

SECTION 7.0

EFFECTS ASSESSMENT METHODOLOGY

The effects assessment in this Applicant-Prepared Draft BA addresses the presence of listed species in the Action Area and includes an analysis of the likely effects of the Proposed Action on the listed species and their habitats. One of the purposes of this Applicant-Prepared Draft BA is to determine whether the Proposed Action is "likely to adversely affect" listed species or critical habitat (USFWS and NMFS 1998). Two related analyses are described in this Applicant-Prepared Draft BA – a population analysis and a habitat analysis.

The population analyses described in this Applicant-Prepared Draft BA are included to assist NMFS in its determination of whether the Proposed Action “*is likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of any critical habitat.*” (16 U.S.C. § 1536(a)(2); see 50 C.F.R. §402.02.) An ESA regulation defines “*Jeopardize the continued existence of*” to mean “*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 the species.*” (50 C.F.R. § 402.02.) The population analysis described in this Applicant-Prepared Draft BA applies the VSP concept, including considerations of abundance, productivity, spatial structure and diversity, for listed species in the appropriate ESU/DPS, as well as in the Action Area of the lower Yuba River.

For the critical habitat effects analysis, an evaluation was conducted of the effects of the Proposed Action on the PBFs of critical habitat and, in particular, on the essential features of that critical habitat in the Action Area, by comparing the conditions of the habitat under the Proposed Action relative to the Environmental Baseline. In addition, for the lower Yuba River, an evaluation was conducted as to whether the Proposed Action would affect the VSP parameter of spatial structure. This Applicant-Prepared Draft BA includes information to assist NMFS as it makes its determination whether the Proposed Action is likely to adversely affect the PCEs of critical habitat.

7.1 Effects Assessment Framework

To determine whether the Proposed Action, as defined and described in this Applicant-Prepared Draft BA, is likely to cause jeopardy, NMFS must examine the Proposed Action in relation to each of the listed species’ current status and the effects of past, present, and reasonably certain future non-federal projects on the species. “*Although the focus of the jeopardy inquiry is on the effects of the agency action, these effects can only be understood in context. This context includes ‘the current status of the listed species,’ the ‘environmental baseline,’ and future ‘cumulative effects.’* (50 C.F.R. 402.02, 402.14(g)(2)-(3))” (S. Yuba River Citizens League v. Nat’l Marine Fisheries Serv., 723 F. Supp. 2d 1247, 1257 (E.D. Cal. 2010)). The ESA Consultation Handbook (USFWS and NMFS 1998) directs NMFS to analyze the Proposed Action against “*...the aggregate effects of everything that has led to the species current status, and, for non-federal activities, those things likely to affect the species in the future.*” The ESA Consultation

Handbook (USFWS and NMFS 1998) also states that NMFS is to provide a conclusion “...regarding whether the aggregate of the factors analyzed under ‘environmental baseline,’ ‘effects of the action,’ and ‘cumulative effects’... are likely to jeopardize the continued existence of the species...”.

Under the Federal Power Act, FERC issues new licenses for existing hydropower projects as the original licenses expire. FERC has determined that licenses issued in relicensing proceedings represent a new commitment of resources (USFWS and NMFS 1998). Therefore, for license renewals, the Handbook provides that the ESA Section 7 analysis is to be conducted as follows.

- *The total effects of all past activities, including effects of the past operation of the project, current non-Federal activities, and Federal projects with completed section 7 consultations, form the environmental baseline;*
- *To this baseline, future direct and indirect impacts of the operation over the new license or contract period, including effects of any interrelated and interdependent activities, and any reasonably certain future non-Federal activities (cumulative effects), are added to determine the total effect on listed species and their habitat.*

Under this approach, the Environmental Baseline and the status of the species are viewed together to determine the ability of each listed species to withstand additional stressors associated with subsequent actions without jeopardizing the continued existence of the species. As stated in *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids* (NMFS 1999): “[i]f the species’ status is poor and the baseline is degraded at the time of consultation, it is more likely that any additional adverse effects caused by the proposed or continuing action will be significant.” [emphasis added] Therefore, NMFS’ determination of whether or not a Proposed Action would cause jeopardy depends partly on the status of the species and the Environmental Baseline.

Section 7(a)(2) of the ESA requires federal agencies (in this case FERC) to satisfy two standards in carrying out their programs. Federal agencies must ensure that their activities are not likely to: 1) jeopardize the continued existence of any listed species, or 2) result in the destruction or adverse modification of designated critical habitat.

According to USFWS and NMFS (1998), regulations implementing these sections of the ESA define “**jeopardize the continued existence of**” as:

*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,” and “destruction or **adverse modification**” as: “a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to,*

alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.

In conducting analyses under Section 7 of the ESA, NMFS uses the following steps (NMFS 1999): 1) consider the status and biological requirements of the affected species; 2) evaluate the relevance of the Environmental Baseline in the Action Area to the species' current status; 3) determine the effects of the proposed or continuing action on the species; 4) consider cumulative effects; and 5) determine whether the Proposed Action, considering the above factors, is likely to appreciably reduce the likelihood of species survival in the wild or adversely modify its critical habitat (Figure 7.1-1). According to NMFS (1999), the analytical framework described above is consistent with the ESA Consultation Handbook and builds upon the Handbook framework “to better reflect the scientific and practical realities of salmon conservation and management on the West Coast”.

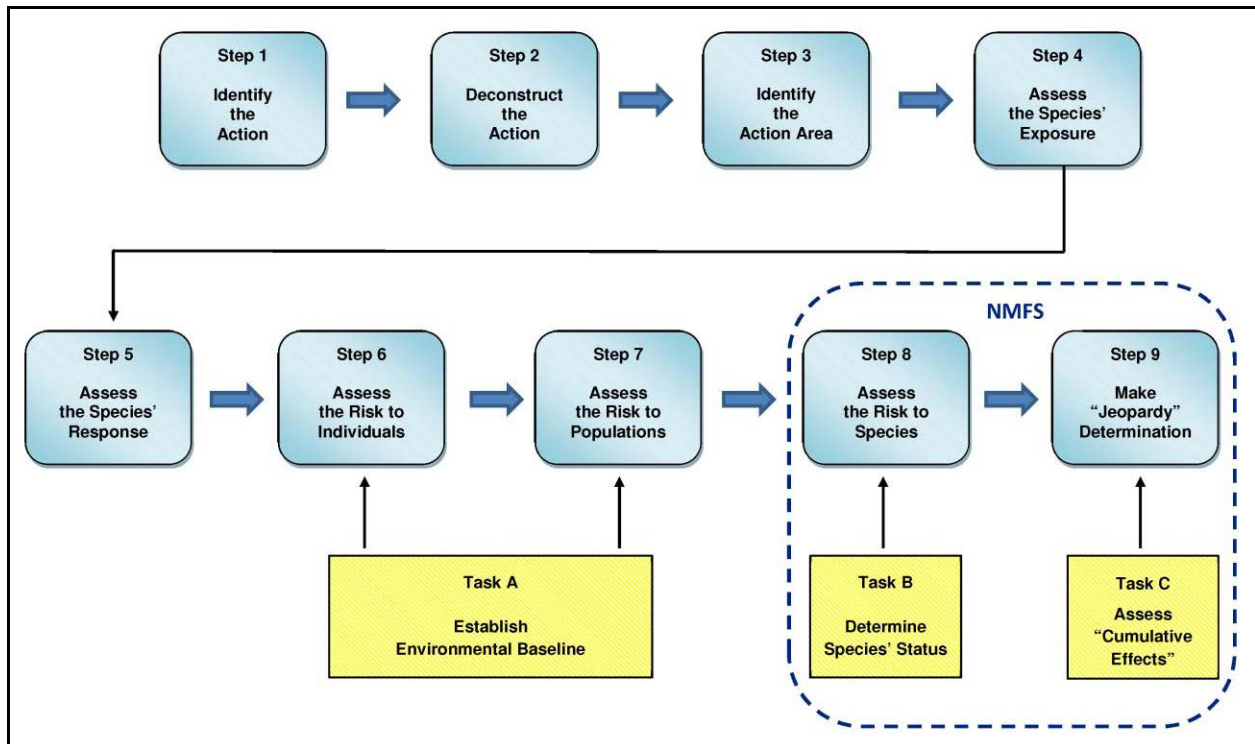


Figure 7.1-1. Conceptual model of the assessment framework (Modified from NMFS 2004a).

Under this framework, after identifying the Proposed Action, the next step in the evaluation process is to “deconstruct” the Proposed Action into its constituent parts to identify the environmental stressors (physical, chemical, or biotic stressors that are directly or indirectly caused by the Proposed Action and, for indirect effects, are “reasonably certain to occur”) and any environmental subsidies (i.e., environmental changes that improve conditions for taxa that prey on, compete with, or serve as pathogens for one or more of the listed species) caused by the Proposed Action (NMFS 2004a). Section 3.0 of this Applicant Prepared Draft BA contains this deconstruction of the Proposed Action.

The effects assessment in this Applicant-Prepared Draft BA then proceeds by considering the extents of the various stressors associated with the Proposed Action, the potential for each listed species to be exposed to these stressors, and the species' potential responses to these exposures. These assessments are conducted in the context of "aggregate effects" and "net effects" of the Proposed Action.

7.2 Aggregate Effects Assessment Approach and "Net Effects" Analysis

The aggregate effects assessment is used to describe the context of the Proposed Action. This Applicant-Prepared Draft BA addresses whether the "aggregate effects" of the Proposed Action, in combination with the Environmental Baseline, status of the species, and cumulative effects, have the potential to adversely affect listed species or their critical habitats. Then the Environmental Baseline (including the status of the species) is used to evaluate the ability of each listed species to withstand the additional stressors associated with the Proposed Action, in the "net effects" analysis. The effects assessments are conducted on a species-by-species and lifestage-specific basis, and take into consideration each of the identified stressors and their characteristics (e.g., spatial and temporal distribution, magnitude, duration). Because the Action Area includes only portions of the listed species' ESU/DPSs, the effects assessment conducted for this Applicant-Prepared Draft BA evaluates potential effects on the individuals and the populations that could be affected within the Action Area, and subsequently evaluates these effects in context of the listed species' respective ESU/DPSs.

This Applicant-Prepared Draft BA performs its "net effects" analysis to assist NMFS in determining whether the Proposed Action will cause "...some deterioration in the species' pre-action condition" (*National Wildlife Federation v. NMFS*, 524 F.3d 917, 930 (9th Cir. 2008)). The net effects analysis in this Applicant-Prepared Draft BA considers guidance provided by *National Wildlife Federation v. NMFS*, 524 F.3d 917, 930 (9th Cir. 2008), which stated "...an agency may not take action that will tip a species from a state of precarious survival into a state of likely extinction. Likewise, even where baseline conditions already jeopardize a species, an agency may not take action that deepens the jeopardy by causing additional harm."

To identify and evaluate potential stressors affecting listed species within the Action Area, the assessment approach involves: 1) the identification of specific stressors to which listed species may be exposed; 2) where exposure may occur; 3) potential pathways of exposure, including the timing, magnitude, duration and frequency of exposure; and 4) characterization of how exposure may vary depending upon the characteristics of the environment, stressor intensity and individual behavior. Habitat modification also may serve as an indirect pathway by which listed species are exposed to potential effects of the Proposed Action (NMFS 2004a).

For each stressor identified for the Environmental Baseline or the Proposed Action, the magnitude of each stressor was ascertained by generally applying the stressor prioritization

framework (“Very High,” “High,” “Medium¹,” and “Low”) used by NMFS (2014a) in Appendix B (Threats Assessment), updated with information obtained since 2009 in the lower Yuba River.

For each stressor that emanates from or is exacerbated by the Proposed Action, the net effects analysis addresses the following: 1) the magnitude of effect of each stressor, to the extent possible; 2) the listed species’ ability to tolerate each stressor; and 3) and the reason why each stressor will, or will not, contribute to the overall likelihood that the listed species or its critical habitat will be adversely affected by the Proposed Action. For this Applicant-Prepared Draft BA, it is recognized that incrementally assessing the magnitude of an individual stressor, or the incremental ability of the listed species to tolerate an individual stressor, is challenging because of the interconnectivity of individual stressors and the inherent variation in biological responses to suites of stressors. Nonetheless, to the extent possible, the net effects analysis addresses the magnitudes of individual stressors associated with the Proposed Action, and evaluates whether such effects are likely to increase risks to the listed species.

The net effect analysis provided in this Applicant-Prepared Draft BA distinguishes between the potential effects to the listed species that are attributable to the Environmental Baseline, and those that are expected to occur as a result of the Proposed Action. The following sections provide additional detail for the methodologies used in conducting the effects assessment.

7.2.1 Environmental Baseline Assessment

The Environmental Baseline identifies the antecedent conditions for individuals and populations before considering any new stressors associated with the Proposed Action (NMFS 2004a). The status of the listed species and populations in the lower Yuba River, including their limiting factors, threats and stressors associated with the Environmental Baseline, were described in detail in Sections 5.0 and 6.0 of this Applicant-Prepared Draft BA. Flow and temperature-related effects associated with current Project operations in the Action Area of the lower Yuba River were quantitatively assessed using model simulation output in Section 6.0. The evaluations were conducted comparing Environmental Baseline conditions to “Without-Project” conditions.

The Environmental Baseline has led to the current status of the species. However, while the Environmental Baseline is limited to the Action Area, a species’ status encompasses the base condition of the species’ entire ESU or DPS, based on the species’ exposure to human activities and natural phenomena throughout its geographic distribution. To determine the context of the Proposed Action and its potential effects on listed species, NMFS first determines the species’ status and risks of extinction or probabilities of persistence at the time of consultation, without considering the potential effects of the proposed action. Through this process, the species’ status provides the point of reference for NMFS’ jeopardy determinations that are made during the ESA consultation (NMFS 2004a).

¹ For this Applicant-Prepared Draft BA, the term “Medium” was replaced with the term “Moderate”.

7.2.2 Proposed Action Effects Assessment

For this step of the effects assessment, NMFS (1999) suggests examining the anticipated direct and indirect effects of the Proposed Action on each listed species and its critical habitat within the context of the species' current status and the Environmental Baseline. A two-part analysis is conducted for this step. The first analytical component focuses on the species itself, and describes the Proposed Action's potential effects on individual fish or populations, or both – and places that effect within the context of the ESU/DPS as a whole (NMFS 1999). The second analytical component focuses on the Action Area and describes the Proposed Action's potential effects, considering each species' biological and habitat requirements in that area.

7.2.2.1 Direct and Indirect Effects

For the Proposed Action, the effects assessment first describes the stressors that are expected to result from the Proposed Action, and then describes each stressor in terms of its intensity, frequency, and duration. The analysis then assesses the likely responses of each listed species to the stressors, and the potential for specific stressors to affect critical habitat. Likely species responses are based upon the timing of when and the location where potential stressors would occur, compared to the lifestage-specific spatial and temporal distributions of each listed species. Likely effects on the PBFs of critical habitat for each listed species are assessed by describing changes in habitat suitability (e.g., flows and water temperatures) and availability for each specific lifestage.

These analytical steps comprise the assessment of potential “exposure” of each listed species and its critical habitat to the stressors that are expected to result from the Proposed Action. According to NMFS (2005c), this assessment of exposure is necessary to assess responses of the listed species and their effects on critical habitat resulting from stressors associated with the Proposed Action, and will serve in large part as the bases of “not likely to adversely affect” or “likely to adversely affect” conclusions included in this Applicant-Prepared Draft BA.

The same methodologies described in Section 6.0 of this Applicant-Prepared Draft BA to evaluate aquatic habitat conditions for spring-run Chinook salmon, steelhead and green sturgeon under the Environmental Baseline are used to evaluate direct and indirect effects of the Proposed Action. The Proposed Action's potential effects are evaluated by comparing simulated aquatic habitat conditions in the lower Yuba River with implementation of the Proposed Action, relative to simulated aquatic habitat conditions in the lower Yuba River under the Environmental Baseline. These simulations for both scenarios are conducted using the Project daily operations and water temperature models for the 41-year period of record (WY 1970-2010).

More specifically, potential effects of the Proposed Action are evaluated for species and lifestage-specific flow dependent habitat availability, including: 1) modeled green sturgeon holding habitat availability; 2) spring-run Chinook salmon, steelhead and green sturgeon spawning habitat availability; 3) potential spring-run Chinook salmon and steelhead redd dewatering; 4) potential juvenile salmonid isolation (stranding); 5) spring-run Chinook salmon and steelhead fry and juvenile rearing habitat availability; and 6) lifestage-specific water

temperature suitabilities for all three species under the Proposed Action relative to the Environmental Baseline.

7.2.2.2 Cumulative Effects Assessment

Cumulative effects must be considered in the analysis of the effects of the Proposed Action (50 C.F.R. §402.12(f)(4)). Cumulative effects are defined by federal regulations as “...*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 C.F.R. §402.02).

This definition of cumulative effects applies only to ESA Section 7 analyses and should not be confused with the broader definitions of cumulative effects in the National Environmental Policy Act (NEPA) or other environmental laws (USFWS and NMFS 1998). The ESA definition of cumulative effects differs from the NEPA definition in two fundamental ways. Under the ESA definition: 1) only “*future State or private activities,*” not future federal activities, are considered, and 2) the impacts must be “*reasonably certain*” to occur, not just reasonably foreseeable.

The Section 7 regulations do not define the term “*reasonably certain to occur,*” but this term is defined in ESA guidance (USFWS and NMFS 1998) as follows:

Indicators of actions ‘reasonably certain to occur’ may include, but are not limited to: approval of the action by State, tribal or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors’ assurance the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project will be authorized.

The cumulative effects assessment in this Applicant-Prepared Draft BA addresses changes in lower Yuba River flows and water temperatures that may result from changes in operations of projects in the upper Yuba River Basin upstream of Englebright Dam, or from forecasted increases in agricultural water supply demand from the Yuba River due to the addition of the capability for surface water deliveries to portions of the Wheatland Water District (WWD) (Wheatland Project).

Flows in the Middle Yuba River and South Yuba River, and many of their tributaries, have experienced re-regulation and diversions of flows since the mid-1800s. Water diversions from the Middle and South Yuba River basins into the Bear River and American River basins originally were made to provide additional flows for hydraulic mining and then changed to diversions for agricultural, domestic and power generation purposes during the late 1800s to early 1900s. Diversions from Slate Creek in the North Yuba River Basin into the Feather River Basin began in the early 1960s (see Section 6.2.4). The owners of these upstream projects recently filed applications for renewals of their FERC licenses. The new FERC licenses for

these projects and increases in water supply demands may result in changes to inflows to the Project from Slate Creek, the Middle Yuba River, and the South Yuba River. The combination of these new FERC licenses, forecasted increases in agricultural water supply demand from the Yuba River for additional surface water deliveries to portions of the WWD, and operations under the Proposed Action could result in cumulative effects on quantities of water and flows in the lower Yuba River.

Increased diversions associated with the Wheatland Project represent a future State or private action reasonably certain to occur. The Cumulative Condition scenario includes the irrigation demands for the Member Units under the Environmental Baseline plus the future additional irrigation demands of WWD, which began receiving surface water through a new canal extension in 2010. For this Applicant-Prepared Draft BA, the cumulative effects assessment does not address changes in exposure of juvenile spring-run Chinook salmon and steelhead to impingement, entrainment and predation rates at the South Yuba/Brophy Diversion Canal and Facilities, because these effects will be evaluated in a future action that will require separate ESA consultation.

Model simulations of hydrologic and water temperature conditions were conducted as part of the analysis of cumulative effects in this Applicant-Prepared Draft BA. A cumulative condition model scenario was developed, which is the same as the Proposed Action except for the following:

- Future-level demands for the WWD (approximately 25 TAF/year of increased demand)
- South Feather Water and Power Agency's (SFWPA) new FERC license conditions for flows on Slate Creek from the South Feather Project (FERC No. 2088)
- Nevada Irrigation District's (NID) new FERC license conditions for flows for the Yuba-Bear Project (FERC No. 2266), with NID's year 2062 water deliveries
- PG&E's new FERC license conditions for flows for the Drum-Spaulding Project (FERC No. 2310), with PG&E's year 2062 water deliveries
- Placer County Water Agency's (PCWA) projected 2062-level water supply demands

Modeling for the Cumulative Condition scenario was limited by available inflow data from the upstream projects. Modeling of the Yuba-Bear and Drum-Spaulding projects new FERC licenses and increased PCWA and NID water supply demands included a period of record of WY 1976 through 2008. As previously described in Section 6.0, modeling in the lower Yuba River for the Environmental Baseline encompassed the period extending from WY 1970-2010. Therefore, to evaluate cumulative effects by comparing hydrologic and water temperature simulations between the Cumulative Condition and the Environmental Baseline, modeling of both scenarios was limited to WY 1976 through 2008. The future-level demands for the WWD were developed using the same methodology as the present-level demands for WWD, as described in YCWA's Technical Memorandum 2-2, *Water Balance/Operations Model*, Attachment 2-2A, except the land-use for the WWD was updated to reflect surface water deliveries to the full district. Water temperature modeling of the Cumulative Condition assumed

identical meteorological and inflow water temperature conditions as under the existing level of development scenarios. Details of the methodology characterizing the modeling scenarios are provided in Technical Memorandum 2-2, *Water Balance/Operations Model*, which can be found on FERC's eLibrary as referenced by the FERC accession number provided in Table E6-2 of Appendix E6, of YCWA's Amended FLA.

The same methodologies described in Section 6.0 to evaluate flow-related aquatic habitat conditions for spring-run Chinook salmon, steelhead and green sturgeon under the Environmental Baseline are used to evaluate effects of the Cumulative Condition. Cumulative Condition effects are evaluated by comparing simulated aquatic habitat conditions in the lower Yuba River with simulated aquatic habitat conditions in the lower Yuba River under the Environmental Baseline.

Potential effects of the Cumulative Condition are evaluated for species and lifestage-specific flow dependent habitat availability, including: 1) modeled green sturgeon holding habitat availability; 2) spring-run Chinook salmon, steelhead and green sturgeon spawning habitat availability; 3) potential spring-run Chinook salmon and steelhead redd dewatering; 4) potential juvenile salmonid isolation (stranding); 5) spring-run Chinook salmon and steelhead fry and juvenile rearing habitat availability; and 6) lifestage-specific water temperature suitabilities for all three species.

7.2.2.2.1 Other Future Non-Federal Activities

The cumulative effects assessment includes identification of other future non-federal activities that are reasonably certain to occur in the Action Area (see Section 8.4), with particular reference to the lower Yuba River. This Applicant-Prepared Draft BA addresses whether the "aggregate effects" of the Proposed Action, in combination with the Environmental Baseline, status of the species, and cumulative effects (i.e., modeled flow-dependent variables), have the potential to adversely affect listed species or their critical habitats.

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