larger streams. As urban and agricultural development occurred, these channels were modified to convey more flow and alleviate flooding of human infrastructure. The drain outlets are either concrete aprons or culverted-concrete structures built to avoid erosion at the confluence of flood-control channels and major streams. The flood-control channels flow mainly during rainstorms, and stop flowing (with the exception of nuisance flows) several days after rains have ceased (VCWPD 2008). Concrete-lined channels are designed with specific flow capacities that the District carefully maintains.

Spatial distribution (or density) of District outlets is high downstream of Cañada de San Joaquin, which is the lower 2.5 miles of the Ventura River. Outlets upstream of this area are widely distributed throughout the upper mainstem. There is no stream gauge proposed for maintenance within the lower 2.5 miles of the Ventura River. And, as noted above, there is no groin to be maintained in this area of the Ventura River.

Table 3. Flood-control facilities and their respective dimensions that are proposed for annual maintenance under the proposed action in designated critical habitat. Each outlet discharges sediment into designated critical habitat during major storm events. Each facility has the potential to receive maintenance each year of the 10-year permit.

Ventura River Watershed District Facility	**Length (feet)**	**Width (feet)**	**Area (acres)**
41728 Cal-trans Secondary Outlet	30	25	0.02
41131 Cañada de San Joaquin Outlet	30	25	0.02
41152 Cañada Larga Channel & Outlet	30	25	0.02
41121 Dent Drain Outlet	30	25	0.02
41721 Dent Secondary Outlet	30	25	0.02
41751 Freeway Side Drain #1 Outlet	30	25	0.02
41752 Freeway Side Drain #2 Outlet	30	25	0.02
41753 Freeway Side Drain #3 Outlet	30	25	0.02
41754 Freeway Side Drain #4 Outlet	30	25	0.02
41755 Freeway Side Drain #5 Outlet	30	25	0.02
41181 Fresno Channel Outlet (see NMFS 2014b)	150	15	0.05
41727 Harrison Secondary Outlet	30	25	0.02
41729 Peking Secondary Outlet	30	25	0.02
41730 Ramona St. Secondary Outlet	30	25	0.02
41731 Simpson St. Secondary Outlet	30	25	0.02
41110 Stanley Ave. Drain Outlet	30	25	0.02
41732 Vince St. Secondary Outlet	30	25	0.02
41023 Santa Ana Road Bridge Sediment Removal	240	225	1.25
Total area impacted within designated critical habitat	**870**	**-**	**1.62**

Channel cleanout is performed by the District using bulldozers, front-loaders, excavators, clamshell cranes, small bobcat tractors, dump trucks, and hand-crews. On occasion sediments and debris will be collected or stockpiled in specific areas and then loaded into dump trucks. Channel cleanout normally occurs in the dry season when the channels are dry, but due to the number and length of flood-control channels throughout the county, cleanout may occur at any time of year under the proposed action. If water is present in channels that need cleanout, then work is performed from the top of bank using a crane with a clamshell or an excavator. Sediments are usually stockpiled and left to dewater prior to hauling offsite for disposal. When work in wet channels is necessary, best-management practices (BMP) are implemented to avoid the release of fine sediments and increased turbidity levels in surface waters. The proposed BMP are described near the end of this section.

Spatial distribution (or density) of District outlets is high between Victoria Avenue Bridge upstream to Franklin Barranca, six miles along the Santa Clara River. This area includes the maintenance footprint of the Victoria Avenue stream gauge (723) and the North Bank groins. Outlets upstream of this area are widely distributed throughout the upper Santa Clara River mainstem and tributaries, however, outlet density is also high for 3.5 miles along lower Sespe Creek to the Sespe mainstem near San Cayetano Road.

Table 4. Flood-control facilities and their respective dimensions that are proposed for annual maintenance under the proposed action in designated critical habitat. Each outlet or drain discharges sediment into designated critical habitat during major storm events. Bank groins will only be maintained through vegetation removal. Each facility has the potential to receive maintenance each year of the 10-year permit.

Santa Clara River Watershed District Facility	Length (feet)	Width (feet)	Area (acres)
43161 Bardsdale Ditch Outlet	30	25	0.02
43191 Basolo Ditch Outlet	30	25	0.02
42511 Brown Barranca Outlet	30	25	0.02
42205 Central Ave. Drain Outlet	30	25	0.02
42491 Clark Barranca Outlet	30	25	0.02
42391 El Rio Drain Outlet	30	25	0.02
43051 Fagan Canyon Outlet	30	25	0.02
42531 Franklin Barranca Outlet	30	25	0.02
43181 Grimes Canyon Outlet	30	25	0.02
42471 Harmon Barranca Outlet	30	25	0.02
43351 Jepson Wash Outlet to Sespe Creek	30	25	0.02
43361 Keefe Ditch Outlet to Sespe Creek	30	25	0.02
42701 Montalvo Golf Course Secondary Outlet	30	25	0.02
42461 Moon Ditch Outlet	30	25	0.02
43305 North Fillmore Drain (Sespe Creek)	30	25	0.02
43041 Peck Road Drain Outlet	30	25	0.02
43251 Real Canyon Outlet	30	25	0.02
42026 Santa Clara River North Bank Groins	300	15	0.10
43305 Sespe Levee Side Drain 1	30	25	0.02
43305 Sespe Levee Side Drain 2	30	25	0.02
43305 Sespe Levee Side Drain 3	30	25	0.02
42176 Stroube Drain Outlet	30	25	0.02
42501 Sudden Barranca Outlet	30	25	0.02
42704 Victoria Ave. Drain Secondary Outlet	30	25	0.02
43271 Warring Wash South Outlet	30	25	0.02
43701 Willard Road Secondary Outlet	30	25	0.02
Total area impacted within designated critical habitat	**1050**	**-**	**0.60**

Debris basin sediment removal.—The District owns and operates ten debris basins within the Ventura River and Santa Clara River watersheds where removal of sediment and organic debris is proposed (Table 5 and 6). There is no proposed debris basin in designated critical habitat for steelhead. On a yearly basis, these debris basins are surveyed and, if necessary, accumulated sediments, rocks, vegetation, and woody debris are removed by the District prior to and sometimes following the wet season. If the drainage above the debris basin has burned in the prior five years, the basins will be cleaned prior to the wet season and several times annually until the vegetation in the watershed recovers. Depending on environmental conditions, not all basins may be cleaned annually.

Table 5. District debris basins outside of designated critical habitat proposed for annual sediment removal under the proposed action within the Ventura River Watershed. All basins have the potential to experience sediment removal each year of the 10-year permit.

Ventura River Watershed Debris Basin Name	Location (outside of designated critical habitat)
Dent Basin	Dent Drainage Channel, 4,900 ft to Lower Ventura River
Fresno Canyon Basin	Fresno Canyon Flood-Control Channel, 1,100 ft to Ventura River (see NMFS 2014b)
Live Oak Basin	Live Oak Creek, 2,200 ft to Ventura River
McDonald Basin	McDonald Canyon Creek, 3,500 ft to Ventura River
Stewart Canyon Basin	Stewart Canyon Creek, 8,950 ft to San Antonio Creek

Sediment and organic debris are removed from basins using bulldozers, front-loaders, excavators, cranes with clamshells or draglines, scrapers, and dump trucks. Heavy machinery usually operates within the bottom of the basin to access accumulated materials. Most basins have access roads for heavy machinery, but access ramps are constructed when no ramp exists. Material is pushed, piled, or otherwise moved to collection areas depending on the nature of the basin and site conditions. The excavated sediments and debris are typically loaded into dump trucks and hauled to a disposal or storage site on District property, or made available for use by contractors as agricultural fill. Most of the basins were designed under the assumption that the basin bottoms and sides would be devoid of vegetation, or support herbaceous vegetation only. Thus, if large woody vegetation has become established within debris basin bottoms, then discing and mowing are typically implemented during debris-basin cleanouts. Basin cleanout generally occurs between July 1 and December 1, and only when the area is dry and can be accessed by heavy machinery.

Table 6. District debris basins outside of designated critical habitat proposed for annual sediment removal under the proposed action within the Santa Clara River Watershed. All basins have the potential to experience sediment removal each year of the 10-year permit.

Santa Clara River Watershed Debris Basin Name	Location (outside of designated critical habitat)
Cavin Basin	Cavin Road Drain, 3,800 ft to Santa Clara River
Fagan Canyon Basin	Fagan Canyon Creek, 9,300 ft to Santa Clara River
Jepson Wash Basin	Jepson Wash, 4,200 ft to Sespe Creek
Real Wash Basin	Real Wash, 8,800 ft to Santa Clara River
Warring Wash Basin	Warring Wash, 8,800 ft to Santa Clara River

Maintenance and repair of flood-control facilities.—The proposed activities depend on whether the facility (stream gauge, groin, outlet, or debris basin) lies in designated critical habitat for endangered SCC steelhead.

For facilities in designated critical habitat, the District proposes routine maintenance and minor repairs (when damage occurs) throughout the year as needed (see Tables 1-4 for all facilities subject to maintenance and minor repairs in designated critical habitat for steelhead).

To implement routine maintenance and minor repairs of damaged flood-control facilities within designated critical habitat (Tables 1-4), the District will use loaders, excavators, concrete trucks, cranes, excavators, and dump trucks. Work is typically conducted from both the top of the banks and the channel depending on site conditions. The amount of earthwork depends on the length of damage and depth of erosion. To gain a visual understanding of the spatial extent for maintenance and repairs, the District outlines the immediate work area or area of direct impact through orange polygons for each facility (i.e., the maintenance footprint). The collection of these orange polygons are contained within the District's catalog pages for the proposed Program.

Regarding facilities that are physically outside designated critical habitat, the proposed maintenance and minor repairs depend on the type of flood-control channel (e.g., earthen-bottom and concrete-lined channels). Earthen flood-control channels will be repaired with onsite materials to reshape and re-compact an eroded bank; if necessary, fill material will be imported, placed, and compacted in eroded areas (PEIR 2008). Damaged portions of improved[1] earthen flood-control channels will be repaired to maintain their original size and configuration. The District will repair minor damages to portions of concrete-lined channels by constructing new

[1] Maintenance work occurs in "improved" and "unimproved" channels. Improved channels have been designed for specific conveyance capacity, and have engineering drawings that specify a certain width and depth. Most "improved" channels are fully or partially lined with concrete. However, there are also "improved" earthen channels that have design dimensions that must be maintained. "Unimproved" channels are earthen channels or channels with bank protection (i.e., rock riprap) and a soft bottom.

concrete forms and pouring fresh concrete. When minor repair of bank protection is necessary, the same type of materials used in the original bank protection will be implemented during the repair activity, and the dimensions of the bank protection will be similar to the pre-damage condition. Access roads are repaired, graded and resurfaced as part of this Program activity.

Temporary water diversion for facility maintenance and repair.—Occasionally, work spaces will be temporarily isolated from flowing water by impounding flows behind a cofferdam or excavated basin, or by shunting the water away from the work area with a diversion berm made of sand bags. Flows from the cofferdam or excavated basin are routed around or through the work area by a bypass system consisting of a temporary culvert, excavated channel, lined flume, or bermed portion of the existing channel. Because of the potential for installation and operation of the water diversion to affect water quality and aquatic life, BMP are incorporated into the design and operation of any water diversion (URS 2007). The majority of water diversions will occur within flood-control channels and debris basins where steelhead are not expected. Water diversions within an area inhabited by steelhead are expected to occur infrequently (Pam Lindsey, District biologist, 2010 and 2012, personal communication). The District developed specific BMP for water diversions (URS 2007), which are provided in Appendix E of the Program Environmental Impact Report (PEIR). The proposed criteria for dictating a biological survey prior to installing a water diversion in the action area are described below.

A biological survey will be conducted by a qualified biologist for facilities with potential habitat for steelhead prior to initiation of the water diversion and any maintenance or repair activity. Prior to initiating work, the District or its contractor will determine if any of the following conditions are present at the facility (URS 2007):

- The facility conveys flows from, to, or is located in, a steelhead-accessible stream.
- The facility supports established wetland or riparian vegetation.
- The facility is an earthen bottom channel or debris basin with ponded or flowing water deeper than three inches.
- The facility conveys perennial flows from a man-made or natural upstream source.
- The facility conveys tidal flows or flows that are tidally influenced.
- The facility is a concrete-lined channel conveying flows deeper than 3 inches.

Prior to initiating work, if the District or its contractor observes any of the above conditions at a facility with flowing or ponded water, then the District will assign a qualified biologist to conduct the biological survey. If the pre-construction biological survey indicates that the facility has the potential for steelhead, then BMP for the protection of steelhead will be implemented as part of the water diversion. BMP for the protection and relocation of steelhead are included in the District's Water Diversion Guide (URS 2007).

Best management practices.—In an attempt to reduce the effects of the Program on endangered steelhead, the District added environmental protection measures to the Program. In preparation for continuation of the Program over the next ten years, the BMP related to steelhead and critical habitat were revised and updated by the District on March 15, 2017 (Appendix A and references therein). The proposed BMP are reproduced below from Appendix A; they are pertinent to minimize adverse effects to steelhead and designated critical habitat for this species.

Survey for Steelhead Migration/Rearing Conditions and Sensitive Aquatic Species Prior to Routine Maintenance Work.

- Applies to earthwork/repairs in surface water and within 100 feet of water in Zones 1 and 2:

<u>ZONE 1:</u>
- Matilija Creek
- San Antonio Creek
- Thacher Creek
- Ventura River

<u>ZONE 2:</u>
- Hopper Creek
- Piru Creek
- Pole Creek (unlined portions)
- Santa Clara River
- Santa Paula Creek
- Sespe Creek

- Approved biologist must survey for steelhead migration or rearing conditions and other sensitive aquatic species prior to earthwork in or within 100 feet of surface water in Zones 1 and 2.
- If flows are deemed sufficient for steelhead migration, then earthwork within or adjacent to the channel shall be postponed until after June 15 and before October 31.
- If rearing habitat is present, then approved biologist shall determine if steelhead are present.
- Steelhead presence notification to NMFS at least 10 days prior to work by District environmental staff.
- If NMFS agrees, then an approved biologist shall isolate the work area with block nets and relocate any steelhead in the work area to suitable habitat with perennial surface water. The biologist shall continuously monitor during water diversion and any work within occupied steelhead habitat.
- Steelhead relocations or other impacts from flow diversion or dewatering shall be documented and reported to NMFS within 30 days of completion of the maintenance work.
- Concrete, grout, brick & mortar or other cement products shall not be used to construct stream diversions when steelhead and other sensitive aquatic species are likely present.
- If steelhead are found dead or injured at the work site, then environmental staff shall notify NMFS immediately.

Safety inspections.—During the wet season, District personnel monitor and visually inspect flood-control facilities to ensure the facilities are functioning to design specifications, and to identify problems or observable flood damage. Safety inspections of flood-control facilities are usually performed during and shortly after major flood events. The District will inspect facilities and document the magnitude and extent of damage to facilities. The District will then use the results of the safety inspections to inform and populate the annual work plan with proposed routine and minor repair activities. Emergency maintenance or emergency repair activities would not be included in the annual work plan as these activities are not included in the proposed action.

1.3.1 Actual and Potential Impact of the Habitat Restoration Program Under the Routine Operations and Maintenance Program is Unknown at this Time.

The Habitat Restoration Program (Program) is excluded from further consideration in this biological opinion. The District has not provided the necessary information and is unable to provide necessary types of information concerning restoration activities, without which NMFS is unable to analyze the extent and magnitude of adverse effects to the listed species and critical habitat subject to this consultation. Specifically, the District is unable to provide any of the following pieces of information: the location of the action, the timing of the action, the duration of the action, and the frequency of restoration activities, which all inform the anticipated magnitude of adverse effects and any anticipation of incidental take from the particular program. As a result, NMFS is unable to predict the potential effects of the activities on endangered steelhead and designated critical habitat for the species. NMFS will only be able to analyze the effects of future projects related to this Program when the relevant information is available and provided to NMFS; the Corps agrees to consult when review of relevant information indicates Program activities may affect endangered steelhead or designated critical habitat. Therefore, the Program is not considered further in this biological opinion based on the insufficiency of information available to develop an understanding of, and accurately predict, the scope of habitat restoration activities.

1.4 Elements of the District's Program not considered in this Biological Opinion

The following activities that were part of the District's Program proposal (Corps' letter of February 1, 2018) have already undergone individual ESA section 7 consultation with NMFS and, therefore, are not considered part of the proposed action in this biological opinion. However, they are considered part of the Environmental Baseline as per 50 CFR 402.02. These activities involve:

- San Antonio Creek Spreading Grounds Project (see NMFS 2012c), and
- Operation and maintenance of the Fresno Canyon Flood Mitigation Project (see NMFS 2014b).

Although operation and maintenance of the valves at Matilija Dam was an element of the proposed action, this specific element was subsequently dropped from the proposed action (see NMFS' letter of May 21, 2018). As a result, this specific activity is not considered part of the proposed action, but the ongoing or future effects of this activity are considered in the *Environmental Baseline* and *Cumulative Effects* sections of this biological opinion.

1.5 Interrelated and Interdependent Actions

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are no known actions interrelated or interdependent to the proposed action.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPM) and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation of critical habitat for SCC steelhead uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBF). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.

- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a Reasonable and Prudent Alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This biological opinion examines the status of the endangered SCC DPS of steelhead that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The biological opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBF that help to form that conservation value.

The endangered SCC DPS of steelhead extends from the Santa Maria River in Santa Barbara County to the Mexican border (inclusive). NMFS characterized the abundance of steelhead in the DPS when the species was originally listed (August 18, 1997, 62 FR 43937) and cited this information as the basis for the re-listing of the SCC DPS of steelhead as endangered (May 3, 2006, 71 FR 834). Estimates of historical (pre-1960s) and more recent (1997) abundance show a precipitous drop in numbers of spawning adults for major rivers in the southern California DPS. An updated status report states that the chief causes for the numerical decline of steelhead in southern California include urbanization, water withdrawals, channelization of creeks, human-made barriers to migration, and the introduction of exotic fishes and riparian plants (Good *et al*. 2005), and the most recent viability assessments and status reviews indicate these threats are essentially unchanged (NMFS 2011, Williams *et al*. 2011, NMFS 2016a, Williams *et al*. 2016). Historical data on steelhead numbers for this region are sparse. The historic and recent steelhead abundance estimates, and percent decline are summarized in Table 7. The run-size estimates illustrate the severity of the numerical decline for the major rivers within range of the SCC DPS of steelhead (Good *et al*. 2005, NMFS 2011, Williams *et al*. 2011, NMFS 2016a, and Williams *et al*. 2016).

Table 7. Historical and recent abundance estimates of adult steelhead in the Southern California DPS. Data are from Good *et al.* 2005, NMFS 2011, and NMFS SWR redd surveys 2009-2011.

	Pre-1950	Pre-1960	1990s	2000s	Percent Decline
Santa Ynez River	20,000-30,000		< 100		99
Ventura River		4,000-5,000	< 100	< 100	96
Santa Clara River		7,000-9,000	< 100	< 10	99
Malibu Creek		1,000	< 100		90

Stream surveys to document the species' current pattern of occurrence concluded that of the 46 watersheds in the DPS which steelhead occupied historically, *O. mykiss* currently occupy only about 40% to 50% of these watersheds (Boughton *et al.* 2005). Fish surveys by NOAA's Southwest Fisheries Science Center (SWFSC), direct observations by NMFS biologists, and anecdotal information from local biologists working on major rivers and creeks throughout the DPS suggest that although steelhead populations continue to persist in some coastal watersheds, the population numbers are exceedingly small (Good *et al*. 2005, Williams *et al*. 2011, Williams *et al*. 2016). On a positive note, there have been observations of steelhead recolonizing vacant watersheds during years with abundant rainfall, notably San Mateo Creek and Topanga Creek (Good *et al*. 2005) including a recent observation of *O. mykiss* in San Mateo Creek (NMFS 2017a). Also, California Department of Fish and Wildlife discovered an adult female steelhead (TL 57.46 cm) on April 26, 2013, during a flow-rate survey in Conejo Creek (Camarillo, California).

NMFS reviews the status and viability of the SCC DPS of steelhead on the basis of available information (including new information) about the species abundance, population growth rate, spatial structure, and diversity (McElhany *et al.* 2000) every five years as required by the ESA. In the last two status reviews, NMFS concluded that the risk of extinction of the endangered SCC DPS of steelhead was unchanged (NMFS 2011 and 2016a).

Life History and Habitat Requirements

The major freshwater life history stages of steelhead involve freshwater rearing and emigration of juveniles, upstream migration of adults, spawning, and incubation of embryos (Shapovalov and Taft 1954, Barnhart 1991, Meehan and Bjornn 1991, Moyle 2002). Steelhead juveniles rear in freshwater for 1-3 years before migrating to the ocean, usually in the spring, where they may remain for up to 4 years. Steelhead grow and reach maturity at age 2 to 4 while in the ocean. In southern California, adults immigrate to natal streams for spawning during December to March, but some adults may not enter coastal streams until spring, depending on flow conditions. Depending on the size of the watershed, adults may migrate several miles or hundreds of miles to reach their spawning grounds. Although spawning may occur during December to June, the specific timing of spawning may vary a month or more among streams within a region. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration two or more years. Female steelhead dig a nest in the streambed and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel; the embryos incubate within the gravel pocket. Hatching time varies from about 3 weeks to 2 months depending on water temperature. The young fish emerge from the nest about 2 to 6 weeks after hatching.

Habitat requirements of steelhead in streams generally depend on the life history stage. Habitat for southern California steelhead consists of water, substrate, and adjacent riparian zone of estuarine and riverine reaches of coastal river basins, and major rivers. Generally, streamflow volume, water temperature, and water chemistry must be appropriate for adult immigration and juvenile emigration. Low streamflow, high water temperature, physical barriers, low dissolved oxygen, and high turbidity may delay or halt upstream migration of adults and timing of spawning, and downstream migration of juveniles and subsequent entry into estuary, lagoon, or ocean. These factors affect steelhead within southern California watersheds to varying degrees, depending on watershed condition, environmental factors such as rainfall totals, and levels of anthropogenic disturbance in the watershed including natural disturbances such as the recent Thomas Fire (ignited in December 2017) and subsequent mud slides. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning, but water temperature and turbidity are also important. Dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. Fine sediments, sand, and smaller particles may fill interstitial spaces between substrate particles, thereby reducing water-flow through and dissolved oxygen levels within a nest. The degree to which this is occurring in individual watersheds depends on the microhabitat conditions, and conditions within individual watersheds and their level of anthropogenic disturbance. Juvenile steelhead require different combinations of water depth and velocity for living space (e.g., pools, riffles, runs), shelter from predators and harsh environmental conditions, adequate food resources, and suitable water quality and quantity, for ontogeny and survival during summer and winter.

Population Viability

One prerequisite for predicting the effects of an action on a species (including establishing a point of reference for the effects analysis) involves an understanding of whether the broad population is likely to experience a reduction in the likelihood of being viable, *i.e.*, the hypothetical state(s) in which extinction risk of the broad population is negligible and full evolutionary potential is retained (Boughton *et al*. 2006, 2007). By definition, a viable salmonid population (VSP) is an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame. Specifically, a viable population should meet four viability thresholds for each of the four criterion types: mean annual run size, ocean conditions, population density, and the anadromous fraction (see Table 1 in Boughton *et al*. 2007). Other processes contributing to extinction risk (catastrophes and large-scale environmental variation) are also important considerations, but by their nature they need to be assessed at the larger temporal and spatial scales represented by DPSs.

The crux of the population definition used here is what is meant by "independent." An independent population is any collection of one or more local breeding units whose population dynamics or extinction risk over a 100-year time period is not substantially altered by exchanges of individuals with other populations. Generally, an independent population is contained within a distinct stream or possibly an entire watershed, and represents a subunit of the entire DPS. Independent populations are important for the long-term viability of the DPS because they are generally more resilient than smaller populations, and they may act as source populations for smaller steelhead populations in adjacent watersheds. The populations of steelhead within the Santa Clara River and Ventura River watersheds would fit this criterion for being independent.

Four principal parameters are used to evaluate the long term viability and conversely the extinction risk for the populations of salmonids that make up the endangered Southern California Coast DPS of steelhead. They are: (1) population size; (2) population growth rate; (3) population spatial structure; and (4) population diversity. These specific parameters are important to consider because they are predictors of extinction risk and reflect general biological and ecological processes that are critical to the growth and survival of steelhead populations, and they are measurable (McElhany *et al*. 2000). To assess viability of a salmonid population, guidelines or decision criteria have been defined for each of the four parameters to further the viability evaluation (McElhany *et al*. 2000). The bases for these criteria can be found in the many publications regarding population ecology, conservation biology, and extinction risk (e.g., Pimm *et al*. 1988, Berger 1990, Primack 2004, see also McElhany *et al*. 2000 and Boughton *et al*. 2007). Populations within the endangered Southern California Coast DPS of steelhead must meet all of the following guidelines for VSP criteria to be considered viable. The four concepts and associated guidelines are outlined below.

***Population Size*.—**Population size provides an indication of the sort of extinction risk that a population faces. In general, small populations are at a greater risk of extinction than large populations because the processes that affect populations operate differently in small populations than in large populations (e.g., Pimm *et al*. 1988, Berger 1990, Primack 2004). For example, variation in environmental conditions leading to low levels of species survival or fecundity for an extended time can cause extinction of small populations. This is not the case for large or broadly distributed populations, which typically exhibit a greater degree of resilience to these factors.

***Population Growth Rate*.—**The productivity of a population (i.e., the number of individuals generated over a specified time interval) can reflect environmental conditions that influence the dynamics of a population and determine abundance over time. In turn, the productivity of a population allows an understanding of the performance of a population across the landscape and habitats in which it exists and its response to those habitats (McElhany *et al*. 2000). Changes in environmental conditions, including ecological interactions, can influence a population's intrinsic productivity or the environment's capacity to support a population, or both. The greater the productivity of a steelhead population the greater its ability to recover from environmental disturbance and the greater its viability. Because of the very low abundance of returning adult steelhead in southern California and highly variable flow conditions that can prevent migration into productive spawning areas, their population growth rates (see Primack 2004 for discussion on population size and growth rates) are reduced, making the populations within the DPS less resilient to disturbance. When populations are less resilient, there is increased risk of further reducing the long-term viability of the DPS as a whole.

***Population Spatial Structure*.—**Understanding the spatial structure of a population is important because the population spatial structure can affect evolutionary processes and, therefore, alter the ability of a population to adapt to spatial or temporal changes in the species' environment (McElhany *et al*. 2000). Populations that are thinly distributed over space are susceptible to experiencing poor population growth rate and loss of genetic diversity (Boughton *et al.* 2007). A population's spatial structure consists of both geographic distributions of individuals in a population and processes that generate that distribution. A population's spatial structure depends fundamentally on habitat quality, spatial configuration, and dynamics as well as dispersal of individuals in the population. Within the endangered Southern California Coast DPS of steelhead, anthropogenic activities such as the introduction of migration barriers have substantially reduced the number of watersheds (or portions of watersheds) that are currently accessible to steelhead. This significantly reduced the spatial structure of populations in the DPS (Boughton *et al.* 2005).

***Population Diversity*.—**Steelhead possess a suite of life history traits, such as anadromy, timing of spawning, emigration, and immigration, fecundity, age-at-maturity, behavior, physiological and genetic characteristics. The more diverse these traits are (or the more these traits are not restricted), the more likely the species is to survive a spatially and temporally fluctuating environment. Factors (natural or anthropogenic) that constrain the full expression of life history traits are expected to affect the diversity of a species (McElhany *et al*. 2000). All of the basins which historically had the largest steelhead populations (e.g., Santa Maria River, Santa Ynez River, Ventura River, Santa Clara River) now possess complete barriers (in some cases multiple barriers) precluding steelhead from a substantial amount of their historical habitat, and as a result there is loss of anadromy in a substantial number of basins within the DPS (Boughton *et al.* 2006). Activities that affect evolutionary processes (e.g., natural selection) have the potential to alter the diversity of the species; the widespread effects of anthropogenic activities in southern California are believed to have contributed to a decline in genetic diversity of SCC steelhead (Girman and Garza 2006).

When considering prescriptive viability at the DPS level, biological diversity and life-history diversity are criterion types each with separate viability thresholds (see Table 1 in Boughton *et al*. 2007). Biological diversity includes consideration of the actual number of viable populations, the ability to inhabit watersheds with drought refugia, and spatial distribution. Life-history diversity includes considering to what extent populations exhibit all three life-history strategies (e.g., fluvial-anadromous, lagoon anadromous, freshwater resident).

In summary, the populations that comprise the endangered Southern California Coast DPS of steelhead have been, and continue to be, severely impacted by anthropogenic factors, and this negatively affects the numbers, reproduction, and distribution of the species. This has led to a decline of over 95 percent for the species (Good *et al*. 2005, Williams *et al*. 2011, and Williams *et al*. 2016). Applying the foregoing evaluation and the guidelines as described by McElhany *et al*. (2000) suggests that the endangered Southern California Coast DPS of steelhead is currently not viable and is at a high risk of extinction. This finding is consistent with conclusions of past and recent technical reviews (Busby *et al*. 1996, Good *et al*. 2005, Williams *et al*. 2011, NMFS 2016a, Williams *et al*. 2016), and the formal listing determination for the species (NMFS 1997, 2006).

Conservation Value of Watershed-Specific Population Units

The SCCDPS of endangered steelhead is divided into five Biogeographic Population Groups (BPGs): Monte Arido Highlands, Conception Coast, Santa Monica Mountains, Mojave Rim and Santa Catalina Gulf Coast (NMFS 2012a). Each BPG is characterized by a unique combination of physical and ecological characteristics that potentially present differing natural selective regimes for steelhead populations utilizing the individual watersheds. The separate watersheds comprising each BPG are generally considered to support individual *O. mykiss* populations (i.e., one watershed = one steelhead population).

The recovery-planning process (NMFS 2012a) indicates that while the endangered SCC DPS of steelhead comprises several watershed-specific population units, only a relative few population units possess a high and biologically plausible likelihood of becoming viable and independent. Populations within the Recovery Planning Area are identified as core 1, core 2, or core 3. The core-1 populations are those populations identified as the highest priority for recovery actions. Both the Santa Clara River and Ventura River steelhead populations are designated as Core 1 watershed (or populations). Core-2 populations form a key part of the recovery implementation strategy and contribute to the set of populations necessary to achieve recovery criteria. Core-3 populations are an integral part of the overall biological recovery strategy by promoting connectivity between populations and genetic diversity across the DPS. Streams classified as Core-1 Populations are essential for recovering the DPS of steelhead as a whole. Therefore, reducing the likelihood of survival and recovery of a Core-1 Population, would have adverse consequences for the survival and recovery of the DPS as a whole. The core designations (Table 7-1 in NMFS 2012a) are based on the expected contribution of the waterway to steelhead recovery when restored to an unimpaired state.

Regional Climatic Variation and Trends

The interaction of changing climate conditions with other stressors such as habitat fragmentation is likely to result in additional threats to natural resources (McCarty 2001, Barnett *et al*. 2008, Kadir *et al*. 2013, Moyle *et al*. 2013), including threats to the viability of steelhead populations (Moyle *et al*. 2017). Southern California warmed three degrees (F) in the last century (EPA 2016). By the end of the century, average annual temperature is projected to rise approximately 4 to 10°F above the historical baseline for the Southwest region (see Karl *et al*. 2009).

Precipitation trends are also important to consider. Projections for precipitation in Southern California are expected to be slightly lower compared to Northern California (Killam *et al*. 2014, Allen and Luptowitz 2017). The Los Angeles region showed a small change in local mean precipitation compared to natural variability for the 21st century (Berg *et al*. 2015), thus the actual climate change signal based on precipitation for California remains unclear as annual variability overwhelms the precipitation trends (see Snyder and Sloan 2005, Killam *et al*. 2014). Regional rainfall models show large variation (VRWC 2015); the sensitivity of the regional results to variability indicates substantial uncertainty in precipitation projections (PRBO Conservation Science 2011) including predictions that incorporate Southern California's rainfall sensitivity to El Niño (see Quan *et al*. 2018). However, predicted hydrological cycle intensification (see Swain *et al*. 2018) and flash-flood predictions suggest an average increase between 30-40% for flash flood occurrences in Southern California with a decrease in the total number of precipitation events, but each event had increased intensity, duration, and soil saturation conditions for the 21st century (Modrick and Georgakakos 2015).

The occurrence of wildfire frequency, duration, and extent are all important parameters to consider when considering a changing climate and associated impacts to steelhead and their habitat. Higher temperatures and drought are likely to increase the severity, frequency, and extent of wildfires (Westerling *et al*. 2006, Westerling and Bryant 2008, Westerling *et al*. 2011, Yoon *et al*. 2015, Abatzoglou and Williams 2016, EPA 2016, Bendix and Commons 2017, Sankey *et al*. 2017). Wildfires periodically burn large areas of chaparral and adjacent woodlands in autumn and winter in southern California, and wildfires have a shorter reoccurrence interval in southern California relative to northern California (see Bendix and Commens 2017).

Thomas Fire Impacts on the Species

The Thomas Fire (December 4-24, 2017) burned a total of 281,893 acres throughout Ventura and Santa Barbara counties including streams that play an essential role in survival and recovery of the SCC DPS of steelhead (Figure 1). Below is a summary discussion on how the Thomas Fire relates to the viability of the endangered SCC steelhead population.

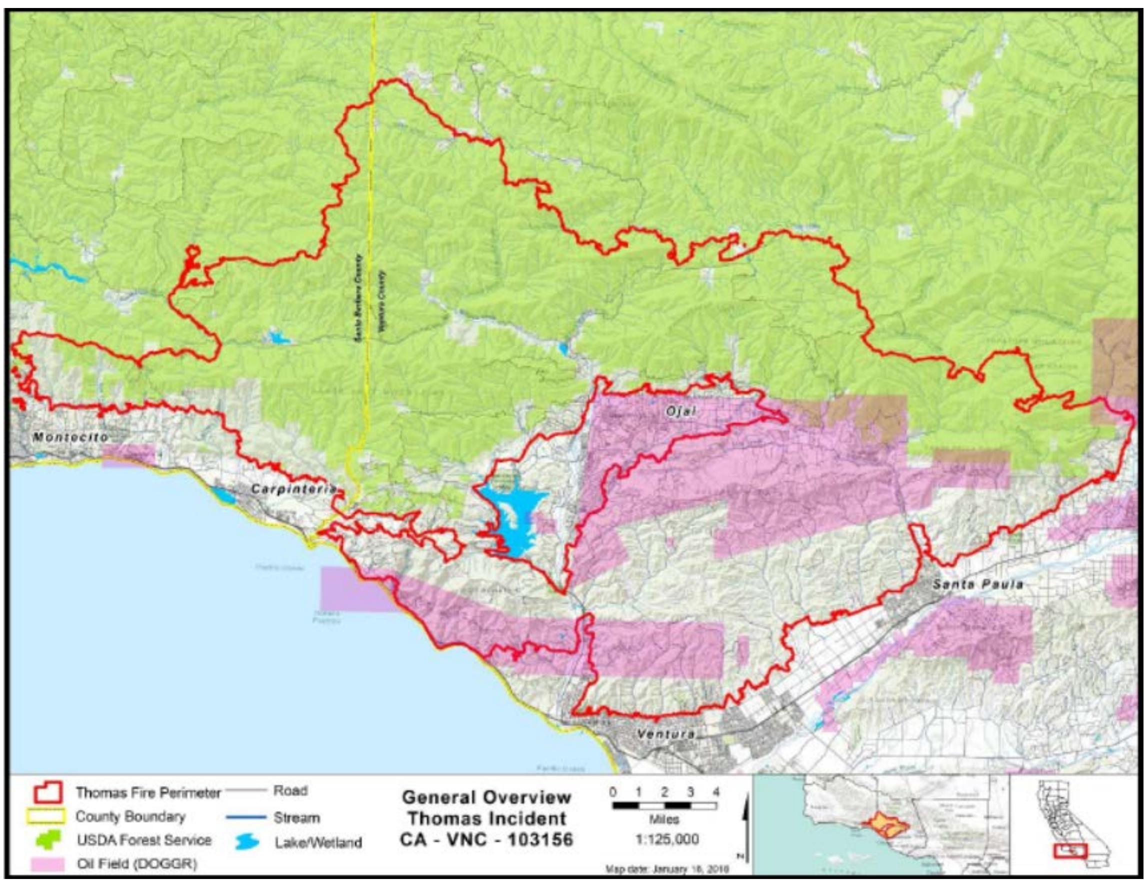

Figure 1. Overview of the Thomas Fire Incident evaluation area. Approximately 54 percent of the total burn acreage is owned by the U.S. Forest Service. Source: WERT 2018.

The fire destroyed riparian corridors and upland vegetation over a widespread area. Many streams lost riparian vegetation. Ecological benefits of riparian vegetation are well documented (Karr and Schlosser 1978, Osborne and Kovacic 1993, Castelle *et al*. 1994, and Sabater *et al*. 2000). Depending on recovery of riparian vegetation (Detenbeck *et al*. 1992, Boughton *et al*. 2006, Hanan *et al*. 2017) and the short reoccurrence fire interval for southern California (Bendix and Commens 2017), NMFS anticipates increased stream temperatures, reduced sources of food and living space for steelhead, and altered sediment dynamics across approximately 11 percent of the DPS range, including waterways that are essential for recovering endangered steelhead.

Subsequent rainfall (January 9, 2018) on denuded slopes caused mudflows to carry substantial amounts of sediment from several hillslopes to depositional areas including middle and estuarine reaches of creeks impacting downstream areas that were not directly affected by fire. Sediment transport will likely produce a shifting mosaic of suitable and unsuitable habitat patches for steelhead (Keller *et al*. 1997, Boughton *et al*. 2006). Based on the extent of direct and indirect effects of the fire in the Ventura River Watershed, NMFS anticipates a measurable decrease in large wood over the long term, benthic organic matter, and insects and detectable changes in macroinvertebrate drift and steelhead diet over the next ten years (Cover *et al*. 2010, Rosenberger *et al*. 2011).

The current drought amplified the fires' effects. The drought commenced in 2012 and included an exceptional drought period from January 2014 through January 2017. Under drought conditions, small population extirpations from stream reaches or segments (e.g., Cooper *et al*. 2015) may be due to loss of cold-water refugia (Wilkin *et al*. 2016, Schultz *et al*. 2017). Forest-canopy water loss in southern California made the forest landscape more vulnerable to fire (Asner *et al*. 2015). The drought will likely delay recovery of riparian vegetation which will prolong the duration of effects from the fire (Verkaik *et al*. 2013). The extended drought and drying conditions associated with projected climate change has the potential to cause local extinction of *O. mykiss* populations, and thus reduce the genetic diversity of fish within the Southern California Coast Steelhead Recovery Planning Area (NMFS 2016a).

Populations within the SCC DPS of steelhead may lack the resilience, diversity, or demographic support to rebound rapidly from a fire disturbance of this magnitude and extent (Dunham *et al*. 2003, Rieman *et al*. 2003, Verkaik *et al*. 2013), therefore the probability for local extinctions linked to any disturbance has likely increased (Gresswell 1999, Rieman *et al*. 2003, Boughton *et al*. 2006). Long-term effects such as changes in steelhead prey taxonomic composition and predator-prey interaction can occur even ten years after a fire (e.g., Rosenberger *et al*. 2011). Additional long-term effects within fire-burned areas can include fast growth, low lipid content, and early maturity of *O. mykiss* (e.g., Rosenberger *et al*. 2015). The entire suite of long-term effects will influence the rate of recovery for not only the Ventura River and Santa Clara River steelhead populations but the overall rate of recovery on the DPS-scale.

Designated Critical Habitat

Critical habitat for the SCC DPS of steelhead was designated on September 2, 2005, and consists of the stream channels listed in 70 FR 52488. Critical habitat has a lateral extent defined as the width of the channel delineated by the ordinary high-water line as defined by the Corps in 33

CFR 329.11, or by its bankfull elevation, which is the discharge level on the streambank that has a recurrence interval of approximately 2 years (September 2, 2005, 70 FR 52522). PBF are components of stream habitat that have been determined to be essential for the conservation of the SCC DPS of steelhead, and are specific habitat components that support one or more steelhead life stages and in turn contain physical or biological features essential to steelhead survival, growth, and reproduction, and conservation. These include:

1. **Freshwater spawning sites** with sufficient water quantity and quality and adequate substrate (i.e., spawning gravels of appropriate sizes) to support spawning, incubation and larval development.

2. **Freshwater rearing sites** with sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions and allow salmonid development and mobility; sufficient water quality to support growth and development; food and nutrient resources such as terrestrial and aquatic invertebrates and forage fish; and natural cover such as shade, submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

3. **Freshwater migration corridors** free of obstruction and excessive predation with adequate water quantity to allow for juvenile and adult mobility; cover, shelter, and holding areas for juveniles and adults; and adequate water quality to allow for survival.

4. **Estuarine areas** that provide uncontaminated water and substrates; food and nutrient sources to support steelhead growth and development; and connected shallow water areas and wetlands to cover and shelter juveniles.

5. **Marine areas** with sufficient water quality to support salmonid growth, development, and mobility; food and nutrient resources such as marine invertebrates and forage fish; and near-shore marine habitats with adequate depth, cover, and marine vegetation to provide cover and shelter.

Streams designated as critical habitat in the SCC steelhead DPS contain the above PBF (PBF 1-3) in differing amounts and to varying degrees, depending on the particular stream, the characteristics of the watershed, and the degree that the watersheds are impacted by anthropogenic factors. Perennial streams with PBF and conditions suitable for steelhead are fewer in the southern portion of the DPS compared to the northern portion. Some of this is due to the amount of coastal development and because there is generally less rainfall in the southern region. During the summer many creeks at the southern edge of the range become intermittent in sections or dry completely (in some cases this occurrence is natural and in other cases it is due to anthropogenic factors), and stream temperatures may become a factor in terms of suitability for rearing steelhead. Overall, steelhead oversummering habitat is thought to have a restricted distribution more so than winter spawning and rearing habitat in the SCC steelhead DPS (Boughton *et al*. 2006).

Streams with high conservation value have most or all of the PBF of critical habitat and extensive areas that are suitable for steelhead spawning, rearing, and migration (NMFS 2012a).

Streams with medium or low conservation value are less suitable for steelhead in terms of spawning, rearing, and migration, and have less of the PBF necessary for steelhead survival growth and reproduction, generally due to anthropogenic factors. Both the Ventura River and Santa Clara River watersheds have been found to have high conservation value for the survival and recovery of the SCC DPS of steelhead. While many streams in the DPS have been found to have high conservation value for survival and recovery of the species, the spawning, rearing, and migratory habitat within the DPS are heavily impacted by dams, diversions, and human development. As a result, much of the available habitat has become severely degraded, and habitat degradation has been a main contributing factor to the current endangered status of the DPS (Good *et al*. 2005). The most recent status reviews found that these threats have remained essentially unchanged (Williams *et al*. 2011, NMFS 2016a, and Williams *et al*. 2016).

As described earlier, the Thomas Fire impacted SCC steelhead viability through direct and indirect effects to PBF mainly in the Ventura River Watershed relative to the Santa Clara River Watershed. The fire burned nearly 80 miles of designated critical habitat (Figure 2). In general, fire impacts include changes in geomorphology (e.g., sediment filled pools and riffles), decreased pool depth, increased solar radiation owing to losses in riparian cover, changes in water quality, increased dissolved nutrients and pH, and changes in pool:riffle ratios (Dunham *et al*. 2003, Earl and Blinn 2003, Aha *et al*. 2014). However, these effects may be pronounced or muted depending on the fire burn severity, timing of subsequent rainfalls (e.g., January 9, 2018, storm event), intensity and duration of ensuing rains, and volume of debris and sediment entering streams.

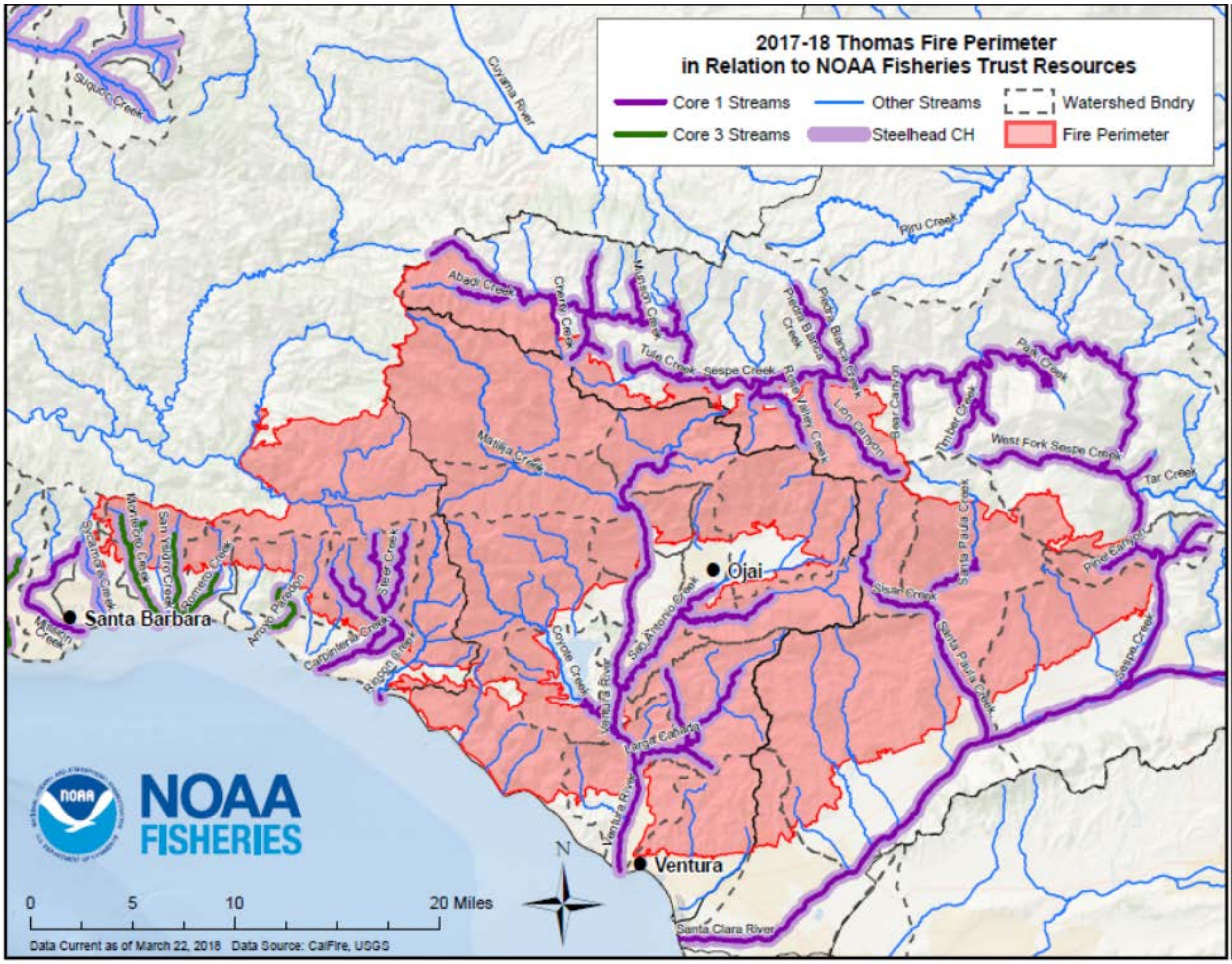

Figure 2. Perimeter of Thomas Fire and extent of affected designated critical habitat. Key: CH = critical habitat. Credit: NMFS' West Coast Region, Rick Morse.

After a fire disturbance, decreased water quality and loss of SCC steelhead habitat can be facilitated by the following physical, chemical and biological changes (USFS 2018):

- Increased surface flows resulting in flooding;
- Increased sedimentation leading to changes in food web structure, reducing primary productivity, with effects to grazers and other benthic macroinvertebrates and their predators (e.g., fish);
- Changes to water quality and chemistry due to ash, smoke, nutrients, and hazardous materials;
- Increased water temperature due to reduction/elimination of riparian cover and increased fine sediment loads;
- Scouring of riparian/aquatic vegetation;
- Changes in streambed/pool habitat due to geomorphic movement (debris flows);
- Mass failure of culverts leading to stream habitat degradation;
- Flushing and extirpation of aquatic biota with limited ability to recolonize rivers, including fish, downstream during and after flood events, respectively.

Debris flows are among the most hazardous consequences of rainfall on burned hillslopes (WERT 2018). The January 9, 2018, storm event trigged a debris flow when Matilija Canyon received approximately six inches of rain in 24 hours. This storm event initiated several debris flows within the Santa Ynez Mountains, and consequently inundated areas within Montecito and Carpinteria in Santa Barbara County. The overall peak runoff throughout impacted areas will likely increase relative to unburned areas for the 2-year and 10-year recurrence intervals.

The Thomas Fire affected 11% of total designated critical habitat within the range of the SCC DPS of steelhead; burned critical habitat was mainly in the Ventura River Watershed (56%) and to a lesser degree in the Santa Clara River Watershed (18%). Indirect effects from the fire (e.g., mudflow, mudslides) likely increase the extent and amount of habitat destruction downstream to the estuary-ocean interface by altering PBF essential to the conservation of a species including a delay in development of such features, which the species relies upon during various life stages.

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The District describes only the immediate area termed the maintenance footprint associated with maintenance or repair activities for each facility under the proposed Program, and thus does not describe the spatial extent (or area) of all the effects from the proposed Program. The action area considered in this biological opinion involves not only the maintenance footprint for each facility but also portions of the Ventura River and Santa Clara River watersheds that may be potentially exposed to effects such as increased levels of turbidity, increased water temperature, or loss of habitat services during the dewatering process. Generally, the likelihood and degree of exposure to effects depends on the facility type, maintenance and repair methods, and the spatial distribution (density) of facilities in each watershed. These are described as follows.

Action area in the Ventura River Watershed.—Within the Ventura River Watershed, the upstream end of the action area begins at RM 17 at Stream Gauge #604 on North Fork Matilija Creek; the downstream end is RM 0.2 at the Caltrans Secondary Outlet #41728 along the west side of the Ventura River estuary. The action area is not continuous between these facilities, but is confined to areas in the vicinity of the District facilities where effects of maintenance activities are expected to occur. With regard to stream gauges, each portion of the action area is the width of the active (bankfull) channel and 50 to 75 feet upstream and downstream of, and including, the maintenance footprint described by the District. With regard to debris basins and flood-control channels, each portion of the action area consists of the facility and the stream area downstream of the drain outlet (estimated between 0 to 200 feet depending on conditions) where sedimentation and turbidity are likely to extend and 50-feet upstream where temporary impacts such as dewatering may occur during a maintenance or repair event.

As mentioned under the proposed action, the District proposes to manage streambed vegetation on four stream gauges in designated critical habitat for steelhead (Table 8). The upstream-most gauge (#604) is near the Mosler Quarry on North Fork Matilija Creek, at about RM 17 (North Fork Matilija Creek RM 0.7). Below provides details on exact location and extent of each portion of the action area associated with each gauge.

Table 8. Additional site details on stream gauges in designated critical habitat that are subject to maintenance under the proposed action.

Gauge #	Gauge Name	River Mile Location	Action Area Portion
604	North Fork Matilija Creek upstream of Mosler Quarry	RM 17 0.7 mi. from Ventura River Confluence	Active channel width; 50' upstream and 50' downstream of (and including) maintenance footprint
602	Matilija Creek at Matilija Hot Springs	RM 16.4 0.2 mi. from Ventura River Confluence	Active channel width; 50' upstream and 50' downstream of (and including) maintenance footprint
608	Ventura River at Foster Park	RM 5.8 on mainstem	Active channel width; 50' upstream and 50' downstream of (and including) maintenance footprint
ME-VR2	Ventura River water quality gauge at Ojai Valley Sanitation District Plant	RM 5.2 on mainstem	75' upstream and 75' downstream of (and including) maintenance footprint

As mentioned under the proposed action, the District proposes to maintain five debris basins located within ephemeral drainages of the watershed outside of designated critical habitat for steelhead (Table 9). The basins are integrated within flood-control channels that ultimately discharge into the Ventura River or San Antonio Creek. Below provides details on exact location and capacity of each basin.

Table 9. Additional site details on debris basins outside of designated critical habitat that are subject to maintenance under the proposed action.

Debris Basin Name	Location	Location of Outlet	Capacity, yd^3
Dent Basin	Dent Drainage Channel, 4,900 ft to Lower Ventura River	RM 2.5	4,100
Fresno Canyon Basin	Fresno Canyon Flood-Control Channel, 1,100 ft to Ventura River	RM 6.8	4,200
Live Oak Basin	Live Oak Creek, 2,200 ft to Ventura River	RM 10.5	45,527
McDonald Basin	McDonald Canyon Creek, 3,500 ft to Ventura River	RM 14.0	23,393
Stewart Canyon Basin	Stewart Canyon Creek, 8,950 ft to San Antonio Creek	San Antonio Cr. 6 mi from Ventura R. confluence	104,215

Action area in the Santa Clara River Watershed.—The upstream end of the action area within this watershed lies at about RM 30 on the mainstem Santa Clara River near the City of Piru at the Warring Canyon Wash drain outlet. The downstream end of the action area is around RM 2.8 at the downstream end of the Victoria Avenue Drain Secondary Outlet near the City of Oxnard. As with the Ventura River, the action area is not continuous between these facilities, but is confined to areas in the vicinity of the District facilities where all effects of maintenance activities are expected to occur (see description in the foregoing). With regard to the North Bank groins facility, the action area includes the maintenance footprint and extends 200 feet upstream and downstream of the maintenance footprint where erosion and scour is likely to occur.

As mentioned under the proposed action, the District proposes to operate and maintain three existing stream gauge locations in designated critical habitat for steelhead (Table 10). Below provides details on exact location and extent of each portion of the action area associated with each gauge.

Table 10. Additional site details on stream gauges in designated critical habitat that are subject to maintenance under the proposed action.

Gauge #	Gauge Name	River Mile Location	Action Area Portion
701	Hopper Creek at Hwy 126 Bridge	1.6 miles upstream of the Santa Clara River and Hopper Creek confluence at RM 27.6	Active channel width; 50' upstream and 50' downstream of (and including) maintenance footprint
709	Santa Paula Creek at Mupu Bridge	5 miles upstream of the Santa Clara River and Santa Paula Creek confluence at RM 14.	Active channel width; 50' upstream and 50' downstream of (and including) maintenance footprint
723	Santa Clara River Victoria Avenue Stream Gauge	RM 2.8	Active channel width; 50' upstream and 50' downstream of (and including) maintenance footprint

As mentioned under the proposed action, the District proposes to maintain five debris basins located within ephemeral drainages of the watershed outside of designated critical habitat for steelhead (Table 11). The basins are integrated within flood-control channels that discharge into the Santa Clara River mainstem. Below provides details on exact location and capacity of each basin.

Table 11. Additional site details on debris basins outside of designated critical habitat that are subject to maintenance under the proposed action.

Debris Basin Name	Location	Location of Outlet	Capacity, yd^3
Cavin Basin	Cavin Road Drain, 3,800 ft to Santa Clara River	RM 25.0	4,100
Fagan Canyon Basin	Fagan Canyon Creek, 9,300 ft to Santa Clara River	RM 13.1	72,000
Jepson Wash Basin	Jepson Wash, 4,200 ft to Sespe Creek	Sespe Creek 3 mi from Santa Clara R. confluence	33,850
Real Wash Basin	Real Wash, 8,800 ft to Santa Clara River	RM 29.8	22,000
Warring Wash Basin	Warring Wash, 8,800 ft to Santa Clara River	RM 30.0	33,100

2.4 Environmental Baseline

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). NMFS considers the impact of climate change predictions and forecasts within this section by referencing back to climate discussions within the Status of the Species (see sub-section *Regional Climatic Variation and Trends*). For example, temperatures are likely to increase in the action area during this century, and flash floods are also likely to increase in frequency. However, the “signal” of climate change in available projections can’t easily be distinguished from the “noise” of natural climate variability over short-time periods (e.g., 10 years). Available climate literature determined that for at least 10 years into the future, and up to 50 years at the regional scale, expected climate is dominated by annual and decadal natural variability, thus the signal of climate change is difficult to distinguish or project (Mochizuki *et al*. 2010, Santer *et al.* 2011, McClure *et al.* 2013, Deser *et al*. 2012). Thus, NMFS concludes that baseline conditions during the next 10 years are likely to mirror current conditions. Droughts, severe floods, and fires may occur.

2.4.1 Status of Steelhead in the Action Area

Santa Clara River Watershed

Prior to 1940, the abundance of adult steelhead in the Santa Clara River watershed was estimated to have been between 7,000 and 9,000, which is believed to have been the second largest steelhead run in southern California (Good *et al.* 2005). While steelhead abundance within the watershed has decreased substantially based on recent monitoring (see Table 7), steelhead adults have continued to be observed in the Santa Clara River at the Vern Freeman Diversion and in areas downstream of the diversion (Table 12). The most recent observations of three adult steelhead in the Santa Clara River occurred in April 2012 (D. Brumback, NMFS, personal communication). These counts underestimate the true number of adult steelhead due to various technical difficulties in operating the fish passage facility and observing passing fish (NMFS 2011). Steelhead juveniles and smolts continue to be observed in the Santa Clara River. Recent trapping of smolts at the Vern Freeman Diversion continues to indicate that smolts are emigrating from the watershed (Kelley 2008). Steelhead juveniles continue to occupy the tributaries, and have recently been observed in Santa Paula Creek, Sisar Creek, Sespe Creek, and Piru Creek (S. Glowacki, NMFS, 2006-2009; and K. Mull, NMFS, 2011-2012, personal observation).

The Santa Clara River steelhead population is a "Core 1" population essential for the successful recovery of the endangered SCC DPS of steelhead. This is, in part, due to the watershed's large size, availability of spawning habitat, and relatively reliable winter river discharge (Boughton *et al*. 2006). Additionally, the steelhead population in the Santa Clara River has been evaluated by NMFS' Technical Review Team as having a high potential for being independently viable, and was ranked second among SCC steelhead watersheds for overall viability, based on watershed habitat conditions, reliable flows, and amount of habitat present.

Table 12. Number of steelhead adults and smolts captured at the Vern Freeman diversion or observed in the Santa Clara River downstream of the Vern Freeman Diversion (sources: Bureau of Reclamation and United Water Conservation District 2004, United 2007, 2008, 2009, 2010, 2011, 2012, 2013, and 2014, Kelley 2008). A "na" indicates no attempt was made to detect individuals for this year.

Year	Adults	Smolts
1994	1	81
1995	1	111
1996	2	82
1997	0	414
1998	na	2
1999	1	3
2000	2	839
2001	2	119
2002	0	3
2003	0	41
2004	0	2
2005	na	na
2006	0	13
2007	na	14
2008	2	133
2009	0	160
2010	0	72
2011	0	19
2012	3	31
2013	0	0
2014	0	11

The Santa Paula Creek subpopulation occupies a watershed reported to contain the least amount (12%) of historic spawning and rearing habitat relative to the other subpopulations (i.e., Sespe Creek 60%, and Piru Creek 28%) in the Santa Clara River Watershed (Moore 1980). However, the majority of historic spawning and rearing habitat in Piru Creek is currently not accessible to anadromous *O. mykiss* owing to the presence of Santa Felicia Dam, increasing the importance of the Santa Paula Creek subpopulation. Furthermore, Stillwater (2007) observed higher densities of rearing *O. mykiss* compared to neighboring subpopulations of the Santa Clara River during recent surveys, and suggested that Santa Paula Creek has some of the highest potential for restoring anadromous *O. mykiss* in the Santa Clara River Watershed. Given the relative amount of available habitat and observed densities of rearing juveniles in the Santa Paula Creek sub-basin, the potential to produce a large number of steelhead is considered high.

Santa Paula Creek and Sespe Creek steelhead subpopulations were impacted by the Thomas Fire. Steelhead utilize the following Sespe Creek tributaries that were affected by the fire: Abadi Creek, Tule Creek, West Fork Sespe Creek, and Boulder Creek. Exposure to habitat loss, fine sediment deposition, reduced riparian cover, changes in water quality, increased temperature, and reduced prey availability is likely to increase mortality and local extirpation within tributaries of the Santa Clara River Watershed. However, given the limited burn area extent within the Santa Clara River Watershed, the likelihood of high mortality across the entire Santa Clara River population and sub-populations is low.

Ventura River Watershed

Within the Ventura River Watershed prior to the completion of Matilija Dam in 1947, Moore (1980) estimated that a minimum of 4,000 to 5,000 steelhead spawned in the Ventura River system in normal water years. Currently, the Ventura River adult steelhead population is likely less than 100 individuals (Busby *et al.* 1996, Titus *et al.* 2001). Although the Ventura River steelhead population has declined substantially, observations of adult steelhead were documented in 1974, 1975, 1978, 1979, 1991, 1993, and 2001 (Titus *et al.* 2001). Monitoring of adult steelhead at the Robles Fishway Facility began in 2006 using a Vaki Riverwatcher System with associated still and video cameras. Since 2006 many adult steelhead have been detected by the Vaki system and recorded on video camera traveling upstream through the Robles Diversion fish passage facility (Table 13; Casitas 2006 through 2017). Prior to a 2011 revision of methods, Casitas Municipal Water District considered steelhead to be adults only if they were greater than 38 cm in length. However, because steelhead may spawn at smaller sizes, and due to technical limitations of the Vaki system, the number of steelhead detected by Casitas Municipal Water District likely underestimate the true number of steelhead migrating in the system. On the other hand, because the Vaki system does not uniquely identify fish, it is possible that some of the detections are duplicates. The Robles Diversion is about 14 miles from the ocean, so counts at the facility do not include adults that spawn in the lower portion of the mainstem Ventura River or in San Antonio Creek, an important spawning tributary (Williams *et al*. 2011).

Table 13. Number of steelhead immigrants and emigrants recently detected at the Robles Diversion fish passage facility (sources: Casitas 2006, 2007, 2008, 2009, 2010, and 2011, 2012, 2013, 2014, 2015, 2016, and 2017). Numbers in parentheses is the average size of migrants. Values for upstream migrants are confirmed *O. mykiss* detections by the Vaki system, which reflects a minimum count as there are additional detection types (e.g., unknown and probable) that were unable to be positively identified by the video recording. Values for downstream migrants are individuals captured in weir-smolt traps from March through June or until water connectivity is lost or water temperature exceeds a daily mean of 22°C. An * denotes smolt trapping was not conducted due to low precipitation or insufficient river flow.

Year	Upstream migrants	Downstream migrants
2006	6 (29 cm)	no smolt trapping proposed
2007	*	no smolt trapping proposed
2008	74 (30 cm) plus 6 adult (55 cm)	0 plus 3 adult "probable" (47 cm)
2009	55 (27 cm)	1 (163 mm)
2010	54 (34 cm)	5 (187 mm)
2011	101 (27 cm)	25 (20 cm)
2012	396 (31 cm)	*
2013	0	*
2014	1 (30 cm)	*
2015	0	*
2016	0	*
2017	11 (32 cm)	0
		2017 field note: trap was operational for 38 consecutive days, 07 March to 13 April)

Adult steelhead have been sighted upstream of the Robles Diversion in North Fork Matilija Creek. In the lower Ventura River, sightings of adult steelhead have occurred, and spawning surveys performed by NMFS in winter and spring 2010, 2011, and 2012 confirmed the presence of large adult steelhead and redds in the Ventura River mainstem downstream of San Antonio Creek. In addition to observations of adults, considerable numbers of steelhead smolts and oversummering juvenile steelhead continue to be observed on a yearly basis in the vicinity of the Robles Diversion (Casitas 2005, 2006, 2008, 2009, 2010, 2011, 2012), and in the lower reaches between San Antonio Creek and Foster Park (TRPA 2007, 2008, 2009).

The Ventura River steelhead population is a "Core 1" population, meaning this population is essential for the successful recovery of the endangered SCC DPS of steelhead. The basis for classifying this watershed as Core 1 involved the watershed's large size, high-quality spawning and rearing habitat, and relatively reliable winter river discharge (Boughton *et al*. 2006). As in the Santa Clara River, the steelhead population in the Ventura River has been evaluated as having a high potential for being independently viable. Of all the watersheds in the SCC DPS, the Ventura River steelhead population was ranked third for overall viability, based on watershed habitat conditions, reliable flows, and amount of habitat present.

The Ventura River steelhead population was also impacted by the Thomas Fire. The extent of fire exposure was higher based on the burn area relative to the Santa Clara River steelhead population. Due to fire intensity, individuals present in North Fork Matilija Creek, San Antonio Creek, and lower Ventura River likely did not survive as 96%, 73%, and 86% of these sub-watersheds burned, respectively (USFS 2018). Steelhead that survived will likely be isolated or confined to limited habitat areas (e.g., Wilkin *et al*. 2016, Schultz *et al*. 2017). It is unlikely that these areas were immune from the subsequent debris flows triggered by the January 9, 2018, storm event. Overall, steelhead survival is likely low after fire effects and debris flows.

2.4.2 Status of Critical Habitat within the Action Area

Santa Clara River Watershed

The Santa Clara River Watershed (1,236 mi.^{2}), including Santa Paula Creek, Sespe Creek, Sisar Creek, Hopper Creek, and Piru Creek, contains about 180 miles of spawning, rearing, and migratory habitat for steelhead, and represents a substantial proportion of critical habitat within the SCC DPS of steelhead (NMFS 2005). Historically, the Santa Clara River mainstem was likely used by adult steelhead for migration into the upstream tributaries (i.e., Sespe Creek) and could have been used by juvenile steelhead for rearing because past accounts indicate water was present within sections of the mainstem during the dry season (Outland 1971, Mann 1975). Today, the Vern Freeman Diversion and Santa Felicia Dam have impeded or completely blocked steelhead access to vast amounts of habitat within the mainstem and tributaries (NMFS 2008a, b). Dams, water diversions, and groundwater pumping have also altered the timing, frequency, magnitude, duration, and rate-of-change of surface flow in the mainstem. Impacts from agriculture, flood-control facilities, highways, bridges, and urbanization have cumulatively reduced the functional value of critical habitat in the Santa Clara River Watershed, and in some portions some functions may have been eliminated (i.e., summer rearing may no longer occur in portions of the mainstem).

The aquatic habitat in the mainstem and tributaries consists of run, riffle, glide, and pool. The aquatic habitat in the mainstem and estuary appears suitable for migration and rearing, while the aquatic habitat in the tributaries appears to provide suitable spawning and rearing habitat (S. Glowacki, NMFS, 2008-2010, personal observation). The mainstem below the Freeman Diversion may become dry for several miles during the dry season, owing to anthropogenic activities. Riparian vegetation is present on the mainstem along the channel banks, within the active channel, and within the confines of levees, where present. The riparian zone is highly variable in terms of species, extent, height, and growth stage, with several types of riparian communities being present including willow riparian forest, cottonwood-willow riparian forest, mulefat scrub, and coyote brush scrub (Padre 2009). In the lower mainstem from the mouth to about five miles upstream, the riparian zone is up to hundreds of feet wide and consists of mature willows, sycamores, and cottonwoods over 30 feet high with trunks up to 12 inches in diameter. Due to the large channel width, the riparian zone provides limited shade over the mainstem active channel.

The Santa Clara River Watershed contains sub-watersheds that support the functional value of designated critical habitat in the action area yet were impacted by the Thomas Fire. The Santa Paula Creek watershed is expected to buffer the species against extirpation, particularly during periods of extended drought that are common to the region. With regard to the Santa Paula Creek drainage, the tributaries in the upper drainage can possess flowing water even during dry periods, further emphasizing the importance of a functioning migratory corridor in the downstream reach providing access to suitable spawning habitat and persistent rearing habitat. Unfortunately, the fire burned 89% of this watershed. Sisar Creek, a tributary to Santa Paula Creek, completely burned. Although two miles of Santa Paula Creek were unaffected by the fire, the creek has a moderate risk for subsequent debris-flow impacts (USFS 2018). Based on NMFS field surveys conducted in June 2018 on Santa Paula Creek, the riparian corridor at Mupu Road (Gauge #709) near Steckel Park remains fully developed, and the tree canopy provides extensive shade over the creek. Sespe Creek had many tributaries within the burn area: Abadi Creek, Tule Creek, West Fork Sespe Creek, and Boulder Creek. As a whole, Sespe Creek watershed was exposed to a low-intensity burn but the majority of the riparian buffer remains functional. Overall, the fire burned 18% of designated critical habitat in the Santa Clara River Watershed (32.7 miles out of a total of 180 miles of designated critical habitat).

Ventura River Watershed

The Ventura River Watershed (169 $mi.^2$), including Matilija and North Fork Matilija Creeks, San Antonio Creek, Lion Creek, and the Ventura River mainstem, contains about 48 miles of spawning, rearing, and migratory habitat that is currently occupied by steelhead (NMFS 2005, Normandeau Associates 2012). Historically, a much greater area of the watershed was accessible by steelhead, but the construction of Matilija Dam, Casitas Dam, and the Robles Diversion have blocked steelhead access to substantial areas of historical habitat in the tributaries of the Ventura River (although the Robles Diversion Dam possesses a fish ladder, the performance of the fish passage has not been reliably assessed, and delays in steelhead detecting the ladder entrance are expected). Some tributaries (e.g., San Antonio Creek) are still accessible to steelhead. The amount and extent of surface flow in the mainstem (i.e., habitat used as sites of freshwater rearing) is affected by diversion of surface water at the Robles Diversion, and by groundwater pumping along the mainstem and tributaries (City of Ventura 2003). Surface flow in the middle reaches of the mainstem (e.g., from the Robles Diversion extending downstream to San Antonio Creek) often ceases during the dry season, particularly in years with limited precipitation. Portions of the mainstem and tributaries are noticeably impaired by ranches, agricultural fields, and orchards located adjacent to the mainstem and tributaries, some of which are on steep, highly erosive hill slopes. Other anthropogenic factors, such as urbanization, agricultural activities, industrial activities, oil development, and flood-control facilities have reduced the quantity and quality of steelhead habitat in the Ventura River Watershed.

The aquatic habitat in the mainstem and tributaries consists of an array of riffles, runs, glides, and pools that appear to provide suitable spawning and rearing sites for adult and juvenile steelhead, based on NMFS' observations of steelhead within the Ventura River (S. Glowacki, R. Bush, and K. Mull, NMFS, 2008-2012, personal observation). Some sections of the mainstem below the Robles Diversion become dry during the summer and fall, with reaches in the upper and lower portions of the mainstem remaining perennial. The riparian zone is well established throughout the mainstem and tributaries. Extensive areas of mature riparian vegetation consisting of sycamores, alders, cottonwoods, and willow species (with some trees over 50 feet high) are present in the mainstem from the confluence of the North Fork Matilija and Matilija Creek to the estuary, and provide shade and cover along some of the perennial portions of the river during the dry season (S. Glowacki and K. Mull, NMFS, 2010-2012, personal observation). Exotic vegetation (i.e., *Arundo donax*) is present in lower areas of the mainstem, with some large stands of Arundo present near the mouth and estuary.

Within the mainstem of the Ventura River extending from the Casitas Vista Bridge upstream to roughly the San Antonio Creek confluence, the active channel contacts banks that have been reinforced with riprap. This specific area provides rearing habitat for steelhead, as evidence by pools upstream and downstream of the Casitas Vista Bridge and approximately eight additional pools farther upstream of this bridge (Normandeau Associates 2012). Despite the presence of riprap along the channel (see NMFS 2014b), the density of spawning gravel and *O. mykiss* redds within the low-flow channel downstream of the Fresno Canyon confluence represents an area with extensive gravel and spawning activity in the mainstem Ventura River. The channel upstream of Casitas Vista Road Bridge is braided and able to meander, but downstream of the bridge, the channel is geologically confined. The bedrock formations below Casitas Vista Road Bridge act as a hydraulic control for the upstream portion of the river that wanders laterally and continues to erode channel banks. Casitas Vista Road Bridge also acts as a constriction in the area that creates a backwater effect at Foster Park when floods are greater than the 50-year event. Additionally, mature Sycamore and Oak trees contribute shade over the mainstem upstream of Casitas Vista Road Bridge.

In addition to portions of the mainstem, Ventura River had two main tributaries within the Thomas Fire burn area accessible to steelhead: San Antonio Creek and North Fork Matilija Creek. North Fork Matilija was exposed to a high-intensity burn while San Antonio Creek underwent a low-intensity burn. Approximately, 96% of North Fork Matilija watershed was burned, and 73% of San Antonio Creek watershed was burned. Overall, the fire burned 56% of designated critical habitat for the Ventura River Watershed (27.1 miles out of a total of 48 miles of designated critical habitat). Below describes future impacts from the fire likely to occur given the extensive disturbance in the Ventura River Watershed.

Some fire impacts remain evident for years. Post-fire conditions such as increased sedimentation through surface runoff from upslope (unpaved roads), greater channel instability (see Sankey *et al*. 2017), or higher nutrient concentrations may lead to conditions favoring nonnative fishes (Dunham *et al*. 2003). The nitrogen cycle disrupts as nitrogen export increases when fire is followed by drought; these dry conditions prolong the period during which nitrogen mobilization is decoupled from plant uptake (see Hanan *et al*. 2017). Also, we anticipate impacts to ecosystem recovery; for example, when fire is preceded by drought, shrub recovery to form a closed canopy is expected to be slow. Increases in summer stream temperature due to the loss of streamside canopy cover continue to have an adverse effect on salmonid habitat (Leonard *et al*. 2017). In general, the process (or rate) of recovery is closely tied to streamside vegetation and hydrologic disturbance patterns following a fire event.

The ongoing drought increased the magnitude of habitat effects from the Thomas Fire. The subsequent storm event (January 9, 2018) during a multi-year drought transformed channel dynamics (e.g., Florsheim *et al*. 2017). Consequences from this include increased sediment transport capacity, which is characterized by the longer residence time of relatively fine-grained post-fire channel sedimentation. Florsheim *et al*. (2017) highlight the complex and substantial effects of multi-year drought on geomorphic responses following fire disturbance. Overall, when considering the impact from the fire against the ongoing drought and the subsequent debris flows, we anticipate the debris flows will delay succession of stream ecosystems, possibly altering recovery trajectories, communities, and food-web interactions (see Tuckett and Koetsier 2016, 2018).

2.4.3 Contribution of the Santa Clara River and Ventura River Steelhead Population Units to DPS Viability and Recovery

Population Units.—The endangered SCC DPS of steelhead comprises several population units (steelhead-bearing watersheds). While 46 drainages support this DPS (Boughton *et al*. 2005), only 10 population units possess a high and biologically plausible likelihood of being viable and independent (Boughton *et al*. 2006). The Santa Clara River and Ventura River watersheds are two population units within the DPS that possess the characteristics needed to be both viable and independent (Boughton *et al*. 2006), predominantly due to large amounts of oversummering habitat, a large network of tributaries, and reliable winter discharge within the two basins. Due to these features, the Santa Clara and Ventura River steelhead population units are important to the viability and recovery of the endangered SCC DPS of steelhead, as described in further detail below.

Independence of the Santa Clara River and Ventura River populations.—The Santa Clara River and Ventura River populations are considered to be independent populations (Boughton *et al*. 2006), and are therefore, once recovered, expected to support steelhead in several adjacent population units via steelhead straying into adjacent watersheds. The creation and maintenance of populations in several adjacent population units effectively increases the number of individuals in the broad population. Given the risk of extinction that small populations face (e.g., Pimm *et al*. 1988, Primack 2004), a larger number of individuals decreases the risk that the broad population would have weakened viability.

One reason why the Santa Clara River and Ventura River population units are considered to be independent populations is because once recovered, they can withstand environmental stochasticity (referred to as "stability") (Boughton *et al*. 2006). Populations in strictly coastal or inland areas of the DPS do not appear to be different in terms of their innate stability over the long term (Boughton *et al*. 2006), but some population units exist in areas where surface water can be perennial and where winter discharge (and therefore migration opportunities for steelhead) is more dependable. This has led to the identification of certain population units in the DPS that are expected to be more stable over the long term than other units not sharing such environmental features. The Santa Clara and Ventura rivers were identified as two such population units (Boughton *et al*. 2006), and due to these characteristics, recovery of steelhead within these basins is considered to be important for recovery of the entire SCC DPS of steelhead.

The value of the Santa Clara River and Ventura River population units to the DPS is further highlighted by their ecologically significant attributes, which are not found in most other population units within the DPS. The Santa Clara River and Ventura River population units represent a large distributional component of the overall range of the DPS, and these population units are two of the largest steelhead-bearing watersheds in the DPS. Without these population units, the number of large population units in the DPS would be reduced. The remaining units are primarily small coastal populations, which, by themselves, do not appear to favor viability and recovery of the DPS due to their small population size and susceptibility to environmental stochasticity (Boughton *et al*. 2006).

The Santa Clara River and Ventura River population units are inland populations, whereas the vast majority of population units are coastal. The value of inland populations lies in their innate habitat characteristics and conditions. Inland population units extend into areas that are drier and warmer than those experienced by coastal population units, and inland population units also have longer migration routes and cover a larger area. Such environmental features are expected to promote diversity (genetic, phenotypic, and ecological) and specific life-history traits (e.g., the ability to migrate long distances, and tolerate elevated temperatures and low flows during the dry season) that favor survival of the species. Additionally, the Santa Clara River and Ventura River populations appear to have been two of the largest in the DPS, particularly during favorable water years (Boughton *et al*. 2007). These features increase the overall viability of recovered Santa Clara River and Ventura River population units, which makes them crucial to the recovery of the broader DPS.

2.4.4. Factors Affecting Steelhead and Critical Habitat within the Action Area

Dams and Water Diversions

The Santa Clara River and Ventura River watersheds are impacted by dams, and large and small water diversions. The dams and diversions have altered the natural flow regimes of these rivers in terms of the timing, duration, magnitude, and frequency, which have decreased the quantity and quality of critical habitat in the action area. On the Santa Clara River, Santa Felicia Dam impounds a major portion of the natural flows from the upper watershed at Lake Piru, and blocks steelhead passage into the upper reaches of Piru Creek (NMFS 2008a). The Vern Freeman Diversion several miles downstream also diverts considerable amounts of water out of the mainstem during the year, and shunts the water to percolation ponds for groundwater recharge. Although there is a fish ladder on the diversion, NMFS determined that the fish ladder is not effective in providing volitional passage for steelhead and is actually an impediment to adult steelhead migration (NMFS 2008b). On Santa Paula Creek, the Harvey Dam is about 3 miles from the confluence with the Santa Clara River and the dam diverts water used by the City of Santa Paula. While there is a fish passage facility on Harvey Dam, it currently does not provide volitional steelhead passage because scour has resulted in the fish ladder entrance being elevated (perched) several feet above the streambed (D. Brumback, NMFS, 2010, personal communication).

Besides the presence of large-scale dams and diversions, small-scale diversions (e.g., Farmer's Irrigation Group Diversion near Santa Paula), and groundwater extraction wells also exist on the

Santa Clara River and impound water from the mainstem. Ecological consequences of dams and diversions and groundwater pumping on the Santa Clara River involve a severe reduction in stream fish migratory opportunities and reduction in the functional value of the aquatic habitat due to impacts to the natural hydrograph, which include severe reduction or elimination of summertime flows and a reduction in wintertime peak flows that steelhead rely on for migration cues (Meehan and Bjornn 1991). As a result, the functional value of critical habitat in the mainstem Santa Clara River has been considerably diminished, and some functions appear to have been eliminated (i.e., summer rearing may no longer occur in the mainstem). Other ecological consequences of dams and water diversions in the Santa Clara River Watershed involve habitat fragmentation, steelhead sub-population isolation, reduction in diversity, and disruption in spatial structure of the steelhead population due to the elimination of volitional migration throughout the watershed. These ecological impacts reduce the viability of the steelhead population in the Santa Clara River Watershed and increase the risk of species extinction (McElhany *et al.* 2000, Boughton *et al*. 2006).

On the Ventura River there are several dams and diversions on the mainstem and in the main tributaries. The first is Matilija Dam, which obstructs flows and sediments in the upper watershed and blocks all steelhead migration. While the dam no longer impounds a substantial amount of water (i.e., now only 600 acre feet), it continues to substantially disrupt natural sediment transport through the watershed. The reservoir behind the dam has almost completely filled with sediment that would otherwise be downstream (Corps 2004). Starting in 2008, as documented by Casitas Municipal Water District, maintenance valve tests were conducted in response to the likelihood of sediment blockage within three valves at Matilija Dam. The purpose of a valve test is to ensure outlet valves are functioning properly as designed. Valve tests involve discharge pulses released from the valves into the Ventura River mainstem. Monitoring results show distinct, temporary yet measurable manipulations to downstream river discharge. Authority to conduct these tests transferred to the Ventura County Watershed Protection District in 2012. Between 2012 and 2016, no tests were conducted by the District. In November 2017, the District carried out a valve test at Matilija Dam as required by the California Division of Dam Safety. The most recent test indicates the main outlet valve is filled with sediment to the extent no flow is able to pass and empty into the Ventura River. However, the greatest impact of the dam is the blockage of 50% of the available spawning and rearing habitat in the Ventura River Watershed (NMFS 2007).

About 2 miles downstream of Matilija Dam, the Robles Diversion diverts substantial quantities of water (up to 500 cfs) to Lake Casitas during winter and spring, and until 2004, blocked upstream migration of steelhead. The Robles Fish Passage Facility was completed in 2004 along with a new plan to release more water for the benefit of adult and juvenile steelhead downstream (NMFS 2003). Nevertheless, the Robles Diversion diverts considerable amounts of surface flow between January and June, and reduces the quantity and quality of aquatic habitat that steelhead use for migrating, spawning, and rearing. There are two main long-term passage issues at this facility: (1) implementation of pending (consensus not yet achieved) drought protection measures that have the potential to shorten the duration and magnitude of fish augmentation flows (NMFS' March 14, 2017, letter to the Bureau of Reclamation), and (2) the design of the original Robles fish ladder in the Biological Assessment included removal of the concrete road crossing and installation of numerous (n=15) low-head stone weirs downstream of the diversion dam to improve steelhead passage to the entrance of the fish ladder. However, only four weirs were constructed and the low-flow crossing remains instream (NMFS' August 31, 2009, letter to U.S. Army Corps of Engineers).

The last major dam in the Ventura River Watershed is the Casitas Dam on Coyote Creek, which has effectively blocked a large portion of the Ventura River Watershed to steelhead and has reduced surface discharge from the Foster Park area downstream to the estuary. Besides the major dams and diversions in the Ventura River Watershed, there are also wells and small-scale diversions that pump subsurface water along the mainstem. Well withdrawals and pumping occur in numerous locations from near Ojai to about the estuary (EDAW 1978). The water extracted by the wells is used mostly for agriculture, but the City of Ventura has numerous wells and a subsurface diversion in the area of Foster Park which it uses for municipal purposes. Pumping of subsurface water by wells and subsurface diversions typically occurs during the dry season when the river flows are low and when juvenile steelhead are oversummering. As a result, the quantity and quality of summer-rearing habitat has been reduced, and is limited to a few key areas in the Ventura River Watershed, either in Matilija or North Fork Matilija Creeks or the lower mainstem between San Antonio Creek and Foster Park (Moore 1980). Ecological consequences of dams and water diversions in the Ventura River Watershed include habitat fragmentation, steelhead sub-population isolation, reduction in population diversity, and reduction in the spatial structure of the steelhead population due to the elimination of volitional migration throughout the watershed. These ecological impacts reduce the viability of the steelhead population in the Ventura River Watershed and increase the risk of species extinction (McElhany *et al*. 2000, Boughton *et al*. 2006).

Land Use and Urbanization

Due to the increasing human population in southern California over the last several decades, there has been an increase in land-use activities and development of large tracts of land within the action area. Land-use activities include urban and industrial development, agriculture, ranching, gravel and sand mining, oil extraction, and road construction. These land-use activities and increased development have led to the need for flood-control facilities, and the construction of levees and other flood-control facilities (e.g., modified ephemeral channels, debris basins, bank groins, drain outlets, and stream gauges) along the Santa Clara and Ventura rivers and tributaries to protect human infrastructure. These land-use activities and associated flood-control facilities are of concern given their reported effects on stream corridors and aquatic habitat, which include habitat destruction and fragmentation, migration barriers, degradation of water quality, loss of riparian vegetation along streambanks, and reduced downstream recruitment of gravels and large woody debris (Karr and Schlosser 1978, Weaver and Garman 1994, NMFS 1996, Spence *et al.* 1996, Bowen and Valiela 2001). These impacts have cumulatively resulted in a reduction of the quantity, quality, and functional value of spawning, migratory, and rearing habitat for steelhead in the Santa Clara and Ventura River watersheds.

Conversion of wildlands for agriculture and ranching are prevalent in the action area. Agricultural and ranching activities increase runoff of nitrogen from fertilizers and animal waste, pesticides, and fine sediments into streams in the action area (i.e., critical habitat for steelhead). An increase in agricultural runoff results in eutrophication (i.e., excessive nutrients) of river mainstems, and their estuaries (Weaver and Garman 1994, Bowen and Valiela 2001, Quist *et al*. 2003). Eutrophication can have negative effects on steelhead and critical habitat because it results in excessive blooms of algae and bacteria in the action area, especially the Ventura River (Leydecker 2006), which lower dissolved oxygen levels and kills macroinvertebrates that salmonids use for food (Warren 1971, Spence *et al*. 1996). Agricultural runoff also results in increased turbidity and sedimentation in streams, which reduces water quality (Alexander and Hansen 1986, Everest *et al*. 1987, Gregory *et al*. 1987) and is harmful to steelhead (Cordone and Kelley 1961, Hillman *et al*. 1987, Chapman 1988).

Increased population densities and the associated proliferation of urban areas within the Ventura and Santa Clara River watersheds has led to a need for new and increased capacity sewage-treatment plants. The increase in sewage treatment and the need for disposal of treated wastewater has led to increased amounts of treated effluent being discharged into the Santa Clara River estuary (by the City of Ventura), and into the Ventura River a few miles upstream of the estuary (by the Ojai Valley Sanitation District) on a year round basis (Leydecker 2006). This has caused further eutrophication and decreased water quality in the action area (Leydecker 2006), which has led to a reduction in the functional value of critical habitat for steelhead within the action area.

As described in the foregoing, the impacts from urbanization and land-use activities are acute and widespread throughout the action area. Because of their cumulative effects, urbanization and human land-use activities resulting from population growth have led to widespread impacts on steelhead and critical habitat for this species in the action area, and have eliminated or dramatically reduced the quality and amount of living space for steelhead. The extensive loss and degradation of habitat is one of the leading causes for the decline in steelhead abundance in southern California and listing of the species as endangered (Good *et al.* 2005, Williams *et al*. 2011, and Williams *et al*. 2016).

Flood-control Facilities

General effects from existing flood-control facilities include modification of the natural hydrologic functions of watersheds, reduction in local beach sand supply, increased turbidity and sediment loading, increased amount of potentially harmful herbicides, increased water temperatures, and disturbance to wetland and riparian habitats, including coastal habitats, and sensitive species (PEIR 2008). Flood-control channels accelerate runoff from urban and agricultural areas, including associated chemicals and pollutants that have been found to negatively affect water quality and aquatic organisms (Karr and Schlosser 1978, Weaver and Garman 1994, NMFS 1996, Spence *et al.* 1996, Bowen and Valiela 2001, Good *et al*. 2005). NMFS' observations and general familiarity with the action area indicate that when steelhead living space is available near facilities protected by riprap, the channel bank lacks natural riparian corridor features that support steelhead behaviors such as rearing and spawning. Consequently, channel modification such as these may prompt the species to alternative areas within a watershed. This has the potential to cause overcrowding and increased competition for food resources. Below provides a focused discussion on current effects from flood-control facilities for the Santa Clara River Watershed and the Ventura River Watershed.

Santa Clara River Watershed.—Extensive areas of the watershed have been affected by flood-control facilities. The largest facilities are levees within the floodplain necessitated by urban and agricultural encroachment along the Santa Clara River and lower Sespe Creek. Most of the levees are owned and maintained by the District, but there are other non-District levees on the mainstem built adjacent to recently constructed housing developments (e.g., River Street Townhomes, Heritage Valley Parks). The District owns and maintains a total of eight levees in the lower reaches of the Santa Clara River and Sespe Creek, some of which are extensive. Other District-owned flood-control facilities in the watershed include five debris basins that are located within ephemeral streams that drain into the Santa Clara River. Currently, the District is in the early design-planning stage for a levee-realignment project on the SCR-1 Levee to meet flood-risk management objectives for the RiverPark and El Rio communities of Oxnard. Geotechnical exploration to inform the re-alignment is scheduled to begin September 2018 (District 2018). Consequently, this re-alignment is expected to maintain the existing levee including improvements to meet certification standards and extend the useful life of the structure in a meaningful way, and thus would perpetuate any ongoing effects of the existing levee into the future.

The largest debris basin in the watershed, which is owned and maintained by the Corps, is a flow-through debris basin located on Santa Paula Creek. The Corps' debris basin, built in 2000, is designed to hold up to 350,000 cubic yards of sediment, and has resulted in complete channelization of the lower two miles of Santa Paula Creek. On August 27, 2013, NMFS issued a final biological opinion to the Corps for the Santa Paula Creek Flood Control Project. The biological opinion concludes the Corps' proposed action was likely to jeopardize the continued existence of endangered steelhead and destroy or adversely modify critical habitat for the species. As a result, the biological opinion includes a reasonable and prudent alternative (RPA), though the Corps has yet to implement the RPA.

In addition to levees and debris basins, there are riprap-stabilized banks, riprap-protected bridges, and rock groins present in various locations along the mainstem and tributaries, not all of which are District-owned and maintained. For instance, the California Department of Transportation owns and maintains numerous bank stabilization projects near bridges and along major roadways within the watershed (i.e., Highway 126, State Routes 33 and 150).

Flood-control facilities such as levees and stabilized banks negatively affect salmonid habitat in several ways (NMFS 2013, 2014a, b, 2017b). Levees have been shown to alter fundamental natural processes that allow habitat in rivers to form and recover from disturbances such as floods, landslides, and droughts. Among the physical and chemical processes basic to habitat formation and salmonid persistence are floods, sediment transport, nutrient cycling, water chemistry, woody debris recruitment, and floodplain processes. Levees and bank stabilization restrict and alter these processes, thereby reducing aquatic habitat diversity, habitat complexity, and habitat quality for salmonids (Brookes 1988, NMFS 2017b).

Levees interfere with lateral migration and meandering that naturally takes place in stream channels, and eliminate connectivity between the channel and the floodplain, which results in a reduction in river braiding, sinuosity, and side channels (Brookes 1988, Mount 1995). The presence of levees also reduces natural sediment inputs from streambanks, some of which provide spawning gravels. Constriction of rivers by levees also increases the likelihood of channel bed scour during high flow events (Brookes 1988, Mount 1995), thereby increasing the potential for scour of redds. Facilities preclude the natural behavior of channels by deepening, smoothing, and straightening, thus speeding the movement of high-flow events, and unfortunately sediment bedload, out to sea (see NMFS 2014a). The foregoing effects on steelhead habitat are observable along District levees in the action area, and appear to be most acute in areas where the levees are in close proximity to the active channel (S. Glowacki, NMFS, 2010, personal observation).

Because District levees on the Santa Clara River are either covered with grout or rock riprap, riparian vegetation is unable to become established on levees, which has reduced the amount of riparian vegetation along the mainstem. Scour due to increased water velocities along levees and hardened banks also negatively affects recruitment of riparian vegetation (Schmetterling *et al.* 2001, Fischenich 2003). In addition, Corps and FEMA requirements have resulted in the ongoing removal of riparian vegetation for 15-feet adjacent to the toe of (most) District levees and bank stabilization facilities (VCWPD 2008). This has decreased the amount and extent of riparian vegetation in the river corridor, and has resulted in the reduction of riparian shade and cover where levees are present near the mainstem. These effects involve a reduction in channel roughness (e.g., woody debris).

Ventura River Watershed.—Extensive areas of the mainstem have been affected by flood-control facilities. Similar to the Santa Clara River Watershed, the largest flood-control facilities are levees built within the floodplain to protect human infrastructure from flooding. The District owns and maintains the four levees present in the Ventura Watershed. The levees are not contiguous, in some cases separated by several miles, and are located only on one side of the river channel. The Live Oak Acres Levee and Casitas Springs Levee are located directly adjacent to residential developments that were built in the floodplain, and the other two levees in the lower river are adjacent to Highway 33 near the City of Ventura. Other flood-control facilities in the watershed include five debris basins that the District owns and maintains. The debris basins are on ephemeral drainages in the watershed, three of which drain into the Ventura River.

In addition to levees and debris basins, there are riprap-stabilized banks, riprap-protected bridges, and rock groins present in various locations along the mainstem and tributaries, all of which are present for flood protection. Riprap stabilized stream banks are typically found near Caltrans bridges including the Casitas Vista Bridge, but there are other stabilized banks on the mainstem in the middle and lower reaches (Stan Glowacki, NMFS, 2010, personal observation), some of which have been constructed by other County agencies or private landowners. The amount of riprap along the active channel depends directly on channel alignment and degree to which the channel meanders. Based on the 2012 channel alignment between Casitas Vista Bridge and the San Antonio Creek confluence, the low-flow channel was adjacent to a relatively greater extent of riprap from the Fresno Canyon confluence (see NMFS 2014b) upstream to the San Antonio Creek confluence, whereas downstream of the Fresno Canyon, the mainstem only flowed along riprap at two spur-dike pools in lower Foster Park (Normandeau Associates 2012). As part of the Matilija Dam Removal Project, the District is planning on upgrading several of its flood-control facilities on the Ventura River, including raising the Live Oak Acres and Casitas

Springs Levee by several feet, and constructing a new levee near the community of Meiners Oaks (NMFS 2007).

In the Ventura River Watershed, levees and stabilized banks have negative effects on steelhead and critical habitat similar to the effects in the Santa Clara River Watershed (see previous section for description of effects). Flood-control facilities on the mainstem have also negatively affected recruitment of riparian vegetation in many areas by concentrating flow along levees, which results in increased water velocities and scouring of riparian vegetation immediately adjacent to levees and hardened banks (S. Glowacki, NMFS, 2010, personal observation). Levees on the Ventura River are covered with grout or riprap, which also prevents the growth of riparian vegetation on these facilities.

Emergency actions undertaken by the District, and other County agencies (e.g., Public Works, Road Department, Parks Department), and the City of Ventura, have also had resulted in adverse effects on significant portions of the middle reaches of the mainstem near Foster Park (S. Glowacki, NMFS, 2010, personal observation). These periodic emergency flood-control activities, which include relocating the active channel with heavy machinery and placing riprap on mainstem banks, have disrupted instream habitat, increased and prolonged turbidity, altered the natural meander pattern of the river, adversely affected the natural recruitment of riparian vegetation, and disrupted the natural maturation and succession of riparian habitats.

Overall, the impacts of flood-control facilities and past and ongoing food-control activities described in the foregoing have reduced the quality and quantity of spawning, rearing and migratory and riparian habitat for steelhead in the Santa Clara River and Ventura River watersheds. These impacts have contributed to the reduction in steelhead population abundance, population spatial structure, population growth rate, and population diversity in the action area (McElhany *et al.* 2000, Good *et al.* 2005), reduced the viability of the watershed-specific steelhead populations, and increased the risk that the SCC DPS of steelhead would become extinct (Good *et al.* 2005, Boughton *et al*. 2006).

Poaching

Fishing is prohibited within the Santa Clara and Ventura River watersheds in anadromous waters below total barriers such as dams where fish can migrate to and from the ocean volitionally (California Code 14 C.C.R. §7.00(f)(4)). Nevertheless, poaching of steelhead is observed within the mainstem, tributaries, and estuaries of the Santa Clara and Ventura River. In addition to illegal fishing, gillnets spanning the entire mainstem channel have been found on several occasions in the lower Ventura River upstream of the estuary. Poaching can reduce the number of steelhead in the action area, which is a concern because the steelhead populations are small.

Wildfires

Wildfires are a significant threat source to the Monte Arido Highlands Biogeographic Population Group (BPG) in the SCC steelhead Recovery Planning Area (NMFS 2012a). The majority of watersheds (85%) available to this BPG have either a high or very high exposure risk to wildfires; this exposure risk is the highest out of all other BPGs in the planning area (Table 4-1 in NMFS 2012a). Wildfires have temporary, major impacts on freshwater habitat including the destruction of riparian vegetation and facilitating the spread of non-native plant and animal species. Subsequent storm events lead to debris flows and increased erosion, transportation, and deposition of massive amounts of fine sediments into watercourses containing coarser-grained spawning gravels. The Thomas Fire did not encompass the entire suite of watersheds in any BPG, rather the fire footprint overlaps mainly with the Ventura River Watershed and minimal overlap with the Santa Ynez River and the Santa Clara River watersheds, as described above. The level of redundancy of independent populations (i.e., Santa Maria River, Santa Ynez River, and Santa Clara River) along with the geographic separation between the Ventura River population and other populations helped minimize risk of population extirpation within the BPG.

2.5 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. This section describes the expected effects of the proposed action on endangered SCC steelhead and their designated critical habitat. The effects were predicted based on an analysis and synthesis of available information regarding the proposed action, the effects of habitat changes on stream fish and aquatic habitat, the life history and habitat requirements of steelhead, and population theory and ecological principles.

2.5.1 Methodology for Determining Effects

NMFS performed the following assessments to identify the effects that are expected to result from the proposed action.

Information Review.—NMFS reviewed existing materials pertaining to the Program and activities under the proposed action that were provided by the Corps and the District. The materials included the District's catalog pages for the Program which provided: (1) an inventory of District facilities maintained per the Program, including specific locations, and (2) descriptions of all Program activities together with information regarding the activity duration, frequency, timing, and extent. Additional information documenting instream conditions within riverine areas adjacent to District facilities was collected by NMFS during site visits and habitat surveys in 2010. Data collected by NMFS included riparian canopy coverage, stream habitat typing, and determination of steelhead presence within riverine areas adjacent to District levees. Within the past eight years, dramatic changes to instream conditions occurred due to the Thomas Fire. Although no District facilities were directly impacted by the Thomas Fire, indirect effects from the fire are evident in habitat conditions such as water quality. For example, San Antonio Creek and the Ventura River experienced a measurable increase in fine sediments within the water column to the extent District redd surveys in San Antonio Creek were postponed due to low water clarity. On May 9, 2018, NMFS made additional instream habitat observations along North Fork Matilija Creek and upper Ventura River. Water turbidity was low along North Fork Matilija Creek, however, the majority of fine sediment and turbidity was evident downstream of the confluence of Matilija Creek with upper Ventura River. Within this portion of the watershed, canopy cover seemed relatively intact with minimal changes.

NMFS reviewed analyses of the effects of the proposed action presented in the Programmatic Environmental Impact Report (PEIR 2008) and in supplemental information provided by the District. Recently on November 7, 2017, the District and NMFS worked together to review revisions, updates, and changes to the Program in anticipation of submitting the District's consultation package to the Corps requesting a Programmatic Individual Permit to replace the expired Regional General Permit for Program activities. In addition, NMFS reviewed the Corps' February 1, 2018, effects analysis for the proposed action.

NMFS' approach to assess effects is based on a review of ecological literature concerning the effects of loss and alteration of habitat elements important to salmonids, including water, substrate, food, and adjacent riparian areas, which are the PBF of critical habitat that will be affected. This information was then compared to the likely effects associated with the proposed Program activities: (1) Program planning, (2) vegetation removal at Program facilities including the application of herbicides within the riparian corridor, (3) sediment removal and release of fine sediments from Program activities, (4) need for continued Program facility maintenance and repair, (5) dewatering activities, (6) best management practices, and (7) safety inspections during the wet season.

***Exposure-Response-Risk Analysis*.—**Using the information obtained from the information review, NMFS performed an exposure-response-risk analysis to predict effects of the proposed action on critical habitat, and on steelhead within the action area. To perform this analysis, NMFS deconstructed the proposed action to determine the types, locations, timing, extent, and expected frequency of environmental stressors (e.g., removal of riparian vegetation) that would occur to critical habitat, and to steelhead, as a result of each category of activities under the proposed action. Then, NMFS determined the location, timing, duration, and frequency of exposure of critical habitat and steelhead to the physical, chemical, and biotic stressors (e.g., loss of shade and cover) resulting from each category of activity. NMFS subsequently determined the expected response of PBF in critical habitat, and of steelhead, to effects of stressors resulting from the activities. The expected responses of steelhead and critical habitat to stressors are based on steelhead life history and habitat requirements, the ecological literature concerning the effects of the stressors on PBF in critical habitat, and observed effects of habitat changes on fish and aquatic habitat.

2.5.2 Effects on Critical Habitat

The predicted effects of the proposed action on designated critical habitat for endangered steelhead involve effects due to Program planning, maintenance of stream gauges and bank groins, use of herbicides, maintaining flood-control facilities, dewatering, and proposed BMP including a lack of monitoring and remediation. Each of these is described as follows. Because safety inspections remain only a visual inspection of facilities and do not require disturbance to designated critical habitat, NMFS does not anticipate safety inspections to result in effects to designated critical habitat.

As discussed more fully below, each effect on designated critical habitat is small given the size of each maintenance footprint including the extent of the action area for each facility, the maintenance (or repair) methods, and the type of facility being maintained (or repaired). Generally, sedimentation effects are expected to occur after the first storm of the winter season while temperature effects are expected to occur in summer, thus these effects on a local, site-specific scale do not overlap within the same season. However, when these effects are combined together on a yearly basis over a 10-year timeframe (duration of the Corps' permit) including the spatial distribution (density) of all Program facilities, there is only a temporary reduction in suitable habitat areas for endangered species within the action area. Consequently, NMFS does not anticipate large-scale restrictions or limitations on the temporal and spatial extent of habitat areas with PBF to support rearing juvenile steelhead.

Assumptions made due to scope of Program planning.—Because the proposed action does not specify a limitation on the size or footprint for repair work in designated critical habitat, the amount and extent of alterations to critical habitat that could result under the action are essentially unbounded at this time. However, over the past five years under the prior Corps permit (RGP No. 92), the Corps authorized approximately 100 minor repairs resulting in a total of 0.26 acre of impacts for Ventura County (Corps 2018). Presuming the same or similar amount of impacts, NMFS anticipates the proposed action could cause a minimum of roughly 0.5 acres of impacts over the 10-year duration of the Corps' permit, however regardless of past Corps records, under the proposed action, the maximum area of potential impact is 7.19 acres (see acreage amounts reported in Tables 1-4), thus impacts over this estimated amount (7.19 acres) are not analyzed in this programmatic biological opinion and will require separate consultation. NMFS anticipates impacts to designated critical habitat because the targeted drain outlets, bank groins, and stream gauges are within designated critical habitat (Tables 1-4). Further, the District conditions all proposed work with the phrase "as needed," which could be as frequently as yearly. As a result, critical habitat could be altered on a yearly basis.

Effects due to maintenance at stream gauges and bank groins.—Because existing vegetation is cleared only within a small area in the vicinity of each stream gauge (Table 1 and Table 2) or bank groin, and only during the dry season, the effects at individual work sites are expected to be discrete, minor, and confined. Based on the description of the proposed action including the District's conditional phrase "as needed" in reference to proposed vegetation maintenance, NMFS expects vegetation maintenance will occur once per year for each gauge and the set of six bank groins. Given this expectation, the additive effects of each site within a single year (5.07 acres), and the annual effects over the 10-year life of the permit, could be large, however. In the following, we describe in greater detail the expected amount and extent of vegetation loss due to the proposed action. Included in this description is the anticipated consequences of the lost vegetation on the value of designated critical habitat for the conservation of endangered steelhead in the action area.

Vegetation removal at stream gauges

Each year, stream-gauge maintenance may remove up to 1.33 acres (445 feet) of vegetation over a 17-mile reach of the Ventura River and 3.64 acres (335 feet) of vegetation over a 14-mile reach of the Santa Clara River (see Table 1, Table 2). The proposed vegetation removal will be confined within the maintenance footprint of each gauge as outlined in the District's catalog pages (Appendix B). Additionally, spatial orientation of the maintenance footprint and existing riparian corridor conditions at particular gauges will result in a different magnitude of effects to designated critical habitat. For example, gauge 604 (North Fork Matilija Creek) maintenance footprint only extends 65 feet downstream of an existing bridge for the entire width of the active channel; gauge 701 (Hopper Creek) has a similar orientation. Unlike all other gauges under the proposed action which are oriented across the active channel, the maintenance footprint for gauge ME-VR2 (Ventura River) is oriented north to south along the channel bank adjacent to the Ojai Valley Sanitation District. Finally, the maintenance footprint of gauge 723 (Santa Clara River) aligns closely with the existing bridge footprint such that impact to instream vegetation is limited beyond the footprint of the bridge (i.e., maintenance extends 100 feet downstream of the bridge). In contrast to gauge 723, the maintenance footprint of gauge 709 resides within a smaller tributary, Santa Paula Creek, where the riparian corridor is fully developed and results in extensive shade over the active channel.

At the scale of the individual stream gauge, the vegetation removal is anticipated to increase radiant-heat exposure of discrete stream areas. The information available does not allow NMFS to assess whether the expected increase in radiant heat would translate into an increase in water temperature. However, if an increase in water temperature is observed at one or more areas, NMFS expects the increase would be small and discrete for at least a few reasons.

First, three (out of seven) stream gauges (ME-VR2, 608, and 723) are on mainstem reaches of the Ventura and Santa Clara rivers where the wetted channel in these areas is relatively wide and already exposed to the sun making the small additional exposure to radiant heat negligible at these sites.

Second, the existing well-developed riparian corridor adjacent to gauge 604 is expected to ameliorate effects of increased radiant heat downstream of the bridge. The maintenance footprint at gauge 701 currently lacks any riparian vegetation. Increased radiant heat to already elevated water temperature (when present) will likely be minimal if detectable at all, thus vegetation removal at this site will not impact shade in this portion of the action area.

Lastly, while the expanded maintenance footprints in the immediate active channel for the remaining two gauges (602 and 709) is expected to increase radiant heat to the immediate areas, the established riparian vegetation on the channel banks, upper terraces, and canyon slopes will continue to shade edge habitat for steelhead and help minimize elevated water temperatures near these stream gauges.

An increase in the amount of exposed soil is expected when removing woody vegetation. While the proposed vegetation maintenance will leave roots or near-ground vegetation intact (see BMP 19), near-ground non-woody vegetation has limited ability to prevent erosion (Dewine and Cooper 2008). If the exposed areas translate into increased levels of sedimentation and turbidity during storms near gauges, then the increase is expected to be confined to a small, discrete portion within the action area. However, there is no past monitoring data to verify anticipated erosion trends at individual or multiple sites. Thus, we based our assessment on our knowledge of erosion control methods at similar project sites and best professional judgement.

Vegetation removal at groins

The proposed removal will not involve vegetation that shades the mainstem or contributes to PBF that support rearing or spawning habitat for endangered steelhead. Trimming tree branches every 3 to 5 years that extend over each groin is expected to cause minimal impact because there will be no loss of shade over the mainstem of the channel where migration habitat occurs most frequently. Inundation of areas near the groins will likely be infrequent due to the channel width and expected flood frequency.

The additive effect from all six maintenance footprints involves reduced amount of low-profile (shrub) vegetation and localized erosion and scour after major storm events. Shrub vegetation within the maintenance footprints supports resting areas during adult steelhead migration, however only when elevated flows infrequently inundate the groins. The loss of channel roughness (i.e., vegetation within 15 feet of each groin) has a low potential to cause a measurable increase in water velocities within the maintenance footprint during a 5- or 10-year storm event.

Effects due to use of herbicides.—The effects of loss and reduction of vegetation due to herbicide application are similar to those discussed above regarding the directed vegetation removal.

Given the manner, timing, and location in which herbicides are proposed for application, and the type of herbicides that are proposed for use, effects to critical habitat within the action area are not expected. For instance, the proposed action includes a number of BMP to reduce the likelihood that herbicide application would contact designated critical habitat for steelhead (Appendix A). Also, the active ingredient in the herbicides used by the District is either glyphosate or imazapyr; both have been shown to bind firmly to soil particles and not runoff from land-based areas during rain events (Norris *et al.* 1991, WSDA 2003). Additionally, glyphosate and imazapyr are known to degrade completely in 2-to-3 months (Norris *et al.* 1991; WSDA 2003), so accumulation of herbicides in or near stream channels from repeated treatments is not expected, presuming application will not be more frequent than once every 3 months. While glyphosate may be associated with increased algal production due to the addition of phosphorous (Austin *et al*. 1991), it may also improve the quality of habitat for salmonids by reducing obstructive aquatic vegetation (Caffrey 1996). Consequently, NMFS does not expect herbicide application would materially diminish the function or value of designated critical habitat for steelhead in the action area.

Effects of maintaining flood-control facilities.—As a reminder, the historic ephemeral channels underwent conversion to flood-control channels and debris basins that are now the basis of the proposed action. Due to the ephemeral nature of these converted streams, there is still no fish-passage connectivity between these facilities and the mainstem channels (S. Glowacki, NMFS 2010, personal observation). The flood-control channels and debris basins contain flowing water mainly during and shortly after rainstorms (VCWPD 2008), and none of the flood-control channels and debris basins are within designated critical habitat for steelhead. In contrast to the above, this section will also include a discussion on maintaining a set of six bank groins, a particular flood-control feature in designated critical habitat of the lower Santa Clara River.

In terms of the expected effects, NMFS anticipates effects due to maintenance activities and the ongoing presence and operation of these structures. Each of these is described more fully as follows.

The anticipated effects from maintaining these structures involve release of fine sediments from disturbed substrates within flood-control channel and debris basin bottoms, and associated sedimentation and turbidity in areas downstream from the channels mainly near the outlets, where the channels drain into steelhead streams (e.g., runoff during storm events). Most (95 percent) of these flood-control channel outlets drain directly onto the outer banks and floodplains of the Ventura River and Santa Clara River mainstem (VCWPD 2008), and given the type and size of material generated from these ephemeral drainages, sedimentation and turbidity is expected to extend as far as 200 feet downstream of each outlet under the proposed action.

Release of fine sediments and turbid runoff is expected during and shortly after rainstorms from the drain outlets into the Ventura River and Santa Clara River mainstems. The rates of sedimentation and levels of turbidity released from these facilities would depend mainly on: (1) the rates of flow within these facilities during rainstorms, and (2) the amounts of sediment within the flood-control channel and debris basin that could become mobilized during rainstorms. While the rates of sedimentation and turbidity levels in runoff originating from flood-control channels have not been measured, NMFS does not expect them to be significantly higher than background levels within the mainstems during storm events due to the small size of these ephemeral drainages compared to the size of the mainstem for the Santa Clara River and Ventura River.

Although increased delivery of sand and smaller particles to waterways from the facilities is expected to continue under the proposed action, this sediment entering the mainstem is not expected to delay or preclude the development of spawning, rearing, or migration habitat including PBF that support each habitat type. The District incorporated specific BMP into the proposed action (Appendix A) that are expected to further avoid or minimize the release of fine sediments and limit increased localized turbidity in designated critical habitat. Based on the foregoing, the runoff material from the constructed flood-control channels and associated outlets is not expected to diminish the value of designated critical habitat in the action area for the conservation of steelhead.

Ongoing maintenance of bank groins has potential effects to designated critical habitat in lower Santa Clara River. As with other flood-control facilities, maintenance materially preserves or enhances the ability of the structures to function as intended for the duration of the Corps permit. As a result, the groins are expected to continue causing increased amounts of localized scour. There is also a potential for groins to cause changes to downstream and upstream erosion patterns beyond the maintenance footprint into habitat for steelhead (Teraguchi *et al*. 2008). Changes to erosion patterns are expected within a small portion of the mainstem (approximately 200 feet upstream and downstream of the bank groins). Although increased scour and erosion are expected to continue under the proposed action, these effects are not expected to delay or preclude the development of spawning, rearing, or migration habitat including PBF that support each habitat type.

Effects due to dewatering a portion of designated critical habitat.—Dewatering is expected to cause temporary loss of living space for endangered steelhead, principally freshwater rearing areas. Streamflow is often low, if present, during the proposed maintenance window (dry season), and typically confined to isolated pools, possibly connected with groundwater. Nonetheless, dewatering is expected to translate into a temporary loss of water-dependent critical habitat for steelhead.

In the process of dewatering a work area, alterations in water quality are expected. In particular, short-term increases in turbidity concentrations are anticipated, chiefly through mobilization of sand and smaller sediment particle types stored in the channel bed. Based on the information provided, turbidity increases are expected to be limited to the actual day of construction and removal of the cofferdam.

Benthic aquatic macroinvertebrates may be temporarily lost or their abundance reduced when creek habitat is dewatered (Cushman 1985). Effects to aquatic macroinvertebrates will be temporary because cofferdam construction will be relatively short-lived. Because stream flows will be maintained around the work area, the effect of macroinvertebrate loss is likely to be negligible. Consequently, food from upstream sources (via drift) will be available downstream of the work area. Following cofferdam removal, rapid macroinvertebrate recolonization (about one to two months) is expected of disturbed areas (Cushman 1985, Thomas 1985, Harvey 1986). Based on the foregoing, the loss of aquatic macroinvertebrates as a result of dewatering activities is not expected to diminish the value of designated critical habitat in supporting endangered steelhead in the action area.

When creek habitat is dewatered, a portion of living space remains temporarily inaccessible to the species. Physical and biological features that support rearing habitat conditions (e.g., pools, refuge habitat, over hanging cover) will be unavailable to the species and ecological services these features provide will be temporarily lost (e.g., suitable water temperature, hiding areas, nutrients within the water column). The exact amount and duration of reduced living space remains unknown at this time because the alignment and orientation of diverted flow depends on the dimensions and characteristics of the immediate maintenance site and associated work area. The proposed action lacks a maximum limit and duration for proposed work areas. Based on past maintenance events and the low frequency of dewatering a portion of designated critical habitat over the last five years, NMFS assumes dewatering activities will require a maximum footprint entirely contained within the defined action area (see description of Action Area). NMFS also assumes, based on past routine maintenance events, all water diversions will have a duration no longer than 15 days to minimize the temporary loss of designated critical habitat.

The District proposes BMP specifically designed to minimize effects on critical habitat when a portion of a stream is dewatered. As a result of avoiding instream maintenance during the rainy season from December 1 to April 1 (BMP 1), the District lowers but does not eliminate the risk of disturbing available living space for steelhead. When maintenance events are proposed in April, May, October or November there is an increased likelihood of isolated pools or wetted channels relative to expected habitat conditions during June through September. These physical features and channel conditions increase the potential of adverse effects to designated critical habitat such as degraded water quality.

To avoid risk of these adverse effects, the proposed action includes habitat surveys for steelhead migration or rearing conditions prior to maintenance events (BMP 5 and BMP 6). These surveys inform the District's planning process for implementing a water diversion as detailed in the proposed Water Diversion Guide (BMP 18; URS 2007). Additionally, proposed maintenance can be postponed until after June 15 and before October 31. However, under the proposed action postponement depends on "sufficient" flows, which is not defined by the BMP. Sufficient flows does not necessarily equate to a minimum requirement for steelhead living space. Thus, the proposed action creates a scenario of implementing work windows when steelhead living space may be present. Risk of reducing the amount of living space during the dewatering process increases because the proposed action includes no specific habitat measurement or assessment (i.e., water depth, habitat connectivity, presence of pools) that would characterize presence of living space including migration or rearing habitat. Given the likelihood of reducing steelhead living space (i.e., wetted channel, isolated pools), the proposed action does not minimize impacts to steelhead living space that may be present under certain water years.

Effects due to lack of monitoring and remediation.—The proposed action lacks a detailed monitoring program. Without a detailed methodology to track and then reconcile spatial and temporal adverse changes, the proposed action is unable to accurately monitor changes in the quality and availability of designated critical habitat owing to the proposed action. The proposed action lacks habitat-performance measures or methodologies to assist in monitoring the effectiveness of proposed BMP and systematically track and report habitat effects due to ongoing maintenance in designated critical habitat.

The proposed annual work plan (one monitoring tool used by the District) provides a basic level of monitoring intended by the District to track harmful effects of the maintenance activities on freshwater migration corridors, freshwater rearing habitat, and spawning sites in designated critical habitat. However, NMFS could find nothing in the project description describing how the monitoring information would be evaluated or used to ensure that PBF of critical habitat would be maintained over time and space within the action area. Without a clear plan to collect and respond to monitoring data that reveals deviations from habitat performance measures, proposed post-construction monitoring efforts have the potential to be insufficient to ensure all adverse effects are truly minimized and contained within the maintenance footprint for each facility under the proposed Program.

Temporal and spatial (density) analysis for additive stressors in critical habitat.—Although each single stressor (e.g., turbidity, sedimentation, erosion) is confined to small areas, when considered together across each watershed, the stressors have the potential to produce adverse effects in critical habitat by creating conditions that reduce or eliminate the value of these areas for steelhead conservation in general and rearing habitat for juvenile steelhead in particular. However, after carefully considering the density and particularly the proximity of certain effects, including the underlying mechanisms for the effects, we conclude that the number (or density) of facilities creates measurable yet minimal impact when considering additive effects at the scale of the riparian corridor throughout mainstem and tributary habitat in each watershed. At the watershed scale, additive effects as a result of the proposed action are not expected to reach a magnitude that reduces conservation value of critical habitat in either the Ventura River or Santa Clara River watershed.

2.5.3 Effects on Endangered SCC Steelhead

NMFS expects the proposed action to result in effects on juvenile steelhead, the only life stage anticipated during the scheduled work period (April 1 through November 30). The proposed safety inspections are not projected to affect juvenile steelhead and therefore are not considered further in this section. The predicted effects of the proposed action on endangered steelhead involve effects due to Program planning, maintenance of flood-control channels and debris basins, herbicides, continually maintaining flood-control facilities, temporary water diversions and steelhead relocation, and lack of monitoring and remediation. Each of these is described as follows.

Assumptions made due to scope of Program planning.—The absence of size limitations to guide design of maintenance activities, in particular repairs to stream gauges, bank groins, and drain outlets, is expected to increase the potential that living space for endangered steelhead would be lost or altered. This conclusion is based in part on the naturally modest habitat characteristics for endangered steelhead throughout southern California, which are therefore susceptible to even small-scale habitat disturbance (Spina *et al*. 2006). If habitat loss or alterations are observed in areas that would normally harbor endangered steelhead (e.g., pools, channel edge habitat providing cover), then NMFS anticipates the reduction in habitat availability has the potential to cause a decrease in the number of individuals (primarily juvenile steelhead) surviving in the vicinity of the impacted area during the dry season when living space for this species is naturally limited. The proposed capture and relocation process is expected to be the primary mechanism for the observed reduction in abundance, if it were to occur.

Effects due to maintenance at stream gauges.—Continual maintenance will be conducted in a manner that avoids adverse effects to steelhead within the action area. Vegetation removal within the two-year floodplain is not expected to extensively alter the amount of shade currently supporting rearing juvenile steelhead within the action area. Additive effects from stream-gauge maintenance (see temporal and spatial analysis in the *Effects on Critical Habitat* section) result in localized and minimal disturbance to habitat features that support steelhead rearing behaviors. As described in the *Effects to Critical Habitat* section, the proposed action lacks a mechanism to monitor or remediate impacts that may extend beyond the maintenance footprint particularly in areas where facility density increases the magnitude of additive effects (e.g., Victoria Avenue gauge and North Bank groins).

Effects of maintaining flood-control facilities.—Steelhead are not expected within the subject flood control channels and debris basins because the channels and their outlets generally do not maintain connectivity with the Ventura River and Santa Clara River mainstems, and flow conditions and depths within these facilities are not suitable for steelhead passage or occupancy (S. Glowacki, NMFS, 2010, personal observation; P. Lindsey, VCWPD, 2012, personal communication). In addition, there has been no documented occurrence of *O. mykiss* in, below, or above any of the debris basins (P. Lindsey, VCWPD, 2012, personal communication).

Therefore, steelhead are not expected to be exposed to maintenance activities within these facilities or their respective drainages.

NMFS expects turbidity exposure to be low for juvenile steelhead. Juvenile steelhead will seek alternative rearing areas with minimized turbidity and avoid sites with degraded water-quality conditions during the wet season. During summer, instances of turbidity as a result of maintenance are likely to be infrequent and not expected to modify steelhead behavior or cause delays in growth for juvenile steelhead. The groins and outlets, in general, are above the two-year floodplain, thus the likelihood of juvenile steelhead living space at these facilities during the summer is relatively low.

Maintaining the existing protection materials on bank groins and drain outlets (e.g., riprap, concrete) through periodic repair may negatively affect steelhead. This is particularly true for ongoing scour, erosion, and channel shaping effects that may encroach or extend into the two-year floodplain and result in loss of rearing habitat (see *Effects to Critical Habitat* section). Assuming the repair footprint is minimized, steelhead would be expected to avoid those localized areas without resulting in any significant effects to juvenile steelhead particularly when repairs to facilities are outside of the two-year floodplain. Facilities that contain riprap typically reside above the two-year flood elevation in designated critical habitat, thus juvenile steelhead will likely have infrequent contact with riprap, given the limited extent of living space during late spring, summer, and fall.

Effects due to use of herbicides.—Under the proposed action, herbicides would be applied to dry channels, and less commonly to channels with open water. Herbicides applied in dry channels are not expected to adversely affect steelhead because herbicides are expected to breakdown before coming into contact with flowing water. Glyphosate was developed in the 1970s, and since that time including field research and relevant studies, no adverse effect on fish or aquatic invertebrates have been documented (Giesy *et al*. 2000). Also, imazapyr does not result in early steelhead developmental toxicity including any detectable adverse effects at the juvenile and smolt life stage. The absence of toxicity at relatively high exposure concentrations suggests that noxious weed control activities are not likely to pose a threat to the health of salmonids at early life stages (Stehr *et al*. 2009, Hapke *et al*. 2016). Given the BMP incorporated into the proposed action, accidental application of the herbicides to open water is speculative and unanticipated. Therefore, application of herbicides in designated critical habitat is not expected to contact steelhead.

Temporal and spatial (density) analysis for additive stressors on steelhead.—The proposed action leads to continued maintenance that typically occurs outside of steelhead rearing areas, thus the additive stressors that occur within the two-year floodplain are not expected to restrict or disrupt steelhead rearing and related behaviors such as foraging, sheltering, and movement. Most of the anticipated impacts were previously discussed in the *Effects to Critical Habitat* section. Each single stressor (temperature, turbidity, sedimentation, erosion) is confined to a localized area within the two-year floodplain and anticipated to be of low magnitude so when considered together across each watershed, these stressors produce minimal effects to juvenile steelhead.

Given the relatively small extent of effects near each facility site (see *Action Area* section), NMFS estimates only a small portion of both the Ventura River and Santa Clara River steelhead populations will be impacted by the proposed action as each affected area is discrete, discontinuous, and based largely on the spatial extent of the existing facility footprint.

Effects due to temporary water diversion and steelhead relocation.—Isolating workspaces from flowing water is expected to temporarily disrupt steelhead behavioral patterns, and potentially cause injury and death. During the dewatering process, the water diversion could harm rearing juvenile steelhead by concentrating or stranding them in residual wetted areas before they are relocated (Cushman 1985), and rearing juvenile steelhead could be killed if they become stranded and are not moved out of the diversion area. In addition, steelhead will be forced to move to adjacent areas of aquatic habitat during water diversion. In the several years that the District has maintained facilities requiring a water diversion, very few steelhead (e.g., less than 20 fish) have been encountered (P. Lindsey, VCWPD, 2012, personal communication). Over the past five years since the issuance of NMFS' September 7, 2012, biological opinion, no steelhead were observed, thus capture and relocation of steelhead due to water-diversion activities has not yet occurred. Our review of the available information, all previous annual maintenance reports from the District, and consideration of climate variability and steelhead population variability over the next ten years (i.e., timing, amount and frequency of elevated flows) indicates no more than 20 juvenile steelhead and zero adult steelhead would be adversely affected potentially each year by temporary water diversions.

Although the proposed capture and relocation of steelhead will remove individuals from harm's way, handling can induce stress and temporary disorientation. Direct injury and mortality can result from physical trauma from contact with humans or machinery. Specifically, direct injury may impair fish movement, feeding, and survival. Fish collecting gear, whether passive (Hubert 1996) or active, has some associated risk to fish, including stress, disease transmission, injury, or death. Throughout relocation efforts, elevated stress and increased distortion can be a result of potential overcrowding during the transfer phase. To minimize the risk of injury or mortality the District proposes specific BMP for capturing and relocating individuals. On an annual basis, no more than 10% of the 20 collected juvenile steelhead are likely be injured during survey and relocation activities. Anticipated level of injury is based on risks associated with handling steelhead in addition to other factors such as exposure to elevated water temperature and low dissolved oxygen prior to being collected. Out of the injured individuals, NMFS expects lethal effects to one juvenile steelhead per year. This is based on the spatial distribution of the proposed maintenance activities in the action area, the area affected during dewatering at each facility, and NMFS' familiarity with the action area, including abundance of steelhead. In part, the amount of injury and lethal effects is expected because NMFS assumes the maximum length for dewatering will not exceed the maintenance footprint at each facility.

Although the proposed action includes specific BMP to capture and relocate steelhead and dewater habitat prior to proposed maintenance activities, there are several process-related details that are absent from these BMP that would further minimize adverse effects to the species such as injury throughout the work period. The District does not specify the areas of expertise required of a biologist who will be capturing, handling, and relocating the species. The proposed action includes only one biologist to carry out activities associated with capture, relocation, and dewatering, which lowers efficiency during the capture effort and likely exposes the species to a higher risk of injury. During the instream work period, the District does not specify the frequency of monitoring the work area or the block nets throughout the different phases of the work period. The District does not include a notification to NMFS if steelhead become entangled in nets, which would allow NMFS to recommend additional measures to reduce future entanglement for the remainder of the work period. The removal process and size of block netting to be used is not specified within the field procedures, thus increasing the risk of injury. Also, the District does not specify the activities the biologist should be doing while the workspace is being isolated from flowing water, nor does the District propose a mechanism to quickly identify and address stranding issues during the dewatering process. Although steelhead relocations or other impacts by flow diversion or dewatering will be documented and reported to NMFS within 30 days of completed maintenance work, the proposed report does not include the number of steelhead observed in the affected area, the number of steelhead relocated, and the date and time of the collection and relocation. Also, the proposed action doesn't include specific details as to what would be included in the proposed report such as measurements on the physical and biological features of critical habitat present at the time of capture. Only one method is proposed for capture (seine net), where other options are available that may minimize risk of injury depending on site characteristics. Finally, the proposed action does not require the biologist to monitor performance of sediment control/detention devices or to identify and reconcile conditions that would expose the species to turbid water, thus further minimizing adverse effects to the species.

Effects due to lack of monitoring and remediation.—The absence of a meaningful monitoring and remediation program from the proposed action is expected to have adverse effects on endangered steelhead, mainly through increased likelihood of injury during capture and relocation efforts including the dewatering process. A temporary reduction in the quality or availability of living space, if observed, has a low potential to cause reductions in abundance of steelhead, chiefly early life stages, owing to the already limited amount of habitat that exists for this species in southern California. However, the proposed action lacks fine-scaled monitoring and remediation, and thus results in the inability to verify whether the extent and the magnitude of habitat modification goes beyond the maintenance footprint throughout the duration of the Corps permit. NMFS estimates only a small portion of both the Ventura River and Santa Clara River steelhead populations will ultimately be affected by the proposed action as all effects are confined to relatively small, discrete and discontinuous areas.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Ongoing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline and cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

Several future, state, local, or private actions are reasonably certain to occur within the Santa Clara River and Ventura River watersheds. These include the Soledad Canyon Gravel mining operation, Soledad Townhomes Project, Keystone Master Homes Project, ongoing roads projects including widening of Interstate 5, Westside Community Project on the lower Ventura River, and continual agricultural-land development. While a few of these proposed actions are physically located outside the action area, many are within the action area, and are expected to create impacts within the action area that affect steelhead and designated critical habitat.

Additionally, the District is in the early design-planning stage for a levee-realignment project on the SCR-1 Levee to meet flood-risk management objectives for the RiverPark and El Rio communities of Oxnard. Consequently, this re-alignment is expected to maintain the existing levee including improvements to meet certification standards and extend the useful life of the structure in a meaningful way, and thus would perpetuate any ongoing effects of the existing levee into the future.

These future actions, collectively, are expected to increase the potential for adverse effects to steelhead, chiefly through increased amounts of impervious surfaces within the watershed and potential for dry and wet-season runoff and input of potentially toxic elements to surface water where steelhead are present. Ongoing urbanization is expected to cause elevated rates of treated-wastewater releases to streams, possibly increasing nitrogen loads and the likelihood of adverse effects on aquatic organisms. Housing developments and levee improvements constructed in or near the historical floodplain of the Santa Clara and Ventura River or their tributaries are expected to cause, or perpetuate, loss of aquatic habitat.

The California Division of Dam Safety requires the 6-inch, 12-inch, and 36- inch valves to be exercised once per year at Matilija Dam. Currently, the District has discretion over this activity and proposes to carry out test-maintenance events on a yearly basis. Given the nature of valve maintenance, there is a risk of adverse effects from the artificial increase in discharge above background streamflow and an increase in sediment discharge (e.g., during pipe-sediment removal). The abrupt flow manipulation during maintenance greatly differs with respect to how the Ventura River hydrology responds to a natural storm event (see NMFS 2012b). Maintenance timing also creates a likelihood of modifying PBF of critical habitat because of a potential overlap with the period when discharge in the lower Ventura River is elevated due to fish-passage augmentation flow releases that Casitas Municipal Water District undertakes at the Robles Diversion Dam.

The probability of exposing the species to effects from valve maintenance depends on the amount of river discharge prior to conducting the test (i.e., river discharge changes based on season). Valve maintenance has the potential to impact the species and its various life stages (juvenile, smolt. adult) when conducted during the migration and spawning period for SCC steelhead. In particular, flow manipulation has the potential to result in fish stranding and affect spawning behavior (NMFS 2012b).

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat for the conservation of the species.

Status of the species summary.—The larger river systems were the historical foundation for the SCC DPS of steelhead. The Ventura River and Santa Clara River watersheds are such systems because of their large size, spawning and rearing habitat quality, relatively reliable winter flows, and potential for being independently viable (Boughton *et al*. 2007). These watersheds are among the largest steelhead-bearing watersheds within the Southern California Coast DPS of steelhead. Up to the late-1940s, the Ventura River Watershed was estimated to support an annual run of 4,000 to 5,000 adult steelhead (Moore 1980) and the Santa Clara River Watershed was estimated to support an annual run of 6,000 to 8,000 (Titus 2001).

However, the abundance of steelhead in these watersheds, like other drainages throughout the DPS, has been dramatically reduced due to a variety of anthropogenic alterations to the watersheds. Presently, the number of steelhead in the Santa Clara River and Ventura River watersheds is small. Likewise, the number of steelhead comprising the DPS is small. The viability of small populations is especially tenuous, and such populations are susceptible to prompt decreases in abundance as a result of natural (e.g., 2017 Thomas Fire) or anthropogenic disturbances (e.g., long-standing dams and barriers), and possess a greater risk of extinction relative to large populations (Pimm *et al*. 1988, Berger 1990, Primack 2004).

The species and its critical habitat are currently subject to extended drought conditions with projections of even warmer temperatures in the future. Although average rainfall projections have high uncertainty, projections seem confident in more frequent, more intense storm events through 2060 (Swain *et al*. 2018). For southern California relative to northern California, wildfires will continue to occur more frequently with greater intensity. When considering the natural climate variability (e.g., precipitation and ocean processes driven by climate), it probably influences the large fluctuations in run sizes that are reported anecdotally for steelhead runs that make up the SCC DPS of steelhead. Observed and predicted climate change effects are generally detrimental to the species, so unless offset by improvements in other factors, the status of the species is expected to be at an elevated risk of worsening over time due to climate change alone.

Given the consequences of past actions and the decreased viability of current steelhead populations, activities that substantially reduce the quality and quantity of habitats are expected to considerably reduce the abundance, productivity, reproduction, and survival of steelhead individuals, in turn decreasing the viability of the overall population (McElhany *et al.* 2000).

Based on the importance of the Santa Clara River and Ventura River watersheds to the conservation of endangered Southern California Coast steelhead, activities that harm steelhead or destroy habitat, including critical habitat, within large watersheds with steelhead population units have implications for viability of the entire Southern California Coast DPS. Overall, the SCC DPS of steelhead is at a high risk of becoming extinct in the foreseeable future.

Environmental baseline summary.—Evidence indicates that past and present anthropogenic activities have reduced the quality and quantity of spawning, migratory, and rearing habitat and degraded the overall conditions within the Santa Clara River and Ventura River watersheds. Additionally, anthropogenic activities are believed to have contributed to declines in steelhead abundance within the entire Santa Clara River and Ventura River watersheds. Because dams (i.e., Santa Felicia, Matilija Dam, Robles Diversion dam, Freeman Diversion dam) have blocked or challenge the capabilities of steelhead to access much of the upstream historical spawning and rearing habitat, and water diversions have severely reduced amounts of surface discharge in the mainstem, abundance of this species decreased in the mainstem of the Santa Clara and Ventura rivers, and upstream tributaries, including those upstream of man-made dams and diversions. Additionally, surface diversions, subsurface diversions, and well-field pumping collectively extract large quantities of water on a yearly basis from the lower Santa Clara River and Ventura River, and this continues today.

Recently, there have been improvements for steelhead in these watersheds. For example, on the Ventura River there has been the construction of a fish passage facility intended to facilitate upstream adult steelhead passage past the Robles Diversion (NMFS 2003) (though the performance of the fish passage at this facility has not been reliably assessed). The removal of the Matilija Dam, which is expected to occur within 15 years, is expected to restore steelhead migration and connectivity to the upper portion of the Ventura River Watershed, and may increase the size and viability of the Ventura River steelhead population (NMFS 2007). Additionally, a plan is being developed to facilitate adult steelhead passage past the Freeman Diversion on the Santa Clara River. Even with implementation of these projects, the effects of past and present anthropogenic activities reduced the population abundance to critically low levels and caused widespread degradation, destruction, and blockage of critical habitat for this species. Within these watersheds, these effects are expected to extend into the future. Current observations and projections for warmer air temperatures and rainfall variability will continue to stress suitable habitat for steelhead and may prolong the time it takes the Ventura River and Santa Clara River steelhead populations to recover. As a result, the SCC DPS of steelhead is expected to continue to have low viability and a high risk of extinction for the foreseeable future.

Effects analysis summary.—With regard to steelhead critical habitat, the proposed action will result in minor vegetation loss and minimal habitat alteration within the action area, thus the magnitude of anticipated effects is low. Consequently, the effects are not expected to result in continual diminishment of PBF that contribute to the current quantity and quality of steelhead living space for the next ten years. The proposed BMP are expected to be partially effective in avoiding or minimizing temporary (e.g., water diversion) and long-term (e.g., continuation of maintenance) adverse effects to migratory, spawning, and rearing habitat, or PBF of critical habitat. However, the proposed action lacks monitoring and remediation elements to effectively characterize and ensure water diversion effects are minimized and confined to the maintenance footprint.

With regard to steelhead, the proposed BMP, biological monitoring, and capture and relocation efforts are expected to limit but not completely avoid injury and mortality of juvenile steelhead. Due to the nature of capture and relocation stresses on juvenile steelhead, extremely limited amount of injury and lethal effects are anticipated given habitat conditions prior to the dewatering process (i.e., already elevated water temperatures, relatively low dissolved oxygen give the proposed work window). Given the small extent of effects near each facility or group of facilities located together, the potential is low to cause large reductions in abundance of juvenile steelhead. Relatively large areas of critical habitat remain available despite the already limited amount of habitat that exists for this species in southern California.

Adverse effects from diversion and relocation activities are likely to be experienced by only small numbers of juvenile steelhead in the action area. Based on NMFS' observations and surveys in southern California streams, NMFS anticipate a small proportion of the total number of rearing juvenile steelhead within a stream will be within the action area. Diversion and relocation will not impact the number of returning adults nor will it impact migrating smolts as both life stages are critical to maintain population viability. Current likelihood of exposure to these activities is low due to existing drought conditions. Extensively dry conditions lower the number of steelhead in the action area due to limited habitat connectivity, elevated water temperatures, and shrinking residual oversummering refuge habitat such as deep, cool pools. However, for the next ten years (i.e., the duration of the Corps' permit), steelhead populations are expected to undergo variability in abundance where some years may have a higher abundance of juvenile steelhead based on the duration of elevated flows and extent of habitat connectivity during summer. Overall, given the expected number of injured (2) and killed (1) individuals on an annual basis across two independent steelhead populations (i.e., the Ventura River and the Santa Clara River watersheds), the effects of diversion, capture, and relocation on steelhead are likely to occur to only a small number of individuals from these populations.

While climate change is expected to continue over the relatively short duration of the action's effects (10 years), NMFS cannot distinguish changes in temperatures, precipitation, or other factor attributable to climate change from annual and decadal climate variability over this 10-year time period. For these reasons, climate change is not expected to amplify the effects of the proposed action in ways not already described in the Effects Section.

Combined effects on designated critical habitat are summarized below. The value of available habitat within the action area is expected to be maintained by the proposed action through isolated, discrete impacts from each facility type, location, and maintenance method. Proposed BMP are expected to maintain and minimize effects to rearing and over-summering habitat features. Specifically, within the 2-year floodplain during spring, summer, and fall, NMFS anticipates minimal change in the quantity and quality of over-summering habitat for juvenile steelhead. The small spatial scale of the action area relative to the continuous river system (watershed) for both the Ventura River and the Santa Clara River suggests that anticipated habitat effects will not appreciably diminish the conservation value of designated critical habitat that supports survival and recovery of endangered SCC steelhead.

Combined effects on endangered SCC steelhead are summarized below. Although injury and death of steelhead is possible owing to the capture and relocation during dewatering, these effects are expected to be infrequent involving only a small portion of both populations and an even smaller portion of total species abundance across the entire SCC DPS. The proposed routine operations and associated maintenance are not projected to worsen migration opportunities or successful passage for adult and juvenile steelhead. The effects of the proposed action, when added to stochastic environmental changes and climate trends anticipated to occur over the next 10 years (duration of proposed action) are not expected to appreciably reduce the numbers, distribution, or reproduction of endangered SCC steelhead. Thus, the proposed action is unlikely to preclude the survival and recovery of endangered SCC steelhead.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of the endangered SCC DPS of steelhead or destroy or adversely modify its designated critical habitat.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to NMFS as specified in this ITS (50 CFR 402.14(i)(3)).

2.9.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur. Incidental take would be in the form of capture and relocation, including injury and mortality, of steelhead during maintenance activities.

Based on the information described above in the biological opinion, NMFS anticipates the following amount of incidental take on an annual basis for the ten years that the programmatic individual permit is valid: capture and relocation of no more than 20 juvenile steelhead in the action area, and no more than 10% of juvenile steelhead shall be injured during capture and relocation activities with lethal effects to one juvenile steelhead per year. The summary of take is reproduced below (Table 15).

Table 15. Anticipated take (Anticipated Stressor) under the proposed action over the next ten years for steelhead (Life Stage) including the method of take (Take Method), climate condition (Water-Year Type), extent of adverse effects (Take Amount/Extent per Year Type) and annual percentage of injured individuals out of total amount captured (Amount of Injured Individuals) and lethal take amount on an annual basis (Lethal Take).

Program Activity	Anticipated Stressor	Life Stage	Take Method	Water-Year Type	Take Amount/ Extent per Year Type	Amount of Injured Individuals (% of captured)	Lethal Take
Dewatering designated critical habitat	Temporary loss of services provided by PBF	Juvenile	Capture and relocation	All water-year types	20 per year	10% per year	1 juvenile per year

2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The measures must be undertaken by the Corps for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of this incidental take statement through enforceable terms that are added to the contract, the protective coverage of section 7(o)(2) may lapse.

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize and monitor incidental take of steelhead:

1. When in designated critical habitat, employ a minimum of two fisheries biologists at each project site to: (1) monitor activities and work areas while a water diversion is operating, and (2) reconcile any condition that could harm or injure steelhead during the dewatering process.

2. Remediate spatial and temporal changes that occur in designated critical habitat during the dewatering process to ensure quality and availability of habitat is restored to pre-project conditions. Develop a detailed monitoring report documenting the effects of dewatering and relocation activities, efficacy of minimization measures and the overall performance of designated critical habitat when flow is restored to the action area.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, then protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. To reduce impacts to the juvenile life stage of steelhead, all maintenance activities that require water diversion and dewatering of stream reaches shall only be conducted between June 15 and October 31. The dewatered portion of the stream shall not exceed the defined action area per maintenance or minor repair activity..

    b. The District shall retain consulting biologists with expertise in the areas of salmonid biology and ecology; fish/habitat relationships; biological monitoring; and, handling, collecting, and relocating salmonid species. A minimum of two qualified fisheries biologists shall be on-site the day the project site is dewatered for relocation of any remaining steelhead, and to monitor the upstream and downstream block nets. Block netting shall have a mesh size of 0.25-inches or less. One or more of the following methods shall be used to capture steelhead; seine, dip net, throw net, minnow trap, by hand. Electrofishing is prohibited. Block nets shall be removed after the water diversion infrastructure is in place. For the remainder of the instream work period requiring stream diversion, one qualified biologist shall be on-site each day the diversion is in place to check the upstream and downstream block nets at a minimum of 3 times per day (before the work activity begins each day, during construction, and after construction has ended for the day). If any fish become entangled in the nets, then this shall be reported to NMFS biologist Brittany Struck (562-432-3905) for the purpose of developing a plan to further minimize harm to steelhead.

    c. The District's biologists shall contact NMFS (Brittany Struck, 562-432-3905) and the Corps point of contact immediately upon making a determination that authorized take levels are likely to be exceeded.

    d. While the workspace is being isolated from flowing water, the biologists shall survey the diversion area (including looking underneath boulders and debris) continuously, and again after isolation of the workspace to ensure that there is no steelhead stranded before any construction work begins. The District or its biologists shall note the number of steelhead observed in the affected area, the number of steelhead relocated, and the date and time of the collection and relocation.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. The District's biologists shall monitor the conduct of work activities, instream habitat, and performance of any sediment control/detention devices for the purpose of identifying and reconciling any condition that could adversely affect steelhead or their habitat. The biologists shall be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat. The District or its biologists shall repair affected habitat features, including re-vegetation or earthwork necessary to restore designated critical habitat to pre-project conditions.

b. The District or its biologists shall provide a written report to NMFS (Brittany Struck, 562-432-3905) within 30 days following completion of work activities that require isolating a workspace from flowing water (i.e., dewatering/water diversion). The report shall include the number and size of all steelhead relocated, injured or killed during the project action or fish relocation; a description of any problems encountered during the project or when implementing terms and conditions; and, photographs of the Program activity area and vicinity before and after project action is complete.

c. The report shall include additional information about creek conditions prior to and after implementation of a water diversion in designated critical habitat. Information shall include: the amount of creek discharge (cfs); water temperature at 0.3m above substrate; GPS location; time of day; dissolved oxygen; conductivity; amount and type of cover present including presence of large woody debris, riparian vegetation, boulder, undercut, or bridge; habitat type (pool, glide, or riffle) including maximum depth, length, average depth, and average width; evidence of flow entering the habitat; inflow channel width and depth.

d. The report shall document unanticipated effects or unanticipated levels of effects on steelhead and their habitat, a description of all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects impacted steelhead or designated critical habitat.

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. The Corps should include in Program monitoring requirements that the District identify areas within a floodplain that have the potential to be restored. Restoration would promote connectivity between the stream channel and historical floodplain. In general, flood-control activities work against natural floodplain processes and result in long-term, ongoing adverse effects to both the historic riparian corridor and floodplain (NMFS 2013, 2014a,b, and 2017b).

2. The Corps should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for

cooperative analysis and funding to support steelhead habitat restoration projects within the Ventura and Santa Clara river watersheds.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Corps' issuance of a Programmatic Individual Permit to Ventura County Watershed Protection District. This Corps permit authorizes the flood-control related Routine Operations and Maintenance Program for the period of 2019-2029.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the Corps. Other interested users could include the District. Individual copies of this opinion were provided to the Corps. This opinion will be posted on the Public Consultation Tracking System. The format and naming adheres to conventional standards for style.

3.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

3.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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5. APPENDICES

Appendix A.

ENVIRONMENTAL BEST MANAGEMENT PRACTICES and PERMIT CONDITIONS SUMMARY

This document was created as a permit compliance reference tool for District staff. The Best Management Practices (BMPs) have been altered from the originals evaluated during the CEQA and permitting processes to clarify content without changing regulatory requirements. These BMPs incorporate all permit conditions received for the Routine Operations & Maintenance Program, including the Biological Opinions from federal agencies (Table 1). Four new BMPs were developed to clarify permit conditions and incorporate other regulatory requirements related to erosion control, environmental training, and invasive aquatic species control. Also included for easy reference are: summaries of the "grandfathered" streambed alteration agreements incorporated by reference to the permits, summaries of endangered species additional conditions, and regulatory agency contact information.

Table 1. Routine Operation & Maintenance Programmatic Permits

AGENCY	PERMIT NO.	DATE ISSUED
U.S. Army Corps of Engineers	Regional General Permit No. 92	2/13/2013
U.S. Fish and Wildlife Service	Biological Opinion	12/12/2012
National Marine Fisheries Service	Biological Opinion	9/7/2012
California Department of Fish and Wildlife	Streambed Alteration Agreement No. 1600-2004-0512-R5	8/3/2009
Los Angeles Regional Water Quality Control Board	Section 401 Water Quality Certification File No. 08-148	8/17/2009

For inquiries regarding these permits or conditions, please contact: (Updated March 2017)
Pam Lindsey, Watershed Ecologist 805-654-2036

ENVIRONMENTAL BEST MANAGEMENT PRACTICES

BMP 1: Avoid Channel Earthwork During the Rainy Season/Events.

- Avoid earthwork in earthen and soft bottom channels from December 1 to April 1 unless water is absent.
- If work is considered critical, work in flowing water is acceptable, provided flow is diverted according to the Water Diversion Guide and sensitive aquatic species not present.
- No earthwork shall be conducted during rain events, or if 0.25 inches or more of rain is forecast within 12 hours of scheduled work.

BMP 2: Prevent Discharge of Silt-Laden Water During Concrete Channel Cleaning.

- Prevent the discharge of silt-laden water or pollutants downstream when removing sediments, vegetation, algae, and trash from concrete channels.
- Install BMPs: silt barriers, sand bags, straw bales, as appropriate per Board Order No. 10-0108; NPDES Permit No. CAS004002, July 8, 2010.
- Follow the Water Diversion Guide if a flow diversion is installed.

BMP 3: Location of Temporary Stockpiles.

- Temporary stockpiles in the channel bottom shall be limited to one working day and not overnight.
- Temporary stockpiles may be placed in channel bottoms or debris basins if they are placed in such a manner that they would not be exposed to flowing water.
- Permanent stockpiles shall be located landward of the 100-year floodplain to the maximum extent feasible.

BMP 4: Survey for Habitat (nesting) Prior to Routine Maintenance Work.

- A biological survey for nesting birds required prior to work from February 1 to September 15 if in or adjacent to suitable habitat.
- Nesting habitat defined as cattail patches, short and tall trees, and shrubby areas. Open gravel, bridges, culverts, and fence posts may also support nests.
- Work= mowing/disking, earth work, clean outs, access road work lasting more than one day, and repairs where nesting bird habitat is in work area or within 300 feet.
- If active bird nests are identified, work within 300 feet (500 feet for raptors) must be postponed until after September 15, unless the biologist determines the nest becomes inactive or a reduced buffer is approved by regulatory agencies.
- No bio survey needed for routine herbicide application in/on facilities to sparse, short (<3 foot) weedy vegetation (includes young (<1year old mule fat, willows or cattails).

BMP 5/6: Survey for Steelhead Migration/Rearing Conditions and Sensitive Aquatic Species Prior to Routine Maintenance Work.

- Applies to earthwork/repairs in surface water and within 100 feet of water:

ZONE 1:	ZONE 2:
• Matilija Creek • San Antonio Creek • Thacher Creek • Ventura River	• Hopper Creek • Piru Creek • Pole Creek (unlined portions) • Santa Clara River • Santa Paula Creek • Sespe Creek

- Approved biologist must survey for steelhead migration or rearing conditions and other sensitive aquatic species prior to earthwork in or within 100 feet of surface water.
- If flows are deemed sufficient for steelhead migration, earthwork within or adjacent to the channel shall be postponed until after June 15 and before October 31.
- If rearing habitat is present, approved biologist shall determine if steelhead are present.
- If other sensitive species are found in the work area, work will stop while District environmental staff contact CDFW/USFWS. The approved biologist may be authorized to relocate these species to nearby suitable habitat.
- **Special authorization is required for water diversion** if flow conditions are suitable for steelhead or other aquatic species, even if the Water Diversion Guide is followed.
- Steelhead presence notification to NMFS at least 10 days prior to work by District environmental staff.
- If authorized by NMFS, an approved biologist shall isolate the work area with block nets and relocate any steelhead in the work area to suitable habitat with perennial surface water. The biologist shall continuously monitor during water diversion and any work within occupied steelhead habitat.
- Steelhead relocations or other impacts by flow diversion or dewatering shall be documented and reported to the NMFS within 30 days of completion of the maintenance work.
- Concrete, grout, brick & mortar or other cement products shall not be used to construct stream diversions when steelhead and other sensitive aquatic species are likely present.
- If steelhead are found dead or injured at the work site, environmental staff shall notify NMFS immediately.
- Any steep-walled excavations that may trap California red-legged frog that will be left overnight in areas within or adjacent to the Ventura River or San Antonio Creek shall be covered.

BMP 7: Continue Existing Procedures for Sediment Removal and Vegetation Control for Specific Reaches in Calleguas Creek Watershed.

- Conduct sediment removal and in-stream vegetation control along unimproved channels along Calleguas Creek, Conejo Creek, Revolon Slough, Arroyo Las Posas and generally throughout Zone 3 in accordance with previous Streambed Alteration Agreements.

See Attached "Grandfathered Streambed Alteration Agreement Conditions."

BMP 8: Avoid Disturbance to Native Beach or Wetland Species.

- Applies to facilities maintained in beach/coastal strand.
- Prior to beach access March 1 to September 15, approved biologist shall survey for western snowy plovers or California least terns nesting or roosting on beach. If present, maintenance work shall be postponed until after the breeding season, unless a species protection plan is be prepared, approved by USFWS/CDFW, and implemented.
- Avoid driving over beach dune vegetation when accessing storm drain outlets.
- Minimize native beach plant removal during outlet maintenance.
- Prior to beach outlet maintenance, environmental staff shall determine if suitable habitat is present at the outlet for tidewater gobies. If suitable habitat is present, approved biologist shall conduct fish surveys. If present and maintenance work affects habitat, work shall be postponed until surface water is absent, unless a species protection plan is prepared, approved by USFWS, and implemented.

BMP 9: Aquatic Pesticide Application.

- Follow the most up-to-date Best Management Practices and the monitoring and reporting requirements in the District's NPDES Stormwater Quality Management Plan.
- Comply with the Ventura County Application Protocol for Pesticides, Fertilizers, and Herbicides, including working under the direction of a Qualified Applicator, using materials approved for aquatic use, following the manufacturer's application directions, avoiding application prior to forecasted storm events and ensuring wind conditions are suitable to avoid spray drift.

BMP 10: Leave Vegetation on Upper Basin Slopes.

- Leave native vegetation on the debris and detention basin slopes above the 20 percent capacity debris line unless any of the following apply:
    - Shrubs and trees are hazards to the stability and function of the basin
    - Sediment meets or exceeds the 20 percent capacity line
    - Slope re-grading is required to correct or prevent rill erosion or other damage
    - Vegetation is on engineered fill
    - Vegetation constitutes a fire hazard to nearby properties.

BMP 11: Leave Patches of Vegetation in Channel Bottom.

- Minimize vegetation removal or thinning in earthen or earthen bottom channels; remove the least amount necessary to achieve the specific maintenance objectives for the reach.
- Remove native vegetation in a non-continuous manner, leaving small patches intact, provided they will not adversely affect conveyance capacity.

BMP 12: Leave Herbaceous Wetland Vegetation in Channel Bottom.

- Minimize removal or thinning of emergent native vegetation rooted in or adjacent to the low flow channel or aquatic habitats, unless inconsistent with maintenance objectives or capacity requirements.

BMP 13: Maximum 15-foot Vegetation-Free Zone at the Toe of the Bank.

- Do not exceed a 15-foot wide vegetation-free zone at levee and bank toes when thinning or removing vegetation for inspection purposes.

BMP 14: Avoid Road Base Discharge.

- Do not place or spill road base, fill, sediments, and asphalt beyond the previously established road bed when working adjacent to channels and basin bottoms.

BMP 15: Mitigate/Replace Temporary Impacts to Habitat.

- Restore native vegetation in temporary work areas after completion of repair or reconstruction work. Prior to work, a vegetation restoration plan must be submitted to the regulatory agencies for approval.
- No habitat restoration sites shall be placed within the routine maintenance limits of the repaired structures.
- Habitat restoration shall only be required if the impacted area supports native wetland or riparian vegetation; no restoration is required for barren areas or areas dominated by non-native plants.

BMP 16: Oak Tree Mitigation Ratio.

- Replace native oak trees removed by maintenance activities if greater than 3 inches in diameter at breast height (dbh), or 2 inches dbh if multi-trunked.
- Oak tree replacement ratios:

TRUNK SIZE (dbh)	RATIO
4 to 6 inches	3:1
6 to 12 inches	5:1
12 to 24 inches	10:1
24 to 36 inches	15:1
>36 inches	20:1

- A tree replacement plan consistent with County Policy or permit requirements, whichever is greater, shall be prepared and submitted to the regulatory agencies prior to implementation.

BMP 17: Concrete Wash-Out Protocols.

- Fluids associated with the curing, finishing and wash-out of concrete shall not be discharged to the channel or basin.
- Concrete wastes (liquid, dust, solids) shall be stockpiled separately from sediment and protected by erosion control measures to prevent discharge to the channel, basin, or waters of the State.
- Conduct appropriate waste management practices based on considerations of flow velocities, site conditions, suitability of erosion control materials, and construction costs.

BMP 18: Water Diversion Guide.

- Follow water diversion methods and procedures established in the District's Water Diversion Guide.
- Baseline water quality monitoring is required PRIOR to installation of any water diversion, daily for the first 5 days the diversion is in place, and weekly thereafter. Contact District environmental staff to contract for/conduct monitoring.
- Fish mortality associated with stream flow diversion or dewatering shall be reported by environmental staff to the California Department of Fish & Wildlife within 24 hours of discovery.

BMP 19: Minimize Erosion from Stream Gauge Maintenance.

- Cut interfering vegetation with chain-saw or hand tools to near ground surface. No herbicide application to stumps. No excavation of roots.
- Implement additional erosion control methods as needed, based on considerations of flow velocities, site conditions, availability of materials, construction costs, durability and maintenance requirements.

BMP 20: Implementation of Integrated Pest Management Program.

- Implement the approved Integrated Pest Management (IPM) program.
- Apply appropriate rodent control methods at each facility as appropriate for site conditions (rodent population, type of facility, season).
- Maintain uniform inspection records for each facility and all control efforts.
- Report IPMP activities to the regulatory agencies annually in the Annual Monitoring Report.

BMP 21: Avoid Spills and Leaks.

- Keep all equipment in good working condition and free of leaks.
- No equipment maintenance or refueling in a channel or basin bottom.
- Place drip pans under all stationary equipment such as motors, pumps, generators, compressors, and welders.
- Spill containment materials must be on site or readily available for any equipment maintenance or refueling that occurs adjacent to a watercourse.
- Train all maintenance crews in spill containment and response.
- Immediately clean up all spills. Submit report to the Office of Spill Prevention and Response.

BMP 22: Biological Surveys in Appropriate Habitat Prior to Vegetation Maintenance.

- Biologists conducting surveys for tidewater goby, California red-legged frog, least Bell's vireo and southwestern willow flycatcher shall be approved by the U.S. Fish & Wildlife Service in writing.
- Prior to sediment removal, vegetation control, or repair work in earthen or earthen bottom facilities, an approved biologist shall survey for threatened, endangered, or sensitive species if suitable habitat occurs in or near work area. If such species are within or in close proximity to the work areas, the District shall reschedule the work when the species are not present.

- If it is necessary to conduct the work while sensitive species are present or in proximity to the work areas, a species protection plan shall be developed, approved by USFWS/NMFS/CDFW, then implemented.
- An approved biologist shall periodically monitor the work area during maintenance activities for wildlife and relocate species as needed to minimize mortality.
- Exotic fish, invertebrate, amphibian and reptile species shall be captured when feasible, dispatched and properly disposed by a qualified biologist.

BMP 23: Invasive Plant Removal Protocols.

- Remove invasive plant species in a manner that prevents propagation.
- Spray or mow plants before seeds ripen, when feasible.
- All cut/removed invasive vegetation shall be taken to a dump as a destruction load.
- Do not stockpile invasive vegetation (including mulch) where materials would wash downstream or allowed to propagate.
- For giant reed (*Arundo donax*), minimize ground disturbance and use foliar glyphosate treatment on smaller infestations, as feasible. Best to apply herbicide May 1 to October 1, if breeding birds absent. No grading to remove root masses unless earthwork is part of routine maintenance work.

BMP 24: Air Quality (Dust Control). The following measures shall be incorporated into maintenance activities to minimize fugitive dust emissions during grading, excavation, and construction activities.

- Minimize the areas disturbed at any one time by clearing, grading, earth moving, or excavation operations to prevent excessive dust.
- Water grading/excavation areas prior to and during work.
- Cover all truck loads; required by California Vehicle Code §23114.
- Prevent fugitive dust (via treatment) on all graded and excavated material, exposed soil areas, stockpiles, including unpaved parking and staging areas, and other active portions of the construction site.
- District staff shall weekly monitor contractor graded and/or excavated inactive areas of the construction site for dust stabilization.
- No grading/earth work during periods of high winds (i.e., wind speed sufficient to cause fugitive dust to impact adjacent properties) to prevent excessive fugitive dust.
- Use rumble strips or track out devices where vehicles enter and exit unpaved roads onto paved road.
- All on site construction roads that have a daily traffic volume of more than 50 daily trips shall be stabilized as to minimize transport of earthen material from the site.
- There shall be at least one qualified District staff on site each work day to monitor the provisions of the Fugitive Dust Mitigation Plan and any other applicable fugitive dust rules, ordinances, or conditions.
- Personnel involved in grading operations shall be advised to wear respiratory protection in accordance with California Division of Occupational Safety and Health Regulations.
- All project construction operations shall be conducted in compliance with all applicable APCD Rules and Regulations with emphasis on Rule 50 (Opacity) and Rule 51 (Nuisance).

BMP 25: Construction Noise.

- Noise-generating construction activities shall be restricted to the daytime (i.e., 7:00 AM to 7:00 PM, Monday through Friday).
- Minimize sustained construction noise adjacent to sensitive wildlife during the nesting season, as directed by the biological monitor.
- When construction noise is anticipated to affect sensitive wildlife, environmental staff shall consult with regulatory agencies regarding additional mitigation measures.

BMP 26: Stabilize Exposed Soil.

- To limit erosion, minimize soil disturbance work in channels and basins to that which can be stabilized prior to rain events.

BMP 27: Native Tree Removal (see BMP 16 for oaks).

- Prior to vegetation removal, a qualified biologist shall prepare an inventory of all native trees in the work area exceeding 4 inches dbh.
- Native trees in temporary impact areas shall be cut to ground level to facilitate regrowth, and not removed by heavy equipment.
- Native California black walnut, cottonwood and sycamore trees exceeding 4 inches dbh shall be replaced at a 10:1 ratio, if removed.
- Replacement trees shall attain a survival rate of 75 percent the first year and 100 percent thereafter, and monitored and maintained for a 5 years after planting.

BMP 28: Environmental Training.

- Prior to any sediment removal, vegetation control, or repair work in earthen or earthen-bottomed channels and basins that contain surface water or native vegetation, a qualified biologist familiar with the work site shall provide training to the work crew regarding potential species present, habitats to avoid, measures to implement to minimize impacts, and events/situations that require work to be stopped and the biologist to be contacted.

BMP 29: Work in California Red-legged Frog Habitat.

- Any steep-walled excavations that may trap California red-legged frogs that will be left overnight in suitable habitat (Ventura River, San Antonio Creek) shall be covered.
- Approved biologists handling California red-legged frogs shall not use gloves, unless they are well-rinsed and composed of vinyl.
- Approved biologists working in California red-legged frog habitat shall follow the Declining Amphibian Task Force Fieldwork Code of Practice.

BMP 30: New Zealand Mudsnail Control Protocols

The protocols have been developed to address the sixty work code activities described in the District's 2012-2013 Annual Work Plan. The work code activities have been lumped into general types of materials/activities to allow the assignment of protocols to be followed to minimize the spread of this invasive species (see Table 2). These protocols address three general modes of potential spread of New Zealand mudsnail; hand tools & boots, mobile equipment and vehicles, and reusable instream materials.

First, determine if the reach to be maintained supports New Zealand mudsnail by reviewing maps and the infested reach list (Table 3). If so, implement Part A.
Second, determine if the equipment to be used was borrowed from the Transportation Department OR last used in another Zone. If so, implement Part B.

Table 2. New Zealand Mudsnail Protocols by Work Code

Protocol	Work Codes
1	PS41, PS42, PT20, PT21, PT22, PT23, PT24, PT25, PT26, PT27, PT28, PT29, PT31, PT32, PT33, PT34, PT35, PT36, PT37, PT38, PT41, PT42, PT43, PT44, PT45, PT47, PT48, PT49, PT51, PT53, PT55, PT56, PT57, PT60, PT61, PT62, PT64, PT65, PT66, PT68, PT70, PT72, PT74, PT76, PT77, PT80, PT83, PT85, PT86, PT88, PT89, PT90, PT91, PT92, PT93
2	PS41, PS42, PT20, PT21, PT22, PT23, PT24, PT25, PT26, PT27, PT28, PT32, PT33, PT34, PT35, PT36, PT37, PT38, PT41, PT42, PT43, PT44, PT45, PT47, PT48, PT49, PT51, PT53, PT55, PT56, PT57, PT60, PT61, PT62, PT64, PT65, PT66, PT68, PT70, PT72, PT74, PT76, PT77, PT80, PT83, PT85, PT86, PT88, PT89, PT90, PT91, PT92, PT93
3	PS41, PS42, PT 22, PT 29, PT31, PT32, PT33, PT40, PT41, PT42, PT43, PT45, PT45, PT48, PT49, PT51, PT53, PT54, PT57, PT60, PT61, PT62, PT64, PT 66, PT68, PT80, PT83, PT85, PT86, PT88, PT89, PT90, PT91, PT92, PT93
4	PT20, PT21, PT23, PT24, PT25, PT26, PT27, PT28, PT34, PT35, PT36, PT37, PT38, PT44, PT51, PT53, PT68, PT70, PT72, PT74, PT76, PT77, PT80, PT85

Part A (infested reaches):

- Wash hand tools, boots and power tools that contact surface water using Protocol 1.
- Wash mobile equipment used in surface water that may have incidental soil attached (e.g., dozers, excavators, discing equipment, wheeled loaders and motor graders) using Protocol 2A (on-site power wash, on-site or off-site hot pressure wash).
- Wash equipment that infrequently crosses the wetted channel and does not have incidental soil attached (e.g., herbicide trailers, chipper, water pumps [hand carried and trailer-mounted], mowers and motor vehicles) using Protocol 3 (on-site or off-site hot or cold pressure wash).
- Wash hard surfaced instream materials that may be transported between work sites (e.g., K-rail, diversion pipe, water hoses and concrete forms) using Protocol 4 (on-site or off-site hot pressure wash).
- Discard sand bags (and other fibrous materials that could harbor mudsnails) which have been immersed in surface waters in a landfill. Do not re-use at other sites.

Table 3. New Zealand Mudsnail Infested Reaches

ZONE	REACH NO.	NAME
2	42011	Pacific Ocean to Harbor Blvd.
2	42012	Harbor Blvd. to Victoria Avenue
2	42151	Camarillo Hills Drain to Hwy 101
2	42152	Hwy 101 to Central Avenue
3	42154	Central Avenue to Wright Road
3	45241	Wright Road to U/S to Drop Structure #2
3	45243	Drop Structure #2
3	45245	Beardsley Wash Drop Structure #2 U/S to Triple Arch
3	45246	Connelly Triple Arch
3	45247	Connelly Triple Arch U/S to Milligan Barranca
3	46101	Arroyo Santa Rosa to Arroyo Conejo N.Fork
3	46102	Arroyo Conejo N. Fork to Arroyo Conejpo South Branch
3	46103	Arroyo Conejo S. Branch to Hillcrest Drive
3	46104	Hillcrest Drive to Moorpark Road
3	46111	Arroyo Conejo to Ventu Park Road
3	46112	Ventu Park Road to Borchard Road
3	46161	Arroyo Conejo to Lynn Road
4	48061	L.A.County Line to Kanan Road
4	48071	L.A. County Line to Conifer Street
4	48072	Conifer Street to Oak Hills Drive
4	48073	Oak Hills Drive through Kanan Road
4	48076	Medea Creek @ Mile 1.2, U/S
4	48101	L.A. County Line U/S North
4	48107	Las Virgines Creek @ Mile 2.6, U/S

U/S: upstream

Part B (borrowed equipment or used in other Zone):

- Wash mobile equipment used in surface water that may have incidental soil attached (e.g., dozers, excavators, discing equipment, wheeled loaders and motor graders) using Protocol 2B (on-site or off-site hot pressure wash).
- Wash equipment that infrequently crosses the wetted channel and does not have incidental soil attached (e.g., herbicide trailers, chipper, water pumps [hand carried and trailer-mounted], mowers and motor vehicles) using Protocol 3 (on-site or off-site hot or cold pressure wash).

Protocol 1 - Hand Tools, Boots and Wetted Power Tools
This control protocol involves cleaning any hand tools, boots and wetted portions of power tools (weed whipper, drill, concrete vibrator, etc.) that come in contact with potentially infected surface water prior to leaving the work site each day OR leaving these materials at the site until the work is complete. Hand tools, boots and wetted portions of power tools must be cleaned before leaving the site using the following procedure:

1. Remove any accumulated mud/soil from the article to be cleaned;
2. Fill a portable plastic tub (child's swimming pool, or equivalent) to a depth allowing complete submersion of the boots or tools with a 4 percent solution (5 fluid ounces per gallon) of a commercial disinfectant (GS High Dilution Disinfectant 256, Spartan Chemical Company);
3. Scrub all surfaces with a brush;
4. Let soak in the disinfectant for approximately 10 minutes;
5. Rinse with **potable** water; and
6. Dispose of the used disinfectant solution in a sewer or upland area where it cannot enter surface waters.

Protocol 2A – Instream Mobile Equipment (Infested Reaches)
This Protocol applies to equipment that is used in the wetted channel and likely to have incidental soil attached, such as dozers, excavators, discing equipment, wheeled loaders and motor graders.

1. All attached soil must be removed at the project site using a pressurized water hose provided by a water truck (or equivalent pressurized water source);
2. Wash water must be contained and not allowed to run-off into a storm drain or drainage feature;
3. The equipment must be washed on-site using a portable hot pressure washer OR taken to the nearest O & M washing facility (Saticoy or Moorpark) for a hot pressure wash;
4. Care must be taken to pressure wash all surfaces with hot water that typically come in contact with surface water and/or wet sediments, such as wheels, tires, discs, dozer tracks, excavator and loader buckets, dozer and grader blades, undercarriage, hydraulic cylinders and hoses, and fenders.

Protocol 2B – Instream Mobile Equipment (All Other Reaches)
This Protocol applies to equipment that is used in the wetted channel and likely to have incidental soil attached, such as dozers, excavators, discing equipment, wheeled loaders and motor graders.

1. The equipment must be washed on-site using a portable hot pressure washer OR taken to the nearest O & M washing facility (Saticoy or Moorpark) for a hot pressure wash.
2. Care must be taken to pressure wash all surfaces with hot water that typically come in contact with surface water and/or wet sediments, such as wheels, tires, discs, dozer tracks, excavator and loader buckets, dozer and grader blades, undercarriage, hydraulic cylinders and hoses, and fenders.

Protocol 3 – Other Mobile Equipment and Vehicles
This Protocol applies to equipment that infrequently crosses the wetted channel and does not have incidental soil attached, such as herbicide trailers, chipper, water pumps (hand carried and trailer-mounted), mowers and motor vehicles.

1. The wheels, tires and undercarriage of this equipment must be pressure washed, either on-site or the nearest O & M washing facility (Saticoy or Moorpark).
2. If washed on-site, wash water must be contained and not allowed to run-off into a storm drain or drainage feature.

Protocol 4 - Reusable Instream Materials
Materials that may be transported between work sites may include sand bags, K-rail, diversion pipe, water hoses and concrete forms (wood). Sand bags immersed in surface waters cannot be fully cleaned, and must be emptied of sand (on-site or the District's maintenance yard) and the bag deposited in a proper trash receptacle.

1. Wash hard surfaced materials on-site using a portable hot pressure washer OR take to the nearest O & M washing facility (Saticoy or Moorpark) for a hot pressure wash.
2. Care must be taken to remove all attached soil or sediment and fully contact all surfaces.

GRANDFATHERED STREAMBED ALTERATION AGREEMENT CONDITIONS SAA 5-270-92: REVOLON SLOUGH

- Control vegetation (banks and bottom) annually after July 1 for 100 feet upstream, under, and 100 feet downstream of all bridges.
- Control vegetation (banks and bottom) annually after July 1 for 50 feet upstream and 50 feet downstream of all grade control structures.
- Sediment may be removed when deposition exceeds two feet above design grade.
- Vegetation control may be by hand, herbicide, or mechanical methods.

Hwy 1 to Las Posas Road Bridge 45101:

- Herbicide inside banks, maintain access road as needed during year.
- No bottom vegetation maintenance.

Las Posas Road Bridge to Hueneme Road Bridge 45103:

- Herbicide inside banks, maintain access road as needed during year.
- July 1 to February 1: on west side bottom allow 50 foot long by 15 foot wide pockets of riparian vegetation separated by 100 foot long vegetation management (non-native species removal) zones. Remove willows greater than 3 inches dbh in pockets.
- July 1 to February 1: Outside riparian pockets, allow 20 percent of bottom with vegetation for two out of three years.
- July 1 to February 1: Outside riparian pockets, all vegetation may be removed every third year.

Hueneme Road Bridge to Wood Road Bridge 45105:

- Herbicide inside banks, maintain access road as needed during year.
- July 1 to February 1: one west side bottom allow solid strip of riparian vegetation 15 feet

wide. Remove willows greater than 3 inches dbh annually.

- July 1 to February 1: Outside riparian pockets, allow 20 percent of bottom to retain vegetation. Remove willows greater than 3 inches dbh annually.
- July 1 to February 1: Outside riparian pockets, all vegetation may be removed every other year from Hueneme Road to Etting Road. Remove willows greater than 3 inches dbh annually.

SAA 5-388-90: PORTIONS OF CALLEGUAS CREEK WATERSHED

- Control vegetation (banks and bottom) annually July 1 to February 1 for 100 feet upstream, under, and 100 feet downstream of all bridges/culverts (except as noted below).
- Control vegetation (banks and bottom) annually July 1 to February 1 for 25 feet upstream and 25 feet downstream of all grade control structures (except as noted below).
- Vegetation control may be by hand, mechanical, or herbicide methods.

Arroyo Simi from Beltramo Road to No. 2 Canyon 47013:

- Herbicide inside banks, maintain access road as needed during year.
- July 1 to February 1: allow 10 foot wide strip of riparian vegetation at toe of each bank. Alternate removal of strips each year.
- July 1 to February 1: maintain up to 16 foot wide vegetation free pilot channel in center of creek bottom.

Arroyo Simi Sycamore Canyon to Erringer Road 47021:

- Herbicide inside banks, maintain access road as needed during year.
- Control vegetation (banks and bottom) as needed 100 feet upstream and 50 feet downstream of all bridges and grade control structures.
- Minimize maintenance activities March 1 to July 1.
- All willow and woody plant species may be controlled.
- Allow up to 25 percent cover of cattails/tules in channel bottom.

Arroyo Simi Erringer Road to Royal Avenue 47021:

- Herbicide inside banks, maintain access road as needed during year.
- July 1 to February 1: control all vegetation (banks and bottom) as needed.
- Vegetation control may be by hand, mechanical, or herbicide methods.

SAA 5-540-91: CALLEGUAS CREEK

- Control vegetation (banks and bottom) annually after July 1 for 100 feet upstream, under, and 100 feet downstream of all bridges/culverts.
- Vegetation control may be by hand, mechanical, or herbicide methods, unless specifically noted below.

Calleguas Creek Highway 1 to Hueneme Road 45021/45023:

- Herbicide inside banks and 25 feet from toe in bottom, maintain access road as needed during year. No other herbicide use in bottom.
- July 1 to February 1: each year allow a 10 foot wide (minimum) strip of riparian vegetation along one side of low flow channel. Alternate mechanical removal of strips

each year.

Calleguas Creek Hueneme Road to 850 ft Upstream of University Road 45025/45027:

- Herbicide inside banks and 25 feet from toe in bottom, maintain access road as needed during year. No other herbicide use in bottom.
- July 1 to February 1: each year allow a 10 foot wide (minimum) strip of riparian vegetation along one side of low flow channel. Alternate mechanical removal of strips each year.

Calleguas Creek Pleasant Valley Road to Seminary Road 45033/45035/45037:

- Herbicide armored banks and 15 feet from toe in bottom, maintain access road as needed during year.
- No removal of native vegetation on natural (unarmored) banks of channel.
- Control vegetation (banks and bottom) annually July 1 to February 1 for 100 feet upstream, under, and 100 feet downstream of all bridges/culverts and stabilizers.
- Allow 20 percent cover of riparian vegetation in channel bottom each year, if feasible.

SAA 5-541-91: ARROYO LAS POSAS CREEK

Covers reaches:
1) Below Hitch Road 45065
2) From S. Grimes Canyon Road to the Moorpark WWTP 45063
3) Stabilizer upstream of Somis 45053
4) Junction of Seminary Road and Arroyo Las Posas 45051

- Vegetation control may be by hand, mechanical, or herbicide methods.
- Control vegetation (banks and bottom) annually July 1 to February 1 for 100 feet upstream, under, and 100 feet downstream of all bridges/culverts and stabilizers.
- Herbicide armored banks and 15 feet from toe in bottom (except established willows), maintain access road as needed during year.

SAA 5-542-91: CONEJO CREEK (LINKED TO SAA 5-115-89)

- Herbicide routinely cleared portions of banks, maintain access road as needed during year.
- Control vegetation (banks and bottom) annually July 1 to February 1 for 100 feet upstream, under, and 100 feet downstream of all bridges.
- Vegetation control may be by hand, herbicide, or mechanical methods, except as noted below.

Conejo Creek -Calleguas Creek Confluence to Highway 101 46011/46012/46013/46014:

- Permanently allow a strip of riparian vegetation along one side of low flow channel.

Conejo Creek Highway 101 to Upland Drain 46015/46016:

- Herbicide inside banks and 25 feet from toe in bottom, maintain access road as needed during year. No other herbicide use in bottom.
- July 1 to February 1: mechanical or hand removal of vegetation in other portions of bottom; allow two 20 foot wide vegetated strips or allow 20 percent of bottom vegetated. If practical, allow vegetated strips along low flow channel.
- July 1 to February 1: remove allowed vegetation the following year; allow new

equivalent vegetated areas.

ENDANGERED SPECIES ADDITIONAL CONDITIONS

Facilities and reaches with the potential for endangered species are mapped in the District's GIS system.

GAMBEL'S WATERCRESS AND MARSH SANDWORT: Conduct full (spring/summer 2014) surveys in 6.98 acres of facilities with suitable habitat. Opportunistically survey for these species during any field visits to facilities with suitable habitat.

SOUTHERN STEELHEAD: See BMP 5/6 above. For Calleguas Creek watershed, steelhead are generally not present, but an occasional stray may occur and we must stop work and notify NMFS and CDFW immediately.

CALIFORNIA GNATCATCHER: See survey triggers and protocols in table below. If species present, stop work and notify USACE and USFWS to determine course of action.

WORK TYPE	SURVEYS NEEDED
A. Heavy equipment more than 1 day adjacent to identified habitat per maps.	A. 3 bird surveys within 7 days prior to work.
B. Heavy equipment work more than 3 days adjacent to identified habitat per maps.	B. Morning bird survey prior to every third day of work.

WESTERN SNOWY PLOVER: Beach grooming at BEMP (near J St. Drain) during March 1 to September 15 requires nesting surveys and coordination with USFWS. Use lifeguard paths for access to minimize impacts to habitat. See also BMP 8.

CALIFORNIA LEAST TERN: Beach grooming at BEMP (near J St. Drain) during March 1 to August 15 requires nesting surveys and coordination with USFWS. Use lifeguard paths for access to minimize impacts to habitat. See also BMP 8.

CALIFORNIA RED-LEGGED FROG: USFWS Biological Opinion identified the following impact minimization measures. "Work" includes herbicide, earthwork, and other maintenance, except access road and fence maintenance. See also BMPs 6 and 29. Applies only in Zone 1.

MEASURE #	ACTION: Zone 1 only
CRLF-1	Approved biologist conducts daily pre-work surveys. Relocate all life stages potentially affected by work.
CRLF-2	Relocation site will be shortest distance to suitable habitat not affected by work.
CRLF-3	Biologist will maintain detailed descriptions of relocated individuals to determine if same individuals are recaptured.
CRLF-4	Biologist will train all O&M personnel and contractors regarding species and work type/boundaries.
CRLF-5	Biologist required to remain on site until all frogs have been relocated, worker education is complete, and vegetation removal has been completed.
CRLF-6	Biologist to permanently remove non-native aquatic species, when feasible.

Take Limits: Must report acreage of habitat affected by maintenance and mitigation each year in the Ventura River Watershed.

TAKE TYPE	ACRES/INDIVIDUALS ANNUALLY
Suitable habitat affected by maintenance and repair activities	2.5 acres per year
Expected take (relocation, harassment, etc) by maintenance and repair	25 individuals (eggs, tadpoles or frogs)
Suitable habitat affected by mitigation or restoration activities	10 acres per year
Expected take by mitigation	50 individuals per year (eggs, tadpoles, frogs)
Critical habitat affected by maintenance and repair activities	2.3 acres per year
Critical habitat affected by mitigation activities	10 acres per year

TIDEWATER GOBY: USFWS Biological Opinion identified the following impact minimization measures. “Work” includes earthwork, and other maintenance, except access road and fence maintenance. See also BMPs 8 and 22.

MEASURE #	ACTION
TWG-1	J St Drain downstream of Hueneme Road 42321 & Oxnard Industrial Drain just upstream and downstream of Hueneme Road 42302: channel cleanouts only when water naturally absent (no pumping or diversion of surface water).
TWG-2& 4	Sediment removal or dewatering in other facilities: biologist to use block nets and relocate gobies from work area to suitable nearby habitat per B.O.
TWG-3	Any pump intakes in occupied goby habitat must be screened.
TWG-5	Biologist required to remain on site to observe fish and potential turbidity levels during all dewatering activities; relocate fish as needed.
TWG-6	Block nets may be left overnight if inspected for efficacy.
TWG-7	Do not release gobies into areas scheduled for work on subsequent days.

Take Limits: Must report acreage of habitat affected by maintenance and mitigation each year in all watersheds.

TAKE TYPE	VENTURA	SANTA CLARA	ORMOND LAGOON	CALLEG CREEK	TOTAL
Suitable habitat affected by maintenance and repair	3 ac /year	0.1 ac./yr	0.1 ac/yr	2 ac/yr	5.2 ac/yr
Expected take (relocation, harassment, etc.) by maintenance and repair	All individuals within affected area				Indeterminate
Suitable habitat affected by mitigation or restoration	0	0	0	0	0
Expected take by mitigation	0	0	0	0	0
Critical habitat affected by maintenance and repair	0.2 ac/yr	0	0	N/A	0.2 ac/yr
Critical habitat affected by mitigation or restoration	0	0	0	N/A	0

LEAST BELL'S VIREO/SW WILLOW FLYCATCHER: USFWS Biological Opinion identified the following impact minimization measures. "Work" includes earthwork, and other maintenance, except access road and fence maintenance. See also BMPs 4, 7, and 22.

MEASURE #	ACTION
LBV-1	If feasible, conduct work between Sept 16 to Feb 28 in facilities with LBV suitable habitat within 500 feet of work area.
LBV -2	March 1 to September 15: approved biologist conduct surveys for LBV/SWFL prior to work with habitat within 500 feet. (see list of facilities)
LBV -3	If LBV/SWFL nest detected, minimum 500 foot buffer between work and nest unless otherwise agreed to by USFWS. Biologist must monitor nest during work.
LBV -4	Mitigation/restoration projects in suitable LBV/SWFL habitat: avoid removal of willow and cottonwood trees >8 inch dbh.

Take Limits: Must report acreage of habitat affected by maintenance and mitigation each year in all watersheds.

TAKE TYPE LBV	VENTURA	SANTA CLARA	CALLEGUAS CREEK	TOTAL
Suitable habitat affected by maintenance and repair	3.5 ac/yr	4.6 ac/yr	17.4 ac/yr	25.5 ac/yr
Expected take by maintenance and repair	3 pairs	4 pairs	10 pairs	17 pairs
Suitable habitat affected by mitigation or restoration	10 ac/yr	15 ac/yr	10 ac/yr	35 ac/yr
Expected take by mitigation	6 pairs	9 pairs	6 pairs	21 pairs

TAKE TYPE SWFL	VENTURA	SANTA CLARA	CALLEGUAS CREEK	TOTAL
Suitable habitat affected by maintenance and repair	3.2 ac/yr	4.5 ac/yr	8.4 ac/yr	16.1 ac/yr
Expected take by maintenance and repair	1 pair	1 pair	1 pair	3 pairs
Suitable habitat affected by mitigation or restoration	10 ac/yr	15 ac/yr	10 ac/yr	35 ac/yr
Expected take by mitigation	1 pair	1 pair	1 pair	3 pairs
Critical habitat affected by maintenance and repair	3 ac/yr	3 ac/yr	N/A	6 ac/yr
Critical habitat affected by mitigation or restoration	10 ac/yr	15 ac/yr	N/A	25 ac/yr

REGULATORY AGENCY CONTACT LIST

Contact Pam Lindsey BEFORE contacting regulatory personnel.

AGENCY	NAME	PHONE	EMAIL
USACE	Antal Szijj	805-585-2147	Antal.J.Szijj@usace.army.mil
USFWS	Jenny Marek Chris Dellith	644-1766 x325 644-1766 x227	Jenny_Marek@fws.gov Chris_Dellith@fws.gov
NMFS	Brittany Struck Anthony Spina	562-432-3905 562-980-4045	Brittany.Struck@noaa.gov Anthony.Spina@noaa.gov
CDFW	Christine Found-Jackson	805-889-2520	Christine.Found-Jackson@wildlife.ca.gov
LARWQCB	Valerie Carillo Zara	213-576-6759	Valerie.CarrilloZara@waterboards.ca.gov

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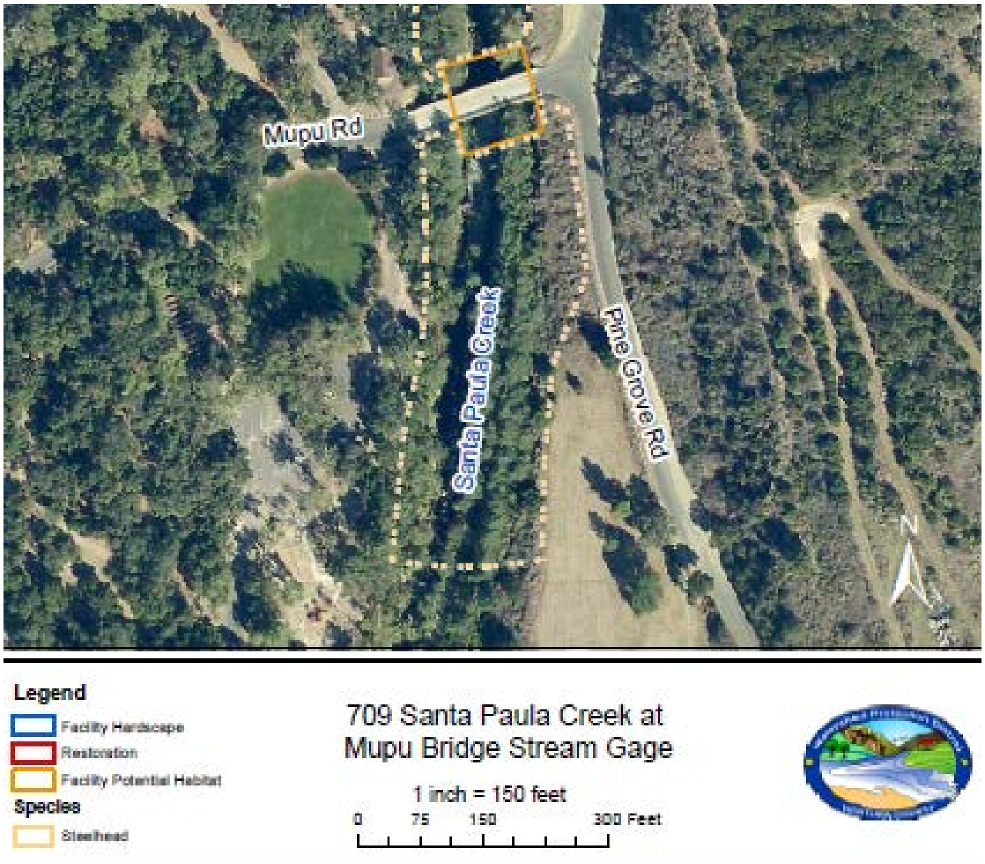
Appendix B. Stream gauge maintenance footprints outlined by the District in provided catalog pages. A complete list of maintenance footprints and their spatial orientation (drains, outlets, gauges, and sediment removal sites) were included in the consultation package from the Corps.



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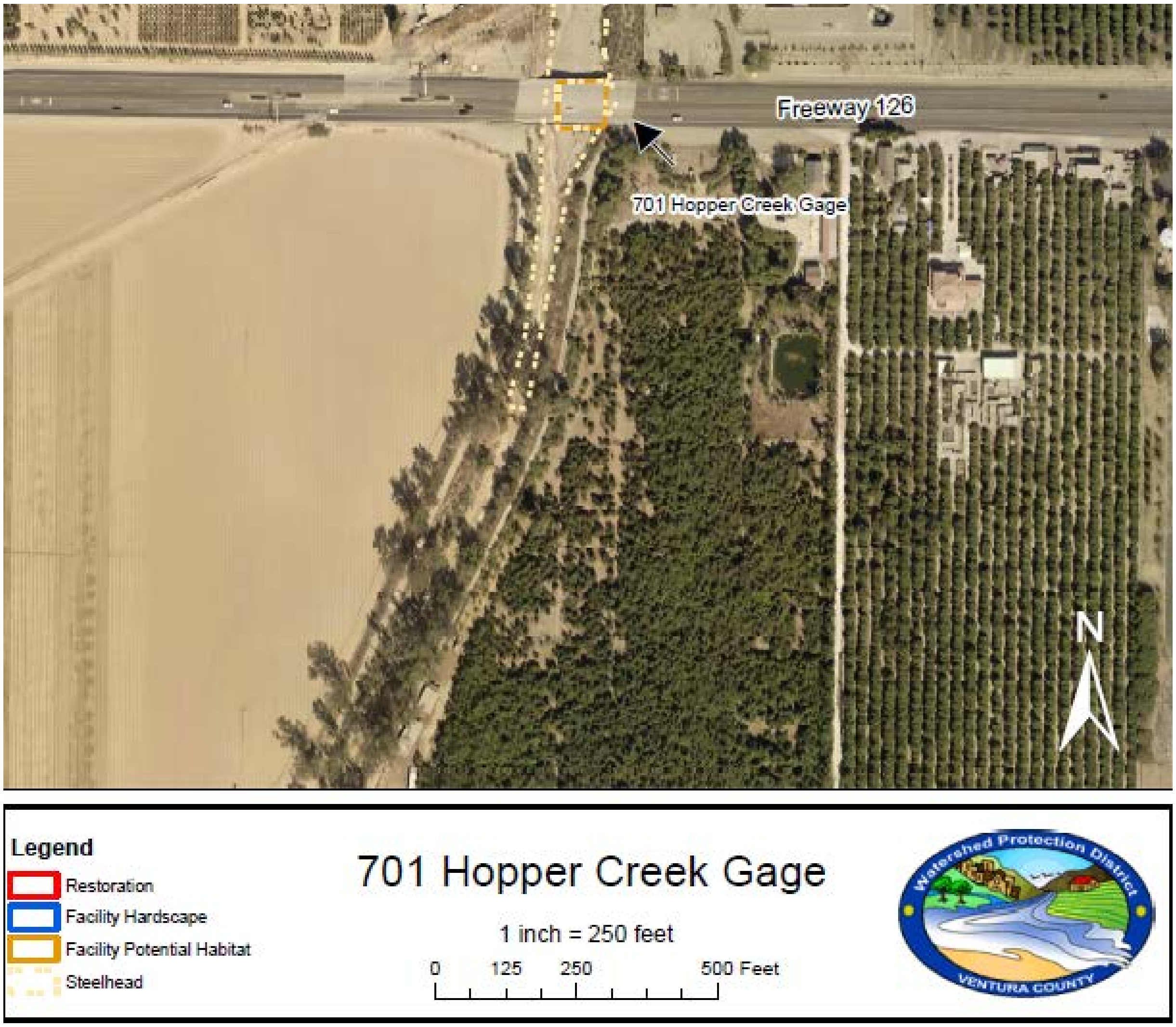
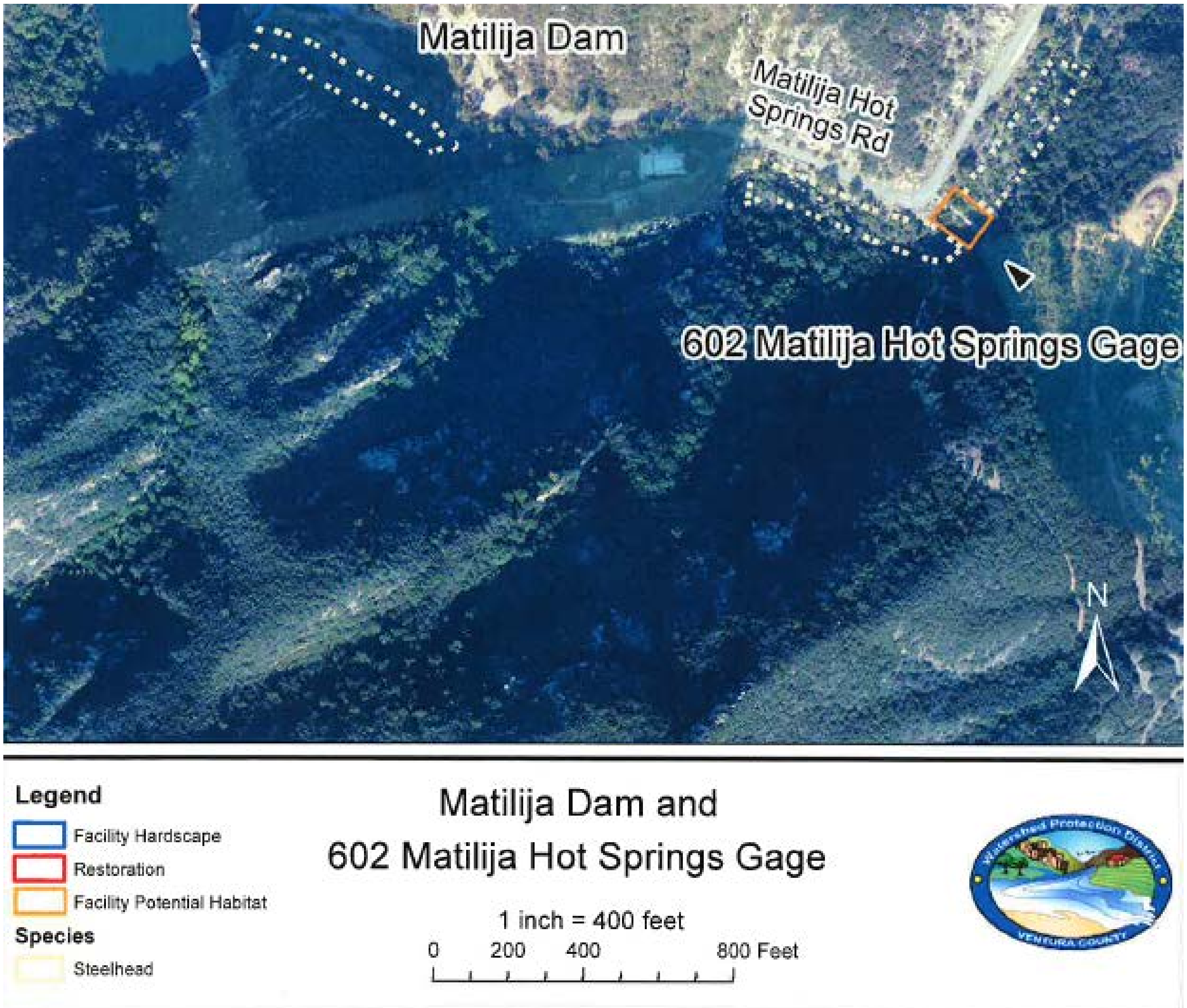
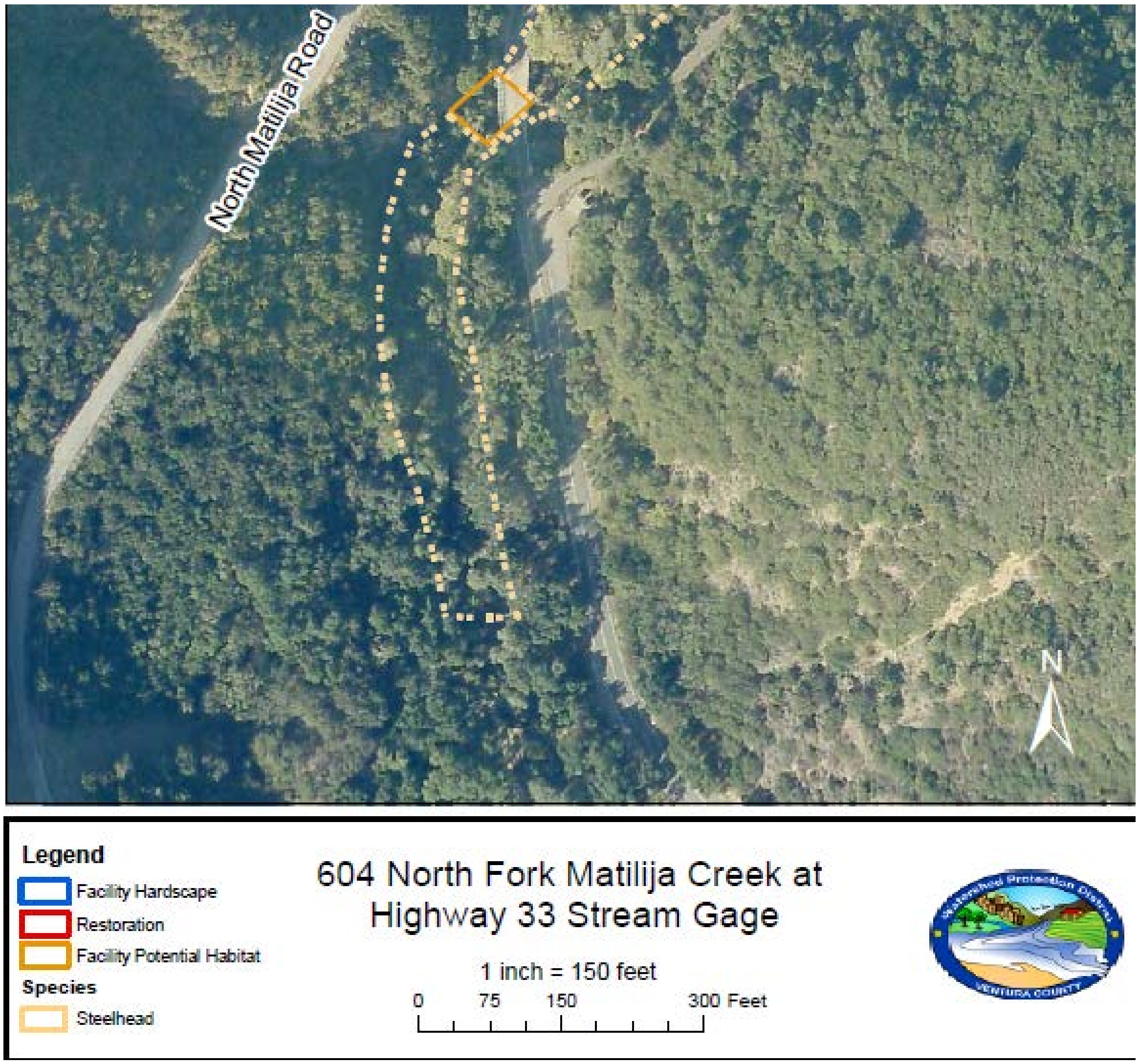

Freeway 126
701 Hopper Creek Gage
N
Legend
Restoration
Facility Hardscape
Facility Potential Habitat
Steelhead
701 Hopper Creek Gage
1 inch = 250 feet
0
125
250
500 Feet
Watershed Protection District
VENTURA COUNTY



Matilija Dam
Matilija Hot Springs Rd
602 Matilija Hot Springs Gage
N
Legend
Facility Hardscape
Restoration
Facility Potential Habitat
Species
Steelhead
Matilija Dam and
602 Matilija Hot Springs Gage
1 inch = 400 feet
0 200 400 800 Feet
Watershed Protection District
Ventura County


North Matilija Road
N
Legend
Facility Hardscape
Restoration
Facility Potential Habitat
Species
Steelhead
604 North Fork Matilija Creek at
Highway 33 Stream Gage
1 inch = 150 feet
0
75
150
300 Feet

Legend

Facility Hardscape

Restoration

Facility Potential Habitat

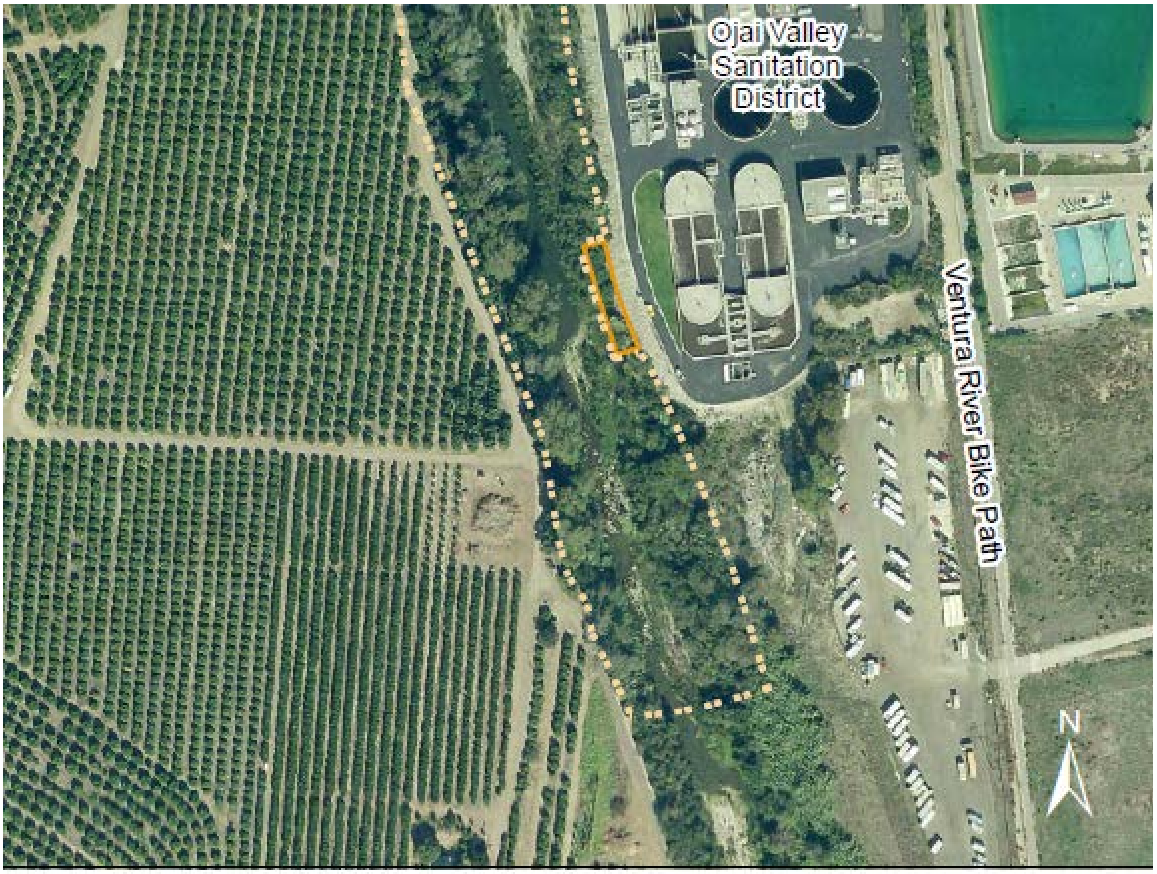
Species

Steelhead

608 Ventura River at
Foster Park Stream Gage

1 inch = 200 feet

0 100 200 400 Feet



Legend
Facility Hardscape
Restoration
Facility Potential Habitat
Species
Steelhead

ME-VR2
Stream Gage

1 inch = 200 feet

0 100 200 400 Feet