

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

August 10, 2022

Refer to NMFS No: WCRO-2022-01875

Jennifer Wheeler Arcata Field Manager (Acting) Bureau of Land Management 1695 Heindon Road Arcata, California 95521-4573

Re: Endangered Species Act Section 7(a)(2) Biological Opinion for the Butte Creek Low Water Crossing Repair Project [6500 (CA-330) P]

Dear Ms. Wheeler:

Thank you for your letter of August 1, 2022, requesting consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Butte Creek Low Water Crossing Repair Project, Bureau of Land Management (BLM) reference 6500 (CA-330) P. This consultation was conducted in accordance with section 7 of the ESA (50 CFR 402, 84 FR 45016). This letter transmits NMFS' final biological opinion for the proposed Butte Creek Low Water Crossing Repair Project.

The enclosed biological opinion describes NMFS' analysis of effects on threatened Northern California (NC) steelhead (*Oncorhynchus mykiss*) and their designated critical habitat in accordance with section 7 of the ESA. Based on the best scientific and commercial information available, NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of NC steelhead, nor is the project likely to destroy or adversely modify designated critical habitat for this species. NMFS expects the proposed action would result in incidental take of NC steelhead. An incidental take statement with terms and conditions is included with the enclosed biological opinion.

Please contact Mike Kelly at (707) 840-5564, Northern California Office, Arcata, or via email at Mike.Kelly@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta Assistant Regional Administrator California Coastal Office

Enclosure

cc: Zane Ruddy, BLM, Arcata Field Office, Arcata, CA Gregory O'Connell, California Department of Fish and Wildlife, Eureka, CA FRN# 151422WCR2022AR00150

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

Butte Creek Low Water Crossing Repair Project Humboldt County, California

NMFS Consultation Number: WCRO-2022-01875 Action Agency: Bureau of Land Management

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?
Northern California (NC) steelhead (<i>Oncorhynchus mykiss</i>)	Threatened	Yes	No	No

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

Issued By:

deilere

Alecia Van Atta Assistant Regional Administrator California Coastal Office

Date: August 10, 2022

TABLE OF CONTENTS

1.	Int	TRODUCTION	1
	1.1.	Background	1
	1.2.	Consultation History	1
	1.3.	Proposed Federal Action	
2.	En	DANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT	
	2.1.	Analytical Approach	4
	2.2.	Rangewide Status of the Species	5
		Species Description and General Life History	
		Status of Species and Critical Habitat	
	2.2.3	Factors Responsible for the Decline of Species and Degradation of Critical Habitat	6
	2.3.		
	2.4.	Environmental Baseline	
	2.4.1	Status of Listed Salmonids and Critical Habitat in the Action Area	
	2.5.	Effects of the Action	
		Fish Exclusion and Relocation	
		Water Quality	
	2.5.3	Temporary Loss of Rearing Habitat 1	
	2.5.5	Effects to NC Steelhead Critical Habitat 1	
		Combined Effects 1	
	2.6.	Cumulative Effects 1	
	2.7.	Integration and Synthesis 1	
	2.7.1	Summary of Baseline, Status of the Species, and Cumulative Effects 1	
	2.7.2	Summary of Effects to Individual Steelhead and Critical Habitat 1	
	2.8.	Conclusion1	
	2.9.	Incidental Take Statement 1	
	2.9.1.		
	2.9.2.		
	2.9.3.		
	2.9.4.		
		Conservation Recommendations	
		Reinitiation of Consultation1	
3.		TA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW	
	3.1	Utility 1	
	3.2	Integrity	
	3.3	Objectivity 1	
4.	Refe	rences 1	9

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 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 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 within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the NMFS Northern California Office in Arcata, California.

1.2. Consultation History

On January 18, 2022, BLM biologist Zane Ruddy emailed NMFS biologist and BLM liaison Julie Weeder about making repairs to the crossing and improving fish passage through the culverts. Julie Weeder contacted NMFS habitat resource specialist Bob Pagliuco to ask whether the project would be eligible for ESA section 7 coverage under the NMFS Restoration Center's programmatic biological opinion (RC PBO).

On January 19, 2022, Bob Pagliuco contacted Zane Ruddy and BLM geologist Sam Flanagan to request additional information about project construction.

On January 21, 2022, Zane Ruddy replied with additional information. Bob Pagliuco forwarded the information to NMFS hydraulic engineer Margaret Tauzer and requested that she evaluate the project's fish passage properties.

On January 27, 2022, Margaret Tauzer responded with her conclusion that the project would not qualify for coverage under the RC PBO because it may improve fish passage, but would only provide partial passage under certain conditions, and would not meet the flood capacity or channel width requirements.

On January 28, 2022, NMFS South Coast Branch Chief Jeff Jahn notified BLM that the project would not qualify for coverage under the RC PBO and would require separate consultation. Jeff Jahn then assigned the consultation to NMFS biologist Mike Kelly.

On February 2, 2022, Mike Kelly emailed Zane Ruddy and Sam Flanagan to provide technical assistance and ask whether BLM would consider proposing an interim repair while pursuing a

full fish passage solution in the near future. Zane Ruddy replied and requested a phone call to discuss possibilities.

On February 9, 2022, Zane Ruddy, Sam Flanagan, and Mike Kelly discussed the project over the phone and agreed that BLM should seek a full fish passage solution with an interim repair project that would undergo a formal section 7 consultation for work during the summer of 2022.

On March 19, 2022, Mike Kelly visited the culvert crossing site.

On June 24, 2022, Zane Ruddy contacted Mike Kelly via email to seek additional technical assistance on a proposal to do interim repair while pursuing a full fish passage solution.

On July 22, 2022, Zane Ruddy provided an updated project description to Mike Kelly for review.

On July 26, 2022, Zane Ruddy contacted Mike Kelly to provide results of a recent snorkel survey intended to assess the number of ESA-listed fish that would need to be relocated, and to ask what additional information NMFS might need to initiate the section 7 consultation.

On July 27, 2022, Zane Ruddy provided additional technical data, and Mike Kelly agreed that the information was sufficient to initiate a formal section 7 consultation and that NMFS agreed to accept BLM's Environmental Assessment and, updated project description, and additional technical data as a Biological Assessment (BA) for the project.

On August 1, 2022, BLM requested formal consultation on the interim repair project. Mike Kelly replied that NMFS had accepted the request, and that the consultation would begin on this day.

1.3. Proposed Federal Action

Under the ESA, "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 action is described in detail in BLM's BA (BLM 2022). Project elements that may affect salmonids, and accompanying measures to minimize impacts, are summarized below, while the remaining project description is incorporated by reference to BLM's BA.

BLM proposes to implement initial repairs to the Butte Creek low-water, double-culvert crossing before October 15, 2022. Additional rock placement may be necessary in each of the following four years, so BLM is proposing a 5-year maintenance program with additional rock placement occurring between July 15 and October 15 between 2023 and 2026. A BLM contractor is currently developing designs to replace the existing culverts with a structure that provides full fish passage. Therefore, the proposed project would take place between 2022 and 2026, and BLM will propose a new crossing for implementation by 2027, which will require a separate ESA section 7 consultation.

In 2022, BLM proposes to place washed rock into a void below one of the culverts. The culvert that requires stabilization is the higher elevation one, and is currently dry as is normally the case at some point during each summer season. All base flow will be in the lower elevation culvert during the work period. Therefore, fish passage through the site would not be affected by the project because isolation of the work area would not block any portion of the watered culvert or plunge pool.

All staging of rock and equipment will take place in a flat area on the south side of the culverts and no vegetation removal is required. Additionally, because the road receives light use and there is room to accommodate occasional vehicles, BLM is not proposing a temporary stream crossing.

The area to be stabilized is 18 feet wide, 12 feet long, and has a maximum depth of 2.5 feet. The concrete apron of the culvert is perched (i.e., has no substrate supporting it) approximately three feet above the stream bottom. To provide stability to the road and culvert, approximately 16 cubic yards of 12- to 24-inch washed rock will be placed by an excavator working from the paved road surface. Only the arm of the excavator would work within the stream. Work would be completed within a three-day period each year.

To minimize negative effects to ESA-listed NC steelhead and other aquatic organisms, BLM will first herd fish from the work area to downstream of the culvert with seine nets. Next, a floating turbidity curtain with weighted bottom cable or chain will be installed to contain suspended sediment and serve as a block net to prevent fish from reentering the work area. BLM anticipates that the curtain will perform well because the work area is a calm pool isolated from stream flow. The precise placement of the turbidity curtain would be determined each year based on site conditions. BLM will monitor turbidity levels immediately outside of the work containment zone (i.e., where fish could be exposed) and would halt operations if levels exceed 60 nephelometric turbidity units (NTUs) at any moment, or are sustained above 30 NTUs for one hour.

The contained area will be seined and then electrofished to remove the remaining fish. Finally, a biologist would snorkel the isolated area to ensure no fish are present. All efforts would be repeated until no fish are detected. Electrofishing activities will follow NMFS' electrofishing guidelines (NMFS 2000). Specifically, BLM would ensure that: 1) handling of fish would be minimized to the maximum extent practicable; 2) buckets would be aerated and shaded; 3) water temperatures in buckets would be kept at or near ambient stream temperatures; 4) fish would be segregated by age class and not over-crowded; 5) sculpins would be held and released separately from steelhead; 6) relocation would take place in the morning when water temperatures are lowest; 7) fish captured by electrofishing would be observed to be fully recovered before release; and 8) fish release sites would be upstream of the project site unless habitat of similar or higher quality is inaccessible or unavailable.

"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). NMFS determined that there are no interrelated or interdependent actions related to the project. The crossing will continue to serve its present

function without inducing additional traffic or facilitating use by types of vehicles unable to use the current road.

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 provide 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 "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably 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, February 11, 2016).

The designation(s) of critical habitat for NC steelhead use(s) the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR part 424) replaced 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:

- Evaluate the rangewide status of the species expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species in the action area.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species, analyze whether the proposed action is likely to directly or indirectly 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.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species

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' "reproduction, numbers, or distribution" for the jeopardy analysis. 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 function of the PBFs that are essential for the conservation of the species.

2.2.1 Species Description and General Life History

NC Steelhead exhibit the most complex suite of life history strategies of any salmonid species. They have both anadromous and resident freshwater life histories that can be expressed by individuals in the same watershed. The anadromous fish generally return to freshwater to spawn as 4- or 5-year-old adults. Unlike other Pacific salmon, steelhead can survive spawning and return to the ocean to return to spawn in a future year. It is rare for steelhead to survive more than two spawning cycles. Steelhead typically spawn between December and May. Like other Pacific salmon, the steelhead female deposits her eggs in a redd for incubation. The 0+ age fish emerge from the gravel to begin their freshwater life stage and can rear in their natal stream for 1 to 4 years before migrating to the ocean between March 1 and July 1 each year, although they have been observed as late as September (Ricker et al. 2014).

2.2.2 Status of Species and Critical Habitat

In this biological opinion, NMFS assesses four population viability parameters to help us understand the status of steelhead and their ability to survive and recover. These population viability parameters are: abundance, population productivity, spatial structure, and diversity (McElhaney et al. 2000). While there is insufficient information to evaluate these population viability parameters in a thorough quantitative sense, NMFS has used existing information, including the Coastal Multispecies Recovery Plan (NMFS 2016) for NC steelhead Distinct Population Segment (DPS), to determine the general condition of each population and factors responsible for their current status. We use these population viability parameters as surrogates for numbers, reproduction, and distribution, the criteria found within the regulatory definition of jeopardy (50 CFR 402.20).

NC Steelhead Abundance and Productivity: With few exceptions, NC steelhead are present wherever streams are accessible to anadromous fish and have sufficient flows. The most recent status review by Williams et al. (2016) reports that available information for winter-run and summer-run populations of NC steelhead do not suggest an appreciable increase or decrease in extinction risk since publication of the last viability assessment (Williams et al. 2011). Williams et al. (2016) found that population abundance was very low relative to historical estimates, and recent trends are downwards in most stocks.

NC Steelhead Spatial Structure and Diversity: NC steelhead remain broadly distributed throughout their range, with the exception of habitat upstream of dams on both the Mad River and Eel River, which has reduced the extent of available habitat. Extant summer-run steelhead populations exist in Redwood Creek and the Mad, Eel (Middle Fork and Van Duzen,) and Mattole Rivers. The abundance of summer-run steelhead was considered "very low" in 1996 (Good et al. 2005), indicating that an important component of life history diversity in this DPS is at risk. Hatchery practices in this DPS have exposed the wild population to genetic introgression and the potential for deleterious interactions between native stock and introduced steelhead. However, abundance and productivity in this DPS are of most concern, relative to NC steelhead spatial structure and diversity (Williams et al. 2011).

Status of Critical Habitat

NMFS considers the action area to be designated critical habitat for NC steelhead.

The condition of NC steelhead critical habitat, specifically the ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human induced factors affecting critical habitat: overfishing, artificial propagation, logging, agriculture, mining, urbanization, stream channelization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Impacts of concern include altered stream bank and channel morphology, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality, lost riparian vegetation, and increased erosion into streams from upland areas (Weitkamp et al. 1995, 64 FR 24049, 70 FR 37160). Diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within the DPS. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

2.2.3 Factors Responsible for the Decline of Species and Degradation of Critical Habitat

The factors that caused declines include hatchery practices, ocean conditions, habitat loss due to dam building, degradation of freshwater habitats due to a variety of agricultural and forestry practices, water diversions, urbanization, over-fishing, mining, climate change, and severe flood

events exacerbated by land use practices (Good et al. 2005, Williams et al. 2016). Sedimentation and loss of spawning gravels associated with poor forestry practices and road building are particularly chronic problems that can reduce the productivity of salmonid populations. Late 1980s and early 1990s droughts and unfavorable ocean conditions were identified as further likely causes of decreased abundance of listed salmonids (Good et al. 2005). The sustained drought in California reduced stream flows and increased temperatures, further exacerbating stress and disease. Ocean conditions have been unfavorable in recent years due to the El Niño in 2015 and 2016. Reduced flows can cause increases in water temperature, resulting in increased heat stress to fish and thermal barriers to migration.

One factor affecting the range wide status and aquatic habitat at large is climate change. Information since these species were listed suggests that the Earth's climate is warming, and that this change could significantly impact ocean and freshwater habitat conditions, which affect survival of steelhead subject to this consultation. In the coming years, climate change will influence the ability to recover these species in most or all of their watersheds. Steelhead are particularly vulnerable to climate change due to their need for year-round cool water temperatures (Moyle 2002). Through effects on air temperatures and stream flows, climate change is expected to increase water temperatures to the detriment of these species. Climate change effects on stream temperatures within Northern California are already apparent. For example, in the Klamath River, Bartholow (2005) observed a 0.5°C per decade increase in water temperature since the early 1960's, and model simulations predict a further increase of 1-2°C over the next 50 years (Perry et al. 2011).

In coastal and estuarine ecosystems, the threats from climate change largely come in the form of sea level rise and the loss of coastal wetlands. Sea levels will likely rise exponentially over the next 100 years, with possibly a 50-80 cm rise by the end of the 21st century (IPCC 2019). This rise in sea level will alter the habitat in estuaries and either provide increased opportunity for feeding and growth or in some cases will lead to the loss of estuarine habitat and a decreased potential for estuarine rearing. Marine ecosystems face an entirely unique set of stressors related to global climate change, all of which may have deleterious impacts on growth and survival while at sea. In general, the effects of changing climate on marine ecosystems are not well understood given the high degree of complexity and the overlapping climatic shifts that are already in place (e.g., El Niño, La Niña, Pacific Decadal Oscillation) and will interact with global climate changes in unknown and unpredictable ways. Overall, climate change is believed to represent a growing threat, and will challenge the resilience of steelhead in Northern California.

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 specific action area for each site is summarized below.

The action area for the project encompasses the entire construction footprint that would be subject to direct impacts due to site isolation, fish relocation, rock placement, and the extent of downstream turbidity excursion. This includes the roadway and shoulders, the stream bottom adjacent to and under the perched culvert, and approximately 300 feet of downstream waters.

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).

In the action area, the threat NC steelhead from climate change is likely to include a continued increase in average summer air temperatures; more extreme heat waves; and an increased frequency of drought (Lindley et al. 2007). In future years and decades, many of these changes are likely to further degrade habitat throughout the watershed by, for example, reducing streamflow during the summer and raising summer water temperatures. Many of these impacts will likely occur in the action area via reduced flows and higher water temperatures.

Additionally, the NMFS Multispecies Recovery Plan (NMFS 2016) describes all summer-run populations as being at the highest level of threat due to climate change compared to winter-run populations.

2.4.1 Status of Listed Salmonids and Critical Habitat in the Action Area

Steelhead in the action area belong to the Van Duzen River population of NC steelhead, which the NMFS Multispecies Recovery Plan indicates is likely well below the population level needed to be at a low risk of extinction (NMFS 2016).

Some steelhead in the action area could be resident rainbow trout. However, the location is within the anadromous range of steelhead, so we consider all observed juvenile "trout" to be NC steelhead.

Butte Creek is designated critical habitat for NC steelhead, and genetic data indicate that the steelhead in Butte Creek are 70-80% summer-run and 20-30% winter-run (Kannry et al. 2020). The pool in the action area provides rearing habitat for juvenile steelhead; however, we do not expect that it is large enough to provide suitable holding habitat for adult summer-run steelhead during the summer construction season. Additionally, the known summer steelhead holding pools are located on the mainstem Van Duzen between Little Larabee Creek and Eaton Roughs (NMFS 2016), which is well downstream of the action area. Therefore, we do not expect adult summer steelhead to be in the action area until after fall rains raise streamflow and trigger upstream migration.

BLM monitoring data from the project location (BLM unpublished data 2012) indicates maximum water temperatures remain below 65 °F throughout the summer, which is suitable juvenile steelhead rearing.

BLM staff performed a snorkel survey of the action area on July 25, 2022, and observed eight young-of-year steelhead and two 2-year-old steelhead in the pool around the affected culvert's

outlet. The snorkeler also observed a young-of-year steelhead pass through the wetted culvert, so it is passable to juveniles at base flow.

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 Fish Exclusion and Relocation

Data on fish relocation efforts from water diversion activities since 2004 shows most average mortality rates are below three percent for salmonids. Therefore, given the measures that would be implemented to avoid and minimize impacts to fish during relocation efforts, NMFS expects no more than three percent of all relocated fish would be subject to potential injury or mortality.

As detailed in section 1.3, BLM proposes isolate the work area and relocate any fish present. Based on the snorkel survey observations described in section 2.4.1, and an assumption that not all fish were seen, BLM conservatively estimates that up to 30 juvenile steelhead may require relocation in each of the five years of the project. While steelhead numbers may vary significantly between years, NMFS agrees that this estimate is reasonable and conservative, and is unlikely to be exceeded in a given year.

While both summer-run and winter-run steelhead are listed within the NC steelhead population, these life history variants represent important ecological diversity within the overall population of NC steelhead, as described in section 2.2 of this opinion. So, we believe it makes sense to consider any impacts to them both together as a single population and as separate sub-populations. Therefore, based on genetic sampling (Kannry et al. 2020), we expect approximately eight of the relocated steelhead to be winter-run and 22 to be summer-run. The results of separately considering potential effects to each sub-population, and what this means to the overall NC steelhead population, are presented in section 2.7 below.

If we apply the three-percent mortality rate (rounded up to the nearest whole number) to the total number of juvenile winter-run and summer-run steelhead that we estimate could be relocated during the five construction seasons, we would expect that no more than two juvenile winter-run NC steelhead, and four juvenile summer-run NC steelhead would be injured or killed during relocation for all five construction seasons combined. We also estimate that these individuals may belong to any of three cohorts in a given year. These cohorts would consist of young-of-year and one- and two-year old steelhead.

2.5.2 Water Quality

Pollutants from construction operations, or from the mobilization of sediment during construction, have the potential to impact water quality within the action area.

Turbidity and Sedimentation

Short term increases in suspended sediment and turbidity are anticipated during project activities. However, we do not expect suspended sediment to be delivered to the stream after construction during the first flow-producing rainfall of the season due to the lack of ground disturbance or vegetation removal.

Increases in suspended sediment or turbidity can affect water quality, which in turn can affect fish health and behavior. Salmonids typically avoid areas of higher suspended sediment, which means they may leave their preferred habitat in order to seek areas with less suspended sediment. Fish unable to avoid suspended sediment can experience negative effects from exposure.

Research has shown that length of exposure to total suspended solids (TSS) plays a more dominant role than TSS concentration (Anderson et al. 1996). Long term exposure to elevated TSS conditions may cause an endocrine stress response (elevated plasma cortisol, glucose, and hematocrits), suggesting an increased physiological burden that could influence growth, fecundity, and longevity (Redding et al. 1987). Therefore, when considering the effects of TSS on listed fish, it is important to consider the frequency and the duration of the exposure, not just the TSS concentration (Newcombe and Jensen 1996).

BLM will use washed rock and will monitor turbidity. They will halt operations if levels exceed 60 NTUs at any moment, or are sustained above 30 NTUs for one hour. These levels and durations are below thresholds known to elicit avoidance responses in salmonids, and are well below harm thresholds (Oregon Department of Environmental Quality 2014). Additionally, work will be conducted from the paved crossing surface and no ground disturbance that may produce sediment delivery to the stream after the first rains of the season are expected. Therefore, NMFS considers the potential amounts and duration of turbidity to be unlikely to reduce the fitness of NC steelhead in the action area.

Pollutants Associated with Stormwater Runoff and Spills

Contaminants generated by traffic, pavement materials, and airborne particles that settle may be carried by stormwater runoff into receiving waters. Stormwater runoff can introduce contaminants (e.g., copper, zinc, cadmium, lead, nickel, and other vehicle-derived chemicals) into waterways, where aquatic species can be affected. Copper and zinc are of particular concern due to their effect on salmonids at low concentrations. Dissolved copper and zinc in stormwater road runoff are difficult to remove, and have known negative effects on salmonids and other fishes (Sandahl et al. 2007). Additionally, Tian et al. (2022) found that a chemical called 6PPD-quinone, which derives from a preservative chemical used in tires, is associated with mortality of steelhead when in high concentration.

The crossing is in a remote area and receives very little traffic use. Therefore, NMFS does not expect reductions in fitness of individual NC steelhead residing in the action area due to toxic materials in stormwater runoff.

Accidental spills from construction equipment pose a significant risk to water quality, particularly for construction activities in or near watercourses, and at the onset of the rainy

season when the first flush could trigger the discharge of spilled materials. However, in-stream activities would be suspended and the area will be cleaned prior to the onset of the rainy season. Furthermore, the proposed minimization measures are expected to prevent chemical contamination during construction. Therefore, NMFS expects the likelihood of an accidental spill of contaminants reaching the stream at a level that would harm fish to be improbable.

2.5.3 <u>Temporary Loss of Rearing Habitat</u>

As described in Section 1.3 of this opinion, BLM will relocate fish and exclude them from the work area. So, this habitat will be unavailable to rearing steelhead for approximately three days in each year that work is required, sometime between July 15 and October 15 in each season. The isolated pool provides cover, depth, and structure indicative of functional rearing habitat. However, BLM will distribute captured fish into functional rearing habitat, and fish that are herded out of the pool will still have access to habitat both up- and downstream of the site. Additionally, the habitat will be reopened after approximately three days. Therefore, we believe this short-term loss of a single pool habitat will not result in decreased fitness or survival of individual NC steelhead.

2.5.5 Effects to NC Steelhead Critical Habitat

Placement of 16 cubic yards of rock under the perched culvert will fill a corresponding volume of rearing habitat. However, given the total volume of the pool and the number of juvenile steelhead we expect to rear there in a given year, NMFS does not expect that the volume taken up by rock will reduce the available habitat to a level that would limit the number of steelhead that would typically rear in the pool. Therefore, we believe this loss of pool volume will not result in decreased fitness or survival of individual NC steelhead. Additionally, we do not expect the level of suspended sediment created by the project to have an appreciable effect on habitat quality in the action area.

2.5.6 Combined Effects

The potential exists for simultaneous construction-related impacts to have a synergistic effect that is greater or different than each stressor acting alone. Simultaneous project impacts may include visual impacts from workers and equipment working near or over the water at the same time that fish may be exposed to suspended sediment, for example. However, because combined effects are likely to be of very low intensity, NMFS does not expect any reductions in listed steelhead fitness from any combined effects of individual construction elements.

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 properly part of the environmental baseline vs. cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

NC steelhead in the action areas may be affected by future, ongoing non-federal activities that may continue to occur on private parcels adjacent to the action area, such as cattle grazing and typical land management and maintenance activities. Cattle access to the creek and associated riparian areas may continue to create adverse impacts mainly downstream of the action area. Additionally, based on satellite imagery, there appears to be marijuana cultivation upstream of the action area, which may result in water withdrawals and use of chemical fertilizers and pesticides. Therefore, some associated habitat degradation my continue; however, we do not have direct evidence that these potential activities contribute to poor habitat conditions in the action area.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species 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 (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution.

2.7.1 Summary of Baseline, Status of the Species, and Cumulative Effects

We describe habitat for NC steelhead at the DPS scale as mostly degraded in section 2.2.2. Although there are exceptions, the majority of streams and rivers in the DPS have impaired habitat. Additionally, this critical habitat often lacks the ability to establish fully functioning features due to ongoing and past human activities. While habitat generally remains degraded across the ESU and DPS, restorative actions have likely improved the conservation value of habitat throughout their ranges.

Steelhead in the action area belong to the Van Duzen River population of NC steelhead, which the NMFS Multispecies Recovery Plan indicates is likely well below the population level needed to be at a low risk of extinction (NMFS 2016).

The Recovery Plan describes summer-run NC steelhead as a major life-history type and an important component of the DPS's viability. The California Fish and Game Commission (CFGC 2021) has recently listed summer-run steelhead as an endangered population within the NC steelhead DPS, and NMFS (2016) describes all summer-run populations as being at the highest level of threat due to climate change. Therefore, we pay particular attention to the proposed action's effects to summer-run steelhead in our assessment of the risk posed to NC steelhead as a result of implementing the proposed action.

The cumulative effects of private activities that may occur in the Butte Creek watershed, as discussed in the environmental baseline section, may continue to impair, but not preclude the recovery of habitat in the action area. Additionally, due to the negligible nature of the proposed action's long-term impacts, NMFS does not expect the proposed action to exacerbate the effects of climate change on salmonids in the action area.

2.7.2 Summary of Effects to Individual Steelhead and Critical Habitat

NMFS anticipates miniscule effects to NC steelhead and their designated critical habitats from expected levels of increased sediment and turbidity, or potential chemical contamination, during or after construction. However, adverse effects are likely due to capture, handling, and relocation efforts intended to protect fish from potential exposure to in-water work activity.

NMFS predicts that up to 22 juvenile summer-run and eight juvenile winter-run steelhead could be relocated in each of the five proposed work seasons. NMFS expects that no more than two juvenile winter-run NC steelhead and four juvenile summer-run NC steelhead would be injured or killed during relocation during all five construction seasons combined.

Overall Individual and Critical Habitat Effects

NMFS also does not expect the loss of two juvenile winter-run and four juvenile summer-run NC steelhead, which may be from a single cohort, or spread over multiple cohorts given the life history characteristics of steelhead, would affect future adult returns in any cohort. This loss of juveniles would represent a miniscule percentage of the overall number of individuals in each population. The overall number of individuals in the populations will likely provide a compensatory effect. Other areas of the Van Duzen and lower Eel River watersheds are expected to continue to contribute to the populations during the time period when some juveniles in the action area may be harmed or killed as a result of this proposed project. Therefore, NMFS does not expect any appreciable effects on VSP parameters, and thus, the proposed action is not expected to reduce the survival and recovery of the NC steelhead DPS, and the project is unlikely to appreciably diminish the value of designated critical habitat for the conservation of NC steelhead.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of NC 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.

2.9.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

Take of juvenile steelhead may occur in the form of capture during fish relocation. For the total of all five years of potential maintenance of the crossing combined, NMFS expects that no more than two juvenile winter-run steelhead and four juvenile summer-run steelhead would be injured or killed during capture and relocation to adjacent habitat, as detailed in sections 2.7.2 and 2.5.1 above.

2.9.2. Effect of the Take

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

2.9.3. <u>Reasonable and Prudent Measures</u>

"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 the following reasonable and prudent measures are necessary and appropriate to minimize take of NC steelhead:

- 1. Undertake measures to ensure that harm and mortality to threatened steelhead resulting from fish relocation activities are low.
- 2. Ensure construction methods, minimization measures, and monitoring are properly implemented during construction.
- 3. Prepare and submit a post-construction report regarding the effects of fish relocation and construction activities.

2.9.4. Terms and Conditions

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

- 1. The following terms and conditions implement reasonable and prudent measure 1:
 - a. Qualified biologists with expertise in the areas of anadromous salmonid biology shall conduct fish relocation activities associated with construction. BLM will ensure that all biologists working on the project are qualified to conduct fish relocation in a manner which minimizes all potential risks to salmonids.
 - b. Salmonids shall be handled with extreme care and kept in water to the maximum extent possible during rescue activities. All captured fish must be kept in cool, shaded, and aerated water protected from excessive noise, jostling, or overcrowding or potential predators any time they are not in the stream, and fish will not be removed from this water except when released. Captured salmonids will be relocated as soon as possible to an instream location in which suitable habitat conditions are present to allow for adequate survival for transported fish and fish already present. Fish will be distributed between multiple areas if biologists judge that overcrowding may occur in a single area.
 - c. If any salmonids are found dead or injured, the biologist will contact NMFS biologist Mike Kelly by phone immediately at 707-840-5564. The purpose of the contact is to review the activities resulting in the take and to determine if additional protective measures are required. All salmonid mortalities will be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location, fork length, and be frozen as soon as possible. Frozen samples will be retained by the biologist until specific instructions are provided by NMFS. The biologist may not transfer biological samples to anyone other than the NMFS Northern California Office in Arcata, California without obtaining prior written approval from the South Coast Branch Chief. Any such transfer will be subject to such conditions as NMFS deems appropriate.
- 2. The following terms and conditions implement reasonable and prudent measure 2:
 - a. BLM shall allow any NMFS employee(s) or any other person(s) designated by NMFS, to accompany field personnel to visit the project site during activities described in this opinion.
 - b. BLM shall contact NMFS within 24 hours of meeting or exceeding take of listed species prior to project completion. Notify Mike Kelly by phone at 707-840-5564 or via email to Mike.Kelly@noaa.gov. This contact acts to review the activities resulting in take and to determine if additional protective measures are required.

- c. BLM shall make available to NMFS data from the turbidity monitoring on a realtime basis (i.e., daily monitoring data should be accessible to NMFS upon request).
- 3. The following term and condition implements reasonable and prudent measure 3:
 - a. BLM shall provide a written report to NMFS by January 15 in each year following construction of the project. The report shall be sent to NMFS via email to Mike.Kelly@noaa.gov or via mail to Mike Kelly at 1655 Heindon Road, Arcata, California 95521. The reports shall contain, at a minimum, the following information:

Construction related activities -- The report will include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on NC steelhead, a description of any and all measures taken to minimize those unanticipated effects, and a statement as to whether or not any unanticipated effects had any effect on NC steelhead; the number of NC steelhead killed or injured during project construction; and photographs taken before, during, and after the activity from photo reference points.

Fish Relocation – The report will include a description of the location from which fish were removed and the release site(s) including photographs; the date and time of the relocation effort; a description of the equipment and methods used to collect, hold, and transport salmonids; the number of fish relocated by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding salmonid injuries or mortalities; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.

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 regarding the development of information (50 CFR 402.02).

NMFS recommends that BLM staff work with NMFS engineering staff to fully analyze the fish passage quality and habitat impacts of this crossing in order to support a future full-passage solution. Please contact Mike Kelly via email at Mike.Kelly@noaa.gov or by phone at 707-840-5564 to arrange this cooperative analysis.

2.11 Reinitiation of Consultation

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

3. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is BLM. Other interested users could include CDFW and the Corps of Engineers. Individual copies of this opinion were provided to BLM. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. 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 and EFH consultation 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 MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

4. References

- Anderson, P. G., B. R. Taylor, and G. C. Balch. 1996. Quantifying the Effects of Sediment Release on Fish and their Habitats. Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 2346, Department of Fisheries and Oceans.
- Bartholow, J. M. 2005. Recent water temperature trends in the Lower Klamath River, California. North American Journal of Fisheries Management 25(1):152–162.
- BLM (Bureau of Land Management) . 2022. Biological Assessment for the Butte Creek Low Water Crossing Repair Project (6500 (CA-330) P). August 2022. Arcata, California.
- BLM. 2012. Unpublished water temperature data provide by Zane Ruddy.
- California Fish and Game Commission. (2021). Press release of June 18, 2021. https://wildlife.ca.gov/News/fgc-release-draft
- Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-66. 597 pp.
- IPCC (Intergovernmental Panel on Climate Change). 2019. Climate Change 2019 Synthesis Report AR5. Valencia, Spain.
- Kannry, S.H., O'Rourke, S.M., Kelson, S.J., Miller, M.R. 2020. On the Ecology and Distribution of Steelhead (Oncorhynchus mykiss) in California's Eel River. Journal of Heredity, Volume 111, Issue 6, September 2020, Pages 548–563.
- Lindley, S. T., R. S. Schick, E. Mora, P. B. Adams, J. J. Anderson, S. Greene, C. Hanson, B. May, D. McEwan, R. B. MacFarlane, C. Swanson, and J. G. Williams. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. San Francisco Estuary and Watershed Science 5: Article 4.
- McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commerce, NOAA Technical Memorandum NMFS-NWFSC-42. 156 pp.
- Moyle, P. B. 2002. Inland Fishes of California. Second Edition. University of California Press. Berkeley, California.
- Newcombe, C. P. and J. O. T. Jensen. 1996. Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact. North American Journal of Fisheries Management, 16(4): 693-727.
- NMFS (National Marine Fisheries Service). 2000. Guidelines for Electrofishing Waters

Containing Salmonids Listed Under the Endangered Species Act. June 2000. Available: http://www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/section4 d/electro2000.pdf.

- NMFS. 2016. Final Coastal Multispecies Recovery Plan. National Marine Fisheries Service, West Coast Region, Santa Rosa, California.
- Oregon Department of Environmental Quality. 2014. Turbidity Technical Review Summary of Sources, Effects, and Issues Related to Revising the Statewide Water Quality Standard for Turbidity. Portland, Oregon.
- Perry, R.W., Risley, J.C., Brewer, S.J., Jones, E.C., and Rondorf, D.W., 2011, Simulating daily water temperatures of the Klamath River under dam removal and climate change scenarios: U.S. Geological Survey Open-File Report 2011-1243. 78 pp.
- Redding, J. M., C. B. Schreck, and F. H. Everest. 1987. Physiological Effects on Coho Salmon and Steelhead of Exposure to Suspended Solids. Transactions of the American Fisheries Society, 116(5), 737-744.
- Ricker, S., and A. Renger. 2014. South Fork Eel River. 2013 Annual Report. California Department of Fish and Wildlife. Anadromous Fisheries Resource Assessment and Monitoring Program, Arcata, California.
- Sandahl, J. F., D. H. Baldwin, J. J. Jenkins, and N. L. Scholz. 2007. A Sensory System at the Interface between Urban Stormwater Runoff and Salmon Survival. Environmental Science and Technology 41(8):2998–3004.
- Tian, Z., M. Gonzalez, C. A. Rideout, H. N. Zhao, X. Hu, J. Wetzel, E. Mudrock, C. A. James, J. K. McIntyre, and E. P. Kolodziej. 2022. 6PPD-Quinone: Revised Toxicity Assessment and Quantification with a Commercial Standard. Environmental Science & Technology Letters 2022 9(2), 140-146, DOI: 10.1021/acs.estlett.1c00910
- Weitkamp, L. A., T. C. Wainwright, G. J. Bryant, G. B. Milner, D. J. Teel, R. G. Kope, and R. S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-24. U.S. Department of Commerce, NOAA, Northwest Fisheries Science Center, Seattle, Washington. 258 pp.
- Williams, T. H., S. T. Lindley, B. C. Spence, and D. A. Boughton. 2011. Status review for Pacific salmon and trout listed under the Endangered Species Act: Southwest. National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California.
- 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.

Federal Register Notices Cited

- 50 CFR 222.102. General Requirements—Endangered Species Act of 1973, as Amended.
- 50 CFR 402.02. Interagency Cooperation—Endangered Species Act of 1973, as Amended.
- 50 CFR 402.14. Consultation Procedures—Endangered Species Act of 1973, as Amended.
- 50 CFR 402.16. Reinitiation of Formal Consultation—Endangered Species Act of 1973, as Amended.
- 50 CFR 600. Magnuson-Stevens Act Provisions; Essential Fish Habitat.
- 64 FR 24049. National Marine Fisheries Service. Final Rule and Correction. Designated Critical Habitat; Central California Coast and Southern Oregon/Northern California Coasts Coho Salmon. May 5, 1999.
- 70 FR 37160. National Marine Fisheries Service. Final Rule. Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. June 28, 2005.
- 81 FR 7414. U.S. Fish and Wildlife Service, National Marine Fisheries Service. Final Rule. Listing Endangered and Threatened Species and Designating Critical Habitat; Implementing Changes to the Regulations for Designating Critical Habitat. February 11, 2016.