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

April 14, 2022 **Refer to NMFS No:** WCRO-2022-00546

Kasey Sirkin, Lead Biologist
United States Army Corps of Engineers, Eureka Field Office
601 Startare Drive, #13
Eureka, California 95501

Re: Endangered Species Act Section 7(a)(2) Biological Opinion for the North Fork Lost River Flow and Habitat Enhancement Project, located in Whitethorn, California (Corps File SPN-2019-00102)

Dear Ms. Sirkin:

Thank you for your letter of March 10, 2022, requesting initiation 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 North Fork Lost River Flow and Habitat Enhancement Project. This letter transmits NMFS' final biological opinion for the proposed North Fork Lost River Flow and Habitat Enhancement Project (Project).

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

In addition, NMFS concurs with the Corps determination that the Project is not likely to adversely affect California Coastal (CC) Chinook salmon (*O. tshawytscha*), Southern Oregon/Northern California Coast (SONCC) coho salmon (*O. kisutch*), or their designated critical habitat.

Please contact Matt Goldsworthy at Matt.Goldsworthy@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

cc: FRN 151422WCR2022AR00051

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

North Fork Lost River Flow and Habitat Enhancement Project

NMFS Consultation Number: WCRO-2022-00546
Action Agency: United States Army Corps of Engineers

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?
Northern California (NC) steelhead	Threatened	Yes	No	No	No
California Coastal (CC) Chinook salmon	Threatened	No	N/A	No	N/A
Southern Oregon/Northern California Coast (SONCC) coho salmon	Threatened	No	N/A	No	N/A

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: April 14, 2022

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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 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at California Coastal NMFS office.

1.2. Consultation History

On March 10, 2022, NMFS received a request from the United States Army Corps of Engineers (Corps) to initiate formal ESA consultation on the proposed Project due to anticipated adverse effects to Northern California (NC) steelhead, and their designated critical habitat. The Corps determined that the Project may affect, but was not likely to adversely affect Southern Oregon/Northern California Coast (SONCC) coho salmon and California Coastal (CC) Chinook salmon and their designated critical habitats. On March 10, 2022, via email, NMFS contacted the Corps to clarify corrections to the proposed action. On March 10, 2022, the Corps confirmed details of the proposed action via email. Consultation was initiated on March 10, 2022.

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 (see 50 CFR 402.02). The Corps proposes to issue a permit pursuant to Section 404 of the Clean Water Act (CWA) of 1972, as amended, 33 U.S.C. § 1344 et seq., to Sanctuary Forest Inc. (SFI) to enhance flow and improve habitat conditions in an important coho habitat restoration project located on Sanctuary Forestland. The proposed project is located approximately 5.6 miles southeast of the intersection of Briceland Thorn Road and Shelter Cove Road (Thorn Junction) near the community of Petrolia, Mendocino County, California; Latitude 39.98861°, Longitude -123.915°.

SFI proposes a variety of restoration approaches to achieve the primary objective of dry-season streamflow enhancement. Many of the proposed techniques have been implemented on other projects, but the Project is unique in that it relies on stacking multiple project types along a one-mile stream reach. The approach relies on a combination of multiple stacked features within a small sub-watershed, which are anticipated to result in measurable flow increases.

SFI proposes to install streamflow enhancement structures along 3,000 feet of the North Fork Lost River (NFLR) along with habitat structures spanning an additional 1,500 feet of NFLR. There are two upslope ponds proposed with volumes of 750,000 and 450,000 gallons as well as spillways and associated infrastructure. Road upgrades will be needed to facilitate the Project, including the replacement of two culverts with a bridge and box culvert, as well as relocating a road further away from the main channel. The work is planned to occur during the dry summer months during 2022 and 2023. Heavy equipment and hand labor will be used to install the structures. Equipment access will be accommodated by selecting routes that reduce the amount of ground and vegetation disturbance and use existing logging roads.

The Project intends to capture wet season runoff in newly constructed surface water and groundwater storage features. Surface water will be stored in two off-stream ponds at the upstream extent of the project and flow will be released during the dry season via pipes and valves. Groundwater storage potential along one mile of stream and adjacent terraces will be significantly increased by elevating the channel bed with a series of grade controls, Beaver Dam Analogue (BDA) structures, and other large wood placement. The channel-spanning structures will incorporate a modified Stage 0 approach wherein strategic grading and partial filling of the incised channel will improve floodplain connectivity. The rate of groundwater flow out of the project reach will be greatly reduced by a series of subsurface clay barriers that will be installed in conjunction with the bed elevating features. Water will passively drain from this reach during the dry season.

Log and Rock Weirs

Log and rock weir structures are proposed within the project reaches where bedrock is close to the streambed elevation and it is therefore not feasible to construct post assisted BDA structures. The log and rock weir structures are keyed into the streambed, thereby bringing the subsurface flow to the surface at each weir. Within these project reaches, weirs are proposed to store gravel, increase groundwater storage in the streambed and banks, increase pool depth and area, and generally increase habitat complexity. The channel is confined with a bed consisting mostly of bedrock throughout reaches where weirs are proposed, so a deep toe trench will not be required. At some locations, the floodplain is broad, so significant lateral excavation will be needed to key the weirs into the bank to prevent flanking. All weirs will be anchored into the streambanks using excavated and backfilled trenches. Gravel to be used as backfill against the weirs will be excavated on site from strategically selected high points in the existing floodplain, where excavation will facilitate increased floodplain access.

Fish passage will be provided for by creating structure with maximum 1-foot jump heights. All structures will be constructed per the specification in the California Department of Fish and Wildlife (CDFW) Habitat Restoration Manual. Subsurface clay restrictive barriers will be constructed in association with these weirs. The project includes a total of seven log and rock weir structures.

Beaver Dam Analogues

BDA structures are proposed within the project reaches where the streambed elevation above bedrock allows for driving posts. These structures have similar objectives as the log weirs: increase gravel storage, increase groundwater storage in the streambed and banks, increase pool

depth and area, and generally increasing habitat complexity. Subsurface clay restrictive layers will be incorporated within all of the BDA reaches. BDA structures will be installed in three different reaches. The post assisted structures will consist of 8-inch diameter posts installed with an excavator attachment to form one or two rows across the channel. Willow stems or other locally sourced brush or tree branches are woven into the post line to create a semipermeable structure. The burlap or coir and cobble, gravel, straw and clay is placed at the upstream base of the structure to reinforce, reduce permeability and retain surface water. Stability measures to reduce scour on the downstream side and tipping of the structures will include placement of cobble and a small diameter log pinned with additional posts. Gravel to be used as backfill against the weirs will be excavated on site from strategically selected high points in the existing floodplain, where excavation will facilitate increased floodplain inundation.

Stage 0 Channel Grading

Due to significant past disturbance of the site, the channel is incised and disconnected from inset floodplains. The channel is further confined by a historic access road built too close to the creek. Although it is unclear what the exact alignment and profile of the channel was during pre-disturbance conditions, this site offers a low-risk opportunity to experiment with a modified Stage 0 channel restoration approach. This approach is different than the Stage 0 approach utilized in Oregon where entire wide valleys have been reshaped. Instead, we are proposing to reshape narrower valleys extending from the base of one hillslope to the opposite side, generally 15feet (ft) to 70ft in width, filling the existing incised channel and adding a combination of grade control and roughness that will directing flows along a more sinuous route. The streamflow enhancement challenges are also very different than the Oregon Stage 0 projects in that there are extreme dry season water scarcity and no snow melt. If streams are aggraded and do not include log weirs with subsurface clay restrictive layers, the flow will be become mostly subsurface. Therefore, to function as storage and completely fill with water, sealed weirs are needed. The weirs proposed for the stage 0 reach are called Buried Stage 0 Weirs because they do not extend above the fill material. The weirs are spaced to ensure that jump heights will be no greater than 1 ft in the event of scour. Every 3rd weir (~ 150 ft spacing) will be built as a valley spanning subsurface restrictive barrier to ensure surface flow. Wood will be placed within the Stage 0 channel footprint to provide roughness.

Large Wood Placement

Designs will follow the CDFW Habitat Restoration Manual where significant wood placements will occur throughout the reach. This includes lengths of channel where no weirs are proposed, and wood loading is the only restoration. These reaches include areas of heavy wood loading where multiple pieces of large wood will be placed in the channel and other locations where a few pieces of wood will be added to existing debris jams. Wood will also be placed in the Stage 0 channel footprint. It is estimated that approximately 120 pieces of large wood will be installed in the channel mainly consisting of logs and trees with rootwads generated from the Southern Pond site and other local sources. Minimal anchoring is proposed, and the large wood will be maintained primarily by sizing it appropriately to not move out of the system (i.e. at least twice as long as the bankfull width) and by wedging it against existing trees. Additionally, the use of placed rootwads and trees that are positioned well up on the bank above 100-yr event water surface elevations (WSE) will result in general stability. The large wood structures have multiple habitat enhancement objectives including enhancing summer and winter habitat as well as

sorting/retaining gravel and reducing channel incision which will also provide a streamflow enhancement benefit.

Culvert Upgrades

Crossing 1 will replace an existing culvert with a bridge which is anticipated to be a 16-ft wide x 40-ft log x 2.5-ft deep prefabricated steel span bridge with concrete bridge deck. The bridge will be set on the same alignment as the existing access roads. The bridge abutments and slopes below the bridge will be clad in Rock Slope Protection (RSP) and feature toe trenches with additional depth to mitigate risk of scour. The RSP will have willow stakes and plantings incorporated. The designs include a roughened channel under the bridge bound on both ends by large boulder grade control structures and backfilled with engineered streambed material (ESM). At least two feet of freeboard under the bridge can be maintained during a 100-year flow event.

Crossing 2 is an existing culvert that will be replaced with a 72-ft long x 17-ft wide x 8-ft high aluminum box culvert embedded approximately 2.5-ft into the roughened channel bed. The slopes surrounding the inlet and outlet of the proposed box culvert will be clad in RSP and feature toe trenches with additional depth to mitigate risk of scour. The RSP will have willow stakes and plantings incorporated. The designs include a roughened channel under the culvert bound on both ends by large boulder grade control structures and backfilled with ESM.

Upslope Terrace Ponds

Implementation of the terrace ponds will include excavation and construction of an earthen berm and spillway built into the natural topography. The spillway will be engineered for 100-year storm events, armored with small rock, and located on native ground (rather than within the berm). The primary objective for both ponds is surface water storage along with metered flow to the creek during the lowest flow months of August 1st to October 15th. Other objectives include retention of surface runoff and shallow groundwater during the wet season. A subsurface clay restrictive barrier within and below the pond berm will increase groundwater storage potential and reduce the rate of surface water and groundwater depletion. Construction of the restrictive barrier will involve digging a trench 3-ft wide by 20-ft deep (down to a natural restrictive layer, either bedrock or blue clay) followed by backfilling with native soil mixed with bentonite and compacting. The berm will then be constructed on top of the subsurface barrier utilizing primarily native soil raised in 1’ lifts and compacted with a vibratory roller. Bentonite may be added to the soil lifts if the clay content of the native soil is determined to be too low. The length of the Northern and Southern pond keyways are estimated at 300-ft and 220-ft respectively.

Dewatering Plan

If streamflow is present, the site will be dewatered and a CDFW qualified fisheries biologist will perform fish and wildlife relocation activities. Dewatering is anticipated in the reach where the modified stage 0 approach will be implemented (1,300-ft in length). Outside the modified stage 0 reach, the Mattole Salmon Group will dewater and complete construction in one section at a time, likely dewatering no more than 1,000-ft at a time (total of 2,000-ft of dewatering planned in the Mattole Salmon Group reach). Temporary coffer dams will be installed at the upstream end of the reach and water will be pumped from the pool immediately upstream. Water will only be pumped during the day. Precautions will be taken to ensure that the water is not flowing over fine sediment. The pump inlet will be screened with 0.125 inch mesh to prevent entrainment of

fish or amphibians that failed to be removed. Water pumped from the stream would be discharged onto the terrace where it would filter back through the duff and soil before reentering the stream to ensure water clarity. Prior to starting a new section, the coffer dam and dewatering equipment will be relocated from the completed reach.

Sediment Control
Erosion and sediment control best management practices (BMPs) will be installed prior to the wet season (October 1 through April 30). Sensitive areas will be protected with construction fencing, which will be maintained throughout the construction work. All disturbed areas will be planted with native grass seed and mulched with rice straw. Straw wattles will be placed along all graded slopes and silt fences will be installed as needed. Silt-laden runoff from work areas will be prevented from entering any waterway. Emergency erosion control materials will be available at the work site, including oil absorbing booms.

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

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 to 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 reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The Corps determined the proposed action is not likely to adversely affect CC Chinook salmon, SONCC coho salmon, or their 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 also relies on the regulatory 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 of critical habitat for NC steelhead use(s) the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 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 ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision 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 critical 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 is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of

the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

2.2.1. Species Description and General Life History

Steelhead are the anadromous form of *O. mykiss*, spending time in both fresh and saltwater. Steelhead generally return to freshwater to spawn as 4 or 5 year old adults. Unlike other Pacific salmonids, 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 salmonids, 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. The California Department of Fish and Wildlife (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

2.2.2.1 Status of 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).

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.

2.2.2.2 Status of NC Steelhead Critical Habitat

The condition of NC steelhead critical habitat, specifically its ability to provide for 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: timber harvest, 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 (Williams et al. 2016, Weitkamp et al. 1995). Diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within the DPS. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

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

The factors that caused declines of species and degradation of critical habitat 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 (Good et al. 2005). Since 2014, drought conditions in California reduced stream flows and increased temperatures, further exacerbating stress and disease. Drought conditions during present conditions in 2021 represent near record low conditions in both precipitation and streamflow. Ocean conditions have been unfavorable in past years due to the El Niño in 2015 and 2016 and other anomalously warm waters in the Gulf of Alaska. 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. The best available information suggests that the earth's climate is warming, and that this could significantly impact ocean and freshwater habitat conditions, and thus the survival of species subject to this consultation. Recent evidence suggests that climate and weather is expected to become more extreme, with an increased frequency of drought and flooding (IPCC 2019). 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 43-84 cm rise by the end of the 21st century (IPCC 2019). This rise in sea level will alter the habitat in estuaries and either provide an 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. Based on the surrounding terrain or other infrastructure, some estuaries will have space to expand as sea level rises, while other estuaries may be reduced in size as saltwater intrusion overwhelms freshwater inputs. 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 NC steelhead.

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 includes approximately one mile of the NFLR and a 1,000-foot portion of the Lost River downstream of its confluence with the NFLR, which is where the effects of suspended sediment and turbidity are expected to occur.

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 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 higher water temperatures and reduced flows.

Steelhead occurring in the action area belong to the Mattole River population of NC steelhead, which is likely well below the number needed (10,700 adults, NMFS 2016) to be at low risk of extinction and therefore likely to be at a high risk of extinction. The Coastal Multi-Species Recovery Plan identified low abundance and a lack of instream flow as the major stressors of the population. Severe weather patterns (drought) was identified as a key threat (NMFS 2016) and the focus of the general recovery strategy is to improve juvenile habitat in the estuary and through improving summer flows.

2.4.1. Status of the Listed Species and Critical Habitat in the Action Area

The condition of designated critical habitats in the action area, specifically their ability to provide for conservation, is degraded from conditions known to support viable populations. The NFLR experiences very low, or no, surface flows during the summer despite there being no diversions in the watershed. Land use practices, including logging and road systems, have greatly increased winter run off resulting in decreased groundwater storage capacity and lower summer stream flows. Widespread removal of large wood from streams has also decreased groundwater storage through channel incision and loss of floodplain connectivity. Wood removal has also resulted in fewer and shallower instream pools that are of insufficient size to withstand drought. Industrial logging practices combined with fire suppression have resulted in overly dense even aged forests with higher evapotranspiration rates which significantly contribute to lower dry season flows. The NFLR within the action area is identified as having high intrinsic potential habitat for NC steelhead (NMFS 2016).

2.4.2. Previous ESA Section 7 Consultations in the Action Area

NMFS' ESA Section 10(a)(1)(A) research and enhancement permits and research projects in the annual CDFW ESA Section 4(d) rule research program could potentially occur in the action area. Salmonid monitoring approved under these programs includes carcass surveys and juvenile surveys. In general, these activities are closely monitored and require measures to minimize take during the research activities. NMFS determined these research projects are unlikely to affect future adult returns.

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 (see 50 CFR 402.02). 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 the factors set forth in 50 CFR 402.17(a) and (b).

2.5.1. Turbidity and Contaminants

Turbidity is expected to extend as far as 1,000 feet into the Lost River from work areas in the NFLR after construction is complete. Because of the significant floodplain grading and subsequent hydraulic corrections (scour), suspended sediment and turbidity are expected to be higher than baseline levels for approximately two years post construction. The magnitude of turbidity is not expected to cause injuries or impede behavior and the duration of turbid conditions will likely be similar to baseline conditions. Regarding toxic contaminants, NMFS expects adverse effects from toxic contaminants leaking into waterways within the action area to be improbable based on most work areas being isolated during construction, and spill prevention and clean-up measures incorporated.

2.5.2. Construction, Dewatering and Fish Relocation

In order to construct the flow and habitat enhancement features of the Project, approximately 3,300-feet of the NFLR will be dewatered and have fish removed and relocated to suitable habitat elsewhere so that individuals are not exposed to construction activities. NMFS expects low densities of NC steelhead during the proposed summer work seasons of 2022 and 2023. During snorkel surveys in summer of 2021 in the mainstem Lost River, there were only an average of one NC steelhead observed per pool; while surveys in the South Fork Lost River observed no NC steelhead (Queener Pers. Comm. 2022). In addition, approximately 1,500-feet of the NFLR will receive various treatments without dewatering or fish removals. The entire 1,500-feet will not be treated, but structures and other elements will be incorporated throughout the reach at various frequencies. This 1,500-ft reach is expected to be dry or intermittent during project implementation.

Densities of juvenile NC steelhead are expected to be very low (one juvenile per 20 square feet) in the portions of the NFLR with wetted conditions. This density of juveniles is similar to the densities reported by the Mattole Salmon Group for the Lost River. The NFLR is small stream with very low summer base flows, with average widths less than 3-ft (3,300-ft reach x 3-ft width equates to 9,900 square feet dewatered). Dividing the total area dewatered (9,900 square feet) by the expected density of juvenile NC steelhead (one fish/20 square feet), indicates that 495 juvenile NC steelhead may be captured and relocated prior to or during the dewatering efforts. Because of the expected low water conditions with fish being constrained in pool habitats, the fish relocation efforts are expected to be very efficient and capture all fish present. However, during fish relocation activities, NMFS expects that one percent of those fish captured and relocated would perish due to handling stress (one percent of 495 individuals equates to five individual NC steelhead juveniles which would likely perish during relocation).

Within the 1,500-ft reach where dewatering is not proposed, similar densities of NC steelhead would be expected (one fish per 20 square feet). The entire 1,500-ft reach will not be treated, but rather, 17 habitat structures would be installed at various intervals. Each of the 17 structures is expected to occupy about 20-feet of stream channel (17 structures x 20-ft/structure equates to 340-ft of linear stream channel being occupied by structure installations). The 340-ft of stream channel receiving treatments (or 1,020 square feet assuming a 3-ft channel width) are where juvenile NC steelhead may be injured or crushed during the installations. Dividing the total area affected by structure installations (1,020 square feet) by the expected density of juvenile NC steelhead indicates that 51 individuals would be exposed to injury or crushing. NMFS expects half of these fish to actually be injured or killed during the installation (26 juvenile NC steelhead crushed or injured).

2.5.3. Fish Passage

Fish passage may be affected by the two road crossing upgrades and from the reach of Stage 0 floodplain work proposed. Both of the road crossing upgrades were designed to facilitate passage of all life stages. The Stage 0 floodplain work and associated weir structures are expected to interrupt the upstream and downstream passage of juvenile steelhead during a proportion of the dry season, when migrating out of dry areas or towards areas with more water may be important for survival. In some cases, the inability to migrate beyond an instream structure may lead to

survival consequences given the history of intermittent flows within the action area. Fish stranded in isolated pools may experience stress from poor water quality, more competition for prey, and increased likelihood of predation. Enhancements to streamflow from the Project may ameliorate the water quantity and quality concerns, but passage impediments will continue to affect future generations if flow enhancements do not occur as expected.

All structures will have a maximum jump height of 12 inches. NMFS expects adult life stages will be able to pass all of the structures, and juvenile passage will be maintained at most sites throughout most of the season. NMFS does not expect any changes to fitness or survival as the result of changes to fish passage.

2.5.4. Bank Armoring

Both of the culvert crossings being upgraded as part of the Proposed Action will rely on RSP to protect the crossing structure from scour. The RSP being proposed contains willow stakes and plantings incorporated into the rock. The RSP and bank armoring proposed at the crossing sites is intended to protect the structure from scour and does not extend upstream or downstream from the crossing nor have any effect on stream avulsion or lateral migration into the future. The action area of NFLR has very narrow valley widths and do not accommodate lateral channel migration. The RSP and bank armoring is not expected to have a negative effect to critical habitat.

2.5.5. Upslope Pond Management

Two large ponds are proposed to be excavated in the upper reaches of the NFLR to provide additional water sources to augment the limited summer base flow in the action area. The ponds will passively capture wet season runoff and release water during the summer low flow season to help increase surface flows. Stored water in these ponds will likely have reduced water quality (low dissolved oxygen and warmer temperatures) when compared to groundwater seepage that likely currently sustains most surface flows in the NFLR. Although the water quality of the pond water may be less desirable, when combined with the anticipated benefits of the Project to increase groundwater elevations throughout the action area, any effect would be ameliorated and diluted by incoming groundwater seepage.

2.5.6. Critical Habitat

The Project will temporarily disrupt designated critical habitat during the two years of construction work anticipated. However, the value of critical habitat after construction is completed is expected to improve. The multiple stacked enhancement features are expected to increase groundwater elevations and corresponding surface flows in the action area, including the mainstem of Lost River where other species (such as SONCC coho salmon) would also benefit from increases in stream flow during the summer months. The quantity and quality of PBFs for NC steelhead are expected to be improved over baseline conditions.

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.

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

NC steelhead in the action area are likely to be affected by future, ongoing non-federal activities like agriculture and timber harvest, both from upstream sources and within the action area. Water diversions also contribute to diminished stream flows and warmer water temperatures. The future effects of agriculture and timber harvest include continued land disturbance, road construction and maintenance, and higher rates of erosion and sedimentation.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. 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.

NC steelhead have declined to a large degree from historic numbers and summer run populations of NC steelhead are in very poor condition. As described in the Effects of the Action section, a small number of juveniles may be injured or killed during construction. NMFS does not expect that the loss of juveniles by this project would impact future adult returns for NC steelhead. Most of the juveniles remaining rear outside of the action area during project work periods and therefore will not be adversely affected by the project. In NMFS' judgement, they are likely to produce enough future spawning adult fish to outweigh any losses from the action area until the restoration is complete. There will be some minor or temporary adverse effects to critical habitat in the action area during Project construction. The Project will improve critical habitat by improving and enhancing a number of PBFs, and also expected to result in increases in the distribution and abundance of the species in the action area. The value and function of critical habitat will be improved by the Project.

The action area could be subject to higher average summer air temperatures and lower total precipitation levels due to climate change. Although the total precipitation levels may decrease,

the average rainfall intensity has increased and is expected to continue to increase in the future. Higher air temperatures would likely warm stream temperatures. Reductions in the amount of precipitation would reduce stream flow levels and estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. For this project, all activities would be completed by 2024 and the likely long term effects of climate change described above are unlikely to meaningfully change within that time frame. Because the project will help restore this part of the NFLR, NMFS expects it will help improve the resilience of species and habitats to climate change. Overall, the project is unlikely to appreciably reduce the likelihood of survival and recovery of NC steelhead, and the project is unlikely to appreciably diminish the value of designated critical habitat for the conservation of the species.

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 NC steelhead, nor destroy or adversely modify its designated critical habitat.

2.9. Incidental Take Statement

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

2.9.1. Amount or Extent of Take

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

Crushing
NMFS expects that up to 26 juvenile NC steelhead will be killed during construction in those reaches where dewatering and fish relocation will not occur.

Relocation
NMFS expects that fish relocation efforts will be efficient and all of the anticipated 495 individual juvenile NC steelhead will be captured, handled, and relocated. A small number (1%) of relocated fish are expected to be killed due to handling injuries, or five juvenile NC steelhead.

Total Amount of Take
Combined, there are 495 individual NC steelhead expected to be captured, handled, and released. One percent (five individuals) of those fish captured and released are expected to be killed and 26 individual juvenile NC steelhead expected to be killed during construction due to crushing and injuries, for a total of 31 juvenile NC steelhead killed.

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 measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of NC steelhead:

1. Ensure that all necessary and appropriate actions are taken to minimize injury and mortality to NC steelhead during structure installation, fish relocation and dewatering work.
2. Submit annual reports regarding construction activities and results.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The Corps or any applicant 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. The Corps and SFI 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. The Corps and SFI shall ensure that any minimization measures described in the Proposed Federal Action section are properly implemented.
c. The Corps and SFI shall inspect and monitor the work areas during and after deconstruction for any individuals which may be injured or killed.
d. The Corps and SFI shall contact NMFS within 24 hours of meeting or exceeding take of listed species prior to project completion. Notify Matt Goldsworthy by phone at 707-357-1338 or email at Matt.Goldsworthy@noaa.gov. NMFS will review the activities resulting in take and determine if additional protective measures are required.

2. The following terms and conditions implement reasonable and prudent measure 2:

    a. SFI shall provide a written report to NMFS by February 15 of each year. The report shall be sent to NMFS via email to Matt.Goldsworthy@noaa.gov. The report shall contain, at a minimum, the following information:

        i. **Fish Relocation and Dewatering** – The report will include 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.
        ii. **Construction and Fish Losses** – The report will summarize any observations that occur regarding injury or death of listed species during construction activities, and summarize the construction work completed each year.

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).

2.11. Reinitiation of Consultation

This concludes formal consultation for the North Fork Lost River Flow and Habitat Enhancement Project. Under 50 CFR 402.16(a): "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: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If 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 written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

2.12. "Not Likely to Adversely Affect" Determinations

2.12.1. CC Chinook Salmon

CC Chinook salmon 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. Chinook salmon are typically present in the stream-estuary ecotone, which is located in the downstream portions of the Mattole River, from early May to early September, with peak abundance in June/July (Wallace and Allen 2007). Similar to coho salmon, prey resources during out-migration are critical to Chinook salmon survival as they grow and move out to the open ocean.

Chinook salmon have not been observed in the NFLR, nor downstream in the Lost River for many years and Chinook are not expected to spawn in or near the action area due to passage impediments downstream of the action area. Because juvenile CC Chinook are expected to migrate downstream towards or into the Pacific Ocean prior to any work beginning, there will be no life stages of CC Chinook salmon exposed to any of the Project effect and therefore any effects to CC Chinook salmon are discountable. The action area is not designated critical habitat for CC Chinook salmon. Therefore, NMFS concurs with the Corps that the Project is not likely to adversely affect SONCC coho salmon individuals or their designated critical habitat.

2.12.2. 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 smolts typically outmigrate between March and July (Ricker et al. 2014). 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.

Like CC Chinook salmon, SONCC coho salmon have not been present within the action area for several years and current passage conditions downstream of the action area likely will continue to preclude the presence of SONCC coho salmon in the action area during Project implementation. NMFS does not expect SONCC coho salmon to be exposed to the effects of the Project and therefore all effects are discountable. Therefore, NMFS concurs with the Corps that the Project is not likely to adversely affect SONCC coho salmon individuals or their designated critical habitat.

3. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

3.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Corps. Other interested users could include SFI, Mattole Salmon Group, and CDFW. Individual copies of this opinion were provided to the Corps. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

3.2. Integrity

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

3.3. Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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