UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

September 7, 2012

In response refer to:
2012/02834

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

Dear Mr. Szijj:

Enclosed is NOAA's National Marine Fisheries Service's (NMFS) biological opinion for the Army Corps of Engineers' (Corps) Regional General Permit (RGP) for implementation of the Ventura County Watershed Protection District (District) Annual Routine Maintenance Plan (AMP) (File # SPL-2008-00052-AJS). The AMP considered in this opinion was revised following NMFS' June 29, 2011, issuance of a draft biological opinion. The biological opinion addresses effects of this action on endangered steelhead (*Oncorhynchus mykiss*) and critical habitat 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 AMP activities are not likely to jeopardize the continued existence of the endangered Southern California 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 Kristin Mull at (562) 980-3265 or via email at Kristin.Mull@noaa.gov if you have any questions concerning the biological opinion or if you would like additional information.

Sincerely,

For Rodney R. McInnis
Regional Administrator

Enclosure

cc: Natasha Lohmus, CDFG
Roger Root, USFWS
Copy to Administrative File: 151422SWR2008PR00333

BIOLOGICAL OPINION

AGENCY:	U. S. Army Corps of Engineers
ACTION:	Issuance of a Regional General Permit to Ventura County Watershed Protection District for their flood-control related Annual Routine Maintenance Plan for the period of 2010-2015 (File # SPL-2008-00052-AJS)
CONSULTATION CONDUCTED BY:	National Marine Fisheries Service, Southwest Region
TRACKING NUMBER	2012/02834
DATE ISSUED:	**September 7, 2012**

I. CONSULTATION HISTORY

On an annual basis, the Ventura County Watershed Protection District (District) performs maintenance activities on and within flood-control facilities throughout Ventura County (County). These activities are the basis of the District's Routine Annual Maintenance Plan (AMP). The purpose of the AMP is to perform routine maintenance on District facilities that has been historically performed by the District. Many of the County's AMP activities occur in streams (hereafter "County streams") within the range of the endangered Southern California Distinct Population Segment (DPS) of steelhead (*Oncorhynchus mykiss*), and within designated critical habitat for this species.

In an attempt to reduce the effects of the AMP on listed species, including steelhead, the District proposed to add supplementary environmental protection measures to the AMP. For the purposes of complying with the California Environmental Quality Act, the District prepared the Environmental Protection Measures for the Ongoing Routine Operations and Maintenance Program Environmental Impact Report (PEIR). The PEIR, which was finalized in May 2008, describes the activities undertaken as part of the AMP, and the expected impacts of the AMP (with the implementation of supplementary environmental protection measures) on County streams. At the beginning of 2008, the Army Corps of Engineers (Corps) and the District initiated discussions with NMFS regarding the development of a programmatic biological opinion for a Regional General Permit (RGP) the Corps was proposing to issue to the District for the AMP. The Corps sent a letter of August 4, 2008, requesting informal Section 7 consultation under the U.S. Endangered Species Act (ESA) for the proposed RGP based on the Corps' preliminary determination that the AMP was not likely to adversely affect steelhead or designated critical habitat for this species within the action area.

After reviewing the Corps' consultation request and the final 2008 PEIR, NMFS concluded that elements of the District's proposed action would result in adverse effects to steelhead and critical habitat for this species. NMFS sent a letter to the Corps of October 23, 2008, stating that NMFS did not concur with the Corps' determination, and that formal consultation was necessary; NMFS also requested additional information regarding the AMP. The Corps responded to NMFS with a request for formal consultation by letter of January 22, 2010, and sent additional information regarding the AMP. After reviewing the Corps' request for formal consultation and additional information, NMFS concluded that formal consultation could be initiated. Formal consultation was thus initiated on January 22, 2010. However, given the large action area and diversity of actions involved in the AMP, NMFS determined there was a need for additional analysis. NMFS sent a letter on April 23, 2010 to the Corps requesting to extend the consultation period an additional 60 days. The Corps responded in a letter of May 4, 2010 granting the consultation period extension, and requested a draft of NMFS' biological opinion prior to the issuance of the final biological opinion. NMFS sent a letter of August 5, 2010, requesting an additional 45 days to complete the consultation. The Corps sent a letter of August 17, 2010 granting NMFS' request.

NMFS issued a draft biological opinion on June 29, 2011, which concluded that the District's proposed maintenance program 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 revision of the District's RGP and revise the opinion accordingly. This revision amends the project scope for the RGP by removing levee maintenance within reaches of the Santa Clara River and Ventura River watersheds that support steelhead. The Corps is no longer proposing to include vegetation maintenance in the maintenance zone extending 15 feet from the toe of levees within designated steelhead critical habitat. This activity will not occur without a future federal permitting action requiring section 7 consultation.

NMFS' April 25, 2012, letter stated that case law precluded NMFS from amending the draft biological opinion to reflect the change in project plans[1]. Because removing levee maintenance activities from the proposed action constituted a change in project plans, NMFS believed reinitiation of formal consultation was required in accordance with 50 CFR §402.16. However, because the final biological opinion had not yet been issued, and because NMFS was still in consultation with the Corps, NMFS later determined that reinitiation of formal consultation was not necessary, and proceeded to consult with the Corps on the revised District RGP. The Corps provided NMFS with full details of the revised RGP on June 21, 2012.

This biological opinion is based on the best scientific and commercial data available, including information included in the Corps' consultation packet, the 2008 Final PEIR for the AMP, observations of riverine habitat noted by NMFS biologists during on-site meetings with the District and aquatic habitat surveys, and the ecological literature. A complete administrative record for this consultation is maintained on file at NMFS' Southwest Regional Office (501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802).

---

[1] *Gifford Pinchot Task Force v. U.S. Forest Service,* 378 F.3d 1059.

II. DESCRIPTION OF THE PROPOSED ACTION

A. Description of AMP Activities

The Corps proposes to issue a 5-year RGP to the District for implementation of their proposed AMP. Generally, the routine activities performed by the District covered by the RGP include (1) inspection and repair of structural facilities such as flood-control channels, headwalls, stream gages, and culverts; (2) removal of vegetation from flood-control channels at channel outlets, as well as the vicinity of stream gages; (3) clearing and excavation of sediments and debris from debris basins and flood-control channels to maintain flood capacity; and (4) restoring maintained flood-control channels and debris basins to design specifications, all for the purpose of maintaining structural integrity and functionality of flood control facilities to prevent overbank flooding and bank erosion that could threaten life and property. The District's proposed AMP has been revised to include supplementary environmental protection measures termed Best Management Practices (BMPs) intended to reduce effects of the AMP on designated critical habitat for endangered steelhead. The Corps' RGP and this biological opinion do not consider emergency actions undertaken by the District during wet season flood events, or activities that are not routine and involve the expansion of District facilities, as part of the AMP, and these actions will not be considered further.

Under the proposed action, the District undergoes an AMP planning process. First, District personnel conduct surveys of County streams, and assessments of District flood-control facilities to determine the activities that are warranted for the current AMP. 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 develops an annual work plan that is submitted to the Corps, NMFS, California Department of Fish and Game (CDFG), and the U.S. Fish and Wildlife Service for review. After agency review, the AMP is revised to respond to any agency comments, or to parse any project which the agencies feel warrant further review, mitigation, or separate consultation. After budgetary approval, the AMP projects are scheduled and implemented. In general, the bulk of AMP activities happen during the dry season from April to October, but AMP activities that take place outside of stream channels may be performed throughout the year. While most of the District facilities are not within streams inhabited by steelhead or designated critical habitat for this species, many District facilities are within the Ventura River and Santa Clara River watersheds, which are occupied by steelhead and include large portions of designated critical habitat.

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 AMP 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. In general, the AMP consists of the following actions:

1. Vegetation management, including trimming, removal, and herbicide use
2. Flood-control channel and debris basin sediment removal

3. Maintenance and repair of damaged flood-control facilities
4. Water diversion for facility maintenance and repair
5. Supplementary BMPs (Appendix A of this biological opinion)
6. Safety Inspections

Detailed descriptions of AMP activities are as follows:

1. 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, the District trims vegetation every 2 years within the active channel width and to about 50 feet upstream and downstream of the gauge to allow for proper gauge function. 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.

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. Chain saws and loppers are used by hand-crews 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 removal.

Herbicides are used for vegetation management 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. 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. These products include glyphosate-based Aquamaster, Accord, Blazon, Magnify, Sta-Put Drift Control, Condition Extra Drift Control, and Tripleline Anti-foam. Aquamaster is the only herbicide that would be applied to open water. On dry stream banks and areas outside of stream channels where the likelihood of contact with surface water does not exist, the District will use other types of herbicides (*e.g.*, RoundUp) to treat pre-emergent and post-emergent vegetation. Herbicides will sometimes be applied with surfactants or adjuvants to increase their effectiveness. The District does not apply herbicides if rain is forecast in the following week. The timing and frequency of herbicide application will vary considerably from year to year due to weather and other environmental conditions, but typically, the District may apply herbicides 2 to 3 times per year. The methods, amounts, and extent of herbicide use vary 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, District personnel will use hand sprayers connected to trucks or backpack sprayers to treat otherwise inaccessible areas along channels or in debris basins.

2. Flood-Control Channel and Debris Basin Sediment Removal

This AMP activity includes the physical removal of sediments, vegetation, debris, and trash that periodically accumulate in flood-control channels, outlets, and debris basins.

a. Flood-Control Channel Sediment Removal

Sediment removal from flood-control channels and flood-control channel drain outlets (*e.g.*, the terminus of a flood-control channel where it drains into a stream) 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. The District's flood-control channels, which include earthen-bottom and concrete-lined channels, are ephemeral channels (*e.g.*, barrancas, which are ditches or gullies that are dry for 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). The District removes organic and inorganic debris from flood-control channels and drains on an as-needed basis, but has not set specific thresholds to determine when accumulated sediments should be removed. Maintenance supervisors base the need for cleanout on a visual inspection which considers the amount of sediments and debris in the channel relative to the channel cross-section, the risk of accumulated sediments, vegetation or debris creating a drain blockage, and the ability of future flows to mobilize and remove the sediment naturally. Concrete-lined channels are designed with specific flow capacities that the District carefully maintains.

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, channel cleanout may occur at any time of year. If water is present in channels that need cleanout, 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 away. When work in wet channels is necessary, BMPs are implemented to avoid the release of fine sediments and the creation of increased turbidity levels into natural waterways during channel cleanout.

With regard to the existing Santa Paula Creek flood control project in the Santa Clara River watershed, transfer of the operation and maintenance responsibilities from the Corps to the

District is expected in the future. The effects of operation and maintenance activities (*i.e.*, O&M manual) that the District would undertake once these responsibilities are delegated to the District are considered in the project-specific consultation with the Corps (Administrative Record Number 151422SWR2012PR00100), and are not considered further in this biological opinion. The Santa Paula Creek flood control project consultation presumes that the District would undertake the operation and maintenance activities as detailed in the O&M manual. In addition, NMFS' current understanding is that while the District would be responsible for undertaking operation and maintenance of the flood control project, the Corps would maintain federal discretion over the project and ensure the District implements operation and maintenance activities consistent with the O&M manual.

b. Debris Basin Sediment Removal

The District owns and operates ten debris basins within the Santa Clara and Ventura River watersheds. On a yearly basis, these debris basins are surveyed and, if necessary, accumulated sediments, rocks, vegetation, and 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 need to be cleaned annually.

Sediment and 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 itself to access accumulated materials. Most basins have access roads for heavy machinery, but access ramps are constructed when no ramps are present. 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/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 vegetation has become established within debris basin bottoms, 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.

3. District Facility Maintenance and Repair

District facilities will deteriorate over time and will require repair or reconstruction, particularly after winters with large amounts of rainfall and flood flows. This AMP category includes a wide variety of work that occurs throughout the year on an as-needed basis when the District will repair and sometimes reconstruct flood-control facilities and other related structures such as access roads and fences. Maintenance and repair work is intended to return District facilities to their original pre-damage condition, and does not include expansion of District facilities or the construction of new facilities. As described in the Consultation History, vegetation maintenance on levees is also not included as part of the proposed action.

To implement repairs and maintenance of damaged flood-control facilities the District will use similar equipment and materials as used in the original construction. Earthen flood-control channels will be repaired and restored to their original size and configuration using heavy machinery. The District will repair damaged concrete-lined channels by constructing new concrete forms and pouring fresh concrete. When 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 AMP activity.

4. Water Diversion for Facility Maintenance and Repair

Occasionally, there will be surface water present within or adjacent to a District flood-control facility that will need to be diverted to allow for an AMP activity to occur. This requires the diversion of surface water, which the District implements using several methods. Typically, the work area will be isolated by impounding flows behind a coffer dam or excavated basin, or by shunting the water away from the work area with a diversion berm made of sand bags. Flows from the coffer dam 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 the water diversion to affect water quality and aquatic life, BMPs are incorporated into the design and operation of any water diversion. The majority of water diversions implemented by the District occur within flood-control channels and debris basins where steelhead are not expected to be present. Water diversions within an area inhabited by steelhead are expected to occur very infrequently (Pam Lindsey, District biologist, 2010 and 2012, pers. comm.). The District has developed specific BMPs for water diversions, which are provided in Appendix E of the PEIR. The BMPs related to steelhead and critical habitat were revised July 12, 2012 and are provided in Appendix A of this document.

5. Supplementary Best Management Practices

In the past, the District implemented a variety of BMPs during routine maintenance activities. Now, the District is proposing to implement additional BMPs designed to further reduce the environmental impacts of the AMP for existing and new flood-control facilities. The supplementary BMPs have been devised to not curtail, reduce, or otherwise inhibit the District's maintenance requirements and activity guidelines. Implementation of the proposed supplementary BMPs will become standard practice for future AMPs, and will be incorporated into the maintenance of any future District flood-control facilities along with any specific BMPs developed during the CEQA review process for new facilities. The proposed supplementary BMPs that are pertinent to steelhead and designated critical habitat for this species are listed in Appendix A.

6. Safety Inspections

During the wet season, District personnel monitor and 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.

B. Interrelated and Interdependent Activities

Interrelated actions are those actions 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 proposed action (50 CFR § 402.02). There are no known actions interrelated or interdependent to the proposed action.

C. Action Area

The proposed action will occur at District facilities throughout Ventura County. Given the size of the County, most of the District's facilities are within inland areas outside of the range of endangered southern California steelhead, and not within designated critical habitat for this species. Therefore, the focus of this biological opinion includes AMP activities occurring exclusively within the range of the endangered steelhead, and within designated critical habitat for this species in the Ventura and Santa Clara River watersheds. A full inventory of District facilities maintained per the AMP, including their precise locations, can be found in the District's PEIR and supplemental materials provided by the District for this consultation.

The action area consists of all areas directly and indirectly affected by District facilities in the Ventura and Santa Clara River watersheds, and AMP maintenance activities on those facilities, over the life of the RGP. Because the specific facilities maintained by the District are expected to change to some extent on a yearly basis, the action area will become the compilation of sites where AMP activities occur over the life of the RGP. The general characteristics of the Ventura and Santa Clara rivers in the action area are described below, along with the categories and general locations of District facilities within the action area. Facility locations are given in river mile (RM) distances from the ocean.

1. Ventura River Watershed

The Ventura River watershed contains substantial amounts of spawning, rearing, and migratory habitat for steelhead because of its large size (*i.e.*, 169 $mi.^2$) and tributary network (NMFS 2005). 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, respectively, based on NMFS' observations of steelhead within the Ventura River (S. Glowacki, R. Bush, and K. Mull, NMFS, 2008-2012, pers. obs.). 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 Matilija Creeks 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, pers. obs.). 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.

The upstream terminus of the action area within this watershed begins at RM 17 at Stream Gauge #604 on north fork Matilija Creek. The downstream terminus of the action area 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 direct and indirect effects of maintenance activities occur. With regard to stream gauges, the action area is the width of the active (bankfull) channel and 50 feet upstream and downstream of the gauge. With regard to debris basins and flood-control channels, 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 may extend.

Stream Gauges.—The District manages streambed vegetation on five stream gauges in the watershed (Table 1). The farthest upstream gauge (#604) is near the Mosler Quarry on the north fork Matilija Creek, located at about RM 17 (North Fork Matilija Creek RM 0.7).

Table 1. Stream gauges on the Ventura River Watershed that are maintained by the District under the AMP.

Gauge #	Location	River Mile Location	Area Affected
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 gauge
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 gauge
605	San Antonio Creek at Casitas Springs	RM 8.3 0.2 mi. from Ventura River Confluence	Active channel width; 50' upstream and 50' downstream of gauge
608	Ventura River at Foster Park	RM 5.8 on mainstem	Active channel width; 50' upstream and 50' downstream of Casitas Vista Bridge
ME-VR2	Ventura River water quality gage at Ojai Valley Sanitation District Plant	RM 5.2 on mainstem	75' upstream and 75' downstream of gauge

Debris Basins.—The District maintains five debris basins located within ephemeral drainages of the watershed (Table 2). The basins are integrated within flood-control channels that ultimately discharge into the Ventura River or San Antonio Creek.

Table 2. Debris Basins within the Ventura River Watershed maintained by the District under the AMP.

Debris Basin Name	Location	Location of Outlet	Capacity in 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

Flood-control channels and drains.—The District owns and maintains 16 flood-control channels with outlets within the watershed located outside of the Ventura River mainstem. Thirteen of the channels drain into the lower Ventura River between the estuary (RM 0.1) and Canada Larga Creek (RM 5). The other flood-control channels drain into the Ventura River between Fresno Canyon (RM 6.8) and Live Oak Creek (RM 10.5). A full listing of the channels including their exact locations is given in the PEIR and supplemental information provided by the District as part of this consultation.

2. Santa Clara River Watershed

The Santa Clara River watershed is one of the largest watersheds in southern California (about 1,236 $mi.^2$) and contains substantial amounts of spawning, rearing, and migratory habitat for steelhead (NMFS 2005). The aquatic habitat in the mainstem and tributaries consists of an assortment of runs, riffles, glides, and pools. 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, pers. obs.). The mainstem section below the Freeman Diversion may become dry for several miles during summer and fall. 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 5 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 upstream terminus 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 terminus of the action area is located about 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 direct and indirect effects of maintenance activities are expected to occur (see description in the foregoing).

Stream Gages.—The District operates and maintains two stream gage locations in the watershed (Table 3). A third stream gage operated by the District at the Freeman Diversion does not require vegetation maintenance due to its location at the diversion facility. Two gages are on the mainstem and the third gage is located on Santa Paula Creek, a tributary to the Santa Clara River. Vegetation is trimmed within the active channel width 50 feet upstream and 50 feet downstream of the gage.

Table 3. Stream gauges in the Santa Clara River Watershed that are maintained by the District under the AMP.

Gauge #	Location	River Mile Location	Area Affected
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 gauge
723	Santa Clara River Victoria Avenue Stream Gauge	RM 2.8	Active channel width; 50' upstream and 50' downstream of gauge

Debris Basins.—The District maintains five debris basins located within ephemeral drainages of the watershed (Table 4). The basins are integrated within flood-control channels that discharge into the Santa Clara River mainstem at the locations given below.

Table 4. Debris Basins maintained by the District within the Santa Clara River Watershed and their approximate locations.

Debris Basin Name	Location	Location of Outlet	Capacity in 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

Flood-control channels and drains.—The District owns and maintains 21 flood-control channels and barrancas within the watershed located outside of the Santa Clara River mainstem.

Nineteen of these drain into the Santa Clara River, and two drain into Sespe Creek. Ten of the flood-control channels (and their drain outlets) are located in the city of Ventura between RM 1 and RM 8. The other 11 flood-control channels are located in or near the cities of Santa Paula, Fillmore and Piru between RM 10 and RM 30. A full listing of the channels including their exact locations is given in the PEIR and additional materials provided by the District during this consultation.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

This biological opinion considers the potential effects of the proposed action on the Southern California DPS of steelhead and their designated critical habitat. The status of this species, their life history and habitat requirements, value of critical habitat, and recent factors affecting populations are described as follows.

A. Status of Southern California Steelhead

The endangered Southern California 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 recent re-listing of the Southern California 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 status review indicates these threats are essentially unchanged (Williams *et al.* 2011, NMFS 2011). Historical data on steelhead numbers for this region are sparse. The historic and recent steelhead abundance estimates, and percent decline are summarized in Table 5. The run size estimates illustrate the severity of the numerical decline for the major rivers in the Southern California DPS of steelhead (Good *et al.* 2005, NMFS 2011, Williams *et al.* 2011).

Table 5. 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 (R. Bush, NMFS, pers. comm.).

	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

Recent stream surveys to document the species' current pattern of occurrence have 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 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). 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). NMFS reviews the status and viability of the Southern California 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 Southern California DPS of steelhead was unchanged (Good *et al.* 2005, Williams *et al.* 2011).

B. 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. 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.

C. 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), including threats to the viability of steelhead populations. In the southwest region (southern Rocky Mountains to the Pacific Coast), the average temperature has already increased roughly 1.5 °F compared to a 1960-1979 baseline period. By the end of the century, average annual temperature is projected to rise approximately 4 to 10 °F above the historical baseline, averaging over the entire region (Karl *et al.* 2009). The southern California region is also experiencing an increasing trend in droughts, as measured by the Palmer Drought Severity Index from 1958 to 2007 (Karl *et al.* 2009). Precipitation trends are also important to consider. The Southwest region, including California, showed a 16% increase in the number of days with very heavy precipitation from 1958 to 2007. In general, for most areas of the country, the fraction of precipitation falling as rain versus snow has increased during the last 50 years (Karl *et al.* 2009). Climate variability in the western United States has also been observed through spring indicators such as lilacs, honeysuckles, and streamflow (Cayan *et al.* 2001). All three indicators exhibited trends toward earlier spring timing since the mid-1970s. Spring climate variability will continue to be an important factor in evaluating how the status of the species is influenced by a changing climate.

Addressing climate trends and projections on an ecoregional scale within southern California provides a focused summary of expected trends (PRBO Conservation Science 2011). Regional climate models[2] project mean annual temperature increases of 1.7 to 2.2 °C (3.1 to 4.0 °F) by 2070. Current regional models predicting changes in rainfall show large variation in results; the sensitivity of the regional results to the variability indicates substantial uncertainty in precipitation projections (PRBO Conservation Science 2011). Although there is relatively little consensus about projected effects of climate change on precipitation patterns, Snyder and Sloan (2005) projected mean annual precipitation in southwestern California to decrease by 2.0 cm (4.0%) by the end of the 21st century. The occurrence of wildfires, frequency, duration, and extent, are all important parameters to consider when considering a changing climate and associated impacts to steelhead and their habitat. Wildfires periodically burn large areas of chaparral and adjacent woodlands in autumn and winter in southern California (Westerling *et al.* 2004). Westerling and Bryant (2008) evaluated wildfire risk in this region and found that the probability of occurrence of large (>200-hectare) fires in southern California ranged from a decrease of 29% to an increase of 28%. The variation in range is due to the type of model used to make forecasts. Finally, changes in vegetation have also been considered (PRBO Conservation Science 2011). The area of chaparral/coastal scrub was projected to decrease 38-44% by 2070, which has strong implications for current and future threats to wildlife. The

[2] See page 43 of PRBO Conservation Science (2011) for a summary of all models referenced, emission scenarios and outputs.

predominant effect of climate change in wildlife populations will likely result from changes in vegetation communities. In addition to vegetation changes, high temperatures will become more common, indicating that southern California steelhead may experience increased thermal stress even though they may withstand water temperatures higher than preferences and tolerances reported for the species (Spina 2007).

D. Status of Critical Habitat

Critical habitat for the Southern California 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). To better define critical habitat for steelhead, NMFS' Critical Habitat Analytical Review Teams (CHARTs) developed a list of Primary Constituent Elements (PCEs) specific to steelhead and their habitat. PCEs are components of stream habitat that have been determined to be essential for the conservation of the Southern California 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 Southern California steelhead DPS contain the above PCEs 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 PCEs 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 up 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 Southern California DPS range (Boughton *et al.* 2006).

As part of the process to gather and analyze information to finalize this most recent designation of critical habitat, CHARTs compiled all available information regarding the distribution and habitat use of steelhead within the Southern California DPS, as well as habitat condition. The CHARTs also performed conservation assessments for all occupied watersheds, including riverine reaches and estuarine areas within each DPS. Essential features of critical habitat for steelhead spawning, rearing, and migration were found in 741 miles (1,186 km) of occupied stream habitat within the 32 Hydrologic Subwatershed Areas of the Southern California Steelhead DPS. Streams with high conservation value were found to have most or all of the PCEs of critical habitat and extensive areas that were suitable for steelhead spawning, rearing, and migration, despite negative effects of human factors. Streams with medium or low conservation value were less suitable for steelhead in terms of spawning, rearing, and migration, and had less of the PCEs necessary for steelhead survival growth and reproduction, generally due to anthropogenic factors. Both the Ventura and Santa Clara River Watersheds have been found to have high conservation value for the survival and recovery of the Southern California 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 review found that these threats have remained essentially unchanged (NMFS 2011).

E. 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). 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. NMFS equates this likelihood of viability with the likelihood of both the survival and recovery for purposes of conducting the jeopardy analysis under section

7(a)(2) of the ESA. 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 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 a broad population of salmonids, in this case the endangered Southern California 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). The endangered Southern California 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. The following are population size guidelines for steelhead in the Southern California DPS as established by McElhany *et al.* (2000).

A population should be large enough to have a high probability of surviving environmental variation of the patterns and magnitudes observed in the past and expected in the future. Recent findings indicate that 4,150 steelhead per year[3] are needed for each individual population unit (steelhead-bearing watershed) if the Southern California DPS is to be viable (Boughton *et al.* 2007). The historical run size of adults within the Southern California DPS of steelhead was roughly estimated to be at least 32,000 to 46,000; yet recent total run size for the same four waterways was estimated at less than 500 adults (Busby *et al.* 1996, Good *et al.* 2005, Williams

---

[3] The developers of this numerical prescription acknowledge the criterion may be biologically infeasible for some waterways, particularly small coastal basins (Boughton *et al.* 2007).

et al. 2011). With regard to the Ventura and Santa Clara River watersheds, only a few adult steelhead have been observed within these streams during the past several years. Additionally, the number of streams currently supporting the endangered Southern California DPS of steelhead has been greatly reduced from historical levels, and watershed-specific extirpations of steelhead have been documented (Boughton *et al.* 2005, Gustafson *et al.* 2007). Overall, the broad population appears to be in a continued state of decline and not capable of surviving fluctuations in environmental conditions.

A population should have sufficient abundance for compensatory processes to provide resilience to environmental and anthropogenic perturbations. The developers of the numerical population viability threshold arrived at the value of 12,500 adult steelhead per 3-year generation time (or 4,150 adult steelhead per year) based on the expectation that the numerical threshold would be sufficient to, in part, combat influences of environmental variability (*e.g.*, irregular inter-annual patterns of precipitation) on the risk of extinction, without consideration of other influences such as anthropogenic activities (Boughton *et al.* 2007). Because abundance of adult steelhead in the endangered Southern California DPS is currently substantially lower than the viability threshold, the current abundance of adult steelhead is not believed to be capable of withstanding influences of environmental fluctuations, let alone perturbations due to anthropogenic activities, which are widespread throughout the DPS.

A population should be sufficiently large to maintain its genetic diversity over the long term. Genetic variability is important because differing genetic traits favor a population being able to survive and reproduce under changing environmental conditions. With regard to the endangered Southern California DPS of steelhead, anthropogenic activities (including migration barriers) have selectively eliminated some steelhead populations from the broad population (*e.g.*, Boughton *et al.* 2005, Gustafson *et al.* 2007), leading us to conclude that much of the genetic diversity of the species has been lost. This conclusion is further supported by findings of recent empirical studies documenting a decline in effective population size and genetic diversity in southern California steelhead (Girman and Garza 2006). That the Southern California DPS has low abundance (compared to the historical abundance) is reason alone to expect a loss of genetic traits that are needed to respond and adapt to a changing environment because such is a problem inherent with small populations (Primack 2004).

A population should be sufficiently abundant to provide important ecological functions throughout its life cycle. The number of individuals required to provide such functions depend mostly on the structure of the species' habitat and biology (McElhany *et al.* 2000). Currently, the number of adults in the subject DPS (estimated at 500 individuals, Busby *et al.* 1996, Good *et al.* 2005) is considerably less than the minimum number of adults needed to maintain the viability of independent populations within the DPS (4,150 adults per year for each independent population, Boughton *et al.* 2007). The underlying basis for the minimum viability threshold includes the functional response of steelhead populations to environmental conditions, and the species' biology, ecology, and genetics, as well as consideration of extinction risk (Boughton *et al.* 2007). Accordingly, the minimum viability threshold is expected to reflect the abundance required to support the expression of biological and ecological functions[4].

[4] See Boughton *et al.* (2007) for a discussion of how viability for listed steelhead can be attained.

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).

A population's natural productivity should be sufficient to maintain its abundance above the viable level. Natural productivity can be measured as the ratio of naturally-produced spawners born in one broodyear to the number of fish spawning in the natural habitat during that broodyear. Under the foregoing scenario, the spawner-to-spawner ratio should fluctuate around 1.0 or higher to maintain abundance, thus, cohorts should be replacing one another at least equally. While information regarding natural productivity of the Southern California DPS is lacking, the magnitude of the decline in the abundance of adult steelhead in the DPS (Busby *et al.* 1996, Good *et al.* 2005) indicates the number of spawners has not been replenished each year.

A viable population that includes naturally spawning hatchery fish should exhibit sufficient productivity from naturally-produced spawners to maintain population abundance at or above viability thresholds in the absence of hatchery subsidy. NMFS is not aware of any evidence indicating naturally spawning hatchery steelhead are substantially contributing progeny to the endangered Southern California DPS of steelhead. While extensive and widespread stocking of steelhead has occurred in southern California streams historically, hatchery steelhead are not currently planted in the DPS except upstream of long-standing barriers to anadromy (Boughton *et al.* 2007). Empirical evidence indicates the historical plants from Fillmore Fish Hatchery and hatcheries from northern California have not contributed substantively to the reproduction and perpetuation of native steelhead ancestry in southern California (Girman and Garza 2006). Regardless of the presence of hatchery fish, the natural productivity in the DPS is not sufficient to maintain abundance of the broad population above the minimum viability threshold.

A viable population should exhibit sufficient productivity during freshwater life-history stages to maintain its abundance at or above viable thresholds. As previously described, the number of adults in the subject DPS is considerably less than the minimum number of adults needed to maintain the viability of independent populations within the DPS (Boughton *et al.* 2007). Recent genetic studies document a decrease in effective population size and genetic diversity (Girman and Garza 2006), both of which indicate a reduction in freshwater productivity. Consequently, the level of production in freshwater has not been sufficient to maintain abundance of the broad population above the minimum viability threshold.

A viable population should not exhibit sustained declines in abundance that span multiple generations and affect multiple brood-year cycles. Evidence indicates abundance of wild steelhead in the Southern California DPS has declined dramatically (Busby *et al.* 1996, Good *et al.* 2005), and many watershed-specific extinctions of this species have been reported (Nehlsen *et al.* 1991, Boughton *et al.* 2005, Gustafson *et al.* 2007). Recent efforts to monitor abundance of adult run sizes in some of the larger watersheds continue to show either no, or extremely low, numbers of returns over a period of several years (*e.g.*, see Tables 6 and 7 below) or multiple generations (assuming a 3-year generation for steelhead). The broad population is not currently viable because estimated run sizes (500 or fewer individuals, Busby *et al.* 1996, Good *et al.* 2005) are considerably less than the minimum threshold needed for the DPS to be viable.

A viable population should not exhibit trends or shifts in traits that portend declines in population growth rate. Evidence indicates abundance of steelhead in the DPS has declined dramatically which suggests population growth rate of the Southern California DPS of steelhead has declined to precariously low levels (Busby *et al.* 1996, Good *et al.* 2005). Many watershed-specific extinctions of this species have been reported (Nehlsen *et al.* 1991, Boughton *et al.* 2005, Gustafson *et al.* 2007). Recent data show adult run sizes in some of the larger watersheds continue to show either no, or extremely low, numbers of returns (Table 5). The decrease in effective population size noted for southern California steelhead (Girman and Garza 2006) suggests a decline in population growth rate.

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).

Habitat patches should not be destroyed faster than they are naturally created. Anthropogenic activities and development have reduced the number of streams, and amounts of both instream and riparian habitat available to steelhead, causing a net decrease in the overall quantity and quality of steelhead habitat in the Southern California DPS (Nehlsen *et al.* 1991, NMFS 1997, Boughton *et al.* 2005, NMFS 2006). Additionally, anthropogenic activities, including flood-control facilities (*i.e.*, levees), have negatively impacted the natural geomorphic and fluvial processes within the Santa Clara and Ventura River watersheds, which has further degraded instream habitat for steelhead. The extensive loss and degradation of habitat is one of the leading causes for the decline of steelhead abundance in the Southern California DPS of steelhead and the listing of the species as endangered (NMFS 1997, 2006). Because human activities have been observed to continually diminish the quantity and quality of stream habitat within the range of the DPS, a negative trend on population viability is expected (McElhany *et al.* 2000).

Natural rates of straying among subpopulations should not be substantially increased or decreased by human actions. While there has been no systematic attempt to assess straying of adult steelhead in southern California streams, information suggests that anthropogenic activities have increased the potential of steelhead straying into non-natal streams. The rationale is based on the fact that because streams (or habitats needed for specific life-history functions) that used to support adult steelhead are no longer accessible to the adults (*e.g.*, Boughton *et al.* 2005), these adults would need to enter streams that are in fact accessible. Dispersal of steelhead has been documented in the Southern California DPS, for instance in the case of Topanga Creek and San Mateo Creek (NMFS 2002, Boughton *et al.* 2006). Increased stray rates due to inaccessibility or degradation of habitat would be expected to reduce population viability, particularly if the strays access unsuitable habitat or are breeding with genetically unrelated individuals (McElhany *et al.* 2000).

Some habitat patches should be maintained that appear to be suitable or marginally suitable, but currently contain no fish. In the Southern California DPS of steelhead, habitat has suffered destruction, modification, and reduction, and is generally not being maintained (e.g., Nehlsen *et al.* 1991, NMFS 1997, Boughton *et al.* 2005, Good *et al.* 2005, NMFS 2006). Within many stream reaches that are accessible to steelhead (but contain few or no fish), urbanization, exploitation of water resources, and flood-control facilities have substantially reduced the quality and the amounts of habitat for steelhead, making the populations more susceptible to environmental perturbations, and decreasing long-term viability of the DPS (McElhany *et al.* 2000, Boughton *et al.* 2005, Good *et al.* 2005).

Source subpopulations (i.e., population units) should be maintained. The habitat supporting source subpopulations within the DPS has been diminished in quality and quantity and is not being maintained. Flood-control channels, road crossings, water diversions, and dams have degraded habitat and eliminated migration (and gene flow) between subpopulation units in smaller basins and larger population units in larger basins (Good *et al.* 2005, Boughton *et al.* 2006).

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).

Human-caused factors such as habitat changes, harvest pressures, artificial propagation, and exotic species introduction should not substantially alter variation in species' traits. In the Southern California DPS, steelhead aquatic habitat and riparian habitat has been severely impacted, and anadromy has been either eliminated or reduced in many drainages due to a variety of anthropogenic factors (Boughton *et al.* 2005, Good *et al.* 2005, NMFS 2006). (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. Most of the migration barriers such as dams and water diversions do not have fish-passage facilities that adequately facilitate unimpeded migration of adult and juvenile steelhead (including remnant populations of residualized steelhead that reside upstream of long-standing barriers) to and from historic spawning and rearing areas and the ocean. This has resulted in anadromy being lost in a substantial number of basins within the DPS (Boughton *et al.* 2006).

Natural processes of dispersal should be maintained and human-caused factors should not substantially alter the rate of gene flow among populations. Anthropogenic factors have altered the rate of gene flow in the endangered Southern California DPS of steelhead. One such factor is the construction and ongoing presence of many impassable dams and barriers throughout the DPS that do not possess fish-passage facilities (Levin and Schiewe 2001). Dams and barriers prevent adult and juvenile steelhead from volitionally migrating throughout the watershed and reaching intended habitats. The natural processes of dispersal and natural gene flow are altered because adults cannot access historically used habitats upstream of dams, and juvenile steelhead trapped above dams cannot migrate to the ocean during the spring emigration. Another factor that has altered gene flow involves the numerous watershed-specific extinctions of steelhead in the Southern California DPS, many of which are related to anthropogenic activities (Nehlsen *et al.* 1991, Boughton *et al.* 2005, Gustafson *et al.* 2007).

Natural processes that cause ecological variation should be maintained. Much of the historical habitat for steelhead in southern California streams has been degraded, eliminated, simplified, and rendered inaccessible to the species (Nehlsen *et al.* 1991, Busby *et al.* 1996, Good *et al.*

2005), and existing habitats are not being maintained. When a species' habitat is altered, the potential for the habitat to promote ecological variation, and a species' ability to cope (and evolve) under fluctuating environmental conditions are also altered (McElhany *et al.* 2000). 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 southern California steelhead (Girman and Garza 2006).

In summary, the Southern California DPS of steelhead has been, and continues to be, severely impacted by anthropogenic factors, and this has negatively affected the abundance, productivity, spatial structure, and diversity of the entire DPS. This has led to an overall decline of the Southern California Steelhead DPS estimated to be over 95 percent (Good *et al.* 2005, Williams *et al.* 2011). Applying the foregoing evaluation and the guidelines as described by McElhany *et al.* (2000) suggests that the Southern California 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), and the formal listing determination for the species (NMFS 1997, 2006).

IV. ENVIRONMENTAL BASELINE

This section reviews the effects of past and present activities and factors leading to the current status of southern California steelhead and critical habitat within the action area. While the District undertakes AMP activities throughout the entirety of Ventura County, the action area with regard to southern California steelhead and designated critical habitat for this species lies within the Santa Clara River and Ventura River watersheds.

A. Status of Steelhead in the Action Area

1. 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 significantly based on recent monitoring (see Table 6), steelhead adults have continued to be observed in the Santa Clara River at the Vern Freeman Diversion and in areas downstream of the diversion. The most recent observations of three adult steelhead in the Santa Clara River occurred in March 2012 (D. Brumback, NMFS, pers. comm.). These counts underestimate the true number of adult steelhead due to various technical difficulties in operating the fish passage facility and observing fish passing through it (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 in most years (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, pers. obs.).

Recently, the NMFS Technical Recovery Team (TRT) identified the Santa Clara River steelhead population as a "Core 1" population essential for the successful recovery of the endangered Southern California Steelhead DPS. This was, 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 the TRT as having a high potential for being independently viable, and was ranked second among southern California steelhead watersheds for overall viability, based on watershed habitat conditions, reliable flows, and amount of habitat present.

Table 6. Numbers of steelhead adults and smolts recently 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, and 2011, Kelley 2008).

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

2. Ventura River Watershed

Within the Ventura River watershed prior to the completion of Matilija Dam in 1947, it is estimated that a minimum of 4,000 to 5,000 steelhead spawned in the Ventura River system in normal water years (Moore 1980). 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 significantly, 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 7; Casitas 2006, 2007, 2008, 2009, 2010, and 2011). 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 numbers 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 7. Numbers of steelhead upstream and downstream migrants recently detected at the Robles Diversion fish passage facility (sources: Casitas 2006, 2007, 2008, 2009, 2010, and 2011). Numbers in parentheses provide the average size of migrants. Casitas Municipal Water District defines "probable" fish as those whose silhouettes are similar to fish but were unable to be positively identified by the video recording.

Year	Upstream migrants	Downstream migrants
2006	6 (29 cm) plus 8 "probable"	19 "probable" (28 cm)
2007	na	na
2008	81 (55 cm) plus 6 adult	183 "probable" plus 3 adult
2009	55 (27 cm)	42 (23 cm)
2010	54	39
2011	101 (27 cm)	49 (27 cm)

Adult steelhead have been sighted upstream of the Robles Diversion in North Fork Matilija Creek during the same period. In the lower Ventura River, sightings of adult steelhead have occurred over the past 5 years, and spawning surveys performed by NMFS in winter and spring 2010, 2011, and 2012 confirmed the presence of large adult steelhead redds in the Ventura River mainstem downstream of San Antonio Creek (R. Bush, NMFS, pers. comm.). 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, and 2011), and in the lower reaches between San Antonio Creek and Foster Park (TRPA 2007, 2008, 2009).

The NMFS TRT recently identified the Ventura River steelhead population as a "Core 1" population essential for the successful recovery of the endangered Southern California 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 Southern California Steelhead DPS, the Ventura River steelhead population was ranked third for overall viability, based on watershed habitat conditions, reliable flows, and amount of habitat present.

B. Status of Critical Habitat within the Action Area

1. Santa Clara River Watershed

The Santa Clara River watershed, including Santa Paula Creek, Sespe Creek, Sisar Creek, Hopper Creek, and Piru Creek, contains about 180 miles of currently accessible spawning, rearing, and migratory habitat for steelhead, and represents a substantial proportion of critical habitat within the Southern California 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).

2. Ventura River Watershed

The Ventura River watershed, 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). 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. 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. 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. 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.

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

Population Units.—The endangered Southern California 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 and Ventura River watersheds are two population units within the DPS that possess the characteristics of being 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 Southern California DPS of steelhead, as described in further detail below.

Independence of the Santa Clara River and Ventura River populations.—The Santa Clara and Ventura River populations are considered to be independent populations (Boughton *et al.* 2006), and are therefore 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 and Ventura River population unit are considered to be independent populations is because 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 Southern California DPS of steelhead.

The value of the Santa Clara 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 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). In addition, the Santa Clara 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 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 the Santa Clara and Ventura River population units, which makes them crucial to the recovery of the broader DPS.

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

1. Dams and Water Diversions

The Santa Clara 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, it has been 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 located 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, pers. comm.).

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.*, 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). 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. 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 Santa Clara River watershed and increase the risk of species extinction (McElhany *et al.* 2000, Boughton *et al.* 2006).

2. 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 along the Santa Clara and Ventura rivers 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).

3. Flood-control Facilities

Santa Clara River Watershed.—Extensive areas of the watershed have been affected by flood-control facilities. The largest facilities are levees located 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. 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 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. As described in the Description of the Proposed Action, any responsibility for the operations and maintenance of this facility that may be assumed in the future by the District is considered under separate consultation with the Corps (NMFS Administrative Record Number 151422SWR2012PR00100). 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 Route (SR) 33 and SR-150).

Flood-control facilities such as levees and stabilized banks negatively affect salmonid habitat in several ways. 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). 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. Scour due to increased water velocities along levees and hardened banks also negatively affects recruitment of riparian vegetation (Schmetterling *et al.* 2001, Fischenich 2003). 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, pers. obs.).

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. 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.

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 all located 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, but there are other stabilized banks on the mainstem in the middle and lower reaches (Stan Glowacki, NMFS, 2010, pers. obs.), some of which have been constructed by other County agencies or private landowners. 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 had 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 growth and 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, pers. obs.). 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, pers. obs.). 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 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 Southern California DPS of steelhead would become extinct (Good *et al.* 2005, Boughton *et al.* 2006).

4. 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 (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 (Mary Larson, CDFG, pers. comm.). 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 (Mike Gibson, Casitas Water District, pers. comm.). Poaching can reduce the number of steelhead in the action area, which is a concern because the steelhead populations are small.

V. EFFECTS OF THE PROPOSED ACTION

This section describes the expected effects of the proposed action on endangered southern California 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.

A. Methodology for Determining Effects

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

Information Review and Synthesis.—NMFS reviewed existing materials pertaining to AMP activities provided by the Corps and the District. The materials included the District's PEIR for the AMP which provided: (1) an inventory of District facilities maintained per the AMP, including specific locations; and, (2) descriptions of all AMP 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 also 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. In addition, NMFS reviewed the analysis of effects of the proposed action provided by the Corps. NMFS also reviewed analyses of the effects of the proposed action found in the PEIR and in supplemental information provided by the District.

Exposure-Response-Risk Analysis.—Using the information obtained from the review and synthesis, NMFS performed an exposure-response-risk analysis to predict effects of AMP activities on critical habitat, and on steelhead within the action area. To perform this analysis, NMFS deconstructed the AMP actions 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 AMP activity. Then, NMFS determined the location, timing, duration, and frequency of exposure of critical habitat and steelhead to the direct and indirect physical, chemical, and biotic stressors (*e.g.*, loss of shade and cover) resulting from each category of AMP activity. NMFS subsequently determined the expected response of PCEs of critical habitat, and of steelhead, to effects of stressors resulting from AMP 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 PCEs of critical habitat, and observed effects of habitat changes on fish and aquatic habitat. Finally, NMFS assessed risk by evaluating the likely effects of the proposed action on steelhead within the action area based on the exposure and response framework described above. NMFS determined how the proposed action, when added to the environmental baseline conditions, will affect the fitness of individual steelhead. A general knowledge of physical, ecological, and biological processes, population dynamics and theory, life history traits, and habitat requirements of steelhead supplemented the analysis and information review, particularly when there was little or no information concerning effects of an impact on steelhead or the aquatic environment.

Jeopardy Assessment.—To assess whether the proposed action would jeopardize the continued existence of the endangered Southern California DPS of steelhead, NMFS considered information about the status and the current viability of the species at the DPS scale (presented in the Status of the Species and Critical Habitat section, and the Environmental Baseline section), information on how the proposed action is expected to adversely affect steelhead at the individual and population levels, and integrated the foregoing information in the Integration and Synthesis of Effects section. The environmental baseline provides reference conditions at the population scale to which NMFS adds the effects of the proposed action in the Integration and Synthesis of Effects section. In the Effects on Steelhead section, NMFS identifies the effects that individual steelhead are expected to experience as a result of the proposed action, and the expected response of steelhead to the effects based on their life history and habitat requirements. Finally, NMFS assessed whether the conditions expected to result from the proposed action, in combination with conditions influenced by other past and ongoing activities (as described in the Environmental Baseline), will affect steelhead at the individual level. The final steps in NMFS' jeopardy assessment are to evaluate first, whether consequences of the proposed action on steelhead growth and survival are reasonably likely to result in changes to the viability of the steelhead population units in the action area (*e.g.*, Santa Clara and Ventura River Watersheds), and then to the viability of the entire endangered Southern California DPS of steelhead.

Adverse Modification Risk Assessment.—The approach to determine whether the proposed action is likely to result in the destruction or adverse modification of designated critical habitat involved consideration of how the proposed action would affect elements of critical habitat identified as essential to the conservation of the species. In the Status of the Species and Critical Habitat section, our critical habitat assessment discusses the biological and physical features (primary constituent elements) of designated critical habitat that are essential to the conservation of the endangered steelhead DPS, the current conditions of such features, and the factors responsible for the current conditions. In the Environmental Baseline section, we discuss the current condition of critical habitat in the action area, the factors responsible for that condition, and the relationship of critical habitat found within the action area to the sum of critical habitat within the entire DPS and how this relates to the conservation of the endangered Southern California DPS of steelhead. In the Effects on Critical Habitat section, NMFS characterizes the effects of the proposed action on designated critical habitat in the action area and evaluates whether the designated critical habitat and primary constituent elements in the action area will continue to provide features and functions that support the biological requirements of steelhead, or will retain the current capacity to establish those features and functions. With regard to critical habitat, this biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR §402.02, which was invalidated by *Gifford Pinchot Task Force v. USFWS*, 378 F.3d 1059 (9th Cir. 2004), amended by 387 F.3d 968 (9th Cir. 2004). Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat. Therefore, in considering effects on critical habitat, NMFS assessed whether implementation of the proposed action would allow critical habitat to remain functional, or allow for primary constituent elements to become functionally established, serving the intended conservation role for the species.

B. Effects on Critical Habitat

1. Maintenance Activities at Stream Gages

The District owns and maintains several stream gages in the action area (Tables 1 and 3). Per the AMP methods and BMP 19, riparian vegetation is removed once every 2 years, and is only trimmed near the streambed with the root systems left intact to allow for re-growth and to reduce streambed erosion. The effects of maintenance activities at stream gauges are expected to involve periodic loss of shade, including filtered light, and overhanging cover/shelter in the active channel in the vicinity of the stream gauges. Because existing vegetation is cleared only within the vicinity of the stream gages, the effects are expected to be confined to the immediate vicinity of the affected stream gage. The total area to be cleared, at a maximum, includes six 100-foot-wide strips and one 150-foot wide strip over a 17-mile reach of the Ventura River and a 14-mile reach of the Santa Clara River (see Tables 1 and 3). This amount of vegetation clearing is not expected to appreciably alter the functional value of critical habitat for steelhead spawning, rearing, or migration, because effects are localized and vegetation in adjacent areas will continue to provide cover and shade for steelhead. Additionally, the effects of vegetation clearing near stream gauges are expected to be infrequent and temporary since the vegetation is trimmed only once every two years near the riverbed, and the root systems are left intact. Thus, the affected vegetation is expected to begin to re-grow shortly after trimming and eventually provide shade and cover over the active channel between trimming cycles. Consequently, stream gage maintenance is only expected to result in a temporary, discountable reduction in the overall quantity and functional value of the riparian zone near stream gauges and the effects on critical habitat are not expected to be significant. Additionally, dewatering of stream channels during vegetation trimming around stream gauges is not necessary because the work is performed during the dry season. Thus, effects to critical habitat from water diversion and dewatering are not expected during stream gage maintenance.

2. Maintenance of Flood-Control Channels and Debris Basins

Flood-control channels and debris basins are in ephemeral drainages that contain flowing water mainly during and shortly after rainstorms have subsided (VCWPD 2008). None of the flood-control channels and debris basins are within designated critical habitat for steelhead. The basin nearest critical habitat is the Fresno Canyon debris basin, which is 1,100 feet from the Ventura River, and the median distance from all debris basins to critical habitat is 4,550 feet. Steelhead are not expected to occur within flood control channels and debris basins because the channels and their outlets generally do not maintain connectivity with the Ventura 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, pers. obs., P. Lindsey, VCWPD, 2012, pers. comm.). Because the basins and flood-control channels are outside of designated critical habitat, direct effects on critical habitat from maintenance, repair, and cleanout of these facilities are not expected to occur. However, indirect effects on critical habitat from maintenance, repair, and cleanout of these facilities, and their access roads, are expected. Indirect effects include 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. Most (95 percent) of these flood-control channel outlets drain directly onto the outer banks and floodplains of the Ventura and Santa Clara River mainstem (VCWPD 2008).

To minimize indirect effects on critical habitat from maintenance of flood control facilities, and their access roads, the District would implement several BMPs as part of the proposed action. These include performing maintenance and cleanout of flood-control channels and debris basins in the dry season when flow is not present, implementing water diversions if flow is present, deploying sediment control devices (*e.g.*, silt fencing, straw bales) downstream of work areas to minimize sedimentation and turbidity releases into steelhead streams during and after maintenance, and checking heavy machinery for leaks prior to work within flood-control channels and basins. The BMPs are expected to avoid or minimize the release of fine sediments and resulting turbidity in streams that are designated critical habitat, and the biggest release of sediments from flood-control channels is expected to be temporary, occurring during rainstorms and periods of elevated turbidity, after which the channels will be free of loose substrates. Thus, the cleanout of flood-control channels and debris basins is expected to result in temporary and insignificant effects to critical habitat within the Ventura and Santa Clara rivers.

While maintenance activities in flood-control channels and debris basins are not expected to result in adverse effects to critical habitat in the Ventura and Santa Clara River, the ongoing presence and operation of these facilities is expected to perpetuate their existing effects into the future. The effects of operating these facilities include increased sedimentation and turbidity, and decreased supply of spawning gravels to downstream habitats. Because the majority of the materials removed from basins is sand and silt with a small proportion of gravel (P. Lindsey, VCWPD, 2012, pers. comm.), the adverse effects of reduced gravel supply on spawning habitat are expected to be discountable. In addition, some of the material removed from debris basins is returned to the river systems when placed for erosion repairs downstream. Because some of the flood-control channels run through urban and agricultural areas, the releases from these channels are expected to contain fine sediments, urban runoff, agricultural runoff, and 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). Because land-based runoff from flood-control channels is expected to occur generally during rainstorms when elevated periods of streamflow occur, adverse effects to critical habitat are expected to be temporary and discountable since rainstorms in southern California are typically short-lived, and the amount of runoff from flood-control channels is small compared to the discharge that would be expected within the Ventura and Santa Clara rivers during rainstorms.

3. Effects of Herbicides on Critical Habitat

As part of vegetation management activities, the District periodically uses herbicides to eliminate vegetation from select flood-control facilities, including LVMAs, flood-control channels, debris basins, and stabilized banks. Herbicides in or near steelhead stream channels are typically applied by personnel with backpack sprayers in areas where vegetation is less than 36-inches high, or on freshly cut vegetation. In areas outside of critical habitat (flood-control channels and debris basins) herbicides may be applied by personnel with backpack sprayers or using boom sprayers in areas not accessible to personnel with backpacks (i.e., steep banks). The effects of loss and reduction of vegetation due to herbicides are similar to those discussed above. To minimize the impacts of herbicides on steelhead critical habitat, the District employs several BMPs, including applying herbicides that are approved for aquatic use by the EPA (*e.g.*, Aquamaster and other glyphosate-based products) in or near stream channels, and in low concentrations that are non-toxic to aquatic species (1 percent).

The District frequently applies herbicides within dry areas and dry stream channels and infrequently in or near open water. Additionally, District personnel only spray foliage, and utilize minimal amounts of herbicides necessary to control vegetation in an attempt to reduce quantities of herbicide introduced into the environment. Thus, NMFS does not expect direct effects to critical habitat within the action area. Indirect effects to critical habitat are not expected because the active ingredient in the herbicides used by the District is glyphosate, which has been shown to bind firmly to soil particles and not runoff from land-based areas during rain events (Norris *et al.* 1991). Additionally, glyphosate is known to degrade completely in 2-to-3 months (Norris *et al.* 1991), 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 indirect adverse effects from herbicides on streams designated as critical habitat in the action area.

C. Effects on Steelhead

1. Maintenance of Flood-Control Channels and Debris Basins

Because flood-control channels and debris basins in the action area flow only during and shortly after rainstorms, and there is no fish passage connectivity between these facilities and the mainstem channels (S. Glowacki, NMFS 2010, pers. obs.), steelhead are not expected to be exposed to the proposed action within these facilities or their respective drainages. There have been no documented occurrences of steelhead or resident rainbow trout in or above any of the debris basins (P. Lindsey, VCWPD, 2012, pers. comm.). As a result, direct effects to steelhead during maintenance of these facilities are not expected. However, indirect effects on steelhead from maintenance of these facilities are expected to occur. Indirect effects would typically involve the release of fine sediments and turbid runoff during and shortly after rainstorms, from the drain outlets into the Ventura 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 predicted, they are not expected to be significantly higher than background levels within the mainstems during storm events due to the small size of these drainages compared to the size of the Santa Clara and Ventura River watersheds. Thus, the indirect effects on steelhead from the maintenance of these facilities, and the existing effects, are not expected to be significant in terms of reducing growth rates or survival of steelhead individuals. With regard to steelhead populations within the Santa Clara and Ventura River watersheds, the indirect effects of flood-control channels and debris basin maintenance are not expected to reduce the overall steelhead population.

2. Effects of Herbicides on Steelhead

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. Since glyphosate was developed in the 1970s, no adverse effects on fish or aquatic invertebrates have been documented (Giesy et al. 2000). Thus, in the infrequent cases in which herbicides are applied to open water, direct and indirect effects to steelhead are expected to be discountable. The application of herbicides at District facilities is not expected to reduce the overall steelhead population.

3. Effects of Water Diversion and Steelhead Relocation

Water diversions within an area inhabited by steelhead are expected to occur very infrequently (P. Lindsey, VCWPD, 2010 and 2012, pers. comm.). However, in the event that a diversion is required, dewatering of the immediate project area is expected to temporarily disrupt steelhead behavior patterns (*i.e.*, rearing, migrating) in the action area. Juvenile steelhead will not be able to rear in the dewatered area during project activities. 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.

While termination of flow will occur within dewatered areas, steelhead are unlikely to occur in areas that are dewatered, and steelhead rearing upstream and downstream of diversion sites are not expected to be affected. 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, pers. comm.). Steelhead may still migrate upstream and downstream through temporary diversions, though it is uncertain if they will do so. Any effects to upstream or downstream steelhead migration are expected to last approximately one week at each diversion site, as connectivity between the upstream and downstream will be restored after the water diversion is removed and creek flows are returned to the channel. Loss of aquatic habitat associated with dewatering and the impedance of migration through the action area will be temporary and is not expected to result in lethal effects, as steelhead will be able to use all aquatic habitat in the vicinity of the dewatered portion of channels, which is of similar quality as dewatered areas (K. Mull, NMFS, 2012, pers. obs.). Overall, effects to steelhead from water diversion are expected to be non-lethal, temporary, and confined to a small number of fish. The effects of the water diversion and relocation on steelhead are not expected to give rise to population-level effects.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. 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. Several future, state, local, or private actions are reasonably certain to occur within the Santa Clara River and Ventura River watershed. These include the Soledad Canyon Gravel mining operation, The Soledad Townhomes Project, The Keystone Master Homes Project, ongoing roads projects including widening of Interstate 5, the 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.

These future actions are expected to increase the potential for adverse effects to steelhead. Increasing the amount of impervious surfaces within the watershed would be expected to increase the 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 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.

VII. INTEGRATION AND SYNTHESIS OF EFFECTS

This section combines the effects of the environmental baseline with effects of the proposed action and cumulative effects. The purpose of this assessment is to develop an understanding of how the combined effects may affect steelhead and critical habitat for this species, the likelihood of survival and recovery of this species, and the functionality of critical habitat to serve the intended conservation role for the species. The methodology for this assessment involved identifying potential environmental effects associated with the actions listed in the Cumulative Effects section, integrating potential effects of these actions with the environmental baseline and expected effects of the proposed action, and qualitatively evaluating these combined effects on steelhead and critical habitat. Other factors that can cause a population to collapse and become extinct (*e.g.,* climate and environmental fluctuations) were included in the assessment as well as the status of steelhead, a brief summary of which is given below.

The larger river systems were the historical foundation for the Southern California DPS of steelhead. The Ventura 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 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 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 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 or anthropogenic disturbances, and possess a greater risk of extinction relative to large populations (Pimm *et al.* 1988, Berger 1990, Primack 2004). 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 and Ventura River watersheds to the conservation of endangered southern California 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 DPS. Overall, the Southern California DPS of steelhead is at a high risk of becoming extinct in the foreseeable future.

A. Summary of Effects of Past and Present Activities

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 and Ventura river watersheds. Additionally, anthropogenic activities are believed to have contributed to declines in steelhead abundance within the action area, and within the entire Santa Clara 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 in the mainstem of the Santa Clara and Ventura rivers, and upstream tributaries, including those upstream of man-made dams and diversions, has decreased. 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). The removal of the Matilija Dam, which is expected to occur within 20 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 that have reduced the population abundance to critically low levels and caused widespread degradation, destruction, and blockage of critical habitat for this species within these watersheds are expected to extend into the future.

As a result, the Southern California DPS of steelhead is expected to continue to have low viability and a high risk of extinction for the foreseeable future.

B. Summary of Effects of the Proposed Action

With regard to steelhead critical habitat, AMP activities proposed by the District are not expected to appreciably diminish the quantity and quality of critical habitat, or to adversely affect PCEs of critical habitat, including riparian vegetation, freshwater-rearing habitat, spawning habitat, and migratory habitat, on a permanent basis within the action area. In habitats currently not used by steelhead, the proposed action is not expected to eliminate riparian habitat patches that would be suitable for use by steelhead at some point in the future. The proposed supplemental BMPs are expected to be effective in avoiding or minimizing temporary adverse effects to migratory, spawning, and rearing habitat, or PCEs of critical habitat.

With regard to steelhead, supplemental BMPs are expected to avoid or minimize adverse effects, including harm, injury, and mortality of juvenile and adult steelhead. Consequently, the proposed action is not expected to adversely affect growth, survival, reproduction, and abundance of steelhead individuals in the action area. As a result, the proposed action is not expected to adversely affect population abundance, population growth rates, or population spatial structure of the endangered steelhead populations in the Santa Clara and Ventura rivers. Thus, the proposed action is not expected to decrease the overall viability of the Southern California DPS of steelhead.

VIII. CONCLUSION

After reviewing the best available scientific and commercial information, the status of the Southern California DPS of steelhead, the environmental baseline, expected effects of the proposed action, cumulative effects, and the combined effects of past and present activities, the proposed action, and actions that are reasonably certain to occur, NMFS concludes the proposed action is not likely to jeopardize the continued existence of the endangered Southern California DPS of steelhead, and is not likely to destroy or adversely modify critical habitat for this species.

IX. INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and 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 permit, the protective coverage of section 7(o)(2) may lapse. 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 the incidental take statement (50 CFR §402.14(i)(3)).

A. Amount or Extent of Take

NMFS believes the proposed action that will occur in the Ventura River and Santa Clara River watersheds, Ventura County, California, may result in the incidental take of steelhead. Incidental take would be in the form of harassment, harm, or mortality of steelhead during steelhead surveys and relocation. Based on activities outlined in the AMP and supplemental materials provided by the District, and field surveys of the Ventura River and Santa Clara River near District flood-control facilities included in the AMP, it is likely that there will be juvenile steelhead in areas where AMP activities are expected to take place. Therefore, NMFS anticipates the following amount of incidental take: on an annual basis for the five years that the RGP is valid, harassment and harm of no more than 20 juvenile steelhead in the action area taken during survey and relocation activities, and no more than 10% of juvenile steelhead shall be killed during survey and relocation activities. This level of mortality may be expected if relocation is necessary due to generally poor water quality in the action area, as described in the Environmental Baseline. The take limits in the foregoing are valid on an annual basis. No other incidental take of steelhead is anticipated as a result of the proposed action.

B. Effect of Take

In the biological opinion, NMFS concludes that the anticipated level of take associated with the proposed action is not likely to result in jeopardy to the endangered Southern California DPS of steelhead or destroy or adversely modify designated critical habitat for this species.

C. Reasonable and Prudent Measures

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

1. Employ a fisheries biologist for the purposes of monitoring AMP project areas and reconciling any condition that could harm or injure steelhead.

2. Notify NMFS of the work timetable and prepare monitoring reports.

D. Terms and Conditions

In order to be exempt from any prohibitions of section 9 of the ESA, the Corps must ensure that the District complies with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary:

1. The following terms and conditions implement reasonable and prudent measure No. 1.
   a. To reduce impacts to migrating adult and juvenile steelhead, the District shall accomplish all maintenance activities that require water diversion and dewatering of stream reaches between June 15 and October 31.
   b. The District shall retain a consulting biologist with expertise in the areas of salmonid biology and ecology; fish/habitat relationships; biological monitoring; and, handling, collecting, and relocating salmonid species during AMP activities requiring water diversion, dewatering of project areas, and steelhead capture and relocation. The biologist shall continuously monitor the work area and the dewatering area during water diversion, excavation and construction activities.
   c. Prior to, during and after the water diversion process, the District's biologist shall survey for steelhead within the construction area where the water diversion will take place. The District's biologist shall contact NMFS (Kristin Mull, 562-980-3265) and the Corps point of contact immediately upon making a determination that authorized take levels are likely to be exceeded. Prior to surveys and water diversion the District's biologist shall isolate the work area upstream and downstream of the diversion with block netting of mesh size 0.25-inches or less, and shall oversee the water diversion. While the workspace is being isolated from flowing water, the biologist shall survey the diversion area (including looking underneath boulders and debris) continuously, and again after isolation of the workspace to ensure that there are no steelhead stranded before any construction work begins. The biologist shall capture steelhead in the isolated wetted work areas, and then relocate steelhead to a suitable instream location (preferably pool habitat) within the nearest suitable habitat adjacent to the work area, where perennial flows are expected to be present. The biologist 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. 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 will be removed after the water diversion infrastructure is in place.
   d. During the diversion of flows, sandbags filled with washed sands and gravels will be used for the berms that will divert water away from the project area or, if applicable, into culverts around the AMP project areas. Concrete, grout, brick, and mortar shall not be used for the construction of diversions.
   e. Following AMP activities that require water diversion and dewatering, the District shall restore streamflows to the pre-project locations.
   f. All equipment shall be cleaned following use and prior to leaving the work site in order to prevent the spread of non-native vegetation and aquatic species. Washing shall not occur in stream channels or in proximity such that it could be washed into streams. At the maintenance yard, equipment and tools shall be inspected and cleaned prior to storage.

g. The District's biologist shall monitor AMP 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. In cases in which steelhead relocation is required, monitoring shall occur daily. The biologist shall be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat.

h. The District's biologist shall contact NMFS (Kristin Mull, 562-980-3265) immediately if one or more steelhead are found dead or injured. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required, and to discuss procedures to be used to handle or dispose of any dead steelhead.

2. The following terms and conditions implement reasonable and prudent measure No. 2.

   a. The District or its consultant shall notify NMFS (Kristin Mull, 562-980-3265) at least 10 working days prior to construction work and water diversion so NMFS can periodically observe activities. These observations may help in devising ways to reduce adverse impacts to steelhead and their habitat for future projects of similar nature.

   b. The District or its biologist shall provide a written report to NMFS (Kristin Mull, 562-980-3265) within 30 days following completion of AMP activities that require dewatering and 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 AMP activity area and vicinity before and after project action is complete. The District or its biologist shall also provide NMFS with full monitoring reports by August 1 of any given year while the RGP is valid, documenting AMP activities that occurred during the prior July 1-June 30 time period.

X. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, or to develop information.

1. The District should include in AMP monitoring reports estimates of areas cleared of vegetation, types of vegetation cleared, turbidity impacts of vegetation clearing and other project activities, amounts and types of herbicides applied, and associated impacts on vegetation or aquatic species.

2. The District 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.

XI. REINITIATION OF CONSULTATION

This concludes formal consultation on the actions outlined in the project proposal. As provided in 50 CFR §402.16, 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 take is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

XII. LITERATURE CITED

Alexander, G. R, and E. A. Hansen. 1986. Sand bed load in a brook trout stream. North American Journal of Fisheries Management 6:9–23.

Austin, A. P., G. E. Harris, and W. P. Lucey. 1991. Impacts of an organophosphate herbicide (glyphosate) on periphyton communities developed in experimental streams. Bulletin of Environmental Contamination and Toxicology 47(1): 29-35.

Barnhart, R. B. 1991. Steelhead (*Oncorhynchus mykiss*). *In* J. Stolz and J. Schnell (Editors), Trout, pages 324 to 336. Stackpole Books, Harrisburg, Pennsylvania.

Berger, J. 1990. Persistence of different-sized populations: an empirical assessment of rapid extinctions in bighorn sheep. Conservation Biology 4: 91-98.

Boughton, D. A., H. Fish, K. Pipal, J. Goin, F. Watson, J. Casagrande, J. Casagrande, and M. Stoecker. 2005. Contraction of the southern range limit for anadromous *Oncorhynchus mykiss*. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-380.

Boughton, D. A., P. B. Adams, E. Anderson, C. Fusaro, E. Keller, E. Kelley, L. Lentsch, J. Nielsen, K. Perry, H. Regan, J. Smith, C. Swift, L. Thompson, and F. Watson. 2006. Steelhead of the south-central/southern California coast: population characterization for recovery planning. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-394.

Boughton, D. A., P. B. Adams, E. Anderson, C. Fusaro, E. Keller, E. Kelley, L. Lentsch, J. Nielsen, K. Perry, H. Regan, J. Smith, C. Swift, L. Thompson, and F. Watson. 2007. Viability criteria for steelhead of the south-central and southern California coast. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-407.

Bowen, J. L., and I. Valiela. 2001. The ecological effects of urbanization of coastal watersheds: historical increases in nitrogen loads and eutrophication of Waquoit Bay estuaries. Canadian Journal of Fisheries and Aquatic Sciences 58:1489–1500.

Brookes, A. 1988. Channelized Rivers: Persepectives for Environmental Management. John Wiley and Sons Limited publishers. 326pp.

Bureau of Reclamation and United Water Conservation District. 2004. Biological assessment of the operations of Vern Freeman diversion dam and fish ladder, Santa Clara River. U.S. Department of the Interior, Fresno, California.

Busby, P. J., T. C Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U. S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-27, 261 pp.

Caffrey, J. M. 1996. Glyphosate in fisheries management. Hydrobiologia 340: 259-263.

Casitas Municipal Water District. 2006. 2006 Annual progress report of the Robles Diversion fish passage facility (draft). Casitas Municipal Water District. 66pp.

Casitas Municipal Water District. 2007. 2007 Annual progress report of the Robles Diversion fish passage facility. Casitas Municipal Water District. 41pp.

Casitas Municipal Water District. 2008. 2008 Progress report for the Robles Diversion fish passage facility. Casitas Municipal Water District. 54pp.

Casitas Municipal Water District. 2009. 2009 Robles fish passage facility progress report. Casitas Municipal Water District. 90pp.

Casitas Municipal Water District. 2010. 2010 Robles fish passage facility progress report. Casitas Municipal Water District. 156pp.

Casitas Municipal Water District. 2011. 2011 Robles fish passage facility progress report. Casitas Municipal Water District. 124pp.

Cayan, D. R., S. A. Kammerdiener, M. D. Dettinger, J. M. Caprio, and D. H. Peterson. 2001. Changes in the onset of spring in the western United States. Bulletin of the American Meteorological Society 82(3): 399- 415.

Chapman, D. W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117:1–21.

City of Ventura. 2003. Draft environmental impact report for the Avenue Water Treatment Plant/Foster Park Facility improvements project. Prepared by URS Corporation, Santa Barbara, California.

Cordone, A. J. and D. W. Kelley. 1961. The influences of inorganic sediment on the aquatic life of streams. California Fish and Game 47:189–228.

Cushman, R. M. 1985. Review of ecological effects of rapidly varying flows downstream from hydroelectric facilities. North American Journal of Fisheries Management 5: 330-339.

EDAW, Inc. 1978. Environmental impact report, Ventura River conjunctive use agreement. Prepared for Casitas Municipal Water District and City of Ventura.

Everest, F. H., R. L. Beschta, J. C. Scrivener, K. V. Koski, J. R. Sedell, and C. J. Cederholm. 1987. Fine sediment and salmonid production: a paradox. Pages 98–142 *in* E. O. Salo and T. W. Cundy, editors. Proceedings of the symposium streamside management: forestry and fishery interactions. University of Washington, Institute of Forest Resources, Seattle.

Fischenich, J. C. 2003. Effects of riprap on riverine and riparian ecosystems, ERDC/EL TR-03-4, U.S. Army Corps of Engineers Research and Development Center, Vicksburg, Massachusetts.

Giesy, J. P., S. Dobson, and K. R. Solomon. 2000. Ecotoxicological risk assessment for Roundup herbicide. Reviews of Environmental Contamination and Toxicology 167: 35-120.

Girman, D., and J. C. Garza. 2006. Population structure and ancestry of *O. mykiss* populations in South-Central California based on genetic analysis of microsatellite data. Final report of the National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California, for the California Department of Fish and Game Project No. P0350021 and Pacific States Marine Fisheries, Contract No. AWIP-S-1.

Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 pp.

Gregory, S. V., G. A. Lamberti, D. C. Erman, K. V. Koski, M. L. Murphy, and J. R. Sedell. 1987. Influences of forest practices on forest production. Pages 233–256 *in* E. O. Salo and T. W. Cundy, editors. Proceedings of the symposium streamside management: forestry and fishery interactions. University of Washington, Institute of Forest Resources, Seattle.

Gustafson, R. G., R. S. Waples, J. M. Myers, L. A. Weitkamp, G. J. Bryant, O. W. Johnson, and J. J. Hard. 2007. Pacific salmon extinctions: quantifying lost and remaining diversity. Conservation Biology 21: 1009-1020.

Hillman, T. W., J. S. Griffith, and W. S. Platts. 1987. Summer and winter habitat selection by juvenile Chinook salmon in a highly sedimented Idaho stream. Transactions of the American Fisheries Society 116: 185–195.

Karl, T. R., J. M. Melillo, and T. C. Peterson, (eds.). 2009. Global Climate Change Impacts in the United States. Cambridge University Press. Available from http://globalchange.gov/publications/371.

Karr, J. R., and I. J. Schlosser. 1978. Water resources and the land-water interface. Science 201: 229–234.

Kelley, E. 2008. Steelhead smolt survival in the Santa Clara and Santa Ynez River Estuaries. Prepared for the California Department of Fish and Game. University of California Santa Barbara. August 2008. 61 pp.

Levin, P. S., and M. H. Schiewe. 2001. Preserving salmon biodiversity. American Scientist 89: 220-227.

Leydecker, A. 2006. The state of the Ventura River. Review of water quality data collected from October 2005 through September 2006 with comparisons to previous data from 2001 to 2005. Santa Barbara Channel Keeper Ventura River Stream Team. Ventura , California. 64 pp.

Mann, J. F. 1975. History of ground water management in the United Water Conservation District. Presented at the Tenth Biennial Conference on Ground Water, Ventura, California, September 11, 1975.

McCarty, J. P. 2001. Ecological consequences of recent climate change. Conservation Biology 15(2): 320-331.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. NOAA Technical Memorandum, NMFS-NWFSC-42.

Meehan, W. R. and T. C. Bjornn. 1991. Salmonid distribution and life histories. *In* W. R. Meehan (Editor), Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats, pages 47-82. American Fisheries Society Special Publication 19, Bethesda, Maryland.

Moore, M. R. 1980. Factors influencing the survival of juvenile steelhead rainbow trout (Salmo gairdneri gairdneri) in the Ventura River, California. Masters Thesis. Humboldt State University. Arcata, California. 82 pp.

Mount, J.F. 1995. California rivers and streams: The conflict between fluvial process and land use. University California Press, Berkeley.

Moyle, P. B. 2002. Inland Fishes of California. Revised and Expanded. Berkeley: University of California Press. 502 pp.

National Marine Fisheries Service. 1997. Endangered and threatened species: listing of several evolutionary significant units (ESUs) of West Coast steelhead. Federal Register [Docket 960730210-7193-02, 18 August 1997] 62(159): 43937-43953.

National Marine Fisheries Service. 2003. Biological Opinion for construction of the Robles Diversion Fish Passage Facility issued March 31, 2003. 68 pp.

National Marine Fisheries Service. 2005. Endangered and threatened species: designated critical habitat for seven evolutionarily significant units of Pacific salmon and steelhead in California. Federal Register 70 (170): 52488-52586.

National Marine Fisheries Service. 2006. Endangered and threatened species: final listing determinations for 10 distinct population segments of west coast steelhead. Federal Register 71(3): 834-862.

National Marine Fisheries Service. 2007. Biological Opinion for Matilija Dam Ecosystem Restoration Project issued March 29, 2007. 66 pp.

National Marine Fisheries Service. 2008a. Biological Opinion for the Federal Energy Regulatory Commission's relicensing of the Santa Felicia Dam Hydroelectric Project issued May 5, 2008. 127pp.

National Marine Fisheries Service. 2008b. Biological Opinion for the operations of the Freeman Diversion by the United Water Conservation District. 98pp plus appendices.

National Marine Fisheries Service. 2011. 5-Year review: summary and evaluation of Southern California Coast steelhead distinct population segment. Southwest Region, Long Beach, California. 27 pp.

Nehlsen, W., J.E. Williams, and J.A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16: 4-21.

Norris, L.A., Lorz, H.W., and S.V. Gregory. 1991. Forest Chemicals. *In* W. R. Meehan (Editor), Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats, pages 207 to 296. American Fisheries Society Special Publication 19, Bethesda, Maryland.

Outland, C. F. 1971. Letter to M. R. Moore, November 8, 1971.

Padre Associates Incorporated. 2009. Santa Clara River Levee Certification Freeman Diversion to Bailard Landfill-Vegetation Management Area and Levee Gap Area Biological Survey Report. Prepared for the Ventura County Watershed Protection District. September 2009. 29 pp. with appendices.

Pimm, S. L., H. L. Jones, and J. Diamond. 1988. On the risk of extinction. American Naturalist 132: 757-785.

PRBO Conservation Science. 2011. Projected effects of climate change in California: ecoregional summaries emphasizing consequences for wildlife. Version 1.0. February.

Primack, R. 2004. A primer of conservation biology, 3rd edition. Sinauer Associates, Inc., Sunderland, MA.

Quist, M. C., P. A. Fay, C. S. Guy, A. K. Knapp, and B. N. Rubenstein. 2003. Military training effects on terrestrial and aquatic communities on a grassland military installation. Ecological Applications 13: 432-442.

Schmetterling, D. A., C. G. Clancy and T. M. Brandt. 2001. Effects of riprap bank reinforcement on stream salmonids in the Western United States. Fisheries 26(7): 6-13.

Shapovalov, L. and A. C. Taft. 1954. The life histories of the steelhead rainbow trout *(Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. State of California, Department of Fish and Game, Fish Bulletin 98.

Snyder, M. A., and L. C. Sloan. 2005. Transient future climate over the western United States using a regional climate model. Earth Interactions 9: Paper No. 11.

Spence, B., G. A. Lomnicky, R. M. Hughes, and R. P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. Management Technology Environmental Research Services Corp., Corvallis, Oregon.

Spina, A. P. 2007. Thermal ecology of juvenile steelhead in a warm-water environment. Environmental Biology of Fishes 80: 23-34.

Thomas R. Payne & Associates. 2007. Steelhead population and habitat assessment in the Ventura River/Matilija Creek Basin. 2006 Final Report by Mark Allen, Scott Riley, and Tom Gast to the Ventura County Flood Control District, Ventura, CA. 87 pp.

Thomas R. Payne & Associates. 2008. Steelhead population and habitat assessment in the Ventura River/Matilija Creek Basin. 2007 Final Report by Mark Allen to the Ventura County Flood Control District, Ventura, CA. 68 pp.

Thomas R. Payne & Associates. 2009. Steelhead population assessment in the Ventura River/Matilija Creek Basin. Draft 2008 Summary Report by Mark Allen to the Ventura County Flood Control District, California Department of Fish & Game, Matilija Coalition, and Patagonia, Inc. 30pp

Titus, R. G., D. C. Erman and W. M. Snider. 2001. History and status of steelhead in California coastal drainages south of San Francisco Bay. *In Preparation* Draft.

U. S. Army Corps of Engineers. 2004. The Matilija Dam Ecosystem Restoration Feasibility Study. Final Report Appendix D. Hydrologic, Hydraulic, and Sediment Studies, September 2004.

U. S. Army Corps of Engineers. 2009. Engineering and design: Guidelines for landscape planting and vegetation management at levees, floodwalls, embankment dams, and appurtenant structures. Engineering Technical Letter 1110-2-571, April 10, 2009.

United Water Conservation District. 2007. Fish passage monitoring and studies, Vern Freeman Diversion Facility, Santa Clara River, Annual Report 2007 Monitoring Season. United Water Conservation District, Santa Paula, California.

United Water Conservation District. 2008. Fish passage monitoring and studies, Vern Freeman Diversion Facility, Santa Clara River, Annual Report 2008 Monitoring Season. United Water Conservation District, Santa Paula, California.

United Water Conservation District. 2009. Fish passage monitoring and studies, Vern Freeman Diversion Facility, Santa Clara River, Annual Report 2009 Monitoring Season. United Water Conservation District, Santa Paula, California.

United Water Conservation District. 2010. Fish passage monitoring and studies, Vern Freeman Diversion Facility, Santa Clara River, Annual Report 2010 Monitoring Season. United Water Conservation District, Santa Paula, California.

United Water Conservation District. 2011. Fish passage monitoring and studies, Vern Freeman Diversion Facility, Santa Clara River, Annual Report 2011 Monitoring Season. United Water Conservation District, Santa Paula, California.

Ventura County Watershed Protection District. 2008. Environmental Protection Measures for the Ongoing Routine Operations and Maintenance Program. Final Program Environmental Impact Report. State Clearinghouse No. 2002091107.

Warren, C. E. 1971. Biology and Water Pollution Control. 1st edition, W.B. Saunders Company, Philadelphia, Pennsylvania. 434 pp.

Weaver, L. A., and G. C. Garman. 1994. Urbanization of a watershed and historical changes in a stream fish assemblage. Transactions of the American Fisheries Society 123:162–172.

Westerling, A. L., and B. P. Bryant. 2008. Climate change and wildfire in California. Climatic Change 87:S231-S249.

Williams, T.H., S.T. Lindley, B.C. Spence, and D.A. Boughton. 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 20 May 2011, update to 5 January 2011 Report. Southwest Region National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California. 98 pp.

Appendix A

Best management practices relative to steelhead as found in the District's PEIR and revised July 12, 2012

BMP 1. Avoid Channel Work During the Rainy Season. Routine maintenance and repair activities in earthen channels and in channels with soft bottoms and bank protection shall not occur during the rainy season 1 December to 1 April to avoid work when water could be present in the drainage due to runoff. Routine maintenance and repair activities may occur during this period if water is absent from the drainage because of low runoff conditions, or activities can be performed without working in flowing water. Work in flowing water during this period may proceed if there are no feasible alternatives and completion of the maintenance work during this time period is critical. The District shall immediately notify CDFG, USFWS, and NMFS if maintenance work in flowing water is considered critical. Work in flowing water shall be conducted according to the BMPs established in the Water Diversion Guide attached as Appendix E to this EIR.

BMP 2. Prevent Discharge of Silt-Laden Water During Concrete Channel Cleaning. The removal of sediments, vegetation, algae, and trash from fully lined improved channels for purposes of NPDES storm water permit compliance shall include measures to prevent the discharge of silt-laden water or pollutants to downstream unimproved channels with soft bottoms (Board Order No. 00-108; NPDES Permit No. CAS004002, adopted on July 27, 2000). These measures may include temporary downstream silt barriers (sand bags, straw bales, in-channel materials), silt fences, upstream diversion, etc. Per Section 401 Water Quality Certification requirements, a Water Diversion Plan would be needed for water diversion activities.

BMP 5. Survey for Steelhead Migration Conditions Prior to Routine Maintenance Work. Prior to maintenance and repair activities in a channel that require the diversion of stream flow, work in flowing water, or work within 100 feet of flowing water on the Ventura River, San Antonio Creek, Thatcher Creek, Santa Clara River, Santa Paula Creek, Sespe Creek, Hopper Creek, Pole Creek (unlined portions), and Piru Creek, a qualified biologist shall survey the diversion area for steelhead and steelhead redds before diversion takes place. Surveys for all sensitive aquatic species in the project area (i.e. California red-legged frogs including egg masses and tadpoles, Arroyo chub, Arroyo toad, and Southwestern pond turtle) shall also be conducted. The District shall immediately notify CDFG, USFWS, and/or NMFS for consultation on specific mitigation actions upon finding sensitive species within or immediately adjacent to any work area. Channel cleanout shall be postponed until the channel is dry if possible. If channel cleanout is considered critical and further delay is not possible, the District shall notify CDFG and NMFS before diverting water and relocating any steelhead that may be present in the work area. The District will follow the Water Diversion Guide provided in Appendix E of the Final Program Environmental Impact Report (May 2008).

BMP 6. Survey for Steelhead Rearing Habitat Prior to Routine Maintenance Work. Prior to maintenance and repair activities in a channel that requires the diversion of stream flow, work in flowing water, or work within 100 feet of flowing water on the Ventura River, San Antonio Creek, Thatcher Creek, Santa Clara River, Santa Paula Creek, Sespe Creek, Hopper Creek, Pole Creek (unlined portions), and Piru Creek, a District biologist or consulting biologist shall survey for steelhead in the work area or within 100 feet of the work area. If steelhead are not present, the work may proceed. If steelhead are present, the District shall follow avoidance and/or relocation procedures approved by NMFS for such maintenance work if the work will occur while fish are present.

BMP 9. Aquatic Pesticide BMPs. The District shall follow the most up-to-date Best Management Practices (BMPs) and the monitoring and reporting requirements in the District's NPDES Stormwater Quality Management Plan (Board Order No. 00-108; NPDES Permit No. CAS004002, adopted on July 27, 2000, available at http://vcstormwater.org/documents/ workproducts/ stormwater_quality_mangement_plan.pdf) when applying herbicides to channels and basins. The District shall also follow BMPs in its Herbicide Manual. The Ventura County Application Protocol for Pesticides, Fertilizers, and Herbicides (included in Appendix I).

BMP 10. Leave Vegetation on Upper Debris Basin Slopes. The District shall not remove established vegetation on the basin slopes above the 20 percent capacity debris line except as follows: (1) the vegetation is non-native; (2) shrubs and trees become hazards to the stability and function of the basin; (3) the sediment meets or exceeds the 20 percent capacity line; (4) slope re-grading is required to correct or prevent rill erosion or other damage, (5) the vegetation is located on engineered fill, or (6) vegetation constitutes a fire hazard to nearby properties.

BMP 11. Leave Patches of Vegetation in Channel Bottom. The District shall minimize vegetation removal or reduction from earthen or earthen bottom channels to the least amount necessary to achieve the specific maintenance objectives for the reach. Vegetation removal in the channel bottom shall be conducted in a non-continuous manner, allowing small patches (e.g., 10' by 25') of in-channel vegetation to persist provided it will not adversely affect conveyance capacity.

BMP 12. Leave Herbaceous Wetland Vegetation in Channel Bottom. Consistent with the maintenance objectives, the District shall avoid removal or reduction of emergent herbaceous wetland vegetation on the channel bottom that is rooted in or adjacent to the low flow channel or a pond in order to provide cover for aquatic wildlife. This same type of vegetation shall be protected during the removal of taller obstructive woody vegetation on the channel bottom.

BMP 13. Maximum 15-foot Vegetation-Free Zone at the Toe of the Bank. When reducing or removing vegetation from channel banks or bottoms for the sole purpose of visual access to inspect the toe of levee and non-levee slopes with riprap or concrete, the District shall treat a maximum 15-foot wide zone from the base of the slope into the channel bottom.

BMP 14. Avoid Road Base Discharge. The District shall implement measures to prevent the discharge of road base, fill, sediments, and asphalt beyond a previously established road bed when working adjacent to channels and basin bottoms.

BMP 15. Mitigate/Replace Temporary Impacts to Habitat. For repair of in-channel structures and features that results in the temporary disturbance of native wetland or riparian vegetation adjacent to the facility, the District shall restore native wetland or riparian vegetation in the affected work areas after the repair or reconstruction work. Restoration shall include planting or seeding native plants that were present prior to the work and/or are compatible with existing riparian vegetation near the work area. The District shall prepare a restoration plan for each repair project that specifies the limits of restoration, planting mix and densities, performance criteria for survival and growth, and at least a three-year maintenance and monitoring procedures. Restoration sites shall be located outside the limits of the repaired structure. If no suitable restoration site is available near the work area or the creation of a restoration area near the work area would conflict with flood control needs, the District shall select another location on District right-of-way in close proximity. If suitable restoration sites are not available, the District shall provide funds to a third party (public agency or non-profit organization) to implement the required mitigation in the same watershed as the impact. Habitat restoration under this BMP shall only occur if the affected areas support native wetland or riparian vegetation; no restoration is required for barren areas or areas dominated by non-native plants. The District shall submit all habitat restoration plans to CDFG, USFWS, and NMFS prior to implementation. The District provides mitigation plans in the Annual Work Plan in April of each year. Restoration plans are required to conform with the Army Corps of Engineers Los Angeles District's Habitat Mitigation and Monitoring Guidelines.

BMP 17. Concrete Wash-Out Protocols. The District shall implement appropriate waste management practices during on site concrete repair operations. Waste management practices will be applied to the stockpiling of concrete, curing and finishing of concrete as well as to concrete wash-out operations. Waste management practices shall be adequate to ensure that fluids associated with the curing, finishing and wash-out of concrete shall not be discharged to the channel or basin. Concrete wastes shall be stockpiled separately from sediment and protected by erosion control measures so that concrete dust and debris are not discharged to the channel or basin. The District shall determine the appropriate waste management practices based on considerations of flow velocities, site conditions, availability of erosion control materials and construction costs.

BMP 18. Water Diversion Guide. Water diversion activities undertaken as part of routine repair and maintenance operations in improved and unimproved channels as well as debris basins shall follow the BMP guidance established as the Water Diversion Guide incorporated into this EIR.

BMP 19. Minimize Erosion from Stream Gage Maintenance. During stream gage maintenance activities, vegetation shall be cleared from channel banks by cutting with chainsaw only. Vegetation removal shall be kept to the minimum necessary (e.g., 50' upstream and downstream of each gage, from top of bank to top of bank) to allow gages to function and provide accurate data. The vegetation roots shall be left intact and not be sprayed with herbicide as a measure to minimize potential erosion of cleared channel banks.

BMP 21. Avoid Spills and Leaks. The District shall ensure that all equipment operating in and near a watercourse, or in a basin, is in good working condition and free of leaks. No equipment maintenance or refueling shall occur in a channel or basin bottom. Spill containment materials must be on site or readily available for any equipment maintenance or refueling that occurs adjacent to a watercourse. In addition, all maintenance crews working with heavy equipment shall be trained in spill containment and response.

BMP 22. Biological Surveys in Appropriate Habitat Prior to Vegetation Maintenance. Prior to any sediment removal, vegetation control (by herbicide application, mowing, or discing), or repair work in earthen or earthen bottom channels and basins that contain native aquatic, riparian, or wetland habitats suitable for sensitive fish and wildlife species, the District shall retain a qualified biologist to conduct appropriate field investigations to determine if any threatened, endangered, or sensitive species are present. If such species are determined to present in 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 the species are present or in proximity to the work areas, the District shall develop other avoidance or relocation measures in consultation with the CDFG, USFWS, or NMFS prior to conducting the work. If the work could affect state or federally listed species or their habitat, the District would employ avoidance or relocation measures approved by USFWS, NMFS, or CDFG, as appropriate, for the maintenance program. This measure includes protection for the following threatened, endangered, or sensitive species that could occur at maintenance sites: tidewater goby, southern steelhead, trout, unarmored threespine stickleback, California red-legged frog, arroyo toad, least Bell's vireo, southwestern willow flycatcher, arroyo chub, southwestern pond turtle, two-striped garter snake, Cooper's hawk, sharp-shinned hawk, yellow warbler, yellow breasted chat, purple marlin, tri-colored blackbird, and long-eared owl.