**SECTION 8.0**

# ANALYSES OF POTENTIAL EFFECTS OF THE PROPOSED ACTION ON ESSENTIAL FISH HABITAT FOR MANAGED SPECIES

The purpose of this Applicant-Prepared Draft EFH Assessment is to assist NMFS in determining whether the Proposed Action "may adversely affect" Pacific Coast salmon EFH for federally managed commercial fishery species (i.e., Chinook salmon) within the Action Area. An "adverse affect" is defined as any impact which reduces the quality and/or quantity of EFH (50 C.F.R. § 600.810(a)).

Adverse effects may include direct or indirect physical, chemical, or biological alterations 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 and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 C.F.R. § 600.810).

## 8.1 EFH Assessment Approach

According to NMFS (2004b), an EFH assessment is required to include the following information: 1) a description of the Proposed Action; 2) an analysis of the effects, including cumulative effects, of the Proposed Action on EFH, the managed species, and associated species (e.g., major prey species), including affected lifestages; 3) the federal agency's views regarding the effects of the Proposed Action on EFH; and 4) proposed mitigation, if applicable (see 50 C.F.R. § 600.920(e)(3)). Rather than repeating information provided in the Applicant-Prepared Draft BA, the Applicant-Prepared Draft EFH Assessment may cross-reference relevant sections in the BA that analyze potential project impacts on species or critical habitats (50 C.F.R. § 600.920(f)).

In assessing the potential impacts of a proposed action, PFMC and NMFS also are guided by several general considerations, including the extent to which: 1) the activity would directly and indirectly affect the distribution, abundance, health, and continued existence of salmon and their EFH; 2) the potential for cumulative impacts to occur; 3) adverse impacts can be avoided through project modification or alternative site selection; and 4) minimization or mitigation that may be used to reduce unavoidable loss of habitat functions and values (PFMC 1999).

As discussed below (see page 3, and Section 8.3), the Proposed Action does not have the potential to influence or alter many of the habitat components that are typically used to evaluate "properly functioning condition" of freshwater EFH for Chinook salmon. Nevertheless, the manner in which the principles of a "properly functioning condition" assessment described in NMFS (1996), NMFS (2009a) and PFMC (1999) are applied to assessment of the Proposed Action in this Applicant-Prepared Draft EFH Assessment are described below.

### 8.1.1 Habitat Descriptors

The various elements that comprise EFH and determine its utility and function can be assessed to define and evaluate current EFH conditions and potential conditions as a result of the Proposed Action. The concept of properly functioning habitat links various habitat elements with habitat function and is used in this assessment as a basis for describing current Chinook salmon EFH and identifying potential Project-related changes in these elements that could affect EFH in the Action Area.

Previously, NMFS (1996) developed an analytical methodology utilizing a Matrix of Pathways and Indicators (MPI; often called "The Matrix") for making effects determinations based on the condition of the environmental baseline (e.g., existing aquatic habitat conditions) and the likely effects of a given project. The pathways for determining the effects of an action are represented as conceptual groupings (e.g., water quality) of habitat condition indicators (e.g., temperature). The effects of the action upon each indicator are classified by whether it will degrade, maintain or restore[1] the indicator. The MPI provides a consistent, but geographically adaptable, framework for effects determinations. The pathways and indicators, as well as the ranges of their associated criteria, are amenable to alteration through the process of watershed analysis, and were designed to be applied to a wide range of environmental conditions (NMFS 1996; 1999). As stated by NMFS (1996), "There will be circumstances where the ranges of numerics or descriptions in the matrix simply do not apply to a specific watershed or basin. In such a case, the evaluator will need to provide more biologically appropriate values. When this occurs, documentation justifying these changes should be presented in the biological assessment, habitat conservation plan, or other appropriate document…"

For purposes of assessing EFH in the Action Area, different indicators and stressors were evaluated for areas designated as Chinook salmon EFH upstream of Englebright Dam, and for areas of EFH downstream of Englebright Dam, as further described below.

Currently, Chinook salmon may not access EFH located in the upper Yuba River watershed because of the presence of the USACE's Englebright Dam. Thus, the assessment of EFH upstream of Englebright Dam is restricted to specific habitat considerations. To evaluate potential effects of the Proposed Action on EFH upstream of Englebright Dam, analyses generally followed the habitat-based "properly functioning condition" framework provided in NMFS (1996) using information from several recently conducted FERC studies in the upper Yuba River watershed.

NMFS (1996) identifies ranges of criteria to facilitate and standardize determinations of effects on anadromous salmonids associated with proposed actions. The ranges of criteria are designed to assist in determining whether specific habitat attributes are "properly functioning," "at risk," or "not functioning properly" (NMFS 1996). A properly functioning condition is defined as "the sustained presence of natural habitat-forming processes in a watershed (e.g., riparian community

[1] Although the term "restore" is used to be consistent with NMFS (1996), the effects of some Proposed Action activities (including conservation measures) actually represent enhancement rather than "restoration" relative to existing aquatic habitat conditions.

succession, bedload transport, precipitation runoff pattern, channel migration) that are necessary for the long-term survival of the species through the full range of environmental variation" (NMFS 1999).

For this assessment, several indicators were modified or eliminated so that the assessment focuses on conditions that are more likely to relate the Proposed Action with EFH in the Yuba River watershed. Additionally, pathways and indicators that are large scale, such as watershed conditions and changes in drainage network, and that are not clearly related to Project effects on EFH, are not addressed in this assessment. Indicators evaluated for the Yuba River watershed upstream of Englebright Dam include: 1) habitat access (physical barriers); 2) flow/hydrology; 3) water temperature; 4) sediment/turbidity; 5) chemical contamination/nutrients; 6) width/depth ratio; 7) streambank conditions; 8) substrate; 9) LWM; 10) watershed conditions (riparian areas); and 11) prey availability.

Because Chinook salmon occupy the lower Yuba River downstream of Englebright Dam, a large amount of information has been developed regarding the manner in which numerous stressors affect habitat, including EFH, and the manner in which these stressors affect the species' ability to utilize the habitat in the lower Yuba River. Characterization of the existing condition of EFH in the lower Yuba River takes advantage of the information developed for habitat-related stressors for Chinook salmon in the lower Yuba River.

# 8.2 Summary of Existing EFH Conditions (Environmental Baseline Condition)

## 8.2.1 Yuba River Watershed Upstream of Englebright Dam

### 8.2.1.1 North Yuba River (New Bullards Bar Dam Reach)

8.2.1.1.1 Habitat Access (Physical Barriers)

Under existing habitat conditions, the EFH in the North Yuba River is considered to be "not properly functioning" due to the presence of the USACE's 260-ft-high Englebright Dam, which currently blocks access by managed species (i.e., Chinook salmon) to available EFH in the Yuba River watershed upstream of Englebright Dam.

8.2.1.1.2 Flow/Hydrology

Typical of the semiarid climate of the Central Valley, the natural or "unimpaired" flow regime of the North Yuba River historically varied greatly in the magnitude, timing, duration, and frequency of flows, both inter-annually and seasonally. The frequency and distribution of habitat types and microhabitat features present in the North Yuba River before construction of New Bullards Bar Dam, mining and other past activities were most likely substantially different from those currently found in the river. Presently, New Bullards Bar Dam and Reservoir control about one-half of the flood flows of the Yuba River watershed. The Project provides essential flood management by reducing the peak flood flow in the North Yuba River and thereby reducing peak

water levels on levees on the Yuba River and the Feather River in the Yuba City/Marysville area downstream to the Sacramento River. Under existing habitat conditions, flood control operations have the potential to affect seasonal peak flows, channel morphology, sediment transport and EFH in the North Yuba River.

Comparison of simulated flows under the Environmental Baseline (i.e., existing conditions), relative to the Without-Project (previously described in Section 7.3 of this Applicant-Prepared Draft EFH Assessment), is carried out in this section to characterize potential "ongoing effects" of the Project under existing conditions, which would not otherwise be expected to occur if the Project did not exist. Comparison of simulated flows under existing conditions to flows under the Without-Project is conducted to estimate the Project's incremental effects to existing hydrologic conditions.

Median monthly simulated flows in the North Yuba River downstream of New Bullards Bar Dam under the existing conditions, relative to the Without-Project, indicate that long-term median monthly flows over the 41-year simulation period and median monthly flows by WYT are substantially lower year-round.

Median monthly flows under the existing conditions scenario remain controlled at 8.0-9.0 cfs year-round during all WYTs (Table 8.2-1). Long-term average median monthly simulated flows under the Without-Project range from approximately 200 cfs to about 400 cfs from July through December, gradually increase during January through May (ranging from 912 cfs to 2,377 cfs), and decrease to 989 cfs in June. Similar patterns of median monthly flows under the Without-Project are observed by WYT, but the magnitudes of the median monthly flows generally decrease from wet WYTs to critical WYTs.

Under existing habitat conditions, EFH in the North Yuba River is currently not accessible and not occupied by managed species (i.e., Chinook salmon) due to the presence of the USACE's Englebright Dam. Due to the lack of WUA-discharge relationships for Chinook salmon in the reaches upstream of Englebright Dam, it is problematic to ascertain the functionality of flows for Chinook salmon EFH. Hence, conclusions regarding functionality of existing flow conditions are not made for Chinook salmon EFH under existing conditions. However it should be noted that flows in the North Yuba River upstream of New Bullards Bar Reservoir represent essentially unimpaired flows, and that reach is not affected by the Project. Flows under existing conditions upstream of Englebright Dam in reaches potentially affected by the Project are used as the basis of comparison in this Applicant-Prepared Draft EFH Assessment.

**Table 8.2-1. Simulated median monthly Environmental Baseline and Without-Project flows for October 1969 through September 2010 for the North Yuba River downstream of New Bullards Bar Dam by WYT.**

| North Yuba River below New Bullards Bar Dam | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Median Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 8 |
| Without Project | 226 | 266 | 421 | 912 | 1,427 | 1,995 | 2,117 | 2,377 | 989 | 362 | 247 | 216 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Environmental Baseline | 8 | 8 | 8 | 9 | 9 | 474 | 9 | 10 | 10 | 9 | 9 | 8 |
| Without Project | 231 | 355 | 1,243 | 2,630 | 2,542 | 3,318 | 3,111 | 3,828 | 2,318 | 708 | 353 | 282 |
| **Above Normal** | | | | | | | | | | | | |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 9 | 9 | 8 |
| Without Project | 237 | 309 | 533 | 1,570 | 2,077 | 2,537 | 2,653 | 3,082 | 1,500 | 455 | 290 | 246 |
| **Below Normal** | | | | | | | | | | | | |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 8 |
| Without Project | 198 | 256 | 395 | 742 | 973 | 1,789 | 2,179 | 2,518 | 888 | 338 | 231 | 201 |
| **Dry** | | | | | | | | | | | | |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 8 | 8 | 8 |
| Without Project | 229 | 232 | 289 | 335 | 633 | 1,289 | 1,441 | 1,132 | 374 | 218 | 157 | 143 |
| **Critical** | | | | | | | | | | | | |
| Environmental Baseline | 8 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 |
| Without Project | 148 | 182 | 412 | 365 | 503 | 799 | 784 | 693 | 310 | 166 | 139 | 123 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

8.2.1.1.3 Water Quality

**Thermal Refugia (Water Temperature)**

Available water temperature monitoring data and simulated water temperatures suggest that for this EFH indicator (i.e., thermal refugia), the New Bullards Bar Reach could be considered "properly functioning" under the baseline (i.e., existing habitat conditions). Due to the continuous release of water from the hypolimnion of New Bullards Bar Reservoir, the upstream end of the reach represents a dependable thermal refugia.

**Sediment/Turbidity**

Sediment sources include bank erosion, surface erosion, debris flows, side channel development, historic spill channel erosion, and current and historic mining debris. It is assumed that New Bullards Bar Dam traps all upstream sources of bedload sediment. The North Yuba River channel downstream of New Bullards Bar Dam is comprised of coarse bed and banks resistant to movement, with storage of sediment in small areas in deep pools, in velocity shadows, and on lateral bars. Mid-channel bars are uncommon, but they exist in every one of the reaches, though whether or not they have been reduced in size or frequency since dam construction is unknown. The Basin Plan requires that waters be free of changes in turbidity that would cause nuisances or adversely affect beneficial uses. This objective is expressed in terms of changes in turbidity (NTU) in the receiving water body: where natural turbidity is 0 to 5 NTUs, increases shall not exceed 1 NTU; where 5 to 50 NTUs, increases shall not exceed 20 percent; where 50 to 100

NTUs, increases shall not exceed 10 NTUs; and where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent. Results of water quality sampling during 2012 indicate that turbidity in the North Yuba River was low. Overall, for this EFH indicator (i.e., sediment/turbidity), the North Yuba River downstream of New Bullards Bar Dam is considered to be "properly functioning" under existing habitat conditions because sediment and turbidity are low.

**Chemical Contamination/ Nutrients**

Water quality in the North Yuba River above the Middle Yuba River was sampled approximately 2.0 mi downstream of New Bullards Bar Dam. Historical water quality data (YCWA 2010) indicates that surface water quality in the New Bullards Bar Reach generally meets Basin Plan Objectives. To supplement the historical data regarding general water quality conditions, YCWA undertook the FERC-approved Study 2.3, Water Quality. YCWA's study data are consistent with historical data. Within and between seasons, water is of a high quality in the New Bullards Bar Reach. YCWA also found that most analytes were reported at non-detectable to just above reporting limit concentrations. The water is generally clear (i.e., average turbidity of <36 NTU), and dissolved oxygen (DO) levels are near saturation. Alkalinity is low (<100 mg/L in all samples) and pH is near neutral.

The SWRCB has identified the North Yuba River from New Bullards Bar Dam to the confluence with the Middle Yuba River as Clean Water Act § 303(d) State impaired for mercury. However, this listing was based on fish tissue concentration data, rather than on surface water concentration data (SWRCB 2010). Mercury in the Yuba River Basin is a legacy of the region's gold mining history. Mercury can affect the nervous systems of higher trophic organisms and is bioaccumulated and transferred to higher trophic organisms through the food-web. The presence of methylmercury in fish tissue suggests that it may be bioaccumulating. Methylmercury is thought to be mercury's most bioavailable form and has been found in the tissue of fish from New Bullards Bar Reservoir that could be consumed by anglers. The presence of methylmercury could presumably also affect the nervous system and other organs of the fish themselves. For this reason, this EFH indicator (i.e., chemical contamination/nutrients) for the North Yuba River is considered to be "at risk" under existing aquatic habitat conditions.

8.2.1.1.4 Channel Condition and Dynamics

**Width/Depth Ratio**

NMFS (1996) considered a properly functioning width/depth ratio to be less than 10, an "at risk" ratio to be 10 to 12, and a not properly functioning ratio to be greater than 12. The average width/depth ratio for the ground-mapped reaches in the New Bullards Bar Reach of the North Yuba River is 20. Therefore, according to NMFS (1996), this EFH indicator (i.e., width/depth ratio) would be considered to be "not properly functioning" under the baseline (i.e., existing aquatic habitat conditions).

**Streambank Conditions**

NMFS (1996) considered streambank conditions to be "properly functioning" if greater than 90 percent of the bank is stable (i.e., less than 10% of the banks are actively eroding). "At risk" indicates that 80-90 percent of the banks are stable, and "not properly functioning" indicates that less than 80 percent of the banks are stable.

The channel in the North Yuba River downstream of New Bullards Bar Dam is characterized by large substrate, steep gradients, vertical confinement, low bank erodibility, and low fine sediment accumulation. Ground-mapped data for the 2.3 mi of the North Yuba River did not identify any bank erosion as a percentage of the reach. Therefore, it is assumed that the banks in this reach are stable and it is considered to be "properly functioning".

8.2.1.1.5 Habitat Elements

**Substrate**

NMFS (1996) and PFMC (1999) identified "properly functioning" substrate conditions to include gravel or cobble as the dominant substrate with clear interstitial spaces, or less than 20 percent embeddedness. Embeddedness ranges between 20-30 percent in gravel/cobble dominated substrate were considered "at risk." Dominant substrates other than gravel or cobble (e.g., bedrock, sand, silt) or embeddedness over 30 percent in gravel/cobble were considered "not properly functioning".

As described in Technical Memorandum 3-8, *Stream Fish Populations Upstream of Englebright Reservoir*, 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, habitat in a 373-ft long site in the North Yuba River upstream of the Middle Yuba River was sampled, and cobbles and boulders were the dominant and sub-dominate substrates, respectively. Survey results report that this site did not have any suitably sized spawning gravel for resident trout. Although average pool tail-out embeddedness (%) was not reported for the New Bullards Bar Reach of the North Yuba River, cobble embeddedness was estimated to the nearest 5 percent in Study 3-1 by visually inspecting the cobble to determine the percent that was buried by fine particles. In the New Bullards Bar Reach, the average percent cobble embeddedness was reported to be 21 percent. Therefore, this EFH indicator (i.e., substrate) is considered to be "at risk" under existing aquatic habitat conditions.

**Large Woody Material**

LWM provides cover and velocity refugia, and can play an important role in the geomorphic processes of a river by changing the localized hydraulics around wood, which can lead to pool formation and the maintenance of channel complexity (Bisson et al. 1987). LWM also aids in reducing channel erosion and buffering sediment inputs by providing sediment storage in headwater streams (NMFS 1996).

In the New Bullards Bar Reach of the North Yuba River, LWM (defined as one log in the diameter class 12 to 24 in, length class 25 to 50 ft, within the wetted channel) was rarely reported. Smaller size classes of LWM were not evenly distributed throughout the reaches surveyed, and the average volume (m3) of LWM per 100 meters in the North Yuba River was reported to be 6.7 m3 per 100 m average. YCWA described the quantity of LWM observed in study sites, but did not estimate the annual volume of wood removed at, or passing into Project facilities and becoming unavailable to downstream reaches. These baseline conditions may be due, at least in part, to the fact that LWM that accumulates in New Bullards Bar Reservoir is gathered annually and is burned every 1 to 3 years, after the appropriate permits are obtained.

Because unobstructed downstream movement of LWM is currently restricted, this EFH indicator (i.e., large woody material) is considered to be "at risk" under the existing aquatic habitat conditions.

#### 8.2.1.1.6 Watershed Conditions (Riparian Areas)

Healthy riparian areas have many characteristics, including: diverse plant species that provide cover and shade, water storage capacity and constant stream flow, vertical stream banks, and habitat for diverse wildlife species (OSU 2013). In well-developed riparian areas, the riparian tree species contribute LWM to the stream bank and channel, which adds to aquatic and terrestrial habitat complexity and organic content, providing a positive feedback loop that supports sediment capture and riparian growth (Naiman et al. 2005). According to NMFS (1996), "properly functioning" riparian habitat provides adequate shade, LWM recruitment, habitat protection and connectivity, and buffers or refugia for sensitive aquatic species (>80% intact).

YCWA collected a variety of quantitative information and made a variety of qualitative observations regarding the riparian communities in Project-affected reaches to assess the current conditions of riparian areas. Existing information regarding riparian areas in the New Bullards Bar Dam reach is limited.

The riparian areas assessed by YCWA in Study 6-1 were found to support woody species in various lifestages, including mature trees, recruits (i.e., saplings) and seedlings, although the abundance of each often depended on the dominant substrates. In the North Yuba River, there was no visible change in riparian vegetation from earliest available photos (i.e., 1937 or 1939, depending on site) to 2009. Canopy cover at North Yuba River sites sampled for BMI was reportedly 7 percent, and the lack of riparian vegetation may be a factor contributing to the overall low BMI scores in this reach (see Technical Memorandum 3-1, *Aquatic Macroinvertebrates Upstream of Englebright Reservoir*, which can be found on FERC's eLibrary as referenced by the FERC accession number provided in Table E6-1 of Appendix E6, of YCWA's Amended FLA). Additionally, field survey efforts determined that, although riparian vegetation is limited, most stream reaches in the North Yuba River were healthy because there is no indication of a lack of riparian function in these areas.

At the assessment site at the North Yuba River upstream from the confluence with the Middle Yuba River, under current Project O&M, the riparian vegetation appears healthy. Field

observations indicated that the majority of the woody species were willows and were present upslope of bankfull, within floodprone areas. Willows have a high tolerable for anaerobic conditions and a medium tolerable to drought; the moisture conditions are suitable for willows and some alders at this lateral distribution. The moisture regime in this area may be supported by fines that provide capillary fringe, but it was difficult to make direct observations of this phenomenon because of the massive boulders blocking the view to the rooting substrate. Woody species may not be present closer to the wetted edge because supporting fines may not be present, inundation of substrate conditions may be too high or continuously long, or the velocities that occur during high flows may prevent establishment.

Although riparian vegetation is limited, YCWA determined that most stream reaches in the North Yuba River were healthy because there is no indication of a lack of riparian function in these areas. YCWA evaluated most stream reaches as healthy because recruits of woody vegetation and a variety of age classes were present in all stream reaches, indicating that germination is occurring under current Project operation and lateral distribution of woody species are within the expected range, with willows near the wetted edge and other hardwood species occurring farther upslope (Harris and McBride 2013).

8.2.1.1.7 Prey Availability

Habitat in some locations in the watershed is not conducive to high abundances of BMI, especially within the North Yuba River where large, granitic boulders dominate the stream, leaving less surface area for BMI. BMI samples were taken at a single site in the North Yuba River at a location approximately 2.0 RM downstream of New Bullards Bar Dam near the confluence with the Middle Yuba River. Sampling at the location provided 325 total organisms per grid, which is below the standard minimum of 500 organisms per grid used for IBI and MMI scoring. Therefore, the reliability of the calculated indices scores are low. The IBI score was 21 and MMI was 16 and classified per MMI standards as "in poor condition." Therefore, prey availability may be considered to be "not properly functioning" under existing conditions.

### 8.2.1.2 Middle Yuba River (with emphasis on the ~1.5 Miles of EFH upstream from the confluence of the Middle Yuba River and the North Yuba River)

8.2.1.2.1 Habitat Access (Physical Barriers)

Under existing habitat conditions, two structures were identified as potential passage barriers/impediments to resident trout in the Middle Yuba River. While the identified trout passage barriers may or may not be large enough to also present a barrier to Chinook salmon, the USACE's 260-ft-high Englebright Dam currently blocks Chinook salmon access to all available EFH in the Yuba River watershed upstream of Englebright Dam. Therefore, this EFH indicator in the Middle Yuba River is considered to be "not properly functioning" due to the presence of Englebright Dam.

#### 8.2.1.2.2 Flow/Hydrology

As discussed above for the North Yuba River (Section 8.2.1.1), this section compares simulated flows under the existing conditions scenario to the Without-Project to estimate the Project's incremental effects to existing hydrologic conditions in the Middle Yuba River above the Yuba River confluence.

Median monthly simulated flows in the Middle Yuba River upstream of the Yuba River confluence under the existing conditions scenario, relative to the Without-Project, indicate that long-term median monthly flows over the 41-year simulation period and median monthly flows by WYT are substantially lower during most months, but are generally similar (i.e., within about 10%) during September and October over the 41-year simulation period and during most WYTs (Table 8.2-2). Median monthly flows generally are more similar under the existing conditions and Without-Project during July through November as WYTs become drier.

**Table 8.2-2. Simulated median monthly Environmental Baseline and Without-Project flows for October 1969 through September 2010 for the Middle Yuba River upstream of the North Yuba River confluence by WYT.**

| Middle Yuba River above Yuba River | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analysis Period** | **Monthly Median Flow (cfs)** | | | | | | | | | | | |
| | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Environmental Baseline | 40 | 45 | 63 | 112 | 154 | 190 | 173 | 123 | 67 | 45 | 39 | 38 |
| Without Project | 45 | 64 | 146 | 374 | 565 | 762 | 724 | 620 | 190 | 69 | 45 | 41 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Environmental Baseline | 41 | 55 | 123 | 251 | 266 | 286 | 273 | 278 | 88 | 52 | 42 | 40 |
| Without Project | 49 | 103 | 423 | 967 | 983 | 1,243 | 1,202 | 1,225 | 651 | 130 | 64 | 50 |
| **Above Normal** | | | | | | | | | | | | |
| Environmental Baseline | 40 | 48 | 72 | 167 | 231 | 254 | 193 | 142 | 81 | 47 | 40 | 39 |
| Without Project | 46 | 72 | 188 | 637 | 837 | 982 | 838 | 763 | 352 | 85 | 52 | 46 |
| **Below Normal** | | | | | | | | | | | | |
| Environmental Baseline | 38 | 44 | 62 | 99 | 136 | 185 | 186 | 140 | 71 | 44 | 39 | 38 |
| Without Project | 39 | 59 | 144 | 305 | 387 | 711 | 737 | 666 | 164 | 65 | 43 | 40 |
| **Dry** | | | | | | | | | | | | |
| Environmental Baseline | 41 | 43 | 50 | 60 | 93 | 147 | 105 | 85 | 58 | 38 | 30 | 29 |
| Without Project | 47 | 52 | 75 | 109 | 268 | 518 | 434 | 243 | 82 | 44 | 31 | 29 |
| **Critical** | | | | | | | | | | | | |
| Environmental Baseline | 29 | 35 | 61 | 61 | 73 | 80 | 65 | 69 | 44 | 29 | 26 | 22 |
| Without Project | 31 | 42 | 135 | 118 | 185 | 253 | 215 | 163 | 71 | 33 | 27 | 22 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

Long-term median monthly flows over the 41-year simulation period under the existing conditions range from about 38 cfs to 67 cfs from June through December, increasing to about 112 cfs to 190 cfs during January through May. Median monthly flows by WYT exhibit similar patterns, and the magnitudes of the median monthly flows generally decrease from wet WYTs to critical WYTs.

Long-term average median monthly simulated flows under the Without-Project range from approximately 41 cfs to 69 cfs from July through November, increase from December through

April (ranging from 146 cfs to 762 cfs), and decrease to about 620 cfs in May and 190 cfs in June. Similar patterns of median monthly flows under the Without-Project are observed by WYT, but the magnitudes of the flows generally decrease from wet WYTs to critical WYTs.

Under existing habitat conditions, EFH in the Middle Yuba River is currently not accessible and not occupied by managed species (i.e., Chinook salmon) due to the presence of the USACE's Englebright Dam. Due to the lack of WUA-discharge relationships for Chinook salmon in the reaches upstream of Englebright Dam, it is problematic to ascertain the functionality of flows for Chinook salmon EFH. Hence, conclusions regarding functionality of existing flow conditions are not made for Chinook salmon EFH under existing conditions. Flows under existing conditions upstream of Englebright Dam in reaches potentially affected by the Project are used as the basis of comparison in this Applicant-Prepared Draft EFH Assessment.

8.2.1.2.3 Water Quality

**Thermal Refugia (Water Temperature)**

Middle Yuba River water temperature monitoring and simulated water temperatures indicate that the upper tolerable WTI values for spring-run Chinook salmon holding, spring-run and fall-run Chinook salmon immigration, spring-run and fall-run Chinook salmon spawning, and spring-run Chinook salmon juvenile rearing would often be exceeded during June through mid-October. Consequently, available data suggest that, for this EFH indicator (i.e., thermal refugia), the Middle Yuba River could be considered "not properly functioning" under existing conditions.

**Sediment/Turbidity**

As described in Section 3.3.1 of Exhibit E of the Amended FLA, the Middle Yuba River has a coarse and resistant bed and banks along most of its length, reducing the potential for lateral or vertical shifting. There are no reliable estimates of sediment removed or passed below Log Cabin Diversion Dam. However, YCWA has records of sediment removal in the Log Cabin Diversion Dam impoundment in 1972 (approximately 40,000 $yd^3$), 1988 (approximately 32,000 $yd^3$), and in 1977 (unknown).

In 2013, YCWA advised FERC that sediment had blocked the low level outlet and threatened to block the fish release valve. YCWA developed a Log Cabin and Our House Diversion Dams Sediment Management Plan in consultation with appropriate federal, state and local agencies, and filed it with FERC in May 2014. The objectives of YCWA's plan are twofold: 1) to provide for dam safety and proper functioning of Project facilities, especially the fish release and low level outlet valves; and 2) to maintain the health of the aquatic environment downstream of the dams by allowing the passage of sediments that occur behind the dams. FERC issued an order approving the mechanical sediment removal and emergency removal of sediment portions of the plan in September 2014. In 2014, YCWA returned the impoundment to near original conditions by removing approximately 11,000 $yd^3$ of sediment. The purpose of the sediment removal from the Log Cabin Diversion Dam impoundment was to unblock the low level outlet and prevent the blockage of the fish release outlet on the dam. Without the removal of the sediment, the only functioning outlet on the dam, the fish release, was in danger of being clogged. This would have

put YCWA in jeopardy of not meeting FERC license minimum flow requirements below the dam.

The Log Cabin and Our House diversion dams are passive-spillway dams that spill regularly. There is pass-through of coarse and fine sediment downstream during large flood events downstream of Our House Diversion Dam, and there may be pass-through over Log Cabin Diversion Dam of fine-grained material (e.g., washload).

Stillwater Sciences (2013) found evidence that shear stresses are likely too high below Our House Diversion Dam to retain material that is stored upstream. Mobile material, such as is currently stored upstream, and available downstream, of Our House Diversion Dam, are stored in deep pools or on pool margins, deposited in small patches associated with boulder and bedrock obstructions, or deposited in the interstices of coarse bed materials. However, there is insufficient material and too high shear stress for substantive aggradation, at least in the steeper reaches (e.g., greater than 2%) of the Middle Yuba River, such as exist below Our House Dam. Results of water quality sampling during 2012 found that turbidity in the Middle Yuba River was low. Consequently, under existing habitat conditions, the Middle Yuba River is considered to be "properly functioning" because water quality sampling results indicated that sediment and turbidity are low.

**Chemical Contamination/ Nutrients**

YCWA's study data for the Middle Yuba River were consistent with the historic studies. Within and between seasons, water is of a high quality. YCWA also found that most analytes were reported at non-detectable to just above reporting limit concentrations. The water is generally clear (i.e., average turbidity of <36 NTU), and near saturation with DO. Alkalinity is low (<100 mg/L in all samples) and pH is near neutral.

Based on data collected before 2009, the SWRCB identified the Middle Yuba River from Bear Creek to the North Yuba River as CWA (§) 303(d) State impaired for mercury, which was based on fish tissue concentrations, rather than on surface water concentrations to support the listing (SWRCB 2010). Because the SWRCB identified the Middle Yuba River from Bear Creek to the North Yuba River as CWA § 303(d) State impaired for mercury, this EFH indicator is considered to be "at risk" for the Middle Yuba River under existing habitat conditions.

8.2.1.2.4 Channel Condition and Dynamics

**Width/Depth Ratio**

NMFS (1996) considered a "properly functioning" width/depth ratio to be less than 10, "at risk" to be 10 to 12, and "not properly functioning" to be greater than 12. The average width/depth ratio for the ground-mapped reaches in the Middle Yuba River did not include the lowermost 1.5 mi with the North Yuba River. However, the average width/depth ratio for the ground-mapped reaches in the Middle Yuba River – Oregon Creek and Our House Diversion Dam Reaches was 24. Therefore, it is assumed that this EFH indicator (i.e., width/depth ratio) would be considered to be "not properly functioning" under the existing conditions according to NMFS (1996).

 

**Streambank Conditions**

Ground-mapped data for the 2.94 mi of the Middle Yuba River did not identify any bank erosion as a percentage of the reach. Because of the amount of bedrock and boulder control, channel stability is good and bank erosion hazard is low to very low. Therefore, for EFH in the Middle Yuba River, it is assumed that the banks are stable, and they would be considered to be "properly functioning".

8.2.1.2.5 Habitat Elements

**Substrate**

As described in Technical Memorandum 3-8, *Stream Fish Populations Upstream of Englebright Reservoir*, habitat in a 349-ft long site in the Middle Yuba River downstream of Yellowjacket Creek was sampled, and cobbles and gravels were found to be the dominant and sub-dominate substrates, respectively. The site did not have any suitably sized spawning gravel for resident trout. Average pool tail-out embeddedness (%) for the Middle Yuba River – Oregon Creek and Our House Diversion Dam Reaches was reported to be 12.6 percent. Cobble embeddedness also was estimated to the nearest 5 percent in Study 3-1 by visually inspecting the cobble to determine the percent that was buried by fine particles. In the Middle Yuba River sub-basin, the average percentage of cobble embeddedness was reported to be 35 percent below the Oregon Creek confluence and 37 percent above the North Yuba River confluence (see Technical Memorandum 3-1, *Aquatic Macroinvertebrates Upstream of Englebright Reservoir*). Therefore, this EFH indicator would be considered to be "at risk/not properly functioning" under existing habitat conditions.

**Large Woody Material**

YCWA's Study 3.8 included sampling of fish populations in the Middle Yuba River. During these surveys, eight pieces of LWM were observed in 2012, and four pieces of LWM were documented in 2013. Presently, wood is periodically removed from trashracks, or passes through Project diversion tunnels and over uncontrolled spillways associated with the Log Cabin and Our House Diversion Dams and the amounts of wood that pass through these tunnels cannot be estimated (see Technical Memorandum 6-1, *Riparian Habitat Upstream of Englebright Reservoir*, 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). In consideration of the survey results and the diversion dam operations upstream, it is assumed that this EFH indicator (i.e., LWM) would be considered to be "at risk" under the existing aquatic habitat conditions according to NMFS (1996) criteria.

8.2.1.2.6 Watershed Conditions (Riparian Areas)

In the Middle Yuba River downstream of Oregon Creek, there was no visible change in riparian vegetation from earliest available photos (i.e., 1937 or 1939, depending on site) to 2009. In the Middle Yuba River downstream of Our House Diversion Dam, riparian vegetation increased over the period between the earliest available photographs (i.e., 1937 and 1939) to 2009. The

Oregon Creek Celestial Valley sub-reach assessment site showed a visible change in floodplain vegetation, but no obvious change to riparian vegetation. The Middle Yuba River upstream of the Oregon Creek assessment site showed localized changes over time, with an overall increase in riparian vegetation from the earliest available photographs (i.e., 1937) to 2009.

The Middle Yuba River above Oregon Creek Confluence sampling site (7.5 mi downstream of Our House Diversion Dam on the Middle Yuba River) reportedly has about 30 percent canopy cover (see Technical Memorandum 3-1, *Aquatic Macroinvertebrates Upstream of Englebright Reservoir*). The Middle Yuba River below Oregon Creek Confluence ground-based sampling site (approximately 0.2 mi downstream of the Oregon Creek confluence on the Middle Yuba River) reportedly has about 15 percent canopy cover (see Technical Memorandum 3-1, *Aquatic Macroinvertebrates Upstream of Englebright Reservoir*). Canopy cover in the Middle Yuba River above North Yuba River confluence was not reported. Overall, there was no indication of any lack of riparian function in these areas. One exception was the Oregon Creek Celestial Valley assessment site, which was dominated by Himalayan blackberry under mid- and over-stories of shrubs and trees; various ages of riparian trees and shrubs were present, but few young recruits and seedlings were observed. In consideration of the survey results, it is assumed that this EFH indicator (i.e., LWM) would be considered to be "at risk" under the existing aquatic habitat conditions according to NMFS (1996) criteria.

#### 8.2.1.2.7 Prey Availability

The Middle Yuba River was sampled for BMI in three locations, 7.5, 8.2 and 12.5 RM downstream of Our House Diversion Dam. At the sites upstream and downstream of Oregon Creek, low abundance limited the collection of organisms to 486 and 476 individuals per grid, respectively. These counts are just under the standard 500 organisms per grid used for IBI and MMI scoring and, therefore, the reliability of the calculated indices scores are considered low. IBI scores were 64, 69, and 59 from upstream to downstream, respectively. MMI scores were 62, 64, and 52 from upstream to downstream, respectively. All MMI scores were rated as 'fair,' and approached a rating of 'good,' which is greater than 67. Overall, it is assumed that the EFH indicator of prey availability may be considered to be "at risk" under existing conditions.

### 8.2.1.3 Yuba River Upstream of Englebright Reservoir

#### 8.2.1.3.1 Habitat Access (Physical Barriers)

Under existing habitat conditions, the EFH in the Yuba River upstream of Englebright Reservoir is considered to be "not properly functioning" due to the presence of the USACE's 260-ft-high Englebright Dam, which currently blocks Chinook salmon access to all available EFH in the Yuba River watershed upstream of Englebright Dam.

#### 8.2.1.3.2 Flow/Hydrology

Prior to the construction of New Bullards Bar Dam and Reservoir, the natural or "unimpaired" historic flow regime of the Yuba River upstream of Englebright Reservoir likely varied greatly in the magnitude, timing, duration, and frequency of flows, both inter-annually and seasonally. The

frequency and distribution of habitat types and microhabitat features present in the Yuba River before construction of New Bullards Bar and Englebright dams, mining and other past activities were most likely substantially different from those currently found in the river.

As described above, New Bullards Bar Dam and Reservoir on the North Yuba River are used to control flood flows in the Yuba River watershed. The Project provides flood management by reducing the peak flood flow in the North Yuba River, which also results in hydrologic effects downstream in the Yuba River upstream of Englebright Reservoir. Consequently, the upstream flood control operations also have the potential to affect seasonal peak flows, channel morphology, sediment transport and EFH in the Yuba River upstream of Englebright Reservoir.

As discussed above for the North Yuba River (Section 8.2.1.1), this section compares simulated flows under the existing conditions to the Without-Project to estimate the Project's incremental effects to existing hydrologic conditions in the Yuba River upstream of Englebright Reservoir. Discussion of simulated flows under the existing conditions and Without-Project is provided for the two primary reaches of the Yuba River upstream of Englebright Reservoir – the North Yuba River/Middle Yuba River Reach (upstream of New Colgate Powerhouse), and the New Colgate Reach (downstream of New Colgate Powerhouse).

**Yuba River Above New Colgate Powerhouse**

Median monthly simulated flows in the Yuba River upstream of the New Colgate Powerhouse under the existing conditions, relative to the Without-Project, indicate that long-term median monthly flows over the 41-year simulation period and median monthly flows by WYT are substantially lower during all months (Table 8.2-3). Median monthly flows generally become more similar under the existing conditions and Without-Project during June through November as WYTs become drier.

**Table 8.2-3. Simulated median monthly Environmental Baseline and Without-Project flows for October 1969 through September 2010 for the Yuba River downstream of the Middle and North Yuba River confluence by WYT.**

| Yuba River above New Colgate Powerhouse | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Median Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Environmental Baseline | 50 | 56 | 81 | 148 | 208 | 261 | 227 | 154 | 84 | 56 | 49 | 48 |
| Without Project | 274 | 333 | 583 | 1,315 | 2,040 | 2,768 | 2,896 | 3,066 | 1,189 | 434 | 293 | 257 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Environmental Baseline | 51 | 69 | 163 | 373 | 376 | 934 | 366 | 384 | 114 | 66 | 53 | 50 |
| Without Project | 280 | 473 | 1,863 | 3,735 | 3,546 | 4,631 | 4,391 | 5,136 | 3,042 | 843 | 419 | 333 |
| **Above Normal** | | | | | | | | | | | | |
| Environmental Baseline | 50 | 60 | 91 | 225 | 315 | 351 | 257 | 180 | 98 | 59 | 50 | 49 |
| Without Project | 284 | 385 | 737 | 2,239 | 2,973 | 3,615 | 3,486 | 3,876 | 1,881 | 546 | 343 | 294 |
| **Below Normal** | | | | | | | | | | | | |
| Environmental Baseline | 48 | 55 | 78 | 130 | 181 | 249 | 246 | 176 | 84 | 55 | 49 | 48 |
| Without Project | 240 | 319 | 540 | 1,060 | 1,402 | 2,552 | 2,914 | 3,245 | 1,047 | 404 | 274 | 241 |
| **Dry** | | | | | | | | | | | | |
| Environmental Baseline | 51 | 53 | 62 | 75 | 120 | 197 | 134 | 104 | 69 | 47 | 39 | 37 |
| Without Project | 276 | 286 | 368 | 448 | 919 | 1,840 | 1,910 | 1,391 | 458 | 262 | 188 | 174 |
| **Critical** | | | | | | | | | | | | |
| Environmental Baseline | 38 | 44 | 78 | 76 | 94 | 106 | 82 | 86 | 55 | 37 | 34 | 30 |
| Without Project | 180 | 224 | 554 | 487 | 699 | 1,064 | 1,018 | 872 | 383 | 201 | 167 | 146 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

Long-term median monthly flows over the 41-year simulation period under the existing conditions range from about 48 cfs to 84 cfs from June through December, increasing to about 148 cfs to 261 cfs during January through May. Median monthly flows by WYT exhibit similar patterns, but the magnitudes of the median monthly flows generally decrease from wet WYTs to critical WYTs.

Long-term average median monthly simulated flows under the Without-Project range from approximately 257 cfs to 583 cfs from July through December, increase from January through May (ranging from 1,315 cfs to 3,066 cfs), and decrease to 1,189 cfs in June. Similar patterns of median monthly flows under the Without-Project are observed by WYT, but the magnitudes of the flows generally decrease from wet WYTs to critical WYTs.

## Yuba River Below New Colgate Powerhouse

Median monthly simulated flows in the Yuba River downstream of the New Colgate Powerhouse under the existing conditions, relative to the Without-Project, indicate that long-term median monthly flows are generally substantially higher during June through December, and are generally substantially lower during January through May over the 41-year simulation period and during most WYTs (Table 8.2-4).

**Table 8.2-4. Simulated median monthly Environmental Baseline and Without-Project flows for October 1969 through September 2010 for the Yuba River downstream of the New Colgate Powerhouse by WYT.**

| Yuba River below New Colgate Powerhouse | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analysis Period** | **Monthly Median Flow (cfs)** | | | | | | | | | | | |
| | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Environmental Baseline | 834 | 805 | 679 | 1,127 | 1,661 | 1,842 | 1,478 | 2,466 | 2,363 | 1,662 | 1,422 | 859 |
| Without Project | 274 | 333 | 583 | 1,315 | 2,040 | 2,768 | 2,896 | 3,066 | 1,189 | 434 | 293 | 257 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Environmental Baseline | 842 | 813 | 1,012 | 3,678 | 3,704 | 4,361 | 3,206 | 3,776 | 3,533 | 2,706 | 1,933 | 923 |
| Without Project | 280 | 473 | 1,863 | 3,735 | 3,546 | 4,631 | 4,391 | 5,136 | 3,042 | 843 | 419 | 333 |
| **Above Normal** | | | | | | | | | | | | |
| Environmental Baseline | 830 | 774 | 707 | 1,734 | 2,909 | 3,360 | 2,377 | 2,792 | 3,001 | 1,987 | 1,618 | 884 |
| Without Project | 284 | 385 | 737 | 2,239 | 2,973 | 3,615 | 3,486 | 3,876 | 1,881 | 546 | 343 | 294 |
| **Below Normal** | | | | | | | | | | | | |
| Environmental Baseline | 836 | 796 | 644 | 1,065 | 945 | 1,123 | 1,387 | 2,520 | 2,396 | 1,631 | 1,331 | 855 |
| Without Project | 240 | 319 | 540 | 1,060 | 1,402 | 2,552 | 2,914 | 3,245 | 1,047 | 404 | 274 | 241 |
| **Dry** | | | | | | | | | | | | |
| Environmental Baseline | 819 | 810 | 658 | 646 | 579 | 381 | 797 | 1,528 | 1,400 | 1,449 | 1,208 | 756 |
| Without Project | 276 | 286 | 368 | 448 | 919 | 1,840 | 1,910 | 1,391 | 458 | 262 | 188 | 174 |
| **Critical** | | | | | | | | | | | | |
| Environmental Baseline | 847 | 855 | 690 | 676 | 564 | 534 | 570 | 1,023 | 1,185 | 1,351 | 963 | 642 |
| Without Project | 180 | 224 | 554 | 487 | 699 | 1,064 | 1,018 | 872 | 383 | 201 | 167 | 146 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

Long-term median monthly flows over the 41-year simulation period under the existing conditions are relatively high, ranging from about 679 cfs to 859 cfs during September through December, increasing to 1,127 cfs in January, and increasing to between 1,422 cfs and 2,466 cfs from February through August. Median monthly flows by WYT exhibit similar patterns, but the magnitudes of the median monthly flows generally decrease from wet WYTs to critical WYTs.

Because New Colgate Powerhouse is not in existence under the Without-Project, simulated Without-Project median monthly flows in the Yuba River below New Colgate Powerhouse are the same as those discussed above for the Yuba River above New Colgate Powerhouse.

Under existing habitat conditions, EFH in the Yuba River upstream of Englebright Reservoir is currently not accessible and not occupied by managed species (i.e., Chinook salmon) due to the presence of the USACE's Englebright Dam. Due to the lack of WUA-discharge relationships for Chinook salmon in the reaches upstream of Englebright Dam, it is problematic to ascertain the functionality of flows for Chinook salmon EFH. Hence, conclusions regarding functionality of existing flow conditions are not made for Chinook salmon EFH under existing conditions. Flows under existing conditions upstream of Englebright Dam in reaches potentially affected by the Project are used as the basis of comparison in this Applicant-Prepared Draft EFH Assessment.

8.2.1.3.3 Water Quality

**Thermal Refugia (Water Temperature)**

Yuba River water temperature monitoring and simulated water temperatures above Englebright Dam indicate that the upper tolerable WTI values for spring-run and fall-run Chinook salmon are generally not exceeded in the Yuba River below New Colgate Powerhouse. Upper tolerable WTI values are often exceeded in the Yuba River below the Middle Yuba River and above New Colgate Powerhouse during June through early October, which includes the spring-run Chinook salmon holding, spring-run and fall-run Chinook salmon adult immigration, spawning and incubation, and spring-run and fall-run Chinook salmon juvenile rearing lifestages. Therefore, this EFH indicator (i.e., thermal refugia) in the Yuba River above Englebright Dam is considered to be "not properly functioning" upstream of New Colgate Powerhouse, and "properly functioning" downstream of New Colgate Powerhouse under existing habitat conditions.

**Sediment/Turbidity**

For this EFH indicator, the Yuba River is considered to be "properly functioning" under existing conditions because water quality sampling results indicated that sediment and turbidity are low.

**Chemical Contamination/ Nutrients**

For the Yuba River upstream of Englebright Reservoir, water is of a high quality. YCWA also found that most analytes were reported to be at non-detectable levels to just above reporting limit concentrations. The water is generally clear (i.e., average turbidity of <36 NTU), and near saturation with DO. Alkalinity is low (<100 mg/L in all samples) and pH is near neutral.

Based on data collected before 2009, the SWRCB identified the Yuba River Upstream of Englebright Reservoir as CWA (§) 303(d) State impaired for mercury (SWRCB 2010). Consequently, this EFH indicator (i.e., chemical contamination/nutrients) for the Yuba River upstream of Englebright Reservoir is considered to be "at risk" under existing conditions.

8.2.1.3.4 Channel Condition and Dynamics

**Width/Depth Ratio**

Because the average width/depth ratio for the ground-mapped reaches in the Yuba River – New Colgate Powerhouse and Middle/North Yuba River Reaches was calculated to be 16, this EFH indicator is considered to be "not properly functioning" under existing habitat conditions. These reaches are mostly incised canyon channels that are largely bedrock controlled and, therefore, channel widths are not very responsive to changes in flows.

**Streambank Conditions**

The banks downstream of New Colgate Powerhouse are generally stable, mostly bedrock and boulder, with only a minor amount of bank erosion that could be due to peaking flows from the

 

New Colgate Powerhouse. Ground-mapped data for the 1.86 mi of the Yuba River – New Colgate Powerhouse and Middle/North Yuba River Reaches did not identify any bank erosion as a percentage of the reach. Therefore, it is assumed that the banks in this reach are stable, and they are considered to be "properly functioning".

8.2.1.3.5 Habitat Elements

**Substrate**

Habitat in a 702-ft long site in the Yuba River downstream of the New Colgate Powerhouse was found to have boulders and cobbles as the dominant and sub-dominant substrates, respectively. Approximately 83 sq ft of resident trout sized spawning gravel was identified in the site. Additionally, habitat in a 411-ft long site in the Yuba River downstream of the Middle Yuba River was sampled, and cobbles and boulder were the dominant and sub-dominant substrates, respectively. This site was absent of suitable sized spawning gravel for resident trout.

Cobble embeddedness also was estimated to the nearest five percent in Study 3-1 by visually inspecting the cobble to determine the percent that was buried by fine particles. In the Yuba River above New Colgate Powerhouse, the average percentage of cobble embeddedness was reported to be 18 percent. In the Yuba River below New Colgate Powerhouse, the average percentage of cobble embeddedness was reported to be 26 percent. Therefore, overall, this EFH indicator (i.e., substrate) would be considered to be "at risk/not properly functioning" under existing conditions.

**Large Woody Material**

In consideration of the 2012 and 2013 survey results and the operational practices upstream that do not allow for the mobilization of LWM downstream of New Bullards Bar Dam on the North Yuba River and Our House and Log Cabin diversion dams on the Middle Yuba River, this EFH indicator is considered to be "at risk" under existing habitat conditions.

8.2.1.3.6 Watershed Conditions (Riparian Areas)

In the Yuba River upstream of New Colgate Powerhouse, there was no visible change in riparian vegetation from earliest available photographs (i.e., 1937 or 1939, depending on site) to 2009. In the Yuba River downstream of the New Colgate Powerhouse riparian assessment site, riparian vegetation increased over the period between the earliest available photograph (i.e., 1937 and 1939) to 2009.

During field surveys conducted in 2011 and 2012, bankfull widths ranged from 200 ft (transect 1), 130 ft (transect 2) and 120 ft (transect 3). Floodprone widths ranged from 335 ft (transect 1), 600 ft (transect 2) and 320 ft (transect 3). Moderate canopy was present (20%) in the Yuba River above New Colgate Powerhouse sampling site (approximately 0.6-mi upstream of New Colgate Powerhouse). The Yuba River below New Colgate Powerhouse sampling site (approximately 0.6-mi downstream of New Colgate Powerhouse) also was reported to have a relatively moderate canopy (22%). According to NMFS (1996), "properly functioning" riparian

habitat provides adequate shade, LWM recruitment, habitat protection and connectivity, and buffers or refugia for sensitive aquatic species (>80% intact). In consideration of the above, this EFH indicator (i.e., riparian areas) is assumed to be "at risk" under existing conditions due to past watershed disturbances and the moderate canopy observed during recent surveys, according to NMFS (1996) criteria.

#### 8.2.1.3.7 Prey Availability

Samples of BMI were collected in two locations on the Yuba River, at 7.6 and 8.8 RM. The lower site is 0.56 RM below New Colgate Powerhouse does not have an impoundment, but receives releases of water that comes from deep within the upstream impoundment at New Bullards Bar Dam. Sampling at the upstream location only provided 198 total organisms per grid, which is below the standard 500 organisms per grid used for IBI and MMI scoring and also represented the lowest number collected for all samples. Therefore, the reliability of the calculated indices scores are considered low. Nonetheless, IBI scores were 30 and 47 from upstream to downstream, respectively. MMI scores were 26 and 34 from upstream to downstream with subsequent ratings of 'poor' and 'fair' respectively. Therefore, prey availability is expected to be "at risk" or approaching "properly functioning" under existing habitat conditions.

## 8.2.2 Yuba River Downstream of Englebright Dam

The Applicant-Prepared Draft EFH Assessment approach for the lower Yuba River downstream of Englebright Dam identifies each of the stressors affecting EFH, and the manner in which these stressors affect the species' ability to utilize EFH in the lower Yuba River. The relative magnitude of each stressor was determined through consideration of the temporal occurrence, duration, spatial applicability, and species exposure and response based upon available information (see Section 6.0 of this Applicant-Prepared Draft EFH Assessment, and Sections 5.0 and 6.0 of the Applicant-Prepared Draft BA).

The key stressors and associated relative magnitudes under existing conditions (i.e., the Environmental Baseline) affecting Chinook salmon in the lower Yuba River are discussed below, and listed in Table 8.2-5. For detailed discussion of these stressors, refer to Section 6.0 of the Applicant-Prepared Draft EFH Assessment and Sections 5.0 and 6.0 of the Applicant-Prepared Draft BA.

**Table 8.2-5. Chinook salmon stressors and associated magnitudes in the lower Yuba River under the Environmental Baseline.**

| Stressor | Relative Magnitude |
|---|---|
| Flow-Dependent Habitat Conditions | |
| Spawning Habitat | Low |
| Flow Fluctuations and Redd Dewatering | Low (spring-run); Low/Moderate (fall-run) |
| Fry and Juvenile Rearing Habitat | Low |
| Fry and Juvenile Stranding and Isolation | Moderate |
| Water Temperature | Low |
| Narrows 2 Operations | Low[1] |
| Passage Impediments/Barriers | |
| Englebright Dam | Very High |
| Daguerre Point Dam | High |
| Predation | Moderate to High |
| Physical Habitat Alteration | |
| Natural River Morphology and Function | High |
| Floodplain Habitat Availability | High |
| Riparian Habitat and Instream Cover (riparian vegetation, instream woody material) | Moderate to High |

[1] The magnitude of this stressor under the Status of the Species (Section 5.0 of the Applicant-Prepared Draft BA) was presented as low. Recently, YCWA installed a hood on the Partial Bypass at Narrows 2, which reduced the potential magnitude of this stressor.

### 8.2.2.1 Flow-Dependent Habitat Conditions

NMFS (2014b) Recovery Plan states that "Implementation of the flow schedules specified in the Fisheries Agreement of the Yuba Accord is expected to address the flow-related major stressors including flow-dependent habitat availability, flow-related habitat complexity and diversity, and water temperatures."

As acknowledged by this statement, stressors associated with instream flows and water temperatures in the lower Yuba River have been addressed, to the extent feasible within hydrological constraints, by the Yuba Accord. In addition, the assessment of aquatic habitat conditions for Chinook salmon in the lower Yuba River and ongoing, existing Project-related effects under the Environmental Baseline, previously described in Section 7 of this Applicant-Prepared Draft EFH Assessment, used modeled lower Yuba River flows, and modeled and monitored water temperatures. Additional flow-dependent analyses in this Applicant-Prepared Draft EFH Assessment used modeled flows and water temperatures to quantify spring-run and fall-run Chinook salmon spawning habitat availability, and spring-run and fall-run Chinook salmon lifestage-specific water temperature suitabilities.

#### 8.2.2.1.1 Spawning Habitat

Habitat duration analyses for spring-run Chinook salmon spawning indicate that the Environmental Baseline achieves over 95 percent of maximum spawning WUA with about a 98 percent probability. The Environmental Baseline provides 80 percent or more of maximum spawning WUA about 98 percent of the time. Habitat duration analyses for fall-run Chinook salmon indicate that over 80 percent of maximum spawning WUA is achieved with about a 94 percent probability. There have been no definitive determinations of how much reduction in WUA would represent a stressor to specific species/lifestages. However, the use of 80 percent of maximum spawning WUA as a benchmark is based upon testimony as part of the SWRCB Mono Lake Decision 1631 process. Dr. Tom Hardy (a fisheries biologist retained by the Los Angeles

Department of Water and Power (LADWP) testified that …"no objective criteria has been validated to guide investigators on what percentage reduction in optimal habitat represents a significant impact, or at what exceedance value associated with either optimal or median habitat represents adequate protection for the aquatic resources." However, Dr. Hardy testified that several instream flow studies that he had participated in targeted a range of 80 to 85 percent of the maximum WUA as optimal habitat conditions. Using 80 percent of maximum WUA[2] as a benchmark, the Environmental Baseline provides optimal spring-run Chinook salmon spawning habitat conditions and optimal fall-run Chinook salmon spawning habitat conditions most of the time.

Also, the Environmental Baseline provides substantially more spring-run Chinook salmon and fall-run Chinook salmon spawning habitat than does the Without-Project. The Environmental Baseline achieves over 80 percent (and even about 95%) of spring-run Chinook salmon maximum spawning WUA with about a 98 percent probability, by contrast to the Without-Project which achieves over 80 percent of maximum spawning WUA with about a 48 percent probability. For fall-run Chinook salmon, the Environmental Baseline provides over 80 percent of maximum spawning WUA with about a 94 percent probability, while the Without-Project provides over 80 percent or more of maximum spawning WUA with only about a 50 percent probability.

For these reasons, flow-dependent spawning habitat availability under the Environmental Baseline is a low stressor to Yuba River Chinook salmon.

#### 8.2.2.1.2 Potential Redd Dewatering

Estimation of potential spring-run Chinook salmon redd dewatering indicates that the long-term annual averages of the percentage of redds built within a given year that would have the potential to be dewatered for every day of the annual embryo incubation period with slightly less frequency under the Environmental Baseline, relative to the Without-Project. Under both scenarios, the potential for redd dewatering is very low, averaging only about 0.01 percent annually. To put this into context, an estimated 1,148 and 1,465 spring-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. Correspondingly, applying the 41-year average, it is estimated that essentially no spring-run Chinook salmon redd would be expected to be dewatered under the Environmental Baseline, and only about 1 spring-run Chinook salmon redd would be expected to be dewatered under the Without-Project during each of these two years.

Estimation of potential fall-run Chinook salmon redd dewatering indicates that the long-term average of the percentage of redds built within a given year would be dewatered less frequently under the Environmental Baseline, relative to the Without-Project. Under the Environmental

[2] In the NMFS and USFWS Biological Opinions on Klamath Project Operations (2013), NMFS reports that available instream habitat of 80 percent of maximum (WUA) has been used as a guideline to develop minimum flow needs for the conservation of anadromous salmonids, and that: (1) NMFS assumes that at least 80 percent of maximum available habitat provides a wide range of conditions and habitat abundance in which populations can grow and recover; (2) where habitat availability is 80 percent of maximum or greater, habitat is not expected to limit individual fitness or population productivity or distribution, nor adversely affect the function of essential features of (coho) salmon critical habitat.

Baseline, the estimated percent of expected redds dewatered is relatively low, averaging only about 1.32 percent annually. To put this into context, an estimated 2,079 and 1,559 fall-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. Correspondingly, applying the 41-year average, it is estimated that only about 27 and 21 fall-run Chinook salmon redds would be expected to be dewatered under the Environmental Baseline during 2009 and 2010, respectively. Under the Without-Project, approximately 99 and 74 redds would be expected to be dewatered during 2009 and 2010, respectively. The relatively higher percentage of redd dewatering for fall-run Chinook salmon is likely due to more frequent uncontrolled high flow events during the fall-run Chinook salmon spawning and embryo incubation period than during the spring-run Chinook salmon spawning and embryo incubation period. This is demonstrated with the higher percentages of potential fall-run Chinook salmon redds dewatered under the Without-Project, in which high flow events in winter and spring are more extreme and varied than under the existing conditions (Environmental Baseline).

Examination of potential egg pocket dewatering indicates that no spring-run Chinook salmon egg pockets would be expected to be dewatered under the Environmental Baseline or the Without-Project. The estimated average annual percentage of expected fall-run Chinook salmon egg pockets potentially dewatered is relatively low, averaging 0.76 percent under the Environmental Baseline, compared to 2.73 percent under the Without-Project.

For these reasons, potential redd dewatering is a low stressor to spring-run Chinook salmon in the lower Yuba River, and a low/moderate stressor to fall-run Chinook salmon.

#### 8.2.2.1.3 Chinook Salmon Fry and Juvenile Rearing Habitat

Habitat duration analyses for both spring-run and fall-run Chinook salmon fry in-channel rearing habitat availability in the lower Yuba River is similar under the Environmental Baseline and the Without-Project. However, compared to the Without-Project, the Environmental Baseline provides more habitat (over most of the distribution for fall-run Chinook salmon and over about the lower 40 percent of the distribution for spring-run Chinook salmon, when habitat is most limiting). Chinook salmon fry full-flow rearing habitat availability (WUA) in the lower Yuba River is slightly lower under the Environmental Baseline relative to the Without-Project.

Habitat duration analyses for both spring-run and fall-run Chinook salmon juvenile in-channel rearing under the Environmental Baseline indicate that over 80 percent (and even up to 90%) of maximum juvenile rearing WUA is achieved with nearly a 100 percent probability over the evaluated 41-year hydrologic period. Overall, the long-term average and average by WYT simulated juvenile spring-run and fall-run Chinook salmon rearing habitat availability is higher under the Environmental Baseline, relative to the Without-Project. Chinook salmon juvenile full-flow rearing habitat availability (WUA) in the lower Yuba River is substantially higher (15.3%) for spring-run Chinook salmon and similar under the Environmental Baseline, relative to the Without-Project. Based on model simulations of WUA-discharge relationships, flow-dependent fry and juvenile rearing habitat availability is a low stressor to Yuba River Chinook salmon.

#### 8.2.2.1.4 Fry Stranding and Juvenile Isolation

Lower Yuba River flows during the winter and spring are often uncontrolled, and stranding of Chinook salmon fry and juveniles can occur naturally during periods of uncontrolled runoff and spills, either through uncontrolled flow fluctuations or as runoff subsides and flows drop to controllable levels.

Based on Yuba River stranding surveys, no relationship was observed between ramping rates in the lower Yuba River and the incidence of fry stranding on low gradient bars within the observed range of ramping rates (flow reductions of 100 to 200 cfs per hour at Narrows 2 Powerhouse) (B. Mitchell, ICF/JSA, pers. comm. 2012). These ramping rates corresponded to changes in stage of 0.4 to 1 in per hour at the study sites, which are well within the rates of stage change considered to be protective.

YCWA's standard operations objective at Narrows 2 has been to reduce flows at a target ramping rate of 100 cfs per hour during normal operations, and at a target ramping rate of 200 cfs per hour when passing storm flows, whenever feasible. These ramping rate changes (i.e., 100 to 200 cfs per hour) associated with YCWA's operations are similar to ramping rates specified for other Central Valley rivers, which generally correspond to recommendations described in WDF (1992), which suggests that reductions in river stage of 1-2 in per hour are protective.

The potential for juvenile salmonid isolation in the lower Yuba River, as indicated by the simulated frequency of the disconnection of off-channel areas from the lower Yuba River (i.e., isolation events), indicates that fewer isolation events occur under the Environmental Baseline relative to the Without-Project. Variable patterns in the percentage of off-channel areas experiencing a given number of isolation events are observed for the individual WYTs. The Environmental Baseline typically results in a lower percentage of all off-channel areas experiencing four or more isolation events, relative to the Without-Project. The overall percentage of all off-channel areas experiencing multiple isolation events generally decreases from wetter to drier WYTs under both the Environmental Baseline and Without-Project. It should be noted that these results are only an indicator of the potential for hydrologic disconnection and off-channel stranding of juvenile salmonids, not necessarily an indicator representing an impact to juvenile salmonids. As previously discussed, some off-channel areas may pose hazards to juveniles, while other off-channel areas may benefit juvenile growth and survival, depending on seasonal, hydrologic, and other environmental factors.

Chinook salmon fry and juvenile stranding and isolation is reduced (and therefore more suitable) under the Environmental Baseline than under the Without-Project, and represents a moderate stressor under the Environmental Baseline.

### 8.2.2.2 Water Temperature

The water temperature suitability evaluation conducted for this Applicant-Prepared Draft EFH Assessment relied upon an update to a water temperature evaluation of existing conditions prepared by the RMT in 2010 and 2013, and is consistent with the evaluation conducted for spring-run Chinook salmon in the Applicant-Prepared Draft BA prepared for the Proposed

 

Action. The evaluation conducted in this Applicant-Prepared Draft EFH Assessment examined exceedance probabilities of lifestage-specific water temperature index values, for both spring-run and fall-run Chinook salmon, using water temperature monitoring data from October 2006 into February 2014 and the Project Relicensing daily water temperature model simulations for the period extending from WY 1970-2010.

The RMT (2010b) concluded that implementation of the Yuba Accord provides a suitable thermal regime for target species in the lower Yuba River, and did not recommend water temperature-related operational or infrastructure modifications at that time. Updated evaluations included in the RMT (2013a) Monitoring and Evaluation report came to the same conclusion, and also did not recommend water temperature-related operational or infrastructure modifications. This Applicant-Prepared Draft EFH Assessment updates the evaluations and supports the previous conclusions in RMT (2010b) and RMT (2013a) for both spring-run and fall-run Chinook salmon.

Comparison of water temperature exceedance probabilities under the Environmental Baseline and Without-Project found that exceedance probabilities are generally similar under both scenarios during the winter through spring months. During the spring through fall months (i.e., May through October), in general water temperatures are substantially more suitable under the Environmental Baseline relative to the Without-Project for all spring-run and fall-run Chinook salmon lifestages.

Consequently, this Applicant-Prepared Draft EFH Assessment concludes that water temperatures are a low stressor to Chinook salmon. As previously discussed, NMFS (2014b) also recognized that water temperature regimes have been greatly improved by implementation of the Yuba Accord. Further, while climate change has been proposed as an increasing stressor to Central Valley Chinook salmon populations, the reliability of the large cold-water pool available in New Bullards Bar Reservoir in most WY types indicates that water temperature regimes in the lower Yuba River would still represent a low stressor under global climate change scenarios currently modeled.

#### 8.2.2.3 Narrows 2 Operations, Flow Changes and Potential Effects to Adult Salmonids

Project FERC relicensing studies (Technical Memorandum 7-11, *Fish Behavior and Hydraulics Near Narrows 2 Powerhouse*, and Technical Memorandum 7-11a, *Radio Telemetry of Spring- and Fall-Run Chinook Migratory Behavior Downstream of Narrows 2 Powerhouse*, both of 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) conducted to date indicate that adult anadromous salmonids (presumably including Chinook salmon) have not been observed entering the draft tube of Narrows 2. Additional analyses regarding Narrows 2 operations and fish movement prepared for the Applicant-Prepared Draft BA indicate that Narrows 2 flow releases do not appear to adversely influence adult Chinook salmon upstream migration, holding or spawning upstream of Daguerre Point Dam. Potential effects appear to be localized to the proximate vicinity of Narrows 2 facilities. Based on the studies conducted for Technical Memorandum 7-11/7-11a, it is apparent that the conditions present in the vicinity of the Narrows

2 Powerhouse, while variable and often dynamic, are within the boundaries of adult Chinook salmon tolerance. At this time, Narrows 2 operations can be characterized as a low stressor to adult Chinook salmon.

#### 8.2.2.4 Passage Impediments/Barriers

##### 8.2.2.4.1 Englebright Dam

Englebright Dam is an impassable barrier to the upstream migration of anadromous salmonids, and marks the upstream extent of currently accessible Chinook salmon habitat in the lower Yuba River. According to NMFS (2007, 2009b), the greatest impact to listed anadromous salmonids in the Yuba River watershed is the complete blockage of access for these species to their historical spawning and rearing habitat above Englebright Dam. Because of the loss of historical spawning and rearing habitat above Englebright Dam, resultant loss of reproductive isolation and subsequent hybridization between spring-run and fall-run Chinook salmon, restriction of spatial structure and associated vulnerability to catastrophic events, the existence of Englebright Dam is a very high stressor to Yuba River Chinook salmon.

##### 8.2.2.4.2 Daguerre Point Dam

Given the entire suite of considerations associated with the design configuration and features of Daguerre Point Dam and its associated fish ladders that reportedly could either delay or impede adult upstream migration, as well as issues identified regarding juvenile downstream passage, the effects associated with the presence of Daguerre Point Dam likely is a high stressor to Yuba River Chinook salmon under the Environmental Baseline.

#### 8.2.2.5 Predation

The extent of predation on juvenile Chinook salmon in the lower Yuba River is not well documented. Although predation is a natural component of salmonid ecology, it has been suggested that in addition to native predators, the rate of predation of salmonids in the lower Yuba River has potentially increased through the introduction of non-native predatory species such as striped bass, largemouth bass and American shad, and through the alteration of natural flow regimes and the development of structures that attract predators (NMFS 2009b).

This stressor includes the predation associated with increases in predator habitat and predation opportunities for piscivorous species created by major structures and diversions, and predation resulting from limited amounts of prey escape cover in the lower Yuba River. Consequently, predation of juvenile salmonids by introduced and native piscivorous fishes occurs throughout the lower Yuba River potentially at relatively high rates. Therefore, predation likely represents a moderate to high stressor to the juvenile lifestage of Yuba River Chinook salmon.

#### 8.2.2.6 Natural River Morphology and Function

From a floodplain meander perspective, braided channels, side channels, and channel sinuosity are created through complex hydraulic-geomorphic interactions. Attenuated peak flows and

controlled flow regimes emanating from the upper Yuba River watershed, and the influence of gravel berms along portions of the lower Yuba River, have affected the natural meandering of the lower Yuba River in the EFH Action Area. The loss of natural river morphology and function is the result of river channelization and confinement, which leads to a decrease in riverine habitat complexity, and thus to a decrease in the quantity and quality of adult and juvenile anadromous salmonid habitat. This is a particularly operative stressor affecting juvenile anadromous salmonid rearing habitat availability.

Thus, restricted availability of complex, diverse habitats such as multiple braided channels and side channels associated with the loss of natural river morphology and function presently continues to be a relatively high stressor to Yuba River Chinook salmon under the Environmental Baseline.

#### 8.2.2.7 Floodplain Habitat Availability

Floodplain habitat, as considered in this section of the Applicant-Prepared Draft EFH Assessment, is narrowly focused on the inundation of floodplain habitat and associated effects on juvenile salmonid rearing. In consideration that this stressor primarily addresses one lifestage, that inundation of floodplain habitat occurs relatively frequently compared to other Central Valley streams, that inundation of floodplain habitat would not necessarily occur each year even under unaltered hydrologic conditions, and that the lower Yuba River floodplain is comprised of unconsolidated alluvium without an abundance of characteristics associated with increased juvenile salmonid growth, lower Yuba River floodplain habitat availability likely is a high stressor to Yuba River juvenile Chinook salmon.

#### 8.2.2.8 Riparian Habitat and Instream Cover (Riparian Vegetation, Instream Woody Material)

In consideration of the importance that riparian vegetation and LWM play in the habitat complexity and diversity, which potentially limits the productivity of juvenile salmonids, the abundance and distribution of these physical habitat characteristics in the lower Yuba River, and the fact that the present availability of riparian habitat and instream cover (in the form of LWM) is a stressor that is manifested every year, it is a stressor of moderate to high magnitude to Yuba River juvenile Chinook salmon.

## 8.3 Potential Effects of the Proposed Action on EFH in the Action Area

The Proposed Action includes both construction-related activities and changes in Project operations. A detailed description of the Proposed Action is provided in Section 4.0 of this Applicant-Prepared Draft EFH Assessment. YCWA proposes to add the following components to the Project facilities, each of which will require some level of construction activity.

For all temporary construction activities related to all of YCWA's proposed conditions, potential effects to aquatic habitat (i.e., EFH) have been evaluated and addressed in the Amended FLA

(see Exhibit E of the Amended FLA) and in the Applicant-Prepared Draft BA. A list of construction-related activities in the Proposed Action that are not anticipated to adversely effect EFH is presented below.

Project Construction

The Proposed Action will involve construction-related modification or enhancement of existing Project facilities and features located in the Action Area, including the following:

- New Colgate Powerhouse New Tailwater Depression System
- New Bullards Bar Dam New Auxiliary Flood Control Outlet
- Modifications to Lohman Ridge Diversion Tunnel Intake
- Modifications to Our House Diversion Dam and Log Cabin Diversion Dam Fish Release Outlets
- Project Roads and Trails
- Recreation-related Construction
- Enhancements to Existing Facilities/Sites Enhancements
- Campgrounds and Picnic Areas
- Day Use Areas and Trails
- Boat Launches
- Construction of New Recreation Facilities
- Kelly Ridge Campground
- Shadow Ridge Campground
- Cottage Creek Picnic Site
- Dark Day RV Dump Station
- Dark Day Entrance Station
- New Colgate Powerhouse River Access
- West Shoreline Trail

As described in Section 4.0, the Proposed Action is comprised of various structural and operational components. However, only some of these components have the potential to result in changes that could affect stressors to managed fish species and EFH in the lower Yuba River. As part of the process to deconstruct the Proposed Action into its constituent parts, stressors that were directly or indirectly caused by, or that have the potential to be intensified by, the Proposed Action were identified, and then were limited to the components that could result in flow- and water temperature-related changes associated with the Proposed Action (see Section 3.3 of the Applicant-Prepared Draft BA for a full description), as listed below.

YCWA's Proposed Project Facilities Operations

- Operation of the New Bullards Bar Dam Auxiliary Flood Control Outlet
- Operation and Maintenance of the New Colgate Powerhouse New Tailwater Depression System
- Ongoing Operation and Maintenance of New Bullards Bar Reservoir Recreation Facilities

YCWA's Proposed Conditions

- YCWA Proposed Condition AR1: Maintain Minimum Streamflows Below Our House Diversion Dam and Log Cabin Diversion Dam
- YCWA Proposed Condition AR2: Control Project Spills at Our House Diversion Dam
- YCWA Proposed Condition AR3: Maintain Minimum Streamflows at Narrows 2 Powerhouse and Narrows 2 Full Bypass
- YCWA Proposed Condition AR4: Control Project Spills at New Bullards Bar Dam
- YCWA Proposed Condition AR5: Implement Aquatic Invasive Species Management Plan
- YCWA Proposed Condition AR6: Implement New Bullards Bar Reservoir Fish Stocking Plan
- YCWA Proposed Condition AR8: Implement Lower Yuba River Aquatic Monitoring Plan
- YCWA Proposed Condition AR9: Control Project Ramping and Flow Fluctuations Downstream of Englebright Dam
- YCWA Proposed Condition AR10: Maintain Minimum Streamflow Below New Bullards Bar Dam
- YCWA Proposed Condition AR11: Periodically Close Lohman Ridge Diversion Tunnel
- YCWA Proposed Condition AR12: Control Project Spills at Log Cabin Diversion Dam
- YCWA Proposed Condition GEN4: Develop and Implement a Coordinated Operations Plan to Assure Licensee's Compliance with the New License for the Yuba River Development Project
- YCWA Proposed Condition GS1: Implement Erosion and Sediment Control Plan
- YCWA Proposed Condition GS2: Implement Our House and Log Cabin Diversion Dams Sediment Management Plan
- YCWA Proposed Condition GS3: Implement Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan
- YCWA Proposed Condition LU1: Implement Transportation System Management Plan

- YCWA Proposed Condition RR1: Implement Recreation Facilities Plan
- YCWA Proposed Condition RR3: Provide Whitewater Boating Below Our House Diversion Dam
- YCWA Proposed Condition WR1: Implement Hazardous Materials Management Plan
- YCWA Proposed Condition WR2: Determine Water Year Types for Conditions Pertaining to Our House Diversion Dam, Log Cabin Diversion Dam and New Bullards Bar Dam
- YCWA Proposed Condition WR3: Determine Water Year Types for Conditions Pertaining to Narrows 2 Powerhouse and Narrows 2 Full Bypass
- YCWA Proposed Condition WR9: Implement Drought Management Plan

As part of this effects assessment, the pathways of exposure (e.g., flow-dependent habitat availability) and the intensity of those flow- and water temperature-related stressors also were considered with respect to the spatial and temporal distribution of those stressors, species-specific potential for exposure, and species-specific response to exposure within the Action Area (i.e., lower Yuba River). Rather than performing an analysis of potential effects associated with each proposed operational change, the effects assessment relied upon hydrological modeling to simulate operations of the Proposed Action as a whole, to assess potential downstream flow and water temperature effects on managed species and EFH in the lower Yuba River. All flow and water temperature-related potential effects to EFH, and indicators of properly functioning habitat conditions in the Yuba River watershed upstream of Englebright Dam, are discussed by specific location below.

## 8.3.1 Yuba River Watershed Upstream of Englebright Dam

### 8.3.1.1 North Yuba River (New Bullards Bar Dam Reach)

#### 8.3.1.1.1 Habitat Access (Physical Barriers)

Four structures were identified as potential passage barriers/impediments to resident trout in the North Yuba River under existing habitat conditions. While the identified trout passage barriers may or may not be large enough to also present a barrier to Chinook salmon (if Chinook salmon were present), the USACE's 260-ft-high Englebright Dam currently blocks Chinook salmon access to all available EFH in the North Yuba River. Consequently, for this indicator (i.e., habitat access), the EFH in the North Yuba River is considered to be "not properly functioning" under the baseline due to the presence of the USACE's Englebright Dam. Because the Proposed Action will not affect fish passage conditions at Englebright Dam, there will be no change to the current lack of access to EFH in the North Yuba River as a result of the Proposed Action.

#### 8.3.1.1.2 Flow/Hydrology

In general, the frequencies and magnitudes of river flows can strongly influence substrate and channel morphology conditions, as well as the amount of spawning and rearing areas available

for salmon. Lower streamflows are more susceptible to seasonal water temperature extremes during both winter and summer (NMFS 1996).

Flow releases from New Bullards Bar Dam directly affect the 2.4-mi section of the North Yuba River from the New Bullards Bar Dam downstream to the North Yuba River's confluence with the Middle Yuba River. The existing Project FERC license requires year-round minimum flows of 5 cfs for the maintenance of fish life in the North Yuba River below New Bullards Bar Dam.

In the 2.4 mi reach downstream of New Bullards Bar Dam, flow conditions for the Proposed Action were developed by YCWA, in part, to augment minimum flows released from Our House and Log Cabin diversion dams to maximize rainbow trout spawning and adult habitat availability in the 5.8 mi long Yuba River reach from the North and Middle Yuba River confluence to the New Colgate Powerhouse (see Section 3.3.3 in the Amended FLA). Increased minimum flows under the Proposed Action will reduce water temperatures in the reach between New Bullards Bar Dam and the confluence with the Middle Yuba River. Minimum flows under the Proposed Action will vary by WYT. The proposed minimum flows would be 5 cfs from April 1 through June 30 each year, and would exceed 5 cfs during the remaining months of any water year. A sensitivity analysis performed using the water temperature models indicates that a minimum flow in excess of 200 cfs would be required to maintain water temperatures below 20.0°C (68°F) immediately upstream of New Colgate Powerhouse. YCWA is not proposing such a minimum flow.

Table 8.3-1 displays simulated average monthly flows in the North Yuba River below New Bullards Bar Dam under the Proposed Action, relative to the Environmental Baseline. Over the long-term average 41-year simulation period, simulated Proposed Action flows increase by 6 cfs (75%) from August through November, are somewhat lower during December through March (about 4.2 to 13.5%), are lower during April through June (about 25 to 29%), and are 1 cfs (7.7%) higher during July, relative to the Environmental Baseline. Differences in simulated average monthly flows under the Proposed Action, relative to the Environmental Baseline, follow a similar pattern during most months of wet and above normal WYs. However, average monthly flows increase during July through March of below normal WYs, during July through March of dry WYs, and during all months of the year during critical WYs, except for the April through June period.

**Table 8.3-1. Flows in the North Yuba River below New Bullards Bar Dam under the Proposed Action and Environmental Baseline.**

| North Yuba River below New Bullards Bar Dam | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Proposed Action | 14 | 14 | 245 | 521 | 356 | 430 | 117 | 254 | 156 | 14 | 14 | 14 |
| Environmental Baseline | 8 | 8 | 267 | 602 | 383 | 449 | 164 | 337 | 209 | 13 | 8 | 8 |
| Difference | 6.0 | 6.0 | -22.0 | -81.0 | -27.0 | -19.0 | -47.0 | -83.0 | -53.0 | 1.0 | 6.0 | 6.0 |
| Percent Difference[3] | 75.0 | 75.0 | -8.2 | -13.5 | -7.0 | -4.2 | -28.7 | -24.6 | -25.4 | 7.7 | 75.0 | 75.0 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Proposed Action | 15 | 15 | 799 | 1,679 | 1,393 | 1,722 | 473 | 607 | 501 | 13 | 13 | 13 |
| Environmental Baseline | 8 | 8 | 756 | 2,015 | 1,513 | 1,825 | 681 | 977 | 728 | 29 | 9 | 8 |
| Difference | 7.0 | 7.0 | 43.0 | -336.0 | -120.0 | -103.0 | -208.0 | -370.0 | -227.0 | -16.0 | 4.0 | 5.0 |
| Percent Difference[3] | 87.5 | 87.5 | 5.7 | -16.7 | -7.9 | -5.6 | -30.5 | -37.9 | -31.2 | -55.2 | 44.4 | 62.5 |
| **Above Normal** | | | | | | | | | | | | |
| Proposed Action | 14 | 14 | 231 | 542 | 164 | 165 | 34 | 288 | 145 | 14 | 14 | 14 |
| Environmental Baseline | 8 | 8 | 360 | 580 | 181 | 165 | 38 | 292 | 156 | 9 | 9 | 8 |
| Difference | 6.0 | 6.0 | -129.0 | -38.0 | -17.0 | 0.0 | -4.0 | -4.0 | -11.0 | 5.0 | 5.0 | 6.0 |
| Percent Difference[3] | 75.0 | 75.0 | -35.8 | -6.6 | -9.4 | 0.0 | -10.5 | -1.4 | -7.1 | 55.6 | 55.6 | 75.0 |
| **Below Normal** | | | | | | | | | | | | |
| Proposed Action | 15 | 15 | 15 | 15 | 15 | 15 | 9 | 186 | 22 | 15 | 15 | 15 |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 191 | 22 | 9 | 9 | 8 |
| Difference | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 0.0 | -5.0 | 0.0 | 6.0 | 6.0 | 7.0 |
| Percent Difference[3] | 87.5 | 87.5 | 87.5 | 87.5 | 87.5 | 87.5 | 0.0 | -2.6 | 0.0 | 66.7 | 66.7 | 87.5 |
| **Dry** | | | | | | | | | | | | |
| Proposed Action | 15 | 15 | 15 | 15 | 15 | 14 | 9 | 9 | 9 | 14 | 14 | 14 |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 8 | 8 | 8 |
| Difference | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 6.0 | 0.0 | 0.0 | 0.0 | 6.0 | 6.0 | 6.0 |
| Percent Difference[3] | 87.5 | 87.5 | 87.5 | 87.5 | 87.5 | 75.0 | 0.0 | 0.0 | 0.0 | 75.0 | 75.0 | 75.0 |
| **Critical** | | | | | | | | | | | | |
| Proposed Action | 11 | 11 | 11 | 11 | 12 | 13 | 8 | 8 | 8 | 9 | 9 | 9 |
| Environmental Baseline | 8 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 |
| Difference | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 5.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 2.0 |
| Percent Difference[3] | 37.5 | 57.1 | 37.5 | 37.5 | 50.0 | 62.5 | 0.0 | 0.0 | 0.0 | 12.5 | 12.5 | 28.6 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

[3] Relative difference of the monthly average

Based on the simulated changes in flow in the North Yuba River under the Proposed Action, it is expected that flow-dependent habitat conditions for Chinook salmon EFH would be improved (e.g., increased habitat availability, slightly lower water temperatures) with increased monthly releases from New Bullards Bar Dam under the Proposed Action during relatively low-flow conditions in the summer and fall. Reductions in average monthly flows over relatively high-flow conditions during the winter and spring months of wetter WYs would not be expected to substantially affect habitat availability or water temperature suitability.

8.3.1.1.3 Water Quality

**Thermal Refugia (Water Temperature)**

Increased minimum flows downstream of New Bullards Bar Dam would result in simulated average daily water temperatures that would be the same or colder throughout this reach under the Proposed Action than those that would occur under the Environmental Baseline (existing

 

aquatic habitat conditions). However, water temperatures at the upper end of this reach are dependably cold throughout the year and represent an existing limited thermal refugia.

Simulated water temperature exceedance probabilities for spring-run and fall-run Chinook salmon lifestage-specific upper tolerable WTI values under the Proposed Action and Environmental Baseline are evaluated in the following sections. To provide consistency with the simulated water temperature evaluation conducted for the Environmental Baseline and Without-Project above, simulated water temperatures are evaluated in this section for the North Yuba River, Middle Yuba River and Yuba River above Englebright Dam, organized by adult migration and holding lifestages, followed by spawning and embryo incubation lifestages, and followed by juvenile rearing and downstream movement/outmigration lifestages.

**Proposed Action compared to Environmental Baseline**

Spring-run Chinook Salmon Adult Immigration

Over the April through September adult immigration lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 68°F over most of the period evaluated at most locations under the Proposed Action, relative to the Environmental Baseline (Table 8.3-2). Water temperatures are substantially more suitable during June in the Middle Yuba River, during June, late August and early September in the Yuba River below the Middle Yuba River, and during June in the Yuba River above New Colgate Powerhouse. Water temperatures under the Proposed Action do not exceed the 68°F index value during any month evaluated in the North Yuba River below New Bullards Bar Dam or in the Yuba River below New Colgate Powerhouse.

In the water temperature comparison tables, the blue shading indicates half-month periods during which the Proposed Action results in water temperatures lower than the lifestage-specific WTI value 10 percent or more often compared to the Environmental Baseline; yellow shading indicates when lifestage-specific WTI values are exceeded 10 percent or more often compared to the Environmental Baseline.

**Table 8.3-2. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon adult migration and holding lifestages under the Proposed Action, relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration | NYR | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | MYR | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | -5.9 | -11.1 | -20.8 | -2.6 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | | | | | | |
| | YR BLW MYR | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | -5.0 | -11.1 | -12.7 | -2.0 | -0.2 | -2.1 | -15.7 | -27.8 | -1.3 | | | | | | |
| | YR ABV COLGATE | 68°F | | | | | | | 0.0 | 0.0 | -1.0 | -9.8 | -13.5 | -10.6 | 2.0 | 0.0 | 0.0 | -0.2 | -4.7 | -3.1 | | | | | | |
| | YR BLW COLGATE | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| Adult Holding | NYR | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | MYR | 65°F | | | | | | | 0.0 | 0.0 | -1.1 | -9.1 | -14.6 | -14.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.3 | | | | | | |
| | YR BLW MYR | 65°F | | | | | | | 0.0 | 0.0 | -1.0 | -8.7 | -12.5 | -9.6 | 1.5 | 0.0 | 0.0 | -0.9 | -20.7 | -29.9 | | | | | | |
| | YR ABV COLGATE | 65°F | | | | | | | 0.0 | -0.2 | -7.3 | -13.9 | -11.7 | -1.5 | 2.8 | 0.0 | 0.0 | 0.0 | -1.5 | -5.7 | | | | | | |
| | YR BLW COLGATE | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |

Spring-run Chinook Salmon Adult Holding

Over the April through September adult holding lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 65°F during most months at all locations, but are substantially more suitable under the Proposed Action during June in the Middle Yuba River, during early June and September in the Yuba River below the Middle Yuba River, and during late May and early June in the Yuba River above New Colgate Powerhouse, relative to the Environmental Baseline. Water temperatures under the Proposed Action do not exceed the 65°F index value during any month evaluated in the North Yuba River below New Bullards Bar Dam or in the Yuba River below New Colgate Powerhouse.

Fall-run Chinook Salmon Adult Immigration and Staging

Over the July through December adult immigration and staging period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 68°F during most months at all locations, with the exception of late August through early September in the Yuba River below the Middle Yuba River, when water temperatures are substantially more suitable under the Proposed Action relative to the Environmental Baseline (Table 8.3-3).

**Table 8.3-3. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon adult migration lifestages under the Proposed Action, relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration and Staging | NYR | 68°F | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 68°F | | | | | | | | | | | | | -2.6 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 68°F | | | | | | | | | | | | | -2.0 | -0.2 | -2.1 | -15.7 | -27.8 | -1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 68°F | | | | | | | | | | | | | 2.0 | 0.0 | 0.0 | -0.2 | -4.7 | -3.1 | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 68°F | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Spring-run Chinook Salmon Spawning

Over the September through mid-October spawning lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Proposed Action and Environmental Baseline, with the exception of early October in the Yuba River below the Middle Yuba River, when water temperatures are substantially more suitable under the Proposed Action (Table 8.3-4).

**Table 8.3-4. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon spawning and embryo incubation lifestages under the Proposed Action, relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spawning | NYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | | | | | |
| | MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | -0.2 | | | | | |
| | YR BLW MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | -0.3 | -14.0 | | | | | |
| | YR ABV COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | -3.3 | | | | | |
| | YR BLW COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.2 | 0.0 | | | | | |
| Embryo Incubation | NYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | -0.2 | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | -0.3 | -14.0 | -3.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | -3.3 | -1.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Spring-run Chinook Salmon Embryo Incubation

Over the September through December embryo incubation lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Proposed Action and Environmental Baseline, with the exception of early October in the Yuba River below the Middle Yuba River, when water temperatures are substantially more suitable under the Proposed Action.

Fall-run Chinook Salmon Spawning

Over the October through December spawning lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Proposed Action and Environmental Baseline, with the exception of early October in the Yuba River below the Middle Yuba River, when water temperatures are substantially more suitable under the Proposed Action (Table 8.3-5).

Fall-run Chinook Salmon Embryo Incubation

Over the October through March embryo incubation lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Proposed Action and Environmental Baseline, with the exception of early October in the Yuba River below the Middle Yuba River, when water temperatures are substantially more suitable under the Proposed Action.

**Table 8.3-5. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon spawning and embryo incubation lifestages under the Proposed Action, relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spawning | NYR | 58°F | | | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 58°F | | | | | | | | | | | | | | | | | | | -0.2 | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 58°F | | | | | | | | | | | | | | | | | | | -14.0 | -3.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 58°F | | | | | | | | | | | | | | | | | | | -3.3 | -1.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 58°F | | | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Embryo Incubation | NYR | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | -0.2 | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | -14.0 | -3.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | -3.3 | -1.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## Spring-run Chinook Salmon Juvenile Rearing and Downstream Movement

Over the year-round juvenile rearing and downstream movement lifestage period, simulated water temperatures are generally similar during most months at all locations with respect to the probability of exceedance of the upper tolerable WTI value of 65°F under the Proposed Action and Environmental Baseline. However, water temperatures are substantially more suitable under the Proposed Action during June in the Middle Yuba River, during early June and September in the Yuba River below the Middle Yuba River, and during late May and early June in the Yuba River above New Colgate Powerhouse (Table 8.3-6).

**Table 8.3-6. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon juvenile lifestages under the Proposed Action, relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Juvenile Rearing and Downstream Movement | NYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.1 | -9.1 | -14.6 | -14.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.3 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.0 | -8.7 | -12.5 | -9.6 | 1.5 | 0.0 | 0.0 | -0.9 | -20.7 | -29.9 | -1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -7.3 | -13.9 | -11.7 | -1.5 | 2.8 | 0.0 | 0.0 | 0.0 | -1.5 | -5.7 | -1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yearling+ Smolt Emigration | NYR | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.0 | | | | | | | | | | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## Spring-run Chinook Salmon Yearling+ Smolt Emigration

Over the October through mid-May yearling+ smolt emigration lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 68°F under the Proposed Action and Environmental Baseline.

Fall-run Chinook Salmon Juvenile Rearing and Downstream Movement

Over the late December through June fall-run Chinook salmon juvenile rearing and downstream movement lifestage period, simulated water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 65°F most of the time under the Proposed Action and Environmental Baseline (Table 8.3-7). However, water temperatures are substantially more suitable under the Proposed Action during June in the Middle Yuba River, during early June in the Yuba River below the Middle Yuba River, and during late May and early June in the Yuba River above New Colgate Powerhouse.

**Table 8.3-7. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon juvenile lifestages under the Proposed Action, relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Juvenile Rearing and Downstream Movement | NYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | 0.0 |
| | MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.1 | -9.1 | -14.6 | -14.1 | | | | | | | | | | | | 0.0 |
| | YR BLW MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.0 | -8.7 | -12.5 | -9.6 | | | | | | | | | | | | 0.0 |
| | YR ABV COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -7.3 | -13.9 | -11.7 | -1.5 | | | | | | | | | | | | 0.0 |
| | YR BLW COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | 0.0 |

## Sediment/Turbidity

The North Yuba River is considered to be "properly functioning" under existing habitat conditions because sediment and turbidity conditions are relatively low.

The Proposed Action has the potential to affect flood flows capable of transporting large amounts of sediment and large sizes of sediment materials. However, the large sizes of substrate materials in the bed and banks of the North Yuba River below New Bullards Bar Dam and the lack of deformable substrates are such that sediment transport is likely to be unchanged and to continue to be minor under the Proposed Action. Therefore, the Proposed Action is not anticipated to adversely affect EFH based on potential changes to this parameter.

## Chemical Contamination/Nutrients

Because the SWRCB has identified the North Yuba River from New Bullards Bar Dam to the confluence with the Middle Yuba River as Clean Water Act § 303(d) State impaired for mercury, this EFH indicator (i.e., chemical contamination/nutrients) for the North Yuba River is considered to be "at risk" under existing habitat conditions.

Relative to existing aquatic habitat conditions, it is not expected that the characterization of this EFH indicator would change as a result of the Proposed Action.

8.3.1.1.4 Channel Condition and Dynamics

**Width/Depth Ratio**

Because ground-mapped reaches in the New Bullards Bar Reach of the North Yuba River identified a width/depth ratio of 20 for the reach, this EFH indicator is considered to be "not properly functioning" under existing habitat conditions.

As part of the Proposed Action, YCWA proposes to increase minimum flows from New Bullards Bar Dam into the North Yuba River from 5 cfs to the 5 to 13 cfs range, depending on water year type. Due to the boulder-dominated substrate conditions in the North Yuba River downstream of New Bullards Bar Dam, it is unlikely that the Proposed Action will have the potential to substantially change width/depth relationships in the North Yuba River. Therefore, relative to existing aquatic habitat conditions in the North Yuba River, substantive changes to this EFH indicator are not anticipated as a result of the Proposed Action.

**Streambank Conditions**

The North Yuba River is mostly laterally and vertically stable (e.g., there is little likelihood of large-scale plan-form change or incision). The channel is characterized by large substrate, steep gradients, vertical confinement, low bank erodibility, and low fine sediment accumulation. Because it is assumed that the banks in this reach are stable and, according to the NMFS (1996) criteria, this EFH indicator is considered to be "properly functioning" under existing habitat conditions. The Proposed Action is not expected to have a significant effect on overall channel stability or the nature of the transport reaches. Relative to existing aquatic habitat conditions in the North Yuba River, no substantive changes to this EFH indicator are anticipated as a result of the Proposed Action.

8.3.1.1.5 Habitat Elements

**Substrate**

Based on habitat mapping and substrate surveys, this EFH indicator (i.e., substrate) is considered to be "at risk" or "not properly functioning" under existing aquatic habitat conditions. Relative to existing aquatic habitat conditions, the Proposed Action is not expected to substantially change this EFH indicator.

**Large Woody Material**

Because unobstructed downstream movement of LWM is currently restricted, this EFH indicator (i.e., large woody material) is considered to be "at risk" under the existing aquatic habitat conditions.

Relative to existing aquatic habitat conditions, the Proposed Action is not expected to adversely affect this EFH indicator.

8.3.1.1.6 Watershed Conditions (Riparian Areas)

One proposed Condition under the Proposed Action has the potential to result in a beneficial effect on riparian vegetation. This is Condition AR10, Maintain Minimum Streamflow Below New Bullards Bar Dam. However, the effects of this condition in the New Bullards Bar Dam Reach will have a less than significant effect on riparian vegetation in the North Yuba River, because the minimum flows will remain about the same during the riparian growing season. In summary, the Proposed Action is expected to maintain flow-related conditions for this EFH indicator (i.e., riparian habitat) in the North Yuba River, relative to existing habitat conditions.

8.3.1.1.7 Prey Availability

BMI samples were collected at one site in the North Yuba River approximately 2.0 RM downstream of New Bullards Bar Dam near the confluence with the Middle Yuba River. Sampling at the location resulted in 325 total organisms per grid, which is below the standard minimum of 500 organisms per grid used for IBI and MMI scoring. Therefore, the reliability of the calculated indices scores are low. Nonetheless, the IBI score was 21 and MMI was 16 and classified per MMI standards as in poor condition.

Habitat in some locations was not conducive to high abundance of BMI, especially within the North Yuba River where large, granitic boulders dominate the stream, leaving less surface area for BMI. Lower scores in these locations appeared to be primarily driven by the existing habitat, and not by other external factors or conditions.

Under the Proposed Action, proposed conditions that may be beneficial to mollusks and BMI include the proposed instream flows associated with Condition AR10, Maintain Minimum Streamflow Below New Bullards Bar Dam, and implementation of an Aquatic Invasive Species Management Plan under Condition AR5. Over the long-term, the proposed flow changes under the Proposed Action are expected to augment the existing hydrologic regime, which would maintain, or could potentially provide a slight benefit to the existing macroinvertebrate communities in the North Yuba River.

**8.3.1.2 Middle Yuba River (with emphasis on the ~1.5 mi of EFH upstream from the confluence of the Middle Yuba River and the North Yuba River)**

8.3.1.2.1 Habitat Access (Physical Barriers)

This EFH indicator in the Middle Yuba River is classified as “not properly functioning” under existing habitat conditions due to the presence of the USACE’s Englebright Dam. Because the Proposed Action will not change fish passage conditions at Englebright Dam, there will be no change to existing habitat access in the Middle Yuba River as a result of the Proposed Action.

8.3.1.2.2 Flow/Hydrology

Flow releases from Our House Diversion Dam directly affect the 22.3-mi section of the Middle Yuba River from Our House Diversion Dam downstream to the confluence of the Middle Yuba

River and the North Yuba River. Releases made at Log Cabin Diversion Dam on Oregon Creek join with releases made at Our House Diversion Dam on the Middle Yuba River affecting the remaining 4.7 mi of the Middle Yuba River down to the confluence with the North Yuba River.

Downstream of Our House Diversion Dam, flow conditions under the Proposed Action were developed by YCWA, in part, to augment minimum flows released from Our House and Log Cabin diversion dams to maximize rainbow trout spawning and adult habitat availability. Minimum flows under the Proposed Action would vary by water year type. YCWA proposes to change minimum flow releases: 1) from Our House Diversion Dam into the Middle Yuba River from the requirement in the existing license of 30-50 cfs to 40-120 cfs, depending on water year type; and 2) from Log Cabin Diversion Dam into Oregon Creek from the requirement in the existing license of between 8-12 cfs to 6-43 cfs, depending on water year type (YCWA proposed Condition AR1, Maintain Minimum Streamflows Below Our House Diversion Dam and Log Cabin Diversion Dam, in Appendix E2 of the Amended FLA). Further, YCWA proposes to include in the new license a requirement to control spills at Our House Diversion Dam by releasing up to 600 cfs (YCWA's proposed Condition AR2, Control Project Spills at Our House Diversion Dam, in Appendix E2 of the Amended FLA), and to control spills at Log Cabin Diversion Dam by releasing up to 100 cfs (YCWA's proposed Condition AR12, Control Project Spills at Log Cabin Diversion Dam, in Appendix E2 of the Amended FLA). The proposed flows will exceed the capabilities of the existing fish release outlets (i.e., maximum existing valve capacities are 59 cfs at Our House Diversion Dam and 18 cfs at Log Cabin Diversion Dam). YCWA also proposes to increase the capacity at each of these outlets to accommodate the new requirements.

Table 8.3-8 displays simulated average monthly flows in the Middle Yuba River above the Yuba River under the Proposed Action, relative to the Environmental Baseline. Over the long-term average 41-year simulation period, simulated Proposed Action flows increase during most months of the year, particularly during June (126.5% increase) and July (113.0% increase), relative to the Environmental Baseline. Average monthly flows also increase during nearly all months of all WYTs.

Based on the simulated increases in flow in the Middle Yuba River under the Proposed Action, it is expected that flow-dependent habitat conditions for Chinook salmon EFH will be improved (e.g., increased habitat availability, slightly lower water temperatures) associated with increased monthly releases from Our House Dam under the Proposed Action, particularly during the summer and fall.

**Table 8.3-8. Flows in the Middle Yuba River above the Yuba River under the Proposed Action and Environmental Baseline.**

| Middle Yuba River above Yuba River Confluence | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Proposed Action | 55 | 175 | 402 | 534 | 474 | 475 | 457 | 484 | 265 | 98 | 49 | 43 |
| Environmental Baseline | 41 | 111 | 285 | 486 | 421 | 418 | 290 | 275 | 117 | 46 | 38 | 36 |
| Difference | 14.0 | 64.0 | 117.0 | 48.0 | 53.0 | 57.0 | 167.0 | 209.0 | 148.0 | 52.0 | 11.0 | 7.0 |
| Percent Difference[3] | 34.1 | 57.7 | 41.1 | 9.9 | 12.6 | 13.6 | 57.6 | 76.0 | 126.5 | 113.0 | 28.9 | 19.4 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Proposed Action | 67 | 339 | 936 | 1,259 | 1,043 | 888 | 1,225 | 1,280 | 723 | 212 | 68 | 58 |
| Environmental Baseline | 47 | 229 | 734 | 1,194 | 999 | 831 | 700 | 559 | 241 | 58 | 43 | 42 |
| Difference | 20.0 | 110.0 | 202.0 | 65.0 | 44.0 | 57.0 | 525.0 | 721.0 | 482.0 | 154.0 | 25.0 | 16.0 |
| Percent Difference[3] | 42.6 | 48.0 | 27.5 | 5.4 | 4.4 | 6.9 | 75.0 | 129.0 | 200.0 | 265.5 | 58.1 | 38.1 |
| **Above Normal** | | | | | | | | | | | | |
| Proposed Action | 51 | 214 | 459 | 690 | 545 | 592 | 323 | 342 | 194 | 87 | 56 | 49 |
| Environmental Baseline | 39 | 130 | 317 | 637 | 466 | 523 | 233 | 251 | 110 | 48 | 41 | 40 |
| Difference | 12.0 | 84.0 | 142.0 | 53.0 | 79.0 | 69.0 | 90.0 | 91.0 | 84.0 | 39.0 | 15.0 | 9.0 |
| Percent Difference[3] | 30.8 | 64.6 | 44.8 | 8.3 | 17.0 | 13.2 | 38.6 | 36.3 | 76.4 | 81.3 | 36.6 | 22.5 |
| **Below Normal** | | | | | | | | | | | | |
| Proposed Action | 47 | 103 | 195 | 187 | 231 | 287 | 258 | 347 | 140 | 68 | 46 | 40 |
| Environmental Baseline | 38 | 58 | 91 | 141 | 183 | 226 | 189 | 266 | 82 | 44 | 39 | 37 |
| Difference | 9.0 | 45.0 | 104.0 | 46.0 | 48.0 | 61.0 | 69.0 | 81.0 | 58.0 | 24.0 | 7.0 | 3.0 |
| Percent Difference[3] | 23.7 | 77.6 | 114.3 | 32.6 | 26.2 | 27.0 | 36.5 | 30.5 | 70.7 | 54.5 | 17.9 | 8.1 |
| **Dry** | | | | | | | | | | | | |
| Proposed Action | 55 | 64 | 105 | 107 | 188 | 224 | 165 | 125 | 86 | 48 | 32 | 30 |
| Environmental Baseline | 42 | 46 | 59 | 73 | 144 | 181 | 123 | 96 | 63 | 38 | 31 | 30 |
| Difference | 13.0 | 18.0 | 46.0 | 34.0 | 44.0 | 43.0 | 42.0 | 29.0 | 23.0 | 10.0 | 1.0 | 0.0 |
| Percent Difference[3] | 31.0 | 39.1 | 78.0 | 46.6 | 30.6 | 23.8 | 34.1 | 30.2 | 36.5 | 26.3 | 3.2 | 0.0 |
| **Critical** | | | | | | | | | | | | |
| Proposed Action | 60 | 81 | 101 | 108 | 108 | 123 | 115 | 105 | 68 | 33 | 27 | 25 |
| Environmental Baseline | 37 | 45 | 71 | 84 | 73 | 87 | 75 | 72 | 46 | 27 | 24 | 24 |
| Difference | 23.0 | 36.0 | 30.0 | 24.0 | 35.0 | 36.0 | 40.0 | 33.0 | 22.0 | 6.0 | 3.0 | 1.0 |
| Percent Difference[3] | 62.2 | 80.0 | 42.3 | 28.6 | 47.9 | 41.4 | 53.3 | 45.8 | 47.8 | 22.2 | 12.5 | 4.2 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

[3] Relative difference of the monthly average

8.3.1.2.3 Water Quality

**Thermal Refugia (Water Temperature)**

As previously described, Middle Yuba River water temperature monitoring and simulated water temperatures indicate that the upper tolerable WTI values for spring-run Chinook salmon holding, spring-run and fall-run Chinook salmon immigration, spring-run and fall-run Chinook salmon spawning and incubation, and spring-run and fall-run Chinook salmon juvenile rearing often are exceeded during June through mid-October. Therefore, this EFH indicator (i.e., thermal refugia) in the Middle Yuba River is considered to be “not properly functioning” under existing habitat conditions.

As described above in Section 8.3.1.1.3, simulated water temperatures under the Proposed Action in the Middle Yuba River above the Yuba River are similar or slightly lower relative to the Environmental Baseline (i.e., existing aquatic habitat conditions). Therefore, the Proposed

Action is not expected to adversely affect EFH (i.e., thermal refugia), or reduce the available area of usable EFH in the Middle Yuba River.

**Sediment/Turbidity**

Overall, for this EFH indicator (i.e., sediment/turbidity), the Middle Yuba River is considered to be "properly functioning" under existing aquatic habitat conditions due to relatively low sediment and turbidity.

Under the Proposed Action, YCWA may need to remove material from Our House Diversion Dam impoundment or Log Cabin Diversion Dam impoundment, or both. Historically, large storms, which have occurred approximately once every 10 to 20 years, have resulted in very large amounts of material accumulating in the impoundments in short periods (e.g., during a single storm period). Large floods in the Middle Yuba River and Oregon Creek capable of transporting sediment will continue to occur every 5 to 10 years because the proposed Project cannot control large floods (i.e., passive spill occurs over Our House and Log Cabin diversion dams during floods). These floods will transport cobble and finer material, move onto and shift cobble/gravel bars and local floodplains, and deposit sand into vegetated riparian zones, and are capable of shifting riparian zones.

YCWA's Proposed Condition GS2, Implement Our House and Log Cabin Diversion Dams Sediment Management Plan, provides an excavation plan that addresses how material would be removed from the impoundments, where the material would be placed, how the material would be transported from the impoundment to its storage location, and measures YCWA would undertake to mitigate any adverse environmental effects. Additionally, YCWA's Proposed Condition GS2 has called for a slower low-level outlet closure following a sediment pass-through event, which is designed to enhance fine sediment deposition upon the floodplains downstream.

YCWA proposes to pass sediment downstream of the Our House and Log Cabin diversion dams by opening the low level (5-ft diameter) outlet valves in the dams. Opening of a low level outlet in a diversion dam is an effective means to pass sediment, which would otherwise accumulate behind the dam, to the river downstream of the dam. This continuous supply of sediment aids in the proper ecological function of the river. Condition GS2 provides that each year, at the appropriate time and when hydraulic conditions are favorable, YCWA will open the low level valves in Our House Diversion Dam and Log Cabin Diversion Dam. Specifically, the strategy is to open the valves for brief periods in the winter when the majority of the water would pass through the outlet – not over the dam – to maximize direction of flow and movement of sediment in the impoundment, and when a high flow is expected to occur soon after, to continue moving sediment downstream of the dam after the pass-through event. The purposes of restricting the event to the winter months is to allow the high spring flows, which are often high enough to continue to mobilize and redistribute moderate size sediment below the dam. Based on historic hydrology, YCWA expects that this condition will be implemented on average every other year at Our House Diversion Dam and once every 3 to 4 years at Log Cabin Diversion Dam.

Sediment passage events at Log Cabin and Our House diversion dams are permitted under a SWRCB-issued Clean Water Act Section 401 Water Quality Certification (WQC), which was issued to YCWA on February 10, 2016, and which is in conformance with the March 4, 2016 FERC-approved August 2016 Log Cabin and Our House Diversion Dam Sediment Management Plan. During January 8-12, 2017, a sediment passage event was conducted at Our House Diversion Dam according to the conditions specified for the Log Cabin and Our House Diversion Dams Sediment Passage Project in the WQC (SWRCB 2016). Sediment passage events may occur at Our House Diversion Dam between November 1 and March 15, when wet conditions (i.e., storm events) are forecast to last at least 48 hours, and instantaneous instream flows will be equal or greater than 600 cfs in the Middle Fork Yuba River, with an expected peak of at least 1,500 cfs during the event.

YCWA monitored forecasts of precipitation and Middle Yuba River flows prior to the January 2017 sediment passage event, and determined that the WQC-specified timing, weather and flow requirements were all met during the sediment passage event. Middle Yuba River flows below Our House Diversion Dam during January 8-12, 2017 peaked at approximately 22,788 cfs (CDEC 2017), which was considerably above the 1,500 cfs requirement in the WQC (SWRCB 2016). YCWA fully opened the Our House Diversion Dam at 10:45 a.m. on January 8, 2017 and maintained it fully opened until 12:15 p.m. on January 12, 2017, when YCWA closed the low level outlet. Due to high flows in the river that resulted in significant spill over the dam throughout the event, YCWA staff could not conduct daily inspections of the low level outlet.

YCWA conducted turbidity monitoring daily throughout the sediment passage event. Turbidity sampling was conducted in compliance with the WQC and included sampling locations on the Middle Yuba River 1,100 ft upstream of the Our House Diversion Dam (upstream of the normal impoundment pool), 375 ft downstream of the dam, and eight miles downstream of the dam 1,400 ft below the Oregon Creek confluence. Initial turbidity readings were collected at the specified locations on January 8, 2017 prior to opening the low level outlet valve at Our House Diversion Dam. The low level outlet valve was opened at 10:45 a.m. and turbidity was measured again at each location. Turbidity values increased from 72 Nephelometric Turbidity Units (NTU) to 86 NTU below the dam and from 74 NTU to 83 NTU below the Oregon Creek confluence. These turbidity increases were within the 15 NTU increase allowed under Condition 5 of the WQC (SWRCB 2016). At the time of the second turbidity measurements, flows had increased approximately 1,500 cfs below the dam, compared to the original readings (Table 8.3-9).

**Table 8.3-9. Turbidity readings and locations during the sediment passage event.**

| Date | Above Our House Diversion Dam | | | Below Our House Diversion Dam | | | Below MYR/OC Confluence | | |
|---|---|---|---|---|---|---|---|---|---|
| | Time | Flow[1] (cfs) | Turbidity (NTU) | Time | Flow[2] (cfs) | Turbidity (NTU) | Time | Flow (cfs) | Turbidity (NTU) |
| 1/8/17 | -- | -- | -- | 09:50 | 7,000 | 72 | 09:20 | 7,600 | 74 |
| **LOW LEVEL OUTLET OPENED AT 10:45 AM** | | | | | | | | | |
| 1/8/17 | -- | -- | -- | 11:06 | 9,500 | 86 | 11:35 | 10,750 | 83 |
| 1/9/17 | 10:45 | 14,221 | 285 | 10:30 | 13,200 | 285 | 09:45 | 16,300 | 310 |
| 1/10/17 | 10:00 | 10,372 | 94 | 10:15 | 9,950 | 96 | 09:45 | 11,750 | 123 |
| 1/11/17 | 11:00 | 8,695 | 67 | 10:50 | 8,650 | 68 | 10:15 | 9,850 | 146 |
| 1/12/17 | 11:20 | 3,630 | 17 | 11:30 | 3,000 | 16 | 10:45 | 3,590 | 19 |
| **LOW LEVEL OUTLET CLOSED AT 12:20 PM** | | | | | | | | | |
| 1/12/17 | 12:45 | 3,458 | 17 | 12:35 | 2,700 | 17 | 13:10 | 3,200 | 23 |

[1] Hourly flows were estimated from CDEC Station "ORH" plus the flow into the Lohman Ridge Tunnel (YCWA YC4 gage).
[2] Hourly flows from CDEC Station "ORH".
[3] Hourly flows were estimated from CDEC Stations "ORH" plus "LCB".

The low level outlet was opened during a significant increase in flow below Our House Diversion Dam, including a peak flow on January 8, 2017 of 22,788 cfs (YCWA 2017). Turbidity measurements on January 9, 2017 were 285 NTU below the dam and 310 NTU below the Oregon Creek confluence. Because these measurements were significantly higher than those recorded on the previous day, YCWA established a new monitoring point upstream of the Our House Diversion Dam impoundment to measure the turbidity of inflows - which were 285 NTU on January 9, 2017 (Table 8.3-9). The inflow turbidity was the same as below the dam, suggesting changes in turbidity were not caused by the low level outlet being open (YCWA 2017). The difference in turbidity values between the dam and confluence locations was likely due to local runoff and input from Oregon Creek, which was flowing at 2,300 cfs at the time of the measurement on January 9, 2017 (YCWA 2017).

Based on the conditions observed between January 8 and 9, 2017, YCWA concluded that high and variable flows made the original baseline turbidity (prior to valve opening) inconsistent with the actual conditions in the Middle Yuba River during the sediment passage event. During each day of monitoring, turbidity measurements below Our House Diversion Dam were within 2 NTU of the inflow sample (Table 8.3-9). Turbidity measurements below the Oregon Creek confluence ranged from 3 NTU to 78 NTU higher compared to the below dam measurements. At no point did turbidity monitoring indicate that the sediment passage event had, or could be, in violation of water quality objectives (YCWA 2017). YCWA did not conduct a sediment passage event at Log Cabin Diversion Dam during January 2017.

To assess the downstream transport and fate of sediment resulting from a pass-through event, and as stated in YCWA's relicensing implementation plan titled, Upper Yuba River Aquatic Monitoring Plan (YCWA Proposed Condition AR7), monitoring of sediment and channel morphology will be conducted both in the impoundments and downstream of the impoundments. Impoundment monitoring will be focused on determining the effectiveness of the sediment pass-through for reducing the amount of both course and fine accumulated sediment in the impoundment. Monitoring downstream of the impoundments will be focused on changes in habitat conditions for aquatic and riparian species.

Condition GS2, Implement Our House and Log Cabin Diversion Dams Sediment Management Plan, is expected to be beneficial to EFH in the Middle Yuba River. Several studies suggest that availability of suitably-sized spawning gravels is limited. Passage of sediments at Our House and Log Cabin diversion dams will likely improve salmonid spawning habitat in the Middle Yuba River by increasing the amount of suitably-sized substrate gravel. Therefore, the Proposed Action is expected to improve EFH conditions associated with sediment/turbidity.

**Chemical Contamination/Nutrients**

Because the SWRCB identified the Middle Yuba River from Bear Creek to the North Yuba River as CWA § 303(d) State impaired for mercury, this EFH indicator is considered to be "at risk" for the Middle Yuba River under existing habitat conditions. Relative to existing aquatic habitat conditions, it is not anticipated that this EFH indicator will be substantively changed as a result of the Proposed Action.

8.3.1.2.4 Channel Condition and Dynamics

**Width/Depth Ratio**

The average width/depth ratio for the ground-mapped reaches in the Middle Yuba River – Oregon Creek and Our House Diversion Dam Reaches was calculated to be 24. Therefore, it is assumed that this EFH indicator (i.e., width/depth ratio) is considered to be "not properly functioning" under the existing conditions according to NMFS (1996).

As part of the Proposed Action, YCWA proposes to increase minimum flow releases from Our House Diversion Dam into the Middle Yuba River from 30-50 cfs to 40-120 cfs, depending on water year type. As described in Section 3.3.1 of Exhibit E of the Amended FLA, the Middle Yuba River has a coarse and resistant bed and banks along most of its length. There is significant bedrock control and the mainstem channel often travels through bedrock gorges.

Although no quantitative studies have been conducted to specifically evaluate Proposed Action effects on width/depth ratio in the Middle Yuba River, given the relatively constrained nature of the channel, it is not expected that increased flows of up to 120 cfs during certain years under the Proposed Action will substantively change this EFH indicator (i.e., width/depth ratio).

**Streambank Conditions**

Ground-mapped data for the 2.94 mi of the Middle Yuba River did not identify any bank erosion as a percentage of the reach. Because of the channel stability and low risk of bank erosion associated with the amount of bedrock and boulder control, streambank conditions are considered to be "properly functioning" under existing aquatic habitat conditions.

Due to the channel stability associated with the bedrock and boulder control in the Middle Yuba River, it is not expected that the Proposed Action will substantively affect this EFH indicator.

8.3.1.2.5 Habitat Elements

**Substrate**

In the Middle Yuba River, cobble and gravel were found to be the dominant and sub-dominant substrates, respectively. The average percentage of cobble embeddedness below the Oregon Creek confluence was reported to be 35 percent, and 37 percent above the North Yuba River confluence (see Technical Memorandum 3-1, *Aquatic Macroinvertebrate Upstream of Englebright Reservoir*). Based on the limited amount of suitably-sized spawning gravels and relatively high levels of embeddedness, this EFH indicator (i.e., substrate) is considered to be "at risk/not properly functioning" under the existing aquatic habitat conditions according to NMFS (1996) criteria.

Condition GS2, Implement Our House and Log Cabin Diversion Dams Sediment Management Plan, is expected to be beneficial to EFH in the Middle Yuba River. Several studies suggest that availability of suitably-sized spawning gravels is limited. Passage of sediments at Our House and Log Cabin diversion dams will likely improve salmonid spawning habitat in the Middle Yuba River by increasing the amount of suitably-sized substrate gravel. Therefore, the Proposed Action is expected to improve EFH conditions associated with substrate.

**Large Woody Material**

Under existing conditions, an unknown quantity of wood currently passes through Project diversion tunnels associated with the Log Cabin and Our House Diversion Dams (see Technical Memorandum 6-1, *Riparian Habitat Upstream of Englebright Reservoir*). In consideration of the riparian vegetation survey results and the diversion dam operations upstream, this EFH indicator is considered to be "at risk" under existing habitat conditions.

As part of the Proposed Action, YCWA proposes to allow mobile instream LWM to continue downstream beyond Our House and Log Cabin diversion dams. YCWA's proposed Condition GS3, Implement Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan, provides that YCWA pass LWM downstream of these two diversion dams. All sizes of LWM greater than 8 inches in diameter and up to 36 ft in length will be allowed to continue downstream beyond the dams. Smaller sized woody material will also be allowed to pass beyond the dams. All root wads will be allowed to pass downstream unless YCWA determines that a root wad presents a risk to the safety of the dam. With regards to Our House and Log Cabin diversion dams, the management of LWM is expected to provide downstream habitat benefits for aquatic and riparian species while ensuring public safety. However, the potential effects of the Proposed Action on LWM are not quantifiable because it is unclear how much LWM passes over the Log Cabin and Our House Diversion Dams rather than passing through the associated diversion tunnels to the New Bullards Bar Reservoir. LWM passing over the diversion dams would be available to downstream reaches, but is unlikely to interact with streamflow. Field observations and literature indicate that the LWM in high gradient reaches becomes suspended on boulders above or outside of the streamflow, and is easily flushed downstream at high flow (Ruediger and Ward 1991). Over the long-term however, it is reasonable to assume that allowing LWM to pass downstream of Our House

Diversion Dam and Log Cabin Diversion Dam will improve habitat conditions, as well as EFH conditions.

8.3.1.2.6 Watershed Conditions (Riparian Areas)

Under existing aquatic habitat conditions, canopy cover in the Middle Yuba River ranges from about 15 percent to 30 percent in the sites surveyed. YCWA characterized the Middle Yuba River sites as generally healthy because there was no indication of a lack of riparian function in these areas.

Under the Proposed Action, Condition GS2, Implement Our House and Log Cabin Diversion Dams Sediment Management Plan, has the potential to enhance downstream riparian vegetation by providing substrate for nursery sites and rooting. Increased sediment downstream of diversion dams may provide fine substrates capable of providing capillary action for germinating seedlings as well as established vegetation.

Conditions AR1, AR2 and AR12 also have the potential to have a beneficial effect on riparian vegetation in the Middle Yuba River. Condition AR1, Maintain Minimum Streamflows Below Our House Diversion Dam and Log Cabin Diversion Dam, provides stabilized flows at levels similar to or higher than current flows on the Our House Diversion Dam Reach and the Log Cabin Diversion Dam Reach, providing conditions for riparian growth along the streamside. Condition AR2, Control Project Spills at Our House Diversion Dam, and Condition AR12, Control Project Spills at Log Cabin Diversion Dam, may enhance riparian germination. The recession limb is designed to more closely follow the recession limb of a natural snow-melt hydrograph (depending on the water year type) during the growing season, which is intended to synchronize with the dispersal of native riparian species, providing more opportunity for successful germination and establishment.

Over the long-term, the proposed increased monthly flow releases under the Proposed Action are expected to augment the existing hydrologic regime, which will maintain, or may provide a slight benefit to the existing adjacent riparian communities and this EFH indicator along the Middle Yuba River.

8.3.1.2.7 Prey Availability

The Middle Yuba River was sampled for BMI in three locations (RM 7.5, 8.2 and 12.5) downstream of Our House Diversion Dam. At the site upstream of Oregon Creek and the site downstream of Oregon Creek, low abundance limited the collection of organisms to 486 and 476 individuals per grid, respectively. These counts are just under the standard 500 organisms per grid used for IBI and MMI scoring and therefore the reliability of the calculated indices scores are considered low. IBI scores were 64, 69, and 59 from upstream to downstream, respectively. MMI scores were 62, 64, and 52 from upstream to downstream, respectively. All MMI scores were rated as ‘fair’ and approached a rating of ‘good’ which is greater than 67.

Under the Proposed Action, proposed conditions that may be beneficial to mollusks and BMI include the proposed instream flows associated with Condition AR1, and implementation of an

Aquatic Invasive Species Management Plan under Condition AR5. Over the long-term, the proposed flow changes under the Proposed Action are expected to augment the existing hydrologic regime, which will maintain, or could potentially provide a slight benefit to the existing macroinvertebrate communities in the Middle Yuba River.

#### 8.3.1.3 Yuba River Upstream of Englebright Reservoir

##### 8.3.1.3.1 Habitat Access (Physical Barriers)

This EFH indicator in the Yuba River upstream of Englebright Dam is classified as "not properly functioning" under existing habitat conditions due to the presence of the USACE's Englebright Dam. Because the Proposed Action will not change fish passage conditions at Englebright Dam, there will be no change to existing habitat access in the Yuba River upstream of Englebright Dam as a result of the Proposed Action.

##### 8.3.1.3.2 Flow/Hydrology

Total river flow in the New Colgate Powerhouse Reach results from a combination of releases from New Colgate Powerhouse, New Bullards Bar Dam on the North Yuba River, Log Cabin Diversion Dam on Oregon Creek, and Our House Diversion Dam on the Middle Yuba River in combination with watershed accretions.

Simulated flows under the Proposed Action, relative to the Environmental Baseline, are compared for three nodes in the Yuba River upstream of Englebright Dam: 1) the Yuba River downstream of the Middle Yuba River; 2) the Yuba River upstream of New Colgate Powerhouse; and 3) the Yuba River downstream of New Colgate Powerhouse.

Table 8.3-10 displays simulated average monthly flows in the Yuba River below the Middle Yuba River under the Proposed Action, relative to the Environmental Baseline. Over the 41-year simulation period, long-term average simulated Proposed Action flows increase during all months of the year with the exception of January, and increase substantially during April through December, relative to the Environmental Baseline. Differences in average monthly simulated flows under the Proposed Action, relative to the Environmental Baseline, generally follow a similar pattern by WYT. However, average monthly flows under the Proposed Action increase substantially during all months of the year during below normal, dry, and critical WYTs.

**Table 8.3-10. Flows in the Yuba River below the Middle Yuba River under the Proposed Action and Environmental Baseline.**

| Yuba River below Middle Yuba River | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Proposed Action | 70 | 189 | 647 | 1,055 | 830 | 905 | 574 | 738 | 422 | 111 | 63 | 57 |
| Environmental Baseline | 49 | 119 | 551 | 1,088 | 804 | 867 | 454 | 612 | 326 | 59 | 46 | 45 |
| Difference | 21.0 | 70.0 | 96.0 | -33.0 | 26.0 | 38.0 | 120.0 | 126.0 | 96.0 | 52.0 | 17.0 | 12.0 |
| Percent Difference[3] | 42.9 | 58.8 | 17.4 | -3.0 | 3.2 | 4.4 | 26.4 | 20.6 | 29.4 | 88.1 | 37.0 | 26.7 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Proposed Action | 82 | 354 | 1,735 | 2,938 | 2,436 | 2,611 | 1,698 | 1,888 | 1,224 | 225 | 81 | 71 |
| Environmental Baseline | 55 | 237 | 1,491 | 3,209 | 2,513 | 2,656 | 1,380 | 1,536 | 969 | 87 | 52 | 51 |
| Difference | 27.0 | 117.0 | 244.0 | -271.0 | -77.0 | -45.0 | 318.0 | 352.0 | 255.0 | 138.0 | 29.0 | 20.0 |
| Percent Difference[3] | 49.1 | 49.4 | 16.4 | -8.4 | -3.1 | -1.7 | 23.0 | 22.9 | 26.3 | 158.6 | 55.8 | 39.2 |
| **Above Normal** | | | | | | | | | | | | |
| Proposed Action | 65 | 228 | 690 | 1,232 | 709 | 756 | 357 | 630 | 338 | 101 | 70 | 63 |
| Environmental Baseline | 47 | 138 | 678 | 1,217 | 647 | 687 | 271 | 543 | 266 | 57 | 50 | 48 |
| Difference | 18.0 | 90.0 | 12.0 | 15.0 | 62.0 | 69.0 | 86.0 | 87.0 | 72.0 | 44.0 | 20.0 | 15.0 |
| Percent Difference[3] | 38.3 | 65.2 | 1.8 | 1.2 | 9.6 | 10.0 | 31.7 | 16.0 | 27.1 | 77.2 | 40.0 | 31.3 |
| **Below Normal** | | | | | | | | | | | | |
| Proposed Action | 62 | 118 | 210 | 202 | 246 | 302 | 266 | 533 | 162 | 83 | 61 | 55 |
| Environmental Baseline | 46 | 66 | 99 | 149 | 191 | 234 | 198 | 457 | 104 | 53 | 47 | 45 |
| Difference | 16.0 | 52.0 | 111.0 | 53.0 | 55.0 | 68.0 | 68.0 | 76.0 | 58.0 | 30.0 | 14.0 | 10.0 |
| Percent Difference[3] | 34.8 | 78.8 | 112.1 | 35.6 | 28.8 | 29.1 | 34.3 | 16.6 | 55.8 | 56.6 | 29.8 | 22.2 |
| **Dry** | | | | | | | | | | | | |
| Proposed Action | 70 | 79 | 120 | 122 | 202 | 239 | 173 | 134 | 95 | 62 | 47 | 44 |
| Environmental Baseline | 50 | 54 | 67 | 81 | 152 | 190 | 131 | 105 | 71 | 47 | 39 | 38 |
| Difference | 20.0 | 25.0 | 53.0 | 41.0 | 50.0 | 49.0 | 42.0 | 29.0 | 24.0 | 15.0 | 8.0 | 6.0 |
| Percent Difference[3] | 40.0 | 46.3 | 79.1 | 50.6 | 32.9 | 25.8 | 32.1 | 27.6 | 33.8 | 31.9 | 20.5 | 15.8 |
| **Critical** | | | | | | | | | | | | |
| Proposed Action | 71 | 92 | 112 | 119 | 120 | 136 | 123 | 112 | 76 | 42 | 36 | 34 |
| Environmental Baseline | 45 | 53 | 79 | 91 | 81 | 95 | 82 | 80 | 54 | 34 | 31 | 31 |
| Difference | 26.0 | 39.0 | 33.0 | 28.0 | 39.0 | 41.0 | 41.0 | 32.0 | 22.0 | 8.0 | 5.0 | 3.0 |
| Percent Difference[3] | 57.8 | 73.6 | 41.8 | 30.8 | 48.1 | 43.2 | 50.0 | 40.0 | 40.7 | 23.5 | 16.1 | 9.7 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

[3] Relative difference of the monthly average

Table 8.3-11 displays simulated average monthly flows in the Yuba River above New Colgate Powerhouse under the Proposed Action, relative to the Environmental Baseline. Over the 41-year simulation period, long-term average simulated Proposed Action flows increase during most months of the year with the exception of January, and increase substantially during April through December, relative to the Environmental Baseline. Differences in simulated average monthly flows under the Proposed Action, relative to the Environmental Baseline, generally follow a similar pattern by WYT. However, average monthly flows increase substantially during nearly all months of the year during below normal, dry, and critical WYTs

**Table 8.3-11. Flows in the Yuba River above New Colgate Powerhouse under the Proposed Action and Environmental Baseline.**

| Yuba River above Colgate Powerhouse | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Proposed Action | 72 | 203 | 687 | 1,128 | 907 | 988 | 630 | 772 | 432 | 114 | 64 | 58 |
| Environmental Baseline | 52 | 134 | 592 | 1,161 | 881 | 950 | 510 | 646 | 337 | 62 | 47 | 46 |
| Difference | 20.0 | 69.0 | 95.0 | -33.0 | 26.0 | 38.0 | 120.0 | 126.0 | 95.0 | 52.0 | 17.0 | 12.0 |
| Percent Difference[3] | 38.5 | 51.5 | 16.0 | -2.8 | 3.0 | 4.0 | 23.5 | 19.5 | 28.2 | 83.9 | 36.2 | 26.1 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Proposed Action | 86 | 385 | 1,827 | 3,091 | 2,581 | 2,734 | 1,796 | 1,942 | 1,241 | 230 | 83 | 73 |
| Environmental Baseline | 59 | 268 | 1,583 | 3,361 | 2,657 | 2,779 | 1,478 | 1,590 | 985 | 92 | 54 | 53 |
| Difference | 27.0 | 117.0 | 244.0 | -270.0 | -76.0 | -45.0 | 318.0 | 352.0 | 256.0 | 138.0 | 29.0 | 20.0 |
| Percent Difference[3] | 45.8 | 43.7 | 15.4 | -8.0 | -2.9 | -1.6 | 21.5 | 22.1 | 26.0 | 150.0 | 53.7 | 37.7 |
| **Above Normal** | | | | | | | | | | | | |
| Proposed Action | 67 | 246 | 741 | 1,333 | 810 | 870 | 418 | 668 | 349 | 104 | 71 | 64 |
| Environmental Baseline | 49 | 156 | 729 | 1,319 | 749 | 800 | 331 | 582 | 277 | 60 | 51 | 50 |
| Difference | 18.0 | 90.0 | 12.0 | 14.0 | 61.0 | 70.0 | 87.0 | 86.0 | 72.0 | 44.0 | 20.0 | 14.0 |
| Percent Difference[3] | 36.7 | 57.7 | 1.6 | 1.1 | 8.1 | 8.8 | 26.3 | 14.8 | 26.0 | 73.3 | 39.2 | 28.0 |
| **Below Normal** | | | | | | | | | | | | |
| Proposed Action | 63 | 126 | 229 | 238 | 291 | 365 | 318 | 569 | 173 | 85 | 62 | 56 |
| Environmental Baseline | 48 | 73 | 118 | 185 | 236 | 297 | 250 | 493 | 116 | 56 | 49 | 47 |
| Difference | 15.0 | 53.0 | 111.0 | 53.0 | 55.0 | 68.0 | 68.0 | 76.0 | 57.0 | 29.0 | 13.0 | 9.0 |
| Percent Difference[3] | 31.3 | 72.6 | 94.1 | 28.6 | 23.3 | 22.9 | 27.2 | 15.4 | 49.1 | 51.8 | 26.5 | 19.1 |
| **Dry** | | | | | | | | | | | | |
| Proposed Action | 73 | 82 | 127 | 135 | 234 | 286 | 201 | 148 | 101 | 64 | 48 | 45 |
| Environmental Baseline | 52 | 57 | 74 | 94 | 183 | 237 | 159 | 119 | 77 | 48 | 40 | 39 |
| Difference | 21.0 | 25.0 | 53.0 | 41.0 | 51.0 | 49.0 | 42.0 | 29.0 | 24.0 | 16.0 | 8.0 | 6.0 |
| Percent Difference[3] | 40.4 | 43.9 | 71.6 | 43.6 | 27.9 | 20.7 | 26.4 | 24.4 | 31.2 | 33.3 | 20.0 | 15.4 |
| **Critical** | | | | | | | | | | | | |
| Proposed Action | 74 | 96 | 125 | 138 | 135 | 156 | 136 | 122 | 79 | 43 | 37 | 35 |
| Environmental Baseline | 48 | 57 | 92 | 110 | 96 | 115 | 96 | 89 | 57 | 35 | 32 | 32 |
| Difference | 26.0 | 39.0 | 33.0 | 28.0 | 39.0 | 41.0 | 40.0 | 33.0 | 22.0 | 8.0 | 5.0 | 3.0 |
| Percent Difference[3] | 54.2 | 68.4 | 35.9 | 25.5 | 40.6 | 35.7 | 41.7 | 37.1 | 38.6 | 22.9 | 15.6 | 9.4 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

[3] Relative difference of the monthly average

Table 8.3-12 displays simulated average monthly flows in the Yuba River below New Colgate Powerhouse under the Proposed Action, relative to the Environmental Baseline. Over the 41-year simulation period, long-term average simulated flows are generally similar under the Proposed Action and Environmental Baseline. Simulated average monthly flows also are generally similar by WYT, with the exception of September in critical WYTs when flows under the Proposed Action are higher (18.5%), relative to the Environmental Baseline.

**Table 8.3-12. Flows in the Yuba River below New Colgate Powerhouse under the Proposed Action and Environmental Baseline.**

| Yuba River below Colgate Powerhouse | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Proposed Action | 814 | 962 | 1,546 | 2,470 | 2,545 | 2,659 | 2,070 | 2,848 | 2,667 | 2,040 | 1,572 | 843 |
| Environmental Baseline | 820 | 940 | 1,509 | 2,522 | 2,542 | 2,661 | 2,045 | 2,874 | 2,655 | 2,037 | 1,591 | 839 |
| Difference | -6.0 | 22.0 | 37.0 | -52.0 | 3.0 | -2.0 | 25.0 | -26.0 | 12.0 | 3.0 | -19.0 | 4.0 |
| Percent Difference[3] | -0.7 | 2.3 | 2.5 | -2.1 | 0.1 | -0.1 | 1.2 | -0.9 | 0.5 | 0.1 | -1.2 | 0.5 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Proposed Action | 832 | 1,307 | 3,364 | 5,709 | 5,745 | 5,939 | 4,124 | 4,499 | 4,075 | 2,733 | 2,203 | 951 |
| Environmental Baseline | 825 | 1,259 | 3,164 | 5,948 | 5,759 | 5,953 | 4,052 | 4,548 | 4,022 | 2,735 | 2,240 | 947 |
| Difference | 7.0 | 48.0 | 200.0 | -239.0 | -14.0 | -14.0 | 72.0 | -49.0 | 53.0 | -2.0 | -37.0 | 4.0 |
| Percent Difference[3] | 0.8 | 3.8 | 6.3 | -4.0 | -0.2 | -0.2 | 1.8 | -1.1 | 1.3 | -0.1 | -1.7 | 0.4 |
| **Above Normal** | | | | | | | | | | | | |
| Proposed Action | 806 | 967 | 1,654 | 2,803 | 3,101 | 3,464 | 2,391 | 3,257 | 3,098 | 2,326 | 1,712 | 876 |
| Environmental Baseline | 820 | 927 | 1,703 | 2,802 | 3,086 | 3,432 | 2,404 | 3,252 | 3,092 | 2,305 | 1,732 | 877 |
| Difference | -14.0 | 40.0 | -49.0 | 1.0 | 15.0 | 32.0 | -13.0 | 5.0 | 6.0 | 21.0 | -20.0 | -1.0 |
| Percent Difference[3] | -1.7 | 4.3 | -2.9 | 0.0 | 0.5 | 0.9 | -0.5 | 0.2 | 0.2 | 0.9 | -1.2 | -0.1 |
| **Below Normal** | | | | | | | | | | | | |
| Proposed Action | 817 | 804 | 772 | 1,172 | 1,169 | 1,269 | 1,362 | 2,728 | 2,549 | 1,917 | 1,409 | 833 |
| Environmental Baseline | 827 | 801 | 753 | 1,158 | 1,154 | 1,301 | 1,348 | 2,742 | 2,527 | 1,916 | 1,415 | 839 |
| Difference | -10.0 | 3.0 | 19.0 | 14.0 | 15.0 | -32.0 | 14.0 | -14.0 | 22.0 | 1.0 | -6.0 | -6.0 |
| Percent Difference[3] | -1.2 | 0.4 | 2.5 | 1.2 | 1.3 | -2.5 | 1.0 | -0.5 | 0.9 | 0.1 | -0.4 | -0.7 |
| **Dry** | | | | | | | | | | | | |
| Proposed Action | 810 | 801 | 666 | 720 | 721 | 513 | 815 | 1,452 | 1,394 | 1,425 | 1,162 | 775 |
| Environmental Baseline | 808 | 798 | 656 | 731 | 723 | 503 | 767 | 1,496 | 1,415 | 1,448 | 1,189 | 787 |
| Difference | 2.0 | 3.0 | 10.0 | -11.0 | -2.0 | 10.0 | 48.0 | -44.0 | -21.0 | -23.0 | -27.0 | -12.0 |
| Percent Difference[3] | 0.2 | 0.4 | 1.5 | -1.5 | -0.3 | 2.0 | 6.3 | -2.9 | -1.5 | -1.6 | -2.3 | -1.5 |
| **Critical** | | | | | | | | | | | | |
| Proposed Action | 791 | 865 | 662 | 680 | 574 | 475 | 621 | 943 | 1,037 | 1,124 | 888 | 635 |
| Environmental Baseline | 814 | 873 | 662 | 676 | 581 | 505 | 640 | 991 | 1,052 | 1,097 | 861 | 536 |
| Difference | -23.0 | -8.0 | 0.0 | 4.0 | -7.0 | -30.0 | -19.0 | -48.0 | -15.0 | 27.0 | 27.0 | 99.0 |
| Percent Difference[3] | -2.8 | -0.9 | 0.0 | 0.6 | -1.2 | -5.9 | -3.0 | -4.8 | -1.4 | 2.5 | 3.1 | 18.5 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 41-year simulation period

[3] Relative difference of the monthly average

Based on the generally similar or slightly increased average monthly flows in the Yuba River above Englebright Dam under the Proposed Action, it is expected that flow-dependent habitat conditions for Chinook salmon EFH will be improved (e.g., increased habitat availability, slightly lower water temperatures) associated with increased monthly releases from Project facilities under the Proposed Action, particularly during the summer and fall.

8.3.1.3.3 Water Quality

**Thermal Refugia (Water Temperature)**

Based on monitoring and simulated water temperatures in the Yuba River above Englebright Dam, this EFH indicator (i.e., thermal refugia) is considered to be “not properly functioning” upstream of New Colgate Powerhouse, and “properly functioning” downstream of New Colgate Powerhouse under existing habitat conditions.

As evaluated and described above in Section 8.3.1.1.3, simulated water temperatures under the Proposed Action in the Yuba River above Englebright Dam are generally similar with respect to spring-run and fall-run Chinook salmon upper tolerable WTI values in the Yuba River below New Colgate Powerhouse, but are similar or lower during the summer and fall in the Middle Yuba River, the Yuba River below the Middle Yuba River and above New Colgate Powerhouse. In fact, water temperatures under the Proposed Action in the Yuba River below the Middle Yuba River are substantially lower during portions of the spring-run Chinook salmon adult immigration and holding, fall-run Chinook salmon adult immigration and staging, spring-run and fall-run Chinook salmon spawning and incubation, and spring-run Chinook salmon juvenile rearing lifestages, relative to the Environmental Baseline (i.e., existing aquatic habitat conditions). Therefore, the Proposed Action is expected to slightly benefit EFH (i.e., thermal refugia) in the Yuba River above Englebright Dam, particularly in the reach below the Middle Yuba River confluence.

**Sediment/Turbidity**

Based on low sediment and turbidity conditions, this EFH indicator (i.e., sediment/turbidity) in the Yuba River above Englebright Dam is considered to be "properly functioning" under existing habitat conditions.

The large size of the substrate in the bed and banks of the Yuba River below the Middle Yuba River confluence and the lack of deformable substrate are such that sediment transport is likely minor. Therefore, the Proposed Action is not anticipated to substantively change this EFH indicator.

**Chemical Contamination/Nutrients**

Because the SWRCB identified the Yuba River upstream of Englebright Reservoir as CWA § 303(d) State impaired for mercury, this EFH indicator is considered to be "at risk" under existing habitat conditions.

Relative to existing conditions, substantive changes to this EFH indicator are not anticipated as a result of the Proposed Action.

8.3.1.3.4 Channel Condition and Dynamics

**Width/Depth Ratio**

The average width/depth ratio for the ground-mapped reaches in the Yuba River – New Colgate Powerhouse and Middle/North Yuba River Reaches was 16. Therefore, this EFH indicator (i.e., width/depth ratio) is considered to be "not properly functioning" under existing conditions according to NMFS (1996) criteria.

As previously described, YCWA proposes to increase minimum flow releases from the North Yuba River by up to 13 cfs and the Middle Yuba River by up to 120 cfs, depending on water year type. As previously described, this 7.1 mi channel of the Yuba River is a confined,

 

bedrock-dominated reach that passes through bedrock canyons with vertical walls that inhibit ground access. Although no quantitative studies have been conducted to specifically evaluate Proposed Action effects on width/depth ratio in the Yuba River Upstream of Englebright Reservoir, it is reasonable to assume that due to the planform geometry, it is unlikely that increased flows from the North Yuba and Middle Yuba rivers during certain years under the Proposed Action will substantially affect this EFH indicator (i.e., width/depth ratio).

**Streambank Conditions**

Based on the generally stable bedrock and boulder-dominated banks downstream of New Colgate Powerhouse, and due to only minor amounts of bank erosion in the New Colgate Powerhouse and Middle/North Yuba River reaches, streambank conditions are considered to be "properly functioning".

Under the Proposed Action, effects on channel stability will not be expected because the reaches are generally transport-dominated, and channels are resistant to further change. As previously discussed, YCWA does not propose any changes to the Project or its operations that would have a significant effect on overall channel stability in the Yuba River above Englebright Dam.

YCWA's proposed Conditions GS2, Implement Out House and Log Cabin Sediment Management Plan, and GS3, Implement Our House and Log Cabin Diversion Dams and New Bullards Bar Reservoir Woody Material Management Plan, will reduce the storage and character of the sediments impounded in the diversion pools and will result in an increase in mobile sediment downstream of Our House and Log Cabin diversion dams, which potentially may increase sediment in the Yuba River above Englebright Dam. The added sediment may create localized deposits, which the channel may then adjust to by possibly moving into, through, and around the deposits. These potential future site-specific channel-shifts in response to increased sediment supply would be considered beneficial to habitat conditions in the Yuba River. However, relative to existing conditions in the Yuba River upstream of Englebright Reservoir, the Proposed Action will not be expected to substantively change this EFH indicator.

8.3.1.3.5 Habitat Elements

**Substrate**

In the Yuba River downstream of the New Colgate Powerhouse, the dominant and sub-dominant substrates were found to be boulders and cobbles, respectively. In the Yuba River above New Colgate Powerhouse, the average percentage of cobble embeddedness was reported to be 18 percent. In the Yuba River below New Colgate Powerhouse, the average percentage of cobble embeddedness was reported to be 26 percent. Based on the above, this EFH indicator is considered to be "at risk/not properly functioning" under existing habitat conditions. Relative to existing conditions, minimal changes to this EFH indicator are expected as a result of the Proposed Action.

**Large Woody Material**

YCWA's Study 3.8, *Stream Fish Populations Upstream of Englebright Reservoir,* included sampling of fish populations at 1 site on the Yuba River (RM 33.7) between New Colgate Powerhouse and Englebright Reservoir. No LWM was documented during 2012 or 2013. In consideration of these survey results and the operational practices upstream that do not encourage the mobilization of LWM downstream of New Bullards Bar Dam on the North Yuba River, this EFH indicator (i.e., LWM) is considered to be "at risk" under existing conditions.

It is reasonable to assume that allowing LWM to pass through Our House Diversion Dam and Log Cabin Diversion Dam over the long-term could make LWM available to downstream reaches in the Yuba River upstream of Englebright Reservoir, which could improve habitat conditions, as well as this indicator of EFH.

8.3.1.3.6 Watershed Conditions (Riparian Areas)

During field surveys conducted in 2011 and 2012, moderate canopy (20%) was present in the Yuba River above New Colgate Powerhouse sampling site (approximately 0.6-mi upstream of New Colgate Powerhouse). The Yuba River below New Colgate Powerhouse sampling site (approximately 0.6-mi downstream of New Colgate Powerhouse) also was reported to have a relatively moderate canopy (22%). Therefore, due to past watershed disturbance and the moderate canopy observed during recent surveys, this EFH indicator is assumed to be "at risk" under existing habitat conditions.

As discussed in Technical Memorandum 6-1, *Riparian Habitat Upstream of Englebright Reservoir,* in the Yuba River downstream of New Colgate Powerhouse, the Proposed Action will inundate bankfull widths most frequently from December to July, with low frequency or no inundation from September to November. Flood prone widths are infrequently inundated, with January having the highest percentage of days of inundation under With-Project Hydrology (existing conditions).

Over the long-term, the proposed increased monthly releases under the Proposed Action are expected to augment the existing hydrologic regime, which will maintain, and may provide a slight benefit to the existing adjacent riparian communities and this EFH indicator along the Yuba River upstream of Englebright Reservoir.

8.3.1.3.7 Prey Availability

Samples of BMI were collected in two locations on the Yuba River - RM 7.6 and RM 8.8. The lower site is 0.56 RM below New Colgate Powerhouse and does not have an impoundment, but releases water from deep within the upstream impoundment. Sampling at the upstream location produced only 198 total organisms per grid, which is below the standard 500 organisms per grid used for IBI and MMI scoring and also is the lowest number collected for all samples. Therefore, the reliability of the calculated scores are considered low. Nonetheless, IBI scores were 30 and 47 from upstream to downstream, respectively. MMI scores were 26 and 34 from upstream to downstream with subsequent ratings of 'poor' and 'fair' respectively.

Habitat in some locations was not conducive to high abundance of BMI. Lower scores in these locations appeared to be primarily driven by the existing habitat, and not by other external factors or conditions.

Existing hydrology within the Yuba River has reduced higher flow events and increased base flows during summer months. There is a subset of BMI that out-competes other common species during higher flow events and may be reduced in abundance as a result of fewer high flow events. Conversely, the stable base flows favor a higher species density, which also increases available feeding resources to local fish populations. While the Proposed Action may create a small incremental effect as a result of altered flood flows, overall, it is not anticipated that overall BMI species abundances will be substantively affected.

Under the Proposed Action, proposed conditions that may be beneficial to mollusks and BMI include the minimum streamflow conditions (AR1, Maintain Minimum Streamflows Below Our House Diversion Dam and Log Cabin Diversion Dam, and AR10, Maintain Minimum Streamflow Below New Bullards Bar Dam), and implementation of an Aquatic Invasive Species Management Plan under Condition AR5. Over the long-term, the proposed flow changes under the Proposed Action are expected to augment the existing hydrologic regime, which will maintain, or may potentially provide a benefit to the existing macroinvertebrate communities in the Yuba River Upstream of Englebright Reservoir.

#### 8.3.1.4 Summary of EFH in the Yuba River Watershed Upstream of Englebright Dam

Overall, the Proposed Action will not eliminate, diminish, or disrupt the unoccupied EFH in the Yuba River watershed upstream of Englebright Reservoir. Although climate change was identified as a new threat during the 2011 5-Year review, effects on EFH that may result from climate change would not be attributable to the Proposed Action. In fact, it is anticipated that the Proposed Action will achieve moderate improvements in aquatic habitat conditions, while maintaining as much hydropower generation as possible, to offset fossil fueled electricity generation and support renewable generation sources. This will minimize the contribution of the Proposed Action to the effects of global warming, within the ability of the Proposed Action to affect this stressor. Nevertheless, it is recognized that climate change will continue to be a stressor to EFH for Chinook salmon. Of the other 31 threats to Pacific salmon EFH identified in Amendment 14 of the FMP and the 2011 5-Year review, the Proposed Action could potentially affect EFH through changes in flows and water temperatures in the reaches of the Yuba River upstream of Englebright Reservoir that are downstream of Project facilities. However, flow and water temperature-related effects on EFH upstream of Englebright Reservoir associated with the Proposed Action are expected to result in non-substantial effects, or beneficial effects.

### 8.3.2 Yuba River Downstream of Englebright Dam

As previously described, the Proposed Action is comprised of various structural and operational components. However, only a select number of those components have the potential to result in operations-related changes that could affect stressors to listed fish species or their critical habitats in the lower Yuba River.

For this Applicant-Prepared Draft EFH Assessment, specific evaluations were conducted to address proposed changes in Narrows 2 operations under the Proposed Action that will directly affect instream flows in the lower Yuba River.

#### 8.3.2.1 Flow-Dependent Habitat Conditions

Flow-dependent analyses described in this Applicant-Prepared Draft EFH Assessment used modeled flows and water temperatures to quantify spawning habitat availability, potential redd dewatering, fry and juvenile rearing habitat availability, potential fry and juvenile isolation, and lifestage-specific water temperature suitabilities for spring-run and fall-run Chinook salmon. Methods to conduct the flow-dependent analyses are the same as those described in Section 6.0 of the Applicant-Prepared Draft BA. Each of these considerations are evaluated in this Section 8.0 under the Proposed Action, relative to the Environmental Baseline, and their relative magnitudes as stressors to spring-run and fall-run Chinook salmon in the lower Yuba River are presented. Note that for the lower Yuba River, results by WYT classifications are in accordance with the Yuba River Index (YRI). Water year types based on the YRI are as defined in SWRCB Decision 1644. WYT designation uses DWR published Full Natural Flow for the Yuba River at Smartsville for water years 1970 to 1999, and for water years 2000 to 2010 uses the final determination for each year based on DWR Bulletin 120 and updates of Yuba River Unimpaired flow at Smartsville. Although WY 1977 is considered to be a conference year in YCWA's proposed conditions in Amended Appendix E2 of the Amended FLA, it is included in the water year type summary tables as a critical year, but discussed separately under the Proposed Action and Cumulative Condition analyses.

##### 8.3.2.1.1 Spring-run Chinook Salmon Spawning Habitat Availability

Spawning WUA for spring-run Chinook salmon was evaluated for simulated flows up to 5,000 cfs, which generally represents the bankfull flow in the lower Yuba River. Because flows do not exceed 5,000 cfs over the 41-year simulation period during the September through mid-October spring-run Chinook salmon spawning period, this limitation does not exclude any simulated daily flows from the spring-run Chinook salmon spawning WUA analysis. Tables 8.3-13 displays the long-term average and average by WYT spring-run Chinook salmon spawning habitat (percent of maximum WUA) under the Proposed Action and the Environmental Baseline.

Over the entire 41-year simulation period, long-term average spring-run Chinook salmon spawning habitat availability (percent of maximum WUA) in the lower Yuba River is similar under the Proposed Action relative to the Environmental Baseline (long-term average of 99.3% versus 98.8% of the maximum WUA, respectively). The Proposed Action provides very similar amounts of spawning habitat during wet, above normal, below normal and dry WYs, and provides 2.8 percent more habitat during critical WYs. As with the Environmental Baseline, the Proposed Action provides, on the average, over 80 percent (and even 90%) or more of maximum spawning WUA during all WYTs.

**Table 8.3-13. Long-term and water year type average spring-run Chinook salmon spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Proposed Action | 99.3 | 99.3 | 99.3 | 99.6 | 99.6 | 98.9 |
| Environmental Baseline | 98.8 | 99.3 | 99.4 | 99.6 | 99.6 | 96.1 |
| Difference | 0.5 | 0.0 | -0.1 | 0.0 | 0.0 | 2.8 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat durations for spring-run Chinook salmon spawning under the Proposed Action and Environmental Baseline s are presented in Figure 8.3-1. The Proposed Action provides similar amounts of spawning habitat availability overall, but provides more spawning habitat availability over about the lowest 2 percent of the lower portion of the exceedance probability distribution. Also, the Proposed Action provides 80 percent (and even 90%) or more of maximum spawning WUA about 100 percent of the time, while the Environmental Baseline provides 80 percent (and even 90%) or more of maximum spawning WUA about 98 percent of the time.

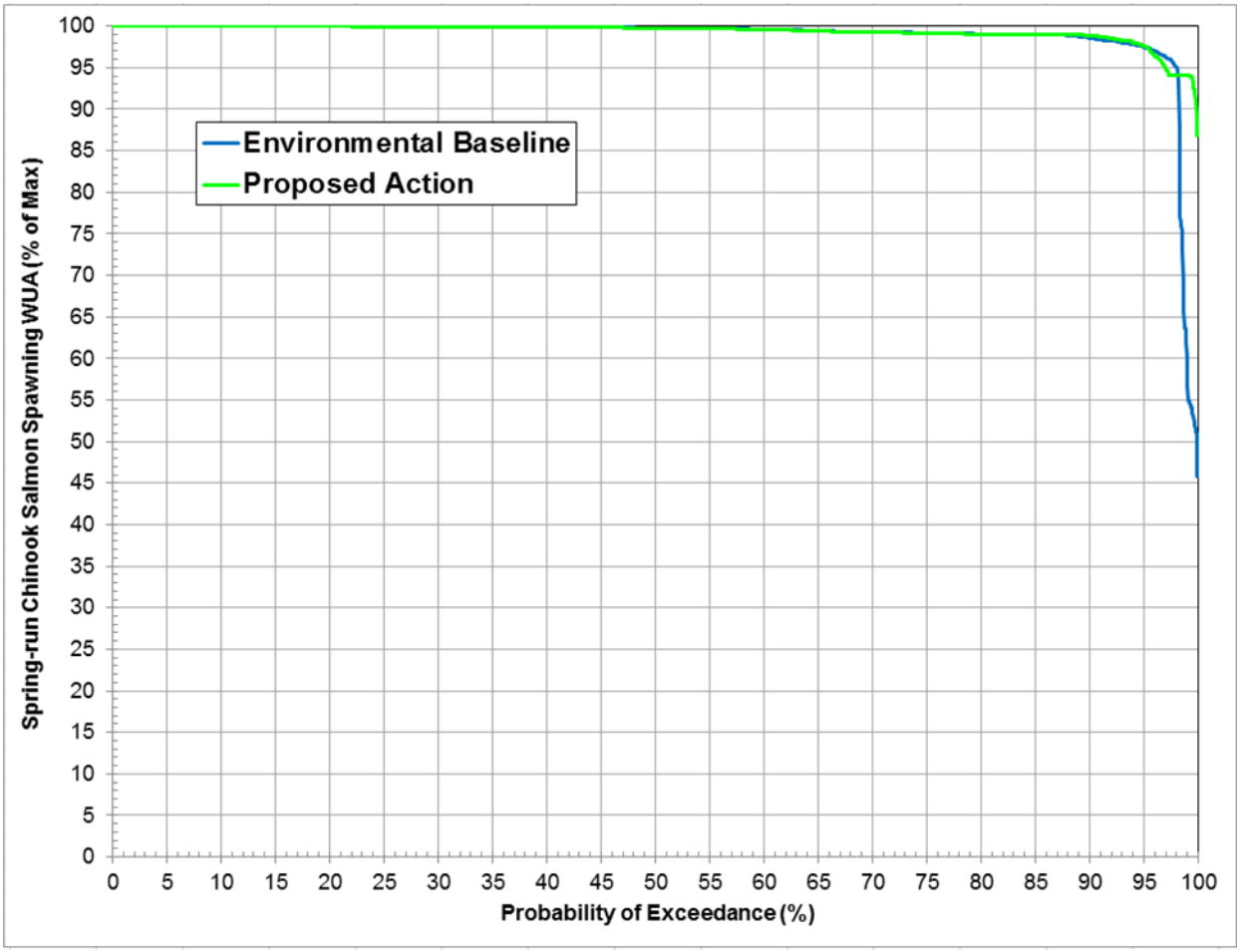


**Figure 8.3-1. Spring-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), for analytical purposes the corresponding spring-run Chinook salmon spawning period extends from September 1 – October 15 of 1977. During that spawning season, 94 percent of spring-run Chinook salmon maximum spawning WUA was provided under the Proposed Action, compared to 72 percent provided under the Environmental Baseline.

Spring-run Chinook salmon spawning habitat availability under the Proposed Action is generally similar to the Environmental Baseline overall, provides more habitat during the conference WY, and represents a low stressor under the Proposed Action.

#### 8.3.2.1.2 Fall-run Chinook Salmon Spawning Habitat

Spawning WUA for fall-run Chinook salmon was evaluated for simulated flows up to 5,000 cfs, which generally represents the bankfull flow in the lower Yuba River. During the October through December fall-run Chinook salmon spawning period, flows exceed 5,000 cfs during about 3.3 percent of the days over the 41-year simulation period for the Proposed Action, and

about 2.9 percent of the days under the Environmental Baseline, which were excluded from the fall-run Chinook salmon spawning WUA analysis. Tables 8.3-14 displays the long-term average and average by WYT of fall-run Chinook salmon spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.

**Table 8.3-14. Long-term and water year type average fall-run Chinook salmon spawning WUA (percent of maximum) under the Proposed Action and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Proposed Action | 95.8 | 94.1 | 95.0 | 96.6 | 97.3 | 97.6 |
| Environmental Baseline | 95.8 | 93.8 | 95.6 | 96.6 | 97.6 | 97.8 |
| Difference | 0.0 | 0.3 | -0.6 | 0.0 | -0.3 | -0.2 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average spring-run Chinook salmon spawning habitat availability (percent of maximum WUA) in the lower Yuba River is the same under the Proposed Action, relative to the Environmental Baseline (long-term average of 95.8 % versus 95.8 % of maximum WUA, respectively). The Proposed Action also provides similar amounts of spawning habitat by WYT. Both the Environmental Baseline and the Proposed Action provide over 90 percent of maximum spawning WUA during any WYT.

Habitat durations for fall-run Chinook salmon spawning under the Proposed Action and Environmental Baseline are presented in Figure 8.3-2. The Proposed Action provides similar amounts of spawning habitat availability overall, but provides slightly less spawning habitat availability over about the 83-86 and 88-92 percent of the exceedance probability distribution. The Proposed Action and Environmental Baseline both provide over 80 percent of maximum spawning WUA with about a 94 percent probability. Additionally, the Proposed Action and the Environmental Baseline provide 90 percent or more of maximum spawning WUA about 90 and 92 percent of the time, respectively.

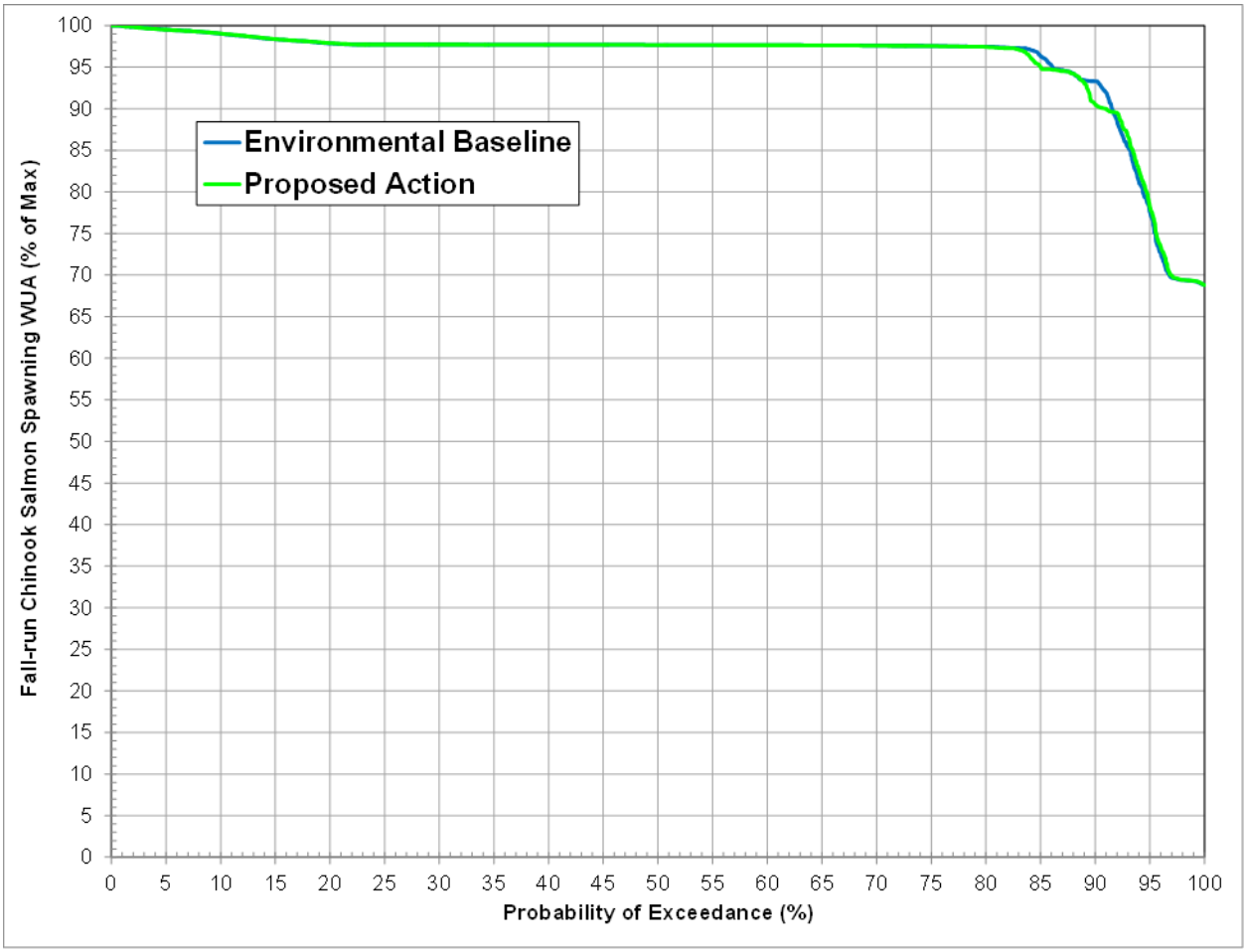


**Figure 8.3-2. Fall-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), for analytical purposes the corresponding fall-run Chinook salmon spawning period extends from October 1 – December 31 of 1977. During that spawning season, 90.3 percent of fall-run Chinook salmon maximum spawning WUA was provided under the Proposed Action and 93.1 percent was provided under the Environmental Baseline.

Flow-dependent spawning habitat availability under the Environmental Baseline is a low stressor to Yuba River fall-run Chinook salmon. Because of the similarity in spawning habitat availability under the Proposed Action relative to the Environmental Baseline, this stressor remains characterized as low under the Proposed Action.

Moreover, the Proposed Action overall provides substantially more fall-run Chinook salmon spawning habitat over most of the exceedance distributions relative to the Without-Project under both the RMT and Relicensing Participants' WUA-discharge relationships.

8.3.2.1.3 Potential Redd Dewatering

Since the development of the existing flow fluctuation criteria, additional data and information have been collected and models developed to better analyze the potential for Chinook salmon redd dewatering in the Yuba River (see Section 6.0 of the Applicant-Prepared Draft BA). Proposed new flow fluctuation criteria were developed for the Proposed Action (see Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam in Appendix E2 of the Amended FLA).

**Spring-run Chinook Salmon**

For every day of the annual embryo incubation period over 41 years, the long-term annual average of the percentages of spring-run Chinook salmon redds that potentially would have been dewatered under the Proposed Action and Environmental Baseline both are very low, only 0.02 percent and 0.01 percent respectively. Applying these 41-year averages of estimated redd dewatering, it is estimated that essentially no spring-run Chinook salmon redd would be expected to have been dewatered under the Proposed Action and Environmental Baseline during 2009 and 2010[3].

The average percentage of redds potentially dewatered would be very small, and would be very similar under the Proposed Action, relative to the Environmental Baseline during all WYTs (Table 8.3-15).

**Table 8.3-15. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Proposed Action | Environmental Baseline | Difference | Proposed Action | Environmental Baseline | Difference |
| Long-term (All WYs) | 0.02% | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% |
| Wet | 0.03% | 0.02% | 0.01% | 0.00% | 0.00% | 0.00% |
| Above Normal | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% | 0.00% |
| Below Normal | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Dry | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Critical | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

WYT defined by the Yuba River Index (YRI) WY Hydrologic Classification.
Percentage estimates based on the WY 1970-2010 simulation period.

The long-term and water year type averages of the percentage of egg pockets dewatered indicates that no egg pockets would be dewatered under the Proposed Action or the Environmental Baseline during any WYT. During the one conference year (WY 1977) in the simulated period

[3] All phenotypic spring-run Chinook salmon redds identified in the lower Yuba River during the weekly near-census 2009 and 2010 Chinook salmon redd surveys were combined into one dataset. As described in Section 6.0 of the Applicant-Prepared Draft BA, an estimated 1,148 and 1,465 spring-run Chinook salmon redds were constructed in the lower Yuba River during 2009 and 2010, respectively. See Section 6.5 of the Applicant-Prepared Draft BA for the detailed description of the redd dewatering methodology.

of evaluation (WY 1970-2010), no redds or egg pockets would potentially be dewatered under the Proposed Action or under the Environmental Baseline.

Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for spring-run Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period). Under this proposed condition, Licensee shall not reduce the flow downstream of Englebright Dam to less than the larger of: 1) the applicable minimum streamflow requirement specified in YCWA's Proposed Condition AR3; or 2) the flow that would result from applying the maximum flow reduction amount specified in Table 1 of this condition corresponding to the base flow range determined using the maximum 5-day average flow that occurred on days when this condition was in effect during that September 2 through December 31 period. During the period of September 2 through 5, the base flow range for this proposed condition shall be determined by the average daily flow on September 1.

Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. It would not apply: (a) to Project operations during emergencies, (b) to releases required by USACE's flood control criteria, (c) to releases required to maintain a flood control buffer or for other flood control purposes, (d) to bypasses of uncontrolled flows into Englebright Reservoir, (e) during times when Englebright Dam is spilling, or (f) when releases are governed by the limits of Table 3 of this condition. When this condition would apply, Licensee shall make reasonable efforts to operate New Bullards Bar Reservoir and Project facilities downstream of Englebright Dam and coordinate with the operator of the Narrows Project (FERC Project No. 1403) to avoid fluctuations in the flow of the Yuba River downstream of Englebright Dam and daily changes in Project operations affecting releases or bypasses of flow downstream of Englebright Dam shall be continuously measured at USGS Smartsville Streamflow Gage 11418000.

During the days over the 41-year period of evaluation when this proposed condition would apply, it would provide the intended protection for spring-run Chinook salmon redd dewatering (Table 8.3-16).

**Table 8.3-16. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline for those days in the 41-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Proposed Action | Environmental Baseline | Difference | Proposed Action | Environmental Baseline | Difference |
| Long-term (All WYs) | 0.02% | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% |
| Wet | 0.03% | 0.02% | 0.01% | 0.00% | 0.00% | 0.00% |
| Above Normal | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% | 0.00% |
| Below Normal | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Dry | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Critical | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

WYT defined by the Yuba River Index (YRI) WY Hydrologic Classification.
Percentage estimates based on the WY 1970-2010 simulation period.

Spring-run Chinook salmon redd dewatering under the Proposed Action is estimated to be very low and similar to that under the Environmental Baseline. Redd dewatering under the Proposed Action represents a low stressor to spring-run Chinook salmon.

### Fall-run Chinook Salmon

For every day of the annual embryo incubation period over the 41 years, the long-term annual average of the percentages of fall-run Chinook salmon redds that potentially would have been dewatered under the Proposed Action and Environmental Baseline both are low, averaging 1.59 percent and 1.32 percent annually, respectively. Applying these long-term averages to the number of fall-run Chinook redds observed during 2009 and 2010 (2,079 and 1,559 redds, respectively), it is estimated that between about 33 and 21 fall-run Chinook salmon redds would have been dewatered under the Proposed Action and Environmental Baseline.

The average percentage of redds potentially dewatered under the Proposed Action would also be small and slightly higher than the average percentage under the Environmental Baseline during all WYs (Table 8.3-17).

**Table 8.3-17. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Proposed Action | Environmental Baseline | Difference | Proposed Action | Environmental Baseline | Difference |
| Long-term (All WYs) | 1.59% | 1.32% | 0.27% | 0.92% | 0.76% | 0.16% |
| Wet | 3.40% | 2.88% | 0.52% | 2.14% | 1.79% | 0.35% |
| Above Normal | 0.73% | 0.55% | 0.18% | 0.30% | 0.23% | 0.07% |
| Below Normal | 0.99% | 0.84% | 0.15% | 0.45% | 0.37% | 0.08% |
| Dry | 0.30% | 0.20% | 0.10% | 0.08% | 0.04% | 0.04% |
| Critical | 0.16% | 0.09% | 0.07% | 0.02% | 0.01% | 0.01% |

WYT defined by the Yuba River Index (YRI) WY Hydrologic Classification.
Percentage estimates based on the WY 1970-2010 simulation period.

The long-term and water year type averages of the percentages of egg pockets dewatered under the Proposed Action are very low, about half or less of the percentages of dewatered redds, and these percentages are very similar to the corresponding averages under the Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), an estimated 0.2 percent of fall-run Chinook salmon redds and 0.0 percent of egg pockets would potentially be dewatered under the Proposed Action, nearly the same as the percentages expected under the Environmental Baseline (0.1% and 0.0%, respectively).

As previously discussed, Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period).

Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. During the days over the 41-year period of evaluation when this proposed condition would apply, it would provide the intended protection for fall-run Chinook salmon redd dewatering (Table 8.3-18).

**Table 8.3-18. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Proposed Action relative to the Environmental Baseline for those days in the 41-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Proposed Action | Environmental Baseline | Difference | Proposed Action | Environmental Baseline | Difference |
| Long-term (All WYs) | 0.39% | 0.30% | 0.09% | 0.15% | 0.10% | 0.05% |
| Wet | 0.65% | 0.57% | 0.08% | 0.31% | 0.20% | 0.11% |
| Above Normal | 0.44% | 0.28% | 0.16% | 0.14% | 0.09% | 0.05% |
| Below Normal | 0.17% | 0.07% | 0.10% | 0.03% | 0.00% | 0.03% |
| Dry | 0.28% | 0.18% | 0.10% | 0.08% | 0.04% | 0.04% |
| Critical | 0.12% | 0.07% | 0.05% | 0.02% | 0.01% | 0.01% |

WYT defined by the Yuba River Index (YRI) WY Hydrologic Classification.
Percentage estimates based on the WY 1970-2010 simulation period.

Fall-run Chinook salmon redd dewatering under the Proposed Action is estimated to be very low and similar to that under the Environmental Baseline. Redd dewatering under the Proposed Action represents a low/moderate stressor to fall-run Chinook salmon.

8.3.2.1.4 Fry and Juvenile Rearing Habitat Availability

**Spring-run Chinook Salmon Fry In-channel Rearing Habitat**

Table 8.3-19 displays the long-term average and average by WYT spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline. During the mid-November through mid-February spring-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 13 percent of the days over the 41-year simulation period for the Proposed Action, and during about 12 percent of the days under the Environmental Baseline. These days were excluded from the spring-run Chinook salmon fry in-channel rearing WUA analysis.

**Table 8.3-19. Long-term and WYT average spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Proposed Action | 88.6 | 88.6 | 89.0 | 87.6 | 88.0 | 89.7 |
| Environmental Baseline | 88.6 | 88.6 | 88.9 | 87.6 | 88.2 | 89.7 |
| Difference | 0.0 | 0.0 | 0.1 | 0.0 | -0.2 | 0.0 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average fry in-channel rearing habitat availability (percent of maximum WUA) in the lower Yuba River is the same under the Proposed Action and Environmental Baseline (long-term average of 88.6% of the maximum WUA). The Proposed Action and Environmental Baseline also result in very similar amounts of WUA by WYT. Both the Proposed Action and the Environmental Baseline provide an average of over 80 percent of fry rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon fry rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-3. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over the entire distribution. Both the Proposed Action and Environmental Baseline provide over 80 percent fry rearing maximum WUA over the entire exceedance probability distributions.

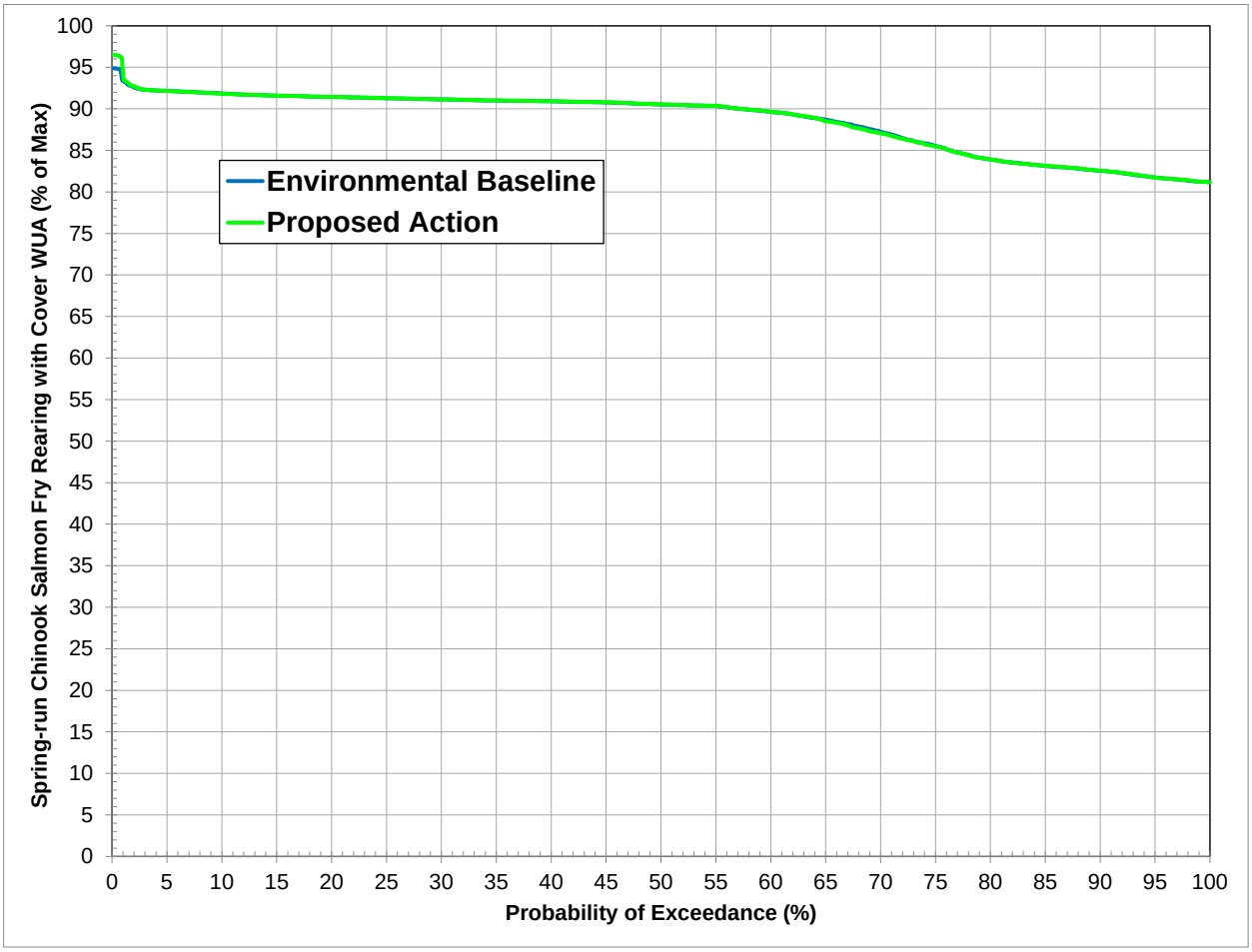


**Figure 8.3-3. Spring-run Chinook salmon fry in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.**

During the fry rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), 91.2 percent of spring-run Chinook salmon fry rearing maximum

WUA was provided under the Proposed Action compared to 91.2 percent provided under the Environmental Baseline.

**Fall-run Chinook Salmon Fry In-channel Rearing Habitat**

Table 8.3-20 displays the long-term average and average by WYT fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline. During the mid-December through April fall-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 19.6 percent of the days over the 41-year simulation period for both the Proposed Action and the Environmental Baseline. These days were excluded from the fall-run Chinook salmon fry in-channel rearing WUA analysis.

**Table 8.3-20. Long-term and WYT average fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Proposed Action | 87.2 | 88.3 | 87.2 | 85.4 | 85.6 | 88.7 |
| Environmental Baseline | 87.2 | 88.2 | 87.3 | 85.4 | 85.7 | 88.6 |
| Difference | 0.0 | 0.1 | -0.1 | 0.0 | -0.1 | 0.1 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is the same under the Proposed Action and Environmental Baseline (long-term average of 87.2%). The Proposed Action and Environmental Baseline also result in similar amounts of WUA by WYT. Neither the Proposed Action nor the Environmental Baseline provides over 90 percent of fry rearing maximum WUA during any WYT, although both scenarios provide an average of over 80 percent of fry rearing maximum WUA during all WYTs.

Habitat durations for fall-run Chinook salmon fry in-channel rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-4. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over the entire distribution. Both the Proposed Action and Environmental Baseline provide over 80 percent of fry rearing maximum WUA with about a 100 percent probability.

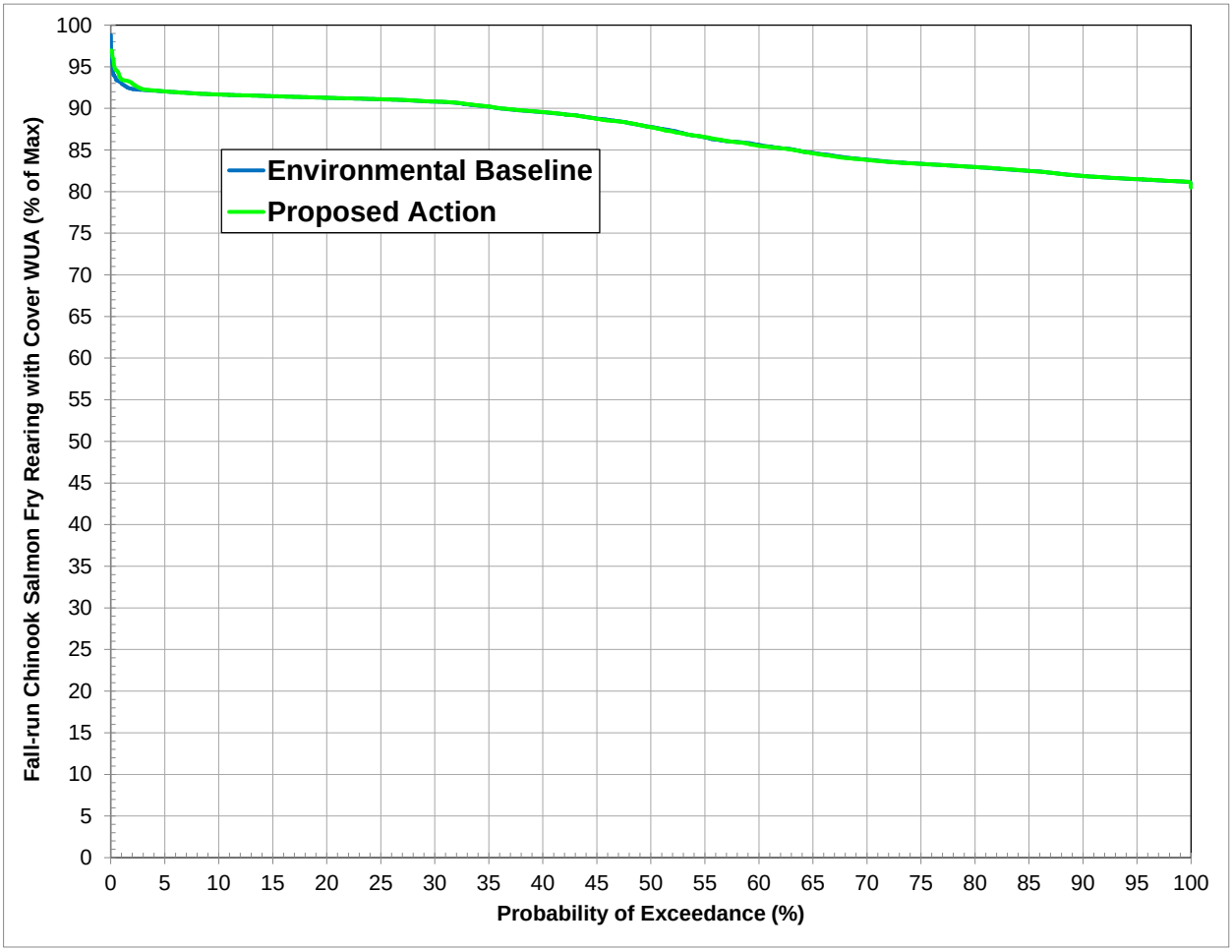


**Figure 8.3-4. Fall-run Chinook salmon fry in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.**

During the fry rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), 92.6 percent of fall-run Chinook salmon fry rearing maximum WUA was provided under the Proposed Action compared to 90.4 percent provided under the Environmental Baseline.

### Spring-run Chinook Salmon Juvenile In-channel Rearing Habitat

Table 8.3-21 displays the long-term average and average by WYT spring-run Chinook salmon juvenile in-channel rearing habitat (percent of maximum WUA) under the Proposed Action and Environmental Baseline. During the year-round spring-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 41-year simulation period for the Proposed Action, and about 10 percent of the days under the Environmental Baseline. These days were excluded from the spring-run Chinook salmon juvenile in-channel rearing WUA analysis.

**Table 8.3-21. Long-term and WYT average spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Proposed Action | 96.5 | 95.6 | 95.7 | 96.4 | 97.5 | 97.8 |
| Environmental Baseline | 96.3 | 95.5 | 95.7 | 96.4 | 97.5 | 97.1 |
| Difference | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.7 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Over the entire 41-year simulation period, long-term average juvenile in-channel rearing habitat availability in the lower Yuba River is similar under the Proposed Action and Environmental Baseline (long-term average of 96.5% and 96.3% of the maximum WUA, respectively). The Proposed Action and Environmental Baseline also result in similar amounts of WUA by WYT, but the Proposed Action provides slightly more habitat (0.7%) during critical WYs. Both the Proposed Action and Environmental Baseline provide over 80 percent (and even 90%) of juvenile in-channel rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon juvenile in-channel rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-5. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over nearly the entire distribution. The Proposed Action and Environmental Baseline achieve over 80 percent (and even 90%) of juvenile in-channel rearing maximum WUA with about a 99 percent probability.

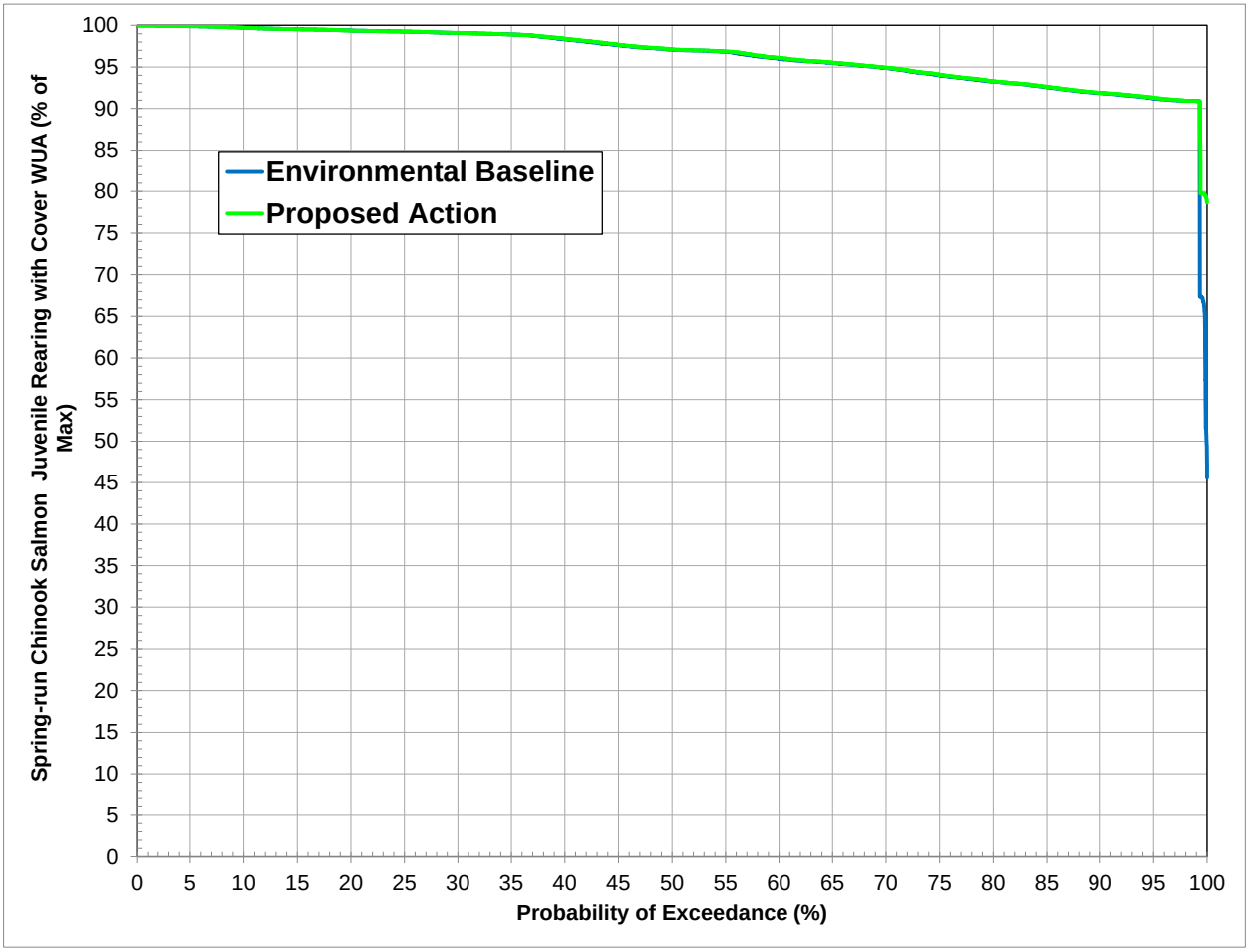


**Figure 8.3-5. Spring-run Chinook salmon juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.**

During the juvenile rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), 94.9 percent of spring-run Chinook salmon maximum juvenile rearing WUA was provided under the Proposed Action compared to 89.0 percent provided under the Environmental Baseline.

### Fall-run Chinook Salmon Juvenile In-channel Rearing Habitat

Table 8.3-22 displays the long-term average and average by WYT fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline. During the mid-January through June fall-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 20 percent of the days over the 41-year simulation period for both the Proposed Action and the Environmental Baseline. These days were excluded from the fall-run Chinook salmon juvenile in-channel rearing WUA analysis.

Over the entire 41-year simulation period, long-term average juvenile rearing habitat availability (WUA) in the lower Yuba River is the same under the Proposed Action and Environmental

Baseline (long-term average of 95.0 percent of the maximum WUA). The Proposed Action and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Proposed Action and Environmental Baseline provide over 80 percent (and even 90%t) of fall-run Chinook salmon juvenile in-channel rearing maximum WUA during all WYTs.

**Table 8.3-22. Long-term and WYT average fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Proposed Action and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Proposed Action | 95.0 | 93.5 | 93.5 | 94.2 | 96.2 | 97.5 |
| Environmental Baseline | 95.0 | 93.5 | 93.5 | 94.2 | 96.3 | 97.5 |
| Difference | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Habitat durations for fall-run Chinook salmon juvenile in-channel rearing under the Proposed Action and Environmental Baseline is presented in Figure 8.3-6. The Proposed Action and Environmental Baseline provide very similar amounts of habitat over the entire distribution. The Proposed Action and Environmental Baseline achieve over 80 percent (and even 90%) of juvenile in-channel rearing maximum WUA with about a 99 percent probability.

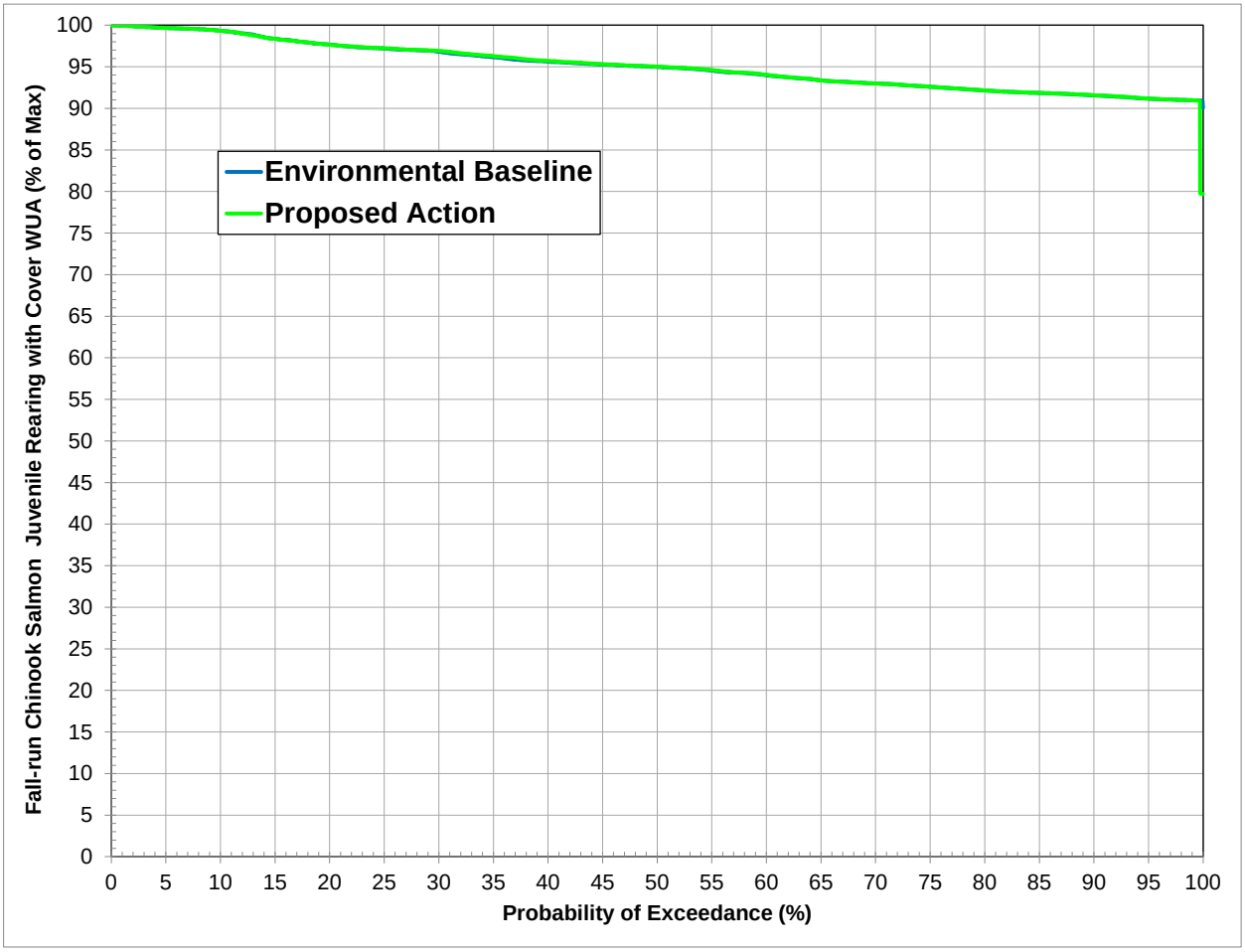


**Figure 8.3-6. Fall-run Chinook salmon juvenile in-channel rearing habitat duration over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.**

During the juvenile rearing season of the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), 95.9 percent of fall-run Chinook salmon juvenile rearing maximum WUA was provided under the Proposed Action compared to 96.7 percent provided under the Environmental Baseline.

### Spring-run Chinook Salmon Fry Full-Flow Rearing Habitat

Table 8.3-23 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

**Table 8.3-23. Spring-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Proposed Action** | | | | | | |
| **Total Days in Analysis** | **3,772** | **1,380** | **552** | **644** | **460** | **736** |
| Days ≤ 5,000 cfs | 3,298 | 959 | 507 | 639 | 458 | 735 |
| Days > 5,000 cfs | 474 | 421 | 45 | 5 | 2 | 1 |
| **Avg. WUA** | **154.4** | **58.1** | **22.4** | **25.3** | **18.3** | **30.3** |
| WUA ≤ 5,000 cfs | 131.1 | 37.4 | 20.2 | 25.1 | 18.2 | 30.2 |
| WUA > 5,000 cfs | 23.3 | 20.7 | 2.2 | 0.2 | 0.1 | 0.0 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **3,772** | **1,380** | **552** | **644** | **460** | **736** |
| Days ≤ 5,000 cfs | 3,317 | 979 | 506 | 639 | 458 | 735 |
| Days > 5,000 cfs | 455 | 401 | 46 | 5 | 2 | 1 |
| **Avg. WUA** | **154.3** | **58.0** | **22.3** | **25.3** | **18.3** | **30.3** |
| WUA ≤ 5,000 cfs | 131.8 | 38.1 | 20.1 | 25.1 | 18.2 | 30.2 |
| WUA > 5,000 cfs | 22.5 | 19.9 | 2.3 | 0.2 | 0.1 | 0.0 |
| **Differences** | | | | | | |
| **Avg. WUA** | **0.1** | **0.1** | **0.1** | **0.0** | **-0.1** | **0.0** |
| **% change** | **0.1%** | **0.2%** | **0.3%** | **0.0%** | **-0.4%** | **0.0%** |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification
[2] Based on the WY 1970-2010 simulation period.

For the entire simulation period, very similar amounts of fry rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in similar amounts of fry rearing habitat for all WYTs.

Long-term average of fall-run Chinook salmon fry weighted usable area (WUA) without cover, in acres, under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation and relative contribution to the long-term average of days when flows were ≤ 5,000 cfs and days when flows were > 5,000 cfs for the full simulation period and by water year type and the differences between the two scenarios.

Figure 8.3-7 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline s. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional fry rearing WUA is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.

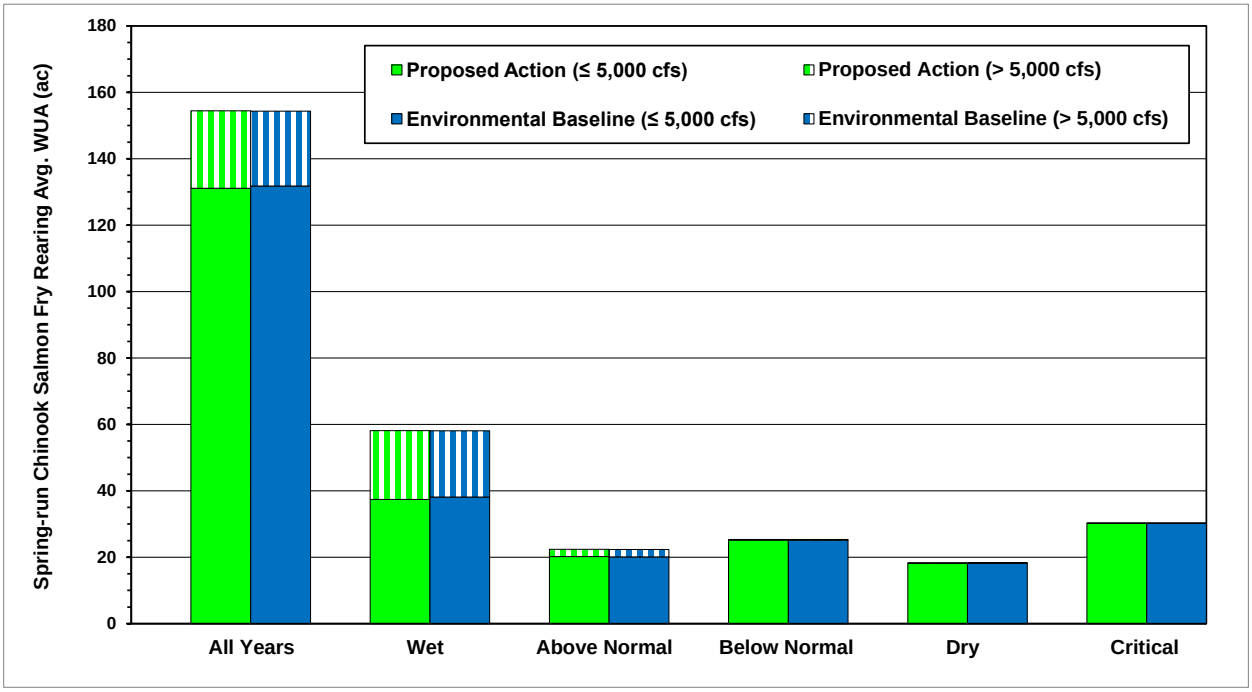


**Figure 8.3-7. Comparison of the amounts (in acres) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.**

### Fall-run Chinook Salmon Fry Full-Flow Rearing Habitat

Table 8.3-24 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

For the entire simulation period, very similar amounts of fry rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in similar amounts of fry rearing habitat for all WYTs.

**Table 8.3-24. Fall-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Proposed Action** | | | | | | |
| **Total Days in Analysis** | **5,586** | **2,043** | **817** | **954** | **681** | **1,091** |
| Days ≤ 5,000 cfs | 4,489 | 1,151 | 686 | 887 | 678 | 1,087 |
| Days > 5,000 cfs | 1,097 | 892 | 131 | 67 | 3 | 4 |
| **Avg. WUA** | **152.0** | **59.2** | **21.5** | **24.3** | **17.3** | **29.7** |
| WUA ≤ 5,000 cfs | 116.0 | 29.5 | 17.4 | 22.3 | 17.2 | 29.6 |
| WUA > 5,000 cfs | 36.0 | 29.6 | 4.1 | 2.1 | 0.1 | 0.1 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **5,586** | **2,043** | **817** | **954** | **681** | **1,091** |
| Days ≤ 5,000 cfs | 4,493 | 1,154 | 686 | 888 | 678 | 1,087 |
| Days > 5,000 cfs | 1,093 | 889 | 131 | 66 | 3 | 4 |
| **Avg. WUA** | **152.0** | **59.1** | **21.5** | **24.3** | **17.4** | **29.7** |
| WUA ≤ 5,000 cfs | 116.1 | 29.5 | 17.4 | 22.3 | 17.3 | 29.6 |
| WUA > 5,000 cfs | 35.9 | 29.6 | 4.1 | 2.0 | 0.1 | 0.1 |
| **Differences** | | | | | | |
| **Avg. WUA** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.1** | **0.0** |
| **% change** | **0.0%** | **0.1%** | **0.0%** | **0.1%** | **-0.4%** | **0.1%** |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-8 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon fry WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional fry rearing WUA is provided by days when flows were > 5,000 cfs for dry and critical WYTs.

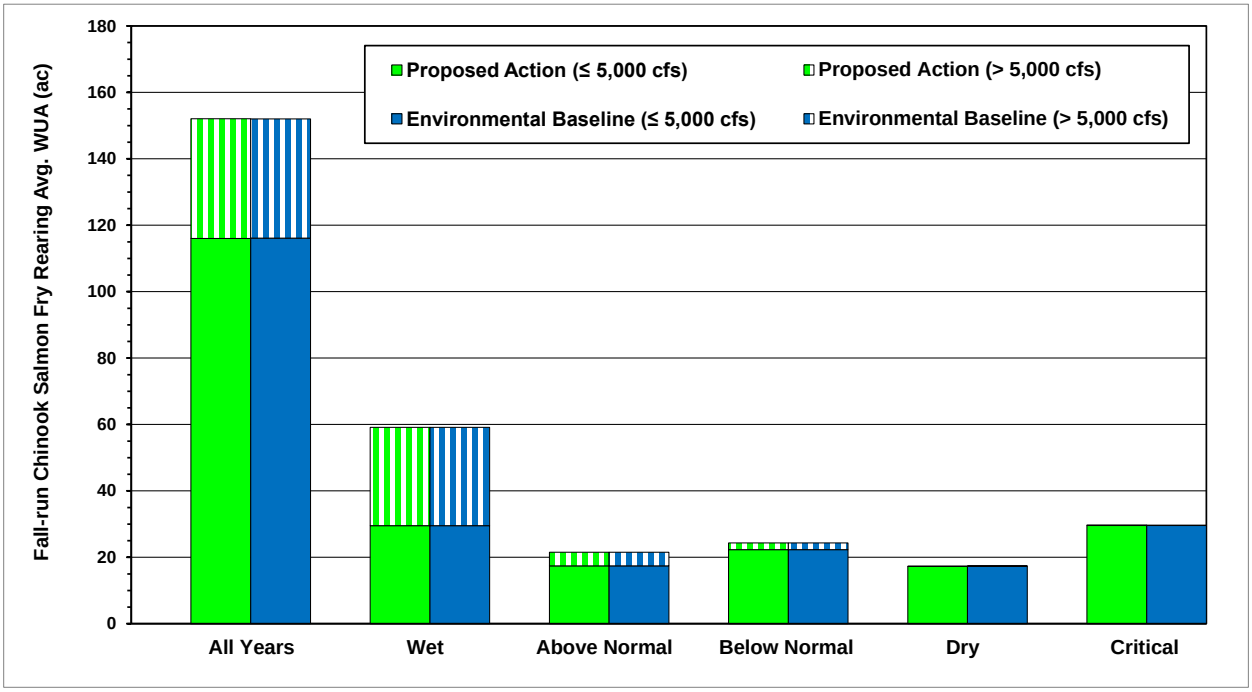


**Figure 8.3-8. Comparison of the amounts (in acres) of fall-run Chinook salmon fry weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.**

## Spring-run Chinook Salmon Juvenile Full-Flow Rearing Habitat

Table 8.3-25 displays the full-flow analysis of the amounts (ac) of spring-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. For the entire simulation period, similar amounts of juvenile rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in very similar amounts of juvenile rearing habitat for all WYTs, with the exception of critical WYs when 0.8 percent more habitat is provided under the Proposed Action.

**Table 8.3-25. Spring-run Chinook salmon juvenile weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Proposed Action** | | | | | | |
| **Total Days in Analysis** | **14,974** | **5,477** | **2,191** | **2,557** | **1,826** | **2,923** |
| Days ≤ 5,000 cfs | 13,387 | 4,175 | 2,002 | 2,468 | 1,823 | 2,919 |
| Days > 5,000 cfs | 1,587 | 1,302 | 189 | 89 | 3 | 4 |
| **Avg. WUA** | **253.8** | **92.5** | **35.9** | **42.7** | **31.4** | **51.3** |
| WUA ≤ 5,000 cfs | 223.8 | 67.5 | 32.6 | 41.1 | 31.4 | 51.3 |
| WUA > 5,000 cfs | 30.0 | 25.0 | 3.3 | 1.5 | 0.0 | 0.1 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **14,974** | **5,477** | **2,191** | **2,557** | **1,826** | **2,923** |
| Days ≤ 5,000 cfs | 13,411 | 4,198 | 2,003 | 2,468 | 1,823 | 2,919 |
| Days > 5,000 cfs | 1,563 | 1,279 | 188 | 89 | 3 | 4 |
| **Avg. WUA** | **253.3** | **92.4** | **35.9** | **42.6** | **31.4** | **50.9** |
| WUA ≤ 5,000 cfs | 223.7 | 67.8 | 32.6 | 41.1 | 31.4 | 50.8 |
| WUA > 5,000 cfs | 29.6 | 24.6 | 3.3 | 1.5 | 0.0 | 0.1 |
| **Differences** | | | | | | |
| **Avg. WUA** | **0.5** | **0.1** | **0.0** | **0.0** | **0.0** | **0.4** |
| **% change** | **0.2%** | **0.1%** | **0.0%** | **0.0%** | **-0.1%** | **0.8%** |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-9 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional juvenile rearing WUA is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.

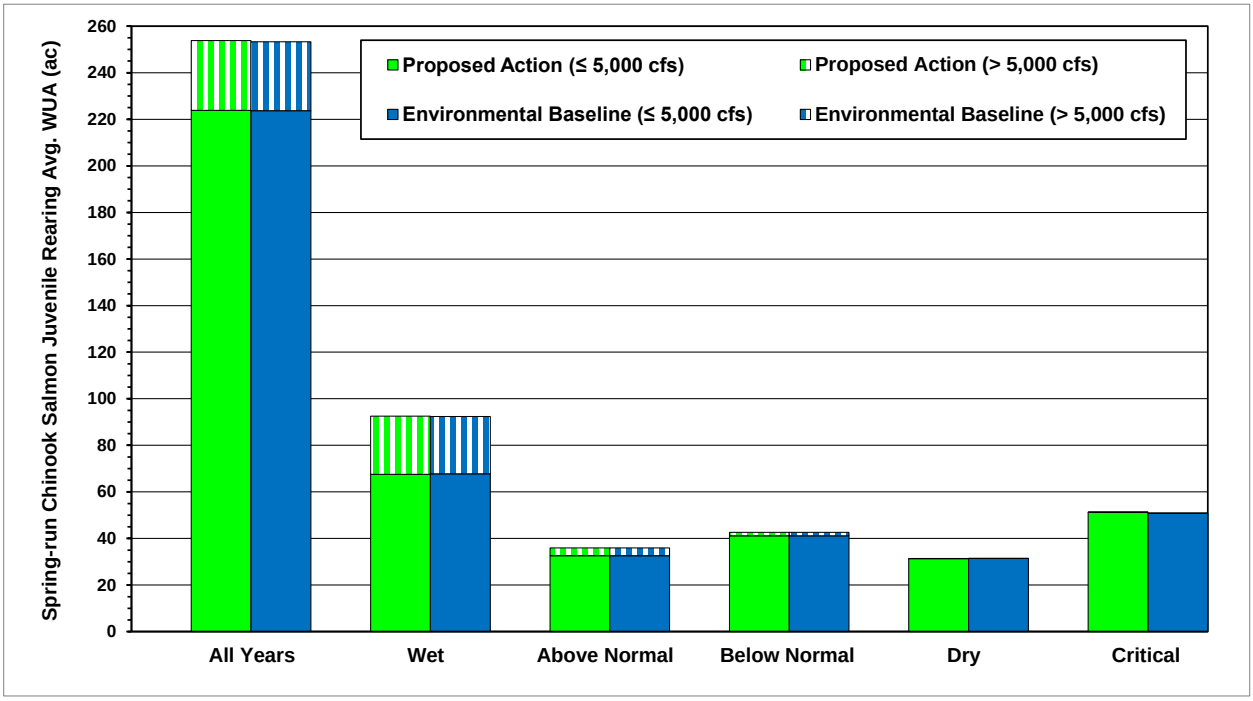


**Figure 8.3-9. Comparison of the amounts (in acres) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.**

## Fall-run Chinook Salmon Juvenile Full-Flow Rearing Habitat

Table 8.3-26 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. For the entire simulation period, similar amounts of juvenile rearing habitat (total WUA) are available under the Proposed Action and the Environmental Baseline. Relative to the Environmental Baseline, the Proposed Action results in similar amounts of juvenile rearing habitat for all WYTs.

**Table 8.3-26. Fall-run Chinook salmon juvenile weighted usable area (WUA) without cover (in acres) under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Proposed Action** | | | | | | |
| **Total Days in Analysis** | **6,816** | **2,493** | **997** | **1,164** | **831** | **1,331** |
| Days ≤ 5,000 cfs | 5,475 | 1,422 | 820 | 1,078 | 828 | 1,327 |
| Days > 5,000 cfs | 1,341 | 1,071 | 177 | 86 | 3 | 4 |
| **Avg. WUA** | **246.6** | **91.6** | **33.8** | **40.2** | **30.3** | **50.7** |
| WUA ≤ 5,000 cfs | 191.3 | 46.6 | 27.0 | 36.9 | 30.2 | 50.5 |
| WUA > 5,000 cfs | 55.3 | 45.0 | 6.8 | 3.3 | 0.1 | 0.2 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **6,816** | **2,493** | **997** | **1,164** | **831** | **1,331** |
| Days ≤ 5,000 cfs | 5,474 | 1,420 | 821 | 1,078 | 828 | 1,327 |
| Days > 5,000 cfs | 1,342 | 1,073 | 176 | 86 | 3 | 4 |
| **Avg. WUA** | **246.4** | **91.5** | **33.8** | **40.2** | **30.3** | **50.7** |
| WUA ≤ 5,000 cfs | 191.2 | 46.5 | 27.0 | 36.9 | 30.2 | 50.5 |
| WUA > 5,000 cfs | 55.2 | 45.0 | 6.8 | 3.3 | 0.1 | 0.2 |
| **Differences** | | | | | | |
| **Avg. WUA** | **0.1** | **0.1** | **0.0** | **0.0** | **-0.1** | **0.1** |
| **% change** | **0.1%** | **0.1%** | **0.1%** | **0.1%** | **-0.2%** | **0.1%** |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification
[2] Based on the WY 1970-2010 simulation period.

Figure 8.3-10 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon juvenile WUA without cover under the Proposed Action and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to above normal and from below normal to dry WYTs, and increasing amounts were provided for below normal and critical WYTs. For both the Proposed Action and Environmental Baseline, relatively little additional juvenile rearing WUA is provided by days when flows were > 5,000 cfs for dry and critical WYTs.

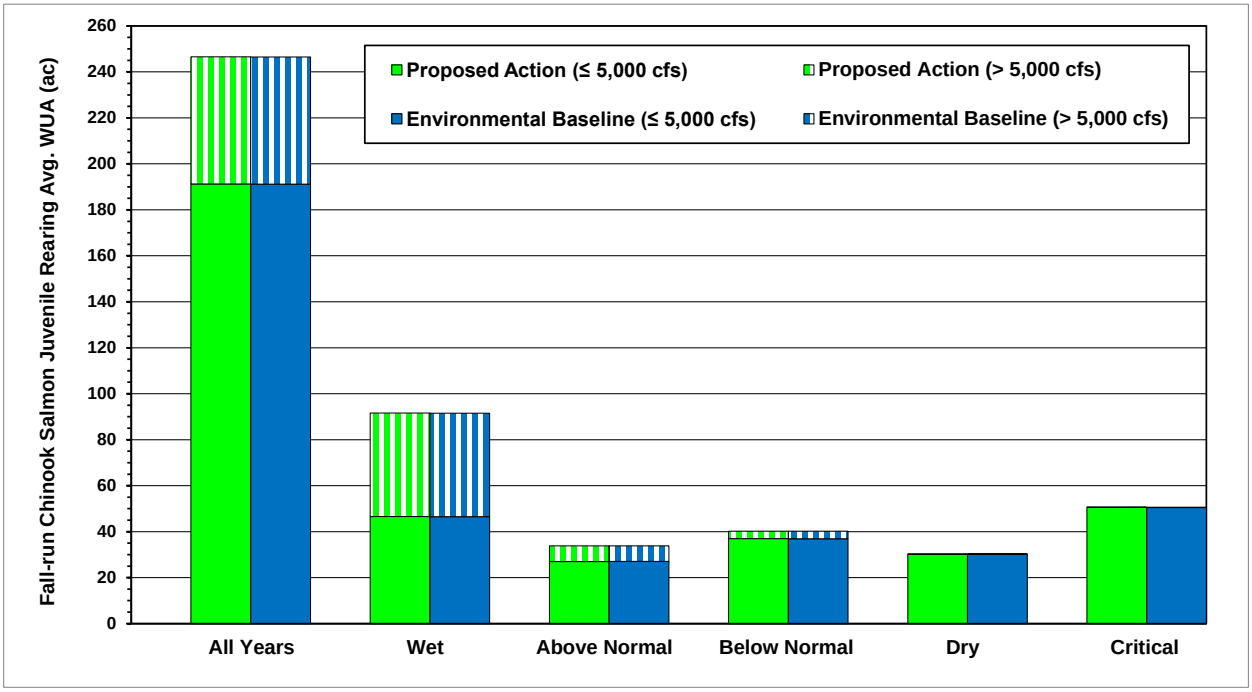


**Figure 8.3-10. Comparison of the amounts (in acres) of fall-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Proposed Action and the Environmental Baseline over the 41-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.**

## Fry and Juvenile Rearing Habitat as Stressors

Chinook salmon flow-dependent fry and juvenile rearing habitat availability under the Proposed Action is very similar to that under the Environmental Baseline. Flow-dependent fry and juvenile rearing habitat availability under the Proposed Action represents a low stressor to spring-run and fall-run Chinook salmon.

As a stressor, flow-dependent rearing habitat availability is distinct from rearing habitat physical structure. The geomorphic conditions caused by hydraulic and dredge mining since the mid-1800s, and the construction of Englebright Dam, continue to limit habitat complexity and diversity in the lower Yuba River. Physical habitat structure components providing instream object and overhead cover, as well as high channel sinuosity and hydraulic complexity, can be generally characterized as limited in the lower Yuba River.

Restricted availability of complex, diverse habitats associated with the loss of natural river morphology and function, combined with limited availability of physical habitat structure components providing instream and overhead object cover, continues to be a high stressor to rearing juvenile anadromous salmonids. Fry and juvenile rearing physical habitat structure under the Environmental Baseline is a high stressor to Yuba River Chinook salmon, and will remain a high stressor under the various scenarios evaluated in this Applicant-Prepared Draft EFH Assessment, including the Proposed Action.

### 8.3.2.2 Fry Stranding and Juvenile Isolation

#### 8.3.2.2.1 Fry Stranding

Lower Yuba River flows during the winter and spring are often uncontrolled, and stranding of spring-run and fall-run Chinook salmon fry and juveniles can occur naturally during periods of uncontrolled runoff and spills, either through uncontrolled flow fluctuations or as runoff subsides and flows drop to controllable levels. In addition to existing flow fluctuation and ramping rate restrictions, it is expected that under the Proposed Action, the potential for fry and juvenile stranding will be further minimized associated with implementation of Proposed Condition AR9, Control Project Ramping and Flow Fluctuations Downstream of Englebright Dam.

The proposed decrease in the maximum authorized ramping rate for flow reductions, from 500 cfs per hour under YCWA's current FERC license, to 200 cfs per hour under the Proposed Action, is anticipated to minimize potential effects to juvenile salmonids associated with stranding in the lower Yuba River.

#### 8.3.2.2.2 Juvenile Isolation

The proposed lower maximum authorized ramping rate for flow reductions under the Proposed Action also is anticipated to reduce the potential for juvenile isolation in the lower Yuba River, relative to the Environmental Baseline. The lower maximum authorized ramping rate may better allow juvenile salmonids to volitionally move out of off-channel areas, with the more gradual reductions in flow rates under the Proposed Action.

Figure 8.3-11 displays the annual average number of off-channel areas (as a percentage of the total number of off-channel areas) that experience n isolation events in the entire lower Yuba River for the Proposed Action and Environmental Baseline, for all water years combined (i.e., long-term average), and for wet, above normal, below normal, dry and critical WYs. Examination of all water years and averages by WYT indicates that the relative frequency of isolation events under the Proposed Action and Environmental Baseline are very similar. For all WYs combined, a slightly lower percentage of all identified off-channel areas in the lower Yuba River do not experience and isolation event under the Proposed Action (38.7%) compared to the Environmental Baseline (39.0%). Similar average percentages of all off-channel areas in the lower Yuba River experience 1 or 3 isolation events (about 9 and 13%, respectively) under both the Proposed Action and Environmental Baseline. The Environmental Baseline results in about 14 percent of all off-channel areas experiencing 2 isolation events compared to about 13 percent under the Proposed Action. Both the Environmental Baseline and the Proposed Action result in low percentages of all off-channel areas experiencing 4 or more isolation events. The frequencies of isolation events generally decrease from wetter to drier WYTs under both the Proposed Action and Environmental Baseline.

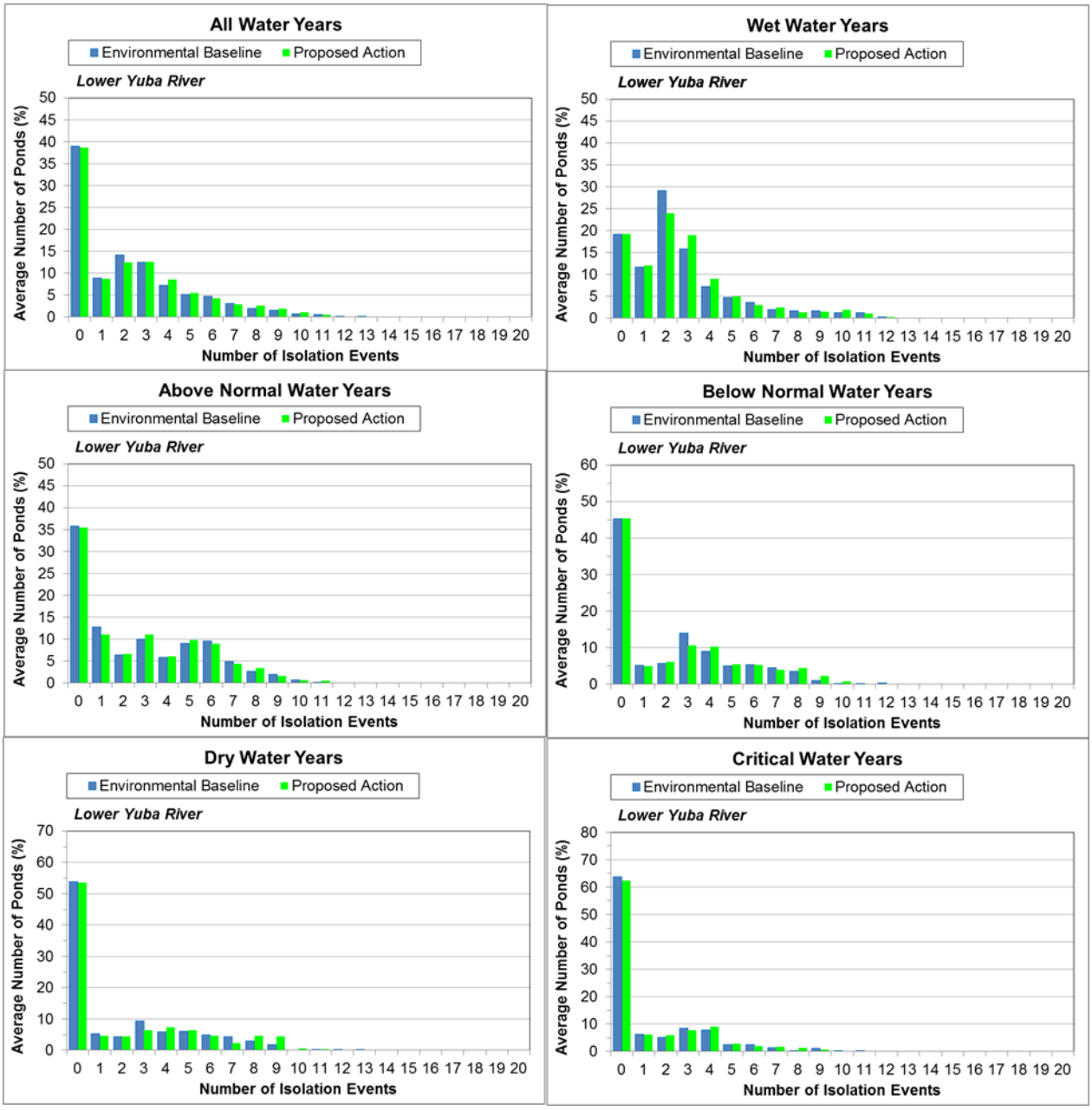


**Figure 8.3-11. Average percent of all off-channel areas in the lower Yuba River experiencing the specified number of isolation events over the 41-year hydrologic period for the Proposed Action and Environmental Baseline.**

It should be noted that these results are only an indicator of the potential for off-channel stranding of juvenile salmonids. As previously discussed, some off-channel areas may pose hazards to juveniles, while other off-channel areas may benefit juvenile growth and long-term survival, depending on many factors.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), the frequencies of isolation events is very similar under the Proposed Action and Environmental Baseline.

Under the Environmental Baseline, fry and juvenile stranding is a stressor of low to medium magnitude to Chinook salmon. Because the Proposed Action is anticipated to reduce the potential for stranding and isolation, the Proposed Action is expected to reduce the magnitude of this stressor, the potential "exposure" of Chinook salmon to this stressor, and the effects of this stressor on Chinook salmon. Therefore, this stressor is expected to be reduced to a low magnitude to Chinook salmon in the lower Yuba River under the Proposed Action. In addition, both the Proposed Action and Environmental Baseline result in less frequent isolation events compared to the Without-Project.

#### 8.3.2.3 Water Temperature

8.3.2.3.1 Proposed Action Compared to the Environmental Baseline

**Spring-run Chinook Salmon**

Table 8.3-27 displays the differences in spring-run Chinook salmon lifestage-specific upper tolerable WTI value exceedance probabilities under the Proposed Action relative to the Environmental Baseline (i.e., the probability of exceeding a WTI value under the Proposed Action minus the probability of exceeding that WTI value under the Environmental Baseline).

Upper tolerable WTI exceedance probabilities are generally similar under the Proposed Action and Environmental Baseline during the fall through spring months (i.e., October through May) for all lifestages of spring-run Chinook salmon. Some differences in simulated water temperatures occur during the spring-run Chinook salmon adult holding, and juvenile rearing and downstream movement lifestages. For all months of the year, no lifestage-specific upper tolerable WTI values are exceeded more often with a 10 percent or greater probability at any of the three evaluated locations under the Proposed Action, relative to the Environmental Baseline.

**Table 8.3-27. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon lifestages under the Proposed Action relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration | SMRT | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | Below DPD | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | -0.5 | -1.4 | -1.5 | -0.3 | -1.6 | -2.3 | | | | | | |
| | MRY | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 0.3 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| Adult Holding | SMRT | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | Below DPD | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.2 | | | | | | |
| | MRY | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.8 | 1.1 | 2.6 | 4.4 | 3.5 | 2.8 | 3.2 | 2.3 | 0.3 | | | | | | |
| Spawning | SMRT | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | | | | | |
| Embryo Incubation | SMRT | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| Juvenile Rearing and Downstream Movement | Below DPD | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.2 | -1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MRY | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 1.1 | 2.6 | 4.4 | 3.5 | 2.8 | 3.2 | 2.3 | 0.3 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yearling+ Smolt Emigration | Below DPD | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MRY | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

During the adult holding period extending from late May through mid-September, water temperatures at the Marysville gage are slightly higher somewhat more often under the Proposed Action compared to the Environmental Baseline. However, as previously discussed, adult spring-run Chinook salmon do not spend extended periods of time at downstream locations (e.g., Marysville), and they primarily exhibit holding behavior just downstream of Daguerre Point Dam or above Daguerre Point Dam.

During the juvenile rearing and downstream movement lifestage, which extends year-round, water temperatures during the summer at the Marysville gage are slightly higher somewhat more often under the Proposed Action compared to the Environmental Baseline. However, over the 2006-2016 monitoring period, measured water temperatures at Marysville have rarely exceeded the upper tolerable WTI value of 65°F for juvenile rearing and downstream movement, with the exception of two days during 2013, 23 days during 2014, and during approximately June through September 2015 (after a multi-year drought) at the Marysville gage. As previously discussed, it is not expected that juvenile spring-run Chinook salmon would spend extended periods of time at downstream locations (e.g., Marysville), and juvenile Chinook salmon primarily rear where water temperatures are suitable in more upstream reaches of the lower Yuba River (RMT 2013a). Also, exposure of downstream migrating juveniles during summer months to water temperatures at Marysville would not be expected to substantially occur, because only minimal outmigration occurs during the summer, and because rearing temperatures further upstream in this reach below Daguerre Point Dam are suitable.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), water temperature differences between the Proposed Action and the Environmental Baseline demonstrate similar patterns among the three evaluation locations (Smartsville, Daguerre Point Dam and Marysville). Water temperatures under the Proposed Action and Environmental Baseline are very similar (generally within about 1% or less) most of the time from October through August at Smartsville, from October through mid-June at Daguerre Point

Dam, and from October through mid-June at Marysville. At Smartsville, water temperatures under the Proposed Action become slightly warmer (about 1°F) during the first half of July and slightly cooler (approximately 1-2°F) during late June and September than those under the Environmental Baseline. At Daguerre Point Dam, water temperatures under the Proposed Action are slightly cooler during early April (about 1-2.5°F), are slightly warmer during late June (about 1°F), and generally become increasingly cooler from July through September, particularly during September when water temperatures are about 3 to 6°F (about 4 to 9%) cooler, relative to the Environmental Baseline. At Marysville, water temperatures are slightly warmer (about 1°F) during late March, are cooler (about 1-4°F) during the first half of April, are warmer (about 3-4°F) during late June, and become increasingly cooler under the Proposed Action from July through September, with temperatures under the Proposed Action ranging from about 4 to 12°F (about 6 to 14%) cooler than the Environmental Baseline. These cooler water temperatures under the Proposed Action would be more suitable water temperatures during the summer, which includes portions of the spring-run Chinook salmon adult immigration and holding, spawning, and juvenile rearing and downstream movement lifestages.

Under the Environmental Baseline, water temperatures are a low stressor to Yuba River spring-run Chinook salmon. Although relatively minor increases in simulated water temperatures with relatively low probabilities of occurrence are estimated to occur under the Proposed Action relative to the Environmental Baseline, this stressor remains characterized as low under the Proposed Action.

## Fall-run Chinook Salmon

Table 8.3-28 displays the differences in fall-run Chinook salmon lifestage-specific upper tolerable WTI value exceedance probabilities under the Proposed Action relative to the Environmental Baseline (i.e., the probability of exceeding a WTI value under the Proposed Action minus the probability of exceeding that WTI value under the Environmental Baseline).

**Table 8.3-28. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon lifestages under the Proposed Action relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration and Staging | Below DPD | 68°F | | | | | | | | | | | | | -0.5 | -1.4 | -1.5 | -0.3 | -1.6 | -2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MRY | 68°F | | | | | | | | | | | | | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Spawning | SMRT | 58°F | | | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| | Below DPD | 58°F | | | | | | | | | | | | | | | | | | | 3.9 | 0.9 | 0.2 | 0.0 | 0.0 | 0.0 |
| Embryo Incubation | SMRT | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| | Below DPD | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 3.9 | 0.9 | 0.2 | 0.0 | 0.0 | 0.0 |
| Juvenile Rearing and Downstream Movement | Below DPD | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.5 | | | | | | | | | | | | 0.0 |
| | MRY | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 1.1 | 2.6 | | | | | | | | | | | | 0.0 |

Water temperature exceedance probabilities are generally similar under the Proposed Action and Environmental Baseline during all half-month periods of the year evaluated for lifestages of fall-run Chinook salmon. Slight increases in upper tolerable WTI exceedance probabilities occur during June of the juvenile rearing and downstream movement lifestage at Marysville, and during early October of the spawning and embryo incubation lifestages at Daguerre Point Dam. However, as previously discussed, fall-run Chinook salmon are primarily observed spawning during October in the upper reaches (upstream of Daguerre Point Dam) in the lower Yuba River. Spawning fall-run Chinook salmon begin expanding their spatial distribution further downstream in later fall months as suitable temperatures become available near or downstream of Daguerre Point Dam (RMT 2013a).

As previously described for spring-run Chinook salmon, during the one conference year (WY 1977) in the simulated period of evaluation (WY 1970-2010), water temperature differences between the Proposed Action and the Environmental Baseline have similar patterns among the three evaluation locations. Under the Proposed Action, lower water temperatures at Daguerre Point Dam and Marysville would be more suitable water temperatures during the summer, which includes portions of the fall-run Chinook salmon adult immigration and staging lifestage.

Under the Environmental Baseline, water temperatures are a low stressor to Yuba River spring-run and fall-run Chinook salmon. Although relatively minor increases and decreases in simulated water temperatures with relatively low probabilities of occurrence are estimated to occur under the Proposed Action relative to the Environmental Baseline, this stressor remains characterized as low for Chinook salmon under the Proposed Action.

#### 8.3.2.4 Narrows 2 Operations and Fish Movement

The Proposed Action includes changes to Narrows 2 operations involving the previously described changes to conference year flows, flow fluctuation criteria and coordinated operations of the Narrows Project. Potential effects associated with Narrows 2 operations include redd dewatering and fry and juvenile stranding and isolation, as discussed above. The potential expressions of stressors (i.e., redd dewatering, fry and juvenile stranding and isolation, changes in flows and water temperatures, and flow-dependent habitat conditions) associated with Narrows 2 operations are evaluated independently.

Project FERC relicensing studies (Technical Memorandum 7-11, *Fish Behavior and Hydraulics Near Narrows 2 Powerhouse,* 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) conducted to date indicate that adult anadromous salmonids (presumably including spring-run Chinook salmon) have not been observed entering the draft tube of Narrows 2. Additional analyses regarding Narrows 2 operations and fish movement prepared for this Applicant-Prepared Draft BA indicate that Narrows 2 flow releases do not appear to adversely influence adult spring-run Chinook salmon upstream migration, holding or spawning in the Yuba River upstream of Daguerre Point Dam. Potential effects appear to be localized to the proximate vicinity of Narrows 2 facilities. Technical Memorandum 7-11a, *Radio Telemetry Study of Spring- and Fall-run Chinook Salmon Downstream of Narrows 2 Powerhouse* (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) examined fine-scale movements of adult Chinook salmon in the Yuba River downstream of the Narrows 2 Powerhouse to just upstream of the Narrows 1 Powerhouse. Acoustic telemetry was used to track adult Chinook salmon from August until late October of 2015 under two operational conditions; flow from the Full Bypass, and no discharge from any Narrows 2 facilities. GIS analysis of fish positions indicated little difference in fish behavior between the two operational conditions (i.e., none of the Narrows 2 Facilities operating, and only the Full Bypass operating) observed. Based on the studies conducted for Technical Memorandum 7-11/7-11a, it is apparent that the conditions present in the vicinity of the Narrows 2 Powerhouse, while variable and often dynamic, are within the boundaries of adult Chinook salmon tolerance.

Potential effects to adult Chinook salmon appear to be localized to the proximate vicinity of the Narrows 2 facilities. Narrows 2 operations have the potential to adversely affect adult Chinook salmon holding. There have been observations of adult Chinook salmon apparently confined in an isolated pool in the channel near Narrows 2 Powerhouse. Measures have been taken to physically restructure the potential isolation areas, and monitoring, reporting and fish rescue procedures have been developed. Under the Environmental Baseline, Narrows 2 operations are characterized as a low stressor, and would remain a low stressor to adult Chinook salmon under the Proposed Action.

#### 8.3.2.4.1 Riparian Habitat and Instream Cover (Riparian Vegetation, Instream Woody Material)

The Amended FLA includes a condition to limit the amount of flow reduction (2.5 cm/day) from one day to the next to promote riparian vegetation seedling establishment during the period of April 1 through July 15. The initiation of this period (April 1) was established based upon the USFWS/Cal Fish and Wildlife (October 2015) proposal. The July 15 ending date was established based on the date after which uncontrolled flows would not be expected to occur each year (i.e., no storm-induced precipitation or snowmelt runoff requiring ramp-down). Reedy et al. (2016) identified a maximum recession rate of 2.5 cm/day, citing recommendations by Mahoney and Rood (1998) and Stella et al. (2006), for riparian vegetation seedling establishment.

The flow reduction measure applies to day-to-day release reductions when the previous day's flow is at or below 4,130 cfs, which is the combined release capacity of the Narrows 2 and Narrows 1 powerhouses, as measured at the Smartsville gage. Table 8.3-29 specifies the maximum daily flow reductions during April 1 through July 15 that apply for specified ranges of previous day flow.

**Table 8.3-29. Allowable maximum flow reductions from the previous day average flow during the period extending from April 1 through July 15 (from Table 3 in AR9).**

| Previous Day Average Flow Range (cfs) | Maximum Flow Reduction (cfs) |
|---|---|
| 400 - 999 | 79 |
| 1,000 – 1,999 | 150 |
| 2,000 – 4,130 | 200 |

Daily flows under the Proposed Action and the Environmental Baseline were modeled over the entire simulation period (1970-2010). The Proposed Action includes all of the measures in the Amended FLA, including the riparian vegetation recession flow rate reduction limits.

Evaluation of stage change reductions were conducted for the Parks Bar Reach on the lower Yuba River. The Parks Bar Reach was selected as an indicator of stage change on the lower Yuba River because it: 1) is a relatively long reach (4.7 mi); 2) is located about mid-way between Englebright and Daguerre Point dams; and 3) exhibits an intermediate stage-discharge relationship relative to other reaches (Strom et al. 2016 as cited in Reedy et al. 2016).

Under the Environmental Baseline, day-to-day stage reductions of greater than 2.5 cm occurred during 346 days, compared to 279 days under the Proposed Action, out of the 4,346 days included in the period of evaluation (106 days per year for the 41-year simulation period). Therefore, the flow reduction rate limitation included in the Proposed Action resulted in a nearly 20 percent reduction in the number of days exceeding the 2.5 cm/day criterion. For context, the Without-Project would result in 822 days exceeding the 2.5 cm/day flow reduction criterion, or almost 3 times more days than the Proposed Action.

The flow reduction criteria are only implemented for a portion of the entire evaluation period, because managed releases only occur up to the combined capacity of Narrows 1 and Narrows 2, which is 4,130 cfs. Because the criterion is only applied on some of the days, stage reductions greater than the target maximum reduction of 2.5 cm/day still occur. Also, the criterion is applied at the Smartsville gage location, which is located just downstream of the Narrows 1 and Narrows 2 powerhouses. Downstream of the gage, Deer Creek flows, which are mostly unregulated, enter the lower Yuba River. Flow changes from this tributary affects the amount of stage change downstream in the Yuba River.

Figure 8.3-12 is an exceedance probability plot of the amount of stage reduction per day for the Proposed Action and the Environmental Baseline. The exceedance distributions demonstrate the probability of occurrence (percent) of stage reductions exceeding a specified daily amount. They include the full range of daily flow reduction rates (cm/day) and are not limited to days when flows are less than 4,130 cfs. Approximately 10 percent of the time the Proposed Action results in lower rates of flow reduction (cm/day) than the Environmental Baseline. From April 1 through July 15 over the 41-year evaluation period, the Proposed Action would result in a flow reduction rate of 2.5 cm/day or less about 89 percent of the time, compared to 86 percent of the time under the Environmental Baseline.

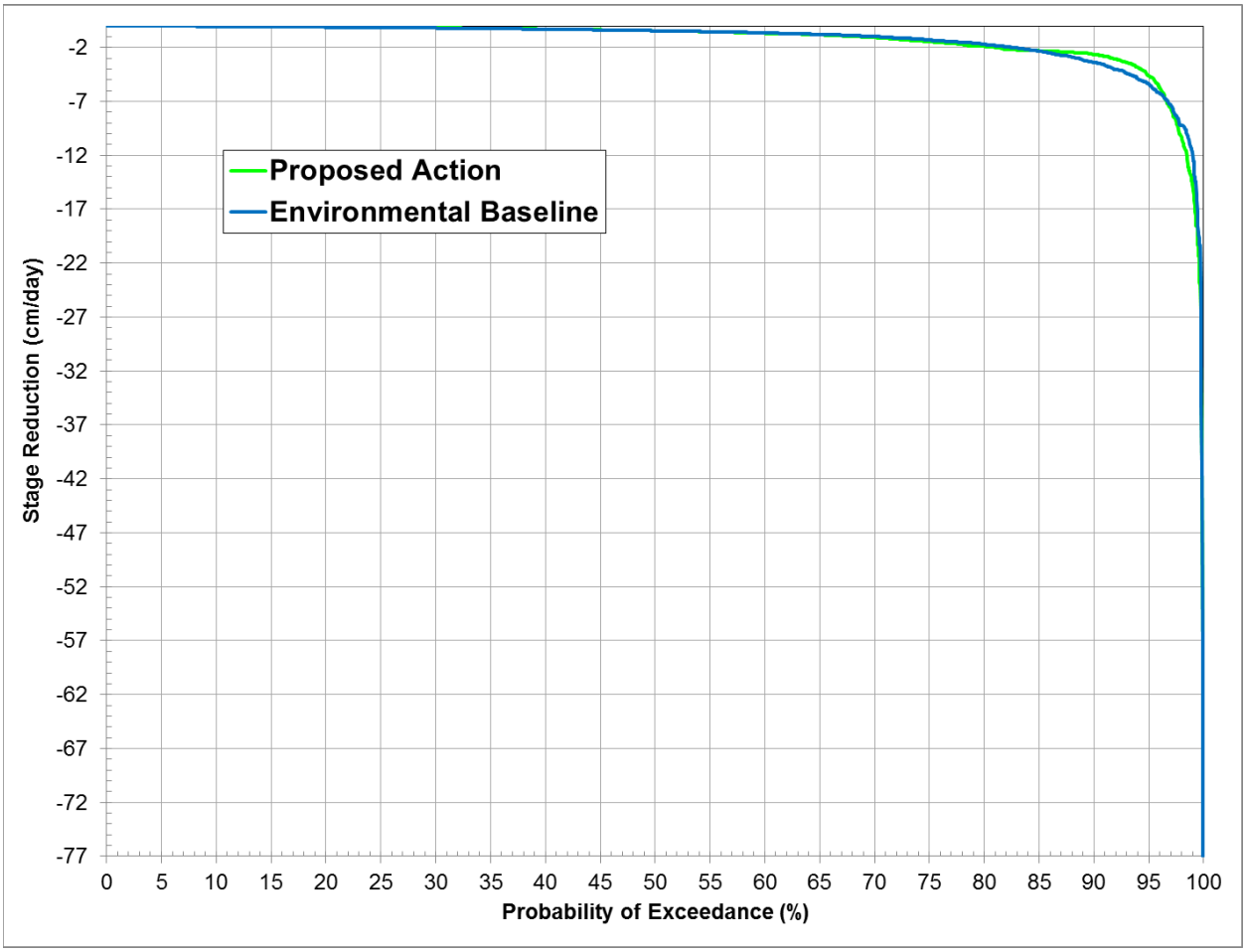


**Figure 8.3-12. Exceedance probability of specified daily stage reductions (cm/day) from April 1 through July 15 under the Proposed Action and the Environmental baseline over the 41-year period of evaluation.**

Riparian vegetation seedling establishment recession rates are somewhat improved under the Proposed Action relative to the Environmental Baseline. Because spring recession rates of 2.5 cm/day or less are estimated to occur about 89 percent of the time, riparian vegetation recession rates represent a low stressor under the Proposed Action.

Under the Environmental Baseline, riparian vegetation and LWM, related primarily to the historical effects of upstream hydraulic mining on the channel geomorphology, and the existence of multiple large dams upstream, provide reduced habitat complexity and diversity, which potentially limits the productivity of juvenile salmonids. The limited availability of riparian habitat and instream cover (in the form of LWM) is a stressor that is manifested every year. Consequently, it was concluded that riparian habitat and instream cover are a stressor of moderate to high magnitude to Yuba River juvenile spring-run Chinook salmon. Under the Proposed Action, implementation of YCWA's Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, is expected to eventually improve riparian vegetation recruitment by restricting flow reductions during the riparian

vegetation seedling establishment period to rates proposed by USFWS/Cal Fish and Wildlife (October 2015) of a stage decrease less than 2.5 cm/day. However, in consideration of the slight improvement to riparian vegetation establishment provided by Proposed Condition AR9, and in consideration of the timeframe required for riparian vegetation establishment, under the Proposed Action riparian habitat and instream cover would continue to represent a moderate to high stressor to juvenile spring-run Chinook salmon.

8.3.2.4.2 Other Stressors

Stressors and their magnitudes, other than those associated with flow-dependent effects described above, to Chinook salmon in the lower Yuba River are the same under the Proposed Action and the Environmental Baseline.

#### 8.3.2.5 Summary of EFH in the Yuba River Downstream of Englebright Dam

Overall, the Proposed Action will not eliminate, diminish, or disrupt EFH in the Yuba River downstream of Englebright Dam. The Proposed Action will not affect the potential exposure of Chinook salmon to stressors in the lower Yuba River under the existing conditions, nor will the Proposed Action change the magnitudes of existing stressors. Although climate change was identified as a new threat during the 2011 5-Year review (NMFS and PFMC 2011), effects on EFH that may result from climate change would not be attributable to the Proposed Action. Nevertheless, it is recognized that climate change will continue to be a stressor to EFH for Chinook salmon. Of the other 31 threats to Pacific salmon EFH identified in Amendment 14 of the FMP and the 2011 5-Year review, the Proposed Action may potentially affect EFH through changes in flows and water temperatures in the Yuba River downstream of Englebright Dam. However, flow and water temperature-related effects on EFH downstream of Englebright Dam associated with the Proposed Action are expected to result in non-substantive adverse effects, or beneficial effects.

## 8.4 Past, Present, and Reasonably Foreseeable Future Actions that Potentially Affect EFH in the Action Area (Cumulative Effects)

As defined in one of the EFH regulations, “cumulative impacts are impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time” (50 C.F.R. § 600.815(a)(5)).

This regulation goes on to state that the cumulative assessment should include an “assessment of the cumulative and synergistic effects of multiple threats, including the effects of natural stresses (such as storm damage or climate-based environmental shifts) and an assessment of the ecological risks resulting from the impact of those threats on EFH” (50 C.F.R. § 600.815(a)(5)).

### 8.4.1 Past and Present Actions

Past and present actions contribute to the current condition of resources, and are intrinsically embedded in the baseline (i.e., existing aquatic conditions). These activities include harvesting, grazing, mining, operations and maintenance of the USACE's Englebright and Daguerre Point dams and water deliveries. Although these activities have the potential to affect the EFH in the Yuba River watershed, they are outside the Commission's authority to regulate.

Timber harvesting and grazing, which occur both on federal and private land, have the potential to affect EFH (i.e., both water quantity and water quality, including water temperatures, and riparian habitat) in the upper Yuba River watershed.

Mining, which also occurs on both federal and private land in the watershed, can affect water quality, especially metal contaminant concentrations. Most notably, historic hydraulic mining has had drastic effects on geology and soils in the Yuba River, especially on channel morphology, substrates and riparian vegetation. While these effects are most obvious in the Yuba River downstream of Englebright Dam, mining also has affected the watershed upstream of the dam, and consequently the EFH there.

The USACE's Englebright and Daguerre Point dams also affect Chinook salmon and EFH. Englebright Dam was constructed in 1941 to create a debris retention reservoir on the Yuba River that captures sediments produced by upstream hydraulic mining activities. Englebright Dam has been a complete barrier to upstream fish passage since its construction in 1941, and presently blocks access by anadromous salmonids to historically utilized habitat located upstream above the dam. The original purpose of the Daguerre Point Dam was to stabilize the Yuba River channel and to retain debris originating from hydraulic mining in the Yuba River watershed. As discussed in the Applicant-Prepared Draft BA, there are numerous issues associated with anadromous fish passage at Daguerre Point Dam. However, the USACE continues to operate the fish ladders at Daguerre Point Dam to provide fish passage for managed species, including Chinook salmon.

The hydrology of the Yuba River, and flows in the lower Yuba River, have been, currently are being altered, and in the future will be, substantially altered by three hydroelectric power projects that export water from the upper Yuba River watershed. These projects are: (a) the South Feather Power Project (FERC Project No. 2088), operated by the South Feather Water and Power Agency (SFWPA); (b) the Yuba-Bear Project (FERC Project No. 2266), operated by the Nevada Irrigation District (NID); and (c) the Drum-Spaulding Project (FERC Project No. 2310), operated by the Pacific Gas and Electric Company (PG&E). Non-project diversions and exports of water to watersheds outside the Yuba River by other users affect flows in Project-affected reaches (see Section 3.1.2.4 of Exhibit E to the Amended FLA). Table 8.4-1 lists, for the WY 1990 to WY 2016 period, the historical annual average amounts of water exported out of the North, Middle and South Yuba River sub-basins by these projects. This table lists the average annual export amounts by WY type, and those amounts as percentages of the total unimpaired runoff of the Yuba River basin for each corresponding WY type. As shown in Table 8.4-1, the average annual amount of total exports is 22 percent of the average annual unimpaired runoff of the Yuba River

basin at Smartsville for this period, and these total exports range from an average of 34 percent in Critically Dry WYs to 15 percent in Wet WYs.

**Table 8.4-1. Exports of water from Yuba River Sub-basins from WY 1990 through 2016 averaged by water year type.**

| Water Year Type[1] | SFWPA from North Yuba River Sub-Basin[2] | NID from the Middle Yuba River Sub-Basin[3] | PG&E (with deliveries to NID and PCWA) from the South Yuba River Sub-Basin[4] | Total Exports | Yuba River Basin Unimpaired Runoff at Smarstville[5] | Total Exports as Percent of Unimpaired Runoff |
|---|---|---|---|---|---|---|
| | (ac-ft) | | | | | (%) |
| Wet | 101,134 | 71,108 | 427,187 | 599,429 | 3,868,638 | 15% |
| Above Normal | 89,850 | 71,869 | 390,512 | 552,231 | 2,499,928 | 22% |
| Below Normal | 67,749 | 58,023 | 312,909 | 438,681 | 1,654,992 | 27% |
| Dry | 57,491 | 45,288 | 270,560 | 373,339 | 1,114,903 | 33% |
| Critically Dry | 29,960 | 43,091 | 221,643 | 294,694 | 878,211 | 34% |
| Average | 73,601 | 59,519 | 335,998 | 469,117 | 2,128,348 | -- |
| Percent of Unimpaired | 3.5% | 2.8% | 15.8% | 22.0% | -- | -- |

[1] Refer to Section 2.2.3.1.1 of Exhibit E for a description of Smartsville Index WY types.
[2] Volumes derived from flow records of USGS Gage 11413250, Slate Creek Tunnel nr Strawberry Valley, CA.
[3] Volumes derived from flow records of USGS Gage 11408000, Milton-Bowman Tunnel Outlet nr Graniteville, CA.
[4] Volumes derived from USGS Gages 11414200, South Yuba Canal nr Emigrant Gap, CA, plus USGS Gage 11414170, Drum Canal at Tunnel Outlet nr Emigrant Gap, CA, minus USGS Gage 11408000, Milton-Bowman Tunnel Outlet nr Graniteville, CA.
[5] As published by DWR.

Downstream of the Project, water diversions from the Yuba River may affect aquatic habitat conditions (e.g., water quantity, quality and water temperature) in the Yuba River downstream of Englebright Dam, and thus may affect EFH and managed species. For use of water within the Yuba River Basin, the largest diversions are made for deliveries to YCWA's Member Units. For the period of 2006 to 2015 these diversion have been as much as 305,000 ac-ft in a year and have averaged 262,000 ac-ft per year, which is 12.3 percent of the average annual volume of total unimpaired runoff of the Yuba River watershed at Smartsville for this period, as published by DWR. These non-Project water diversions for use in-basin and the exports of water to basins outside the Yuba River watershed described above have the potential to affect water resources, managed fish species and EFH.

Other activities that could interact with the Project and may cumulatively adversely affect EFH include other multipurpose water projects in the Yuba River watershed, which are described in Section 3.0 of Exhibit E of the Amended FLA. FERC has the authority to regulate some of those projects.

## 8.4.2 Reasonably Foreseeable Future Actions

Based on FERC's April 2011 Scoping Document 2, the temporal scope for any resource identified as potentially having cumulative effects will look 30 to 50 years into the future, which is based on the potential term of a new license, concentrating on the effect on the resource from reasonably foreseeable future actions.

It is reasonable to assume that the past and present actions described above will continue in the future, although the magnitude of the actions may change. Timber harvesting and grazing are

 

declining. Hydraulic mining was prohibited, unless the sediments produced were kept out of the rivers, in the late 1800's, but other forms of mining continue. The USACE continues to operate and maintain Englebright and Daguerre Point dams.

Flows in the Middle Yuba River and South Yuba River, and many of their tributaries, have been regulated and diverted since the mid-1800s. Water diversions from the Middle and South Yuba River basins into the Bear River and American River basins were originally made to provide flows for hydraulic mining. The purposes of these diversions changed to agricultural and domestic purposes during the late 1800s and the early 1900s. Diversions from Slate Creek in the North Yuba River Basin into the Feather River Basin began in the 1960s. Annual water demands are projected to increase in the future. NID expects its demand will increase from a recent historical average of 140,000 ac-ft to 201,000 ac-ft by 2062, and PCWA anticipates its demand will increase from 115,000 ac-ft to 118,000 ac-ft by 2062. Information provided in the materials submitted to FERC by NID and PG&E for the relicensing of the Yuba Bear Hydroelectric Project (FERC Project No. 2266) and the Drum Spaulding Project (FERC Project No. 2310), respectively, indicate that, for their proposed projects and under future 2062 conditions, exports will not change significantly compared to the historical exports that have occurred in the recent past. This is because the amounts of water that these projects have diverted in the recent past have been limited only by the capacities of their project facilities, and have been significantly greater than either their present consumptive demands or their projected future consumptive demands. Thus, NID and PG&E project relicensing model results indicate that there will be only small changes in these projects' exports from the Middle and South Yuba rivers sub-basins, even though there will be much larger increases in the consumptive demands that are supplied by these exports[4]. For similar reasons, it is expected that SFWPA's exports from Slate Creek will not change significantly in the future.

YCWA projects that its annual demands will increase by approximately 20,000 ac-ft per year with the completion of the Wheatland Project, which would deliver surface water to portions of the Wheatland Water District in southern Yuba County currently irrigated by groundwater. Within the next 50 years, FERC is expected to issue new licenses for non-exempt hydroelectric projects in the basin. Section 3.1.1 of Exhibit E of the Amended FLA describes the license status of each of these projects, some of which are in various stages of relicensing.[5]

The cumulative effects assessment in this Applicant-Prepared Draft EFH Assessment addresses changes in Yuba River flows and water temperatures that may result from the future operation of projects in the upper Yuba River Basin upstream of Englebright Dam and increased diversions associated with implementation of the Yuba-Wheatland In-Lieu Groundwater Recharge and

[4] See Supplement Number 1, *Updated Runs of the Yuba-Bear HEC-ResSim Water Balance/Operations Model*, to Amended Exhibit E, Appendix E12, in PG&E's Amended Final License Application for a New License, FERC Project No. 2310-193, Pacific Gas and Electric Company, August 2012.

[5] To investigate hydroelectric conditions under reasonably foreseeable future actions, YCWA provides in this Exhibit E a Water Balance/Operations Model scenario that includes expected inflow into the Project based on Forest Service's proposed FPA Section 4(e) flow conditions for SFWPA's South Feather Power Project, NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project (i.e., *With-YCWA Proposed Project (Future)* model run scenario). The scenario also includes anticipated future water deliveries, which occur both upstream and downstream of the Project. The scenario is for the year 2062, since this is the most distant water delivery forecast, and it is uncertain how the deliveries will increase over time or when the new licenses for the upstream projects will be issued.

Storage Project (Wheatland Project). Modeling of projects in the upper Yuba River Basin upstream of Englebright Dam was available for the period extending from WY 1976 through 2008, and therefore cumulative effects were evaluated by comparing hydrologic and water temperature simulations for that period. Otherwise, the same methodologies were used to evaluate potential effects to listed species and their critical habitat in the lower Yuba River associated with the Cumulative Condition, relative to the Environmental Baseline.

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

- South Feather Water and Power Agency's 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 (YB) Project (FERC No. 2266).
- PG&E's new FERC license conditions for flows for the Drum-Spaulding (DS) Project (FERC No. 2310).
- Placer County Water Agency's (PCWA) projected 2062-level water supply demands NID's projected 2062-level water supply demands.

The foregoing reasonably foreseeable future actions in the Yuba River watershed upstream of Englebright Reservoir have the potential to change instream flow and water temperature regimes in Project reaches. In addition, future-level demands for the Wheatland Water District (approximately 25 TAF/year of increased demand) in the Yuba River downstream of Englebright Dam have the potential to affect cumulative-condition flows and water temperatures. Hence this additional projected demand also is included in modeling of the cumulative scenario. The following analyses of EFH cumulative effects address flow and water temperature changes in the North Yuba River below New Bullards Bar, the Middle Yuba River above the confluence with the Yuba River, and the Yuba River upstream of Englebright Dam under the Cumulative Condition relative to existing conditions.

These evaluations are followed by identifications of other future non-federal activities that are reasonably certain to occur in the EFH Action Area, with particular reference to the lower Yuba River. Identified activities are evaluated as to whether they have the potential to affect MSA species (i.e., Chinook salmon) or their EFH, including any effects related to instream flows and water temperatures.

## 8.4.3 Yuba River Watershed Upstream of Englebright Dam

### 8.4.3.1 Flows

8.4.3.1.1 North Yuba River (New Bullards Bar Dam Reach)

Table 8.4-2 displays the simulated long-term average flows and average flows by water year type in the New Bullards Bar Dam Reach of the North Yuba River under the Cumulative Condition, relative to the Environmental Baseline (i.e., existing condition). Over the entire 33-year simulation period, long-term average flows in this reach of the North Yuba River would not increase during July, increase by 75 percent from August through November, and decrease by 7.8 to 43.8 percent from December through June, under the Cumulative Condition, relative to the Environmental Baseline. Simulated mean monthly flows by WYT generally show similar patterns during most months of wet and above normal WYs. However, during dry, and critical WYs, and the one extreme critically dry WY (1977), no decreases in average monthly flow are observed from July through March, when increases range up to 85 percent under the Cumulative Condition, relative to the Environmental Baseline.

Reductions in mean monthly flows from January through June over the 33-year simulation period are driven primarily by reductions in flows during wet and above normal WYTs. Flows are substantially higher during these months in wet and above normal WYTs relative to drier WYTs under both the Environmental Baseline and Cumulative Condition. Because mean monthly flows are relatively high during most of the January through June period in wet and above normal WYTs, the substantial reductions in simulated flows during these months under the Cumulative Condition are not anticipated to substantially affect habitat conditions, relative to the Environmental Baseline. The simulated increases in mean monthly flows under the Cumulative Condition during the lower flow months in all WYTs are anticipated to substantially improve instream habitat conditions during these months.

Overall, simulated flows in the North Yuba River below New Bullards Bar Dam under the Cumulative Condition are anticipated to result in improved flow-dependent habitat conditions for Chinook salmon EFH (e.g., increased habitat availability, slightly lower water temperatures) associated with increased monthly releases from New Bullards Bar Dam, particularly during most of the summer and fall months of all WYTs.

**Table 8.4-2. Long-term average flow and average flow by water year type in the New Bullards Bar Dam Reach of the North Yuba River under the Cumulative Condition, relative to the Environmental Baseline.**

| North Yuba River below New Bullards Bar Dam | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| Long-term | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Cumulative Condition | 14 | 14 | 295 | 372 | 397 | 449 | 99 | 242 | 146 | 14 | 14 | 14 |
| Environmental Baseline | 8 | 8 | 322 | 487 | 471 | 487 | 176 | 391 | 210 | 14 | 8 | 8 |
| Difference | 6.0 | 6.0 | -27.0 | -115.0 | -74.0 | -38.0 | -77.0 | -149.0 | -64.0 | 0.0 | 6.0 | 6.0 |
| Percent Difference[3] | 75.0 | 75.0 | -8.4 | -23.6 | -15.7 | -7.8 | -43.8 | -38.1 | -30.5 | 0.0 | 75.0 | 75.0 |
| Water Year Types[1] | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Cumulative Condition | 15 | 15 | 892 | 1,431 | 1,383 | 1,510 | 366 | 555 | 562 | 13 | 13 | 13 |
| Environmental Baseline | 8 | 8 | 821 | 1,907 | 1,701 | 1,769 | 660 | 1,098 | 806 | 31 | 9 | 8 |
| Difference | 7.0 | 7.0 | 71.0 | -476.0 | -318.0 | -259.0 | -294.0 | -543.0 | -244.0 | -18.0 | 4.0 | 5.0 |
| Percent Difference[3] | 87.5 | 87.5 | 8.6 | -25.0 | -18.7 | -14.6 | -44.5 | -49.5 | -30.3 | -58.1 | 44.4 | 62.5 |
| **Above Normal** | | | | | | | | | | | | |
| Cumulative Condition | 13 | 13 | 337 | 79 | 259 | 356 | 25 | 307 | 24 | 14 | 14 | 14 |
| Environmental Baseline | 8 | 8 | 561 | 98 | 265 | 254 | 54 | 333 | 46 | 9 | 9 | 8 |
| Difference | 5.0 | 5.0 | -224.0 | -19.0 | -6.0 | 102.0 | -29.0 | -26.0 | -22.0 | 5.0 | 5.0 | 6.0 |
| Percent Difference[3] | 62.5 | 62.5 | -39.9 | -19.4 | -2.3 | 40.2 | -53.7 | -7.8 | -47.8 | 55.6 | 55.6 | 75.0 |
| **Below Normal** | | | | | | | | | | | | |
| Cumulative Condition | 15 | 15 | 15 | 15 | 15 | 15 | 9 | 215 | 9 | 15 | 15 | 15 |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 281 | 13 | 9 | 9 | 8 |
| Difference | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 0.0 | -66.0 | -4.0 | 6.0 | 6.0 | 7.0 |
| Percent Difference[3] | 87.5 | 87.5 | 87.5 | 87.5 | 87.5 | 87.5 | 0.0 | -23.5 | -30.8 | 66.7 | 66.7 | 87.5 |
| **Dry** | | | | | | | | | | | | |
| Cumulative Condition | 15 | 15 | 15 | 15 | 15 | 14 | 9 | 9 | 9 | 14 | 14 | 14 |
| Environmental Baseline | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 8 | 8 | 8 |
| Difference | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 6.0 | 0.0 | 0.0 | 0.0 | 6.0 | 6.0 | 6.0 |
| Percent Difference[3] | 87.5 | 87.5 | 87.5 | 87.5 | 87.5 | 75.0 | 0.0 | 0.0 | 0.0 | 75.0 | 75.0 | 75.0 |
| **Critical** | | | | | | | | | | | | |
| Cumulative Condition | 11 | 11 | 11 | 11 | 12 | 13 | 8 | 8 | 8 | 9 | 9 | 9 |
| Environmental Baseline | 8 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 |
| Difference | 3.0 | 4.0 | 3.0 | 3.0 | 4.0 | 5.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 2.0 |
| Percent Difference[3] | 37.5 | 57.1 | 37.5 | 37.5 | 50.0 | 62.5 | 0.0 | 0.0 | 0.0 | 12.5 | 12.5 | 28.6 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 33-year simulation period

[3] Relative difference of the monthly average

8.4.3.1.2 Middle Yuba River above the Confluence with the North Yuba River

Table 8.4-3 displays the simulated long-term average flows and average flows by water year type in the Middle Yuba River downstream of Our House Dam and upstream of the confluence with the North Yuba River under the Cumulative Condition, relative to the Environmental Baseline. Over the entire 33-year simulation period, long-term average flows in the Middle Yuba River above the Yuba River would increase substantially during all months of the year, particularly during June (138.6%) and July (142.2%) under the Cumulative Condition, relative to the Environmental Baseline. Simulated mean monthly flows by WYT under the Cumulative Condition increase during all months of the year.

**Table 8.4-3. Long-term average flow and average flow by water year type in the Middle Yuba River above the confluence with the North Yuba River under the Cumulative Condition, relative to the Environmental Baseline.**

| Middle Yuba River above Yuba River | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| Long-term | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Cumulative Condition | 60 | 164 | 407 | 483 | 512 | 473 | 475 | 483 | 272 | 109 | 57 | 51 |
| Environmental Baseline | 41 | 102 | 297 | 439 | 462 | 413 | 300 | 283 | 114 | 45 | 37 | 36 |
| Difference | 19.0 | 62.0 | 110.0 | 44.0 | 50.0 | 60.0 | 175.0 | 200.0 | 158.0 | 64.0 | 20.0 | 15.0 |
| Percent Difference[3] | 46.3 | 60.8 | 37.0 | 10.0 | 10.8 | 14.5 | 58.3 | 70.7 | 138.6 | 142.2 | 54.1 | 41.7 |
| Water Year Types[1] | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Cumulative Condition | 74 | 244 | 909 | 1,264 | 1,132 | 865 | 1,230 | 1,271 | 729 | 238 | 86 | 73 |
| Environmental Baseline | 47 | 165 | 757 | 1,211 | 1,105 | 807 | 709 | 591 | 251 | 58 | 43 | 43 |
| Difference | 27.0 | 79.0 | 152.0 | 53.0 | 27.0 | 58.0 | 521.0 | 680.0 | 478.0 | 180.0 | 43.0 | 30.0 |
| Percent Difference[3] | 57.4 | 47.9 | 20.1 | 4.4 | 2.4 | 7.2 | 73.5 | 115.1 | 190.4 | 310.3 | 100.0 | 69.8 |
| **Above Normal** | | | | | | | | | | | | |
| Cumulative Condition | 55 | 264 | 494 | 480 | 658 | 653 | 350 | 357 | 163 | 95 | 67 | 61 |
| Environmental Baseline | 36 | 159 | 341 | 434 | 566 | 576 | 251 | 267 | 83 | 48 | 41 | 40 |
| Difference | 19.0 | 105.0 | 153.0 | 46.0 | 92.0 | 77.0 | 99.0 | 90.0 | 80.0 | 47.0 | 26.0 | 21.0 |
| Percent Difference[3] | 52.8 | 66.0 | 44.9 | 10.6 | 16.3 | 13.4 | 39.4 | 33.7 | 96.4 | 97.9 | 63.4 | 52.5 |
| **Below Normal** | | | | | | | | | | | | |
| Cumulative Condition | 48 | 127 | 237 | 191 | 207 | 286 | 258 | 307 | 159 | 75 | 53 | 46 |
| Environmental Baseline | 37 | 63 | 104 | 144 | 157 | 207 | 190 | 276 | 80 | 43 | 39 | 37 |
| Difference | 11.0 | 64.0 | 133.0 | 47.0 | 50.0 | 79.0 | 68.0 | 31.0 | 79.0 | 32.0 | 14.0 | 9.0 |
| Percent Difference[3] | 29.7 | 101.6 | 127.9 | 32.6 | 31.8 | 38.2 | 35.8 | 11.2 | 98.8 | 74.4 | 35.9 | 24.3 |
| **Dry** | | | | | | | | | | | | |
| Cumulative Condition | 62 | 71 | 112 | 111 | 188 | 224 | 166 | 126 | 92 | 54 | 36 | 33 |
| Environmental Baseline | 42 | 46 | 59 | 73 | 144 | 181 | 123 | 96 | 63 | 38 | 31 | 30 |
| Difference | 20.0 | 25.0 | 53.0 | 38.0 | 44.0 | 43.0 | 43.0 | 30.0 | 29.0 | 16.0 | 5.0 | 3.0 |
| Percent Difference[3] | 47.6 | 54.3 | 89.8 | 52.1 | 30.6 | 23.8 | 35.0 | 31.3 | 46.0 | 42.1 | 16.1 | 10.0 |
| **Critical** | | | | | | | | | | | | |
| Cumulative Condition | 49 | 63 | 94 | 113 | 109 | 123 | 115 | 105 | 73 | 36 | 30 | 28 |
| Environmental Baseline | 37 | 45 | 71 | 84 | 73 | 87 | 75 | 72 | 46 | 27 | 24 | 24 |
| Difference | 12.0 | 18.0 | 23.0 | 29.0 | 36.0 | 36.0 | 40.0 | 33.0 | 27.0 | 9.0 | 6.0 | 4.0 |
| Percent Difference[3] | 32.4 | 40.0 | 32.4 | 34.5 | 49.3 | 41.4 | 53.3 | 45.8 | 58.7 | 33.3 | 25.0 | 16.7 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 33-year simulation period

[3] Relative difference of the monthly average

Overall, simulated flows in the Middle Yuba River above the Yuba River under the Cumulative Condition are anticipated to result in improved flow-dependent habitat conditions for Chinook salmon EFH (e.g., increased habitat availability, slightly lower water temperatures) associated with increased monthly releases from Project facilities, particularly during the summer and fall months of all WYTs.

#### 8.4.3.1.3 Yuba River Upstream of Englebright Reservoir

**Yuba River below the Middle Yuba River Confluence**

Table 8.4-4 displays the simulated long-term average flows and average flows by water year type in the Yuba River downstream of the Middle Yuba River confluence under the Cumulative Condition, relative to the Environmental Baseline. Over the entire 33-year simulation period, long-term average flows in the Yuba River below the Middle Yuba River would increase

substantially during April and June through December (13.4 to 108.5%) under the Cumulative Condition, relative to the Environmental Baseline, and decrease somewhat during January (7.8%) and February (2.6%) With the exception of winter and spring months of wet WYs and December of above normal WYs, simulated mean monthly flows by WYT generally increase substantially under the Cumulative Condition, relative to the Environmental Baseline. Because flows under the Environmental Baseline are relatively high during the winter and spring months of wet WYs (and during December of above normal WYs), reductions in simulated flows under the Cumulative Condition are not anticipated to substantially affect habitat conditions during these months.

**Table 8.4-4. Long-term average flow and average flow by water year type in the Yuba River below the Middle Yuba River confluence under the Cumulative Condition, relative to the Environmental Baseline.**

| Yuba River below Middle Yuba River | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| | Long-term | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Cumulative Condition | 74 | 178 | 703 | 855 | 909 | 922 | 574 | 725 | 418 | 123 | 71 | 64 |
| Environmental Baseline | 49 | 110 | 620 | 927 | 933 | 900 | 476 | 674 | 325 | 59 | 45 | 44 |
| Difference | 25.0 | 68.0 | 83.0 | -72.0 | -24.0 | 22.0 | 98.0 | 51.0 | 93.0 | 64.0 | 26.0 | 20.0 |
| Percent Difference[3] | 51.0 | 61.8 | 13.4 | -7.8 | -2.6 | 2.4 | 20.6 | 7.6 | 28.6 | 108.5 | 57.8 | 45.5 |
| | Water Year Types[1] | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Cumulative Condition | 89 | 259 | 1,800 | 2,695 | 2,516 | 2,375 | 1,597 | 1,826 | 1,291 | 251 | 99 | 86 |
| Environmental Baseline | 55 | 173 | 1,578 | 3,118 | 2,806 | 2,576 | 1,369 | 1,690 | 1,057 | 89 | 52 | 51 |
| Difference | 34.0 | 86.0 | 222.0 | -423.0 | -290.0 | -201.0 | 228.0 | 136.0 | 234.0 | 162.0 | 47.0 | 35.0 |
| Percent Difference[3] | 61.8 | 49.7 | 14.1 | -13.6 | -10.3 | -7.8 | 16.7 | 8.0 | 22.1 | 182.0 | 90.4 | 68.6 |
| **Above Normal** | | | | | | | | | | | | |
| Cumulative Condition | 69 | 278 | 831 | 559 | 917 | 1,009 | 375 | 664 | 188 | 109 | 81 | 75 |
| Environmental Baseline | 44 | 167 | 902 | 532 | 830 | 830 | 305 | 600 | 129 | 57 | 49 | 49 |
| Difference | 25.0 | 111.0 | -71.0 | 27.0 | 87.0 | 179.0 | 70.0 | 64.0 | 59.0 | 52.0 | 32.0 | 26.0 |
| Percent Difference[3] | 56.8 | 66.5 | -7.9 | 5.1 | 10.5 | 21.6 | 23.0 | 10.7 | 45.7 | 91.2 | 65.3 | 53.1 |
| **Below Normal** | | | | | | | | | | | | |
| Cumulative Condition | 63 | 142 | 252 | 206 | 222 | 301 | 266 | 522 | 169 | 90 | 68 | 61 |
| Environmental Baseline | 45 | 71 | 112 | 152 | 165 | 216 | 199 | 557 | 93 | 52 | 47 | 45 |
| Difference | 18.0 | 71.0 | 140.0 | 54.0 | 57.0 | 85.0 | 67.0 | -35.0 | 76.0 | 38.0 | 21.0 | 16.0 |
| Percent Difference[3] | 40.0 | 100.0 | 125.0 | 35.5 | 34.5 | 39.4 | 33.7 | -6.3 | 81.7 | 73.1 | 44.7 | 35.6 |
| **Dry** | | | | | | | | | | | | |
| Cumulative Condition | 77 | 86 | 127 | 126 | 203 | 239 | 174 | 135 | 101 | 68 | 51 | 47 |
| Environmental Baseline | 50 | 54 | 67 | 81 | 152 | 190 | 131 | 105 | 71 | 47 | 39 | 38 |
| Difference | 27.0 | 32.0 | 60.0 | 45.0 | 51.0 | 49.0 | 43.0 | 30.0 | 30.0 | 21.0 | 12.0 | 9.0 |
| Percent Difference[3] | 54.0 | 59.3 | 89.6 | 55.6 | 33.6 | 25.8 | 32.8 | 28.6 | 42.3 | 44.7 | 30.8 | 23.7 |
| **Critical** | | | | | | | | | | | | |
| Cumulative Condition | 60 | 74 | 105 | 124 | 121 | 136 | 123 | 113 | 80 | 45 | 39 | 37 |
| Environmental Baseline | 45 | 53 | 79 | 91 | 81 | 95 | 82 | 80 | 54 | 34 | 31 | 31 |
| Difference | 15.0 | 21.0 | 26.0 | 33.0 | 40.0 | 41.0 | 41.0 | 33.0 | 26.0 | 11.0 | 8.0 | 6.0 |
| Percent Difference[3] | 33.3 | 39.6 | 32.9 | 36.3 | 49.4 | 43.2 | 50.0 | 41.3 | 48.1 | 32.4 | 25.8 | 19.4 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 33-year simulation period

[3] Relative difference of the monthly average

Slight reductions in long-term mean monthly flows from January and February over the 33-year simulation period are driven primarily by reductions in flows during wet WYTs. Because mean monthly flows are relatively high during January and February of wet WYTs, the reductions in simulated flows during these months under the Cumulative Condition are not anticipated to

substantially affect habitat conditions, relative to the Environmental Baseline. The simulated increases in mean monthly flows under the Cumulative Condition during most months during above normal, below normal, dry, and critical WYTs are anticipated to substantially improve instream habitat conditions in the Yuba River below the Middle Yuba River confluence during these months.

Overall, simulated flows in the Yuba River below the Middle Yuba River under the Cumulative Condition are anticipated to result in improved flow-dependent habitat conditions for Chinook salmon EFH (e.g., increased habitat availability, slightly lower water temperatures) associated with increased monthly releases from Project facilities, particularly during the summer and fall months of all WYTs.

**Yuba River above New Colgate Powerhouse**

Table 8.4-5 displays the simulated long-term average flows and average flows by water year type in the Yuba River above New Colgate Powerhouse under the Cumulative Condition, relative to the Environmental Baseline. Over the entire 33-year simulation period, long-term average flows the Yuba River below the Yuba River above New Colgate Powerhouse would increase substantially during April and June through December (12.6 to 103.2%) under the Cumulative Condition, relative to the Environmental Baseline. Slight reductions in long-term average monthly flows occur during January and February (7.2 and 2.4%, respectively). With the exception of during most winter and spring months of wet WYs, December of above normal WYs, and May of below normal WYs, simulated mean monthly flows by WYT generally increase substantially under the Cumulative Condition, relative to the Environmental Baseline. Because flows under the Environmental Baseline are relatively high during the winter and spring months of wet WYs (as well as during December of above normal WYs and May of below normal WYs), reductions in simulated flows under the Cumulative Condition are not anticipated to substantially affect habitat conditions during these months.

Slight reductions in long-term mean monthly flows during January and February over the 33-year simulation period are driven primarily by reductions in flows during wet WYTs. Because mean monthly flows are relatively high during January and February of wet WYTs, the reductions in simulated flows during these months under the Cumulative Condition are not anticipated to substantially affect habitat conditions, relative to the Environmental Baseline. The simulated increases in mean monthly flows under the Cumulative Condition during most months in above normal, below normal, dry, and critical WYs are anticipated to substantially improve instream habitat conditions in the Yuba River above New Colgate Powerhouse during these months.

Overall, simulated flows in the Yuba River above New Colgate Powerhouse under the Cumulative Condition are anticipated to result in improved flow-dependent habitat conditions for Chinook salmon EFH (e.g., increased habitat availability, slightly lower water temperatures) associated with increased monthly releases from Project facilities, particularly during the summer and fall months of all WYTs.

**Table 8.4-5. Long-term average flow and average flow by water year type in the Yuba River above New Colgate Powerhouse under the Cumulative Condition, relative to the Environmental Baseline.**

| Yuba River above Colgate Powerhouse | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Cumulative Condition | 76 | 190 | 742 | 922 | 988 | 1,001 | 629 | 758 | 429 | 126 | 72 | 65 |
| Environmental Baseline | 51 | 122 | 659 | 993 | 1,012 | 980 | 532 | 707 | 335 | 62 | 47 | 45 |
| Difference | 25.0 | 68.0 | 83.0 | -71.0 | -24.0 | 21.0 | 97.0 | 51.0 | 94.0 | 64.0 | 25.0 | 20.0 |
| Percent Difference[3] | 49.0 | 55.7 | 12.6 | -7.2 | -2.4 | 2.1 | 18.2 | 7.2 | 28.1 | 103.2 | 53.2 | 44.4 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Cumulative Condition | 92 | 280 | 1,890 | 2,848 | 2,673 | 2,493 | 1,695 | 1,883 | 1,309 | 256 | 101 | 88 |
| Environmental Baseline | 58 | 194 | 1,667 | 3,271 | 2,964 | 2,695 | 1,467 | 1,747 | 1,074 | 94 | 54 | 53 |
| Difference | 34.0 | 86.0 | 223.0 | -423.0 | -291.0 | -202.0 | 228.0 | 136.0 | 235.0 | 162.0 | 47.0 | 35.0 |
| Percent Difference[3] | 58.6 | 44.3 | 13.4 | -12.9 | -9.8 | -7.5 | 15.5 | 7.8 | 21.9 | 172.3 | 87.0 | 66.0 |
| **Above Normal** | | | | | | | | | | | | |
| Cumulative Condition | 71 | 298 | 880 | 642 | 1,028 | 1,127 | 437 | 699 | 199 | 112 | 82 | 76 |
| Environmental Baseline | 46 | 187 | 951 | 615 | 941 | 948 | 368 | 636 | 140 | 60 | 51 | 50 |
| Difference | 25.0 | 111.0 | -71.0 | 27.0 | 87.0 | 179.0 | 69.0 | 63.0 | 59.0 | 52.0 | 31.0 | 26.0 |
| Percent Difference[3] | 54.3 | 59.4 | -7.5 | 4.4 | 9.2 | 18.9 | 18.8 | 9.9 | 42.1 | 86.7 | 60.8 | 52.0 |
| **Below Normal** | | | | | | | | | | | | |
| Cumulative Condition | 64 | 152 | 275 | 244 | 264 | 361 | 320 | 559 | 180 | 92 | 69 | 62 |
| Environmental Baseline | 46 | 80 | 135 | 189 | 207 | 277 | 252 | 593 | 104 | 54 | 48 | 47 |
| Difference | 18.0 | 72.0 | 140.0 | 55.0 | 57.0 | 84.0 | 68.0 | -34.0 | 76.0 | 38.0 | 21.0 | 15.0 |
| Percent Difference[3] | 39.1 | 90.0 | 103.7 | 29.1 | 27.5 | 30.3 | 27.0 | -5.7 | 73.1 | 70.4 | 43.8 | 31.9 |
| **Dry** | | | | | | | | | | | | |
| Cumulative Condition | 80 | 89 | 134 | 139 | 235 | 286 | 203 | 149 | 107 | 70 | 52 | 48 |
| Environmental Baseline | 52 | 57 | 74 | 94 | 183 | 237 | 159 | 119 | 77 | 48 | 40 | 39 |
| Difference | 28.0 | 32.0 | 60.0 | 45.0 | 52.0 | 49.0 | 44.0 | 30.0 | 30.0 | 22.0 | 12.0 | 9.0 |
| Percent Difference[3] | 53.8 | 56.1 | 81.1 | 47.9 | 28.4 | 20.7 | 27.7 | 25.2 | 39.0 | 45.8 | 30.0 | 23.1 |
| **Critical** | | | | | | | | | | | | |
| Cumulative Condition | 63 | 79 | 118 | 143 | 136 | 156 | 136 | 122 | 84 | 46 | 40 | 37 |
| Environmental Baseline | 48 | 57 | 92 | 110 | 96 | 115 | 96 | 89 | 57 | 35 | 32 | 32 |
| Difference | 15.0 | 22.0 | 26.0 | 33.0 | 40.0 | 41.0 | 40.0 | 33.0 | 27.0 | 11.0 | 8.0 | 5.0 |
| Percent Difference[3] | 31.3 | 38.6 | 28.3 | 30.0 | 41.7 | 35.7 | 41.7 | 37.1 | 47.4 | 31.4 | 25.0 | 15.6 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 33-year simulation period

[3] Relative difference of the monthly average

## Yuba River below New Colgate Powerhouse

Table 8.4-6 displays the simulated long-term average flows and average flows by water year type in the Yuba River below New Colgate Powerhouse under the Cumulative Condition, relative to the Environmental Baseline. Over the entire 33-year simulation period, long-term average flows the Yuba River below the Yuba River below Colgate Powerhouse would increase slightly during November, December, and June through August, and decrease slightly during January, March through May, September and October under the Cumulative Condition, relative to the Environmental Baseline. Similar patterns of generally slightly increased and decreased mean monthly flows are exhibited during most months by WYT.

**Table 8.4-6. Long-term average flow and average flow by water year type in the Yuba River below New Colgate Powerhouse under the Cumulative Condition, relative to the Environmental Baseline.**

| Yuba River below Colgate Powerhouse | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis Period | Monthly Mean Flow (cfs) | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| **Long-term** | | | | | | | | | | | | |
| **Full Simulation Period[2]** | | | | | | | | | | | | |
| Cumulative Condition | 787 | 930 | 1,610 | 2,220 | 2,592 | 2,592 | 2,008 | 2,740 | 2,553 | 1,987 | 1,573 | 827 |
| Environmental Baseline | 818 | 921 | 1,561 | 2,282 | 2,592 | 2,604 | 2,058 | 2,841 | 2,545 | 1,951 | 1,553 | 829 |
| Difference | -31.0 | 9.0 | 49.0 | -62.0 | 0.0 | -12.0 | -50.0 | -101.0 | 8.0 | 36.0 | 20.0 | -2.0 |
| Percent Difference[3] | -3.8 | 1.0 | 3.1 | -2.7 | 0.0 | -0.5 | -2.4 | -3.6 | 0.3 | 1.8 | 1.3 | -0.2 |
| **Water Year Types[1]** | | | | | | | | | | | | |
| **Wet** | | | | | | | | | | | | |
| Cumulative Condition | 808 | 1,040 | 3,298 | 5,434 | 5,832 | 5,672 | 3,936 | 4,451 | 4,074 | 2,751 | 2,283 | 943 |
| Environmental Baseline | 828 | 1,022 | 3,072 | 5,760 | 6,052 | 5,855 | 3,970 | 4,692 | 4,074 | 2,707 | 2,273 | 948 |
| Difference | -20.0 | 18.0 | 226.0 | -326.0 | -220.0 | -183.0 | -34.0 | -241.0 | 0.0 | 44.0 | 10.0 | -5.0 |
| Percent Difference[3] | -2.4 | 1.8 | 7.4 | -5.7 | -3.6 | -3.1 | -0.9 | -5.1 | 0.0 | 1.6 | 0.4 | -0.5 |
| **Above Normal** | | | | | | | | | | | | |
| Cumulative Condition | 776 | 1,134 | 1,945 | 1,864 | 3,253 | 3,848 | 2,474 | 3,216 | 2,885 | 2,223 | 1,641 | 859 |
| Environmental Baseline | 819 | 1,077 | 2,015 | 1,856 | 3,147 | 3,750 | 2,692 | 3,254 | 2,913 | 2,191 | 1,634 | 872 |
| Difference | -43.0 | 57.0 | -70.0 | 8.0 | 106.0 | 98.0 | -218.0 | -38.0 | -28.0 | 32.0 | 7.0 | -13.0 |
| Percent Difference[3] | -5.3 | 5.3 | -3.5 | 0.4 | 3.4 | 2.6 | -8.1 | -1.2 | -1.0 | 1.5 | 0.4 | -1.5 |
| **Below Normal** | | | | | | | | | | | | |
| Cumulative Condition | 793 | 820 | 877 | 1,341 | 1,271 | 1,170 | 1,453 | 2,699 | 2,514 | 1,877 | 1,408 | 813 |
| Environmental Baseline | 821 | 813 | 824 | 1,271 | 1,166 | 1,135 | 1,416 | 2,831 | 2,520 | 1,847 | 1,391 | 830 |
| Difference | -28.0 | 7.0 | 53.0 | 70.0 | 105.0 | 35.0 | 37.0 | -132.0 | -6.0 | 30.0 | 17.0 | -17.0 |
| Percent Difference[3] | -3.4 | 0.9 | 6.4 | 5.5 | 9.0 | 3.1 | 2.6 | -4.7 | -0.2 | 1.6 | 1.2 | -2.0 |
| **Dry** | | | | | | | | | | | | |
| Cumulative Condition | 779 | 771 | 655 | 750 | 781 | 537 | 773 | 1,481 | 1,468 | 1,474 | 1,217 | 779 |
| Environmental Baseline | 808 | 798 | 656 | 731 | 723 | 503 | 767 | 1,496 | 1,415 | 1,448 | 1,189 | 787 |
| Difference | -29.0 | -27.0 | -1.0 | 19.0 | 58.0 | 34.0 | 6.0 | -15.0 | 53.0 | 26.0 | 28.0 | -8.0 |
| Percent Difference[3] | -3.6 | -3.4 | -0.2 | 2.6 | 8.0 | 6.8 | 0.8 | -1.0 | 3.7 | 1.8 | 2.4 | -1.0 |
| **Critical** | | | | | | | | | | | | |
| Cumulative Condition | 767 | 855 | 657 | 647 | 530 | 461 | 589 | 924 | 1,053 | 1,154 | 915 | 614 |
| Environmental Baseline | 814 | 873 | 662 | 676 | 581 | 505 | 640 | 991 | 1,052 | 1,097 | 861 | 536 |
| Difference | -47.0 | -18.0 | -5.0 | -29.0 | -51.0 | -44.0 | -51.0 | -67.0 | 1.0 | 57.0 | 54.0 | 78.0 |
| Percent Difference[3] | -5.8 | -2.1 | -0.8 | -4.3 | -8.8 | -8.7 | -8.0 | -6.8 | 0.1 | 5.2 | 6.3 | 14.6 |

[1] As defined by the "Smartsville Index" described in Section 3.3.2 and Appendix E2 of the Amended FLA

[2] Based on a 33-year simulation period

[3] Relative difference of the monthly average

With the exception of the 14.6 percent flow increase during September of critical WYs, the slight increases and decreases in long-term average flows and average monthly flows by WYT are not anticipated to substantially affect habitat conditions in the Yuba River below New Colgate Powerhouse under the Cumulative Condition, relative to the Environmental Baseline. The increase in mean monthly flows under the Cumulative Condition during September in critical WYs is anticipated to substantially improve instream habitat conditions in the Yuba River below New Colgate Powerhouse during drier conditions, primarily due to potentially improved water temperature suitability. Reductions in mean monthly flows during the winter are not expected to substantially affect habitat conditions, particularly in consideration of thermally suitable habitat conditions during the winter months.

Overall, simulated flows in the Yuba River below New Colgate Powerhouse under the Cumulative Condition are anticipated to result in similar flow-dependent habitat conditions for Chinook salmon EFH, but are expected to improve habitat conditions during September of critical WYTs.

### 8.4.3.2 Water Temperatures

Simulated water temperature exceedance probabilities for spring-run and fall-run Chinook salmon lifestage-specific upper tolerable WTI values under the Cumulative Condition and Environmental Baseline are evaluated in the following sections. For efficiency of presentation, and to provide consistency with the simulated water temperature evaluation conducted for the Environmental Baseline and Without-Project above, simulated water temperatures are evaluated in this section for the North Yuba River, Middle Yuba River and Yuba River above Englebright Dam, organized by adult migration and holding lifestages, followed by spawning and embryo incubation lifestages, followed by juvenile rearing and downstream movement/outmigration lifestages.

#### 8.4.3.2.1 Cumulative Condition compared to Environmental Baseline

**Spring-run Chinook Salmon Adult Immigration**

Over the April through September adult immigration lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 68°F over most of the period evaluated at most locations under the Cumulative Condition, relative to the Environmental Baseline (Table 8.4-7). Water temperatures under the Cumulative Condition are substantially more suitable during June in the Middle Yuba River and in the Yuba River above New Colgate Powerhouse, and during June and early September in the Yuba River below the Middle Yuba River, relative to the Environmental Baseline.

**Table 8.4-7. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon adult migration and holding lifestages under the Cumulative Condition, relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration | NYR | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | MYR | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | -6.8 | -11.3 | -21.0 | -3.4 | 0.0 | 0.0 | 0.2 | 0.8 | 1.8 | | | | | | |
| | YR BLW MYR | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | -5.7 | -10.7 | -12.7 | -2.2 | -0.2 | -1.2 | -9.3 | -21.0 | -1.4 | | | | | | |
| | YR ABV COLGATE | 68°F | | | | | | | 0.0 | 0.0 | -1.2 | -8.7 | -11.7 | -11.1 | 1.8 | 0.0 | 0.0 | -0.2 | -4.4 | -3.2 | | | | | | |
| | YR BLW COLGATE | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| Adult Holding | NYR | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | MYR | 65°F | | | | | | | 0.0 | 0.0 | -1.4 | -8.3 | -14.5 | -16.8 | -0.2 | 0.0 | 0.0 | 0.0 | 0.8 | 0.6 | | | | | | |
| | YR BLW MYR | 65°F | | | | | | | 0.0 | 0.0 | -1.2 | -8.3 | -11.3 | -10.5 | 1.8 | 0.0 | 0.0 | -0.6 | -13.9 | -25.3 | | | | | | |
| | YR ABV COLGATE | 65°F | | | | | | | 0.0 | -0.2 | -8.1 | -12.1 | -11.5 | -1.6 | 3.2 | 0.0 | 0.0 | 0.0 | -1.4 | -6.9 | | | | | | |
| | YR BLW COLGATE | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |

**Spring-run Chinook Salmon Adult Holding**

Over the April through September adult holding lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 65°F during most months at all locations. However, water temperatures under the Cumulative Condition are substantially more suitable during June in the Middle Yuba River, during June and

September in the Yuba River below the Middle Yuba River, and during late May and early June in the Yuba River above New Colgate Powerhouse, relative to the Environmental Baseline.

## Fall-run Chinook Salmon Adult Immigration

Over the July through December adult immigration and staging period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 68°F during most months at all locations, with the exception of early September in the Yuba River below the Middle Yuba River, when water temperatures are substantially more suitable under the Cumulative Condition relative to the Environmental Baseline (Table 8.4-8).

**Table 8.4-8. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon adult migration lifestages under the Cumulative Condition, relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration and Staging | NYR | 68°F | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 68°F | | | | | | | | | | | | | -3.4 | 0.0 | 0.0 | 0.2 | 0.8 | 1.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 68°F | | | | | | | | | | | | | -2.2 | -0.2 | -1.2 | -9.3 | -21.0 | -1.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 68°F | | | | | | | | | | | | | 1.8 | 0.0 | 0.0 | -0.2 | -4.4 | -3.2 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 68°F | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## Spring-run Chinook Salmon Spawning

Over the September through mid-October spawning lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Cumulative Condition and Environmental Baseline (Table 8.4-9).

## Spring-run Chinook Salmon Embryo Incubation

Over the September through December embryo incubation lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Cumulative Condition and Environmental Baseline.

**Table 8.4-9. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon spawning and embryo incubation lifestages under the Cumulative Condition, relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spawning | NYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | | | | | |
| | MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 1.8 | | | | | |
| | YR BLW MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | -0.2 | -9.3 | | | | | |
| | YR ABV COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | -2.4 | | | | | |
| | YR BLW COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.2 | 0.0 | | | | | |
| Embryo Incubation | NYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 1.8 | -0.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 58°F | | | | | | | | | | | | | | | | | 0.0 | -0.2 | -9.3 | -3.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | -2.4 | -2.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## Fall-run Chinook Salmon Spawning

Over the October through December spawning lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Cumulative Condition and Environmental Baseline (Table 8.4-10).

**Table 8.4-10. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon spawning and embryo incubation lifestages under the Cumulative Condition, relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spawning | NYR | 58°F | | | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 58°F | | | | | | | | | | | | | | | | | | | 1.8 | -0.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 58°F | | | | | | | | | | | | | | | | | | | -9.3 | -3.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 58°F | | | | | | | | | | | | | | | | | | | -2.4 | -2.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 58°F | | | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Embryo Incubation | NYR | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 1.8 | -0.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | -9.3 | -3.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | -2.4 | -2.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## Fall-run Chinook Salmon Embryo Incubation

Over the October through March embryo incubation lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 58°F under the Cumulative Condition and Environmental Baseline.

## Spring-run Chinook Salmon Juvenile Rearing and Downstream Movement

Over the year-round juvenile rearing and downstream movement lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 65°F under the Cumulative Condition and Environmental Baseline during most months. However, water temperatures are substantially more suitable under the Cumulative Condition during June in the Middle Yuba River, during June and September in the Yuba River below the Middle Yuba River, and during late May and early June in the Yuba River above New Colgate Powerhouse (Table 8.4-11).

## Spring-run Chinook Salmon Yearling+ Smolt Emigration

Over the October through mid-May yearling+ smolt emigration lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 68°F under the Cumulative Condition and Environmental Baseline.

**Table 8.4-11. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon juvenile lifestages under the Cumulative Condition, relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Juvenile Rearing and Downstream Movement | NYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.4 | -8.3 | -14.5 | -16.8 | -0.2 | 0.0 | 0.0 | 0.0 | 0.8 | 0.6 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.2 | -8.3 | -11.3 | -10.5 | 1.8 | 0.0 | 0.0 | -0.6 | -13.9 | -25.3 | -1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -8.1 | -12.1 | -11.5 | -1.6 | 3.2 | 0.0 | 0.0 | 0.0 | -1.4 | -6.9 | -0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yearling+ Smolt Emigration | NYR | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MYR | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW MYR | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR ABV COLGATE | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.2 | | | | | | | | | | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | YR BLW COLGATE | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

### Fall-run Chinook Salmon Juvenile Rearing and Downstream Movement

Over the late December through June fall-run Chinook salmon juvenile rearing and downstream movement lifestage period, water temperatures are generally similar with respect to the probability of exceedance of the upper tolerable WTI value of 65°F most of the time under the Cumulative Condition and Environmental Baseline (Table 8.4-12). However, water temperatures are substantially more suitable during June in the Middle Yuba River and in the Yuba River below the Middle Yuba River, and during late May and early June in the Yuba River above New Colgate Powerhouse under the Cumulative Condition.

**Table 8.4-12. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon juvenile lifestages under the Cumulative Condition, relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Juvenile Rearing and Downstream Movement | NYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | 0.0 |
| | MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.4 | -8.3 | -14.5 | -16.8 | | | | | | | | | | | | 0.0 |
| | YR BLW MYR | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.2 | -8.3 | -11.3 | -10.5 | | | | | | | | | | | | 0.0 |
| | YR ABV COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -8.1 | -12.1 | -11.5 | -1.6 | | | | | | | | | | | | 0.0 |
| | YR BLW COLGATE | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | 0.0 |

## 8.4.4 Yuba River Downstream of Englebright Dam

The cumulative effects assessment in this Applicant-Prepared Draft EFH Assessment addresses changes in flows and water temperatures in the Yuba River downstream of Englebright Dam resulting from changes in operations of projects in the upper Yuba River Basin upstream of Englebright Dam, and increased diversions associated with implementation of the Yuba-Wheatland In-Lieu Groundwater Recharge and Storage Project (Wheatland Project).

Increased diversions associated with the Wheatland Project represent a future state or private action reasonably certain to occur. The Cumulative Condition includes the irrigation demands

for the Member Units listed previously plus the future irrigation demands of Wheatland Water District, which began receiving surface water through a new canal extension in 2009. Prior to 2009 when YCWA started providing water to the WWD under a water service contract, water users within WWD relied solely on groundwater for irrigation. The Wheatland Project now conveys surface water, diverted by YCWA at Daguerre Point Dam, to WWD through the South Canal system. The Wheatland Project is being constructed in two phases. Phase 1, which was completed in 2009, provides for delivery of surface water to WWD and the immediate irrigation of approximately 7,750 acres of the approximately 9,200 acres that will be served upon the completion of both phases. Under Phase 1, WWD's contract with YCWA provides for a total allocation (base and supplemental) of 23,092 ac-ft per year. When Phase 2 is completed, this contract will allow for a total allocation (base and supplemental) of 40,230 ac-ft per year. For this Applicant-Prepared Draft EFH Assessment, the cumulative effects assessment does not address changes in exposure of juvenile spring-run Chinook salmon 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 requiring separate ESA and MSA consultation.

Modeling of projects in the upper Yuba River Basin upstream of Englebright Dam is available for the period extending from WY 1976 through 2008, and therefore cumulative effects were evaluated by comparing hydrologic and water temperature simulations for that period, under both the Cumulative Condition and the Environmental Baseline (i.e., existing conditions). Otherwise, the same methodologies utilized for comparison of the Proposed Action and existing conditions scenarios were used to evaluate potential effects to managed species and their EFH in the Yuba River downstream of Englebright Dam associated with the Cumulative Condition, relative to existing conditions (also referred to as the Environmental Baseline, the term used in the Applicant-Prepared Draft BA).

In addition to these quantitative hydrologic and water temperature evaluations, an evaluation is presented here for each stressor to listed species that was identified under the existing conditions discussion. This presentation discusses whether the Cumulative Condition would affect that stressor, whether that effect would be beneficial or adverse, and the resultant magnitude of effect of each stressor. These evaluations are followed by identifications of other future non-federal activities that are reasonably certain to occur in the Action Area, with particular reference to the Yuba River downstream of Englebright Dam. Identified activities are evaluated as to whether they have the potential to affect managed species or their EFH, including any effects related to instream flows and water temperatures.

#### 8.4.4.1 Flow-Dependent Habitat Conditions

##### 8.4.4.1.1 Spring-run Chinook Salmon Spawning Habitat Availability

Because flows do not exceed 5,000 cfs during the September through mid-October spring-run Chinook salmon spawning period under the Cumulative Condition and Environmental Baseline, the limitation does not exclude any daily flows from the spring-run Chinook salmon spawning WUA analysis. Tables 8.4-13 displays the long-term average and average by WYT of spring-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

**Table 8.4-13. Long-term and water year type average spring-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Cumulative Condition | 99.2 | 99.0 | 99.1 | 99.6 | 99.7 | 99.0 |
| Environmental Baseline | 98.6 | 99.3 | 99.4 | 99.6 | 99.6 | 95.9 |
| Difference | 0.6 | -0.3 | -0.3 | 0.0 | 0.1 | 3.1 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average spring-run Chinook salmon in-channel spawning habitat availability (percent of maximum WUA) in the lower Yuba River is similar, but slightly higher under the Cumulative Condition relative to the Environmental Baseline (long-term average of 99.2% versus 98.6% of maximum WUA). The Cumulative Condition provides very similar amounts of spawning habitat availability (percent of maximum WUA) during all WYTs, with the exception of critical WYs, when the Cumulative Condition provides 3.1 percent more spawning habitat. As with the Environmental Baseline, the Cumulative Condition provides, on the average, over 80 percent (and even 90%) of maximum spawning WUA during all WYTs.

Habitat durations for spring-run Chinook salmon spawning under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-1. The Cumulative Condition provides similar amounts of in-channel spawning habitat availability over nearly the entire exceedance probability distribution, relative to the Environmental Baseline. Also, the Cumulative Condition achieves over 80 percent (and even 90%) of maximum spawning WUA with about a 100 percent probability, while the Environmental Baseline achieves over 80 percent of maximum spawning WUA with about a 98 percent probability.

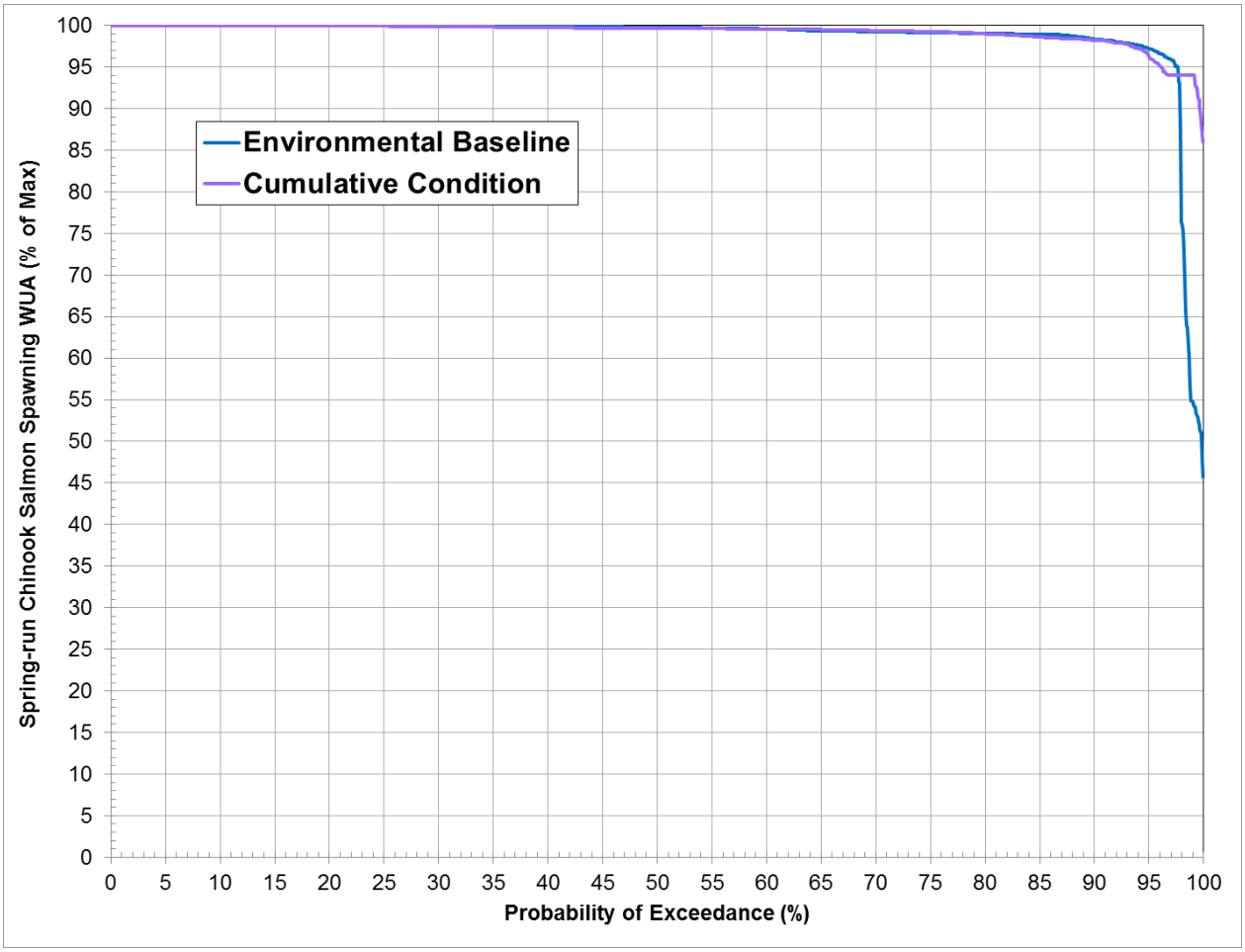


**Figure 8.4-1. Spring-run Chinook salmon spawning habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), 94.3 percent of spring-run Chinook salmon maximum spawning WUA was provided under the Cumulative Condition compared to 71.5 percent provided under the Environmental Baseline.

Flow-dependent spawning habitat availability under the Cumulative Condition is similar to, or slightly greater than that under the Environmental Baseline. Flow-dependent spawning habitat availability for spring-run Chinook salmon remains characterized as a low stressor under the Cumulative Condition.

#### 8.4.4.1.2 Fall-run Chinook Salmon Spawning Habitat Availability

Because a small proportion (3.3% and 2.8%, respectively) of daily flows exceed 5,000 cfs during the October through December fall-run Chinook salmon spawning period under the Cumulative Condition and Environmental Baseline, these daily flows were excluded from the fall-run Chinook salmon spawning WUA analysis. Tables 8.4-14 displays the long-term average and

average by WYT of fall-run Chinook salmon spawning habitat (percent of maximum WUA) under the Cumulative Condition and Environmental Baseline.

**Table 8.4-14. Long-term and water year type average fall-run Chinook salmon spawning WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Cumulative Condition | 96.0 | 94.3 | 95.4 | 95.6 | 97.4 | 97.7 |
| Environmental Baseline | 96.1 | 94.2 | 96.0 | 95.8 | 97.6 | 97.8 |
| Difference | -0.1 | 0.1 | -0.6 | -0.2 | -0.2 | -0.1 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average fall-run Chinook salmon in-channel spawning habitat availability (percent of maximum WUA) in the lower Yuba River is similar under the Cumulative Condition and Environmental Baseline (long-term average of 96.0 and 96.1 percent of the maximum WUA, respectively). The Cumulative Condition provides similar amounts of spawning habitat by WYT, but provides 0.1 percent more maximum spawning habitat during wet WYs, and 0.6 percent less during above normal WYs. Both the Environmental Baseline and the Cumulative Condition provide, on the average, over 90 percent of maximum spawning WUA during any WYT.

Habitat durations for fall-run Chinook salmon spawning under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-2. The Cumulative Condition provides similar amounts of in-channel spawning habitat availability overall, but provides somewhat less spawning habitat availability over about the 87-93 percent of the exceedance probability distribution. Also, the Cumulative Condition and the Environmental Baseline provide over 80 percent of maximum spawning WUA with about a 95 percent probability, and provide over 90 percent of maximum spawning WUA with about a 92-93 percent probability.

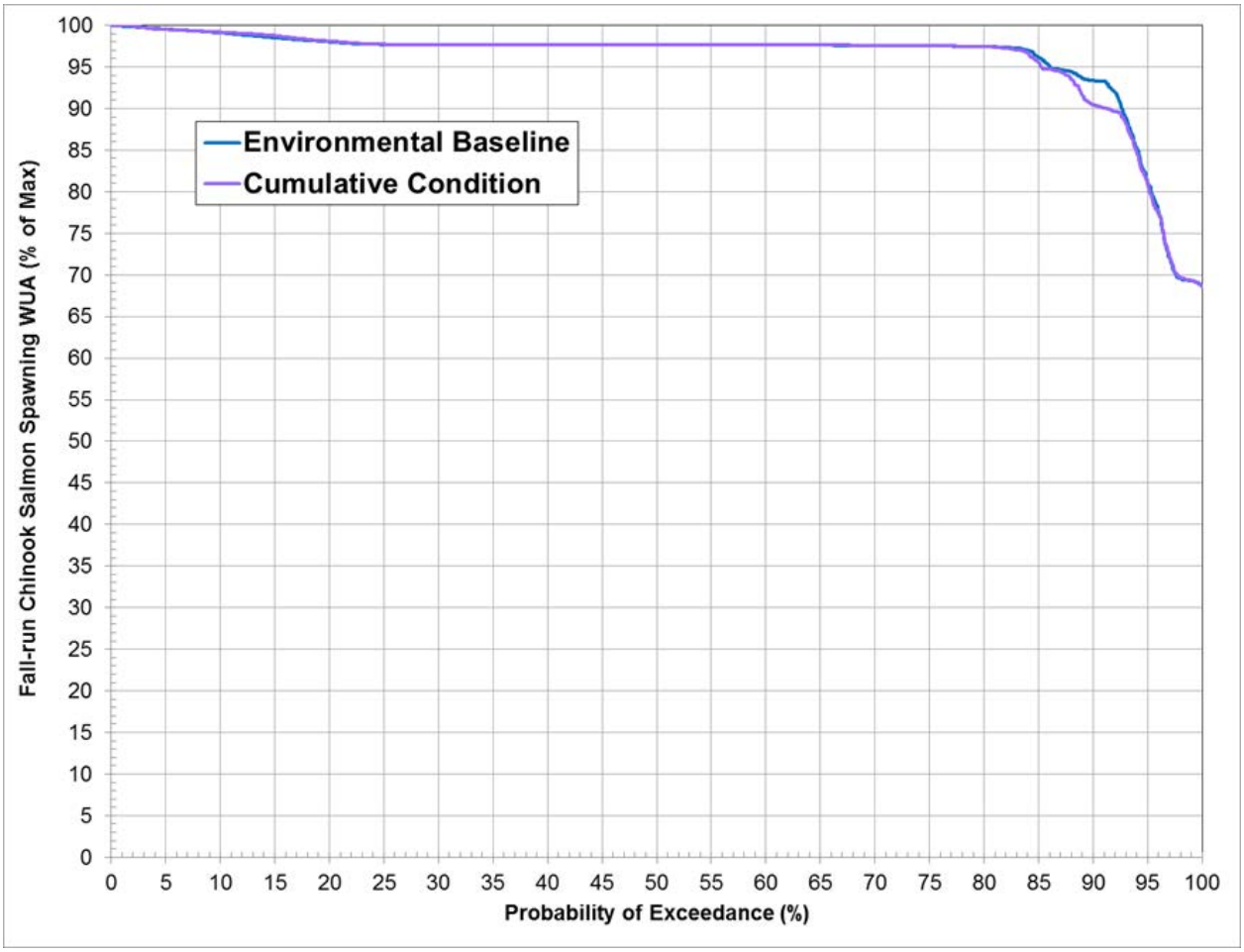


**Figure 8.4-2. Fall-run Chinook salmon spawning habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), 90.3 percent of fall-run Chinook salmon maximum spawning WUA was provided under the Cumulative Condition compared to 93.1 percent provided under the Environmental Baseline.

Flow-dependent spawning habitat availability under the Cumulative Condition is similar to, or slightly greater than that under the Environmental Baseline. Flow-dependent spawning habitat availability for fall-run Chinook salmon remains characterized as a low stressor under the Cumulative Condition.

### 8.4.4.2 Potential Redd Dewatering

#### 8.4.4.2.1 Spring-run Chinook Salmon

For every day of the annual embryo incubation period over the 33 years simulated, the long-term annual average of the percentage of spring-run Chinook salmon redds potentially dewatered under the Cumulative Condition is very low, and similar to that under the Environmental

Baseline. The average percentage of redds potentially dewatered by WYTs under the Cumulative Condition would be very low, and similar to that under the Environmental Baseline (Table 8.4-15).

**Table 8.4-15. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Cumulative Condition | Environmental Baseline | Difference | Cumulative Condition | Environmental Baseline | Difference |
| Long-term (All WYs) | 0.03% | 0.01% | 0.02% | 0.00% | 0.00% | 0.00% |
| Wet | 0.06% | 0.02% | 0.04% | 0.00% | 0.00% | 0.00% |
| Above Normal | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% | 0.00% |
| Below Normal | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Dry | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Critical | 0.01% | 0.00% | 0.01% | 0.00% | 0.00% | 0.00% |

The long-term and WYT averages of the percentage of egg pockets dewatered indicates that no egg pockets would be dewatered under the Cumulative Condition or the Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), no spring-run Chinook salmon redds or egg pockets would potentially be dewatered under the Cumulative Condition or under the Environmental Baseline.

As previously discussed, Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for spring-run Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period).

Proposed Condition AR9 does not necessarily apply to every day each year of the embryo incubation period. During the days over the 33-year period of evaluation when this proposed condition would apply, it would provide the intended protection for spring-run Chinook salmon redd dewatering (Table 8.4-16).

**Table 8.4-16. Estimated spring-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline for those days in the 33-year period of record during which the flow reduction criteria specified in Proposed Condition AR9 would apply.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Cumulative Condition | Environmental Baseline | Difference | Cumulative Condition | Environmental Baseline | Difference |
| Long-term (All WYs) | 0.03% | 0.01% | 0.02% | 0.00% | 0.00% | 0.00% |
| Wet | 0.06% | 0.01% | 0.05% | 0.00% | 0.00% | 0.00% |
| Above Normal | 0.01% | 0.01% | 0.00% | 0.00% | 0.00% | 0.00% |
| Below Normal | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Dry | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Critical | 0.01% | 0.00% | 0.01% | 0.00% | 0.00% | 0.00% |

Spring-run Chinook salmon redd dewatering under the Cumulative Condition is estimated to be very low and similar to that under the Environmental Baseline. Potential redd dewatering would be a low stressor to spring-run Chinook salmon under the Cumulative Condition.

#### 8.4.4.2.2 Fall-run Chinook Salmon

For every day of the annual embryo incubation period over the 33 years simulated, the long-term annual average of the percentage of fall-run Chinook salmon redds potentially dewatered under the Cumulative Condition is low, averaging 1.57 percent annually, very similar to the 1.20 percent average under the Environmental Baseline. Applying these long-term averages to the number of fall-run Chinook redds observed during 2009 and 2010 (2,079 and 1,559 redds, respectively), it is estimated that about 32 and 19 fall-run Chinook salmon redds would have been dewatered under the Cumulative Condition and Environmental Baseline, respectively.

The average percentage of redds potentially dewatered would also be small, and generally similar under the Cumulative Condition and Environmental Baseline during all WYTs (Table 8.4-17), with the percentages generally decreasing from "wetter" to "drier" years under both scenarios.

**Table 8.4-17. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Cumulative Condition | Environmental Baseline | Difference | Cumulative Condition | Environmental Baseline | Difference |
| Long-term (All WYs) | 1.57% | 1.20% | 0.37% | 0.85% | 0.68% | 0.17% |
| Wet | 3.39% | 2.73% | 0.66% | 2.00% | 1.68% | 0.32% |
| Above Normal | 0.53% | 0.43% | 0.10% | 0.30% | 0.24% | 0.06% |
| Below Normal | 2.25% | 1.44% | 0.81% | 0.97% | 0.65% | 0.32% |
| Dry | 0.31% | 0.20% | 0.11% | 0.09% | 0.04% | 0.05% |
| Critical | 0.15% | 0.09% | 0.06% | 0.02% | 0.01% | 0.01% |

The long-term and water year type averages of the percentage of egg pockets dewatered under the Cumulative Condition are very low, about half of the percentages of potentially dewatered redds, and they are very similar to the averages under the Environmental Baseline.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), an estimated 0.28 percent of fall-run Chinook salmon redds and 0 percent of egg pockets would potentially be dewatered under the Cumulative Condition, compared to 0.01 percent of redds and 0 percent of egg pockets under the Environmental Baseline.

As previously discussed, Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam, was developed in part to minimize the potential for Chinook salmon redd dewatering during the period from September 2 through December 31 (corresponding to the spring-run Chinook salmon spawning and incubation period).

Proposed Condition AR9 would not necessarily apply to every day each year of the embryo incubation period. During the days over the 33-year period of evaluation when this proposed condition would apply, it would provide the intended protection for fall-run Chinook salmon redd dewatering (Table 8.4-18).

**Table 8.4-18. Estimated fall-run Chinook salmon redd and egg pocket potential dewatering under the Cumulative Condition relative to the Environmental Baseline for those days corresponding to the specific conditions during which the flow reductions specified in Proposed Condition AR9 apply.**

| WYT Categories | Redd Dewatering Index (%) | | | Egg Pocket Dewatering Index (%) | | |
|---|---|---|---|---|---|---|
| | Cumulative Condition | Environmental Baseline | Difference | Cumulative Condition | Environmental Baseline | Difference |
| Long-term (All WYs) | 0.41% | 0.30% | 0.11% | 0.12% | 0.10% | 0.02% |
| Wet | 0.84% | 0.64% | 0.20% | 0.26% | 0.24% | 0.02% |
| Above Normal | 0.26% | 0.20% | 0.06% | 0.10% | 0.10% | 0.00% |
| Below Normal | 0.15% | 0.09% | 0.06% | 0.02% | 0.00% | 0.02% |
| Dry | 0.28% | 0.18% | 0.10% | 0.08% | 0.04% | 0.04% |
| Critical | 0.13% | 0.07% | 0.06% | 0.02% | 0.01% | 0.01% |

Fall-run Chinook salmon redd dewatering under the Cumulative Condition is estimated to be very low and similar to that under the Environmental Baseline. Potential redd dewatering would be a low/moderate stressor to fall-run Chinook salmon under the Cumulative Condition.

8.4.4.2.3 Fry and Juvenile Rearing Habitat Availability

**Spring-run Chinook Salmon**

Fry In-channel Rearing Habitat

During the mid-November through mid-February spring-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 13 percent of the days over the 33-year simulation period for the Cumulative Condition, and about 12 percent of the days for the Environmental Baseline These days were excluded from the spring-run Chinook salmon fry in-channel rearing WUA analysis. Table 8.4-19 displays the long-term average and average by WYT of spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

**Table 8.4-19. Long-term and WYT average spring-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Cumulative Condition | 88.4 | 88.4 | 88.9 | 86.7 | 87.5 | 89.6 |
| Environmental Baseline | 88.6 | 88.6 | 88.8 | 87.0 | 88.2 | 89.7 |
| Difference | -0.2 | -0.2 | 0.1 | -0.3 | -0.7 | -0.1 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is very similar under the Cumulative Condition and Environmental Baseline (long-term average of 88.4% and 88.6% of the maximum WUA). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline provide an average of over 80 percent of fry in-channel rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon fry in-channel rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-3. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution, but the Cumulative Condition provides slightly more habitat over about the upper 5 percent of the distribution, and provides slightly less habitat over about 20 percent of the distribution. The Cumulative Condition and Environmental Baseline both achieve 80 percent or more of fry in-channel rearing maximum WUA with 100 percent probability.

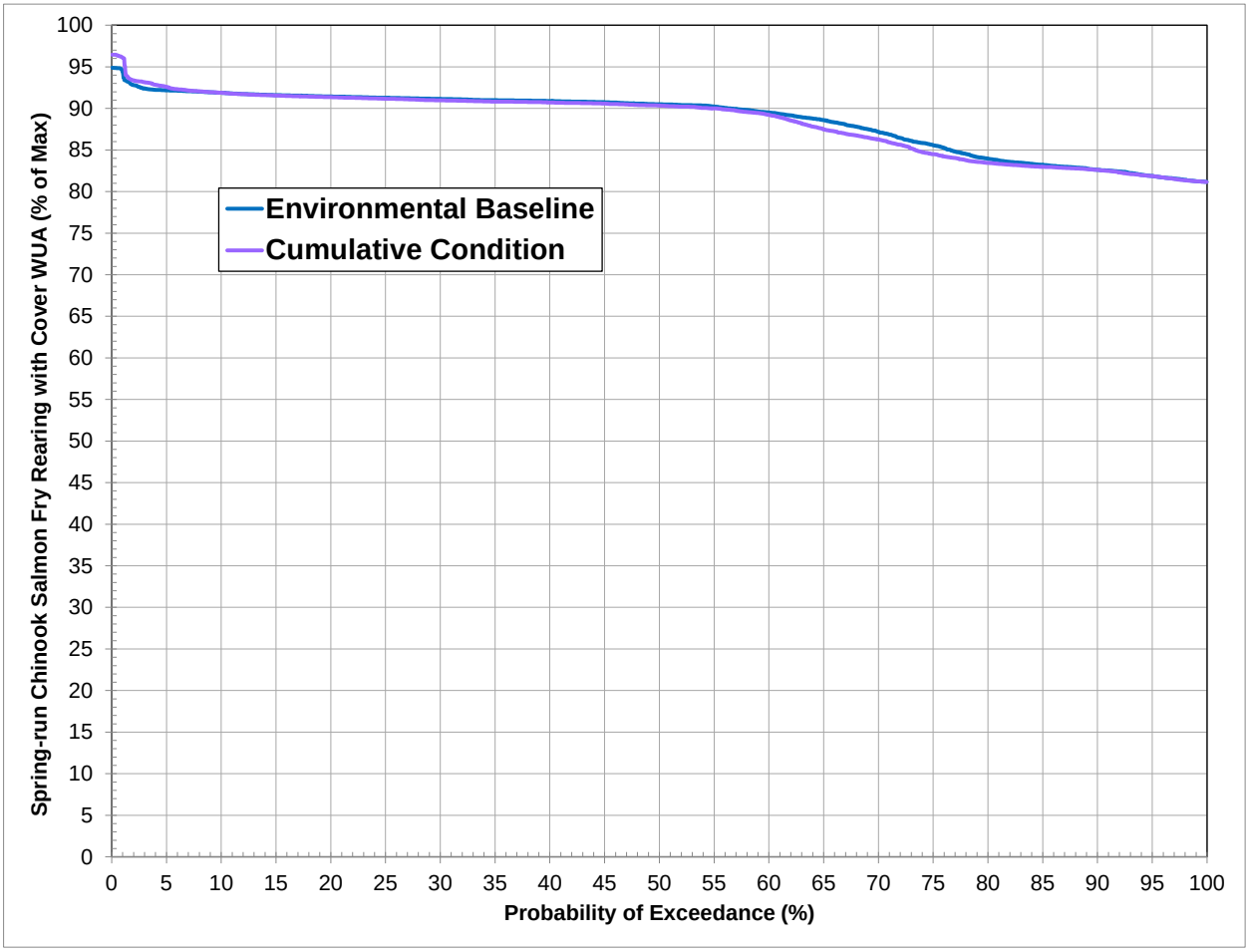


**Figure 8.4-3. Spring-run Chinook salmon fry in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), 92.5 percent of spring-run Chinook salmon fry in-channel rearing maximum WUA was provided under the Cumulative Condition compared to 91.2 percent provided under the Environmental Baseline.

Fry Full-Flow Rearing Habitat

Table 8.4-20 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

**Table 8.4-20. Spring-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Cumulative Condition** | | | | | | |
| **Total Days in Analysis** | **3,036** | **1,012** | **460** | **368** | **460** | **736** |
| Days ≤ 5,000 cfs | 2,656 | 665 | 436 | 363 | 457 | 735 |
| Days > 5,000 cfs | 380 | 347 | 24 | 5 | 3 | 1 |
| **Avg. WUA** | **153.8** | **53.2** | **23.0** | **17.7** | **22.5** | **37.5** |
| WUA ≤ 5,000 cfs | 130.8 | 32.1 | 21.5 | 17.4 | 22.3 | 37.5 |
| WUA > 5,000 cfs | 23.1 | 21.1 | 1.5 | 0.3 | 0.2 | 0.1 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **3,036** | **1,012** | **460** | **368** | **460** | **736** |
| Days ≤ 5,000 cfs | 2,677 | 682 | 438 | 364 | 458 | 735 |
| Days > 5,000 cfs | 359 | 330 | 22 | 4 | 2 | 1 |
| **Avg. WUA** | **154.4** | **53.3** | **23.0** | **17.8** | **22.8** | **37.6** |
| WUA ≤ 5,000 cfs | 132.4 | 33.0 | 21.6 | 17.6 | 22.7 | 37.6 |
| WUA > 5,000 cfs | 22.0 | 20.3 | 1.4 | 0.2 | 0.1 | 0.1 |
| **Differences** | | | | | | |
| **Avg. WUA** | **-0.6** | **-0.1** | **0.0** | **-0.1** | **-0.3** | **-0.1** |
| **% change** | **-0.4%** | **-0.1%** | **0.0%** | **-0.6%** | **-1.4%** | **-0.3%** |

[1] As defined by the Yuba River Index WY (YRI) Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

For the entire simulation period, very similar amounts of fry rearing habitat (total WUA) are available under the Cumulative Condition compared to the Environmental Baseline, as well as for each of the WYTs.

Figure 8.4-4 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, a trend was observed of the most spring-run Chinook salmon fry habitat occurring during wet WYs with decreasing amounts from wet to below normal WYs, then fry habitat increasing for dry and critical WYs. For both the Cumulative Condition and Environmental Baseline, relatively little to no additional fry rearing habitat is provided by days when flows were >5,000 cfs for below normal, dry, and critical WYTs.

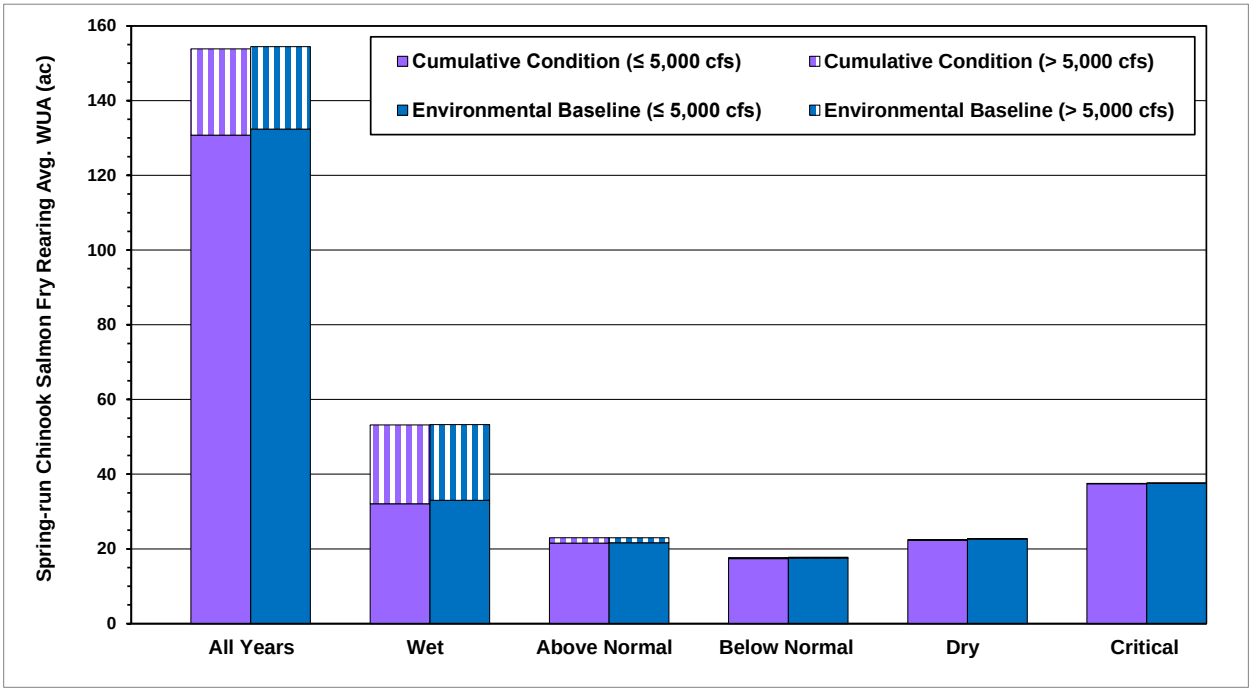


**Figure 8.4-4. Comparison of the amount (in acres) of spring-run Chinook salmon fry weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤5,000 cfs and for days when flows were >5,000 cfs.**

Juvenile In-Channel Rearing Habitat

During the year-round spring-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 11 percent of the days over the 33-year simulation period for the Cumulative Condition and Environmental Baseline. These days were excluded from the spring-run Chinook salmon juvenile in-channel rearing WUA analysis. Table 8.4-21 displays the long-term average and average by WYT of spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

**Table 8.4-21. Long-term and WYT average spring-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Cumulative Condition | 96.4 | 95.4 | 95.6 | 96.2 | 97.2 | 97.5 |
| Environmental Baseline | 96.5 | 95.5 | 95.8 | 96.4 | 97.5 | 97.1 |
| Difference | -0.1 | -0.1 | -0.2 | -0.2 | -0.3 | 0.4 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average juvenile in-channel rearing habitat availability (WUA) in the lower Yuba River is very similar under the Cumulative Condition and Environmental Baseline (long-term average of 96.4% and 96.5% of the maximum WUA, respectively). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline provide an average of over 80 percent (and even over 95%) of juvenile in-channel rearing maximum WUA during all WYTs.

Habitat durations for spring-run Chinook salmon juvenile rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-5. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution, but the Cumulative Condition does provide more habitat over about the lower 1 percent of the distribution when juvenile rearing is most limited. The Cumulative Condition and Environmental Baseline both achieve over 80 percent (and even 90%) of juvenile in-channel rearing maximum WUA with about a 99 percent probability.

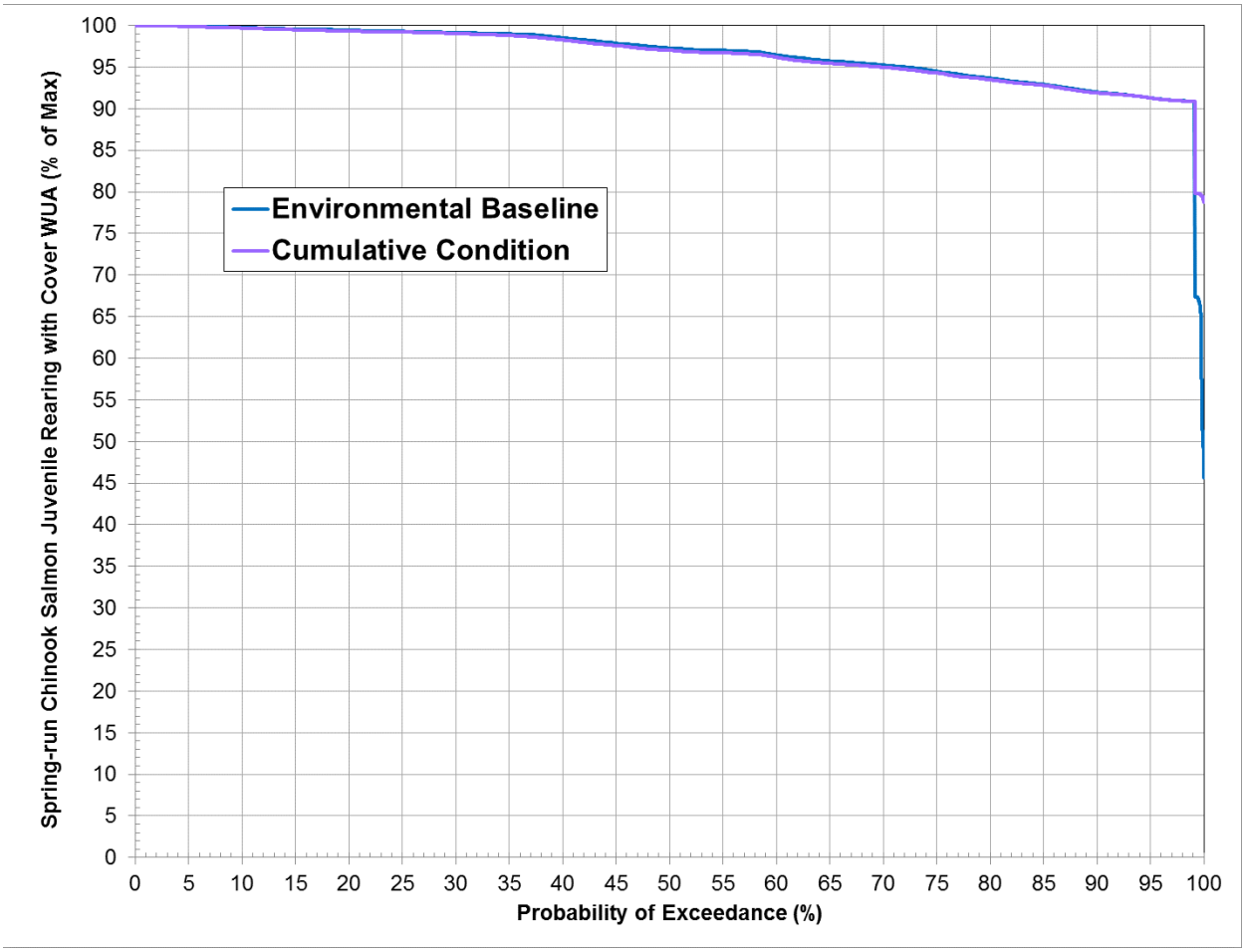


**Figure 8.4-5. Spring-run Chinook salmon juvenile in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), 93.7 percent of spring-run Chinook salmon juvenile in-channel rearing maximum WUA was provided under the Cumulative Condition compared to 89.0 percent provided under the Environmental Baseline.

Juvenile Full-Flow Rearing Habitat

Table 8.4-22 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. For the entire simulation period and by WYT, very similar amounts of juvenile rearing habitat (total WUA) are available under the Cumulative Condition and the Environmental Baseline.

**Table 8.4-22. Spring-run Chinook salmon juvenile weighted usable area (WUA) without cover (in acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤5,000 cfs and for days when flows were >5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Cumulative Condition** | | | | | | |
| **Total Days in Analysis** | **12,053** | **4,017** | **1,826** | **1,461** | **1,826** | **2,923** |
| Days ≤ 5,000 cfs | 10,766 | 2,936 | 1,687 | 1,403 | 1,821 | 2,919 |
| Days > 5,000 cfs | 1,287 | 1,081 | 139 | 58 | 5 | 4 |
| **Avg. WUA** | **254.3** | **84.7** | **37.1** | **30.2** | **38.8** | **63.4** |
| WUA ≤ 5,000 cfs | 223.9 | 58.9 | 34.0 | 29.0 | 38.7 | 63.4 |
| WUA > 5,000 cfs | 30.4 | 25.8 | 3.1 | 1.3 | 0.1 | 0.1 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **12,053** | **4,017** | **1,826** | **1,461** | **1,826** | **2,923** |
| Days ≤ 5,000 cfs | 10,776 | 2,952 | 1,679 | 1,403 | 1,823 | 2,919 |
| Days > 5,000 cfs | 1,277 | 1,065 | 147 | 58 | 3 | 4 |
| **Avg. WUA** | **254.8** | **85.0** | **37.2** | **30.4** | **39.1** | **63.2** |
| WUA ≤ 5,000 cfs | 224.5 | 59.3 | 34.0 | 29.1 | 39.0 | 63.1 |
| WUA > 5,000 cfs | 30.3 | 25.6 | 3.2 | 1.3 | 0.1 | 0.1 |
| **Differences** | | | | | | |
| **Avg. WUA** | **-0.6** | **-0.2** | **-0.1** | **-0.1** | **-0.3** | **0.2** |
| **% change** | **-0.2%** | **-0.3%** | **-0.3%** | **-0.4%** | **-0.7%** | **0.3%** |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Figure 8.4-6 displays the full-flow analysis of the amounts (in acres) of spring-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to below normal WYTs, then increasing amounts were provided for dry and critical WYTs. For both the Cumulative Condition and Environmental Baseline, relatively little additional juvenile

rearing habitat is provided by days when flows were > 5,000 cfs for below normal, dry and critical WYTs.

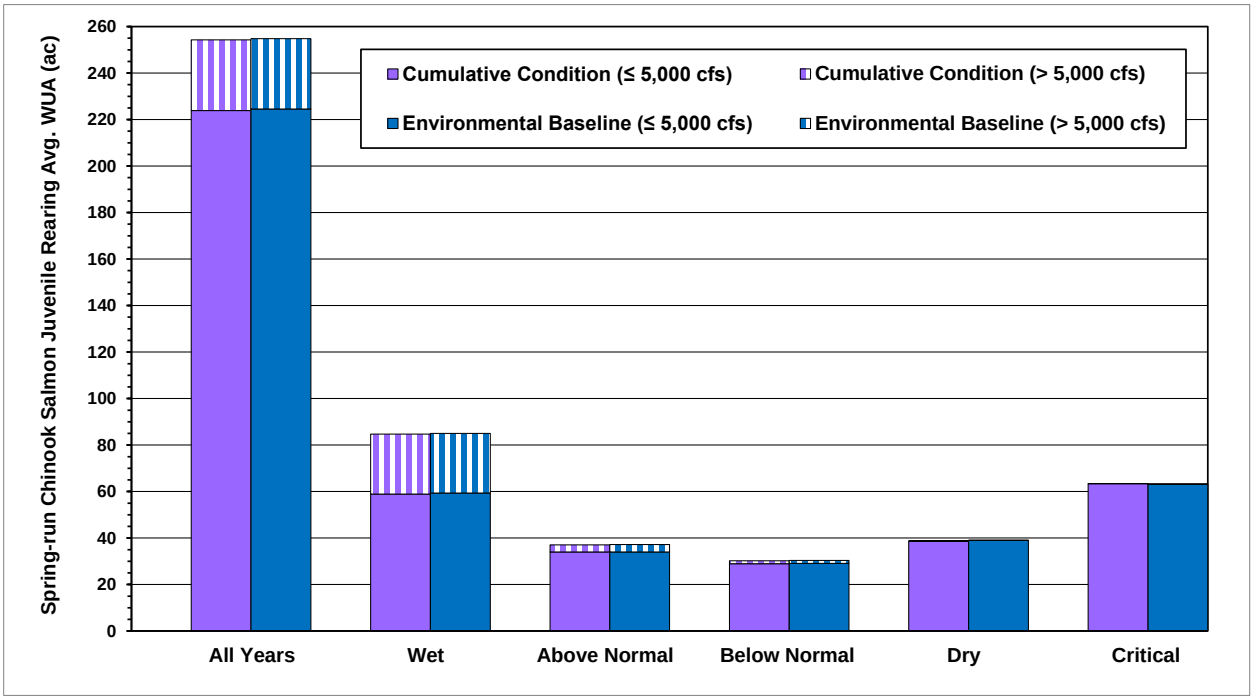


**Figure 8.4-6. Comparison of the amounts (in acres) of spring-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.**

## Fall-run Chinook Salmon

Fry In-Channel Rearing Habitat

During the mid-December through April fall-run Chinook salmon fry rearing period, flows exceed 5,000 cfs during about 20 percent of the days over the 33-year simulation period for both the Cumulative Condition and the Environmental Baseline. These days were excluded from the fall-run Chinook salmon fry in-channel rearing WUA analysis. Table 8.4-23 displays the long-term average and average by WYT of fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

Over the entire 33-year simulation period, long-term average fry rearing habitat availability (WUA) in the lower Yuba River is similar under the Cumulative Condition and Environmental Baseline (long-term average of 87.1% and 87.3% of the maximum WUA, respectively). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and the Environmental Baseline provide an average of 80 percent of fry in-channel rearing maximum WUA during all WYTs.

**Table 8.4-23. Long-term and WYT average fall-run Chinook salmon fry in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Cumulative Condition | 87.1 | 88.3 | 86.9 | 85.1 | 85.2 | 88.5 |
| Environmental Baseline | 87.3 | 88.3 | 87.2 | 85.1 | 85.7 | 88.6 |
| Difference | -0.2 | 0.0 | -0.3 | 0.0 | -0.5 | -0.1 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Habitat durations for fall-run Chinook salmon fry in-channel rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-7. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution, but the Cumulative Condition provides slightly more habitat over about the upper 3 percent of the distribution. The Cumulative Condition and Environmental Baseline both achieve 80 percent of fry in-channel rearing maximum WUA with about a 100 percent probability.

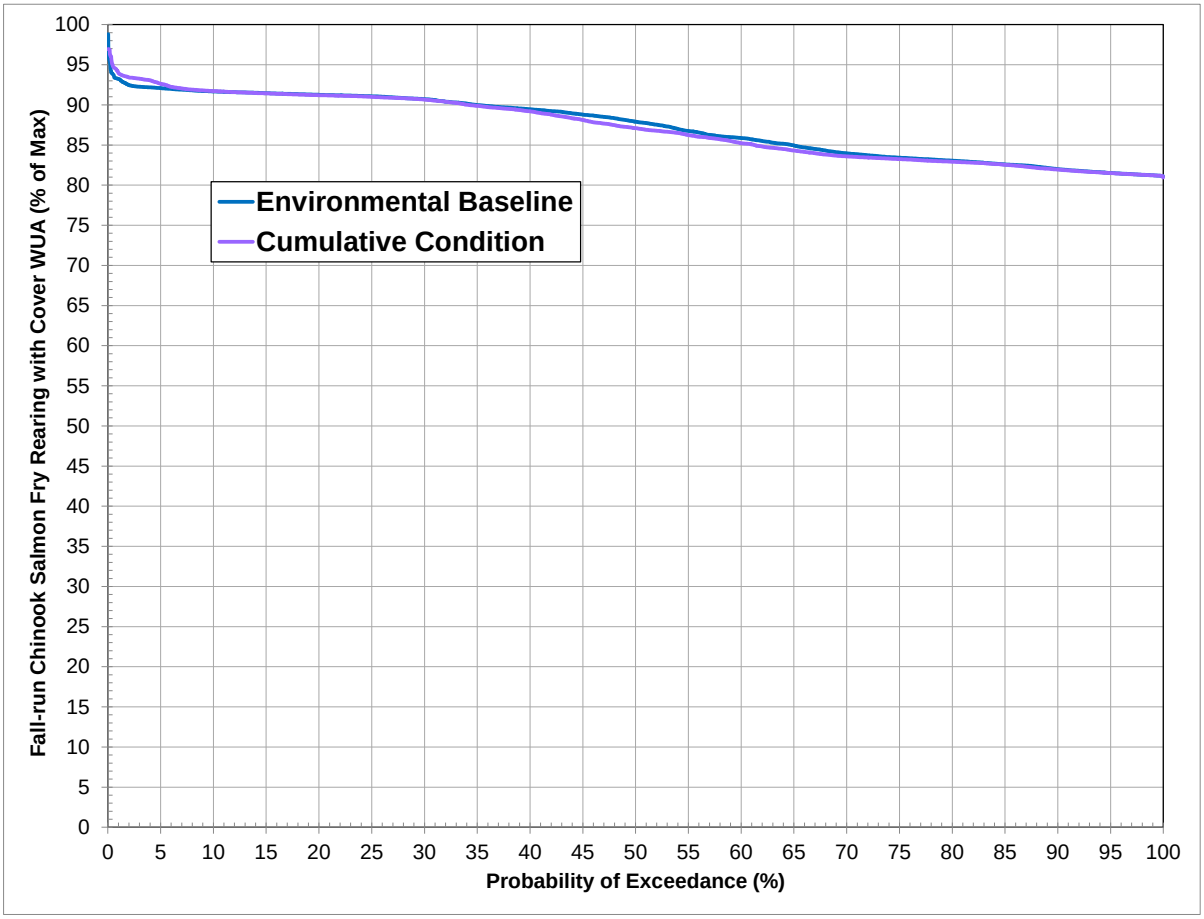


**Figure 8.4-7. Fall-run Chinook salmon fry in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), 93.5 percent of fall-run Chinook salmon fry in-channel rearing maximum WUA was provided under the Cumulative Condition compared to 92.0 percent provided under the Environmental Baseline.

Fry Full-Flow Rearing Habitat

Table 8.4-24 displays the full-flow analysis of the amounts (ac) of fall-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Results are shown for all days, for days when flows were less than or equal to 5,000 cfs and for days when flows were greater than 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period (all years) and by water year type.

**Table 8.4-24. Fall-run Chinook salmon fry weighted usable area (WUA) without cover (in acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤5,000 cfs and for days when flows were >5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Cumulative Condition** | | | | | | |
| **Total Days in Analysis** | **4,497** | **1,499** | **681** | **545** | **681** | **1,091** |
| Days ≤ 5,000 cfs | 3,583 | 746 | 586 | 488 | 676 | 1,087 |
| Days > 5,000 cfs | 914 | 753 | 95 | 57 | 5 | 4 |
| **Avg. WUA** | **152.3** | **54.8** | **22.1** | **17.3** | **21.3** | **36.8** |
| WUA ≤ 5,000 cfs | 115.0 | 23.7 | 18.4 | 15.1 | 21.2 | 36.6 |
| WUA > 5,000 cfs | 37.2 | 31.0 | 3.7 | 2.2 | 0.2 | 0.2 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **4,497** | **1,499** | **681** | **545** | **681** | **1,091** |
| Days ≤ 5,000 cfs | 3,595 | 751 | 591 | 488 | 678 | 1,087 |
| Days > 5,000 cfs | 902 | 748 | 90 | 57 | 3 | 4 |
| **Avg. WUA** | **152.9** | **54.9** | **22.2** | **17.3** | **21.6** | **36.9** |
| WUA ≤ 5,000 cfs | 115.9 | 23.9 | 18.7 | 15.1 | 21.5 | 36.7 |
| WUA > 5,000 cfs | 37.0 | 31.0 | 3.5 | 2.2 | 0.1 | 0.2 |
| **Differences** | | | | | | |
| **Avg. WUA** | **-0.6** | **-0.2** | **-0.1** | **0.0** | **-0.3** | **-0.1** |
| **% change** | **-0.4%** | **-0.3%** | **-0.3%** | **-0.2%** | **-1.3%** | **-0.2%** |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

For the entire simulation period, similar amounts of fry rearing habitat (total WUA) are available under the Cumulative Condition compared to the Environmental Baseline, as well as for each of the WYTs.

Figure 8.4-8 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon fry WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, a trend was observed of the most fall-run Chinook salmon fry habitat occurring during wet WYs with decreasing amounts from wet to below normal WYs, then fry habitat increasing for dry and critical WYs. For both the Cumulative Condition and Environmental Baseline, relatively little to no additional fry rearing habitat is provided by days when flows were > 5,000 cfs for dry and critical WYTs.

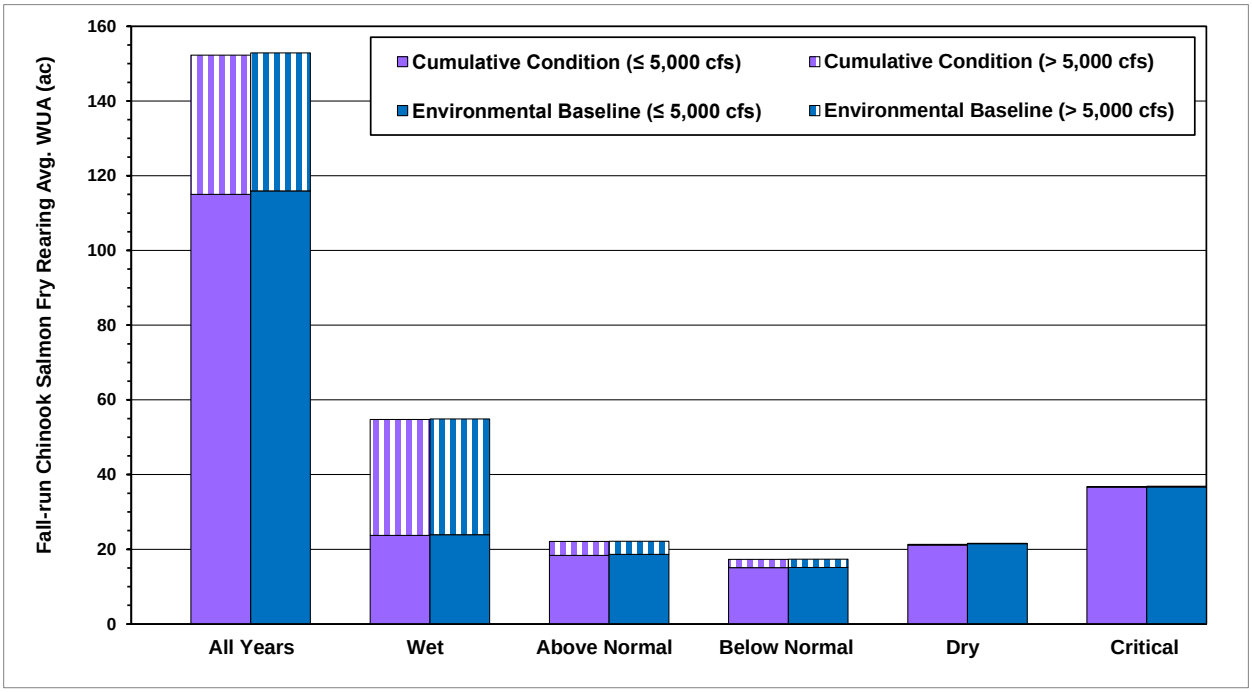


**Figure 8.4-8. Comparison of the amounts (in acres) of fall-run Chinook salmon fry weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.**

Juvenile In-Channel Rearing Habitat

During the mid-January through June fall-run Chinook salmon juvenile rearing period, flows exceed 5,000 cfs during about 20 percent of the days over the 33-year simulation period for the Cumulative Condition and Environmental Baseline. These days were excluded from the fall-run Chinook salmon juvenile in-channel rearing WUA analysis. Table 8.4-25 displays the long-term average and average by WYT of fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.

**Table 8.4-25. Long-term and WYT average fall-run Chinook salmon juvenile in-channel rearing WUA (percent of maximum) under the Cumulative Condition and Environmental Baseline.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| Cumulative Condition | 95.1 | 93.3 | 93.3 | 94.1 | 95.9 | 97.3 |
| Environmental Baseline | 95.3 | 93.3 | 93.6 | 94.3 | 96.3 | 97.5 |
| Difference | -0.2 | 0.0 | -0.3 | -0.2 | -0.4 | -0.2 |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Over the entire 33-year simulation period, long-term average juvenile in-channel rearing habitat availability (WUA) in the lower Yuba River is similar under the Cumulative Condition and Environmental Baseline (long-term average of 95.1% and 95.3% of the maximum WUA, respectively). The Cumulative Condition and Environmental Baseline also result in similar amounts of WUA by WYT. Both the Cumulative Condition and Environmental Baseline provide an average of over 80 percent (and even over 90%) of juvenile in-channel rearing maximum WUA during all WYTs.

Habitat durations for fall-run Chinook salmon juvenile in-channel rearing under the Cumulative Condition and Environmental Baseline are presented in Figure 8.4-9. The Cumulative Condition and Environmental Baseline provide similar amounts of habitat over the entire distribution. The Cumulative Condition and Environmental Baseline both achieve over 80 percent (and even 90%) of maximum juvenile in-channel rearing maximum WUA with about a 99 percent probability.

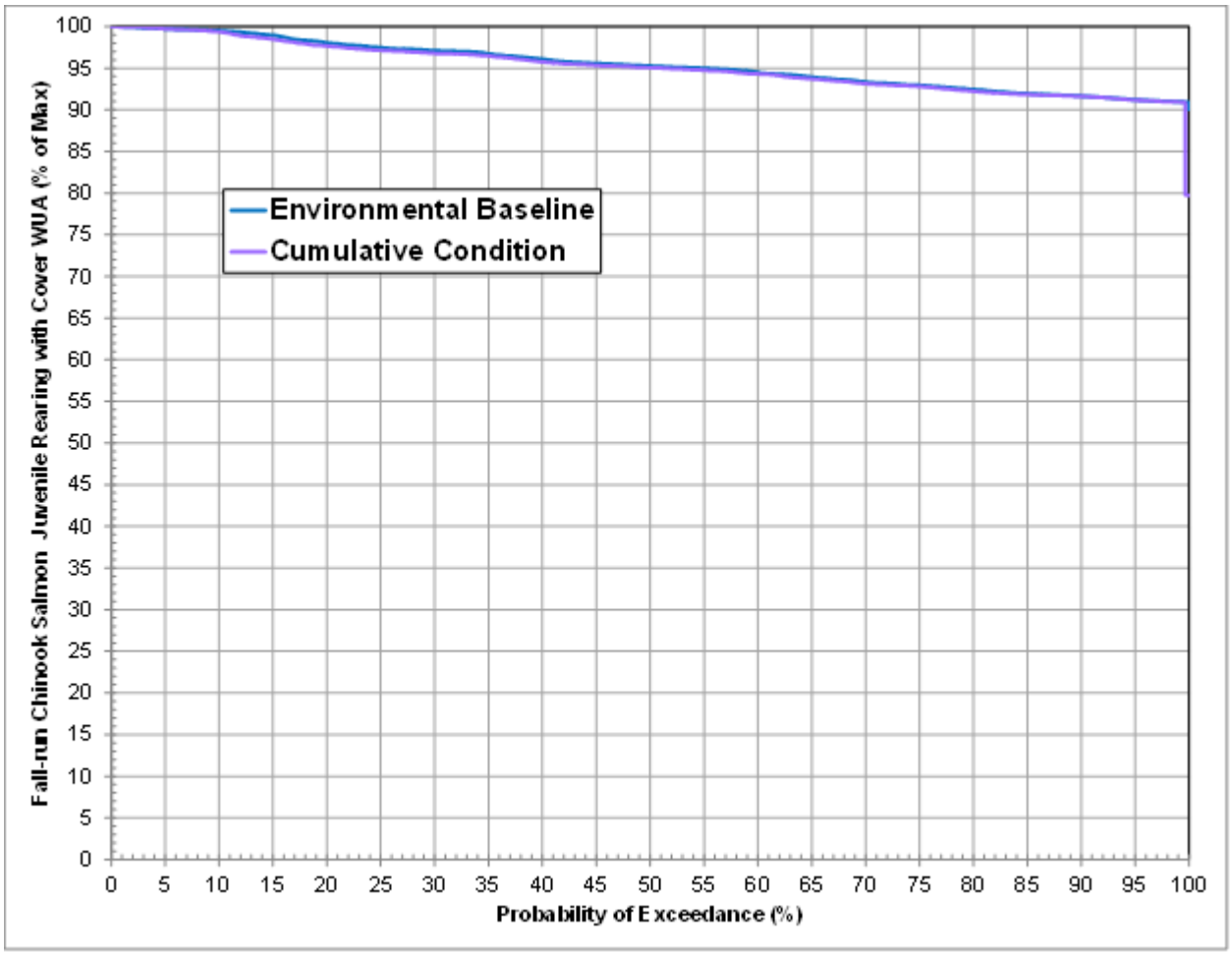


**Figure 8.4-9. Fall-run Chinook salmon juvenile in-channel rearing habitat duration over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.**

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), 95.9 percent of fall-run Chinook salmon juvenile in-channel rearing maximum WUA was provided under the Cumulative Condition compared to 96.7 percent provided under the Environmental Baseline.

Juvenile Full-Flow Rearing Habitat

Table 8.4-26 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon juvenile rearing WUA without cover under the Cumulative Condition and the Environmental Baseline. For the entire simulation period and by WYT, similar amounts of juvenile rearing habitat (total WUA) are available under the Cumulative Condition and the Environmental Baseline.

**Table 8.4-26. Fall-run Chinook salmon juvenile weighted usable area (WUA) without cover (in acres) under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation for days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs, and the differences between the two scenarios over the long-term full simulation period and by water year type.**

| Scenario | Long-term Full Simulation Period[2] | WYTs[1] | | | | |
|---|---|---|---|---|---|---|
| | | Wet | Above Normal | Below Normal | Dry | Critical |
| **Cumulative Condition** | | | | | | |
| **Total Days in Analysis** | **5,487** | **1,829** | **831** | **665** | **831** | **1,331** |
| Days ≤ 5,000 cfs | 4,405 | 943 | 699 | 610 | 826 | 1,327 |
| Days > 5,000 cfs | 1,082 | 886 | 132 | 55 | 5 | 4 |
| **Avg. WUA** | **247.9** | **84.5** | **34.9** | **28.6** | **37.3** | **62.6** |
| WUA ≤ 5,000 cfs | 192.2 | 38.2 | 28.5 | 25.9 | 37.0 | 62.4 |
| WUA > 5,000 cfs | 55.7 | 46.3 | 6.4 | 2.7 | 0.2 | 0.2 |
| **Environmental Baseline** | | | | | | |
| **Total Days in Analysis** | **5,487** | **1,829** | **831** | **665** | **831** | **1,331** |
| Days ≤ 5,000 cfs | 4,390 | 934 | 691 | 610 | 828 | 1,327 |
| Days > 5,000 cfs | 1,097 | 895 | 140 | 55 | 3 | 4 |
| **Avg. WUA** | **249.1** | **84.7** | **35.1** | **28.7** | **37.7** | **62.9** |
| WUA ≤ 5,000 cfs | 192.5 | 37.8 | 28.4 | 26.1 | 37.5 | 62.7 |
| WUA > 5,000 cfs | 56.6 | 46.9 | 6.7 | 2.7 | 0.1 | 0.2 |
| **Differences** | | | | | | |
| **Avg. WUA** | **-1.2** | **-0.3** | **-0.1** | **-0.1** | **-0.4** | **-0.3** |
| **% change** | **-0.5%** | **-0.3%** | **-0.4%** | **-0.4%** | **-1.1%** | **-0.5%** |

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1976-2008 simulation period.

Figure 8.4-10 displays the full-flow analysis of the amounts (in acres) of fall-run Chinook salmon juvenile WUA without cover under the Cumulative Condition and the Environmental Baseline. For both scenarios, decreasing amounts of total habitat were provided from wet to below normal WYs, then increasing amounts were provided for dry and critical WYs. For both the Cumulative Condition and Environmental Baseline, relatively little additional juvenile rearing habitat is provided by days when flows were >5,000 cfs for dry and critical WYs.

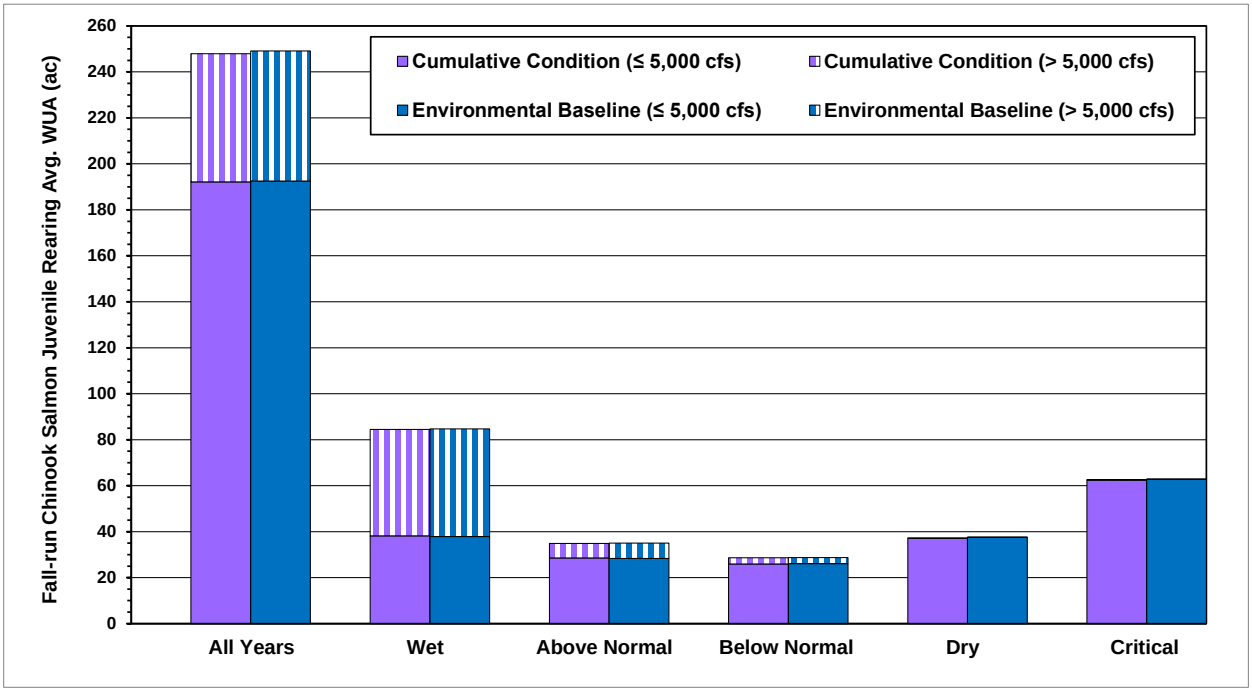


**Figure 8.4-10. Comparison of the amounts (in acres) of fall-run Chinook salmon juvenile weighted usable area (WUA) without cover under the Cumulative Condition and the Environmental Baseline over the 33-year period of evaluation. Shown are the amounts over the long-term full simulation period (all years) and by water year type of total habitat provided on days when flows were ≤ 5,000 cfs and for days when flows were > 5,000 cfs.**

Fry and Juvenile Rearing Habitat as Stressors

Spring-run and fall-run Chinook salmon flow-dependent fry and juvenile rearing habitat availability under the Cumulative Condition is similar to that under the Environmental Baseline. Flow-dependent fry and juvenile rearing habitat availability under the Cumulative Condition represents a low stressor to spring-run and fall-run Chinook salmon.

As a stressor, flow-dependent rearing habitat availability is distinct from rearing habitat physical structure. Aquatic habitat complexity and diversity is limited in the lower Yuba River. Restricted availability of complex, diverse habitats such as multiple braided channels and side channels associated with the loss of natural river morphology and function continues to be a high stressor to rearing juvenile anadromous salmonids. Fry and juvenile rearing physical habitat structure under the Environmental Baseline is a high stressor to Yuba River Chinook salmon. Although separate initiatives (by the AFRP and the USACE) are presently contemplating and evaluating habitat improvement measures in the lower Yuba River, they are not sufficiently advanced at this time to represent reasonably foreseeable actions within the context of this Applicant-Prepared Draft EFH Assessment. These and potentially similar initiatives may reduce the severity of Chinook salmon fry and juvenile rearing physical habitat structure as a stressor eventually if they are implemented, but it remains a high stressor under the Cumulative Condition.

#### 8.4.4.3 Fry and Juvenile Stranding and Isolation

The proposed lower maximum authorized ramping rate under the Proposed Action also is anticipated to reduce the potential for juvenile isolation in the lower Yuba River under the Cumulative Condition, relative to the Environmental Baseline. The lower maximum authorized ramping rate may better allow juvenile salmonids to volitionally move out of off-channel areas.

Figure 8.4-11 displays the annual average number of off-channel areas (as a percentage of the total number of off-channel areas) that experience n isolation events in the entire lower Yuba River for the Cumulative Condition and Environmental Baseline for all water years combined, and separately for wet, above normal, below normal, dry and critical WYs. The relative frequencies of isolation events under the Cumulative Condition and Environmental Baseline are very similar. The frequency of isolation events generally decreases from wetter to drier WYTs under both the Cumulative Condition and Environmental Baseline.

As discussed for the Proposed Action, the new flow fluctuation criteria under the Proposed Action (and under the Cumulative Condition) is anticipated to reduce the potential for juveniles to be isolated.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), the frequency of isolation events are very similar under the Cumulative Condition and Environmental Baseline.

Under the Environmental Baseline, fry and juvenile stranding and isolation is a stressor of moderate magnitude to Chinook salmon. Because the Cumulative Condition is anticipated to reduce the potential for stranding and isolation, the Cumulative Condition is expected to reduce the magnitude of this stressor, the potential "exposure" of Chinook salmon to this stressor, and the effects of this stressor on Chinook salmon EFH. Therefore, this stressor is expected to be reduced to a low to moderate magnitude to Chinook salmon in the lower Yuba River under the Cumulative Condition.

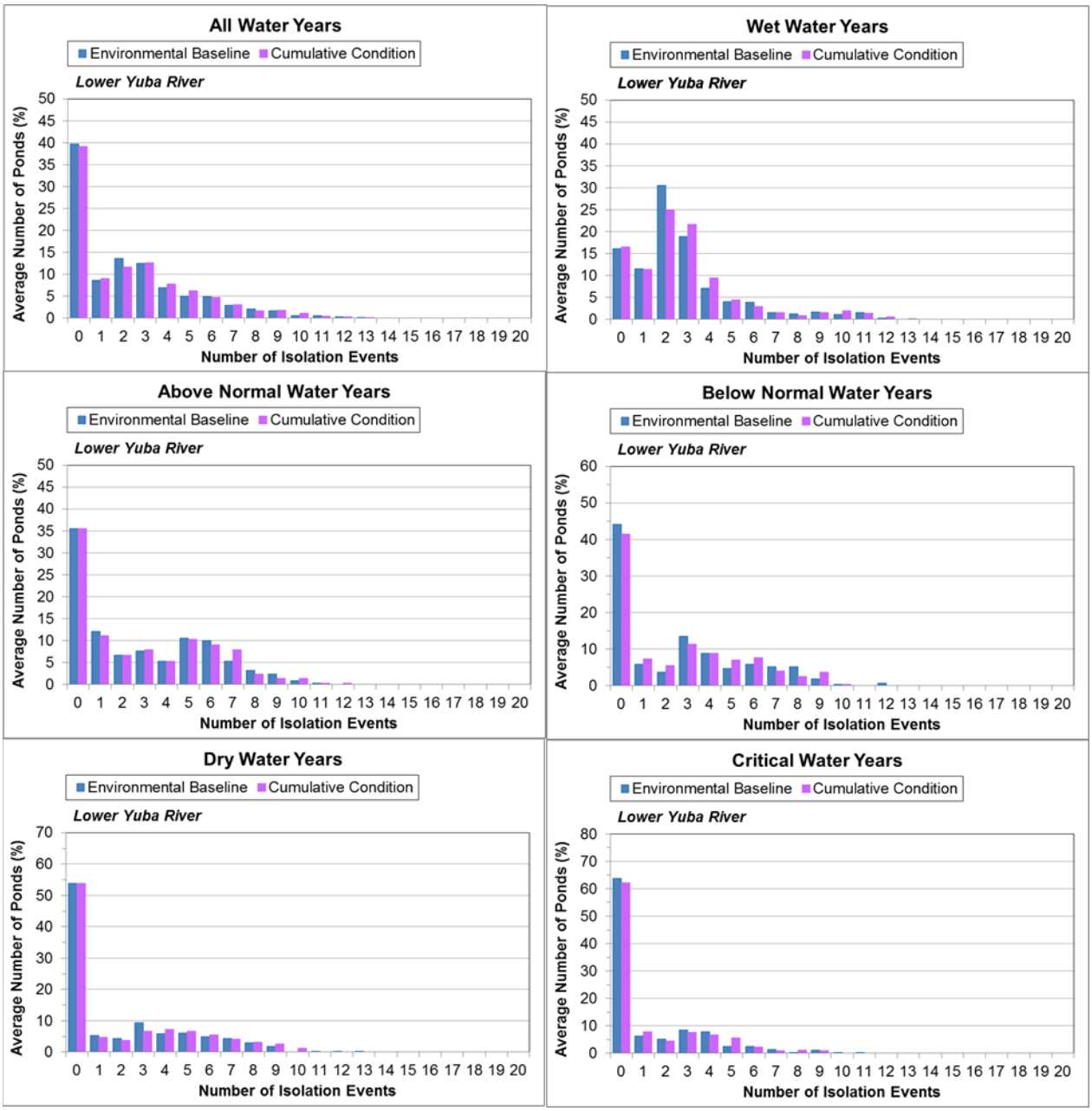


**Figure 8.4-11. Average percent of all off-channel areas in the lower Yuba River experiencing the specified number of isolation events over the 33-year hydrologic period for the Cumulative Condition and Environmental Baseline.**

### 8.4.4.4 Water Temperature

8.4.4.4.1 Cumulative Condition Compared to the Environmental Baseline

**Spring-run Chinook Salmon**

Table 8.4-27 displays the differences in spring-run Chinook salmon lifestage-specific upper tolerable WTI value exceedance probabilities under the Cumulative Condition relative to the Environmental Baseline (i.e., the probability of exceeding a WTI value under the Cumulative Condition minus the probability of exceeding that WTI value under the Environmental Baseline).

**Table 8.4-27. Difference in simulated upper tolerable water temperature exceedance probabilities for spring-run Chinook salmon lifestages under the Cumulative Condition relative to the Environmental Baseline.**

| Spring-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration | SMRT | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | Below DPD | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.4 | -0.8 | -2.5 | -2.0 | -0.9 | -2.4 | -2.8 | | | | | | |
| | MRY | 68°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| Adult Holding | SMRT | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| | Below DPD | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.4 | | | | | | |
| | MRY | 65°F | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | -0.6 | 0.8 | 2.4 | 4.9 | 3.0 | 3.0 | 3.4 | 1.6 | | | | | | |
| Spawning | SMRT | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | | | | | |
| Embryo Incubation | SMRT | 58°F | | | | | | | | | | | | | | | | | 0.0 | 0.0 | 0.0 | -0.8 | -1.4 | 0.0 | 0.0 | 0.0 |
| Juvenile Rearing and Downstream Movement | Below DPD | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.4 | -1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MRY | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.6 | 0.8 | 2.4 | 4.9 | 3.0 | 3.0 | 3.4 | 1.6 | -0.2 | -0.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Yearling+ Smolt Emigration | Below DPD | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MRY | 68°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | -1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Water temperature exceedance probabilities are generally similar under the Cumulative Condition and Environmental Baseline most of the time for all lifestages of spring-run Chinook salmon. Some differences in simulated water temperatures primarily occur during the spring-run Chinook salmon adult holding, and juvenile rearing and downstream movement lifestages. For all months of the year, no lifestage-specific upper tolerable WTI values are exceeded more often with a 10 percent or greater probability at any of the three evaluated locations under the Cumulative Condition, relative to the Environmental Baseline.

During the adult holding period, water temperatures at the Marysville location are slightly higher during late June through September under the Cumulative Condition compared to the Environmental Baseline. However, as previously discussed, adult spring-run Chinook salmon do not spend extended periods of time at downstream locations (e.g., Marysville), and they primarily exhibit holding behavior just downstream of Daguerre Point Dam or above Daguerre Point Dam.

During the juvenile rearing and downstream movement lifestage, which extends year-round, water temperatures at the Marysville location are slightly higher during late June through

 

September under the Cumulative Condition compared to the Environmental Baseline. However, exposure of downstream migrating juveniles during summer months to water temperatures at Marysville would not be expected to substantially occur due to minimal outmigration during the summer, and the suitability of rearing temperatures further upstream in this reach below Daguerre Point Dam.

During the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), water temperatures under the Cumulative Condition and Environmental Baseline are very similar (generally within about 1% or less) during most of October, and during mid-March through July at Smartsville, during most of October, and most of the time from mid-March through mid-June at Daguerre Point Dam, and during most of October, and most of March through mid-June at Marysville. At Smartsville, water temperatures under the Cumulative Condition are slightly cooler (about 1-2%) during late October through mid-March, and cooler (about 1-4%) during August through September, relative to the Environmental Baseline. At Daguerre Point Dam, water temperatures under the Cumulative Condition are slightly cooler (about 1-2%) during late October through early March, generally slightly cooler (about 1-5%) during early April, slightly warmer (about 1-2%) during early June, and increasingly cooler from late June through September, particularly during September when water temperatures are about 3 to 7°F (about 5 to 9%) cooler, relative to the Environmental Baseline. Similar patterns are observed at Marysville, where water temperatures are somewhat warmer during late June and become increasingly cooler from July through September, although the magnitudes of the differences are greater, with temperatures under the Cumulative Condition that are about 3°F (about 3-5%) warmer during late June, and that are about 4 to 12°F (about 6 to 15%) cooler during July through September, relative to the Environmental Baseline. These generally cooler water temperatures under the Cumulative Condition would represent more suitable water temperatures during the summer, which includes portions of the spring-run Chinook salmon adult immigration and holding, spawning, and juvenile rearing and downstream movement lifestages.

Under the Environmental Baseline, water temperatures are a low stressor to Yuba River spring-run Chinook salmon. Although relatively minor increases in simulated water temperatures with relatively low probabilities of occurrence are estimated to occur under the Cumulative Condition relative to the Environmental Baseline, this stressor will remain as a low stressor under the Cumulative Condition.

**Fall-run Chinook Salmon**

Table 8.4-28 displays the differences in fall-run Chinook salmon lifestage-specific upper tolerable WTI value exceedance probabilities under the Cumulative Condition relative to the Environmental Baseline (i.e., the probability of exceeding an upper tolerable WTI value under the Cumulative Condition minus the probability of exceeding that WTI value under the Environmental Baseline).

**Table 8.4-28. Difference in simulated upper tolerable water temperature exceedance probabilities for fall-run Chinook salmon lifestages under the Cumulative Condition relative to the Environmental Baseline.**

| Fall-run Chinook Salmon Lifestage | Node | Upper Tolerable WTI Value | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sep | | Oct | | Nov | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Immigration and Staging | Below DPD | 68°F | | | | | | | | | | | | | -0.8 | -2.5 | -2.0 | -0.9 | -2.4 | -2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | MRY | 68°F | | | | | | | | | | | | | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Spawning | SMRT | 58°F | | | | | | | | | | | | | | | | | | | 0.0 | -0.8 | -1.4 | 0.0 | 0.0 | 0.0 |
| | Below DPD | 58°F | | | | | | | | | | | | | | | | | | | 17.8 | 2.5 | -1.0 | 0.0 | 0.0 | 0.0 |
| Embryo Incubation | SMRT | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 0.0 | -0.8 | -1.4 | 0.0 | 0.0 | 0.0 |
| | Below DPD | 58°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | 17.8 | 2.5 | -1.0 | 0.0 | 0.0 | 0.0 |
| Juvenile Rearing and Downstream Movement | Below DPD | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.2 | | | | | | | | | | | | 0.0 |
| | MRY | 65°F | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.6 | 0.8 | | | | | | | | | | | | 0.0 |

Water temperature exceedance probabilities are generally similar under the Cumulative Condition and Environmental Baseline during most months of the year for all lifestages of fall-run Chinook salmon. Differences in exceedance probabilities under the Cumulative Condition are generally minor, with the exception of a substantial increase during the first half of October of the spawning and embryo incubation lifestages below Daguerre Point Dam, relative to the Environmental Baseline. However, fall-run Chinook salmon are primarily observed spawning during October in the upper reaches (upstream of Daguerre Point Dam) of the lower Yuba River. Spawning fall-run Chinook salmon begin expanding their spatial distribution further downstream in later fall months as suitable temperatures become available near or downstream of Daguerre Point Dam (RMT 2013a).

As previously described for spring-run Chinook salmon, during the one conference year (WY 1977) in the simulated period of evaluation (WY 1976-2008), water temperature differences between the Cumulative Condition and the Environmental Baseline demonstrate similar patterns among the three evaluation locations. Under the Cumulative Condition, lower water temperatures at Daguerre Point Dam and Marysville would be more suitable water temperatures during the summer, which includes portions of the fall-run Chinook salmon adult immigration and staging lifestage.

Under the Environmental Baseline, water temperatures are a low stressor to Yuba River fall-run Chinook salmon. Although relatively minor increases and decreases in simulated water temperatures with relatively low probabilities of occurrence are estimated to occur under the Cumulative Condition relative to the Environmental Baseline, this stressor will remain as a low stressor under the Cumulative Condition.

### 8.4.4.5 Narrows 2 Operations and Fish Movement

The Cumulative Condition does not include any changes to Narrows 2 operations, other than the previously described changes to conference year flows, flow fluctuation criteria, and coordinated operations with the Narrows Project under the Proposed Action. YCWA's Proposed Condition AR9, Control Project Ramping and Flow Fluctuation Downstream of Englebright Dam

includes… "Licensee shall make reasonable efforts to operate New Bullards Bar Reservoir and Project facilities downstream of Englebright Dam and coordinate with the operator of the Narrows Project (FERC Project No. 1403) to avoid fluctuations in the flow of the Yuba River downstream of Englebright Dam and daily changes in Project operations affecting releases or bypasses of flow downstream of Englebright Dam."

YCWA is aware of five salmon observations that may be related to stranding in the vicinity of the Narrows 2 Development facilities along the lower Yuba River. Four incidental observations of apparent strandings were recorded during data collection activities for YCWA's Study 7.11, *Fish Behavior and Hydraulics Near Narrows 2 Powerhouse*. Two occurred prior to initiation of Study 7.13, *Fish Stranding Associated with Shutdown of Narrows 2 Powerhouse Partial Bypass*, and included an observation by YCWA operators on October 23, 2012 of a fish carcass on the bank near the pool at the base of the Full Bypass and an observation by Relicensing Participants on October 25, 2012 of a fish carcass on the bank near the Partial Bypass. The other two incidental observations occurred in 2013. The first observation included an observation of a fish carcass near Narrows 2 Powerhouse on October 7, 2013. The second observation included multiple fish in an isolated pool in the channel near Narrows 2 Powerhouse on October 13, 2013. The fifth observation was made during fish stranding monitoring as part of YCWA's Narrows 2 Facilities Prioritized Operations and Monitoring Plan (Prioritized Operations Plan) and Streambed Monitoring Below Englebright Dam Plan (Streambed Monitoring Plan) in October 2015. These incidents are further described in Section 6.0 of the Applicant-Prepared Draft BA.

Under the Environmental Baseline, Narrows 2 operations were characterized as a low stressor to adult Chinook salmon. Under the Proposed Action, it is anticipated that Narrows 2 operations would be characterized as a low stressor to adult Chinook salmon.

#### 8.4.4.6 Passage Impediments/Barriers

##### 8.4.4.6.1 Englebright Dam

The existence of Englebright Dam is a very high stressor to Yuba River spring-run Chinook salmon under the Environmental Baseline (existing conditions). Because the Cumulative Condition would not affect the magnitude of this stressor, the potential "exposure" of Chinook salmon to this stressor, or the effects of this stressor on its EFH, it would remain as a very high stressor to Chinook salmon in the Yuba River under the Cumulative Condition.

##### 8.4.4.6.2 Daguerre Point Dam

Because the Cumulative Condition will not affect the potential "exposure" of Chinook salmon to this stressor, the magnitude of this stressor, and the effects of this stressor on Chinook salmon EFH, this stressor would remain a high stressor to Chinook salmon in the Yuba River downstream of Englebright Dam.

#### 8.4.4.7 Predation

Because the Cumulative Condition would not affect the potential "exposure" of Chinook salmon to this stressor or the magnitude of this stressor, it would remain a moderate to high stressor to Chinook salmon in the Yuba River.

#### 8.4.4.8 Physical Habitat Alteration

##### 8.4.4.8.1 Natural River Morphology and Function

Because the Cumulative Condition would not affect the potential "exposure" of Chinook salmon to this stressor, the magnitude of this stressor, or the effects of this stressor on Chinook salmon EFH, this stressor would remain a relatively high stressor to Chinook salmon in the Yuba River.

##### 8.4.4.8.2 Floodplain Habitat Availability

Because the Cumulative Condition would not affect the potential "exposure" of Chinook salmon to this stressor, the magnitude of this stressor, or the effects of this stressor on Chinook salmon EFH, this stressor would remain a high stressor to Chinook salmon in the Yuba River.

##### 8.4.4.8.3 Riparian Habitat and Instream Cover (Riparian Vegetation, Instream Woody Material)

The Amended FLA includes a condition to limit the amount of flow reduction (2.5 cm/day) from one day to the next to promote riparian vegetation seedling establishment during the period of April 1 through July 15. Reedy et al. (2016) identified a maximum recession rate of 2.5 cm/day, citing recommendations by Mahoney and Rood (1998) and Stella et al. (2006), for riparian vegetation seedling establishment.

The flow reduction measure applies to day-to-day release reductions when the previous day's flow is at or below 4,130 cfs, which is the combined release capacity of the Narrows 2 and Narrows 1 powerhouses, as measured at the Smartsville gage.

Daily flows under the Proposed Action and the Environmental Baseline were modeled over the entire simulation period (1976-2008). The Cumulative Condition includes all of the measures in the Amended FLA, including the riparian vegetation recession flow rate reduction limits.

Under the Environmental Baseline, day-to-day stage reductions of greater than 2.5 cm occurred during 272 days, compared to 206 days under the Cumulative Condition. Therefore, the flow reduction rate limitation included in the Proposed Action resulted in about a 24 percent relative reduction in the number of days exceeding the 2.5 cm/day criterion. Because the criterion is only applied on some of the days, stage reductions greater than the target maximum reduction of 2.5 cm/day still occur.

Figure 8.4-12 is an exceedance probability plot of the amount of stage reduction per day for the Cumulative Condition and the Environmental Baseline. The exceedance distributions

 

demonstrate the probability of occurrence (percent) of stage reductions exceeding a specified daily amount. They include the full range of daily flow reduction rates (cm/day) and are not limited to days when flows are less than 4,130 cfs (i.e., a total of 3,498 days included in the period of evaluation, or 106 days per year for the 33-year simulation period). Approximately 10 percent of the time the Cumulative Condition results in lower rates of flow reduction (cm/day) than the Environmental Baseline. From April 1 through July 15 over the 33-year evaluation period, the Cumulative Condition would result in a flow reduction rate of 2.5 cm/day or less about 90 percent of the time, compared to 86 percent of the time under the Environmental Baseline.

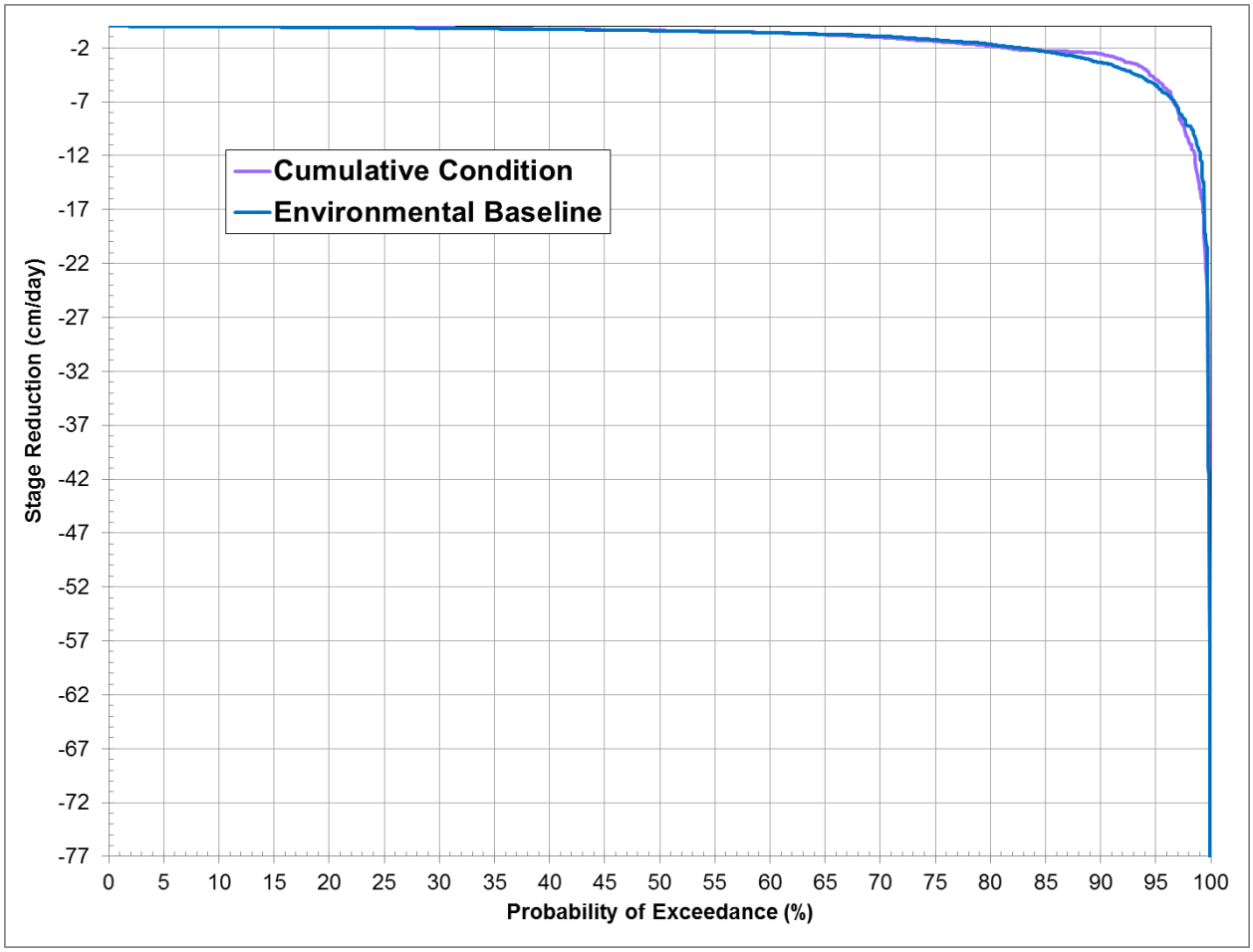


**Figure 8.4-12. Exceedance probability of specified daily stage reductions (cm/day) from April 1 through July 15 under the Cumulative Condition and the Environmental baseline over the 33-year period of evaluation.**

Riparian vegetation seedling establishment recession rates are somewhat improved under the Cumulative Condition relative to the Environmental Baseline. Because spring recession rates of 2.5 cm/day or less are estimated to occur about 90 percent of the time, riparian vegetation recession rates represent a low stressor under the Cumulative Condition.

Under the Environmental Baseline, riparian vegetation and LWM, related primarily to the historical effects of upstream hydraulic mining on the channel geomorphology, and the existence of multiple large dams upstream, provide reduced habitat complexity and diversity, which potentially limits the productivity of juvenile salmonids. The limited availability of riparian habitat and instream cover (in the form of LWM) is a stressor that is manifested every year. Consequently, it was concluded that riparian habitat and instream cover are a stressor of moderate to high magnitude to Yuba River juvenile spring-run Chinook salmon under the Environmental Baseline. Under the Proposed Action (and also the Cumulative Condition), implementation of YCWA's Proposed Condition AR9, Control Project Ramping and Flow Fluctuations Downstream of Englebright Dam, is expected to eventually improve riparian vegetation recruitment by restricting flow reductions during the riparian vegetation seedling establishment period to rates proposed by USFWS/Cal Fish and Wildlife (October 2015) of a stage decrease less than 2.5 cm/day.

Although the ability of the lower Yuba River to support riparian vegetation has been substantially reduced by the historic impacts from mining activities, the dynamic nature of the river channel results in periodic creation of high-value shaded riverine aquatic (SRA) cover for fish and wildlife (Beak 1989). Since completion of New Bullards Bar Reservoir, the riparian community (in the lower Yuba River) has expanded under summer and fall streamflow conditions that have generally been higher than those that previously occurred (SWRCB 2003). Comparison of aerial photographs from 1937 and 2010 (see Technical Memorandum 6-2, *Riparian Habitat Downstream of Englebright Dam*) showed that for all of the reaches in the lower Yuba River downstream of the Narrows Canyon, the amounts of riparian vegetation have increased.

Under the Cumulative Condition, riparian habitat and instream cover would represent a moderate stressor to juvenile spring-run Chinook salmon in the lower Yuba River because of: 1) the slight anticipated improvement to riparian vegetation with the implementation of condition AR9 of the Proposed Action and the timeframe required for riparian vegetation establishment; and 2) the potential continued increase in riparian vegetation observed in the lower Yuba River since the cessation of hydraulic mining and the construction of multiple large dams upstream.

## 8.4.5 Other Future Activities in the Lower Yuba River

The following reasonably foreseeable potential actions could be considered to have the potential to affect flows or other EFH conditions in the lower Yuba River. For the reasons discussed below, none of these activities is likely to have adverse cumulative effects on EFH.

### 8.4.5.1 BVID Dry Creek Recapture Project

Browns Valley Irrigation District is planning a tailwater recapture project that will relieve irrigation water supply constraints by pumping water from French Dry Creek ("Dry Creek") at times when Dry Creek flows are primarily composed of tailwater from irrigated lands draining to Little Dry Creek (BVID 2017).

 

BVID will convey recycled flows from a pumping plant on Dry Creek to rice fields presently irrigated exclusively by diversions from the lower Yuba River. The warmer reclaimed water will be delivered into BVID's Pipeline Canal and applied by its customers to rice lands where the elevated water temperatures benefit rice production. Application of tailwater recaptured from Dry Creek to the agricultural lands within BVID's service area will reduce the district's demand for water diverted directly from the lower Yuba River, thus balancing the reduction in inflows to the river that will result from pumping this water from Dry Creek with an equivalent reduction in diversion from the Yuba River. The project is of regional significance because it will reduce diversions from the lower Yuba River (Yuba County 2007).

The project proposes to recapture up to a maximum of 10 cfs of irrigation return flow from Dry Creek during the irrigation season, which typically runs from April through October (BVID 2017). It is estimated that the influx of irrigation return flow raises Dry Creek's temperature by an average of 4–5ºC and introduces sediments, nutrients, and other constituents into Dry Creek approximately 1.8 mi upstream of its confluence with the lower Yuba River (BVID 2017). By pumping water from Dry Creek downstream of the confluence with Little Dry Creek when Dry Creek flows are primarily comprised of return water from irrigated lands, the project is expected to improve water quality by removing some of the thermal and pollutant load from Dry Creek before it reaches the lower Yuba River. BVID will continue to meet existing minimum flow requirements with releases of cool, good quality water from Collins Lake. Any time that BVID is recapturing irrigation return water, there will be an equal and concurrent reduction in BVID's diversions from the Yuba River at its Pumpline facilities (BVID 2009). Use of the recaptured return water for the rice fields will reduce BVID diversions of cool surface water from the lower Yuba River, and this substitution will retain cool water in the lower Yuba River, which will benefit fisheries resources and aquatic habitat (BVID 2009).

#### 8.4.5.2 The Trust for Public Lands Excelsior Project

The Excelsior Project is a collaborative conservation effort on the lower Yuba River, featuring 924 acres of wetlands, oak woodlands, gold-rush archeological remnants, and miles of critical riparian salmon spawning habitat (Excelsior Chronicles 2010). As many as 60 homes were planned along the lower Yuba River on the property once owned by the Excelsior Mining Company. The Trust for Public Lands, in collaboration with Cal Fish and Wildlife, intends to turn part of the land over to the University of California Sierra Field Research Extension Station for salmon studies and restoration work before eventually opening it to the public (Fimrite 2009). The California Wildlife Conservation Board, in concert with the Trust for Public Lands, voted to acquire the 528-ac Yuba Narrows Ranch, ensuring that this property would be permanently protected as open space. In July of 2011, Cal Fish and Wildlife acquired the Yuba Narrows Ranch, which includes frontage along almost two miles of critical salmon spawning habitat along the lower Yuba River, and will be managed and permanently protected as open space. The conservation easement will permit access from Highway 20 into the Yuba Narrows Ranch, providing miles of hiking and acres of recreational opportunities. The property is well known for its scenic beauty and attractiveness to fisherman for its Chinook salmon and steelhead. It offers recreational boaters and hikers with panoramic views of the river, Rose Bar Bridge to the west, and the Englebright Dam on the east. The acquisition also provides connections to over five miles of recreational areas previously deemed inaccessible (CDFG 2010). The site is

representative of early California history and includes a traversable Miner's Trail that was constructed and used by miners during the California Gold Rush. It is anticipated that portions of the property, including the Miner's Ditch Trail, will become open to public access. Remnants of an historic Chinese wall and mining tunnel also remain intact on the property from California's gold mining past (CDFG 2010a).

Additionally, in 2012, the Bear-Yuba Land Trust acquired Phase 1 the historic 157-ac Black Swan Ranch portion of the Excelsior property, which is located near the confluence of Deer Creek and overlooks Englebright Reservoir and the lower Yuba River (Excelsior Project 2013). In 2013, the Wildlife Conservation Board purchased Phase 2 of the Black Swan, in collaboration with the Cal Fish and Wildlife. In 2016, the Bear-Yuba Land Trust purchased an additional 15 acres of wetland habitat west of the Black Swan Preserve, resulting in a total of over 700 acres of permanently conserved and publically accessible land. Trails and parking areas are under development (Excelsior Project 2017).

Beginning in the fall of 2011, conservation easements were placed on parcels of the Excelsior Ranch. The blue oak woodlands that occupy the large majority of the Excelsior Ranch will be permanently protected as open space, and managed jointly by the Ranch's steward-owners, who will also play a significant role in oversight of the Black Swan and Yuba Narrows conservation areas. In this way, more than 870 ac (over 95%) of the Excelsior property will be permanently protected as open space (Excelsior Project 2017).

Although the adjacent Yuba Narrows and Black Swan Ranches are now protected, the Blue Point Mine, located on private property, is identified as an additional area of potential conservation (Excelsior Project 2017). Despite its cultural and historical values, the Blue Point Mine is zoned for five-acre residential development and has a valid use permit to operate as a quarry. The Excelsior Foundation has a larger vision for the Blue Point Mine area – that the 505 acres of natural and historical resources, ditches and trails, escarpments and lower Yuba River access, be permanently protected and made available to the public to create over 1,200 acres of conservation area (Excelsior Project 2017). The Excelsior Foundation continues its efforts to preserve and protect the Blue Point Mine area (Excelsior Project 2017).

#### 8.4.5.3 Yuba Goldfields Sand and Gravel Mining Operations and Reclamation Projects

The Yuba Goldfields area is designated and zoned "Extractive Industrial" under the Yuba County General Plan, which allows surface mining as a permitted use. Operators within and adjacent to the Yuba Goldfields currently supply construction materials, including asphaltic concrete, to projects within southern Placer and Yuba counties. The following five aggregate mines (Figure 8.4-13, SMGB 2014) in the Yuba Goldfields are considered for purposes of the cumulative effects analysis.

- Teichert Marysville Aggregate Mining Site and Reclamation Project (590 acres, located southwest of and adjacent to the Western Aggregates operation)

 

- Teichert Hallwood Mine and Reclamation Project (up to 752 acres, located approximately 3 miles northeast of Marysville and adjacent to the north bank of the Yuba River)
- Western Aggregates Hallwood Mine and Amended Reclamation Plan (520 acres, located on the north side of the lower Yuba River)
- Knife River (formerly Baldwin) Hallwood Mine and Reclamation Project (202 acres, located adjacent to the Teichert Hallwood operation)
- Dantoni Property Mine and Reclamation Project (180 acres, located adjacent to the western boundary of Western Aggregates operation)
- Cal Sierra Development Mine and Reclamation Project (1,420 acres, located on and adjacent to the Western Aggregates Amended Reclamation Plan area)

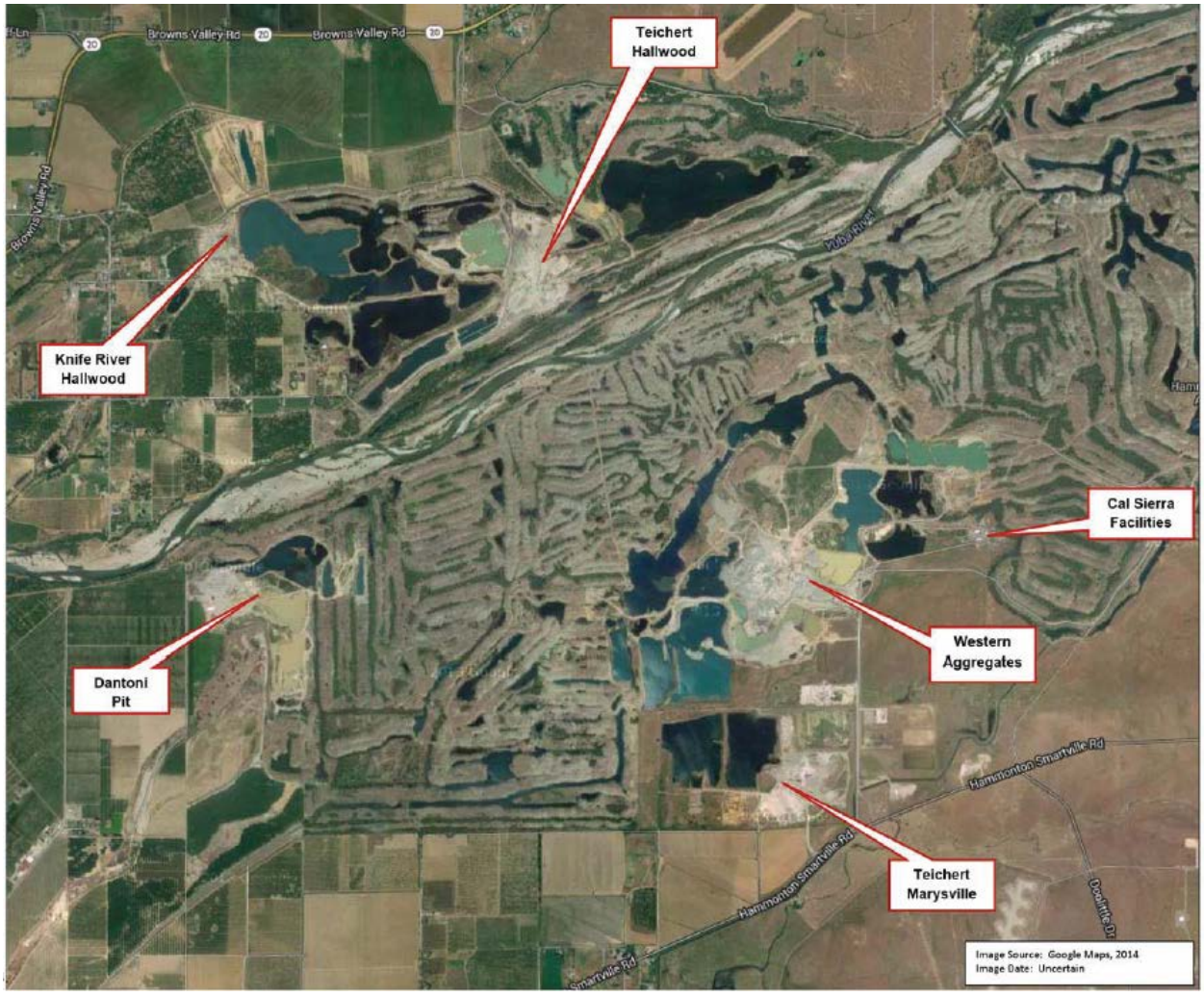


**Figure 8.4-13. Aggregate mines in the Yuba Goldfields (Source: SMGB 2014).**

Each of these projects is a surface mine or reclamation operation located in the Yuba Goldfields that has the potential to result in physical changes to aquatic habitat in the vicinity of the lower Yuba River. Therefore, these projects have the potential to cumulatively effect listed species and their critical habitat in the EFH Action Area.

#### 8.4.5.3.1 Teichert Aggregates and Teichert Materials

Teichert Aggregates mines and processes sand and gravel deposits in addition to hard rock, immediately adjacent to the Yuba Goldfields approximately five miles northeast of Marysville, California, and two miles south of the Yuba River. The mine operates on an approximately 590-ac site and mines to depths of approximately 200 ft (Placer County 2007; SMGB 2014). Mining operations use pit dewatering techniques, and/or draglines and hydraulic excavators to extract mined materials in saturated conditions (below groundwater levels). According to Placer County (2007), production is 500,000 tons per year (t/y) to 1 million tons per year (mty) depending on specific market demands. For purposes of assessing cumulative effects, it was previously assumed that this facility would be operating at its maximum estimated production rate of 1 mty (Placer County 2007). Reclamation of the Teichert Marysville site will create open water with shoreline habitat encompassing approximately 420 acres of the site (SMGB 2014).

Operations for Teichert Materials Inc.'s Hallwood Plant near Marysville, California, mine aggregate on 752 acres in the Yuba Goldfields along the banks of the lower Yuba River, producing crushed stone, sand, and gravel (Aggregates Manager 2014; SMGB 2014). Approximately 488 acres of the project site are considered by Teichert to be mineable (SMGB 2014). A contiguous ridge of dredger tailings along the north bank of the Yuba River south of the mining operations (locally referred to as a "training wall") separates mining and reclamation activities from the Yuba River. Due to the economic downturn several years ago, the Hallwood Plant became more efficient, and production was reduced to about one quarter of its permitted limits during 2014 (Aggregates Manager 2014). Although sales or aggregate occur year-round, the processing plant only operates for seven to nine months a year. When the processing plant shuts down at the end of the year, a month is spent making repairs to the plant equipment (Aggregates Manager 2014).

The reclamation plan for Teichert Materials Inc.'s Hallwood Plant assumes that the estimated quantity of aggregate to be mined on the project site is approximately 57 million tons (SMGB 2014). The maximum depth of surface mining operations will be approximately 200 feet below dry season groundwater levels. When excavation exceeds depths of 60 feet below the groundwater table, a dredge will be used. Wet mining operations will create areas of open water in the West Lake, East Lagoon, and Lower Fin portions of the project site. Only West Lake would be excavated to a depth of approximately 200 feet below groundwater, with the depth of East Lagoon and Lower Fin limited to approximately 60 feet below groundwater. Mining operations will be conducted in four separate phases based on the locations of viable aggregate material and operational considerations (SMGB 2014). Reclamation will generally occur concurrently with mining operations within each phase as mining in specific areas is completed. Reclamation and revegetation will commence in areas where mining activities are complete and future disturbance from adjacent activities can be avoided. Upon completion of mining operations and implementation of the reclamation plan, the Hallwood site would consist of

 

natural buffer areas around three lakes of varying sizes and depths. The two largest lakes, West Lake and East Lagoon, will cover approximately 134 and 83 acres, respectively. In accordance with the reclamation plan, the site would ultimately support 5.5 acres of emergent marsh habitat, 44.0 acres of riparian wetland habitat, and 25.7 acres of riparian upland habitat (SMGB 2014).

#### 8.4.5.3.2 Western Aggregates

The Western Aggregates facility mines and processes sand and gravel deposits within the Yuba Goldfields south of the Yuba River and north of Hammonton-Smartville Road (Placer County 2007). The mine operates an active aggregate (sand and gravel) mining operation pursuant to vested rights, which were confirmed in 2010 by the State Mining and Geology Board (SMGB) to cover an approximately 3,900-acre area (Western's Vested Rights Area) situated in the Yuba Goldfields (SMGB 2014). Mined aggregate material is hauled to an onsite processing plant that includes crushers, screeners, and a conveyor. The mitigated negative declaration for the mine (adopted March 23, 1977) estimated the mining rate to be about 600,000 t/y (Placer County 2007).

In 2008, Western Aggregates and SYRCL, along with the Yuba River Preservation Foundation and Yuba Outdoor Adventures, signed an Agreement in Principle to establish a conservation easement along three miles of river frontage of the Yuba River downstream of the Parks Bar Bridge (YubaNet 2008). The easement area, consisting of approximately 180 ac of land owned by Western Aggregates, will be used by the four signatories for habitat restoration for salmon, trout, and other native Yuba River species.

The conservation easement will prohibit development or mining on the encumbered lands (except for disturbance that may be necessary for habitat restoration), and will outline a range of potential prescriptions for habitat restoration (YubaNet 2008). The project also will incorporate pedestrian access to the lower Yuba River through several walk-through gates to be established at locations to be agreed upon at a future date.

The parties plan to implement the project in three phases. Initially, the project will protect and conserve land from vehicular damage to habitat. Concurrently, SYRCL will lead design and feasibility studies for physical habitat restoration. In the second phase, habitat for salmon and riparian wildlife will be restored through a series of projects over the encumbered lands. Finally, the project contemplates implementing long-term enhancement and monitoring of these restored habitats. The timing of the completion of the three phases is unknown at this time because of the funding needs of the project (YubaNet 2008). Western initiated a Yuba Salmon Enhancement Fund through a "challenge grant" to SYRCL of $50,000, and Western agreed to match SYRCL's fund-raising of the project dollar-for-dollar for the first $50,000 raised by SYRCL (YubaNet 2008). The four parties to the Agreement in Principle also must obtain the consent of certain third parties who have varying interests in some of the lands contemplated for the conservation easement (YubaNet 2008).

On April 9, 2015, the SMGB approved the Amended Reclamation Plan for Western Aggregates Yuba County Operations (SMGB 2015a). Western Aggregates plans to remove aggregates (estimated to be up to 414 million tons) to an initial depth of -20 feet below msl (approximately

100 feet below the average pond surface level) over an approximately 1,960-acre area (of the 3,900 Vested Rights Area), during a phased 45-year surface mining operation, creating a series of five open-water ponds bordered by vegetation and dikes or berms (SMGB 2015b; SMGB 2014). Aggregate operations are anticipated to occur in three 15-year phases. During the life of the Amended Reclamation Plan, it is estimated that the average number of acres on which surface mining operations would occur during any one year will be approximately 35 acres (SMGB 2014). After completion of reclamation activities, a relatively flat land contour with five large lakes would remain (Figure 8.4-14).

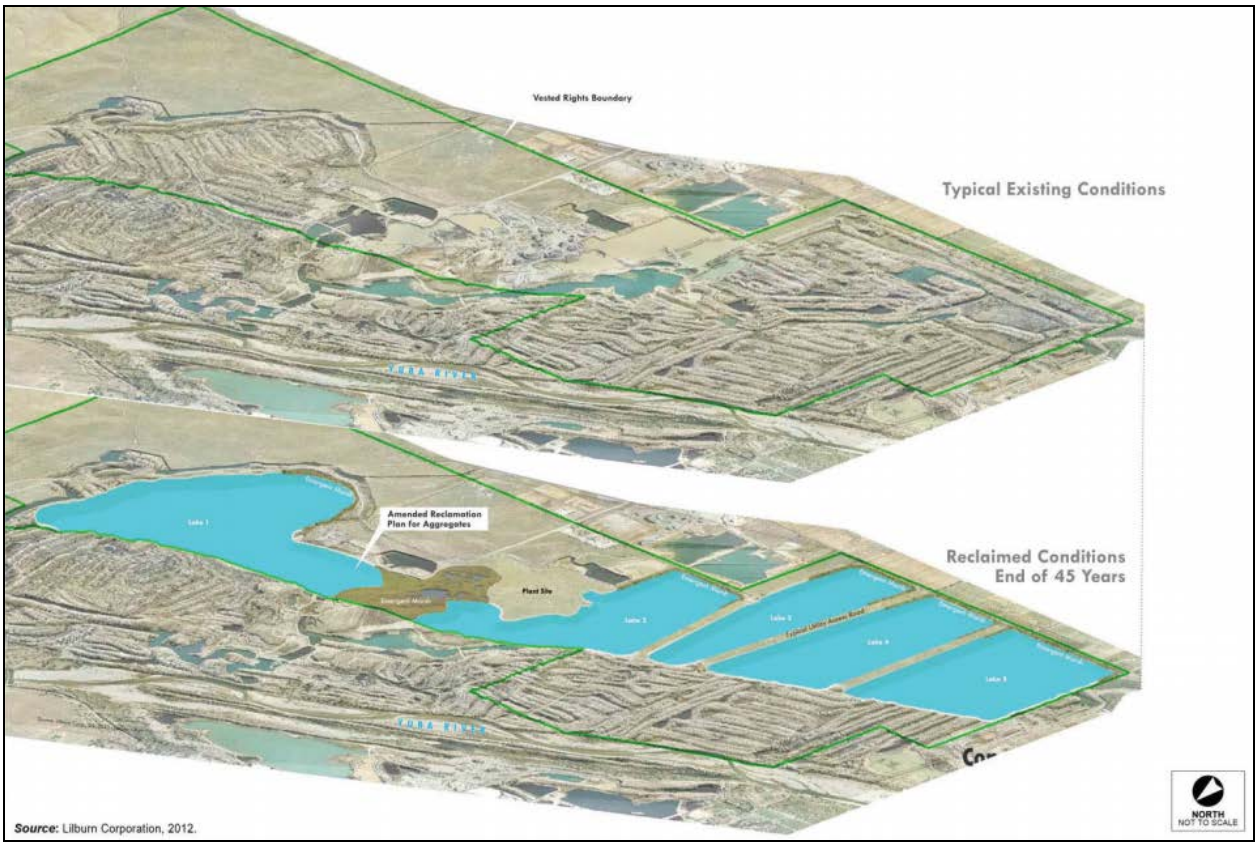


**Figure 8.4-14. Conceptual simulation reclaimed areas in the Yuba Goldfields resulting from implementation of Western Aggregate's Amended Reclamation Plan (SMGB 2014).**

Volunteer riparian growth has been found to establish within 6 to 8 months of inactivity around the circumference of ponds in the Yuba Goldfields (SMGB 2014). According to the Amended Reclamation Plan, "(a)reas above the water table which are revegetated should not require follow-up monitoring based upon the demonstrated success of revegetation completed on the subject property by Cal Sierra Development, Inc." However, financial assurance for the Amended Reclamation Plan include funding the monitoring revegetation performance for 5 years following the conclusion of the reclamation phasing plan (SMGB 2014).

#### 8.4.5.3.3 Knife River Construction (formerly Baldwin Contracting Company) Hallwood Aggregate Facility

The Baldwin Contracting Company, Incorporated and Springer Family Trust proposed to expand its aggregate mining operations in the Hallwood area of east-central Yuba County, just west of the Yuba Goldfields off SR 20 (Placer County 2007). Baldwin Contracting conducted mining operations on 275 ac and was planning a phased expansion of about 200 ac over a period of 14 to 20 years, with expansion occurring 30 ac at a time. The expansion would have resulted in mining of an additional 500,000 t/y to 1 mty. Applications were submitted to Yuba County for a change of zone, a General Plan amendment, and a Yuba County surface mining permit, and to the California State Office of Mines and Geology for a permit amendment (Placer County 2007). The existing excavation area in the Yuba Goldfields was previously mined for aggregate and gold, and the proposed expansion area is currently in fruit orchards and has not been mined (California RWQCB 2010). Aggregate reserves exist to a depth of approximately 75 ft in both areas (California RWQCB 2010). A Report of Waste Discharge was submitted to the Central Valley Regional Water Quality Control Board for expansion of an existing aggregate facility, which was approved in 2010.

Currently, Knife River Construction (formerly Baldwin Contracting Company) conducts aggregate mining and reclamation operations on a site encompassing approximately 400 acres located adjacent to SR 20 in unincorporated Yuba County, approximately 3 miles northeast of Marysville. The Knife River Hallwood site is adjacent to (and north and west of) the Teichert Hallwood site. Based on information provided by the SMGB,[6] reclamation of the Knife River Hallwood site would occur under Reclamation Plan (RP) 92-01, which was clarified in 1999 via a minor amendment submitted to Yuba County by the operator (Clarification of Reclamation Plan #92-01 for Baldwin Hallwood Mine [CID #91-58-0002], Yuba County, California, October 1999). Implementation of the reclamation plan would create a series of open ponds with vegetated shorelines with a combined acreage of about 203 acres (SMGB 2014).

#### 8.4.5.3.4 Dantoni Property

The Dantoni Property mining and reclamation operations, formerly referred to as Trinco Rock and Asphalt, is an active mining operation run by Kino Aggregates, Inc (SMGB 2013), located approximately 6 miles east of Marysville in unincorporated Yuba County. The project site is situated immediately west of the western boundary of the Western Aggregates operations along the south bank of the Yuba River. The Dantoni Property encompasses approximately 197 acres (SMGB 2014). Aggregate mining, processing, and reclamation operations are ongoing. Excavation below 60 feet below grade would be accomplished using a bucket line dredge, suction cutter dredge, or other excavation equipment. The maximum depth of surface mining operations would be approximately 40 feet below average groundwater levels, but it is predicted that excavation would not be able to exceed a depth of minus 100 feet mean sea level. Wet mining operations would create areas of open water in several areas of the project site. A total of approximately 180 acres of the 197-acre site would be mined and reclaimed within the 40-year projected planning period. Reclamation of the project site will create open water ponds with

[6] W. Arcand, personal communication by State Mining and Geology Board with R. Hanson, Atkins (January 14, 2014).

vegetated shorelines. A 10- to 60-foot-wide band of riparian vegetation would surround the northern perimeter of the lake. Mining operations within the 2006 reclamation plan boundary are proposed to be terminated approximately 40 years from approval of the reclamation plan (near 2046/2047) (SMGB 2014).

#### 8.4.5.3.5 Cal Sierra Development

Gold mining operations on the Western Aggregates site are conducted by a separate company called Cal Sierra Development, Inc. ("Cal Sierra") and typically occur concurrently with Western Aggregate's operations on the same Yuba Goldfields property (SMGB 2014). Seven ponds comprise Cal Sierra's areas of dredging operations, and the ponds are demarcated by Cal Sierra as Pond No. 1 through Pond No. 6, and the most recent Working Pond. Most of the Cal Sierra site has been dredged at least twice, and in some parts of the property three to four phases of dredging has occurred, each time to a greater depth with larger and/or more efficient recovery equipment (SMGB 2015b). Cal Sierra shares its currently approved Reclamation Plan (RP 80-01) with Western Aggregates, although Western Aggregates has recently received approval of an amended reclamation plan reflective of their vested rights area for aggregate minerals (SMGB 2015b). RP 80-01 covers approximately 2,000 acres, all of which apply to Cal Sierra's gold operations. Historically, Cal Sierra used bucket-line dredges that harvested materials from a depth of over 120 feet below water elevation, separated the fines and precious metals from the ore, and deposited the cobble tailings in their wake via a stacker or monitor. Western Aggregates retrieved those tailings from the conveyor stockpile and transported them via truck to their aggregate plant for processing. Areas dredged by Cal Sierra that are not incorporated in the Western Aggregates Amended Reclamation Plan will be reclaimed under RP 80-01 and will consist primarily of recontoured and revegetated dredger tailings (SMGB 2014).

### 8.4.5.4 Yuba County General Plan Update

The Yuba County General Plan Update Final EIR, in part, evaluated cumulative biological impacts in 2030 associated with implementing the general plan (Yuba County 2011). The cumulative effects assessment stated that past development in Yuba County, ranging from conversion of land to agricultural production to recent expansion of urban development, has resulted in a substantial loss of native habitat to other uses. This land conversion has benefited a few species, such as those adapted to agricultural, urban, and rural-scale developed uses, but the overall effect on native plants, animals, and habitat has been negative. Although many future projects and plans included in the cumulative scope of this analysis would be required to mitigate those impacts, in compliance with the CEQA, federal ESA, California ESA, and other State, local, and Federal statutes, many types of habitats and species are provided no protection. Therefore, it can be expected that the net loss of native habitat for plants and wildlife, agricultural lands, and open space areas that support important biological resources in Yuba County and related areas will continue (Yuba County 2011). The cumulative loss of habitat for special status species, such as habitat for riparian and aquatic species (e.g., California red-legged frog, giant garter snake, and western yellow-billed cuckoo) have already resulted in drastic declines in numbers of these species (Yuba County 2011). The evaluation focused on terrestrial species and their habitats.

 

In Yuba County, most established riparian vegetation occurs along the largest rivers; the Feather River, Yuba River, and Bear River, and south Honcut Creek. Important riparian corridors also occur along Dry Creek and other tributaries to Honcut Creek and the Yuba River. Riparian vegetation is present in the surrounding region along the Sacramento River and in the Sutter Bypass. Agricultural, residential, and industrial water use and land development have resulted in a significant cumulative reduction in the extent of riparian habitats in the County and surrounding region. Implementing Action NR 5.3, which requires private and public projects to provide setbacks to protect riparian habitat as a condition of project approvals, is expected to substantially reduce impacts on riparian habitats, although complete avoidance may not be possible while still allowing full build out of the designated land uses. Therefore, the 2030 General Plan would have a cumulatively considerable contribution to this significant cumulative impact.

The County anticipates that implementation of the Yuba-Sutter Regional Conservation Plan (YSRCP) would reduce cumulative biological resources impacts. The YSRCP is both a federal Habitat Conservation Plan (HCP) and a state Natural Community Conservation Plan (NCCP). The YSRCP will provide an opportunity to mitigate potential impacts to biological resources that may occur through implementation of the General Plan. The YSRCP will also provide comprehensive species and ecosystem conservation, and contribute to the recovery of threatened and endangered species in Northern California (Sutter County 2014). A Notice of Preparation was issued in late 2014, followed by public scoping meetings for the YSRCP during early 2015. The YSRCP is still in draft form and an Environmental Impact Report is under preparation, but the County anticipates that it will be finalized and adopted before the 2030 General Plan is fully implemented.

#### 8.4.5.5 Yuba-Sutter Regional Conservation Plan

According to Yuba County et al. (2011), the Yuba-Sutter Regional NCCP/HCP (currently referred to as the YSRCP) will address actions associated with future urban development, irrigation improvements, local flood control projects, and road improvements within Yuba and Sutter counties. During the early planning stages, a group of independent science advisors provided recommendations in a document titled Report of Independent Science Advisors for the Yuba and Sutter County Natural Community Conservation Plan/Habitat Conservation Plan (Conservation Biology Institute 2006).

Fish species to be considered in the YSRCP include spring-run Chinook salmon, fall-run Chinook salmon, steelhead, green sturgeon, white sturgeon, Sacramento splittail and Pacific lamprey (Conservation Biology Institute 2006). The reach of the lower Yuba River extending through and somewhat beyond the Yuba Goldfields was identified as having important Chinook salmon spawning habitat worthy of special attention in conservation, restoration, and enhancement measures. Fisheries-related recommendations included the need for additional information on the known distribution of fish species in local streams and associating these to the degree possible with information on flow regimes, known or suspected barriers, and other habitat quality variables (e.g., presence or absence of nonnative aquatic species; width and quality of riparian vegetation). This information would be used to identify potential actions that could aid in the recovery of local fish populations by removing physical passage barriers, removing water

contaminants, altering the timing, duration, or magnitude of stream flows, or restoring riparian vegetation and/or adjacent upland buffering (Conservation Biology Institute 2006).

#### 8.4.5.6 City of Wheatland, Reclamation District 2103, and Reclamation District 817 External Flood Source Flood Protection Projects

Four levee improvement alternatives have been identified as part of this project to mitigate the flooding issues associated with the City of Wheatland General Plan Area. The fourth alternative is the Reclamation District 2103 Bear River Levee Remediation, which is sponsored by local land developers and is designed to provide 200-year protection for the upper portion of the Bear River levee. This project would provide additional flood protection and management for the Upper Bear River and the City of Wheatland.

#### 8.4.5.7 Trust for Public Land - Yuba River Acquisitions Plan

This project represents an historic opportunity to acquire three priority conservation areas along the Yuba River. The acquisition of these properties will help ensure the security of water quality in the Yuba River, protect threatened and endangered fisheries, create new recreational opportunities, and increase public access. These properties are part of the Yuba River Wildlife Area Conservation Conceptual Area Protection Plan (CAPP), which coordinates Cal Fish and Wildlife's acquisition and management activities on more than 81,000 ac of the Yuba River corridor.

Retain Flood Control Options: Protection of the project properties will increase long-term flood control options by protecting critical watershed lands in the river corridor and ensuring ownership and management patterns below and upstream of major water supply, power generation, and flood control facilities.

Restore and Protect Salmon and Steelhead Habitat: The project will protect, preserve and restore riparian and aquatic habitat for State and Federally listed Chinook salmon and steelhead trout and implement important conservation elements of the Yuba River CAPP, the Yuba River Conservancy, and the Lower Yuba Technical Work Group.

Create Habitat Connectivity: This project will provide tremendous opportunities for habitat connectivity, including:

- East-West connectivity along the Yuba River: The properties included in this project will provide protection for up to 14.5 mi of Yuba River through a 21 mi corridor.
- Downstream river connectivity: This project will provide valuable river corridor connectivity between Englebright Dam and Parks Bar necessary for the restoration of existing salmon and steelhead
- Blue oak woodland corridor: The project will protect crucial properties in the center of a roughly twenty-mile north–south oak woodland corridor that stretches from the Cal Fish and Wildlife Daugherty Wildlife Area to the Spencerville Wildlife Area and Beale Air Force Base.

- Protect Agricultural Lands: The project will preserve and protect important agricultural lands, including grassland and rangelands along the river corridor that provide important wildlife habitat, riparian zones and protect sensitive aquatic environments.

#### 8.4.5.8 U. S. Army Corps of Engineers' Yuba River Ecosystem Restoration Feasibility Study

The Yuba River Ecosystem Restoration Feasibility Study (YRERFS) was one of only four ecosystem restoration studies initiated by the USACE in 2014. An initial evaluation completed in September 2014 concluded there are significant National Ecosystem Restoration benefits associated with restoration of ecosystem structures, functions, and processes in the Yuba River. A Feasibility Cost Sharing Agreement between the USACE and YCWA was signed in June 2015. The objectives of the YRERFS are as follows.

- Improve the quantity, quality, and complexity of riparian habitats in the lower Yuba River over the 50-year period of analysis.
- Improve the quantity, quality, and complexity of aquatic and floodplain habitats in the lower Yuba River over the 50-year period of analysis.
- Restore connectivity of riparian habitat along the Yuba River over the 50-year period of analysis.
- Restore hydrologic connectivity of aquatic and floodplain habitat along the lower Yuba River over the 50-year period of analysis.
- Restore opportunities for reproductive isolation among Chinook salmon runs in the Yuba River watershed over the 50-year period of analysis.
- Provide recreation opportunities on project lands in the Yuba River watershed over the 50-year period of analysis.

YCWA, and several local conservation groups, support the YRERFS as an important step in the development of a contemporary, science-based assessment of the Yuba River ecosystem, which includes three listed fish species (spring-run Chinook salmon, steelhead, green sturgeon) and the two USACE debris dams (Daguerre and Englebright). The YRERFS includes an evaluation of options to improve Yuba River fish passage and fisheries habitat.

The feasibility study, which has been underway for about 1½ years and is anticipated to extend another 3 years before the study process will be complete, is investigating a suite of about 35 habitat enhancement actions in the lower Yuba River. As part of the study, a focused array of alternatives is in the process of being formulated by identifying management measures (e.g., habitat enhancement actions, improved fish passage) and then assembling those measures into alternatives to address the stated objectives. The focused array of alternatives will then be evaluated based on output (ecosystem benefits) and cost. Ecosystem outputs will be quantified for each alternative in terms of habitat units that include an assessment of both quantity and quality of habitat.

The USACE's current policy is to complete the feasibility phase within 3 years (USACE 2014). Completion of the study, with the signing of a Chief's Report, is expected in July 2019. After the feasibility phase is completed, the USACE would be able to submit a report to Congress to obtain further authorization and funding for project implementation (USACE 2001).
When implemented, the USACE's ecosystem restoration project is anticipated to enhance EFH in the lower Yuba River through improved habitat connectivity, and enhancement of several major components of Chinook salmon freshwater EFH - primarily habitat associated with juvenile rearing and juvenile migration.

#### 8.4.5.9 Anadromous Fish Restoration Program Lower Yuba River Habitat Restoration Efforts

The Anadromous Fish Restoration Program (AFRP) has several ongoing efforts towards lower Yuba River habitat enhancement in cooperation with local land owners. The AFRP has funded several projects along the lower Yuba River, which are, at some level, already underway in the lower Yuba River. They are listed below.

- Teichert Hallwood Facility Salmonid Habitat Restoration Project
- Yuba River Canyon Salmon Habitat Restoration Project
- Yuba River Upper Rose Bar Project
- Long Bar Habitat Enhancement Plan
- Yuba River Phase 1 Habitat Enhancement and Flood Risk Reduction Project

Each of the projects listed above will enhance aquatic habitat conditions for Chinook salmon in the lower Yuba River. Potential freshwater HAPCs that would benefit from the enhancement actions being undertaken include: 1) spawning habitat; 2) thermal refugia; and 3) complex channels and floodplain habitats. Once fully implemented, these AFRP projects will provide an overall benefit to EFH in the lower Yuba River.

### 8.4.6 Out-of-Basin Future Activities

As previously discussed in this Applicant-Prepared Draft EFH Assessment, FERC's April 2011 Scoping Document 2 includes anadromous fish and EFH as potentially cumulatively affected resources. The Scoping Document 2 states that FERC has "…tentatively determined a cumulative geographic scope for anadromous fish and EFH that includes the Yuba River Basin downstream to the confluence with the Feather River, the lower Feather River, to the lower Sacramento River, and through the Sacramento-San Joaquin Delta to the San Francisco Bay."

Because the managed fish species (i.e., Chinook salmon) that inhabit the lower Yuba River are anadromous, they do not reside in the lower Yuba River during their entire lifecycles. Actions throughout the Yuba River Basin and downstream to San Francisco Bay, including proposed Project actions, have the potential to affect the numbers of juveniles and smolts that are produced and survive outward emigration and returning adults to the Yuba River, and the conditions of those individuals. Aquatic habitat conditions at the ESU scale, including the Feather River, the

 

Sacramento River and the Delta have the potential to affect Chinook salmon. For this reason, the recommended geographic scope in FERC's April 2011 scoping document was included in this Applicant-Prepared Draft EFH Assessment to the extent necessary to understand potential effects on Chinook salmon and designated EFH, and how the Project would contribute to those effects. For example, to characterize the existing habitat conditions associated with EFH for Chinook salmon in this Applicant-Prepared EFH Assessment, additional consideration was given to the aquatic habitat conditions, and potential limiting factors and threats that may influence Chinook salmon from both local and ESU-wide perspectives.

The discussion of the status of species managed under the Pacific Coast Salmon FMP (PFMC 2012) includes information on the species' life history, current known range and habitat use, distribution, and other data regarding factors necessary to the species' survival. Because in recent years managed species (i.e., Chinook salmon) are declining through many areas of their range, the overall population trend of a species has implications for new proposals that could result in additional effects on the species (USFWS and NMFS 1998). The trends of the remaining populations of managed species form the basis for evaluating the effects of a proposed action on that species. USFWS and NMFS (1998) further state that "Unless a species' range is wholly contained within the action area, this analysis [describing the status of a species within the action area] is a subset of the preceding rangewide status discussion."

Although this Applicant-Prepared Draft EFH Assessment does not include Sacramento River reaches downstream of the Feather River or the Delta as part of the Action Area, these areas are considered in the context of the spring- and fall/late fall-run Chinook salmon ESUs, respectively.

#### 8.4.6.1 Feather River, Sacramento River and Delta

The Yuba River discharges into the Feather River, whose basin encompasses a broad variety of terrain, climate, historic use, and flora and fauna. Over 80 percent of the upper Feather River watershed is federally owned land managed by the Forest Service as part of the PNF. Approximately 11 percent of the upper Feather River watershed is alluvial valleys that are predominantly privately owned and used for livestock grazing. The rest of the land is used for other agricultural purposes, urban development and wildlife habitat.

Water originating from the Feather River drainages provides significant amounts of water to California's State Water Project, which provides water to meet urban and agricultural demands. The Feather River Basin also produces significant forest and agricultural outputs. Flow in the lower Feather River is controlled mainly by releases from Oroville Reservoir, the second largest reservoir in the Sacramento River Basin and part of DWR's Oroville Project (FERC Project No. 2100), and by flows from the Yuba and Bear rivers. As with many Sierra Nevada foothill streams and rivers, the Feather River Basin has historically been influenced by large-scale gold mining operations. To a lesser degree, gold mining operations still continue within the western slope watersheds.

The Feather River flows into the Sacramento River, the largest river in California, which provides water for municipal, agricultural, recreational, and environmental purposes throughout northern and southern California. Most of the Sacramento River flow is controlled by

Reclamation's Shasta Dam and Reservoir, and river flow is augmented by imports of Trinity River water through clear and spring creek tunnels to Keswick Reservoir. The Sacramento River is an important corridor for anadromous fish moving between the ocean and Delta, and upstream river and tributary spawning and rearing habitats.

An interconnected network of water channels and man-made islands, the Delta stretches nearly 50 mi from Sacramento south to the City of Tracy, and spans almost 25 mi from Antioch east to Stockton (Public Policy Institute of California 2007). The Delta is a complex area for both anadromous fisheries production and distribution of California water resources for numerous beneficial uses. Approximately 42 percent of the state's annual runoff flows through the Delta's maze of channels and sloughs, which surround 57 major reclaimed islands and nearly 800 un-leveed islands (WEF Website 2006). The Delta also includes the federal CVP Jones Pumping Plant and the SWP Banks Pumping Plant in the south Delta (export pumps). Water withdrawn from the Delta provides for much of California's water needs, including both drinking water and water for agricultural irrigation purposes.

#### 8.4.6.2 Projects Considered but not included in the EFH Cumulative Effects Assessment

##### 8.4.6.2.1 Yuba Salmon Forum

Several comments on YCWA's DLA cited the on-going work of the Yuba Salmon Forum (YSF) and NMFS' 2009 Draft Recovery Plan7 for Sacramento River anadromous salmonids, and argued that YCWA should include actions concerning upstream fish passage at Englebright Dam and introductions of anadromous fish into streams in the Yuba River watershed upstream of Englebright Dam in the Amended FLA's cumulative impacts analysis. (See March 3, 2014 FWN's comments, pp. 36-37; March 3, 2014 Cal Fish and Wildlife's comments, p. 50; March 3, 2014 USFWS' comments, pp. 7-8; and March 3, 2014 NMFS' comments, Encl. A, pp. 2-3.) However, although the YSF prepared some technical reports regarding potential habitat conditions in streams on the Yuba River watershed and potential fish-passage measures, the YSF has not developed any specific proposed actions.

##### 8.4.6.2.2 Yuba Salmon Partnership

Parties to the YSF have formed the Yuba Salmon Partnership (YSP) and currently are negotiating a settlement agreement to expand the Yuba River watershed's contribution to recovery of anadromous salmonids in the Central Valley, which may include reintroduction actions. However, those negotiations have not concluded and the cost and feasibility of any reintroduction actions still is being evaluated. Moreover, neither the 2009 Draft Recovery Plan, nor the 2014 Final Recovery Plan, contains any specific proposed actions for fish passage or introductions of anadromous fish into these streams. Also, before any project to introduce anadromous fish into these streams could proceed, there would have to be detailed plans, funding, possibly Congressional approval, NEPA and CEQA review, and permitting. For these reasons, it is uncertain if or when any such actions may occur, and it is very uncertain what

[7] NMFS issued a Final Recovery Plan in 2014.

 

components (e.g., fish ladders or fish-collection facilities) would be included in any such project and where fish would be released into and collected from such streams. YCWA, therefore, has not included any fish passage or fish introduction actions as reasonably foreseeable actions in the cumulative impacts discussions in this Applicant-Prepared Draft EFH Assessment.

#### 8.4.6.2.3 California WaterFix Project

The Foothills Water Network (FWN) also argued that an update of the SWRCB's Bay-Delta Water Quality Control Plan, potential related changes in Feather River flows, and the Bay-Delta Conservation Plan (BDCP) should be included in the Amended FLA's cumulative impacts analysis. (March 3, 2014 FWN's comments, pp. 37-39.) YCWA has not included any potential SWRCB update of the Bay-Delta Water Quality Control Plan or any related changes in Feather River flows in the cumulative impacts discussions of this Applicant-Prepared Draft EFH Assessment because the SWRCB's process to update this plan has not proceeded far enough for YCWA or the Commission to know what amendments to this plan may be adopted in the future. DWR and the Bureau of Reclamation (Reclamation) now are pursuing possible development of the proposed BDCP Delta conveyance facilities through the California WaterFix Project. California Water Fix is a controversial $15,000,000,000 plan proposed by Governor Edmund G. Brown and DWR to build two large, four-story tall tunnels to carry fresh water from the Sacramento River under the Delta toward the intake stations for the SWP and the CVP. YCWA has not included any potential changes in Project operations that may occur because of the California WaterFix Project because it is not possible at this time to know whether or not the California WaterFix Project will be implemented, or, if it is implemented, how its implementation might affect Project operations, or flows and water temperatures in the spring- and fall/late fall-run Chinook salmon ESUs.

Page Left Blank