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

NMFS Consultation Number: *WCRO-2019-11596*

Action Agency: NOAA's National Marine Fisheries Service

Table 1. Affected Species and NMFS' Determinations:

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

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

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1 INTRODUCTION

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

1.1 Background

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through the NOAA Institutional Repository (https://repository.library.noaa.gov/), after approximately two weeks. 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 November 15, 2018, NMFS received an application from NMFS' California Coastal Office in Long Beach (applicant) to renew an ESA Section 10 Enhancement of Survival permit for the endangered Southern California (SC) Distinct Population Segment (DPS) of steelhead (*Oncorhynchus mykiss*) (NMFS 2018). Although the proposed activities are for the purpose of enhancing the conservation of endangered steelhead, the activities would nonetheless result in take of the species. Accordingly, NMFS prepared this biological opinion to assess the effects of authorizing the requested type and amount of take on the SC DPS. This biological opinion is based on the best scientific and commercial data available, including the description of the enhancement activities (NMFS 2018), a knowledge of and experience in the watershed and streams where the enhancement activities will be conducted, and expected effects of the activities on steelhead.

1.3 Proposed Federal Action

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

The proposed federal actions involves NMFS renewing a 10-year research and enhancement permit 14159-2R for the applicant; the current 10-year permit (#14159) expires on December 31, 2019. The applicant has requested non-lethal take of juvenile and adult steelhead, intentional lethal take of fry, and permission to recover carcasses. A brief summary of the field activities and requested type and amount of take (NMFS 2018) follows.

1.3.1 Steelhead Rescue and Relocation

The permit would grant NMFS the authority to legally allow its own biologists or those of the California Department of Fish and Wildlife (CDFW) to capture and relocate steelhead. The decision criteria for undertaking a steelhead rescue and relocation involve:

- An imminent risk of instream dewatering.
- Water quality characteristics known or believed to be harmful to the species.
- Stream characteristics increase the potential that predation or poaching would eliminate most or all of the steelhead contained within discrete mesohabitats.
- A man-made streamflow reduction that cannot or will not be halted to avoid an imminent risk of instream dewatering.
- A "suitable" relocation area exists (characteristics of relocation areas are described later).
- The rescue and relocation would represent a meaningful contribution to the enhancement of the endangered Southern California DPS of steelhead (e.g., factors to be considered include the number and life stage of the at-risk individuals).
- All reasonable options for ameliorating the need for a rescue have been considered.

CDFW will notify, in writing, the designated NMFS point of contact of the need to rescue and relocate steelhead prior to implementing any rescue and relocation operation. The written notification will provide the following information:

- The justification for rescuing steelhead, including an assessment of the applicability of the rescue criteria.
- The name of the waterway where the subject rescue and relocation would occur.
- A brief description of the specific conditions believed to be prompting the rescue (e.g., naturally dry conditions, or anthropogenic activity causing the reduction in flow).
- An estimate of the number of steelhead that are expected to be rescued.
- The name of the waterway and location (GPS coordinates) where the collected steelhead would be relocated.
- A description of the plan that will be implemented to monitor the status of the relocated individuals over time.

Steelhead are expected to be captured using nets, traps, and electrofishing equipment, though the latter is to be used only when other methods have proven, or are expected, to be ineffective. Only field equipment decontaminated following CDFW protocols for elimination of quagga mussel and New Zealand mud snail will be used in steelhead rescue and relocation operations. The following lists the equipment that is expected to be maintained on site when steelhead are collected for relocation:

- Seines
- Dip nets
- Waders
- Traps (e.g., minnow traps, fyke-nets)
- Portable air pumps with air stones
- Portable oxygen cylinder with regulator
- Aeration tablets
- Dissolved oxygen meter
- Thermometer
- Containers to hold and transport steelhead
- Water chiller or ice

- Water pumps
- Electroshocking equipment
- Block nets
- Stress coat
- Rescue and relocation data sheets
- Portable pump (to draw down water level to facilitate fish capture)

To minimize the likelihood that steelhead would be harmed or killed during rescue and relocation operations, the following measures will be implemented whenever NMFS and CDFW undertake such operations:

- Minimize turbidity in the rescue area.
- Use block nets to enclose the rescue area.
- Place steelhead in a holding container with well-oxygenated, cool stream water.
- Add water conditioner (i.e., Novaqua, Stress Coat) to holding water to reduce stress and preserve slime coat.
- Monitor and maintain suitable oxygen and temperature levels in holding containers.
- Minimize physical disturbance and thermal changes to holding containers.
- Acclimate steelhead in holding containers to relocation areas.
- Minimize overcrowding in holding containers.
- Ensure lids are secured to holding containers during transport.

Prior to undertaking a steelhead rescue, NMFS and CDFW will identify the steelhead life stage in need of rescue as a means of determining the most logical location for relocation. Candidate areas must be capable of accommodating additional steelhead without creating detrimental effects (e.g., significantly increased competition for food, space, or cover) to steelhead residing in or near the relocation area, and possess sufficient space, complex cover or shelter, water quality, and access to food. The possible relocation areas are as follows:

- Instream areas within the same stream
- Instream areas in different stream within the same watershed
- Estuary within the same watershed
- Instream areas or estuary within an adjacent watershed
- Ocean

With regard to spent adult steelhead, if an estuary is not available within the same watershed or an adjacent watershed, then steelhead adults will be placed in the ocean near the mouth of the stream where the fish were collected. If adults do not appear to have spawned, they will be placed in far upstream reaches near viable spawning habitat within the stream where captured. With regard to smolts, individuals will be placed in the estuary or the farthest downstream reach where viable habitat exists. Age-0 and age-1 and older non-smolts, will be placed in upstream perennial reaches.

NMFS expects that the number of steelhead rescued in any given year will be highly variable, but up to 2100 steelhead (2000 juveniles and 100 adults) could be rescued and relocated within a given year with up to 101 steelhead unintentionally injured or killed (100 juveniles and 1 adult) within a given year. Tissue from endangered steelhead is requested for retention.

1.3.2 Salvage Steelhead Carcasses to Assess Age, Growth, and Toxicology

The applicant will collect and retain carcasses of steelhead that are obtained opportunistically through coordination with the public and stakeholders, and through the applicant's field work. Scales and otoliths will be removed and examined using standard methods to assess age, growth and possible relationships with environmental characteristics and conditions. Organs will be removed as necessary to support toxicological investigations. The applicant requests to retain up to 100 adult and 250 juvenile carcasses during the entire term of the permit.

Carcasses will be individually sealed in freezer-grade bags, placed on dry ice, and either brought in or shipped to: NMFS, Attention Steelhead Team, 501 West Ocean Boulevard, Suite 4200, Long Beach, California, 90802. The following data will be generated for each carcass:

- Date of salvage
- Stream name
- GPS coordinates of salvage location
- Carcass-tracking number
- Fork length (mm)
- Weight (g)
- Name of salvager
- Apparent/suspected cause of death

1.3.3 Emergent-fry Trapping to Assess Spawning Ecology

The applicant proposes to capture a representative sample of fry from *O. mykiss* nests (redds) in the Ventura River Watershed for the purposes of understanding the role and contribution of the resident form of *O. mykiss* to the overall population of *O. mykiss* in the watershed and basic information on the ecology of the resident form.

Fry-emergence traps will be placed on a maximum of 20 randomly selected redds about two to three weeks before the timing of peak emergence. To minimize disturbance to the developing embryos, the proposed trapping will be scheduled to coincide after the eyed-embryo stage (~220 temperature units) but prior to hatch (575 temperature units) (Leitritz and Lewis 1980). At 16°C, the period between the eyed stage and hatch corresponds to approximately 21 potential trapping days. The applicant will use a modified fry emergence trap design inspired from Fraley et al. (1986) and Radtke (2008). The fry trap design will incorporate a round metal hoop buried in the substrate with trailing net and mesh openings of 1/16-inch diameter, and a rounded PVC fry-resting chamber. These traps will safely accommodate emergent fry densities of 572/m^2 for a duration of 1-week. Depending on the overall size of sampled redds, emergence traps are expected to sample only a proportion of the fry emerging from each redd. The emergence traps will be checked bi-weekly to prevent overcrowding and minimize holding time.

All *O. mykiss* fry (<30-mm) removed from the traps will be enumerated and lethal samples will be collected systematically (i.e., 1 of 20, or until a maximum of 20/redd are collected). Individual specimens will be euthanized in ethanol. Nonlethal samples will only be enumerated and immediately returned to the river unharmed. Traps will be inspected early or late in the day during low-light conditions to minimize the likelihood of predation on released fish. Emergent fry fork-length and weight will be recorded in the field for all lethal samples prior to preservation. Mean fry fork-lengths for each redd will be compared to values reported in the literature in an attempt to differentiate offspring from anadromous steelhead and resident rainbow trout mothers. The caudal fin from lethal samples will be clipped and stored dry on blotting paper for DNA analysis. Both sagittal otoliths will be removed in the laboratory using a dissecting microscope and stored dry prior to otolith microchemistry analysis (Sr:Ca).

The applicant requests 2,000 non-lethal and 200 intentional lethal take of fry each year. The requested amount of take is based on a review of information indicating the number of fry that can be produced from redds (Kuligowski et al. 2005) and redd-area data from the applicant's spawning surveys in the Ventura River. Based on this review, about 200 fry may be produced from the average redd in the Ventura River. Lethal take of up to 10 % (≤ 20 individuals/ redd) of the emergent fry from trapped redds should allow for a statistically significant sample size (Yan and Zhang 2004; Kuligowski et al. 2005) for conducting genetic and otolith analyses to investigate anadromous versus resident fish origin. All remaining fry captured in the emergent traps (>90%) will be enumerated and immediately released. Unintentional take of other *O. mykiss* life stages (i.e., parr, smolt, adult) is not expected due to the localized, confined nature of fry trapping activities.

Fry traps will be constructed and operated in such a manner to reduce the likelihood of harming *O. mykiss* and non-target species. Each individual trap will only be operated long enough to capture the swim-up fry. Trap operation will commence when instream temperature-monitoring data indicate the developing embryos are at the "eyed" stage. Trap installation will occur around a portion of the tailspill of each redd at the eyed stage because this is the developmental stage at which the embryos are most tolerant to stress (Jensen and Collins 2003). Each redd will be photographed at time of first observation and these photographs will be referenced during trap installation to prevent disturbance to the egg pocket where the embryos are buried. Redd-area measurements will be used to select the appropriately sized emergent trap for each trapping site to ensure a good fit. Trap enclosures will be securely imbedded into the stream substrate to exclude non-target species and predators. Traps will be checked more frequently than recommended in the literature to reduce the likelihood of harm.

1.3.4 Assess the Effectiveness of Steelhead Relocations

Because the effectiveness of the relocations is not entirely clear, the applicant proposes to assess the behavior, movement, abundance, and condition of steelhead that are relocated under the requested permit with comparison to a representative sample of steelhead that have not been relocated. To this end, the field studies are expected to involve:

- Installing one or more bi-directional fish traps to assess upstream and downstream movement of treatment (relocated) and reference (non-relocated) groups of steelhead.
- Capturing steelhead to measure condition (length and weight) and abundance of treatment and reference groups.
- Undertaking direct underwater observation of steelhead in treatment and reference groups to assess behavior, particularly shortly after a relocation event has been completed, and

abundance.

The applicant would tag and mark a subset of adult and juvenile steelhead to distinguish treatment and reference steelhead groups that are collected as part of rescue-relocation efforts and then track the individuals over time and space as necessary to assess effectiveness of the relocations. Steelhead will be anesthetized using a dilution of Tricaine Methanesulfonate (MS-222) with a buffer of sodium bicarbonate. The recommended concentration of MS to anesthetize salmonids is about 40 mg/l (Schoettger and Julin 1967) and will be adjusted as necessary by NMFS biologists depending on water temperature. Tags will be interrogated and recorded using tag readers. The applicant will use the protocol set forth by the 2014 PIT Tag Marking Procedures Manual, or most current version, for all PIT tag operations. An outward surficial mark may be applied to individuals, in addition to tags, using distinctive fin clips or other minimally intrusive means (e.g., Panjet inoculator/elastomer) to assess behavior and habitat use shortly after relocations, based on direct underwater observations. A low incidence of mortality from the tags is expected (Dare 2003; Hill et al. 2006; Acolas et al. 2007), therefore, the applicant requests the authority to PIT-tag 100 of all steelhead rescued, and lethal take of 5% or 5 juveniles of the permitted non-lethal take of 2100 rescued fish.

1.3.5 Collect and Maintain Specimens to Improve Species Management and Protection

The applicant would assess of how improper anthropogenic activities have, or are, affecting endangered steelhead, and to document observable adverse effects to the species (e.g., collect and enumerate dead individuals in an impacted area). To this end, the field studies are expected to involve:

- Capturing endangered steelhead to assess abundance and distribution of this species in impacted and reference stream reaches.
- Capturing endangered steelhead to measure habitat-use patterns of this species within sections of impacted and unimpacted streams.
- Capturing and (or) containing endangered steelhead within instream enclosures to investigate condition, growth rate, and movement of steelhead in affected and unaffected reaches of streams.
- Collecting dead and dying specimens in impacted stream areas.

The applicant requests the capture and temporary holding of adult and juvenile steelhead (including potentially tagging and tracking) with subsequent release to the stream, and collection and retention of dead and dying specimens. Numerically, an annual non-lethal take of 5 adult and 500 juveniles (10 adult and 50 juvenile carcasses), and unintentional lethal take of 1 adult and 25 juveniles are requested for this assessment.

1.3.6 Develop Predictive Model for Maximum Size of Juvenile Steelhead in Streams

This study proposes two phases of investigation to determine juvenile steelhead size upon ocean entry: (1) mensurative experiment to assess relationships between primarily physical habitat features and habitat-specific maximum size of juvenile steelhead, and (2) validation to test one or more specific hypotheses regarding the underlying relationships determined through the first-phase of investigation.

To develop the capabilities to quantitatively predict the habitat-specific maximum size of juvenile steelhead based on physical and non-physical attributes of the species' habitat, the applicant would apply standard electrofishing techniques in a small number (≤ 10) of randomly selected habitats in several streams (minimum of 12 streams, maximum of 20) within the DPS in one or more years for the purpose of capturing juvenile steelhead. Non-lethal take of 1,000 juvenile steelhead, and unintentional lethal take of 50 juveniles is requested. All fish would be measured and weighed, and a small number of scales would be removed from a small number of specimens. Physical attributes of each sampled habitat would be measured and recorded. The collected data would be analyzed to quantitatively assess relationships between habitat-specific maximum size of juvenile steelhead and habitat attributes.

If a predictive model is developed, the applicant will undertake the second phase of study for the purpose of assessing the model's predictive performance. The method for validating the predictive model would involve one or more of the following approaches:

- Collecting "fresh data" according to the methods applied in the first phase of study and then investigating the predictive performance of the model using standard validation techniques.
- Physically manipulating discrete sections of one or more streams to deliberately accentuate or create physical attributes that are predicted to promote large maximum size of juvenile steelhead. Then, collecting fresh data in manipulated and unmanipulated habitats according to the methods applied in the first phase of study and investigating the predictive performance of the model using standard validation techniques.
- Physically manipulating the location of large juvenile steelhead in streams to test one or more specific hypotheses concerning the underlying relationship between size of juvenile steelhead and habitat attributes. This would necessitate enclosing steelhead within specific sample units in one or more streams.

1.3.7 Invasive Species Management

There are five field methods proposed for potential use in invasive species management:

- Snorkelers will enter the water at the downstream end of a habitat unit and survey in an upstream direction to minimize disturbance of juvenile steelhead. Observed fish will be identified to species, and an estimate of length, life stage, and number of individuals will be recorded.
- Backpack electrofishing will be conducted in stream locations that can be waded safely. Block-nets will be used to prevent fish from leaving a treatment area and to capture any stunned fish that drift downstream. Only field supervisors and crew members with appropriate training and experience will operate the electrofishing equipment. To further minimize impacts, methods and electrofishing settings will adhere to NMFS' Electrofishing Guidelines. Visual surveys from the streambank or potentially snorkeling will be conducted prior to electrofishing to ensure no adult steelhead is present in the habitat unit.
- In habitats where electrofishing is not effective, a seine net may be used. To prevent fish from leaving the sampled habitat, block nets will be installed at the upstream and downstream boundary of the habitat prior to seining. Any steelhead captured during a

seine haul will be kept separate from invasive species and placed in aerated container (minimum 5-gallon) prior to processing.

- Hook-and-line may be used to capture invasive species from complex deep water habitats where the other sampling methods are not practical. Tackle will be limited to fishing rods with artificial lures and barbless hooks. Sampling will occur between June and November when adult steelhead presence in freshwater is less likely. Should an adult steelhead be observed in a habitat unit, no hook-and-line sampling will be conducted in that unit. If a steelhead is incidentally captured using hook-and-line, this sampling method will halt immediately in that habitat unit.
- Divers may engage in spearfishing to capture invasive species in units where other sampling methods have proven ineffective. Divers will only release a spear if no steelhead is observed within the potential strike range.

Fish captured during the electrofishing and seine sampling described above will be identified to species, and each species will be contained in separate buckets with aerated, fresh water from the creek, maintained within two degrees of the ambient stream temperature, or in live wells placed in areas of the creek with flowing water. Non-target native fish (e.g. steelhead) will be enumerated, and released. All invasive species will be anesthetized, measured for length, and euthanized following American Veterinary Medical Association approved methods.

All juvenile steelhead will be anesthetized, measured for length, and then released when recovered. Steelhead will be closely observed in an anesthetic bath of Alka–Seltzer Gold (aspirin free) brand sodium bicarbonate (NaHCO3). The lowest concentration of sodium bicarbonate that will permit safe handling will be used. Juvenile steelhead will be anesthetized in groups of two fish, are expected to be sufficiently anesthetized after one to two minutes in the anesthetic bath, and will be processed immediately following loss of equilibrium. Stress Coat will be added to the anesthetic solution to reduce stress from loss of the protective slime layer during handling. After length and weight are recorded, steelhead will be placed in 5-gallon buckets of aerated fresh stream water to recover prior to release back into the stream.

The requested annual take associated with these invasive species management activities is (1) non-lethal capture and release of up to 1000 juvenile steelhead while electrofishing, (2) non-lethal capture and release of up to 200 juvenile steelhead while seining, and (3) non-lethal capture and release up to 5 juvenile steelhead while during use of hook-and-line. The potential annual unintentional lethal take resulting from the proposed invasive species removal activities is up to 61 juvenile steelhead (50 from electrofishing, 10 from seining, and 1 adult from hook-and-line) or no more than 5% of the total captured. No intentional lethal take of steelhead is proposed or expected.

In summary, across all activities, the applicant expects the following type and amount of take to be the maximum in a given year (Table 2). Non-lethal take in parentheses represents steelhead carcasses. Lethal take includes both intentional and incidental mortalities.

Table 2. Maximum amount of take in a given year

Activity	Lethal Take		Non-Lethal Take	
	Adult	**Juvenile**	**Adult**	**Juvenile**
Rescue and relocation	1	100	100	2000
Salvage carcasses (permit duration)	0	0	(100)	(250)
Spawning ecology	0	200	0	2000
Relocation effectiveness	0	5	0	100
Improve species management and protection	1	25	5 (10)	500 (50)
Predictive model of juvenile maximum size	0	50	0	1000
Invasive-species management	0	61	0	1205

"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 independent action associated with the proposed action based on NMFS's review of the consultation package.

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

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

2.1 Analytical Approach

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

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

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

We use the following approach to determine whether a proposed action is likely to jeopardize listed species:

- Identify the rangewide status of the species expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an “exposure-response-risk” approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to the species.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

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

2.2.1 Status of the Species

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

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

Table 3. 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, personal communication).

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

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

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

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 to reside 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 grow to 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 (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 area 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 Influence of a Changing Climate on the Species

One factor affecting the rangewide status of endangered 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 1.5°F 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 southern California steelhead in freshwater streams include damage to spawning redds and washing away of incubating eggs due to higher winter stream flow (2009), and poor freshwater survival due to longer and warmer periods of drought (Hanak et al. 2001; 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 southwestern California to decrease by 2.0 cm (four percent) by the end of the 21st century.

Wildfires periodically burn large areas of chaparral and adjacent woodlands in autumn and winter in southern California (Westerling et al. 2004). Increased wildfire activity over recent decades reflects sub-regional responses to changes in climate, specifically observations of warmer and earlier onset of spring along with longer summer-dry seasons (Westerling et al. 2004; Westerling and Bryant 2008).

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 (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).

2.2.5 Designated Critical Habitat

Critical habitat for the SC DPS of steelhead was designated on September 2, 2005, and consists of the stream channels listed in (70 FR 52488). Critical habitat has a lateral extent defined as the width of the channel delineated by the ordinary high-water line as defined by the Corps in 33 CFR 329.11, or by its bankfull elevation, which is the discharge level on the streambank that has a recurrence interval of approximately 2 years (September 2, 2005, 70 FR 52522). PBF are components of stream habitat that have been determined to be essential for the conservation of the SC 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 SC steelhead DPS contain the above PBF (PBF 1-3) in differing amounts and to varying degrees, depending on the particular stream, the characteristics of the watershed, and the degree that the watersheds are impacted by anthropogenic factors. Perennial streams with PBF and conditions suitable for steelhead are fewer in the southern portion of the DPS compared to the northern portion. Some of this is due to the amount of coastal development and because there is generally less rainfall in the southern region. During the summer many creeks at the southern edge of the range become intermittent in sections or dry completely (in some cases this occurrence is natural and in other cases it is due to anthropogenic factors), and stream temperatures may become a factor in terms of suitability for rearing steelhead. Overall, steelhead over-summering habitat is thought to have a restricted distribution more so than winter spawning and rearing habitat in the SCC steelhead DPS (Boughton et al. 2006).

Streams with high conservation value have most or all of the PBF of critical habitat and extensive areas that are suitable for steelhead spawning, rearing, and migration (NMFS 2012). Streams with medium or low conservation value are less suitable for steelhead in terms of spawning, rearing, and migration, and have less of the PBF necessary for steelhead survival growth and reproduction, generally due to anthropogenic factors. Both the Ventura River and Santa Clara River watersheds have been found to have high conservation value for the survival and recovery of the SC DPS of steelhead. While many streams in the DPS have been found to have high conservation value for survival and recovery of the species, the spawning, rearing, and migratory habitat within the DPS are heavily impacted by dams, diversions, and human development. As a result, much of the available habitat has become severely degraded, and habitat degradation has been a main contributing factor to the current endangered status of the DPS (Good et al. 2005). The most recent status reviews found that these threats have remained essentially unchanged (Williams et al. 2011; NMFS 2016; Williams et al. 2016).

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

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

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

Debris flows are among the most hazardous consequences of rainfall on burned hillslopes (WERT 2018). The January 9, 2018, storm event trigged a debris flow when Matilija Canyon

received approximately six inches of rain in 24 hours. This storm event initiated several debris flows within the Santa Ynez Mountains, and consequently inundated areas within Montecito and Carpinteria in Santa Barbara County. The overall peak runoff throughout impacted areas will likely increase relative to unburned areas for the 2-year and 10-year recurrence intervals.
The Thomas Fire affected 11% of total designated critical habitat within the range of the SCC DPS of steelhead; burned critical habitat was mainly in the Ventura River Watershed (56%) and to a lesser degree in the Santa Clara River Watershed (18%). Indirect effects from the fire (e.g., mudflow, mudslides) likely increase the extent and amount of habitat destruction downstream to the estuary-ocean interface by altering PBF essential to the conservation of a species including a delay in development of such features, which the species relies upon during various life stages.

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The proposed action will take place throughout the entire range of the SC DPS which includes coastal streams from the Santa Maria River to the Mexican border.

2.4 Environmental Baseline

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

2.4.1 Status of Steelhead in the Action Area

As mentioned above, this permit covers rescues that meet the criteria and studies throughout the entire range of the SC DPS. Therefore, the status of the species in the action area is the same as described in the Status of the Species (Section 2.2).

2.4.2 Status of Critical Habitat in the Action Area

Historically, the river mainstems were likely used by adult steelhead for migration into the upstream tributaries 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, a number of introduced structures have impeded or completely blocked steelhead access to vast amounts of habitat within the mainstem and tributaries (NMFS 2008a; NMFS 2008b). 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 throughout the SC DPS, and in some functions may have been eliminated (i.e., summer rearing may no longer occur in portions of the mainstem).

The Thomas Fire impacted a vast areas of critical habitat within the SC DPS of steelhead. For instance, the fire burned 89% of this watershed. Sisar Creek, a tributary to Santa Paula Creek, completely burned.

The recent several-years of drought increased the magnitude of habitat effects from the Thomas Fire. The subsequent storm event (January 9, 2018) during a multi-year drought transformed channel dynamics (i.e., Florsheim et al. 2017). Consequences from this include increased sediment transport capacity, which is characterized by the longer residence time of relatively fine-grained post-fire channel sedimentation. Florsheim et al. (2017) highlight the complex and substantial effects of multi-year drought on geomorphic responses following fire disturbance.

2.4.3 Factors Affecting Steelhead and Critical Habitat in the Action Area

Based on a review of reports specific to many coastal streams and major rivers within the entire SC DPS, NMFS' familiarity with activities occurring in the action area, and the reported effects of habitat changes or alterations on the aquatic environment, evidence indicates a number of past and present anthropogenic activities have reduced the quality and quantity of habitat within the action area and killed steelhead. These activities involve construction and operation of water storage and diversion facilities, conversion of wildlands, wastewater release to the river, land-use activities, and groundwater pumping (Schwartzberg and Moore 1995; BOR 2004; Kelley 2004; BOR 2005). While some activities are upstream of the action area, the activities adversely affect steelhead in the action area (e.g., in the case of land-use activities causing input of sand and smaller particles to habitats within the action area, or in the case of a surface-water diversion reducing discharge in the action area). The factors affecting steelhead and critical habitat are described as follows, beginning with construction of dams.

Dams and diversions often have effects on fishery resources and quality of steelhead habitat (Blahm 1976; Mundie 1991; Smith et al. 2000). Many river systems within the SC DPS have several significant dams and diversions located in their watersheds including the damming of Piru Creek (through construction of Santa Felicia Dam and Pyramid Lake Dam), Castaic Creek (construction of Castaic Lake Dam), Dry Canyon (Dry Canyon Reservoir), Bouquet Canyon (Bouquet Reservoir) within the Santa Clara River watershed, Malibu Creek (Rindge Dam), Ventura River (Matilaja Dam), Cuyama River (Twitchell Resevoir), and construction of Bradbury Dam on the Santa Ynez River. All of these dams block steelhead from a substantial amount of historical spawning and rearing habitat because none of these reservoirs were constructed to allow passage of fish in the upstream direction. Major diversions such as the Vern Freeman diversion and Harvey diversion dam in the Santa Clara River watershed, while they have fish passage structures in place, are considered to present significant impediments to fish passage, thereby having ecological consequences similar to those reported for the construction of dams. Operations of dams and diversions may decrease water available for surface flows, reducing rearing opportunities for steelhead and adversely affecting the physicochemical and biological characteristics of streams (Poff et al. 1997).

Surface and groundwater pumping can have impacts on steelhead and their habitat in many coastal streams (e.g., Gato Creek, San Ysidro Creek, Carpinteria Creek, Gobernador Creek, Rincon Creek, Romero Creek, Montecito Creek) and larger river systems (e.g., Santa Maria River, Santa Ynez River, Ventura River, Santa Clara River). In some cases, these pumping operations have reduced available surface flows and even dried portions of streams, thereby reducing available habitat quantity and quality for rearing steelhead. In many watersheds there are certain portions of the stream that dry, apparently naturally, yearly, though we suspect groundwater pumping accelerate instream drying.

Further, a significant conclusion is that "local groundwater pumping over the last 100 years has severely depleted groundwater basins and reduced the frequency and duration of surface flows, with subsequent effects on steelhead trout migration and rearing" (BOR 2005). Historical accounts in several SC DPS river systems, such as the Santa Clara River, indicate mainstem flows may have been present year round (Mann 1975; BOR 2005), suggesting the availability of over-summering habitat (freshwater rearing sites) for juvenile steelhead in the mainstem. That juvenile steelhead historically reared in mainstem habitats would not be unexpected because such habitat use has been reported in studies conducted in Washington (Loch et al. 1988), British Columbia (Hartman and Brown 1987), Alaska (Johnson et al. 1994; Bramblett et al. 2002), and California (Spina et al. 2005). Given the functional value of mainstem river and coastal stream habitats in the ecology of steelhead, loss of critical habitat such as freshwater rearing sites, through surface and groundwater pumping, is considered unfavorable for the conservation of steelhead. Reductions in the frequency and duration of surface-flow connectivity between tributaries and the mainstem Santa Clara River, and within the river, increase the potential for disrupting emigration of juvenile steelhead (BOR 2004; BOR 2005).

Changes in land use through conversion of lands (i.e., due to development of urban areas) can increase input rates of nitrogen and sediment (i.e., sand and smaller particles) to receiving waters (and, therefore, critical habitat for steelhead), leading to reductions in the quality of critical habitat and abundance of desirable aquatic species, and increased eutrophication of receiving waters such as estuaries and streams (Weaver and Garman 1994; Bowen and Valiela 2001; Quist et al. 2003). Consequently, the proliferation of urban areas within many of the coastal watersheds throughout the SC DPS as well as major river watersheds such as the Santa Clara River, Ventura River, Santa Maria River, and Santa Ynez River and development of sewage-treatment plants discharging treated sewage to the Santa Clara River, Santa Ynez River, Ventura River, Malibu Creek, and their estuaries year round (UWCD and Castaic Lake Water Agency 1996; NMFS 2000; BOR 2005) are of concern.

Direct and indirect evidence of cattle in riparian areas and streams within the Santa Clara River, Santa Ynez River, and Santa Maria River watersheds, as well as in several coastal streams in Santa Barbara County, have been observed, and formal cattle operations are maintained near the town of Piru and in Los Angeles County (Schwartzberg and Moore 1995). Cattle have been observed in and along parts of these rivers and tributaries, grazing on slopes above waterways, and exposing soil, thereby increasing the potential for water-quality alterations related to sedimentation and turbidity (Platts 1991).

Mining of sand and gravel occurs in many watersheds has been undertaken since the early 1900s (Schwartzberg and Moore 1995). Mining contributes soil to streams, and causes sedimentation and turbidity, which can be harmful to fish (Cordone and Kelley 1961; Hillman et al. 1987; Chapman 1988) and their habitat (Everest et al. 1985; Alexander and Hansen 1986; Gregory et al. 1987). Mining can also cause changes to the stream channel (i.e., headcuts, channel widening, etc.) that have the potential of adversely affecting steelhead migration.

2.5 Effects of the Action

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

2.5.1 Impacts of the Taking on Designated Critical Habitat for Endangered Steelhead

The takings are expected to have no detectable impacts on designated critical habitat for endangered steelhead. The proposed enhancement activities involve a few to several fisheries biologists wading or snorkeling discrete locations of waterways; other than causing temporary, minor, if detectable, disturbance to the channel bed, these activities would not alter or impair the ability of critical habitat to serve the intended conservation role for the species.

2.5.2 Impacts of the Taking on Endangered Steelhead

Although authorizing the requested type and amount of take would cause handling and unintentional and limited intentional mortality of endangered steelhead, the impacts of the taking are not expected to have population-wide consequences at either the watershed or DPS scales.

For instance, most of the direct take is in the form of capture and collect, with subsequent release of individuals to the wild. The amount of unintentional and intentional take is small relative to the number of steelhead anticipated in the SC DPS of endangered steelhead, and the applicant will implement precautions to reduce both the likelihood and extent of injury and mortality.

Another reason why we expect the impacts of the taking would not rise to watershed or population levels, is that the requested amount of annual take is not expected to be realized, for at least two reasons. First, all of the enhancement activities would not be undertaken simultaneously in a single year. As a result, take is expected to be diffused throughout the duration of the 10-year permit.

Second, based on experience applying the existing permit, the renewed permit is expected to be applied in only one to four watersheds each year (A. Spina, personal communication).

Third, the waterways where the renewed permit is expected to be applied in practice represents a small fraction of the habitat available throughout the entire SC DPS of endangered steelhead. Applying the permit in a fraction of the available habitat and areas where steelhead densities are anticipated to be low, ensures enhancement activities will affect only a small proportion of watershed-specific populations and the SC DPS.

Another reason why watershed and population level negative consequences are not expected involves the anticipated benefits from the takings. The requested amount and type of take are for the purpose of improving science-based conservation of this endangered species. For instance, rescuing steelhead is expected to promote survival and growth of individual fish, thereby favoring the endangered Southern California DPS of steelhead as a whole. The proposed studies are also expected to produce long-term conservation benefits for the species by informing advanced protection measures for the species through improved monitoring and controls on anthropogenic activities and science-based management of the species. Non-native fish, crustaceans, and amphibians can harm steelhead indirectly through competition for resources or degradation of habitat quality and directly through predation on steelhead. As such, removing these non-native species can be highly beneficial for steelhead.

Overall, NMFS does not expect the impacts of the takings due to the enhancement activities would reduce the long-term viability of the SC DPS of endangered steelhead.

2.6 Cumulative Effects

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

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

Several future, state, local, or private actions are reasonably certain to occur within the SC DPS. Such actions include gravel mining and housing developments. While some of these actions are physically located outside the action area, they are expected to create effects that extend into the action area. For this reason, such actions are considered here. These future actions are expected to increase the potential for adverse effects to steelhead. Increasing the amount of impervious surfaces within the SC DPS 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 floodplains of SC DPS rivers and streams are expected to cause, or perpetuate, loss of aquatic habitat.

2.7 Integration and Synthesis

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

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. The adverse effects include potential injury or mortality during the process of capture and relocation during rescue and study activities, but precautions are in place to minimize, if not eliminate, the risk of injury and mortality. There is also some mortality expected during the emergent fry trapping study, though only a small fraction of the fry present and, therefore, make up a small proportion of the SC DPS of steelhead.

Overall, the impacts to the species are expected to be beneficial though the rescue and relocation activities ultimately enhancing survival, the research activities improving understanding of steelhead, and invasive-species management to reduce competition and enhance habitat for steelhead.

Any impacts to critical habitat would be discountable. Wading or snorkeling in the action area may cause temporary disturbances, but would not alter or diminish the conservation value of the critical habitat.

2.8 Conclusion

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

2.9 Incidental Take Statement

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

The issuance of permit 14159-2R authorizes intentional take of the endangered SC DPS of steelhead that is related to the enhancement of this population through steelhead rescue operations, research, and invasive species management as described in the permit. NMFS does not anticipate any take of listed species that is incidental to the action. This opinion does not authorize any taking of a listed species under section 10(a) or immunize any actions from the prohibitions of section 9(a) of the ESA.

2.10 Conservation Recommendations

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

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

2.11 Reinitiation of Consultation

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

3 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion is the National Marine Fisheries Service. Other interested users could include the California Department of Fish and Wildlife. Individual copies of this opinion were provided to NMFS. The document will be available through the NOAA Institutional Repository (https://repository.library.noaa.gov/), after approximately two weeks. The format and naming adheres to conventional standards for style.

3.2 Integrity

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

3.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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