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

July 8, 2020 **Refer to NMFS No:** WCRO-2020-01830

Dana York
Branch Chief, Environmental Management - E2 Branch
California Department of Transportation, District 1
P.O. Box 3700
Eureka, California 95502-3700

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act, Essential Fish Habitat Response for Reinitiation of Consultation on the Little Lost Man Creek Full Span Bridge Fish Passage Remediation Project (EA 01-0F960)

Dear Mr. York:

Thank you for your letter of July 6, 2020, requesting reinitiation of 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 Little Lost Man Creek Full Span Bridge Fish Passage Remediation Project, California Department of Transportation (Caltrans[1]) reference EA 01-0F960. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)), and concluded that the action would adversely affect the EFH of Pacific Coast Salmon. Therefore, we have included the results of that review in Section 3 of this document.

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 the Southern Oregon/Northern California (SONCC) coho salmon Evolutionarily Significant Unit (ESU), the California Coastal (CC) Chinook salmon ESU, and the Northern California (NC) steelhead Distinct Population Segment (DPS). The action is also not likely to destroy or adversely modify designated critical habitat for the SONCC coho salmon ESU, the CC Chinook salmon ESU, and

[1] Pursuant to 23 USC 327, and through a series of Memorandum of Understandings beginning June 7, 2007, the Federal Highway Administration (FHWA) assigned and Caltrans assumed responsibility for compliance with Section 7 of the federal Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for federally-funded transportation projects in California. Therefore, Caltrans is considered the federal action agency for consultations with NMFS for federally funded projects involving FHWA. Caltrans proposes to administer federal funds for the implementation of the proposed action, and is therefore considered the federal action agency for this consultation.

the NC steelhead DPS. NMFS expects the proposed action would result in incidental take of NC steelhead, CC Chinook salmon and SONCC coho salmon. An incidental take statement is included with the enclosed biological opinion. The incidental take statement includes non-discretionary reasonable and prudent measures and terms and conditions that are expected to further reduce anticipated incidental take of SONCC coho salmon, CC Chinook salmon, and NC steelhead.

Please contact Mike Kelly at (707) 502-9942, Northern California Office, Arcata, or via email at Mike.Kelly@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Susan Leroy, Caltrans, District 1, Eureka, CA
Jennifer Olson, California Department of Fish and Wildlife, Eureka, CA
NMFS ARN# 151422WCR2020AR00146

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act, Essential Fish Habitat Response

Little Lost Man Creek Full Span Bridge Fish Passage Remediation Project,
Humboldt County, California

NMFS Consultation Number: WCRO-2020-01830

Action Agency: California Department of Transportation

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 Oregon/North California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*)	Threatened	Yes	No	No	No
California Coastal (CC) Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	No	No
Northern California (NC) steelhead (*O. mykiss*)	Threatened	Yes	No	No	No
Southern DPS of Pacific eulachon (*Thaleichthys pacificus*)	Threatened	No	N/A	No	N/A

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon FMP	Yes	No

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

Issued By: 

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: July 8, 2020

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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, as amended.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

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 March 6, 2018, NMFS received a Draft Biological Assessment (BA) for the Little Lost Man Creek Full Span Bridge Fish Passage Remediation Project. The purpose of the draft BA was to allow technical assistance.

On March 13, 2018, NMFS notified the California Department of Transportation (Caltrans) via email that additional analyses of pile driving effects would be required to initiate formal consultation. Additionally, via phone call on this date, NMFS offered to prepare example pile driving analyses.

On March 27, 2018, NMFS provided a document via email entitled Recommended Pile Driving Schedule and Fish Protection Strategy for The Little Lost Man Creek Highway 101 Bridge Project. The document further analyzed Caltrans' estimates of distances of potentially injurious pile driving noise. At this time, NMFS recommended that Caltrans consider the new analysis for integration into their BA.

On April 9, 2018, Caltrans submitted an updated BA and requested initiation of formal consultation. NMFS reviewed the request and determined that the information was sufficient to initiate formal consultation for Southern Oregon/Northern California Coast (SONCC) coho salmon, California Coastal (CC) Chinook, and Northern California (NC) steelhead, and their designated critical habitats, as well as MSA EFH consultation. Caltrans also found the Project

was not likely to adversely affect (NLAA) the Southern DPS (SDPS) Pacific eulachon and requested NMFS' concurrence.

On April 18, 2018, NMFS notified Caltrans via email that their request contained sufficient information, and that formal consultation had therefore been initiated on April 9, 2018.

On May 5, 2018, NMFS issued the original Biological Opinion for the Project.

On June 17, 2020, work on the Project began with fish relocation efforts followed by stream diversion and construction access on June 19, 2020. During this period Caltrans contacted Mike Kelly of NMFS to advise that the number of juvenile NC steelhead in need of relocation exceeded the number predicted in the original Biological Opinion. Mike Kelly advised Caltrans to continue with fish relocation and then reinitiate the ESA consultation.

On July 6, 2020, Caltrans' requested reinitiation of formal ESA consultation, provided supporting technical information, and introduced their proposal to modify the Project to no longer include additional fish relocation before pile driving commences. Caltrans determined that the updated Project may adversely affect SONCC coho salmon, CC Chinook salmon, and NC steelhead, and their designated critical habitats. NMFS accepted the request for reinitiation on the same day.

On July 7, 2020, Caltrans provided NMFS the results of a snorkel survey to aid in formulating a new estimate of the number of ESA-listed fish that remained in the action area.

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).

Under MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

For this reinitiation of the ESA consultation, Caltrans proposes to modify the original Project by eliminating additional fish relocation efforts before pile driving commences on approximately July 10, 2020. Additionally, the original consultation anticipated 48-inch foundation piles; however, the final design uses 36-inch piles.

Caltrans proposes to replace a double concrete box culvert with a 60-foot-long, single-span precast slab bridge on U.S. Highway 101 (US 101) at post mile 124.49 in northwestern Humboldt County, approximately three miles north of the town of Orick, California. The purpose of the project is to remove the existing fish passage barrier by constructing a new bridge that would provide full passage for anadromous fish of all life stages, especially juvenile salmonids. Additionally, the project would stabilize a section of degraded streambank and reestablish a small section of floodplain downstream of the new bridge. The project is not proposed to address

any transportation needs.

The bridge would be built roughly on the existing alignment in two stages using half-width construction methodology, which eliminates the need for a temporary traffic crossing. The project is expected to be completed in a single work season in 2019 or 2020. Total estimated working days are 120. All construction work below the ordinary high water mark would be restricted to June 15 through October 31.

Fish relocation for construction access began on June 17, 2020, and is continuing as outmigrating juvenile salmonids are trapped and moved downstream past the in-stream construction zone. This trapping and moving of outmigrating fish will continue. However, due to difficulty in safely relocating recently emerged NC steelhead fry, Caltrans proposes to eliminate the additional fish relocation effort that was originally proposed to occur before pile driving begins. (Please see the *Effects of the Action* section for detailed rationale and anticipated effects.)

A qualified biologist will monitor all in-stream construction activities, including dewatering activities and culvert demolition, to ensure adherence to all environmental permit conditions and avoidance and minimization measures.

The proposed action is described in detail in Caltrans' original BA for this project (Caltrans 2018), with additional details included in Caltrans' letter requesting reinitiation of the consultation (Caltrans 2020). Project elements that may affect salmonids or critical habitat are discussed in detail below, while the remaining project description is incorporated by reference to Caltrans' BA.

Construction Staging and Access
Temporary roads for channel and bank stabilization work would access the channel within the area of proposed rock slope protection (RSP) on the upstream side. On the downstream side, equipment would access the channel within the area of proposed floodplain restoration. During the bank stabilization work on the right bank, equipment will operate from the top of bank. The designated storage area for vehicles, supplies, and construction equipment staging would occur in the parcel across the highway from the entrance to Lost Man Creek Recreational area.

Water Diversion and Aquatic Species Relocation Plan
In order to protect salmonids from impacts that could occur due to construction access, pile driving single strike injury threshold noise, and the realignment and recontouring of the stream, Caltrans proposed to relocate fish from areas of potential impact, and to dewater the stream where construction access is required. Installation of the temporary diversion dam and culvert pipe was conducted beginning on June 19, 2020. The diversion would be removed and the channel restored prior to October 31.

Little Lost Man Creek typically has disconnected flow in the action area during the summer construction season (Caltrans 2018). However, at the start of Project activities on June 17, 2020, the stream was connected and NC steelhead are present throughout the action area. (No SONCC coho or CC Chinook salmon have been found as of July 6, 2020.) Therefore, a qualified biologist relocated fish from areas where construction access activities could injure listed salmonids.

Fish exclusion and relocation was conducted using seining gear, electrofishing gear, dip nets and a fyke net trap. Electrofishing for salmonids complied with *Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act* (NMFS 2000), and seining and other capture and removal techniques adhered to the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al. 2010).

A temporary stream diversion is necessary during construction operations to provide a clean, dry work area and equipment access into the creek channel. A combination of plastic liner, gravel bags, sheet piles, and other clean, impermeable materials were used to construct cofferdams approximately 100 feet upstream and 150 feet downstream of the bridge. Water is pumped around the construction area during work hours, but a temporary culvert is installed to allow free flow of water and downstream fish movement during non-work hours. Any water that seeps into the project area will be pumped to an upland area, where it will be allowed to infiltrate such that turbid waters do not enter surface waters. The diversion was constructed in conformance with a Construction Site Dewatering and Diversion Plan, and an Aquatic Species Relocation Plan. NMFS reviewed these plans, provided feedback, and concurred in May 2020 that the plans met the intent of the original project description and ESA consultation.

Dewatering drawdown occurred incrementally to allow capture and relocation of fish not captured during initial efforts, and to avoid fish stranding. All salmonids removed from the work area were relocated to nearby suitable habitat in Prairie Creek downstream of the diversion.

Handling and mortality of NC steelhead exceeded the number predicted, so Caltrans contacted Mike Kelly of NMFS. He advised to continue the relocation effort and suggested that Caltrans reinitiate the ESA consultation.

Originally, to avoid potential injury caused by exposure to high sound pressure levels (barotrauma), Caltrans proposed to relocate and excluded fish from up to approximately 900 feet of Little Lost Man Creek during pile driving activities. This 900-foot distance is inclusive of the construction access diversion, so it would extend approximately 350 feet upstream and 250 feet downstream of the dewatered area. However, Caltrans is now proposing to eliminate this portion of the fish relocation effort. Pile driving will begin no earlier than July 10 and is expected to last approximately one week.

A daily construction time limit (as determined by monitoring) would be required in order to avoid exceeding the cumulative sound exposure level (cSEL) threshold of 183 dB in Prairie Creek and the predicted 450-foot distance upstream on Little Lost Man Creek. If sound levels are approached, pile driving would cease for a minimum of 12 hours. Monitoring would occur primarily in the Prairie Creek pool at its confluence with Little Lost Man Creek, which is approximately 450 feet from the pile driving location. However, additional monitoring may take place in other pools of Prairie Creek, and upstream of the bridge in Little Lost Man Creek, if NMFS and Caltrans agree that this additional monitoring is prudent at the time of construction. The purpose of this additional monitoring is to account for the phenomenon of high sound levels "popping up" farther away due to the complex transmission of sound through substrate. Hydroacoustic analysis indicates that Caltrans will be able to meet their pile driving schedule

with few, if any, delays. Refer to the *Effects of the Action* section below for details of the hydroacoustic analysis.

The stream diversion will be removed after construction is complete. The site would be re-watered by first removing the temporary cofferdams at each end of the temporary culvert, and then removing the culvert.

Provisions for the Aquatic Species Relocation Plan also included the following measures:

- The mesh on the fish exclusion screens will not exceed 0.25 inch measured diagonally.
- Screens will be inspected daily or more if needed.
- If the biological monitor detects fish above the screens that appear to be outmigrating during the period when Little Lost Man Creek's flow is connected on the surface to Prairie Creek through the project reach, the fish would be moved to Prairie Creek by a qualified biologist. (This process is ongoing and includes use of a fyke net trap.)
- A Caltrans biologist, contractor supplied biologist, or environmental construction liaison would be present during all phases of in-stream construction to assist with relocation efforts as they arise.

Pile Installation
Caltrans proposes to install eight permanent bridge foundation piles. These would be 36-inch diameter cast-in-steel-shell (CISS) piles. The piles would be installed using an impact hammer. Two to three piles would be installed per day and each pile would require an estimated 700 strikes to install. However, pile driving will cease for the day if hydroacoustic monitoring indicates that injurious cSEL levels could be reached beyond the predicted 450 feet up- and downstream distances.

A Hydroacoustic Monitoring Plan was prepared by the contractor prior to construction. The plan addressed the frequency of monitoring, hydrophone locations, techniques for gathering and analyzing acoustic data, quality control measures, and reporting activities. Acoustic monitoring would be performed onsite by a qualified hydroacoustic specialist supplied by the contractor. Regular decibel readings would be collected and documented during all pile driving activities to ensure cSEL thresholds are not exceeded.

Abutment and Superstructure
The abutments would be protected from scour by placement of approximately 440 cubic yards of one-quarter ton RSP covering an area of approximately 0.08 acre. RSP would be keyed in below the channel grade to account for potential scour during high discharge events.

No piers or columns would be required in the channel. The project would not require falsework or trestles within the channel. The height of the bridge over the stream channel would be approximately 8 feet.

The new bridge deck is designed to discharge stormwater into vegetated areas at either end of the bridge, rather than directly into the creek.

Stream Channel Restoration
The stream channel would be reconstructed and the alignment adjusted for hydraulic transition corrections. An approximately 200-foot-long channel (including 100 feet downstream, underneath the bridge itself, and 50 feet upstream) that simulates the adjacent stream channel would be constructed to re-establish a 1.2 percent channel grade and ~25-foot channel width at bank full. Approximately 100 cubic yards of roadway fill and 260 cubic yards of channel stored sediments would be excavated from the crossing and stream channel.

Approximately 380 cubic yards of streambed gravels would be placed to fill the scour pools at the culvert inlet and outlet to maintain the channel grade and prevent degradation of channel material upstream of the existing culvert (head-cutting). Some of this may be taken from the temporarily excavated/stored gravels on site. If imported gravel is used, it will meet the cleanliness and size criteria for "fish rock."

Approximately 100 feet of the north bank of Little Lost Man Creek downstream of the bridge would be stabilized. The banks would be reconstructed with RSP as a foundation under a bioengineered slope consisting of earthen fill and approved native plantings. On the south bank downstream of the bridge, the bank would be pulled back to form a floodplain for a length of approximately 80 feet and a width of approximately 15 feet.

Disturbed Soil/Vegetation and New Impervious Surface
The Project's total disturbed soil area is estimated to be 0.80 acre, represented by areas where construction activities (including staging and storage) would take place, ground would be disturbed, and vegetation would be cleared. Approximately 500 cubic yards of material (dirt/rock) would be imported to construct embankments under portions of the widened roadway to tie in with the new bridge approaches. The impervious surface area within the project area is currently 0.96 acre, and the projected post-project impervious surface area would be approximately 1.01 acres, for an increase of 0.05 acre.

Construction Phase Best Management Practices
Caltrans would require that project contractor(s) implement temporary construction phase best management practices (BMPs) throughout the project to control stormwater discharges and potential discharges of pollutants to surface waters. The Stormwater and Pollution Prevention Plan (SWPPP) would include a waste management section that provides procedural and structural BMPs for collecting, handling, storing, and disposing of wastes generated by project construction to prevent the accidental release of pollutants. The contractor would also be required to submit a Demolition and Debris Containment and Management Plan to the Caltrans Resident Engineer for approval. The approved plans must meet environmental regulations, permits, consultations, agreements, notices, and details of work as specified in the environmental applications.

Because project construction would be dynamic, the contractor would determine locations for implementing these BMPs. Adequate material quantities would be available to allow the contractor sufficient flexibility to implement the BMPs as needed. Construction site BMPs related to water quality include, but are not limited to, the following:

- Trash removal would occur daily.
- Prior to use, equipment must be checked daily and periodically during the day for leaks. Leaking equipment cannot be used until fixed.
- Before entering the job site, all equipment must be cleaned to remove external oil, grease, dirt, or mud.
- Equipment must be pressure washed prior to arrival on the project site and prior to leaving the project site. Only weed-free equipment is allowed in the action area.
- No equipment maintenance or fueling shall be done within 50 feet from any streambed or flowing stream. If it is not practical to move equipment (e.g., large cranes) for fueling or maintenance, the contractor will implement a plan that includes measures to prevent any pollutants from entering Little Lost Man Creek.
- Temporary construction barrier fencing and/or flagging would be installed between the work area and environmentally sensitive areas to restrict access and prevent unnecessary disturbance.
- All heavy equipment would stay out of the channel unless the channel is dewatered or otherwise dry (see also Construction Site Dewatering and Diversion Plan).
- Placement of concrete or concrete slurry would be conducted in a dry or dewatered area (e.g., channel banks above the OHWM or within a dewatered cofferdam or stream channel) to prevent contact of wet concrete with flowing water (see also Construction Site Dewatering and Diversion Plan).
- Any spills or leaks from construction equipment (i.e., fuel, oil, hydraulic fluid, and grease) shall be cleaned up in accordance with the provisions in the SWPPP.
- Use of geo-synthetic fabric (e.g., plastic, filter fabric) barriers to prevent the discharge of contaminants (e.g., sediment, oil and grease, etc.) when equipment is working adjacent to or over waterways.
- Perimeter control BMPs, such as fiber rolls, silt fencing, straw wattles, and gravel-bag berms, would be installed along the work and staging areas to control sediment in runoff from entering adjacent waters.
- Designated staging and fueling areas with appropriate perimeter control BMPs to prevent spills and non-stormwater discharges.
- Rain Event Action Plans would be prepared prior to any forecasted precipitation to ensure adequate stabilization of equipment, materials, and soils.
- If chemical contamination is detected, all project activities would cease and NMFS and permitting agencies would be contacted immediately. Project activities may resume only after regulatory agencies have reasonable assurances that chemical contamination has ceased.
- All waste (concrete, asphalt, etc.) generated during construction would be disposed of at a permitted disposal site.
- Vegetation reestablishment or other stabilization measures would be implemented on disturbed soil areas, per the erosion control plan, and soil disturbing work would be limited during the rainy season.

Provisions for Use of Artificial Light at Night

Artificial night lighting may be required for brief periods during operations that necessitate a full road closure (i.e., to move traffic lanes). The use of artificial lighting would be temporary and of

short duration, likely no more than two nights and fewer than eight hours each occasion. Deflectors would be used to direct light away from the channels and focused specifically on the portion of the bridge actively under construction. Lighting on the bridges and near watercourses would be limited to critical need (i.e., due to accelerated work schedule to meet permit deadlines or reaching a critical juncture in work at a time when it would be infeasible to stop construction) to minimize the effects of artificial light on sensitive biological resources.

Revegetation, Plant Establishment, and Invasive Weed Control
Downstream of the new bridge, the bank stabilization and floodplain restoration work would remove one 16-inch diameter red alder and several small willows, but the activity would occur primarily in an area with vertical banks currently barren of vegetation. After all construction materials are removed, the project area would be restored to a natural setting by grading, placing erosion control, and replanting with native species. A revegetation and monitoring plan would be developed that outlines methods that would be implemented to restore all areas temporarily impacted by construction. Replanting would be subject to a plant establishment period as defined by project permits, which would require Caltrans to adequately water plants, replace unsuitable plants, and control pests. Caltrans would also implement a program of invasive weed control in all areas of soil disturbance caused by construction to improve habitat for native species in and adjacent to disturbed soil areas within the project limits.

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.

Caltrans determined the proposed action is not likely to adversely affect Southern DPS Pacific eulachon or its critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.13).

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 as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) 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.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- 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 and critical habitat, analyze whether the proposed action is likely to: (1) 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, or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative 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' "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 function of the PBFs that are essential for the conservation of the species.

2.2.1 Species Description and General Life History

SONCC Coho Salmon: Coho salmon have a generally simple 3-year life history. The adults typically migrate from the ocean and into bays and estuaries towards their freshwater spawning grounds in late summer and fall, and spawn by mid-winter. Adults die after spawning. The eggs are buried in nests, called redds, in the rivers and streams where the adults spawn. The eggs incubate in the gravel until fish hatch and emerge from the gravel the following spring as fry. These 0+ age fish typically rear in freshwater for about 15 months before migrating to the ocean. The juveniles go through a physiological change during the transition from fresh to salt water called smoltification. Coho salmon typically rear in the ocean for two growing seasons, returning to their natal streams as 3-year old fish to renew the cycle.

CC Chinook Salmon: The CC Chinook salmon ESU are typically fall spawners, returning to bays and estuaries before entering their natal streams in the early fall. The adults tend to spawn in the mainstem or larger tributaries of rivers. As with the other anadromous salmon, the eggs are deposited in redds for incubation. When the 0+ age fish emerge from the gravel in the spring, they typically migrate to saltwater shortly after emergence. Therefore, Chinook salmon typically enter the estuary as smaller fish compared to coho salmon. Similar to coho salmon, prey resources during out-migration is critical to Chinook salmon survival as they grow and move out to the open ocean.

NC Steelhead: 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 only 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.

Steelhead have a similar life history as noted above for coho salmon, in the sense that they rear in freshwater for an extended period before migrating to saltwater. As such, they enter the estuary as larger fish (mean size of about 170 to 180 mm or 6.5 to 7.0 inches) and are, therefore, more oriented to deeper water channels in contrast to Chinook salmon that typically enter the estuary as 0+ fish. The CDFW data indicate that steelhead smolts generally migrate downstream toward the estuary between March 1 and July 1 each year, although they have been observed as late as September (Ricker et al. 2014). The peak of the outmigration timing varies from year to year within this range, and generally falls between early April and mid-May.

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 each species 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 Recovery Plan for SONCC Coho Salmon (NMFS 2014) and Coastal Multispecies Recovery Plan (NMFS 2016), to determine the general condition of each population and factors responsible for the current status of each DPS or ESU. 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).

Status of SONCC Coho Salmon

SONCC Coho Salmon Abundance and Productivity: Although long-term data on coho salmon abundance are scarce, the available evidence from short-term research and monitoring efforts indicate that spawner abundance has declined since the last status review for populations in this ESU (Williams et al. 2016). In fact, most of the 30 independent populations in the ESU are at high risk of extinction because they are below or likely below their depensation threshold, which can be thought of as the minimum number of adults needed for survival of a population.

SONCC Coho Salmon Spatial Structure and Diversity: The distribution of SONCC coho salmon within the ESU is reduced and fragmented, as evidenced by an increasing number of previously occupied streams from which SONCC coho salmon are now absent (NMFS 2001, Good et al. 2005, Williams et al. 2011, Williams et al. 2016). Extant populations can still be found in all major river basins within the ESU (70 FR 37160). However, extirpations, loss of brood years, and sharp declines in abundance (in some cases to zero) of SONCC coho salmon in several streams throughout the ESU indicate that the SONCC coho salmon's spatial structure is more fragmented at the population-level than at the ESU scale. The genetic and life history diversity of populations of SONCC coho salmon is likely very low and is inadequate to contribute to a viable ESU, given the significant reductions in abundance and distribution.

Status of CC Chinook Salmon

CC Chinook Salmon Abundance and Productivity: Low abundance, generally negative trends in abundance, reduced distribution, and profound uncertainty as to risk related to the relative lack of population monitoring in California have contributed to NMFS' concern that CC Chinook salmon are at risk of becoming endangered in the foreseeable future throughout all or a significant portion of their range. Where monitoring has occurred, Good et al. (2005) found that historical and current information indicates that CC Chinook salmon populations are depressed. Uncertainty about abundance and natural productivity, and reduced distribution are among the risks facing this ESU. Concerns regarding the lack of population-level estimates of abundance, the loss of populations from one diversity stratum , as well poor ocean survival contributed to the

conclusion that CC Chinook salmon are "likely to become endangered" in the foreseeable future (Good et al. 2005, Williams et al. 2011, Williams et al. 2016).

CC Chinook Salmon Spatial Structure and Diversity: Williams et al. (2011) found that the loss of representation from one diversity stratum, the loss of the spring-run history type in two diversity substrata, and the diminished connectivity between populations in the northern and southern half of the ESU pose a concern regarding viability for this ESU. Based on consideration of this updated information, Williams et al. (2016) concluded the extinction risk of the CC Chinook salmon ESU has not changed since the last status review. The genetic and life history diversity of populations of CC Chinook salmon is likely very low and is inadequate to contribute to a viable ESU, given the significant reductions in abundance and distribution.

Status of NC Steelhead

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 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 Habitats

The condition of SONCC coho salmon, CC Chinook salmon, and NC steelhead critical habitat, specifically its 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, 70 FR 52488). Diversion and storage of river and stream

flow has dramatically altered the natural hydrologic cycle in many of the streams within the ESU's and 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 Habitats

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 SONCC coho salmon (Good et al. 2005). From 2014 through 2016, the drought in California reduced stream flows and increased temperatures, further exacerbating stress and disease. Ocean conditions have been unfavorable in recent years (2014 to present) due to the El Nino 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 all three species of listed salmonids subject to this consultation. In the coming years, climate change will influence the ability to recover some salmon species in most or all of their watersheds. Coho salmon and 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 coho salmon. 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 2007). 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 salmonids 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 action area for the Project encompasses the entire construction footprint that would be subject to ground disturbance and vegetation clearing, including the US 101 roadway and shoulders from PM 8.2 to PM 8.7 where staging and material storage may occur (i.e., temporary and permanent project limits). It also includes Little Lost Man Creek and Prairie Creek in the vicinity of the bridges where listed salmonids could be exposed to minor pulses of turbidity and underwater noise that could result in physical and behavioral hydroacoustic impacts to fish.

Turbidity is not expected to extend beyond the temporary impact limits within Little Lost Man Creek, so it would not enter Prairie Creek. Hydroacoustic noise levels known to elicit behavioral responses in fish could occur in Little Lost Man and Prairie creeks within a 1550-foot radius of pile driving (Caltrans 2018). These behavioral impacts would therefore extend into approximately 1950 feet of Little Lost Man Creek, and 2700 feet of Prairie Creek.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

In the action area, the threat to SONCC coho salmon, CC Chinook salmon, and 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. However, due to the large areas of intact old growth redwood in the Little Lost Man Creek watershed, and the action area's location in the coastal fog belt, the action area maintains low water temperatures throughout the summer. Therefore, the critical habitat in the action area has a very high conservation value for listed salmonids into the future.

2.4.1 Status of Listed Species and Habitat in the Action Area

Coho salmon occurring in the action area belong to the Redwood Creek population of SONCC coho salmon; Chinook salmon occurring in the action area belong to the Redwood Creek population of CC Chinook salmon; and steelhead in the action area belong to the Redwood Creek population of NC steelhead.

Coho Salmon

The Redwood Creek population of SONCC coho salmon is considered likely to be below their depensation threshold (NMFS 2014), which can be thought of as the number of spawners needed for survival of the population. However, based on the general stability in the production of juvenile coho salmon over the last decade of monitoring, Humboldt State University (HSU 2016) concluded that the abundance of coho salmon in the Prairie Creek subbasin is likely at or close to the carrying capacity of the system; that Prairie Creek is a stronghold for coho salmon in the Redwood Creek population; and that the depensation level for the entire Redwood Creek watershed is often exceeded just in Prairie Creek.

Little Lost Man Creek from just upstream of the bridge location and downstream to the confluence with Prairie Creek appears to have been channelized. This simplification of the creek has apparently caused channel incision and loss of instream complexity and pool habitat. Caltrans noted only two shallow pools downstream of the bridge during a stream survey in the summer of 2017. This lower portion of Little Lost Man, unlike most of its watershed, was logged of old growth redwood in the 1960's. Habitat conditions for rearing coho salmon generally improve beginning about 100 feet upstream of the bridge crossing, with more pools and complex cover present in this portion of the action area.

Recent studies of the Prairie Creek watershed (Wilzbach et al. 2016, HSU 2016, Redwood National Park (RNP) 2017) describe water temperatures as being relatively cold (compared to other watersheds in the SONCC coho ESU) in Prairie Creek and its tributaries, including Little Lost Man Creek. The cool temperatures are likely due to the large areas of intact old growth redwood forest as well as the watershed's location in the coastal fog belt. These low temperatures likely explain the slow growth of juvenile coho, which may explain the two-year juvenile freshwater residency of approximately a quarter of the population in a given year (Bell and Duffy 2007). RNP (2017) measured juvenile coho salmon in various Prairie Creek tributaries during August and September and found fork lengths between 43 and 89 millimeters. Sparkman (2014) found that coho salmon fry in Prairie Creek during spring trapping from 2011 to 2013 had an average fork length of 42.5 millimeters and weighed an average of 1.13 grams. Duffy (2012) reported densities of 0.33 juvenile coho salmon per square meter (m^2) in upper Prairie Creek, 0.38 fish/m^2 in Streelow Creek, and 0.77 fish/m^2 in Boyes Creek. Drobny (2016) found coho densities in Prairie Creek of 0.50 fish/m^2.

Generally, adult coho salmon migrate into the action area after the first heavy fall or winter rains between November and February (HSU 2016). Caltrans biologists noted a pair of coho salmon spawning on the first riffle downstream of the bridge crossing during a January 17, 2018 site visit. NMFS and Caltrans biologists also noted redds upstream of the bridge crossing in each of the riffles suitable for spawning within the action area during a site visit later in the month. These

could have been coho or steelhead redds, but were unlikely to be Chinook redds due to their small size and location in this smaller tributary.

During initial fish capture and relocation in the construction access area, which began on June 17, 2020, no coho salmon were found. Additionally, no coho salmon were observed during a July 6, 2020 snorkel survey of the reach of Little Lost Man Creek upstream of the Project. From this data, it seems unlikely that coho spawned in Little Lost Man this year. However, it is possible that young-of-year coho may disperse into the reach below the Project from Prairie Creek. Therefore, we conservatively estimate that 10 young-of-year coho could be in the action area.

Chinook Salmon

The habitat conditions in the action area described above for coho salmon are generally applicable to Chinook salmon as well. Chinook salmon in the Prairie Creek watershed display primarily an ocean-type rearing pattern; i.e., they migrate to sea or the estuary shortly after hatching. However, smolt trapping conducted on Prairie Creek has found yearling outmigrants, but in numbers on the order of 0.1 to 0.2 percent of the population (NMFS 2016). In general, Chinook smolt outmigration from Prairie Creek peaks from April through May (NMFS 2016). Spawning in the Prairie Creek watershed occurs primarily from November through February (NMFS 2016). However, due to its small size, Chinook salmon may not spawn in Little Lost Man Creek in the action area. Chinook salmon of the Redwood Creek population are considered to be above their depensation threshold (NMFS 2016).

During initial fish capture and relocation in the construction access area, which began on June 17, 2020, no Chinook salmon were found. Additionally, no Chinook salmon were observed during a July 6, 2020 snorkel survey of the reach of Little Lost Man Creek upstream of the construction zone. From this data, and given that Chinook salmon in this population likely do not spawn in Little Lost Man Creek, and they would have completed outmigration in the spring, it seems unlikely that any Chinook salmon reside in the action area. However, we cannot completely rule out presence due to individual variation in juvenile Chinook migratory behavior, so we estimate that up to three individuals could remain in the action area.

Steelhead

The habitat conditions in the action area described above for coho salmon are generally applicable to steelhead as well. Prairie Creek steelhead enter freshwater from the ocean with well-developed gonads in late fall and winter, and spawn between February and April. Like rearing juvenile coho salmon in the Prairie Creek watershed, juvenile steelhead also appear to grow slowly due to low water temperatures in the action area. RNP (2017) measured juvenile steelhead in various Prairie Creek tributaries and found fork lengths between 32 and 115 millimeters. Sparkman (2014) found that steelhead fry in Prairie Creek during spring trapping from 2011 to 2013 had an average fork length of 40.1 millimeters. They did not provide weights, but weights are probably comparable to those published for coho salmon of similar length indicated above.

Unlike most streams in the SONCC coho ESU, juvenile coho salmon usually outnumber juvenile steelhead in Prairie Creek. For example, Drobny (2016) found a density of 0.50 coho/m^2 in

Prairie Creek, but found a juvenile trout density of 0.20 fish/m^2. Recent information from Wilzbach et al. (2016) and NMFS (2016) indicates that adult steelhead abundance continues to be above the depensation level and have a low likelihood of extinction.

However, as noted above, many more juvenile steelhead were encountered during fish relocation. The fish relocation crew reported that several steelhead redds appear to have been constructed in the action area, which is likely responsible for the abundance of very small steelhead fry. Since June 17, no steelhead fry have been able to migrate downstream through the construction zone due to screens, but they have been caught daily in the fyke trap as they migrate downstream, and were moved into Prairie Creek. Recently-emerged salmonids experience high densities in spawning areas, so they characteristically disperse to habitat with lower densities (Quinn 2005), as the fry upstream of the construction zone appear to be doing.

Therefore, we would expect the density of steelhead fry in the reach below the construction zone to continue to decrease over time. Given the numbers of young-of-year steelhead encountered in the first segment of the downstream reach in June, which is approximately half as long as the remaining downstream reach, and that densities are likely to have become lower, we estimate that approximately the same number of young-of-year steelhead remain in the downstream reach as were in the first segment. Therefore, we estimate that approximately 500 young-of-year steelhead remain, but no older year classes are likely present due to lack of pool habitat.

The snorkel survey on July 6, 2020, recorded 251 young-of-year steelhead and 3 yearling or older individuals. The crew noted that water clarity was excellent, but they had trouble seeing into some of the heavier cover. Therefore, the actual numbers were likely higher. We think a reasonable estimate is that approximately 300 young-of-year, and 10 yearling or older steelhead remain the action area upstream of the construction zone.

In sum, we estimate that approximately 800 young-of-year, and 10 yearling or older juvenile steelhead remain in the action area.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

2.5.1 Fish Relocation and Stream Diversion

Approximately 250 linear feet of Little Lost Man Creek (100 feet upstream and 150 feet downstream of the bridge) was dewatered by diverting and pumping the streamflow around the construction location beginning on June 29, 2020. This measure avoids the late fall-winter migration period for adult salmon that may pass through the project area to spawn in most years,

and the spring-early summer smolt out-migration. The diversion would, however, be constructed and remain in place during the period when juvenile salmonids may utilize the waters for summer rearing. This initial stream diversion and dewatering required fish capture and relocation.

As of July 6, 2020, 647 juvenile NC steelhead have been relocated from the construction access area, and the crew has recorded 42 mortalities. The original Biological Opinion and Incidental Take Statement predicted 100 juvenile steelhead would be relocated from the entire 900-foot construction and hydroacoustic impact reach. Additionally, the mortality rate is approximately twice the predicted amount.

Fish Relocation
Removing fish from the temporary construction area in Little Lost Man Creek is expected to significantly reduce the number of fish potentially injured or killed during the summer work season. In the absence of fish relocation, juvenile salmonids would be exposed to dewatering, thermal stress, desiccation, physical injury from construction equipment, and sound levels that Caltrans predicts would exceed the single strike threshold (206 dB) during pile driving operations. These exposures would likely kill them. However, while fish relocation substantially avoids impacts from construction, fish relocation activities themselves can injure or even kill fish. The amount of unintentional injury or mortality attributable to fish removal varies widely depending on the method used, ambient conditions, and the expertise and experience of the field crew. Fish collecting gear, whether passive or active poses some risk to individuals, including stress, disease transmission, injury, or death (Hayes et al. 1996). In addition, relocated fish may have to compete with other fish for available resources such as food and habitat, and the growth rate of fish can be slowed when population density is high (Ward et al. 2007).

Based on the results of various studies of salmonid seasonal occupancy and densities, as well as consideration of the quality of habitat both upstream and downstream of the pile driving location (see *Environmental Baseline* section), NMFS expected that no more than 150 juvenile coho, five juvenile Chinook salmon, and 100 juvenile steelhead would be captured and distributed to suitable habitat in Prairie Creek. As noted above, as of July 6 the crew has relocated 647 juvenile steelhead from the dewatered area, and are continuing to relocate fish as they attempt to migrate downstream. The crew has not encountered any coho or Chinook salmon.

Mortality of Relocated Fish
Data on fish relocation efforts from water diversion activities since 2004 shows most average mortality rates are below three percent for salmonids. Given the measures that would be implemented to avoid and minimize impacts to fish during relocation efforts, NMFS expected no more than three percent of all relocated fish would be subject to potential injury or mortality. However, to date, the crew has reported a mortality rate of over 6%, all of which have been young-of-year steelhead. This mortality rate is unlikely to be due to the experience of the fish relocation crew, which NMFS staff have worked with on previous projects.

Based on conversations with Caltrans staff and the lead biologist of the relocation crew, as well as familiarity with the project location, NMFS believed that the high mortality rate is due to the very small size of the steelhead fry (19 to 45 millimeters), the shallow gravel and cobble

substrate of the downstream reach of the creek where most of the small steelhead are, the complex habitat upstream of the reach, and turbidity generated as crews walk through the numerous clay layers exposed on the upstream creek bottom (Caltrans 2020; personal communication, Doug Parkinson, July 3, 2020).

The rock and cobble present in the downstream reach likely provides refuge for juvenile steelhead, which are known to seek refuge under rocks when disturbed. The inches-deep flow, gravel/cobble substrate, and behavior make the fish difficult to locate, so they are likely experiencing multiple electroshocking exposures and may be crushed as the crew wades. Fish crushed under rocks may not be discovered. Additionally, the small size of the juvenile steelhead could make them particularly vulnerable to predation by the larger salmonids in the available release locations.

The habitat upstream includes pools, undercut banks, and complex large and small woody debris jams that make fish capture difficult and highly intrusive. The crew must disturb the woody debris in order to capture fish, and they are encountering many other species, some classified by California as sensitive, including cutthroat trout, various amphibians, and numerous brook lamprey that are currently spawning throughout the action area.

If we apply the actual 6% minimum mortality rate to the predicted number of young-of-year NC steelhead remaining in the originally proposed fish relocation area, we would expect an additional 48 mortalities.

Caltrans proposes to eliminate additional fish relocations. They believe that the hypothetical injuries that may occur due to pile driving are outweighed by the real threat of additional high mortality of listed species, as well as disturbance to habitat and impacts to numerous other sensitive aquatic species. Caltrans' letter requesting reinitiation of the ESA consultation includes the following information:

> *It has been noted that ground-radiated noise is dominated by low frequencies, and underwater sound pressure levels do not propagate as efficiently in shallow-water environments as in open, deep-water environments (Caltrans 2015). Geotechnical and geomorphic site conditions in the project area differ from those at the example project. Because the pile diameter is now 36", the piles are land based, a clear water diversion is in place, and the pools adjacent to the clear water diversion are less than 1 meter deep, there will be substantial transmission loss of noise vibrations between the piles and the fish habitat. Depending on pile driving conditions, the sound levels above 150 dB, which were predicted to accumulate to cause cSEL-related barotrauma, may not propagate as far as originally predicted.*
>
> *No research or projects to support physical injuries associated with the cSEL threshold currently exist. The best available science demonstrates no physical injuries associated with the cSEL; for example, the caged fish study conducted for the Mad River 101 Bridges Replacement Project (Caltrans 2010). The dual metric criteria, particularly the cSEL, continues to be overly conservative. However, the 2008 interim criteria remain until agencies work together to develop needed updates to the current interim criteria.*

> *In conclusion, we believe the properties of sound transmission through substrate into shallow confined waters significantly reduces the threat of harmful exposure to fish, and fish relocation exposes them to more harm. Based on our experience and observations, we believe the risk of injury to fish would be very low if they were simply left in place.*

In addition to Caltrans' rationale, Mike Kelly of NMFS (personal observation) was on site as a fisheries monitoring consultant during all pile driving conducted on the banks of the Mad River during the referenced bridge replacement project, and he provides the following observations.

> *The Mad River Bridges project included a fish exclusion zone, from which we were required to remove a minimum of 80% of the ESA-listed salmonids. Therefore, a number of wild juvenile coho and steelhead remained in the zone of predicted barotrauma. These remaining fish were exposed repeatedly to sound levels that are predicted to cause injury. These fish continued normal behavior, such as surface feeding, and I observed no injury or mortality. Additionally, I remained on site until the fish exclusion weirs were removed several days after completion of pile driving. I also did not observe delayed injury or mortality. So, in addition to the caged fish that showed no sign of injury, exposed wild fish appear to have been physically unharmed.*

Therefore, NMFS has reviewed the references cited by Caltrans as well as the anecdotal information provided by Mike Kelly, and we conceptually agree that it may make sense to forego additional fish relocation intended to protect fish from hypothetical injury in order to avoid some amount of certain injury. However, we note that current policy requires that we assume injury within the zone of cSEL above 183 dB. Therefore, our jeopardy analysis assumes all exposed fish to be killed. Please refer to the *Integration and Synthesis* section for this analysis.

Stream Diversion

Adult salmonid migration and spawning, and smolt migration, are not likely to be affected because the diversion would be constructed after smolts have completed emigration from small tributaries such as Little Lost Man Creek, and then removed prior to the onset of adult spawning migration. Passage of redistributing juveniles may be limited by the diversion; however, the proposed work windows minimize exposure and avoid peak timing of juvenile redistribution. Additionally, movements by adult and juvenile salmonids in Little Lost Man Creek are typically prevented by disconnected/subsurface flow until the onset of the first substantial rains of the season.

While the diversion would not likely be in place when adults or juveniles migrate through the action area, NMFS considered the potential due to the request for the work season to end on October 31. NMFS typically recommends that in-channel work end on October 15 in order to minimize the chances of adult salmon and steelhead entering a work area. Extensions to the work window are routinely agreed upon dependent on weather conditions, and many instream projects continue up to and beyond October 31. Because Caltrans needs the additional two weeks in order to meet the expected construction schedule, NMFS examined the potential for adult coho, Chinook, and steelhead to be impacted by work between October 15 and October 31.

The sandbar at the mouth of Redwood Creek typically closes to form a lagoon during the summer, and breaches during elevated fall flows. Adult salmon and steelhead are unable to access Redwood Creek and its tributaries until after the bar breaches. Madej (2012) studied the opening and closing of the bar from 1997 to 2010 and found that the bar breached before October 31 only twice (October 11 and September 21) during those 14 years.

Chinook salmon are typically the first fish to enter the river after the bar breaches, followed by coho and then steelhead. Therefore, NMFS believes that there is a low likelihood of Chinook entering the Prairie Creek system in October, and an extremely low likelihood of coho or steelhead entering. (See Section 2.4.1 for details.)

If adult salmonids entered Little Lost Man Creek while the diversion was in place, they may be able to pass upstream through the temporary culvert. If they were unable to pass upstream, they would likely find spawning habitat elsewhere with minimal delay. Additionally, if adult salmonids were in Little Lost Man Creek when the diversion was removed, they could be exposed to a brief pulse of turbidity as the culvert was pulled and as the channel in the work area adjusted during the high flows. Adult salmonids appear to be little impacted by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991).

Therefore, NMFS does not expect the stream diversion to affect the fitness of any individuals, or to negatively influence the passage of any life stages of SONCC coho salmon, CC Chinook salmon, or NC steelhead.

2.5.2 Noise and Visual Disturbance

General Construction Noise and Visual Disturbance
Construction, demolition activities, and night lighting could cause behavioral responses and stress in juvenile salmon and steelhead present during the in-stream work period of June 15 to October 31. However, the stream diversion and fish relocation efforts will exclude fish from the construction zone, so general construction noise and potential visual disturbance would be improbable apart from the work required to install the diversion and relocate the fish, which is analyzed above.

Impact Noise and Hydroacoustic Effects
Caltrans (2018) evaluated potential underwater noise levels generated by planned construction activities, and determined that impact pile installation could exceed currently adopted hydroacoustic noise thresholds known to cause injury to fish. Based on analyses provided in Caltrans' BA (Caltrans 2018) and confirmed by NMFS, single strike noise levels that are known to cause injury to fish (>206 dB) would be limited to a radius of approximately two meters from a pile, which is well within the area of stream diversion. Therefore, listed salmonids would not be exposed to single strike injurious noise levels.

Sound energy levels above 150 dB can accumulate to cause barotrauma in exposed fish. This cumulative sound exposure level is referred to as cSEL. Because NMFS and Caltrans expect some juvenile salmonids in the action area to weigh less than 2 grams, a cSEL exposure

threshold of 183 dB is proposed. According to Caltrans' analysis, injurious cSEL could be reached in the pool at the confluence of Little Lost Man and Prairie creeks, and potentially in Prairie Creek up- and downstream of this pool, toward the end of the daily pile driving schedule. However, Caltrans believes the pile driving schedule can be met with minimal delays without having to exclude and relocate fish in Prairie Creek. Therefore, Caltrans proposes real-time monitoring by a hydroacoustic specialist during all pile driving operations in order to avoid exceeding the cSEL injury level.

Hydroacoustic monitoring during pile driving will confirm avoidance of injurious levels of sound pressure, and pile driving will cease before injurious cumulative sound exposure levels (cSEL) are reached in a given day. Therefore, NMFS agrees that real time monitoring will ensure that exposure of juvenile salmonids to injurious sound levels in Prairie Creek will not occur.

Additionally, juvenile salmonids could be exposed to underwater noise levels exceeding the behavior thresholds (150dB) without reaching the injurious cSEL threshold. Caltrans' analysis predicts that exposure to 150 dB sound levels would occur over a radius of 1550 feet. This radius would include up to 2700 feet of Prairie Creek, and 1100 of Little Lost Man Creek above the proposed fish exclusion area.

Temporary behavioral changes that fish may exhibit in response to pile driving noise include startling, altering behavioral displays, avoidance, displacement, and reduced feeding success. Observations of juvenile steelhead exposed to pile driving noise above the 150 dB behavioral threshold at the Mad River Bridges Highway 101 project indicate that the fish quickly habituate to the noise and resume normal surface-feeding behavior within a few minutes of the fist pile strikes (Mike Kelly, NMFS, personal observation). Therefore, NMFS believes that periodic behavioral changes caused by sub-injurious sound exposure during the course of one week or less will not result in a decrease in fitness or survival of individual listed salmonids.

However, Caltrans proposes to forego additional fish relocation as detailed in section 2.5.1 above. Therefore, juvenile salmonids will be exposed to cSEL's that are considered above the injury threshold. For the purposes of our jeopardy analysis, NMFS considers all of these exposed fish to be lost from the population.

2.5.3 Water Quality

Pollutants from construction operations, highway stormwater runoff, or from the mobilization of sediment and dust both during and after construction, all have the potential to impact water quality within the action area.

Turbidity and Sedimentation
Short term increases in suspended sedimant and turbidity are anticipated during a number of Project-related activities. These activities include installation and removal of the stream diversion, worker access to the streambed, and fish relocation efforts. Additionally, there is likely to be an increase in suspended sediments and turbidity throughout the action area during the first rainfall of the season as disturbed sediments mobilize and adjust.

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 displace themselves from 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).

Activities that could produce the majority of potential suspended sediments will occur while the site is dry or de-watered, and salmonids would have been relocated outside of the work area and not exposed to turbidity. Removal of the stream diversion would be performed gradually to avoid potential stream sediment disturbance and transport. Adjustment of the channel during the first rains of the season will likely produce turbidity of short duration and low concentration, and will occur when the most vulnerable life stages are not present. Additionally, through project design and implementation of standard wet-weather BMPs, as described in detail in Caltrans' BA (Caltrans 2018), levels of suspended sediment and turbidity are expected to be controlled sufficiently to avoid exposing salmonids to injurious durations and concentrations. Therefore, NMFS considers the potential amounts and duration of turbidity generated by the proposed Project to be unlikely to reduce the fitness of listed salmonids 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 metals (e.g., copper, zinc, cadmium, lead and nickel) 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).

However, the Project will not increase the amount of traffic in the action area, and as such the traffic-related contaminants are expected to remain similar to pre-project levels. Additionally, stormwater drainage at the new bridge is designed to discharge into vegetated areas at either end of the bridge, rather than directly into the creek. Therefore, reductions in fitness of individual listed salmonids residing in the action area due to toxic materials in stormwater runoff are not expected.

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 all construction areas stabilized prior to the onset of the rainy season. Furthermore, the proposed minimization measures are expected to prevent chemical

contamination during construction. Given the minimization measures and BMPs proposed, NMFS expects the likelihood of an accidental spill of contaminants reaching a waterway to be improbable.

2.5.4 Effects to Critical Habitat

NMFS expects long-term improvement to the quality and quantity of critical habitat due to the proposed action. The SONCC Coho Salmon Recovery Plan (NMFS 2014) lists barriers to fish passage as a "low-severity impediment," and the Coastal Multi-Species Recovery Plan for CC Chinook Salmon and NC Steelhead (NMFS 2017) rates passage past physical barriers as "very good" for adults and "good" for juveniles in the Redwood Creek watershed. However, the Prairie Creek watershed provides valuable refugia habitat for juvenile salmonids (NMFS 2017), and because the proposed action primarily addresses juvenile salmonid passage, it is likely to improve this important function and aid in species recovery.

The recovery plans also indicate "intrinsic potential" for specific reaches of streams. Intrinsic potential describes the potential of a reach of stream to support rearing juvenile salmonids regardless of the current condition of the stream reach. The recovery plans list Little Lost Man Creek as having reaches of high intrinsic potential for coho and steelhead, and low intrinsic potential for Chinook. Given the length of habitat with high intrinsic potential that the project will make more readily accessible to juveniles, the project is likely to have a positive impact on SONCC coho salmon and NC steelhead recovery. Additionally, the project proposes to restore a small amount of floodplain connectivity in Little Lost Man Creek. Lack of floodplain and channel structure is listed as a very high stress to SONCC coho salmon in the Redwood Creek watershed. While limited floodplain function is proposed to be restored to an area only 80 feet long and 15 feet wide on one side of the channel downstream of the bridge, it addresses a high priority recovery action.

Streambanks and Streambed
Abutments for the new bridge will occupy portions of the natural streambank, resulting in an artificial setting with concrete or RSP instead of native bank materials. However, the bridge abutments and RSP are limited in spatial extent and occur only adjacent to the existing bridge and roadway. The majority of this area is already in an artificial setting and occupied by the current concrete box culvert. Placement of new bridge will continue much of this artificial setting into the future, although impacts will likely be reduced because a natural streambed will replace the concrete culvert bottom, and the new channel width will provide more natural conveyance of water and debris. Because the proposed changes to the streambanks and channel in the action area represent an overall improvement compared to baseline condition, NMFS does not expect any reduction in the quantity or quality of designated critical habitat due to this project action.

Impervious Surface
As a result of the project, there would be an estimated 0.14-acre increase in impervious surface. New impervious surface has the potential to cause an increase in peak flow and higher runoff volumes that can lead to channel scouring and bank erosion which, in turn, can increase sediment and turbidity in receiving waters. It can also lead to decreased storage capacity and outflow

efficiency, thereby negatively affecting floodplain processes that are important for salmonids. However, due to the relatively small amount of new impervious surface in a watershed that is almost entirely within old growth redwood forest, NMFS believes that no changes in peak flow or runoff volume would occur that could produce a meaningfully measurable impact to salmonid habitat.

Riparian Habitat
As the riparian area adjacent to the bridge is subject to routine maintenance, it is of low quality and dominated by Himalayan blackberry. The clear water diversion would be installed by manual labor by way of foot access and would not require riparian vegetation removal. Downstream of the new bridge, bank stabilization and floodplain restoration work would remove one 16-inch diameter red alder and several small willows, but the activity would occur primarily in an area with vertical banks currently barren of vegetation. After the bank stabilization work, habitat complexity and riparian vegetation should be improved.

The bridge work is expected to have minimal impact on the functional values of existing riparian habitat for coho, Chinook, and steelhead, and would be improved post-construction. Given the small scale of the impact, the minimal temporal loss of riparian function, and the vegetative cover that would remain adjacent to the project site, no measurable increase in water temperature or reduction in the amount of terrestrial food input into the project area watercourses is anticipated. In addition, disturbed areas would be stabilized, and vegetation reestablished. Therefore, impacts to riparian vegetation are not expected to result in any fitness consequences to individual listed salmonids in the action area.

2.5.5 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 watercourses at the same time when fish may be exposed to noise and vibration from construction equipment or pile driving activities. Fish may also be exposed to noise and/or visual disturbances during minor increases in turbidity when the clear water diversion is removed. Most potential project impacts would not occur simultaneously due to logistics of bridge construction that require one phase of the project to be completed prior to starting another. For instance, removal of the concrete culvert or the clear water diversion would not occur simultaneously to abutment construction, thereby eliminating the potential compounding effects of those activities. Because combined effects are either unlikely or of very low intensity, NMFS does not expect any reductions in listed salmonid 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 and 402.17(a)). 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.

SONCC coho salmon, CC Chinook, and NC steelhead in the action area are unlikely to be affected by future non-federal activities such as rural development, road construction and timber harvest because the watershed is protected by the Redwood State and National Park. 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 versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

2.7. Integration and Synthesis

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

NMFS has developed a Viable Salmonid Population (VSP) concept which includes the parameters of population abundance, population growth rate, population spatial structure, and population diversity for defining a viable population which is an independent Pacific salmonid population that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time period. An ESU or DPS is typically made up of multiple independent populations. Therefore, NMFS must assess whether changes to VSP parameters of the independent populations affected by a proposed action results in a reduction in the numbers, reproduction, or distribution of the ESU or DPS as a whole.

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

We describe critical habitat for SONCC coho salmon, CC Chinook salmon, and NC steelhead at the ESU/DPS scale as mostly degraded in section 2.2.2. Although there are exceptions, the majority of streams and rivers in these ESUs/DPS have impaired habitat. Additionally, critical habitat in the ESUs often lacks the ability to establish essential features due to ongoing and past human activities. While habitat generally remains degraded across the ESUs/DPS, restorative actions have likely improved the conservation value of critical habitat throughout the range of these ESUs/DPS.

SONCC coho in the action area belong to the Redwood Creek Population of the Central Coast Stratum. This population is likely below the depensation threshold and has a high risk of extinction (NMFS 2014).

CC Chinook in the action area belong to the Redwood Creek Population of the North Coastal Diversity Stratum. This population is likely above the depensation threshold and has a low risk of extinction (NMFS 2016).

NC steelhead in the action area belong to the Lower Redwood Creek Population of the Northern Coastal Diversity Stratum. This population is likely above the depensation threshold and has a low risk of extinction (NMFS 2016).

The cumulative effects of those state, private, and tribal activities that occur in the Redwood Creek watershed, as discussed in the environmental baseline section, may continue to impair, but not preclude the recovery of, critical habitat in the action area. NMFS expects that ongoing improvements in legacy effects of poor timber harvest practices and agricultural and urban development will result in improved habitat conditions for SONCC coho salmon, CC Chinook salmon, and NC steelhead. Additionally, focused recovery actions as identified in the Recovery Plan (NMFS 2014, 2016) are expected to further improve habitat in Redwood Creek.

The action area is expected to be more resilient than other streams in California to the effects of climate change because all of the upstream land is in public ownership with large areas of intact forest and significant stands of old-growth redwood. Because of this, the action area typically does not exceed lethal temperatures for salmonids. Additionally, due to the negligible nature of the action's long-term impacts, NMFS does not expect the proposed action to exacerbate the effects of climate change on salmonids or their critical habitat in the action area.

2.7.2 Summary of Effects to Individual Salmonids

NMFS anticipates miniscule effects to SONCC coho salmon, CC Chinook salmon, and NC steelhead and their critical habitats from expected levels of chemical contamination, temporary and permanent loss of riparian vegetation, disturbance of streambanks and the streambed due to construction access, and increased sediment and turbidity during various activities. Adverse effects of the proposed action on these salmonids may occur due to exposure to high energy sound during impact pile driving. Adverse effects are also likely due to capture, handling, and relocation efforts intended to protect fish from potential exposure to in-water work activity and pile driving. The following is a summary of potential and known levels of mortality by life stage.

- No adult salmonids are expected to be directly impacted by the project.
- No juvenile coho or Chinook salmon were found during fish relocation efforts or during the July 6 snorkel survey.
- As of July 6, 647 juvenile steelhead were handled during relocation efforts. Of these, 42 young-of-year and zero yearling or older juveniles were killed.
- Young-of-year steelhead continue to disperse, and the fish relocation crew traps them in a fyke net for relocation to Prairie Creek. This passive method of capture is safer than direct capture methods; however, some small number of young-of-year steelhead may still be killed.
- Approximately 10 juvenile coho, 3 young-of-year Chinook, 800 young-of-year steelhead, and 10 yearling or older juvenile steelhead would be exposed to cumulative sound pressure levels that are predicted to cause injury. NMFS considers that all of the exposed fish will be killed.

- The total predicted mortality (known mortality to date plus expected additional mortality from fyke net trapping and relocation, and sound exposure) is approximately 10 juvenile coho, 3 young-of-year Chinook, 850 young-of-year steelhead, and 10 yearling or older juvenile steelhead

The loss of 10 juvenile SONCC coho, which would primarily be young-of-year individuals, though a few could be yearlings, is not expected to affect future adult returns in any cohort. The loss of juveniles represents a miniscule percentage of the overall number of individuals in the population. The overall number of individuals in the population will likely provide a compensatory effect. Other areas of the Redwood Creek watershed are expected to continue to contribute to the population 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 SONCC coho salmon ESU, and the project is unlikely to appreciably diminish the value of designated critical habitat for the conservation of the species.

The loss of 3 juvenile CC Chinook salmon is not expected to affect future adult returns. The loss of juveniles represents a miniscule percentage of the overall number of individuals in the population. The overall number of individuals in the population will likely provide a compensatory effect. Other areas of the Redwood Creek watershed are expected to continue to contribute to the population 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 CC Chinook ESU, and the project is unlikely to appreciably diminish the value of designated critical habitat for the conservation of the species.

Survival of fry to adult in salmonids varies greatly, but 1% to 2% is generally accepted for steelhead. Therefore, the loss of 850 young-of-year and 10 yearling or older NC steelhead could affect future adult returns. However, this loss would represent a small percentage of the overall number of individuals in the population. Additionally, the Redwood Creek population is above the depensation level and has a low likelihood of extinction (NMFS 2016). The overall number of individuals in the population will likely provide a compensatory effect. Other areas of the Redwood Creek watershed are expected to continue to contribute to the population 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 the species.

2.7.3 Summary of Effects to Critical Habitat

NMFS has determined that the effects to critical habitat from the proposed action are limited to short-term effects on the streambed substrate and streambanks, minor turbidity events, and short-term and miniscule permanent effects of riparian vegetation loss. The new bridge will fully span the channel and 100-year floodplain. The Project will also create a floodplain bench downstream of the new bridge. Therefore, some beneficial effects to critical habitat may occur due to restoration of more natural fluvial processes and increase space for habitat. The project is also

designed to allow unimpeded fish passage, which will make critical habitat more accessible to spawning and rearing salmonids. The results of our analysis indicate that negative effects on critical habitat would be temporary or negligible. Therefore, changes to critical habitat due to the project are unlikely to appreciably reduce the likelihood of survival and recovery of SONCC coho salmon ESU, CC Chinook salmon ESU, or the NC steelhead DPS.

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, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SONCC coho salmon, CC Chinook salmon, or NC steelhead or destroy or adversely modify their 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, or has occurred, as follows:

- Take of juvenile steelhead in the form of capture during fish relocation and diversion activities occurred. 647 juvenile steelhead have been captured and relocated since June 17. Mortality of young-of-year steelhead resulting from relocation activities, including netting and electrofishing, was 42 individuals. (Caltrans will continue to capture and relocate any salmonids attempting to migrate downstream; however, these captures have been limited to a small number of young-of-year steelhead and we expect only a small number of additional mortalities due to the passive method of capture being employed.)

- Additional mortality is expected due to exposure to barotrauma-causing impact pile driving. NMFS expects that up to 10 juvenile coho, 3 juvenile Chinook, 850 young-of-year steelhead, and 10 yearling or older juvenile steelhead could suffer injuries leading to mortality.

- Caltrans proposes to monitor sound levels during pile driving to ensure that attenuation distances are not exceeded. Caltrans will report any exceedances to NMFS immediately. If attenuation distances are exceeded, reinitiation of consultation may be necessary. In this case, sound pressure levels are a surrogate for the predicted extent of take because we cannot count fish injured by sound from pile driving as we cannot necessarily see them. Established protocols for hydroacoustic impacts (Caltrans 2015) clearly define the pressure levels over which injury is expected to occur, and provide guidance for determining distances of injurious sound levels. In the above Biological Opinion, we have estimated the expected number of individual salmonids that may be exposed within these hydroacoustic impact distances; therefore, for the purposes of monitoring take, the measured distances are an appropriate surrogate for take.

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of SONCC coho salmon, CC Chinook salmon and NC steelhead:

1. Undertake measures to ensure that harm and mortality to threatened coho salmon, Chinook salmon and 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 Caltrans must comply with them in order to implement the RPMs (50 CFR 402.14). Caltrans 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. Caltrans 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 pools if biologists judge that overcrowding may occur in a single pool.
    c. Caltrans or their contractor shall monitor any screens used to block fish access on a daily basis, or more frequently if necessary, to ensure that no impingement occurs, and to assess whether significant downstream migration is occurring. If downstream migrating fish aggregate at the screen(s), the qualified biologist will relocate these fish to suitable downstream habitat.
    d. If any salmonids are found dead or injured, the biologist will contact NMFS biologist Mike Kelly by phone immediately at (707) 502-9942. 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. Caltrans 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. Caltrans shall contact NMFS within 24 hours of meeting or exceeding take of listed species prior to project completion. Notify Mike Kelly by phone at 707-502-9942. This contact acts to review the activities resulting in take and to determine if additional protective measures are required.
c. Caltrans shall make available to NMFS data from the hydroacoustic monitoring on a real-time basis (i.e., daily monitoring data should be accessible to NMFS upon request).
d. Caltrans shall monitor the reaches of stream that are predicted to experience sound pressure levels that are expected to injure fish. During pile driving, and in the days after pile driving is completed, biologists shall observe the response of exposed listed salmonids and record any observed injuries or mortalities. If mortalities are observed, a sub-sample of no more than 20 fish should be collected and preserved as per term and condition 1.d above.

3. The following term and condition implements reasonable and prudent measure 3:

a. Caltrans shall provide a written report to NMFS by January 15 of the 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, CA 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 salmonids, 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 ESA-listed fish; the number of salmonids (by ESU and DPS) killed or injured during Project construction; and photographs taken before, during, and after the activity from photo reference points; and a qualitative assessment of the fate of individual salmonids exposed to pile driving noise above barotrauma thresholds.

Fish Relocation – The report will include a description of the location from which fish were removed and the release site 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 critical habitat or regarding the development of information (50 CFR 402.02). NMFS has no conservation recommendations to suggest.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Little Lost Man Creek Fish Passage Bridge Project. As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service 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 identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

Critical habitat for the Southern DPS of eulachon (*Thaleichthys pacificus*) is designated in the Redwood Creek watershed, including Prairie Creek and its tributaries. Therefore, the action area is located within eulachon critical habitat. The action area could provide spawning habitat for Pacific eulachon. The peak spawning entry of eulachon into river systems is typically during February and March (75 FR 13012). Newly hatched larvae are immediately washed downstream after hatching a few weeks after spawning (Moyle 2002). Therefore, no life stage of eulachon would be present in the action area during the construction season between June 15 and October 31 and therefore all of the effects of the Project would be discountable for individual eulachon.

While the proposed rebuilding and regrading of the streambed within the project footprint would disturb spawning substrate, the streambed would return to a natural condition after the first few heavy rains of winter. Adult eulachon would not spawn in the location until after this time; therefore, disturbance to spawning substrate would be insignificant. Other potential impacts to eulachon critical habitat (e.g., sedimentation, riparian disturbance) are described in the Effects of the Action section above, and would apply to eulachon habitat as well as salmonid habitat. Based on these analyses, none of the other potential impacts would be significant.

Additionally, the existing box culvert is likely to be a passage barrier to spawning adult eulachon. Therefore, remediation of this barrier would extend the availability of eulachon critical habitat upstream of the barrier into higher quality habitat than is available below the barrier. Therefore, designated critical habitat for the Southern DPS of Pacific eulachon is not likely to be adversely affected by the proposed action, and the overall impact is expected to be beneficial.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA , EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)]

This analysis is based, in part, on the EFH assessment provided by Caltrans and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fisheries Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

Essential Fish Habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802[10]). "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle. The term "adverse effect" means any impacts which reduce the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrates and loss of, or injury to, benthic organisms, prey species, and their habitats, and other ecosystem components. Adverse effects may be site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.910). The EFH consultation mandate applies to all species managed under a Fishery Management Plan (FMP) that may be present in the action area.

There is suitable habitat for juvenile salmon rearing, and adult salmon spawning in both Little Lost Man and Prairie creeks. Habitat Areas of Particular Concern (HAPC) are described as complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and

submerged aquatic vegetation. HAPCs exist in the action area as: spawning habitat and complex channel and floodplain habitat in both Little Lost Man and Prairie creeks.

3.2 Adverse Effects on Essential Fish Habitat

Both Chinook salmon and coho salmon are expected to occur seasonally within the action area. The adverse effects to coho salmon and Chinook salmon, and critical habitat have already been described in the *Effects* section. The adverse effects to EFH and HAPCs in the action area include:

1. Temporary reduction in habitat available during dewatering activities in Little Lost Man Creek.
2. Noise and visual disturbance during impact pile driving and associated construction activities.
3. Temporary reduction in water quality caused by increase in suspended sediments and turbidity during first rain events following construction.
4. Temporary loss of riparian and wetland vegetation.

3.3 Essential Fish Habitat Conservation Recommendations

The anticipated adverse effects from the proposed action are temporary and minor. The project is designed to improve habitat conditions and habitat availability. NMFS has determined that all desirable and feasible habitat improvements are incorporated into the proposed action. Therefore, NMFS has no EFH recommendations at this time.

3.4 Supplemental Consultation

Caltrans must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. 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.

4.1 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 are [*name of*

Federal action agency(ies)]. Other interested users could include [*e.g., permit or license applicants, citizens of affected areas, others interested in the conservation of the affected ESUs/DPS*]. Individual copies of this opinion were provided to the [*name of action agency(ies)*]. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2 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.

4.3 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, if applicable*] 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, if applicable*], and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

5. 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.

Bell, E., and W. G. Duffy. 2007. Previously undocumented two-year freshwater residency of juvenile coho salmon in Prairie Creek, California. Transactions of the American Fisheries

Society 136:966–970.

Bjornn, T. C., and D. W. Reiser. (1991). Habitat Requirements of Salmonids in Streams. American Fisheries Society Special Publication 19(837): 83-138.

California Department of Fish and Game. 2002. Status review of California coho salmon north of San Francisco. Report to the California Fish and Game Commission. April. 232 pp, plus appendices.

Caltrans. 2010. Mad River Bridges Replacement Project Effects of Pile Driving Sound on Juvenile Steelhead. March 2010.

Caltrans. 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of pile Driving on Fish.CTHWANP-RT-15-306.01.01. Division of Environmental Analysis. November 2015.

Caltrans. 2018. Little Lost Man Creek Full Span Bridge Fish Passage Remediation Project biological assessment. EA 01-0F960. April 2018. Eureka, California.

Caltrans. 2020. Letter from Dana York Requesting Reinitiation of Section 7 Consultation and Appendices.

Drobny, P. Y. 2016. Influence of Body Size, Intra- and Inter-Specific Salmonid Densities, and Habitat on Overwinter Survival of Juvenile Coho Salmon (*Oncorhynchus Kisutch*) In Prairie Creek, California. A Thesis Presented to The Faculty of Humboldt State University. May 2016. 68 pp.

Duffy, W.G. 2012. Prairie Creek Sub-Basin Life Cycle Monitoring Project. California Cooperative Fish and Wildlife Research Unit. Humboldt State University. Final Report for: California Department of Fish and Game Fisheries Restoration Grants Program (Project Number: P0710530)

Fisheries Hydroacoustic Working Group [FHWG]. (2008). Agreement in Principal for Interim Criteria for Injury to Fish from Pile Driving Activities. Memorandum to NOAA Fisheries, U.S. Fish and Wildlife Service, California/Washington/Oregon Departments of Transportation, California Department of Fish and Game, and U.S. Federal Highways Administration. June 12, 2008.

Flosi, G. S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 2010. California Salmonid Stream Habitat Restoration Manual. Part IV Fish Sampling Methods. California Department of Fish and Game Wildlife and Fisheries Division.

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.

Hayes, D. B., C. P. Ferreri, and W. W. Taylor. 1996. Active fish capture methods. Pages 193–220 *in* B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society. Bethesda, Maryland. 732 pp.

Humboldt State University. 2016. State of the Fisheries & Aquatic Resources of Prairie Creek. Final Report to Redwood National and State Parks for Cooperative Agreement Number P13AC00848, Task Agreement Number P14AC01284. Margaret A. Wilzbach, California Cooperative Fish & Wildlife Research Unit, Humboldt state University. January 28, 2016. 72 pp.

IPCC. 2007. Climate Change 2007 Synthesis Report. Valencia, Spain.

Kelly, M. 2018. Personal observation.

Kelly, M. 2020. Personal observation.

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.

Madej, M.A. 2012. unpublished data on timing and closure of the mouth of Redwood Creek.

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/section4d/electro2000.pdf.

NMFS. 2001. Status review update for coho salmon (*Oncorhynchus kisutch*) from the Central California Coast and the California portion of the Southern Oregon/Northern California Coast Evolutionarily Significant Units. National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California. April 12. 43 pp.

NMFS. 2014. Final recovery plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*). September 2014.

Arcata, California.

NMFS. 2016. 5-Year Review: Summary & Evaluation of Southern Oregon/Northern California Coast Coho Salmon. Arcata, California. 70 pp.

NMFS. 2017. Coastal Multi-Species Recovery Plan. Santa Rosa, California.

Parkinson, D. 2020. Personal communication. July 3, 2020

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.

PFMC (Pacific Fishery Management Council). 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon. Pacific Fishery Management Council, Portland, Oregon. September 2014. 196 pp. + appendices.

Quinn, T. P. 2005. The Behavior and Ecology of Pacific Salmon and Trout. University of Washington Press, Seattle. 378 pages.

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.

Redwood National Park. 2017. Lower Prairie Creek Watershed Fish Distribution Lower Prairie Creek Area Planning Project Fish and Wildlife Branch – February 2017

Ricker, S. J., and C. W. Anderson. 2014. Results of Freshwater Creek Salmonid Life Cycle Monitoring Station 2013–2014. California Department of Fish and Game, Anadromous Fisheries Resource Assessment and Monitoring Program, 50 Ericson Ct., Arcata, CA 95521.

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.

Sparkman, M.D., M.A. Wilzbach, P.Y. Drobny, M.E. Gordon, and C.M.G. Boone. 2015. Prairie Creek Monitoring Project, 2014 Season: a report to the Fisheries Restoration Grants Program (Project No. P1210321)

Ward, D. M., K. H. Nislow, J. D. Armstrong, S. Einum, and C. L. Folt. 2007. Is the Shape of the Density–Growth Relationship for Stream Salmonids Evidence for Exploitative Rather than Interference Competition? *Journal of Animal Ecology, 76*:135–138.

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.

Wilzbach, M.A., M.D. Sparkman, P.Y. Drobny, M.E. Gordon, and C.M.G. Boone. 2016. Prairie Creek Monitoring Project, 2015 Season: a report to the Fisheries Restoration Grants Program (Project No. P1210321), 98 pp.

Federal Register Notices Cited

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.

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.

75 FR 13012. National Marine Fisheries Service. Final Rule. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of Eulachon. May 17, 2010.