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

September 25, 2019 **Refer to NMFS No**: WCRO-2019-01650

Aaron O. Allen, Ph.D.
Army Corps of Engineers – North Coast Branch
60 South California Street, Second Floor
Ventura, California 93001

Re: Endangered Species Act Section 7(a)(2) Biological Opinion for the Pismo Creek RV Resort in Pismo Beach, California

Dear Dr. Allen:

NOAA's National Marine Fisheries Service (NMFS) hereby transmits the enclosed biological opinion pursuant to Section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 *et seq*.) for the U.S. Army Corps of Engineers' (Corps) permitting of the Pismo Creek RV Resort's proposed bank stabilization (proposed action) along a segment of the Pismo Creek estuary, in the City of Pismo Beach, California. This biological opinion addresses the effects of the proposed action on the federally threatened South-Central California Coast (SCCC) Distinct Population Segment (DPS) of steelhead (*Oncorhynchus mykiss*) and designated critical habitat for this species in accordance with Section 7 (a)(2) of the ESA.

The biological opinion concludes that the proposed action is not likely to jeopardize the continued existence of the threatened SCCC DPS of steelhead or destroy or adversely modify designated critical habitat for this species. NMFS believes the proposed action is likely to result in incidental take of threatened steelhead and, therefore, the attached incidental take statement includes the amount and extent of anticipated incidental take with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to minimize and monitor incidental take of threatened steelhead.

Updates to the regulations governing interagency consultation (50 CFR part 402) will become effective on September 26, 2019 [84 FR 44976]. Because this consultation was pending and will be completed prior to that time, we are applying the previous regulations to the consultation. However, as the preamble to the final rule adopting the new regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." Thus, the updated regulations would not be expected to alter our analysis.

Please contact Matt McGoogan at NMFS' Southern California Branch of the California Coastal Office in Long Beach, 562-980-4026 or at Matthew.McGoogan@noaa.gov, if you have a question concerning this Section 7 consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Administrative File: 151422WCR2019CC00059
Dennis Michnuik, CDFW, San Luis Obispo
Emma Ross, Corps, Ventura

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

Pismo Creek RV Resort Bank Stabilization

NMFS Consultation Number: WCR-2019-01650

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

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

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: September 24, 2019

Table of Contents

1.0 INTRODUCTION 3
1.1 Background 3
1.2 Consultation History 3
1.3 Proposed Action 4
1.3.1 Interrelated and Interdependent Actions 6
1.4 Action Area 6
2.0 ENDANGERED SPECIES ACT: INCIDENTAL TAKE STATEMENT 7
2.1 Analytical Approach 7
2.2 Rangewide Status of the Species and Critical Habitat 8
2.2.1 Status of the Species 8
2.2.2 General Life History of Steelhead 10
2.2.3 Steelhead Habitat Requirements 10
2.2.4 Status of Designated Critical Habitat 11
2.2.5 Influence of a Changing Climate on the Species 13
2.3 Environmental Baseline 13
2.3.1 Status of Aquatic Habitat in the Action Area 14
2.3.2 Status of Steelhead in the Action Area 14
2.3.3 Factors Affecting Species Environment in the Action Area and Vicinity 14
2.4 Effects of the Action 15
2.4.1 Effects of the Action on Critical Habitat for SCCC Steelhead 15
2.4.1.1 Alteration of Aquatic Habitat 15
2.4.1.2 Alteration of Estuary Banks and Channel Bed 16
2.4.1.3 Alteration of Water Quality 17
2.4.1.4 Distrubance to Near Channel Vegetation 17
2.4.2 Effects on SCCC Steelehad 18
2.4.2.1 Capture and Relocation of Steelehad 18
2.4.2.2 Temporary reduction in the availability of forage, living space, and cover 19
2.4.2.3 Steelhead Movement and Migration 19
2.4.2.4 Altered Water Quality 20
2.4.2.5 Alteration of channel shading 20
2.5 Cumulative Effects 20
2.6 Integration and Synthesis 21
2.7 Conclusion 22
2.8 Incidental Take Statement 22
2.8.1 Amount or Extent of Take 22
2.8.2 Effect of the Take 22
2.8.3 Reasonable and Prudent Measures 22
2.8.4 Terms and Conditions 23
2.9 Conservation Recommendations 24
2.10 Reinitiation of Consultation 24
3.0 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW 24
3.1 Utility 24
3.2 Integrity 25
3.3 Objectivity 25
4.0 REFERENCES 25

1. INTRODUCTION

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

1.1 Background

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

Updates to the regulations governing interagency consultation (50 CFR part 402) will become effective on September 26, 2019 [84 FR 44976]. Because this consultation was pending and will be completed prior to that time, we are applying the previous regulations to the consultation. However, as the preamble to the final rule adopting the new regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." Thus, the updated regulations would not be expected to alter our analysis.

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

1.2 Consultation History

On February 20, 2019, NMFS received the U.S. Army Corp of Engineer's (Corps) request for formal consultation under Section 7 of the ESA. The request involves the Corps' permitting of the Pismo Creek RV Resort's (Resort) proposed stabilization of a segment of the Pismo Creek Estuary (proposed action), in the City of Pismo Beach, California. The proposed action is of concern because Pismo Creek is within the range of the threatened South-Central California Coast (SCCC) Distinct Population Segment of steelhead (*Oncorhynchus mykiss*) and is designated critical habitat for the species. The Corps determined the proposed action may affect steelhead and critical habitat.

After careful review of the Corps' consultation request, NMFS determined additional information was necessary to develop a clear understanding of the proposed action's potential effects on steelhead and designated critical habitat for this species (50 CFR § 402.13). To this end, NMFS sent the Corps a letter dated March 22, 2019, outlining the additional information necessary to initiate consultation.

On April 17, 2019, NMFS met with the Corps and Resort representatives at the project site on Pismo Creek to discuss the proposed action and potential additional project modifications and minimization measures.

On April 23, 2019, NMFS received the Corps' electronic correspondence transmitting supplemental information on the proposed action. NMFS determined this supplemental information was sufficient to develop a clear understanding of the proposed action, including the effects of the action. As such, formal consultation was initiated on the same day.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR §402.02).

Overview of the Proposed Action: The proposed action involves the Corps' permitting of the Resort's proposed activities for stabilizing an approximately 900-foot section of the southeastern bank along the upper portion of the Pismo Creek Estuary. The proposed action is necessary to alleviate further deterioration of the embankments and prevent loss of Resort property and facilities. The primary method of stabilization involves installing rock slope-protection (RSP) and covering the RSP with a bioengineered layer of soil and native riparian plantings. Best-management practices (BMP) are incorporated into the proposed action and will be implemented while the stabilization activities are being undertaken. Construction of the proposed action is expected to be completed during one season, with all in-channel work to occur between June 1 and October 31. General categories of activities associated with the proposed action involve: (1) dewatering the work areas, (2) construction in the dry, and (3) post-construction. Each of these categories is summarized as follows. For greater detail on these activities refer to the biological assessment (KMA 2018) for the proposed action.

1. Dewatering work areas:

To prepare for construction in dry conditions, the Resort proposes to isolate the work areas from surface water. Activities associated with dewatering involve the following.

- Having two or more biologists with extensive experience in steelhead ecology and handling steelhead (hereafter referred to as "steelhead biologists") onsite during dewatering to: (1) provide pre-construction training to workers on steelhead biology, minimization measures, and permit conditions; (2) oversee work-area isolation and dewatering activities; and, (3) relocate any steelhead captured from dewatered areas.

- Isolating work areas in 100-foot segments will be completed in succession (i.e., only one 100-foot segment will be dewatered at a time) moving from the downstream extent of the treated bank toward the upstream boundary to reduce the duration an area is dewatered and the size of that area.

- Isolating work areas through installation of a water-filled bladder-dam positioned parallel to and approximately 30-feet out from the bank. In this position the dam will extend less than ½ the width of the wetted channel allowing the free flow of water and

unimpeded passage of aquatic species around the work area.

- The steelhead biologists sweeping a seine from the shoreline's edge out toward the center-line of the channel.

- Installing a block-net immediately behind the seine once in the center of the channel to prevent steelhead from re-entering the work area.

- The steelhead biologists using seines and dip nets in the isolated area behind the block-net to remove any aquatic animals (including steelhead) that may still be in the work area and relocating those individuals into the adjacent estuary.

- Positioning the bladder dam behind the block net and gradually filling with water until the dam isolates the work area and the block nets can be removed.

- Using pumps with screened intakes (wire mess no larger than 0.094-inches) to slowly dewater the work area. As dewatering occurs, steelhead biologists will be present to relocate any remaining steelhead found in the work area to the adjacent estuary.

- Pumping water from isolated work areas (if turbid) to on-site settling tanks to allow settling of suspended sediment prior to returning the water to Pismo Creek.

- Limiting de-watering activities between June 1 and October 31 to avoid the primary steelhead migration season and conduct work when streamflow into the action area is typically lowest.

- Each work area remaining dewatered for approximately two weeks while in-channel construction is complete.

2. Construction Activities:

- Having a steelhead biologist present during construction to monitor project activities and implement minimization measures (e.g., installing erosion and sediment-control devices). The biologist will have the authority to halt work activities as necessary to ensure existing BMP are installed and functioning properly as well as recommend and/or implement any necessary additional measures to avoid and minimize adverse effects to SCCC steelhead and critical habitat for this species.

- Removing up to 19 trees while leaving at least 15 large willow and two large pine trees in place.

- Installing ungrouted ¼ to ½ ton RSP in an approximately 6-foot wide and 6-foot deep trench excavated along the base of the estuary's bank.

- Backfilling the RSP with native soil.

- Overlaying a porous geogrid fabric on the backfilled bank above the RSP.
- Installing at least 3 to 5 root-wads (salvaged onsite) within the RSP and geogrid.
- Backfilling an additional layer (one to two feet) of soil over the geogrid.
- Re-grading the estuary's bed to pre-construction elevations and contours.
- Slowly deflating and re-watering the finished work area.
- Repeating this dewatering and construction process (described above) for each 100-foot work area (about 9 times) until the entire proposed length (900-foot) of bank treatment is complete.

3. Post-Construction:

- Extensive planting and seeding of any disturbed areas and the new bank immediately after construction with a combination of trees from pots, willow and cottonwood cuttings, and a native seed mix.
- Providing NMFS with a written post-construction summary. This summary will include (1) the location and description the work area, (2) the starting and ending dates of construction, (3) description and photos of the work completed and BMP implemented, (4) the number of SCCC steelhead relocated from the work area and documentation of any mortality, and (5) a description of the instructions and recommendations the steelhead biologist provided during construction.
- Conducting annual monitoring for 5-years after construction is complete for the purpose of documenting and reporting the progress of re-vegetation and overall site recovery. The annual report will be submitted to NMFS and the Corps by December 31st of each of the 5 years.

1.3.1 Interrelated and Interdependent Actions

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

1.4 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The action area encompasses the riparian corridor to the top of bank and includes a total of about 1200 linear feet of Pismo Creek along the estuary near the mouth of the creek in Pismo Beach, California. The upper extent of the action area begins about 1000-feet up-channel from the Highway 1 Bridge crossing and extends to about 200-feet down-channel from this bridge. The action area includes the (1) 900-foot segment of estuary bank and channel that will undergo construction and (2) 300-foot segment of estuary immediately down-channel from the construction area where effects of the proposed action such as elevated turbidity are anticipated to extend. The Resort estimates the proposed action will result in permanent impacts to 40 linear feet (0.005 acre) of bank and temporary impacts up to 887 linear feet (.0.26 acres) of bank within the action area.

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

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

2.1 Analytical Approach

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

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This biological opinion relies on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. We finalized, as of March 14, 2016, the following regulatory definition: destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (Final Rule, 81 FR 7214).

The designation of critical habitat uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414; February 11, 2016) replace this term with physical or biological features (PBF). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of

whether the original designation identified PCE, PBF, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach conclusions regarding the jeopardy and adverse modification standards.
- If necessary, define a reasonable and prudent alternative to the proposed action.

The primary document that the Corps submitted for NMFS consideration in the development of this biological opinion is the biological assessment (KMA 2018) for the proposed action. This biological assessment provides a detailed description of the proposed action, engineering designs, potential effects of the action on steelhead and critical habitat for this species, and measures to minimize these effects. The biological assessment also included a (1) Habitat Mitigation and Monitoring Plan, (2) Project Construction and Dewatering Plan, and (3) Species Protection and Relocation. To further inform the assessment of potential effects on threatened steelhead and designated critical habitat, NMFS relied on relevant ecological literature, documented in the official record for the proposed action, and NMFS' own field observations during a recent site visit (April 2019) of the action area.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of threatened steelhead, as determined by the level of extinction risk that the listed species faces, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section informs the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR §402.02.

2.2.1 Status of the Species – *Oncorhynchus mykiss* is one of six Pacific salmon in the genus *Oncorhynchus* that are native to the coast of North America. The natural history of this species dictates the terminology fisheries biologists and resource managers use when discussing *O. mykiss*, its habitat, and distribution. If the species remains in freshwater throughout their entire life cycle (and reside upstream of longstanding migration barriers), they are referred to as resident trout (non-anadromous), or rainbow trout. The anadromous or ocean-going form of *O. mykiss* are listed under the ESA (NMFS 2006) and is typically referred to as "steelhead." Globally, steelhead are found in the western Pacific through the Kamchatka Peninsula in Asia, east to Alaska, south to southern California, and even reported in Baja California del Norte (Ruiz-Campos and Pister 1995).

The listed unit of anadromous *O. mykiss* is termed a "distinct population segment" or DPS (NMFS 2006), and the listed unit contains several individual or fish-bearing watersheds. The DPS recognizes only the anadromous *O. mykiss*. In accordance with the listing decision, this biological opinion solely uses the DPS terminology and provides NMFS' conclusion as to the likelihood of jeopardy to the species based only on effects to the listed DPS. This biological opinion analyzes the effects of the proposed action on the following listed DPS and designated critical habitat, which occur in the action area:

Salmonid Species	ESU/DPS Name	Original Listing	Revised Listing(s)	Critical Habitat Designations
Steelhead (*O. mykiss*)	South-Central California Coast DPS	FR Notice: 62 FR 43937 Date: 08/18/1997	FR Notice: 71 FR 5248 Date:01/05/2006	FR Notice: 70 FR 52488 Date: 09/02/2005

The threatened SCCC DPS of steelhead extends from the Pajaro River, Santa Cruz County, south to, but not including the Santa Maria River, Santa Barbara County. 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 relisting of the SCCC DPS of steelhead as threatened (January 5, 2006, 71 FR 834). In the mid-1960's the California Department of Fish and Game (CDFG) estimated an annual run size of 17,750 adult steelhead in this coastal DPS. Recent estimates for those SCCC rivers where comparative abundance information is available generally show a substantial decline during the last 30 years. For instance, though no recent estimate for total run size exist for the entire DPS, there are recent run size estimates available for five rivers (the Pajaro River, Salinas River, Carmel River, Little Sur River, and Big Sur River). The total annual run of steelhead for these five rivers is currently estimated at fewer than 500 adults compared with a total of 4,750 for the same rivers in 1965, which suggests a substantial decline for this entire DPS from 1965 levels. Abundance observations for adult steelhead in the Carmel River are the only time series within SCCC DPS with data gathered for 1964 through 1977 and 1988 to 2002 (Good *et al.* 2005). Based on these data there was a declining trend in the population from 1964 to the early 1990's to 2002. Despite this recent increase in abundance the estimated population of steelhead in this system is still less than 5% of historic population estimates and it is uncertain if this upward trend will be sustained into the future.

As part of the assessment and relisting of SCCC steelhead, NMFS convened a biological review team (BRT) composed of an expert panel of scientists. The BRT evaluated the viability and extinction risk of naturally spawning populations within each DPS. The BRT found high risks to abundance, productivity, and the diversity of the SCCC DPS and expressed particular concern for the DPS's connectivity and spatial structure. When a species is listed, Section 4(c)(2) of the ESA requires a review of the status of that species at least once every five years to determine if a change in status is necessary. During the most recent status review for SCCC steelhead (NMFS 2016; Williams *et al.* 2016) it was determined that there is little evidence to suggest that the biological status of the overall population has changed appreciably and factors for the populations decline appeared to have essentially remained unchanged. As a result, the review concluded that the SCCC population of steelhead should continue to be listed as a threatened population.

2.2.2 General Life History of Steelhead – *O. mykiss* possesses an exceedingly complex life history (Behnke 1992). Distinctly different than other Pacific salmon, steelhead adults can survive their first spawning and return to the ocean until the next year to reproduce again. For returning adults, the specific timing of spawning can vary by a month or more among rivers or streams within a region, occurring in winter and early spring. The spawning time frames depend on physical factors such as the magnitude and duration of instream flows and sand-bar breaching. Once they reach their spawning grounds, females will use their caudal fin to excavate a nest (redd) in streambed gravels where they deposit their eggs. Males will then fertilize the eggs and, afterwards, the females cover the redd with a layer of gravel, where the embryos (alevins) incubate within the gravel. Hatching time can vary from approximately three weeks to two months depending on surrounding water temperature. The young fish (fry) emerge from the redd two to six weeks after hatching. As steelhead begin to mature, juveniles or "parr" will rear in freshwater streams anywhere from 1-3 years. Juvenile steelhead can also rear in seasonal coastal lagoons or estuaries of their natal creek, providing over-summering habitat.

Juvenile steelhead emigrate to the ocean (as smolts) usually in late winter and spring and reach maturity at age 2-4, but steelhead can reside in the ocean for an additional 2-3 years before returning to spawn. The timing of emigration is influenced by a variety of parameters such as photoperiod, temperature, breaching of sandbars at the river's mouth and streamflow. Extended droughts can cause juveniles to become landlocked, unable to reach the ocean (Boughton *et al*. 2006).

Through studying the otolith (small ear stone) microchemistry of *O. mykiss*, researchers further understand the complex and intricate life history of steelhead. Specifically, resident rainbow trout can produce steelhead progeny; likewise, steelhead can yield resident rainbow trout progeny (Zimmerman and Reeves 2000). Additionally, evidence indicates that sequestered populations of steelhead (*e.g*., above introduced migration barriers) can exhibit traits that are the same or similar to anadromous specimens with access to the ocean. Examples include inland resident fish exhibiting smolting characteristics and river systems producing smolts with no regular access for adult steelhead. This evidence suggests the ecological importance of the resident form to the viability of steelhead and the need to reconnect populations upstream and downstream of introduced migration barriers. The loss or reduction in anadromy and migration of juvenile steelhead to the estuary or ocean is expected to reduce gene flow, which strongly influences population diversity (McElhany *et al*. 2000). Evidence indicates genetic diversity in populations of southern California steelhead is low (Girman and Garza 2006).

2.2.3 Steelhead Habitat Requirements – Habitat requirements of steelhead generally depend on the life history stage. Steelhead encounter several distinct habitats during their life cycle. Water discharge, water temperature, and water chemistry must be appropriate for adult and juvenile migration. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning. Furthermore, dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. The presence of interspatial spaces between large substrate particle types is important for maintaining water-flow through the nest as well as dissolved oxygen levels within the nest. These spaces can become filled with fine sediment, sand, and other small particles. Additionally, juveniles need abundant food sources, including insects, crustaceans, and other small fish. Habitat must also provide places to hide from

predators, such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. Steelhead also need places to seek refuge from periodic high-flow events (side channels and off channel areas) and may occasionally benefit from the availability of cold-water springs or seeps and deep pools during summer. Estuarine habitats can be utilized during the seaward migration of steelhead, as these habitats have been shown to be nurseries for steelhead. Estuarine or lagoon habitats can vary significantly in their physical characteristics from one another but remain an important habitat requirement as physiology begins to change while juvenile steelhead become acclimated to a saltwater environment.

2.2.4 Status of Designated Critical Habitat –The PBFs[1] of designated critical habitat that are essential for the conservation of threatened steelhead are listed in Table 1.

Habitat for steelhead has suffered destruction and modification, and anthropogenic activities have reduced the amount of habitat available to steelhead (Nehlsen *et al*. 1991; NMFS 1997; Boughton *et al*. 2005; NMFS 2006). In many watersheds throughout the range of the SCCC DPS, the damming of streams has precluded steelhead from hundreds of miles of historical spawning and rearing habitats (e.g., Los Padres Dam and San Clemente Dam within the Carmel River watershed, Uvas Dam and Pacheco Dam within the Pajaro River watershed, Salinas Dam on the Salinas River, San Antonio Dam on the San Antonio River, Lopez Dam on Arroyo Grande Creek). These dams create physical barriers and hydrological impediments for adult and juvenile steelhead migrating to and from spawning and rearing habitats. Likewise, construction and ongoing impassable presence of highway projects have rendered habitats inaccessible to adult steelhead (Boughton *et al*. 2005). Within stream reaches that are accessible to this species (but that may currently contain no fish), urbanization (including effects due to water exploitation) has in many watersheds eliminated or dramatically reduced the quality and amount of living space for juvenile steelhead. The number of streams that historically supported steelhead has been dramatically reduced (Good *et al*. 2005). Groundwater pumping and diversion of surface water contribute to the loss of habitat for steelhead, particularly during the dry season (*e.g*., Spina *et al*. 2006). The extensive loss and degradation of habitat is one of the leading causes for the decline of steelhead abundance in south-central California and listing of the species as threatened (NMFS 1997; NMFS 2006).

A significant amount of estuarine habitat has been lost across the range of the DPS with an average of only 25 percent of the original estuarine habitat remaining (NMFS 2011). The condition of these remaining wetland habitats is largely degraded, with many wetland areas at continued risk of loss or further degradation. Although many historically harmful practices have been halted, much of the historical damage remains to be addressed and the necessary restoration activities will likely require decades. Many of these threats are associated with the larger river systems such as the Carmel, Salinas, Pajaro, and Big Sur rivers, but they also apply to smaller coastal systems such as San Luis Obispo, Pismo, and Arroyo Grande creeks. Overall, these threats have remained essentially unchanged for the DPS as determined by the last status review (NMFS 2016; Williams *et al.* 2016)

[1] The essential features include water characteristics, soil type, geological features, sites, prey, vegetation, symbiotic species, single or complex combination of habitat characteristics, and ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity (per proposed rule: Docket No. FWS–HQ–ES–2012–0096; Docket No. 120106025–3256–01; 4500030114 on May 12, 2014; 50 CFR 424 Vol. 79, No. 91. Page 27066-27077).

though some individual, site specific threats have been reduced or eliminated as a result of conservation actions such as the removal of small fish passage barriers.

Table 1. Physical or biological features critical to the conservation of sites determined essential to support one or more life stages of steelhead (NMFS 2005).

Physical or Biological Features	Physical Characteristics	Essential to Conservation
Freshwater spawning sites	With water quantity and quality conditions and substrate supporting spawning, incubation and larval development.	Without these features the species cannot successfully spawn and produce offspring.
Freshwater rearing sites	With water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.	Without these features juveniles cannot access and use the areas needed to forage, grow, and develop behaviors (*e.g.*, predator avoidance, competition) that help ensure their survival.
Freshwater migration corridors	Free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.	Without these features juveniles cannot use the variety of habitats that allow them to avoid high flows, avoid predators, successfully compete, begin the behavioral and physiological changes needed for life in the ocean, and reach the ocean in a timely manner; allow steelhead adults in a non-feeding condition to successfully swim upstream, avoid predators, and reach spawning areas on limited energy stores.
Estuarine areas	Free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.	Without these features juveniles cannot reach the ocean in a timely manner and use the variety of habitats that allow them to avoid predators, compete successfully, and complete the behavioral and physiological changes needed for life in the ocean; they provide a final source of abundant forage for adult steelhead that will provide the energy stores needed to make the physiological transition to fresh water, migrate upstream, avoid predators, and develop to maturity upon reaching spawning areas.
Near-shore marine areas	Free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.	Without these features juveniles cannot successfully transition from natal streams to offshore marine areas.
Offshore marine areas	With water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.	Without them juveniles cannot forage and grow to adulthood.

2.2.5 Influence of a Changing Climate on the Species – One factor affecting the rangewide status of threatened steelhead, and aquatic habitat at large, is climate change. For the Southwest region (southern Rocky Mountains to the Pacific Coast), the average temperature has already increased roughly 1.5ºF compared to a 1960-1979 baseline period. High temperatures will become more common, indicating that southern California steelhead may experience increased thermal stress even though this species has shown to endure higher than preferable body temperatures (Spina 2007).

Precipitation trends are also important to consider. The Southwest region, including California, showed a 16 percent increase in the number of days with heavy precipitation from 1958 to 2007. Potential impacts to south-central California steelhead in freshwater streams include damage to spawning redds and washing away of incubating eggs due to higher winter stream flow (USGCRP 2009), and poor freshwater survival due to longer and warmer periods of drought (Hanak *et al*. 2011; Mastrandrea and Luers 2012), which may lead to lower host resistance of steelhead to more virulent parasitic and bacterial diseases (McCullough 1999; Marcogliese 2001). Snyder and Sloan (2005) projected mean annual precipitation in central western California to decrease by 1.6 cm (2.8% percent) by the end of the 21st century.

Changes in vegetation patterns for this region will include substantial increases in the amount of grassland and decreases in most other vegetation communities (e.g., chaparral, coastal scrub, blue oak woodland, and foothill pine). Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al*. 2002). Additionally, upper ocean temperature is the primary physical factor influencing the distribution of steelhead in the open ocean, and a warming climate may result in a north-ward shift in steelhead distribution, for example (Myers and Mantua 2013).

In summary, observed and predicted climate-change effects are generally detrimental to the species, given the unprecedented rate of change and uncertainty about the ability to adapt, so unless offset by improvements in other factors, status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. In general, climate change projections cannot be distinguished from annual and decadal climate variability for approximately the first 10 years of the projection period (see Cox and Stephenson 2007). While there is uncertainty associated with projections beyond 10 years, which increases over time, the direction of change is relatively certain (McClure *et al*. 2003).

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR §402.02).

2.3.1 Status of Aquatic Habitat in the Action Area – Aquatic habitat within the action area consists of a backwatered portion of the Pismo Creek estuary that can range from a few inches to about 6 or 7-feet deep depending on the location in the estuary, elevation of the sandbar at the

mouth, tidal influx, and streamflow coming in. The active channel in the action area ranges from approximately 50 to 200-feet wide. Substrate of the estuary's banks and bed through the action area is primarily fine sandy loam material with sporadic gravels and larger rock. Large sections of the proposed work area are experiencing erosion and slumping along the southeastern bank. Riparian vegetation within the action area include arroyo willow, pine, and non-native spider gum (*Eucalyptus conferruminata*) that provide canopy cover. Pismo Creek is perennial, with lowest flows observed in summer and fall. Water within the action area is typically brackish due to sea water influx into the estuary. Overall the PBF of critical habitat for juvenile steelhead rearing (i.e., natural cover, shelter, water quality/quantity, and riparian) exist throughout the action area. Additionally, the PBF for migration are considered suitable through the action area, as there is no obvious barrier to adult or juvenile steelhead migration.

2.3.2 Status of Steelhead in the Action Area – Although no estimate of steelhead abundance in Pismo Creek is available, there have been numerous sightings of steelhead within the creek. The presence of juvenile steelhead in the vicinity and action area has been documented. In May 2005, a "smolt sized steelhead" was observed in the Pismo Creek estuary and the California Department of Fish and Wildlife has observed young-of-the-year, age 1+, and age 2+ steelhead throughout Pismo Creek (Becker and Reining 2008). In August 2001, the Morro Group surveyed Pismo Creek about 1500-feet upstream of the action area and observed approximately 50 juvenile steelhead (Morro Group 2001). In sampling the estuary with seines, California State Parks captured less than 10 juvenile steelhead in two or three the annual surveys between 2005 and 2010 (Doug Rischbieter, California State Parks, August 2019, pers comm.). Based on these surveys, anecdotal observations of juvenile steelhead within the vicinity of the action area, and NMFS' own recent (April 2019) observations of the action area and experience throughout San Luis Obispo County, NMFS estimates that up to 100 juvenile steelhead may be present in the entirety of the work area to be dewatered. Adult steelhead are not expected to be present within the action area during the time of construction activities (June 1 to October 31).

2.3.3 Factors Affecting Species Environment in the Action Area and Vicinity

Road Encroachment and Urban Development

Residential developments and the Resort complex exist along the adjacent estuary banks within the action area. Highway 101 and a wastewater treatment plant are located immediately upstream of the action area. The location of the roads and homes likely results in runoff from the road surfaces entering the creek during rainstorms, which probably reduces the water quality within the action area to some degree. The effects on water quality from road surface runoff are most likely to occur during the winter when there is runoff during rainstorms. Runoff from road surfaces contains dirt, oils, automotive fluids, and petro chemicals that are harmful to aquatic life, including steelhead (Spence *et. al.* 1996). Road and residential development located along the creek within the action area have contributed to the confinement of the estuary and diminished riparian vegetation. Additionally, the input of nitrogen and phosphorus from treated wastewater immediately upstream of the action area can lead to increased eutrophication of receiving waters such as rivers and streams (Carey and Migliaccio 2009). Consequently, the proliferation of urban areas within the action area and vicinity is of concern.

Agricultural Development

Cultivated fields and open farmlands dominate the Edna Valley upstream of the action area on Pismo Creek. Agricultural conversions of floodplains are recurring sources of threats to instream and estuarine habitat. There is potential for increased turbidity or nutrient loading due to runoff from agriculture areas adjacent to the creek. High turbidity concentrations can cause fish mortality, reduce fish feeding efficiency and decrease food availability (Gregory and Northcote 1993; Velagic 1995). Agricultural runoff can transfer nutrients and pesticides to the creek, which can in turn lower dissolved oxygen levels by increasing algae growth in streams and decreasing forage for steelhead (Spence *et al.,* 1996).

In addition, demands on groundwater occur from upstream agricultural activities. The total estimated gross groundwater supply for the Edna Valley Groundwater Sub-Basin is estimated to be 4,700 AFY with the total estimated range of gross water demand for the basin to be between 4,000 to 4,500 AFY (SLO County 2014). Reduced streamflow or stream drying could result in a significant reduction or loss of habitat and even mortality to steelhead (Spence *et al.* 1996). These impacts if occurring have the potential to adversely impair steelhead growth and survival within Pismo Creek.

2.4 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR §402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. The expected effects of the proposed action are as follows, beginning with effects on designated critical habitat.

2.4.1 Effects of the Action on Critical Habitat for SCCC Steelhead

2.4.1.1 Alteration of Aquatic Habitat – Isolating and dewatering in-channel work areas can reduce the availability and diminish the function of the critical habitat as a rearing area (i.e., living and foraging space) and migration corridor. The proposed action involves dewatering about nine 100-linear feet (300-square foot) sections of Pismo Creek in succession (one at a time) for about two weeks each during the dry season (between June 1 and October 31) to allow construction work in the dry.

Temporary loss of habitat due to the dewatering is expected to translate into loss of aquatic macroinvertebrate forage for steelhead. However, effects to aquatic macroinvertebrates resulting from dewatering will be temporary because individual work areas will only be dewatered for about two weeks each. Macroinvertebrates are expected to rapidly recolonize (about one to two months) following re-watering of the work areas (Thomas 1985; Harvey 1986) of the work areas. In addition, the effects of macroinvertebrate loss on the quality of the rearing area is expected to be negligible because the work areas are divided into relatively small 100-foot segments resulting in the dewatering of less than 2% of the estuary at any one time. The majority of the estuary, which appears to be of comparable or higher quality rearing habitat to the work areas (M. McGoogan

NMFS 2019, pers. obs.), will remain available as foraging areas while the work areas are dewatered. Based on the foregoing, the temporary loss of aquatic macroinvertebrates as a result of dewatering activities is not expected to reduce the function of critical habitat for rearing.

Installing the water-bladder dams for isolating and dewatering the work areas constitutes an adverse effect on designated critical habitat, specifically living space for juvenile steelhead, for at least a few reasons. First, a portion of a rearing area and migration corridor will be dewatered and rendered unusable for at least a few months at a time. This is considered an adverse effect because rearing areas are essential for growth and survival of juvenile steelhead, and estuaries have proven to be particularly important for juvenile steelhead to acquire the large size that favors marine survival (Bond *et al*. 2008, Hayes *et al*. 2008). Second, the quality and availability of designated critical habitat in the action area has already been diminished and reduced due to a number of anthropogenic factors. Therefore, the loss of habitat due to the dewatering represents further loss of habitat. However, elements of the proposed action, including the proposed BMP, and site characteristics, are expected to reduce the amount and extent of the dewatering effects on living space for steelhead. For instance, the bladder dam will extend less than half the distance across the channel allowing the remaining wetted portion of the channel through the action area to remain unimpeded and fully functional as a migration corridor during construction. Further, because the dewatering will be performed in small sections incrementally, the individual impacted area is quite small compared to the amount and extent of estuary habitat that would remain unaffected. In this regard, rearing areas and a migration corridor will remain outside the area that is impacted by the dewatering and bladder. Lastly, the dewatering will be temporary because the bladder dam will be removed once construction is complete returning the entire channel's function as an unimpeded migration corridor.

2.4.1.2 Alteration of Estuary Banks and Channel Bed – The use of RSP and general effects of bank stabilization can result in changes to the channel bed and fluvial geomorphic processes that reduce the function of the action area for migration and rearing (i.e., cover and food). The inherent intent of bank stabilization efforts is to prevent lateral channel migration, which can force channels into a simplified linear configuration and accelerate water velocity that erode and deepen vertically (Leopold *et al*. 1968; Dunn and Leopold 1978). The resulting "incised" channel fails to create and maintain aquatic and riparian habitat complexity through lateral migration. The RSP itself is often homogenous and typically provides less complex habitat than natural unimpaired banks. The resulting simplified channel typically produces limited macroinvertebrate prey (Lennox and Rasmussen 2016), less cover for rearing juvenile steelhead, and increased water-velocity for more challenging migration conditions.

The bioengineered design of the proposed action is expected to minimize the magnitude and effects of increased water-velocity on the function of the action area as a migration corridor. For instance, we don't anticipate potential changes to the channel bed and fluvial geomorphic processes that would accelerate water velocity through the action area because the work areas will be re-graded to elevations and contours similar to those present prior to construction and consist primarily of native material from the estuary's banks and channel bed. The RSP will be adjacent to the active channel with the majority of RSP buried below the elevation of the channel bed. As such, the channel is expected to retain the same basic geomorphic shape and sediment composition once construction is complete, isolation structures are removed, and streamflow returns through the entire action area.

Further, the incorporation of three to five root-wads in the RSP and extensive planting of bank with native riparian vegetation is expected to increase channel roughness and slow water-velocity.

Although the RSP is homogeneous and will limit lateral channel migration, the potential loss of habitat complexity is expected to be minimized with (1) the retention of at least 17 mature trees in the action area after construction, (2) installation of in-channel root-wads anchored along the bank, (3) burying the majority of RSP, and (4) extensive planting through the action area with native riparian vegetation (i.e. trees and shrubs) that are expected to provide cover, slow water-velocity, and increase habitat complexity. These foregoing elements of the proposed action are expected to promote natural-like characteristics and condition along the banks of the estuary in the work area, which favor the development and maintenance of living space for steelhead.

Overall, we do not expect the proposed action would cause the sorts of channel changes and conditions that can affect the quality or availability of the migration corridor or greatly reduce habitat complexity in the action area. Therefore, the anticipated alteration of the estuary banks or channel bed with the proposed action, specifically the RSP, is not expected to appreciably reduce the functional value of the action area as migration corridor or rearing habitat.

2.4.1.3 Alteration of Water Quality – We expect that increases in sedimentation and turbidity levels resulting from construction activities would be minimal and temporary, for at least a few reasons. First, the proposed action includes a number of sediment and erosion-control measures to reduce the likelihood that sediment would be introduced to the wetted area. Second, the activities occurring in the wetted area are expected to be confined to seining and installing and then removing the water-bladder dams, within localized areas, and short lived. Third, the dewatering activities include precautions for returning clean water to the estuary, and isolating work areas from water prior to the beginning of construction activities.

2.4.1.4 Disturbance to Near Channel Vegetation – The removal of up to 19 trees constitutes an adverse effect to riparian vegetation within the action area, principally causing increased water temperatures (Mitchell 1999; Opperman and Merenlender 2004) and decreased water quality (Lowrance *et al*. 1985; Welsch 1991) attributable to a loss of shade and cover over the active channel. However, we don't expect the effects to rise to these levels for a number of reasons. First, the loss of vegetation as a result of the proposed action will be confined to discrete locations throughout the 900-linear feet of bank that will be repaired. Second, at least 17 large trees (15 willow and two pine) will remain through the reach to continue providing cover and shade to the channel and minimize effects from discrete removal of trees. Third, the reduction in near-channel vegetation is expected to be temporary, because the Resort proposes extensive planting and seeding of any disturbed areas immediately after construction with a combination of native trees from pots, willow and cottonwood cuttings, and a native seed mix. The relatively high volume of proposed post-construction planting is expected to increase shade and cover along this bank of the estuary over the long term. Fourth, based on NMFS' experience observing the response of riparian vegetation to similar human-made disturbances (M. McGoogan, NMFS 2019, pers. obs.), the riparian zone is expected to recover from the proposed action one to two years following the completion of construction.

Overall, due to the discrete and temporary nature of the effects on riparian vegetation, the proposed action is not expected to diminish the overall functional value of the action area as a migratory corridor or rearing habitat. Additionally, the Resort proposes monitoring to ensure the successful recovery of replanted areas within the action area for five years following completion of the proposed bank stabilization and reporting these monitoring results to NMFS and the Corps by December 31st each year of monitoring.

2.4.2 Effects on SCCC Steelhead

The discussion for the remaining portion of the effects analysis will focus on direct and indirect effects to threatened SCCC steelhead in the action area as a result of the proposed action. The following section is organized to explain effects to this species based on expected effects on designated critical habitat. Because the timing of the in-channel work is outside the steelhead migration season, only juvenile steelhead are expected to be present in the action area and affected by the proposed action. Therefore, the following effects discussion focuses on juvenile steelhead.

2.4.2.1 Capture and Relocation of Steelhead – Work areas will be isolated and dewatered resulting in the need to capture and relocate any juvenile steelhead found in these areas during the dewatering process. Although there is risk of harm and mortality to steelhead inherent with handling and relocating these individuals, overall these dewatering and steelhead-relocation efforts are expected to greatly reduce impacts to juvenile steelhead.

Capture activities necessitate that neighboring suitable relocation habitat be available. In this regard, the Resort proposes relocating steelhead to the estuary adjacent to the work areas that are dewatered. The amount of estuary habitat not directly impacted by the dewatering is extensive and of sufficient quality to support the relocated individuals (M. McGoogan NMFS 2019, pers. obs.). Although the Resort will document the capture and relocation of juvenile steelhead within the dewatered area, the proposed action does not include a provision for notifying NMFS in real time if a steelhead mortality occurs or a protocol for processing one or more dead steelhead.

Based on steelhead survey results and anecdotal observations of juvenile steelhead in the vicinity of the action area on Pismo Creek, NMFS expects up to 100 juvenile steelhead will need to be relocated. NMFS expects that up to 5 juvenile steelhead may be injured or killed as a result of the proposed action. This estimated mortality is based on NMFS' experience and knowledge gained on similar proposed actions in San Luis Obispo County during the last several years. Based on NMFS' general familiarity of steelhead abundance in south-central California in general, and San Luis Obispo County streams in particular, the anticipated number of juvenile steelhead that may be injured or killed as a result of the proposed action is likely to represent a small fraction of the overall watershed-specific populations and the entire SCCC DPS of threatened steelhead. Therefore, the effects of the relocation on steelhead are not expected to give rise to population-level effects.

2.4.2.2 Temporary reduction in the availability of macroinvertebrate forage, living space, and cover – The proposed action has the potential to reduce macroinvertebrate forage, living space, and cover available to juvenile steelhead in the short-term during construction and over the long-term when construction is complete. In the short-term, steelhead will experience a temporary loss of

macroinvertebrate forage and living space while work areas are isolated and dewatered. In the long-term (post-construction), as discussed in section 2.4.1.2, bank stabilization and the use of RSP can result in lasting changes to the channel's physical attributes and fluvial geomorphic processes that reduce habitat complexity important to juvenile steelhead for cover, food production, and foraging. Reduced macroinvertebrate forage can result in slower growth and smaller size of juvenile steelhead, which in turn, can contribute to a reduced likelihood of juvenile survival (Thompson and Beauchamp 2016). Adverse effects from decreased living space can include decreased growth and survival of juvenile steelhead resulting from increased steelhead density and competition for food resources. Decreased cover can also contribute to reduced juvenile survival through increased risk of predation on individuals.

However, the effects from reduced steelhead macroinvertebrate forage resulting from loss of access to work areas during construction is expected to be temporary and minimal for at least several reasons. First, as discussed in Section 2.4.1.1, work areas are relatively small (less than 2% of the estuary) compared to the remaining comparable estuary habitat available for steelhead foraging. Second, the work areas will only be dewatered for a short duration (about two weeks for each individual 100-ft section). Third, rapid macroinvertebrate recolonization of work areas is anticipated when re-watering occurs.

The effects on juvenile steelhead owing to the loss of living space are also expected to be temporary and minimal for a few reasons. Generally, steelhead numbers in the estuary are expected to be relatively low compared to the size of the estuary. Further, the living space that will be lost while work areas are dewatered is relatively small compared to the remaining comparable estuary habitat available to steelhead. Therefore, the loss of living space is not expected to noticeably increase steelhead density or competition for food. Finally, work areas will only be dewatered for a short duration and will be accessible to steelhead once re-watered and construction is complete.

The measures incorporated in bioengineered design of the proposed action are expected to minimize or eliminate the foregoing post-construction effects on the availability of cover. The primary minimization measures of the bioengineered design involve (1) retaining at least 17 mature trees in the action area after construction, (2) burying the majority of RSP, (3) backfilling the RSP with native soil, (4) installing at least 3 to 5 in-channel root-wads anchored along the bank, and (5) extensively planting the action area with native riparian vegetation (i.e. trees and shrubs). These foregoing elements of the proposed action are expected to promote natural-like characteristics and condition along the banks of the estuary in the work area, which favor the development and maintenance of living space, and by extension, cover for steelhead. Further, the extent of the proposed plantings has the potential to increase food production for steelhead once the plants and trees mature.

2.4.2.3 Steelhead Movement and Migration – Steelhead movement is not expected to be substantially restricted through the action area during construction or over the long-term after work activities are complete. Although steelhead will be temporarily excluded from dewatered work areas, these work areas are small (100-linear feet) and extend less than ½ the distance across the estuary channel, allowing unimpeded movement of steelhead around the bladder dam during construction. In the long-term, the post-construction re-grading of the channel is expected to retain the pre-project geomorphic characteristics and condition. Additionally, characteristics and

condition of the action area are expected to remain within the passage requirements of steelhead, owing to the natural habitat characteristics expected to form following extensive planting of vegetation on the estuary bank and in-channel installation of root-wads which are expected to create low-velocity refuges for steelhead during high flow events.

2.4.2.4 Altered Water Quality – The anticipated changes in water quality are not expected to translate into acute or chronic adverse effects on steelhead. Highly turbid water can result in decreased feeding and growth of juvenile steelhead (Sigler *et al*. 1984) which, in turn, can decrease juvenile steelhead survival (Thompson and Beauchamp 2016). Although certain activities associated work area isolation, dewatering, and re-watering (i.e., seining, bladder dam installation, dam removal) may increase turbidity, any increase is expected to be localized and last only a few hours or less. Further, installing sediment and erosion-control devices (*e.g.*, use of straw-fiber rolls, silt-fencing, hay bales, settling basins) and isolating work areas from water prior to the beginning of construction activities is expected to reduce the likelihood of water quality changes and the magnitude should a change be observed. Therefore, effects on steelhead associated with increases in sedimentation and turbidity resulting from the proposed action are expected to be minimal and temporary.

2.4.2.5 Alteration of channel shading – The removal of up to 19 trees with the proposed action is expected to result in loss of shade and overhead cover available to steelhead in the action area. A reduction in shade can result in steelhead experiencing increased water temperatures. During periods of high ambient water temperatures (23-28°C), forage behavior has the potential to decline (decreased feeding rate) and agonistic activity may increase (Nielsen *et al.* 1994). However, as discussed in section 2.4.1.4, the loss of vegetation as a result of the proposed action will be confined to discrete locations spread across 900 linear feet of bank with at least 17 large trees (15 willow and two pine) remaining through the reach. These remaining trees will shade the area, based on our observations. Further this reduction in near channel vegetation is expected to be temporary (1 to 2 years) as a result of the extensive proposed planting and seeding of native riparian trees and shrubs immediately after construction is complete. As a result, adverse effects to steelhead do to disturbance of riparian vegetation is expected to be temporary and minimal with the potential for increased shade through the action area as a result of the post-construction plantings.

2.5 Cumulative Effects

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

NMFS is generally familiar with activities occurring in the action area, and at this time is unaware of such actions that would be reasonably certain to occur. Consequently, no cumulative effect is likely, beyond the continuing effects of present land uses that are reasonably certain to occur into the future (see Environmental Baseline, Section 2.3).

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5), taking into account the status of the species, critical habitat, and climate change (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated critical habitat for the conservation of the species.

Juvenile steelhead are expected to be present in the action area during the time the proposed action will be implemented and, therefore, subject to direct and indirect effects associated with aspects of the proposed action. The main risk to individual steelhead involves effects due to capture and relocation, temporary loss of living space, and alteration, including reduction, in the quality and availability of near-shore habitat within the estuary. With regard to the capture and relocation, the adverse effects include potential injury or mortality during dewatering activities, but measures are proposed to minimize, if not eliminate, the risk of injury and mortality, and adjacent instream Pismo Creek estuary habitat is expected to suitably harbor the relocated steelhead. The dewatering will be short lived and localized. The adverse effects to juvenile steelhead resulting from a temporary loss of living space (i.e., reduced growth and survival) are expected to be minimal due to the short duration (about 2 weeks) of loss and relatively small area compared to the remaining available comparable estuary habitat accessible to steelhead during construction. The proposed action also includes measures (e.g., installation of root-wads, extensive native vegetation planting) that are expected to minimize the potential adverse effects on steelhead associated with alteration of near-shore habitat through maintaining habitat complexity expected to provide macroinvertebrate forage and cover for steelhead in the action area after construction is complete.

Based on the steelhead surveys described in the environmental baseline section (2.3.2), NMFS concludes non-lethal take of no more than 100 juvenile steelhead that may be captured and relocated as a result of dewatering within the action area during the construction season, with a potential lethal take of no more than 5 out of the 100, thus the risk of mortality is low. Any juvenile steelhead present in the action area likely make up a small proportion of the SCCC DPS of steelhead. Therefore, the effects of the proposed action on steelhead are not expected to give rise to population-level effects

Overall, the impacts to critical habitat are expected to be temporary and not reduce the functional value of the habitat in the long-term. The proposed bioengineered design (e.g., burying and backfilling much of the RSP, retaining mature trees, installing root-wads, and extensive planting of native trees and shrubs) is expected to minimize the potential effects of bank stabilization and use of RSP on habitat complexity and fluvial-geomorphic processes. The replanted areas are expected to create a functional riparian zone that maintains habitat complexity and increases cover for steelhead and shading of the stream channel within the action area. The impacts from disturbing the streambed and streambanks are not expected to adversely affect the quality or quantity of aquatic habitat; rather, the proposed action is expected to maintain steelhead passage and rearing conditions in the localized area. Maintained passage conditions and rearing habitat are expected to

favor the viability of the threatened SCCC DPS of steelhead and avoids reducing the value of critical habitat for the species within the action area of Pismo Creek.

2.7 Conclusion

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

2.8 Incidental Take Statement

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

2.8.1 Amount or Extent of Take

For reasons discussed in this biological opinion, NMFS believes the proposed action on Pismo Creek on will result in the incidental take (capture, injury, and mortality) of steelhead when portions of the action area are dewatered and juvenile steelhead are captured for relocation to suitable habitats outside the dewatered areas. NMFS anticipates no more than 100 juvenile steelhead will be captured relocated during implementation of the proposed action and that no more than 5 of the 100 juvenile steelhead captured, may be killed. Incidental take will have been exceeded if more than 100 juvenile steelhead are captured or more than 5 juvenile steelhead are killed as a result of the proposed action. The accompanying biological opinion does not anticipate any other form of take incidental to the proposed action.

2.8.2 Effect of the Take

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

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate

to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). NMFS believes following reasonable and prudent measures are necessary and appropriate to minimize and monitor incidental take of steelhead. The results of the effect analysis provide the basis for the following reasonable and prudent measures:

1. Avoid and minimize harm and mortality of steelhead during the relocation activities.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps and Resort must comply with the terms and conditions, which implement the reasonable and prudent measures (50 CFR §402.14). The Corps and Resort have a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR §402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action may lapse.

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

   A. The Resort's biologist shall provide a written steelhead-relocation report to NMFS within 30 working days following completion of construction. The report shall include 1) the number and size of all steelhead relocated during the proposed action; 2) the date and time of the collection and relocation; 3) a description of any problem encountered during the project or when implementing terms and conditions; and 4) any effect of the proposed action on steelhead that was not previously considered. The report shall be sent to Matt McGoogan, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, California 90802-4213.

   B. The Resort's biologist shall contact NMFS (Matt McGoogan, 562-980-4026) 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. All steelhead mortalities shall be retained, frozen as soon as practical, and placed in an appropriate-sized sealable bag that is labeled with the date and location of the collection and fork length and weight of the specimen(s). The biologist shall retain frozen samples until transfer of these samples (usually shipping overnight on dry-ice) can be coordinated with NMFS. Subsequent notification must also be made in writing to Matt McGoogan, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, California 90802-4213 within five days of noting dead or injured steelhead. The written notification shall include 1) the date, time, and location of the carcass or injured specimen; 2) a color photograph of the steelhead; 3) cause of injury or death; and 4) name and affiliation of the person whom found the specimen.

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered

species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR §402.02).

NMFS has no conservation recommendation related to the proposed action considered in this biological opinion.

2.10 Reinitiation of Consultation

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

3. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the Corps and Resort. Other interested users could include the California Department of Fish and Wildlife and U.S. Fish and Wildlife Service. Individual copies of this opinion were provided to the Corps. This opinion will be posted on the Public Consultation Tracking System web site (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). The format and naming adhere to conventional standards for style.

3.2 Integrity

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

3.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

4. REFERENCES

Becker, G.S., and I. J. Reining. 2008. Steelhead/rainbow trout (*Oncorhynchus mykiss*) resources south of the Golden Gate, California.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6, Bethesda, Maryland.

Bond, M. H., Hayes, S. A., Hanson, C. V., and R.B. MacFarlane. 2008. Marine survival of steelhead (*Oncorhynchus mykiss mykiss*) enhanced by a seasonally closed estuary. Canadian Journal of Fisheries and Aquatic Sciences 65: 2242–2252.

Boughton, D. A., H. Fish, K. Pipal, J. Goin, F. Watson, J. Casagrande, and M. Stoecker. 2005. Contraction of the southern range limit for anadromous *Oncorhynchus mykiss*. NOAA Tech. Memo. 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 Tech. Memo. NMFS-SWFSC-394.

Carey, R. O., and K. W. Migliaccio. 2009. Contribution of wastewater treatment plant effluents to nutrient Dynamics in aquatic systems: a review. Environmental Management 44:205-217.

California Department of Transportation (Caltrans). 2015. Pismo Creek Scour Repair Project. Biological Assessment. December 2015.

Cox, P., and D. Stephenson. 2007. Climate change: A changing climate for prediction. Science 317: 207 – 208.

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. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U. S. Department of Commerce, NOAA Technical Memorandum, NMFS-NWFSC-66.

Gregory, R. S., and T. G. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile Chinook salmon (*Oncorhynchus tshawytcha*) in turbid laboratory conditions. Canadian Journal of Fisheries and Aquatic Sciences 50: 233–240.

Hanak, E., J. Lund, A. Dinar, B. Gray, R. Howitt, J. Mount, P. Moyle, and B. Thompson. 2011. Managing California's Water: From Conflict to Reconciliation. Public Policy Institute of California. San Francisco, CA.

Harvey, B. C. 1986. Effects of suction gold dredging on fish and invertebrates in two California streams. North American Journal of Fisheries Management 6: 401–409.

Hayes, S. A., M. H. Bond, C. V. Hanson, E. V. Freund, J. J. Smith, E. C. Anderson, A. J. Ammann, and R. B. MacFarlane. 2008. Steelhead growth in a small central California watershed: upstream and estuarine rearing patterns. Transactions of the American Fisheries Society 137: 114-128.

Kevin Merk Associates, LLC (KMA). 2018. Pismo Creek RV Resort Bank Stabilization and Habitat Enhancement Project Biological Assessment. December 28, 2018.

Lowrance, R., R. Leonard, and J. Sheridan. 1985. Managing riparian ecosystems to control nonpoint pollution. Journal of Soil and Water Conservation 40: 87–91.

Lennox, A. and J. B. Rasmussen. 2016. Long-term effects of channelization on a cold-water stream community. Canadian Journal of Fisheries and Aquatic Sciences 10: 1530-1537.

Marcogliese, D.J. 2001. Implications of climate change for parasitism of animals in the aquatic environment. Canadian Journal of Zoology 79: 1331–1352.

Mastrandrea, M. D., and A. L. Luers. 2012. Climate change in California: scenarios and approaches for adaptation. Climatic Change 111: 5-16.

McClure, M. M., E. E. Holmes, B. L. Sanderson, and C. E. Jordan. 2003. A Large-Scale, Multispecies Status Assessment: Anadromous Salmonids in the Columbia River Basin. Ecological Applications 13:964–989.

McCullough, D. A. 1999. A review and synthesis of effects of alterations to the water

temperature regime on freshwater life stages of salmonids, with special reference to Chinook salmon. Environmental Protection Agency, Seattle. EPA 910-R-99-010.

McElhany, P., M. H. Rucklelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionary significant units. NOAA Tech. Memo. NMFS-NWFSC-42.

Mitchell, S. 1999. A simple model for estimating mean monthly stream temperatures after riparian canopy removal. Environmental Management 24: 77-83.

Morro Group. 2001. Final Environmental Impact Report for the Pismo Wastewater Treatment Facility Expansion. Prepared for City of Pismo Beach.

Myers, K., and N. Mantua. 2013. Climate Change and Ocean Ecology of Northwest Steelhead. The Osprey. The Steelhead Committee of the International Federation of Fly Fishers. Issue No. 75: May.

National Marine Fisheries Service. 1997. Endangered and threatened species: listing of several evolutionary significant units (ESUs) of West Coast steelhead. Federal Register 62 (159): 43937-43953.

National Marine Fisheries Service. 2005. Endangered and threatened species: designated critical habitat for seven evolutionary 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. 2011. South-Central/Southern California Coast Steelhead Recovery Planning Domain. Five-Year Review: Summary and Evaluation of South-Central California Coast Steelhead Distinct Population Segment. November 11. Southwest Region, Long Beach, California.

National Marine Fisheries Service. 2016. 5-Year Review: Summary and Evaluation of South-Central Coast Steelhead Distinct Population Segment. NMFS, West Coast Region California Coastal Office, Santa Rosa, California. 75 pp.

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

Nielsen, J. L., T. E. Lisle, and V. Ozaki. 1994. Thermally stratified pools and their use by steelhead in northern California streams. Transactions of the American Fisheries Society 123: 613-626.

Opperman, J., and A. M. Merenlender. 2004. The effectiveness of riparian restoration for improving instream fish habitat in four hardwood-dominated California streams. North American Journal of Fisheries Management 24(3):822-834.

Ruiz-Campos, G., and E. P. Pister. 1995. Distribution, habitat, and current status of the San Pedro Mártir rainbow trout, *Oncorhynchus mykiss* nelson (Evermann). Bulletin of the Southern California Academy of Sciences. 94: 131-148.

San Luis Obispo County (SLO County). 2014. Integrated Regional Water Management Plan. Prepared with GEI Consultants and support from Fugro Consultants, Dudek, Gutierrez Consultants, and Hollenbeck Consulting. July 2014.

Scavia, D., J. C. Field, D. F. Boesch, R. W. Buddemeier, V. Burkett, D. R. Cayan, M. Fogarty, M. A. Harwell, R. W. Howarth, C. Mason, D. J. Reed, T. C. Royer, A. H. Sallenger, and J. G. Titus. 2002. Climate Change Impacts on U. S. Coastal and Marine Ecosystems. Estuaries 25 (2):149-164.

Sigler, J. W., T. C. Bjornn, and F. H. Everest. 1984. Effects of Chronic Turbidity on Density and Growth of Steelheads and Coho Salmon Ecosystem Approach to Salmonid Conservation. Transactions of the American Fisheries Society 113: 142-150.

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

Spence, B.C., G.A. Lomnicky, R.M. Hughes and R. P. Novitzki. 1996. An Ecosystem Approach to Salmonid Conservation. Funded jointly by the U.S. EPA, U.S. Fish and Wildlife Service and National Marine Fisheries Service. TR-4501-96-6057. Man Tech Environmental Research Services Corp., Corvallis, OR.

Spina, A. P., M. R. McGoogan, and T. S. Gaffney. 2006. Influence of surface-water withdrawal on juvenile steelhead and their habitat in a south-central California nursery stream. California Fish and Game 92: 81-90.

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

Thomas, V. G. 1985. Experimentally determined impacts of a small, suction gold dredge on a Montana stream. North American Journal of Fisheries Management 5:480–488.

Thompson, J. N., and D. A. Beauchamp DA. 2016. Growth of juvenile steelhead *Oncorhynchus mykiss* under size-selective pressure limited by seasonal bioenergetic and environmental constraints. Journal of Fish Biology 89: 1720–1739.

Velagic, E. 1995. Turbidity study: a literature review. Prepared for Delta planning branch, California Department of Water Resources by Centers for Water and Wildland Resources, University of California, Davis.

Welsch, D. J. 1991. Riparian forest buffers: functions and design for protection and enhancement of water resources. USDA Forest Service, NA-PR-07-91, Radnor, Pennsylvania.

Williams, T.H., B.C. Spence, D.A. Boughton, R.C. Johnson, L. Crozier, N. Mantua, M. O'Farrell, and S.T. Lindley. 2016. Viability assessment for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 2 February 2016 Report to National Marine Fisheries Service – West Coast Region from Southwest Fisheries Science Center, Fisheries Ecology Division 110 Shaffer Road, Santa Cruz, California 95060. http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/2016/2016_swfsc.pdf

Zimmerman, C. E., and G. H. Reeves. 2000. Population structure of sympatric anadromous and non-anadromous *Oncorhynchus mykiss*: evidence from spawning surveys and otolith microchemistry. Canadian Journal of Fisheries and Aquatic Sciences 57: 2152-2162.