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

June 11, 2019 **Refer to NMFS No:** WCRO-2019-00445

Mervel Harris
Acting Regional Director
Bureau of Indian Affairs
Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response and Fish and Wildlife Coordination Act Recommendations for the Rowdy Creek Hatchery (Project)

Dear Mr. Harris:

Thank you for your letter of December 20, 2018, 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 Rowdy Creek Hatchery.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action. However, after reviewing the proposed action, we concluded that it would not adversely affect EFH, therefore, no EFH consultation is required.

NMFS has determined that the Bureau of Indian Affairs' (BIA) funding of hatchery Chinook salmon and steelhead production at the Rowdy Creek Fish Hatchery will not jeopardize the continued existence of ESA-threatened SONCC coho salmon or adversely modify or destroy its critical habitat.

We expect the BIA will ensure that the proposed action is implemented as described in the BIA's accompanying Hatchery and Genetic Management Plans for the project and the terms and conditions contained in the enclosed biological opinion.

Please contact Dan Free in our Northern California Office in Arcata, California, at (707) 825-5164 or Dan.Free@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Jennifer Jocobs, Tolowa Dee-ni' Nation, Smith River, CA
Philip Barrington, CDFW, Arcata, CA
ARN File # 151422WCR2019AR00003

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

NMFS Consultation Number: WCRO-2019-00445

Action Agency: Bureau of Indian Affairs

Table 1. Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Southern Oregon/Northern California Coast coho salmon (*Oncorhynchus kisutch*)	Threatened	Yes	No	Yes	No

Table 2. Essential Fish Habitat and NMFS' Determinations:

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	No	No

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

Issued By:

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Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: June 11, 2019

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1 INTRODUCTION

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

1.1 Background

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

We 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.

Because the proposed action would modify a stream or other body of water, NMFS also provides recommendations and comments for the purpose of conserving fish and wildlife resources, and enabling the Federal agency to give equal consideration with other project purposes, as required under the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).

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). A complete record of this consultation is on file at NMFS California Coastal Office in Arcata, California.

1.2 Consultation History

On January 28, 2019, NMFS received a request for formal consultation from the Bureau of Indian Affairs (BIA) on the proposed funding of the Tolowa Dee-ni' Nation's operation of the Rowdy Creek Hatchery (the Hatchery). While the BIA letter was dated December 20, 2018, and was likely sent in late December, the federal government went on furlough until January 28, 2019. Therefore, the initiation date is set at January 28, 2019. NMFS responded with a letter on February 15, 2019, that there was sufficient information to begin the consultation.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). The BIA proposes to fund the Tolowa Dee-Ni' Nation to operate, maintain, and monitor the Rowdy Creek Fish Hatchery (Hatchery; Tolowa Dee-ni' Nation 2018).

The Hatchery program has two purposes: provide fish for harvest and provide educational opportunities to the local community. The primary purpose of the Chinook program is to provide fish for tribal harvest. The primary purpose of the steelhead program is to provide fish for sport and tribal harvest. The program will release between 50,000 and 150,000 subyearling Chinook and 50-80,000 yearling steelhead each year. Release number will be dependent on the number of natural origin fish returning to the Hatchery weir and in-hatchery survival of eggs and juveniles prior to release.

The releases of hatchery Chinook and steelhead juveniles will be done to maximize survival to the ocean with rapid emigration and low residualization rates. Juvenile steelhead between 5 to 7 fish per pound and 180-210 mm, will be released in the Smith River just upstream of the confluence with the South Fork Smith River during March and April during the new moon, and released during high turbidity events, if possible (Jacobs 2019). These parameters should minimize residualization and increase survival to the ocean (Wedemeyer 2001). Chinook juveniles will be released in May and June at a size of 80 fish per pound. Release site for both hatchery Chinook and steelhead is at the Nels Christensen Memorial Bridge (aka Slant Bridge) in the Smith River just upstream of the confluence with the South Fork Smith River.

The Chinook and steelhead programs at the Hatchery will be operated as an integrated program as defined by the California Hatchery Scientific Review Group (HSRG 2012) and the Pacific Northwest Hatchery Scientific Review Group (HSRG 2004). The intent of an integrated program is for the natural environment to drive the adaptation and fitness of a composite population of fish that spawns both in the Hatchery and in the wild (i.e., naturally in the stream).

Program integration occurs by incorporating naturally produced fish into the broodstock and controlling the number of hatchery origin fish that spawn naturally. For a properly integrated program, the HSRGs require that the proportion of natural origin (NOR) Chinook and steelhead incorporated into the Hatchery broodstock (pNOB) exceed the proportion of the natural spawning population composed of hatchery origin (HOR) fish (pHOS).

The HSRG (2014) recommends that for integrated programs associated with populations of high biological significance: *"…the proportion of natural-origin adults in the broodstock (pNOB) should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater and pHOS less than 30%."*

PNI is calculated as follows:

$$PNI = pNOB/(pNOB + pHOS)$$

PNI values > 0.50 are expected to result in increased fitness, reproductive success, life history diversity and productivity of the population over time. The Rowdy Creek program will be operated to achieve a PNI of >0.67.

The program will be operated based on the concepts of hatchery reform as expressed by the CA HSRG (2012) and HSRG (2014). The program will:

- Minimize adverse ecological interactions between hatchery Chinook and steelhead and SONCC coho salmon;
- Manage hatchery broodstock to achieve proper genetic integration with the natural population;
- Minimize adverse ecological interactions between NOR and HOR Chinook and steelhead and coho salmon;
- Minimize the effects of hatchery facilities on the ecosystem in which they operate;
- Establish program goals based on adult abundance;

- Externally mark all hatchery fish;
- Manage the program in a scientifically defensible manner.

With respect to the last bullet, we assume that by following the principles and recommendations of the HSRGs, the program is scientifically sound and therefore scientifically defensible.

Monitoring and evaluation (M&E) will be used to track in-hatchery survival rates by life stage as well as influent and effluent water quality. M&E will also be implemented to determine:

- Chinook and steelhead spawning escapement, pHOS and stray rate;
- Chinook and steelhead ecological effects to juvenile coho salmon;
- Number of Chinook and steelhead harvested and harvest rate;
- Rowdy Creek Chinook and steelhead population productivity, capacity and effective population size.

More detailed study plans for conducting the M&E will be developed once funding is obtained.

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). We are not aware of any interrelated or interdependent action. Although hatcheries can increase fishing and associated incidental take of listed coho salmon, NMFS does not believe the presence of hatchery fish measurably increases the number of fishermen in the Smith River.

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

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

2.1 Analytical Approach

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

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

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

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

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

2.2 Rangewide Status of the Species and Critical Habitat

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

2.2.1 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.

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 (McElhany *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) to determine the general condition of each population and factors responsible for the current status of the SONCC coho salmon 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).

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 (Good et al. 2005, Williams et al. 2011, and 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.

2.2.2 SONCC Coho Salmon Critical Habitat Status

The condition of SONCC coho salmon 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: 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. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

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

The factors that caused declines include hatchery practices, ocean conditions, habitat loss due to dam building, degradation of freshwater habitats due to a variety of agricultural and forestry practices, water diversions, urbanization, over-fishing, mining, climate change, and severe flood events exacerbated by land use practices (Good et al. 2005, Williams et al. 2016). Sedimentation and loss of spawning gravels associated with poor forestry practices and road building are particularly chronic problems that can reduce the productivity of salmonid populations. Late 1980s and early 1990s droughts and unfavorable ocean conditions were identified as further likely causes of decreased abundance of 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 coho salmon subject to this consultation. In the coming years, climate change will influence the ability to recover coho salmon 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, and 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 coho salmon 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 includes the whole Smith River watershed accessible to steelhead and Chinook salmon that are reared at the Hatchery because a small fraction of hatchery fish may stray into any accessible habitat in the Smith River watershed and contribute ocean-derived nutrients and juvenile steelhead and Chinook salmon.

2.4 Environmental Baseline

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

In the action area, the threat to SONCC coho salmon 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 Smith River watershed by, for example, reducing streamflow during the summer and raising summer water temperatures. However, due to the large areas of intact forest in the Smith River watershed and public land restrictions on timber harvest and other habitat degrading activities, the action area should be somewhat buffered by the effects of climate change. Therefore, the critical habitat in the action area has a very high conservation value for coho salmon into the future.

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

Coho salmon occurring in the action area belong to the Smith River population of SONCC coho salmon. The Smith River population of SONCC coho salmon is considered a core population and likely very close to their depensation threshold of 325 adults (NMFS 2014, 2016), which can be thought of as the number of spawners needed for survival of the population. The estimated number of coho salmon in the Smith River that currently may spawn each year is 355 based on 2-years of redd data (NMFS 2016). This is an estimate based on only two-years of data, but is consistent with past estimates and suggests a low, but stable population. The vast majority of coho salmon in the Smith River are found in Mill Creek, which is upstream of the confluence of Rowdy Creek where the hatchery is located. Since the greatest effects are expected to occur associated with adult collection and the Hatchery fish releases, Rowdy and Dominie creeks are more thoroughly discussed. Dominie Creek is a tributary of Rowdy Creek, which is a tributary of the Smith River. The current numbers of coho salmon spawning in Rowdy Creek and Dominie Creek where the Hatchery is located is not known. Recent juvenile surveys have found few coho

salmon in the Rowdy and Dominie creeks (Walkley and Garwood 2017), but presence was documented in 2012 (Garwood 2012). Therefore, NMFS expects coho salmon to be only intermittently present in Rowdy and Dominie creeks and at very low numbers.

Critical habitat within the Smith River ranges from excellent to poor. The key limiting stresses for the Smith River population are impaired estuary/mainstem function and lack of floodplain and channel structure, as they have the greatest impact on the population's ability to produce sufficient spawners to support recovery (NMFS 2014). The juvenile life stage is most limited, primarily due to a lack of access to, and decrease in the quantity of high quality winter (NMFS 2014) and summer rearing habitat, and the estuarine rearing life history trait historically found in the population is limited by the degraded conditions in the Smith River estuary. Although habitat quality in the middle and upper parts of the basin have not been heavily impacted by land use, many areas in the lower parts of the Smith River and the Smith River estuary are creating limitations on the survival and viability of the Smith River coho salmon population. Additionally, the high pesticide use associated with lily bulb agriculture in the Smith River Plain adjacent to streams and drainages that enter the Smith River Estuary are affecting the survival of coho salmon (NMFS and CDFW 2018).

Of particular importance are the five tributaries to the Smith River that flow into the estuary: Rowdy Creek, Ritmer Creek, Delilah Creek, Yontocket Slough, and Morrison Creek. Additionally, a number of unnamed drainages, sloughs, and backwaters that have water in the winter provide non-natal habitat for coho salmon, or would provide habitat if accessible and having adequate water quality. These tributaries and sloughs near the estuary provide vital habitat for juveniles and fry that may be swept downstream during high flow events. This habitat increases survival of juveniles, which increases overall productivity and life history diversity of this population. The juveniles in these streams may express an estuarine life history pattern for rearing. Given the high flows and steep conditions found in the middle and upper Smith River watershed, low gradient tributaries near the estuary likely contribute to the success and continued survival of coho salmon in the Smith River. The lower Smith River and its tributaries are critical to the recovery of coho salmon in the Smith River (NMFS 2014). Therefore, the continued degradation of these habitats primarily from poor agricultural practices has a large impact on the entire population.

Further upstream, refugial areas with good water quality are likely to be available in most cases, but are not always accessible or usable due to high gradients and barriers. These most likely occur where cold, clean water comes in from tributaries and where groundwater emerges into the stream. The estuary and its tributaries within the Smith River Plain, including Rowdy Creek and Dominie Creek, is poor with most of the streams affected by agriculture including the existence of pesticide contamination from lily bulb agriculture (NMFS and CDFW 2018). Other impacts from agriculture include diversions, fish passage barriers, and a paucity of functioning riparian conditions along tributary streams and the mainstem Smith River due to channelization and simplification.

The Hatchery is constructed immediately adjacent to Dominie Creek just above its confluence with Rowdy Creek and a large wall and concrete channel currently eliminates any functioning habitat for coho salmon juveniles or adults. Additionally, there is a weir on Rowdy Creek adjacent to the Hatchery that is used to collect broodstock. This weir is a barrier for juvenile and

adult migration upstream. The weir is operated to allow adult fish to move past the weir unimpeded when broodstock are not collected. However, it is a complete barrier to juvenile upstream movement. There is currently a plan to remove the weir and put in place another barrier system that would provide unimpeded passage of juveniles and adults when the weir is not operating to collect broodstock. However, the cost of this plan is excessive, so it is unknown whether this solution will be implemented.

The Smith River is expected to be more resilient than other streams to the effects of climate change because much of the land is in public ownership including Mill Creek where the majority of coho salmon spawn in the Smith River. These public lands are continuing to provide a "stronghold" for coho salmon because they are either recovering from past degradation or have existing characteristics that provide resiliency (*e.g.*, old growth forest and increased promotion of old growth characteristics in Mill Creek). NMFS does not expect the proposed action to exacerbate the effects of climate change on coho salmon and its critical habitat.

2.5 Effects of the Action

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

2.5.1 Exposure

The Proposed Action would affect coho salmon by creating the following ecological interactions between the Hatchery steelhead and Chinook salmon and coho salmon: competition; predation; redd superimposition; and disease transmission. In addition, the proposed action is expected to decrease marine derived nutrients because of the removal of fish for broodstock and fish harvest. NMFS also expects some adverse effects to coho salmon adults from broodstock collection for the Hatchery operations. For our analysis, we relied on information provided in the hatchery and genetic management plans (HGMPs) prepared by the Tolowa Dee-ni' Nation for the BIA (Tolowa Dee-ni' Nation 2018), peer-reviewed journal publications, and reports from local state, federal, and tribal entities. The Tolowa Dee-ni' Nation (2018) used the PCDRISK-1 model (Pearsons and Busack 2012) to quantify the effects of predation and competition from the Hatchery steelhead and Chinook salmon on coho salmon. PCDRISK-1 is a flexible computer model designed to assist in assessment and reduction of ecological risks to natural origin fish from hatchery fish releases. PCDRISK-1 simulates predation, competition, and disease impacts on naturally produced salmonids caused by hatchery smolts in fresh water as they move downstream or residualize after release (Pearsons and Busack 2012). Individual-based, the model relies upon user specified inputs of up to 45 variables, such as number and size of hatchery and wild fish, and water temperature (Pearsons and Busack 2012). The model generates hatchery and natural fish of specified size distributions, then randomly pairs them for interactions for a specified number of days and encounters (Pearsons and Busack 2012). Unfortunately, the use of the PCDRISK-1 model in this case likely overestimates interactions between hatchery fish and natural steelhead, Chinook, and coho salmon because the model operates on the assumption of almost complete overlap between hatchery and natural fish. As discussed previously, most of the coho salmon in the Smith River Watershed are concentrated in Mill Creek. Therefore, overlap

between hatchery fish and coho salmon juveniles will be limited. We do not expect hatchery juveniles to enter Mill Creek. There may be some overlap between the Hatchery Chinook and steelhead juveniles and coho salmon downstream of release locations, primarily in the mainstem Smith River and estuary. We do not expect the Hatchery juvenile steelhead will move into Smith River Plain tributaries that are mostly used by coho salmon during winter for non-natal rearing. We do expect there will be limited straying of adult hatchery fish into Mill Creek, but this will primarily mean there could be some interaction between adult coho salmon and hatchery steelhead and Chinook. However, we expect this interaction to be limited because of the low number of strays compared to the available habitat in Mill Creek and Chinook salmon will be, for the most part, spawning prior to spawning of coho salmon. Steelhead and coho salmon spawning does temporally overlap, but the low number of hatchery steelhead that may stray into Mill Creek, coupled with the low population numbers of coho salmon and underutilized spawning habitat suggests the likelihood of red superimposition to be negligible. Therefore, we do not expect the straying of up to 100 adult hatchery steelhead and Chinook combined into Mill Creek or other coho salmon spawning areas to result in redd superimposition or other interactions that would reduce the reproduction of coho salmon.

Residualization of hatchery juvenile Chinook salmon and steelhead has the potential to increase interactions with coho salmon juveniles. Information on the number of fish that residualize from the Hatchery production is unknown. However, current information suggests residualization rate may be low since hatchery juveniles have only been observed within approximately a month of their release (Garwood 2019).

2.5.2 Effects of the Hatchery steelhead and Chinook Salmon Production on SONCC Coho Salmon

2.5.2.1 Broodstock Collection

Broodstock are currently collected at the Hatchery weir which blocks migration of coho salmon upstream when weir is operating and not being actively managed. This blockage results in an upstream migration delay of up to 12-hours and increases the potential for predation of coho salmon adults. However, we do not anticipate any adult coho salmon will be preyed upon during broodstock collection efforts because predators would likely pick the more abundant steelhead and Chinook salmon. Additionally, we anticipate up to 20 adult coho salmon may be handled during broodstock collection efforts. We do not anticipate any adult coho salmon will be injured or killed during broodstock collection activities. The weir is a complete barrier to juvenile coho salmon upstream migration which may result in increased predation, increased exposure to higher temperatures, increased exposure to agricultural chemicals, and increased competition when coho salmon juveniles are kept from moving to areas with lower densities of cohorts.

2.5.2.2 Competition

NMFS analyzes the potential for competition when the progeny of naturally spawning hatchery fish and hatchery releases share juvenile rearing areas. The level of effect for this factor ranges from neutral or negligible to negative. Generally speaking, competition and a corresponding reduction in productivity and survival may result from direct interactions when hatchery-origin fish interfere with the accessibility to limited resources by natural-origin fish or through indirect

means, when the utilization of a limited resource by hatchery fish reduces the amount available for fish from the natural population (SIWG 1984). Naturally produced fish may be competitively displaced by hatchery fish early in life, especially when hatchery fish are more numerous, are of equal or greater size, when hatchery fish take up residency before naturally produced fry emerge from redds, and if hatchery fish residualize. Hatchery fish might alter naturally produced salmon behavioral patterns and habitat use, making them more susceptible to predators (Hillman and Mullan 1989; Steward and Bjornn 1990).

Hatchery-origin fish may alter naturally produced salmonid migratory responses or movement patterns, leading to a decrease in foraging success (Hillman and Mullan 1989; Steward and Bjornn 1990). Actual impacts on naturally produced fish would thus depend on the degree of dietary overlap, food availability, size-related differences in prey selection, foraging tactics, and differences in microhabitat use (Steward and Bjornn 1990). Specific hazards associated with competitive impacts of hatchery salmonids on listed naturally produced salmonids may include competition for food and rearing sites (NMFS 2012). In an assessment of the potential ecological impacts of hatchery fish production on naturally produced salmonids, the Species Interaction Work Group (SIWG 1984) concluded that naturally produced coho salmon, Chinook salmon and steelhead are all potentially at “high risk” due to competition (both interspecific and intraspecific) from hatchery fish of any of these three species.

Several factors influence the risk of competition posed by hatchery releases: whether competition is intra- or interspecific; the duration of freshwater co-occurrence of hatchery and natural-origin fish; relative body sizes of the two groups; prior residence of shared habitat; environmentally induced developmental differences; and, density in shared habitat (Tatara and Berejikian 2012). Intraspecific competition would be expected to be greater than interspecific, and competition would be expected to increase with prolonged freshwater co-occurrence. Although newly released hatchery smolts are commonly larger than natural-origin fish, and larger fish usually are superior competitors, natural-origin fish have the competitive advantage of prior residence when defending territories and resources in shared natural freshwater habitat. Tatara and Berejikian (2012) further reported that developmental differences between hatchery-origin fish and natural-origin fish of various life stages are variable and can favor both hatchery- and natural-origin fish. They concluded that of all factors, fish density of the composite population in relation to habitat carrying capacity likely exerts the greatest influence.

En masse hatchery salmon smolt releases may cause displacement of rearing naturally produced juvenile salmonids from occupied stream areas, leading to abandonment of advantageous feeding stations, or premature out-migration (Pearsons *et al*. 1994). Pearsons *et al.* (1994) reported small-scale displacement of juvenile natural-origin rainbow trout from stream sections by hatchery steelhead. Small-scale displacements and agonistic interactions observed between hatchery steelhead and naturally produced juvenile trout were most likely a result of size differences and not something inherently different about hatchery fish.

A proportion of the smolts released from a hatchery may not migrate to the ocean but rather reside for a period of time in the vicinity of the release point. These non-migratory smolts (residuals) may directly compete for food and space with natural-origin juvenile salmonids of similar age. They also may prey on younger, smaller-sized juvenile salmonids. Although this

behavior has been studied and observed, most frequently in the case of hatchery steelhead, residualism has been reported as a potential issue for hatchery coho and Chinook salmon as well. Therefore, for all species, monitoring of natural stream areas in the vicinity of hatchery release points may be necessary to determine the potential effects of hatchery smolt residualism on natural-origin juvenile salmonids.

Critical to analyzing competition risk is information on the quality and quantity of spawning and rearing habitat in the action area, including the distribution of spawning and rearing habitat by quality and best estimates for spawning and rearing habitat capacity. Additional important information includes the abundance, distribution, and timing for naturally spawning hatchery fish and natural-origin fish; the timing of emergence; the distribution and estimated abundance for progeny from both hatchery and natural-origin natural spawners; the abundance, size, distribution, and timing for juvenile hatchery fish in the action area; and the size of hatchery fish relative to co-occurring natural-origin fish.

NMFS expects minor effects from competition between coho salmon juveniles and the Hatchery steelhead and Chinook salmon juveniles. Juvenile salmonids of different species generally segregate into different habitat niches because of different physiologies and morphologies. However, some overlap can be expected which would potentially increase negative competitive interactions between coho salmon and the Hatchery production. These interactions would most likely lead to a decrease in growth rate from competition for food and increased aggressive interactions. Increased predation from an increase in foraging activity and movement out of more favorable habitats for avoiding predation may also reduce survival of some coho salmon juveniles. However, release timing and location, size of release of hatchery juveniles, rapid emigration to the ocean of the Hatchery fish, and the relatively low number of the Hatchery fish released likely results in minimal adverse competitive interactions between the Hatchery juveniles and coho salmon juveniles because most of the coho salmon juveniles are found in Mill Creek or in non-natal tributaries where the Hatchery fish are not expected to be found. NMFS expects a few coho salmon juveniles may not survive as a result of these competitive interactions. However, we expect this number to be very low and not measurably affect the productivity of coho salmon in the Smith River.

2.5.2.3 Predation

Another potential ecological effect of hatchery releases is predation. Salmon and steelhead are piscivorous and can prey on other salmon and steelhead. Predation, either direct (direct consumption) or indirect (increases in predation by other predator species due to enhanced attraction), can result from hatchery fish released into the wild. Considered here is predation by hatchery-origin fish and by the progeny of naturally spawning hatchery fish and by avian and other predators attracted to the area by an abundance of hatchery fish. Hatchery fish originating from egg boxes and fish planted as non-migrant fry or fingerlings can prey upon fish from the local natural population during juvenile rearing. Hatchery fish released at a later stage, so they are more likely to emigrate quickly to the ocean, can prey on fry and fingerlings that are encountered during the downstream migration. Some of these hatchery fish do not emigrate and instead take up residence in the stream (residuals) where they can prey on stream-rearing juveniles over a more prolonged period. The progeny of naturally spawning hatchery fish also can prey on fish from a natural population and pose a threat. In general, the threat from predation

is greatest when natural populations of salmon and steelhead are at low abundance and when spatial structure is already reduced, when habitat, particularly refuge habitat, is limited, and when environmental conditions favor high visibility.

SIWG (1984) rated most risks associated with predation as unknown, because there was relatively little documentation in the literature of predation interactions in either freshwater or marine areas. More studies are now available, but they are still too sparse to allow many generalizations to be made about risk. Newly released hatchery-origin yearling salmon and steelhead may prey on juvenile fall Chinook and steelhead, and other juvenile salmon in the freshwater and marine environments (Pearsons and Fritts 1999). Low predation rates (0 to 0.5 fish/hatchery smolt) have been reported for released steelhead juveniles (Naman and Sharpe 2012). Hatchery steelhead timing and release protocols used widely in the Pacific Northwest were shown to be associated with negligible predation by migrating hatchery steelhead on fall Chinook fry, which had already emigrated or had grown large enough to reduce or eliminate their susceptibility to predation when hatchery steelhead entered the rivers (Sharpe *et al.* 2008).

Predation may be greatest when large numbers of hatchery smolts encounter newly emerged fry or fingerlings, or when hatchery fish are large relative to naturally produced fish (SIWG 1984). Due to their location in the stream or river, size, and time of emergence, newly emerged salmonid fry are likely to be the most vulnerable to predation. Their vulnerability is believed to be greatest immediately upon emergence from the gravel and then their vulnerability decreases as they move into shallow, shoreline areas. Emigration out of important rearing areas and foraging inefficiency of newly released hatchery smolts may reduce the degree of predation on salmonid fry

Some reports suggest that hatchery fish can prey on fish that are up to 1/2 their length (Pearsons and Fritts 1999; HSRG 2004) but other studies have concluded that salmonid predators prey on fish 1/3 or less their length (Hillman and Mullan 1989; Cannamela 1992). Hatchery fish may also be less efficient predators as compared to their natural-origin conspecifics, reducing the potential for predation impacts (Olla *et al*. 1998).

Because there is little temporal or spatial overlap between hatchery smolts from the Hatchery and natural-origin fish, there is little threat from predation or competition. As with the discussion of competition, available information suggests that hatchery smolts leave the river promptly and we expect that only a small fraction remains in the river (Quinones 2003, Quinones and Mulligan 2005, Garwood 2019). We expect a prompt emigration from the Smith River following release because of release size and timing and the short distance to the ocean as observed in other rivers (*e.g.*, Mad River). The small number of fish that remain in the river would have a negligible effect on SONCC coho salmon. These fish would be expected to reside in the vicinity of where they were released, miles downstream from the most important salmon and steelhead production areas.

The risk of adverse ecological interactions will be minimized by:

- Releasing hatchery smolts that are physiologically ready to migrate. Hatchery fish released as smolts emigrate seaward soon after liberation, minimizing the potential for competition with juvenile natural-origin fish in freshwater (Steward and Bjornn 1990).
- Operating the Hatchery such that smoltification occurs for nearly the entire population.
- Releasing hatchery smolts in lower river areas, below areas used for stream-rearing natural-origin juveniles.

2.5.2.4 Disease

Hatchery fish will be assessed for disease/health status prior to releases. Fish will not be released if in a diseased state. Additionally, overlap of the Hatchery fish with coho salmon is expected to be small. Therefore, NMFS thinks the likelihood of disease transfer from the Hatchery fish to coho salmon to be negligible.

2.5.2.5 Monitoring and Evaluation

NMFS also analyzes proposed monitoring and evaluation (M&E) for its effects on listed species and on designated critical habitat. The level of effect for this factor ranges from positive to negative. Generally, negative effects on the fish from M&E are weighed against the value or benefit of new information, particularly information that tests key assumptions and that reduces critical uncertainties. M&E actions including but not limited to collection and handling (purposeful or inadvertent), holding the fish in captivity, sampling (*e.g.*, the removal of scales and tissues), tagging and fin-clipping, and observation (in-water or from the bank) can cause harmful changes in behavior and reduced survival. These effects should not be confused with handling effects analyzed under broodstock collection. In addition, NMFS also considers the overall effectiveness of the M&E program. There are five factors that NMFS takes into account when it assesses the beneficial and negative effects of hatchery M&E: (1) the status of the affected species and effects of the proposed M&E on the species and on designated critical habitat, (2) critical uncertainties over effects of the Proposed Action on the species, (3) performance monitoring and determining the effectiveness of the Hatchery program at achieving its goals and objectives, (4) identifying and quantifying collateral effects, and (5) tracking compliance of the Hatchery program with the terms and conditions for implementing the program.

SONCC coho salmon adults may be briefly handled during enumeration activities, which may include the use of seining, angling, or snorkeling. We anticipate up to 20 adult coho salmon and 5000 juvenile coho salmon may be handled during M&E activities. The adult and juvenile numbers (20 and 5000) used for the assessment are high and based on the numbers that may be handled once population numbers begin to recover. For example, population enumeration activities in the Mad River which is assumed to have a similar coho salmon population as the Smith River results in the handling of fewer than 5 coho salmon each season because areas where coho salmon congregate are typically avoided (Sparkmann 2019). Note that some broodstock collection and M&E activities will likely occur coincidentally. No adult coho salmon are expected to be injured or killed as a result of M&E efforts.

Trapping, handling, and releasing outmigrating salmonids could result in injury or mortality to coho salmon juveniles, and releasing fish at downstream locations could reduce natal cues and increase stray rates. The primary contributing factors to stress and death from handling are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18ºC or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps that are not emptied on a regular basis. Debris buildup in traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis. In addition, predation of salmonid fry in the trap can range from less than 1 percent to more than 10 percent in any given year (Duffy *et al*. 2011). Between 1999 and 2001, Duffy et al. (2011) found that predation on coho salmon averaged 1.28 percent of the total captured coho salmon (i.e., including coho salmon recovered in predators' stomachs) in migrant traps set in Prairie Creek, a tributary of Redwood Creek, CA. The highest annual predation on coho salmon in the trap was 3.19 percent of the total captured coho salmon (i.e., including coho salmon recovered in predators' stomachs; Duffy *et al.* 2011). The fork lengths of the eaten coho salmon were almost all 55 mm or less (Duffy *et al.* 2011). This indicates that subyearlings are most at risk from predation, while yearlings and smolts are generally not eaten in traps. Aside from predation, coho salmon mortality associated with downstream migrant trapping on the Shasta and Scott rivers ranged from 0 to 5.7 percent for subyearlings, 0 to 7.9 percent for yearlings, and 0 percent for age 2+ fish (Chesney and Yokel 2003, Daniels *et al.* 2011).

Although mortalities in the trapping operations mentioned above ranged as high as 7.9%, trapping operations conducted by CDFW and the Smith River Alliance from 2014-2017 on Mill Creek, a tributary to the Smith River, had mortality rates that ranged from a high of 2.26% in 2014 for young-of-year (YOY) coho salmon in 2014 to only 0.09% in 2016 (Walkley *et al.* 2017). YOY individuals are the most susceptible to injury and predation from trapping operations. The Smith River and its tributaries are much colder and have higher dissolved oxygen concentrations than the Scott and Shasta Rivers discussed above which would result in lower mortalities during trapping. Additionally, Walkley *et al*. (2017) specifically discussed measures employed during the 2015-2017, trapping seasons to reduce mortality of YOY from 2.26% in 2014 to 0.09%-1.31% in 2015-2017. Therefore, NMFS expects that juvenile mortalities from trapping operations will not exceed 1% during most years.

Although sites selected for relocating fish will likely have similar water temperature as the capture site and should have ample habitat, in some instances relocated fish may endure short-term stress from crowding at the relocation sites. Relocated fish may also have to compete with other salmonids that are already at the relocation sites, which can increase competition for available resources such as food and habitat. Some of the fish at the relocation sites may choose not to remain in these areas and may move either upstream or downstream to areas that have more habitat and lower fish densities. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. In addition, the number of fish affected by increased competition is not expected to be significant as most relocated fish will move quickly further downstream to the estuary or ocean.

Juvenile trapping operations including sampling for genetics, mark-recapture studies, and scale analysis may result in the handling and sampling of up to 5,000 juvenile coho salmon. NMFS expects up to 1% of juvenile coho salmon trapped may be injured or die during trapping and these potential losses are not expected to reduce adult abundance.

2.5.3 Effects to Critical Habitat

NMFS expects only minor effects to critical habitat from the proposed action. Marine-derived nutrients from Chinook carcasses may be reduced in Rowdy Creek from the proposed removal of both broodstock and excess hatchery fish for Tribal cultural purposes. However, the Hatchery may result in an overall increase of adult Chinook in Rowdy Creek, depending on survival. Steelhead production activities at the Hatchery are not expected to measurably affect the amount of marine-derived nutrients because only a fraction die after spawning.

The current weir and hatchery infrastructure adversely affects migratory habitat within Rowdy and Dominie creeks. Future improvements for migratory purposes are proposed, but currently unfunded. Water use in the Hatchery is non-consumptive such that flows are not reduced below the Hatchery because water is immediately returned to the river after passing through the Hatchery. A slight increase in nutrients is expected after water passes through the Hatchery, but this is not expected to reduce the quality of critical habitat in the action area. Water temperature is not expected to increase after passing through the Hatchery.

2.6 Cumulative Effects

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

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the actions 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).

NMFS expects ongoing effects on critical habitat and SONCC coho salmon individuals primarily from agriculture and timber harvest, but also from rural residential activities including diverting water for the town of Smith River, Fort Dick, and Pelican Bay Prison. The Town of Smith River has a significant diversion on Rowdy Creek which appears to be drying the creek during summer low flows. Agriculture results in sediment, nutrients, and pesticide inputs that are adversely affecting coho salmon and its critical habitat.

2.7 Integration and Synthesis

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

NMFS has developed a 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/DPS is typically made up of multiple independent populations. Therefore, NMFS must assess whether changes to VSP parameters of the independent population results in a reduction in the numbers, reproduction, or distribution of the ESU /DPS as a whole.

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

The current status of habitat in the action area is improving relative to past conditions that lead to the listing of SONCC coho salmon. Timber harvest practices and road building practices have improved and a number of fish passage projects have been implemented in the Smith River Watershed. The lower Smith River is still affected by the existence of levees. Intense agricultural production in the Smith River Plain will continue to affect non-natal rearing and outmigrant juvenile coho salmon and habitat. NMFS assumes that the productivity of coho salmon Smith River is primarily limited by the current quantity and quality of the salmonid habitat available in the Smith River Plain and that future improvements to habitat conditions would promote their recovery.

Population monitoring of coho salmon has been limited until recently and NMFS puts the most recent adult coho salmon population estimate as just above the depensation number of 325 at 355 adults (NMFS 2016).

The cumulative effects of those state, private, and tribal activities that occur in the watershed as discussed in the environmental baseline (e.g., timber harvest and agriculture) will continue to impair, but not preclude the recovery of, habitat in the action area. NMFS expects that new regulations in the coming years for lily bulb farming, as well as 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. Additionally, focused recovery actions as identified in the SONCC Coho Salmon Recovery Plan are expected to further improve habitat for coho salmon in the Smith River.

The Smith River is expected to be more resilient than other streams to the effects of climate change because much of the land is in public ownership including Mill Creek where the majority of coho salmon spawn in the Smith River. These public lands are continuing to provide a "stronghold" for coho salmon because they are either recovering from past degradation or have existing characteristics that provide resiliency (e.g., old growth forest and increased promotion of old growth characteristics in Mill Creek). NMFS does not expect the proposed action to exacerbate the effects of climate change on coho salmon and its critical habitat.

2.7.2 Summary of Effects to Coho salmon Individuals

The potential effects of the proposed action on SONCC coho salmon are limited to a minor increase in competition with the Hatchery releases. In addition, a negligible increase in predation by hatchery-origin steelhead smolts after release is expected. NMFS does not expect either competition or predation to reduce the number of coho salmon adults. A small number of coho salmon adults will be captured during broodstock collections and M&E efforts, but no mortalities or injuries are expected. It should be noted that broodstock collection and M&E efforts will be done simultaneously and provide a dual purpose, when possible. That is, efforts to collect broodstock will more than likely be done in conjunction with efforts to collect coho salmon abundance estimates. Since no adult mortalities are expected, NMFS does not expect any measurable effects on VSP parameters for adult coho salmon from ecological interactions (competition and predation), broodstock collection, or adult M&E efforts. Finally, juvenile coho salmon may be captured as part of M&E efforts. The estimated mortalities from these efforts is estimated at up to 1% of captured. This small number of mortalities is not expected to measurably reduce the abundance or population growth rate and have no effect on spatial structure and diversity. Therefore, the proposed action is not expected to significantly reduce any VSP parameter for coho salmon in the Smith River, and, thus, is not expected to reduce the survival or recovery of the SONCC Coho Salmon ESU.

2.7.3 Summary of Effects to Critical Habitat

NMFS has determined that the effects on critical habitat from the Hatchery program are limited to only short-term effects on the migratory corridor from operations of the weir. Such effects on critical habitat would, therefore, be negligible. A small, negative effect on PBFs affected by a decrease in marine-derived nutrients is expected from the decrease in carcasses upstream if excess hatchery fish are removed. Therefore, the proposed action will not destroy or adversely modify designated critical habitat for SONCC coho salmon.

2.8 Conclusion

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

2.9 Incidental Take Statement

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

2.9.1 Amount or Extent of Take

Incidental take of SONCC coho salmon would occur as a result of the Proposed Action from: (1) broodstock collection, including the operation of the weir; (2) ecological effects (competition and predation) in juvenile rearing areas; and (3) monitoring and evaluation (M&E). Chinook and steelhead broodstock collection is expected to result in non-lethal capture of up to 20 coho salmon adults.

It is not possible to quantify the amount of individual juvenile coho salmon taken as a result of competition and predation from juvenile hatchery releases in the action area because it is not possible to meaningfully measure the number of interactions between hatchery-reared juveniles and natural origin juvenile coho salmon, or between the progeny of hatchery-origin natural spawning fish and natural-origin coho salmon, and locating small, dead fish is practically impossible due to predation, decomposition, and poor water visibility.

M&E is expected to incidentally take a certain number of adult and juvenile coho salmon. NMFS anticipates up to 20 adult coho salmon may be handled during broodstock collection activities and up to 20 adult coho salmon will be handled during M&E activities. Adult coho salmon are not expected to be injured or killed during broodstock collection activities. M&E is not expected to injure or kill adult coho salmon, but up to 1% of coho salmon juveniles captured (i.e., up to 50 coho salmon juveniles annually based on handling up to 5,000 juveniles during M&E activities) may be injured or 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 nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

NMFS concludes that the following reasonable and prudent measures are necessary and appropriate to minimize the impacts from the proposed Hatchery program on the SONCC Coho Salmon ESU:

1. BIA must ensure implementation of the Rowdy Creek Hatchery program as described in this opinion.
2. BIA must follow criteria and guidelines specified in this opinion for their respective monitoring and evaluation activities within the Smith River. Where specifics are not provided, a detailed proposal for monitoring must be provided to NMFS.
3. BIA must provide reports to the NMFS California Coastal Office annually for the Rowdy Creek Hatchery and all related monitoring and evaluation activities in the Smith River

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the BIA or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). BIA 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. BIA must ensure the Tolowa Dee-ni' Nation implement the Hatchery programs as described in the submitted HGMPs (Tolowa Dee-ni' Nation 2018). NMFS must be notified in advance of any change in hatchery operations that would potentially result in increased incidental take of SONCC coho salmon.

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

    a. Any M&E proposals shall be submitted to NMFS for approval at least 6 months prior to implementation. BIA must ensure the Tolowa Dee-ni' Nation take the greatest care when handling coho salmon including minimizing handling, using anesthesia, salt, ice, and slime maintenance chemicals, as necessary. Any mortalities or injuries must be quantified and submitted to NMFS in the annual report.

    b. The BIA must ensure the Tolowa Dee-ni' Nation analyze the ecological effects of releasing fish in the Smith River upstream of the Hatchery prior to using the upriver release site, and submit the analysis to NMFS' Northern California Office. Until such analysis shows that ecological effects of predation and competition with coho salmon juveniles is low as assumed in this opinion, the Tolowa Dee-ni' Nation must release hatchery juveniles at the boat ramp in the Smith River downstream of Highway 101.

3 The following terms and conditions implement reasonable and prudent measure 3:

    a. By July 1 of each year, the BIA must send annual reports on (1) Rowdy Creek Hatchery monitoring, evaluation, and research results to:

NMFS Northern California Office
1655 Heindon Road
Arcata, California 95521.

b. BIA shall convene a hatchery team consisting of NMFS and BIA (or its delegate) and hatchery personnel that will meet at least annually to discuss the annual reports and any other technical or HGMP-related issues.

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).

We recommend the BIA fully fund the removal of the existing Hatchery weir and provide necessary funds to conduct the proposed M&E as well as rehabilitation of existing hatchery facilities to modern standards. This conservation recommendation will help ensure the operation of the Hatchery will help conserve salmon and steelhead in the Smith River. Additionally, removal of the existing Hatchery weir will ensure salmon and steelhead have unimpeded access to Rowdy and Dominie creeks.

Additionally, we recommend evaluation of the role Rowdy Creek Hatchery may have with regard to recovering coho salmon in the Smith River, and specifically, Rowdy and Dominie creeks.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Rowdy Creek Chinook and Steelhead Hatchery Programs.

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

3 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. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” 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) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

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

NMFS has determined that adverse effects on Pacific Salmon Essential Fish Habitat (EFH) are not expected. No construction is expected to occur under the proposed action and no other activities are proposed that will rise to the level of adversely affecting EFH. Therefore, consultation is not necessary.

4 FISH AND WILDLIFE COORDINATION ACT

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development (16 USC 661). The FWCA establishes a consultation requirement for Federal agencies that undertake any action to modify any stream or other body of water for any purpose, including navigation and drainage (16 USC 662(a)), regarding the impacts of their actions on fish and wildlife, and measures to mitigate those impacts. Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources, and providing equal consideration for these resources. NMFS' recommendations are provided to conserve wildlife resources by preventing loss of and damage to such resources. The FWCA allows the opportunity to provide recommendations for the conservation of all species and habitats within NMFS' authority, not just those currently managed under the ESA and MSA.

The following recommendations apply to the proposed action:

We recommend the BIA fully fund the removal of the existing Hatchery weir and provide necessary funds to conduct the proposed M&E as well as rehabilitation of existing hatchery facilities to modern standards.

The action agency must give these recommendations equal consideration with the other aspects of the proposed action so as to meet the purpose of the FWCA.

This concludes the FWCA portion of this consultation.

5 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.

5.1 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 BIA. Other interested users could the Tolowa Dee-ni' Nation and California Department of Fish and Wildlife. Individual copies of this opinion were provided to the BIA. The format and naming adheres to conventional standards for style.

5.2 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.

5.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

6 REFERENCES

Bartholow, J.M. 2005. Recent water temperature trends in the Lower Klamath River, California. North American Journal of Fish Management 25:152-162.

Cannamela, D.A. 1992. Potential Impacts of Releases of Hatchery Steelhead Trout Smolts on Wild and Natural Juvenile Chinook and Sockeye salmon. A White Paper, Idaho Department of Fish and Game, Boise, Idaho.

Chesney, W. R., and E. M. Yokel. 2003. Annual report, Shasta and Scott River juvenile salmonid outmigrant study, 2001-2002. Project 2a1. State of California, The Resources Agency, Department of Fish and Game, Northern California, North Coast Region, Steelhead Research and Monitoring Program. January. 37 pp. plus 2 appendices.

Daniels, S. S., A. Debrick, C. Diviney, K. Underwood, S. Stenhouse, and W. R. Chesney. 2011. Final Report: Shasta and Scott River Juvenile Salmonid Outmigrant study, 2010 P0710307. California Department of Fish and Game. Anadromous Fisheries Resource Assessment and Monitoring Program. Yreka, CA. May

Duffy, W. G., E. P. Bjorkstedt, and C.S. Ellings. 2011. Predation on juvenile Pacific salmon *Oncorhynchus* spp. In downstream migrant traps in Prairie Creek, California. North American Journal of Fisheries Management 31: 51-164.

Garwood, J. May 20, 2019. Email reply to Dan Free regarding residualization of Rowdy Creek Hatchery Steelhead.

Garwood, J. 2012. Historic and recent occurrence of coho salmon (*Oncorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionary Significant Unit. California Department of Fish and Game, Fisheries Branch Administrative Report 2012-03.

Good, T. P., R. S. Waples, and P. B. Adams. 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-66. 598 pp.

Hillman, T. W., and J. W. Mullan, editors. 1989. Effect of hatchery releases on the abundance of wild juvenile salmonids. Report to Chelan County PUD by D.W. Chapman Consultants, Inc., Boise, ID.

HSRG (Hatchery Scientific Review Group). 2004. Technical discussion Integrated Hatchery Programs. Prepared by the HSRG, Washington Department of Fish and Wildlife, and Northwest Indian Fisheries Council.

HSRG. 2012. California Hatchery Review Statewide Report. Prepared for the US Fish and Wildlife Service and Pacific States Marine Fisheries Commission. April 2012.

HSRG. 2014. On the Science of Hatcheries. An updated perspective on the role of hatcheries in salmon and steelhead management in the Pacific Northwest. Updated October 2014.

Intergovernmental Panel on Climate Change (IPCC). 2007. Impacts, Adaptation, and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the IPCC, Cambridge University Press.

Jacobs, J. May 22, 2019. Email reply to Dan Free regarding changing proposed action to include a number of ways to reduce residualization of hatchery steelhead.

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 the viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin, San Francisco Estuary and Watershed Science 5: Article 4.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-42. Seattle. 156 p.

Moyle, P.B. 2002. Inland Fishes of California. Second Edition. University of California Press. Berkeley, California.

NMFS. 2012. Effects of Hatchery Programs on Salmon and Steelhead Populations: Reference Document for NMFS ESA Hatchery Consultations. Craig Busack, Editor. March 7, 2011. NMFS Northwest Regional Office, Salmon Management Division. Portland, Oregon.

NMFS. 2014. Final recovery plan for the Southern Oregon/Northern California Coast evolutionarily significant unit of coho salmon. September 2014. Arcata, California.

NMFS. 2016. 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.

NMFS and CDFW. 2018. Smith River Plain Dissolved Copper Monitoring Report 2017-2018. National Marine Fisheries Service, Arcata, CA.

Olla, B.L., M.W. Davis, and C.H. Ryer. 1998. Understanding how the Hatchery Environment Represses or Promotes the Development of Behavioral Survival Skills. Bull. Mar. Sci. 62(2):531–550.

Pearsons, T. N., and C. A. Busack. 2012. PCD Risk 1: A tool for assessing and reducing ecological risks of hatchery operations in freshwater. Environmental Biology of Fishes. 94: 45-65.

Pearsons, T. N., and A. L. Fritts. 1999. Maximum size of Chinook salmon consumed by juvenile coho salmon. North American Journal of Fisheries Management. 19(1): 165-170.

Pearsons, T. N., G. A. McMichael, S. W. Martin, E. L. Bartrand, M.Fischer, S. A. Leider, G. R. Strom, A. R. Murdoch, K. Wieland, and J. A. Long. 1994. Yakima River Species Interaction Studies - Annual report 1993. Division of Fish and Wildlife, Project No. 1989-105, Contract No. DE-BI79-1993BP99852, Bonneville Power Administration, Portland, Oregon.

Perry, R.W., J.C. Risley, S.J. Brewer, E.C. Jones, and D.W. Rondorf. 2011. Simulating Daily Water temperatures of the Klamath River under Dam Removal and Climate Change Scenarios. USGS. File Report 2011-2043.

PFMC (Pacific Fishery Management Council). 1999. Description and identification of essential fish habitat, adverse impacts and recommended conservation measures for salmon. Appendix A to Amendment 14 to the Pacific Coast Salmon Plan. Pacific Fishery Management Council, Portland, Oregon. March.

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

Peterson, W.T., J.L. Fisher, C.A. Morgan, J.O. Peterson, B.J. Burke, and K. Fresh. 2015. Ocean ecosystem indicators of salmon marine survival in the Northern California current. National Marine Fisheries Service Northwest Fisheries Science Center. December. 94 p

Shapovalov, L., and A.C. Taft. 1954. The life histories of the steelhead rainbow trout *Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. California Department of Fish and Game Fish Bulletin 98. 375 p.

SIWG (Species Interaction Work Group). 1984. Evaluation of Potential Interaction Effects in the Planning and Selection of Salmonid Enhancement Projects. J. Rensel, chairman and K. Fresh, editor. Prepared by the Species Interaction Work Group of the Enhancement Planning Team. Washington Dept. Fish and Wildlife. Olympia, Washington.

Steward, C.R., and T.C. Bjornn. 1990. Supplementation of Salmon and Steelhead Stocks with Hatchery Fish: A Synthesis of Published Literature. In Analysis of Salmon and Steelhead Supplementation, William H. Miller editor. Report to Bonneville Power Administration (BPA). Portland, Oregon. Project No. 88-100.

Sparkmann, M. June 10, 2019. Email Reply to Dan Free regarding the number of coho salmon handled during M&E activities in the Mad River.

Tatara, C. P., and B. A. Berejikian. 2012. Mechanisms influencing competition between hatchery and wild juvenile anadromous Pacific salmonids in fresh water and their relative competitive abilities. Environmental Biology of Fishes. 94(1): 7-19.

Tolowa Dee-ni' Nation. 2018. Hatchery and Genetic Management Plans: Rowdy Creek Hatchery steelhead and Chinook salmon. Prepared for the Bureau of Indian Affairs to fulfill Responsibility under Section 7 of the ESA.

Walkley, J., and J. M. Garwood. 2017. 2011-2016 Salmonid Redd Abundance and Juvenile Salmonid Spatial Structure in the Smith River Basin, California and Oregon. Final Progress Report to the California Department of Fish and Wildlife. Fisheries Restoration Grants Program. Grantee agreement: P1210524.

Walkley, J., J.D. Deibner-Hanson, J. Garwood, and M. Parish Hanson. Mill Creek Salmonid Life Cycle Monitoring Station Juvenile Coho salmon Outmigrant Trapping Project 2014-2017, Smith River, California. Final Report to California Department of Fish and Game, FRGP, Agreement P1410546.

Wedemeyer, G.A. 2001. Fish Hatchery Management, 2nd ed. American Fisheries Society, Bethesda, MD.

Westerling, A.L., B.P. Bryant, H.K. Preisler, T.P. Holmes, H.G. Hidalgo, T. Das, and S.R. Shrestha. 2011. Climate change and growth scenarios for California wildfire. Climate Change 109(1):445-463.

Williams, T.H., B. Spence, W. Duffy, D. Hillemeier, G. Kautsky, T.E. Lisle, M. McCain, T. Nickelson, E. Mora, and T. Pearson. 2008. Framework for assessing viability of threatened coho salmon in the Southern Oregon/Northern California Coasts evolutionarily significant unit. NOAA Technical Memorandum NMFS-SWFSC-432. U.S. Department of Commerce, NOAA, NMFS, Southwest Fisheries Science Center Santa Cruz, California. 113 pp.

Williams, T.H., D.A. Boughton, S.T. Lindley, and B.C. Spence. 2011. Southern Oregon/Northern California Coast Recovery Domain 5-Year Review: Summary and Evaluation of Southern Oregon/Northern California Coast Coho Salmon ESU. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Fisheries Ecological Division, Southwest Fisheries Science Center, Santa Cruz, CA.

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. 182 p.

Federal Register Notices Cited

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. Federal Register.

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. Federal Register.

70 FR 52488. National Marine Fisheries Service. Final Rule. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. September 2, 2005. Federal Register.

81 FR 7214. Fish and Wildlife Service and the National Oceanographic and Atmospheric Administration. Final Rule. Interagency Cooperation-Endangered Species Act of 1973, as Amended. Definition of destruction or adverse modification of critical habitat. February 11, 2016. Federal Register.