DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Operations and Readiness Branch

JUL 03 2012

Mr. Rod McInnis
Regional Administrator
National Marine Fisheries Service
501 West Ocean Boulevard, Suite 4200
Long Beach, CA 90802-4213

Dear Mr. McInnis:

The U.S. Army Corps of Engineers, Sacramento District (Corps) has received the National Marine Fisheries Service's Biological Opinion (Opinion) related to the effects of the Corps' long-term operation and maintenance of Englebright and Daguerre Point Dams and Englebright Reservoir on the Yuba River on threatened Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened California Central Valley steelhead (*O. mykiss*), threatened Southern distinct population segment of north American green sturgeon (*Acipenser medirositris*), and their designated critical habitat. I appreciate the time you and your staff have devoted to preparing the Opinion and your willingness to maintain a continuing dialogue regarding the content and conclusions in the Opinion, including meeting with my staff and me on March 14, May 29 and June 22, 2012.

As you are aware, based on the discussions we have had since NMFS issued the Opinion, the Corps has very serious concerns about various aspects of the Opinion such as the description of the action and action area, the scientific basis for the analysis and conclusions, and the scope and breadth of the Reasonable and Prudent Alternative (RPA), the reasonable and prudent measures (RPMs) associated with the Incidental Take Statement, and NMFS' approach to baseline effects among other things. Our concerns are described in more detail in three documents enclosed with this letter – Attachment 1, *U.S. Army Corps of Engineers, Sacramento District Itemized Comments on the NMFS' February 2012 Final Jeopardy Biological Opinion on the Lower Yuba River*, Attachment 2, *Comments on NMFS February 29, 2012 Biological Opinion* prepared by HDR Engineering, Inc and Attachment 3, *Comments on NMFS Biological Opinion of Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir* prepared by Dr. Gregory B. Pasternack, Ph.D., M.ASCE. Notwithstanding these serious concerns, the Sacramento District conditionally accepts the RPA. Nonetheless, we will we continue to review the RPA actions to determine which actions are within the scope of the Corps' existing authority and appropriations and which actions require additional authority or appropriations. We will also assess whether there may be opportunities for the Corps to participate in other federal or non-federal entities' processes to achieve the goals of the RPA.

The Corps is proceeding immediately to implement RPA measure NTFP 5 which involves maintaining the current fish passage facilities at Daguerre in accordance with the terms of Judge Karlton's July 25, 2011 order. We are also in the process of preparing two Environmental Assessments – one for the proposed injection of 5,000 tons of gravel into the Englebright Dam Reach in summer 2012 (RPA Measure GAP 1) and one for the placement of instream woody material during fall 2012.

The Corps shall work collaboratively with NMFS and other stakeholders in the Yuba River watershed to improve conditions for anadromous fish in the Yuba River. We look forward to having an open and continuing dialogue with NMFS as we further refine our approach to the RPA and RPMs. As we continue our discussions with NMFS and various stakeholders, we reserve the right to provide a supplement to these comments if necessary. If you have any questions regarding the Corps' approach to the RPA or RPMs, please contact Mr. Randy Olsen at (916)557-5275 or Mr. Doug Grothe at (530) 432-6427.

A copy of this letter is being furnished to Ms. Maria Rea, National Marine Fisheries Service, Mr. Curt Aikens, Yuba County Water Agency, and Mr. David Moller, Director, Power Generation, Pacific Gas and Electric Company.

Sincerely,

for William J. Leady, P.E.
Colonel, U.S. Army
District Commander

Enclosures

ATTACHMENT 1

U.S. Army Corps of Engineers, Sacramento District Itemized Comments on the NMFS' February 2012 Final Jeopardy Biological Opinion on the Lower Yuba River

I. INTRODUCTION

The formal section 7 consultation process between the U.S. Army Corps of Engineers, Sacramento District (Corps) and the National Marine Fisheries Service (NMFS) on the Englebright and Daguerre Point Dams has a long history dating back to March 2000, when the Corps first initiated formal consultation on its operation and maintenance activities at the Dams. Since then, NMFS has issued four Biological Opinions (BO) related to these projects, with the most recent opinion in February 2012 reaching a conclusion of "jeopardy". The long consultation history on these projects will not be repeated here as it is summarized in the NMFS BO. The Corps appreciates the time and effort that NMFS' staff has devoted to the various consultations on these projects. However, because the information and analysis in the BO on the Corps' action will likely be used in future opinions on other federal actions, the Corps thinks it is important that the technical and factual deficiencies with the February 2012 jeopardy BO be corrected.

The purpose of this document is to provide a discussion and analysis of the major concerns the Corps has with the February 29, 2012 jeopardy BO and Reasonable and Prudent Alternative (RPA) on the operation and maintenance of Englebright and Daguerre Point Dams on the Yuba River. (NMFS No. 2012/00238). This document, in addition to Attachments 2 and 3, discusses why the Corps believes the analysis in the BO is flawed and the RPA is inappropriate and inconsistent with the requirements of 50 CFR § 402.02. It also discusses concerns with the Incidental Take Statement and Conservation recommendations.

II. BACKGROUND

On October 14, 2011, the Corps submitted a comprehensive draft Biological Assessment (BA) to NMFS requesting formal consultation on the operation and maintenance of both Englebright and Daguerre Point Dams. The final BA was submitted in January 2012. The BA evaluated the effects of the operation and maintenance activities on 3 species listed as "threatened" under the Endangered Species Act (*16 U.S.C. 1531, et seq.*) (ESA) and their designated critical habitat. The BA determined that the proposed operation and maintenance activities "*may affect, and are likely to adversely affect*" Central Valley spring-run Chinook salmon and Central Valley steelhead, but concluded that these adverse effects would not appreciably reduce the likelihood of both the survival and recovery either species. The BA also concluded that operation and maintenance would not result in the destruction or adverse modification of spring-run Chinook salmon or Central Valley steelhead critical habitat. As for the Southern Distinct Population Segment (DPS) of North American green sturgeon, the BA determined that the Corps' actions "*may affect, but are not likely to adversely affect*" that species and its critical habitat. The conclusions in the Corps' BA are based on the best currently available science regarding the species and their habitat and the Yuba River. Chapter 3 of the Corps' BA provides a detailed description of the ongoing operation and maintenance activities at Englebright and Daguerre Point Dams. For purposes of this document, only a brief summary of the project authorizations and ongoing activities is provided.

Englebright Dam and Reservoir are located downstream of New Bullards Bar Dam on the Yuba River. Authorized by the Rivers and Harbors Act of August 30, 1935 (P. L. 409, 74^{th} Congress, 1^{st} Session, 49 Stat. p. 1028-1049), for the purpose of debris storage and power development, Englebright Dam was constructed by the California Debris Commission in 1941. Englebright Dam is 260 feet high, and the storage capacity of Englebright Reservoir was 69,700 acre-feet (AF) at the time of construction. When the California Debris Commission was decommissioned in 1986, administration of Englebright Dam passed to the Corps pursuant to Section 1106 of the 1986 Water Resources Development Act (P. L. 99-662, 99^{th} Congress, 2nd Session, November 7, 1986).

Because Englebright Dam was constructed as a sediment retention facility, it does not contain a low-level outlet. Unregulated flood flows spill over Englebright Dam. Following construction of Englebright Dam in 1941 and extending until approximately 1970, controlled flow releases from Englebright Dam were made through the Pacific Gas & Electric (PG&E) Narrows I Project facilities. Since about 1970 to the present, controlled flow releases from Englebright Reservoir into the lower Yuba River have been made from the PG&E Narrows I and the Yuba County Water Agency (YCWA) Narrows II power plants.

The purpose for the Corps' ongoing maintenance of Englebright Dam pertains to dam infrastructure safety and security. The Corps does not have authority or discretion to control Narrows I, Narrows II or Englebright Reservoir operations; the Corps activities are restricted to coordination and cooperation with PG&E and YCWA. The water stored in Englebright Reservoir provides opportunities for recreation and hydroelectric power. YCWA and PG&E administer water releases for hydroelectric power, irrigation, and other beneficial uses (e.g., instream flow requirements) and is regulated and permitted for these activities by the Federal Energy Regulatory Commission (FERC).

Additionally, the Corps operates and maintains recreation-related facilities on and around Englebright Reservoir, as identified and described in the 2007 Harry L. Englebright Lake Operational Management Plan. Along the 24 miles of Englebright Reservoir's shoreline, the developed facilities include: (1) 96 campsites; (2) 9 picnic sites; (3) 1 group picnic shelter with 4 tables; (4) 2 boat launching ramps (Narrows and Joe Miller Ravine) maintained by the Corps; (5) a private marina operated by a concessionaire; and (6) 5 parking lots containing a total of 163 parking spaces.

Englebright Reservoir also has a trout fishery almost exclusively supported by planted catchable trout. The State of California Department of Fish and Game (CDFG) annually stocked approximately 22,000 catchable size (7 to 10 inch) rainbow trout in Englebright Reservoir from 1965 through 2007. CDFG ceased planting hatchery trout in Englebright Reservoir from 2007 to 2011, but has recently received approval to resume the planting program, which started in October 2011. The fish now being planted are a triploid strain that cannot interbreed with existing populations. PG&E is required to plant fish in Englebright Reservoir as a condition of PG&E's FERC license. Annually, PG&E plants 2,500 lbs of rainbow trout in Englebright Reservoir, and it is anticipated that PG&E will continue to stock Englebright Reservoir in the future.

Daguerre Point Dam is located on the lower Yuba River approximately 11.5 River Miles (RM) upstream from the confluence of the lower Yuba and lower Feather rivers and 10 RM downstream of Englebright Dam. The Rivers and Harbors Act of 1902 authorized the construction of the Yuba River Debris Control Project, of which Daguerre Point Dam is a part. Construction of Daguerre Point Dam was funded through a 50-50 cost share between the California Debris Commission and the State of California. Construction was completed, and Daguerre Point Dam became operational in 1910. As with Englebright Dam, upon decommissioning of the California Debris Commission, administration of Daguerre Point Dam was assumed by the Corps.

The original purpose of the Daguerre Point Dam was to retain hydraulic mining debris to protect navigation in the Feather and Sacramento Rivers. Although not an authorized project purpose, the dam provides head for diversions of water for irrigation, primarily between April and October. The dam and appurtenances consist of an overflow concrete ogee spillway with concrete apron and concrete abutments, concrete fishways on both abutments, and a locally owned and operated irrigation diversion structure at the northern end of the dam. Two fish ladders, and three licensed irrigation diversions, depend on either the hydraulic head created by the dam or the continuance of diversion capabilities due to the influence of the dam preventing additional channel incision above the dam. However, in the absence of the dam, the water diversions could still occur. The Corps' park personnel operate and maintain the structure, in coordination with CDFG, for the purpose of ensuring efficient operation of the fish ladders and maintenance, safety and security of the dam infrastructure.

III. SPECIFIC CONCERNS WITH THE FEBRUARY 29, 2012 BIOLOGICAL OPINION

A. Description of Proposed Action and Action Area

NMFS' BO incorrectly describes the Corps' proposed action and the purpose of the Corps' action. By expanding the action area far beyond what the Corps described in its BA and inappropriately including actions which have no causal connection to the Corps' action as interrelated and interdependent actions, NMFS has grossly overstated the species effects attributable to the Corps.

The BO states that the purpose of the Corps' ongoing operation and maintenance of Englebright and Daguerre Point Dams is to perpetuate the existence of the dams (*BO pages 166, 214, and 243*). This assertion is incorrect. As noted in Section II above, the Corps is required to operate and maintain the dams and has no discretion not to continue such operation and maintenance. The purpose of our operation and maintenance is to ensure the safety and security of the structures and to ensure the fish ladders at Daguerre Point Dam continue to operate. The dams continue to exist because they have been authorized by Congress and unless and until Congress deauthorizes the dams and appropriates funds to transfer or decommission the dams, they will remain in place. Thus, the Corps has no discretionary authority or control over their continued existence. [1]

The NMFS BO describes the action area as "the active stream channels and riparian corridors of the Yuba River starting at and including New Bullards Bar Dam and reservoir, Log Cabin Diversion Dam, Our House Diversion Dam and pool, Spaulding Dam, Lake Spaulding, Milton Reservoir, and Lake Bowman…extending past and through Englebright Dam and reservoir, and Daguerre Point Dam and pool; downstream to the lower Feather River and the Sutter Bypass to the confluence with the Sacramento River." (*BO, page 9*) NMFS further states that the action area includes what NMFS describes as "interrelated and interdependent" actions at hydropower facilities and water diversions facilities that influence or are influenced by Englebright and Daguerre Point dams and operations and the service areas supplied with water from diversion from the Daguerre Point Dam pool." (*BO, page 9*)

In describing what NMFS considers to be "interrelated and interdependent" actions, the BO states the following:

> NMFS considers the Yuba River Development Project to be interrelated and interdependent with operation and maintenance of Englebright and Daguerre Point dams, because: (1) Englebright and Daguerre Point dams are basic structural features used by the Yuba River Development Project and the Narrows II powerhouse; (2) the Yuba River Development is *[sic]* uses the dams to provide the hydraulic head for hydropower and water delivery; (3) the operation and maintenance activities that keep these dams in place are essential activities intended to perpetuate the status quo of conjunctive use on these dams; (4) easements, agreements, and licenses are issued and entered into by the Corps for the Yuba River Development Project; and (5) operational decisions made by the Corps at both dams are dependent upon operational decisions made by the YCWA in its operation of the Yuba River Development Project.

[1] The Endangered Species Act consultation requirements only apply to "actions in which there is discretionary Federal involvement or control." 50 CFR § 402.03

> NMFS considers the Yuba-Bear/Drum-Spaulding Project to be interrelated and interdependent with operation and maintenance of Englebright and Daguerre Point dams, because: (1) operational decisions made by PG&E and Nevada Irrigation District affect flows and operational decisions at the PG&E Narrows I powerhouse and YCWA's Narrows II powerhouse; (2) the PG&E Narrows I powerhouse is dependent upon the baseline existence of the Englebright to provide the hydraulic head for hydropower; (3) the operation and maintenance activities that keep Englebright Dam in place are essential activities intended to perpetuate the status quo of conjunctive use at Englebright Dam; (4) Narrows I and Narrows II powerhouses have integrated operations administered by YCWA; (5) a licenses from the Corps is needed for PG&E to continue to utilize outlet facilities and storage space in its current manner; (6) mitigation for the PG&E license from FERC includes trout planting in Englebright Reservoir; and (7) operational decisions made by the Corps at both dams are dependent upon operational decisions made by the YCWA in its operation of the Narrows I powerhouse in conjunction with the Yuba River Development Project. (*BO, page 8*)

As an example of these "interrelated and interdependent" actions, the BO refers to "how operations of the dams and reservoirs (New Bullards, Our House, Log Cabin, Milton and Jackson Meadows) on the North Yuba River and Middle Yuba River affect which Lower Yuba River Accord flow schedule is implemented in a given year." (*BO, page 9*). This analytical framework incorrectly applies the terms "interrelated" and "interdependent" as those terms are defined in 50 CFR § 402.02 and as those terms are interpreted in the Endangered Species Consultation Handbook. The proper test for whether one action is "interrelated" or "interdependent" with another action is "but for" causation. The "but for" test considers whether an activity would occur but for the federal action. (*Endangered Species Consultation Handbook, pages 4-26 and 4-27*).

Contrary to NMFS assertions in the BO, the Yuba River Development Project is not interrelated or interdependent with the Corps' operation and maintenance of either Englebright Dam or Daguerre Point Dam. As explained in comments provided by YCWA on the draft BO in February 2012:

> While the Narrows II Powerhouse was constructed to take advantage of the existence of Englebright Dam, which had been constructed many years earlier, the Yuba River Development Project could continue to operate without Englebright Dam or Daguerre Point Dam as explained in the February 28,2012 Curt Aikens letter. For example, while the Narrows II Powerhouse provides approximately 10% of the power generated by the Project, the remaining 90% of the generation, which occurs at the New Colgate Powerhouse, could continue without Englebright Dam. Similarly, while Daguerre Point Dam provides the hydraulic head for two facilities

> that divert water from the Lower Yuba River, these facilities could be replaced with other facilities that did not depend on Daguerre Point Dam. Also, the removal of Daguerre Point Dam would not affect any water rights to, or long term water delivery contracts for, Yuba River water. (*Howard "Chip" Wilkins' letter to NMFS dated February 28, 2012, page 7; see also Curt Aikens' letter to NMFS dated February 28, 2012, pages 3-4*)

The practical effect of NMFS' improper definition of the action area is that activities over which the Corps has no discretionary authority or control have been included as part of the Corps' action and therefore included in the analysis of effects of the action on the listed species (*see generally BO, Section VI*). As is more fully described in the Corps' BA, the Corps has no discretionary control over YCWA's Yuba River Development Project or any management or operational decisions made in relation to that project. Nevertheless, the BO attempts to assign responsibility to the Corps for managing flows and prescribing flow conditions on the Yuba River (*BO, pages 166 – 188, 239, and 266*), even though Yuba River flows are already being managed through the lower Yuba River Accord process. Although the Corps is not a party to the Lower Yuba River Accord, it is our understanding that through the Accord process, "a comprehensive set of minimum instream flows for the lower Yuba River" have been established (*Curt Aikens' letter to NMFS dated February 28, 2012, page 9*).

In the absence of the Lower Yuba River Accord process, issues regarding water temperatures and flows should be addressed in the context of the FERC relicensing process. In fact, the Yuba River Development Project is currently undergoing relicensing. FERC is the federal agency with exclusive jurisdiction over development of hydro-power by non-federal entities and as such has a direct authority and obligation to prescribe flow conditions if necessary. Instead, NMFS has taken the position that the Corps, through its easements and licenses has to ability to impose conditions related not only to flows, but also fish passage and other measures. The easements and licenses that the Corps has issued for the non-federal hydropower facilities at Englebright Dam and downstream of Englebright Dam are simply ministerial. Without an approval and license from FERC, the hydro-power facilities could not operate regardless of any license or easement from the Corps. [2]

As part of the FERC relicensing process, the Corps expects that NMFS and FERC will engage in a consultation regarding the effects of the continued operation of the Yuba River Development Project. Through this consultation process, NMFS could prescribe flow and/or temperature requirements for the Yuba River Development Project should NMFS determine that such requirements are necessary. Contrary to statements made by NMFS' staff at a January 12, 2012 meeting between NMFS and the Corps, the fact that the Corps was the first federal agency to request consultation is not a basis for expanding

[2] FERC's authority under the Federal Power Act is fully described in YCWA's comments on the draft BO and will not be repeated here. (*see Wilkins letter to NMFS, pages 7-9*)

the Corps' action to encompass private actions over which the Corps has no discretionary authority or control. The definition of the Corps' action is subject to the limitations specified in 50 CFR §402.03.

As with the Yuba River Development Project, the Corps does not control whether or not water is diverted from the Yuba River through the three agricultural diversions downstream of Englebright (Browns Valley, Hallwood-Cordua, and South Yuba-Brophy), the quantity and timing of those diversions, or the ultimate use of the water once diverted. Notwithstanding this fact, the NMFS BO includes the effects of water diversions as part of the Corps' action (*BO, pages 166 – 188*).

Similarly, the Corps has no discretionary authority or control over PG&E's Drum-Spaulding project or Nevada Irrigation District's (NID) Yuba-Bear project. Also there is no "but-for" causal connection between the Corps' ongoing operation and maintenance of Englebright and Daguerre Point Dams and PG&E's or NID's operations. In the BO, NMFS attempts to link Yuba-Bear and Drum-Spaulding operations to the Corps by claiming that operational decisions at Yuba-Bear and Drum-Spaulding affect PG&E's and YCWA's decisions at the Narrows I and Narrows II powerhouses. The Corps does not believe there is a causal connection between Yuba-Bear and Drum-Spaulding and Narrows I and II. But, even if such a causal connection existed, it does not follow logically that the Corps would have the ability to dictate operations and flows at either Yuba-Bear or Drum-Spaulding. The Corps does not make any operational decisions at either Englebright or Daguerre based on PG&E's or YCWA's operations on upstream projects.

NMFS will have an opportunity to address the effects of the Yuba-Bear and Drum-Spaulding projects during the FERC relicensing process for these projects. The Corps understands that PG&E has already initiated the relicensing process with FERC and that NMFS is aware of and participating in that process.

B. Baseline

The NMFS BO seems to include impacts that should be part of the environmental baseline as effects of the Corps' proposed action. Environmental baseline is defined in 50 CFR § 402.02 as "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation and the impact of State or private actions which are contemporaneous with the consultation in process." But the BO includes the continued existence of Englebright and Daguerre Point Dams as part of the effects analysis for the proposed action rather than as part of the baseline (*BO, pages 168 – 188*), even though the BO seems to acknowledge that continued existence of the projects should be included in the environmental baseline . (*BO, pages 123 -124*).

Additionally, by improperly categorizing various non-federal actions as interrelated and interdependent with the Corps' action, NMFS has included what should be baseline effects due to non-federal actions, as effects of the Corps' action (*see generally, BO section VI*). As noted in footnote 1 above, the Corps has no discretionary authority or control over the continued existence of the dams and has no discretion to remove the dams. The BO acknowledges that the Corps has no authority or discretion for dam removal, so it is unclear why the continued existence of the dams is analyzed as part of the effects of the Corps' action.

C. Authorities

The NFMS' BO provides a summary of the authorities NMFS believes would allow the Corps to proceed with implementing the various measures described in the RPA (*BO page 211 – 214*).[3] However, in many instances, the BO fails to acknowledge or mention the significant constraints associated with the cited authorities that might preclude immediate action by the Corps. Below is a summary of the authorities the Corps believes are applicable to the various measures in the RPA, including the constraints and limitations of those authorities. The BO should be modified to include a discussion of these constraints and limitations.

1. Endangered Species Act (16 U.S.C. 1531, et seq.) – The BO summarizes the relevant and applicable sections of the ESA. However, Section 7(a)(2) states that agencies "shall…utilize their authorities in furtherance of the purposes of this chapter…". In other words, the ESA doesn't give an agency any authority that it doesn't already have. It authorizes federal agencies to use their *existing* authorities to carry out programs for the conservation of threatened and endangered species.

2. Federal Power Act, Section 4(e) (16 U.S.C. 797(e)) Allows federal agencies to prescribe conditions to ensure FERC licenses are not inconsistent with the purposes of a project. NMFS's BO asserts that section 4(e) allows the Corps' to require "upstream and downstream fish passage of the hydroelectric projects at Englebright Dam." (*BO, page 214*) However, fish passage is not an authorized purpose for Englebright. As noted above, Englebright Dam is a debris dam that was

[3] NMFS improperly included "environmental stewardship" as an authority that would allow the Corps to implement fish passage at Englebright Dam. "Environmental stewardship" is not an authority separate and distinct from the various authorities mentioned in this section, rather it is an umbrella term designed to capture the full breadth and scope of legislative authorities and other environmental mandates applicable to Corps activities and programs. More information about the Corps' environmental stewardship can be found at: http://www.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/219/Article/173/environmental-stewardship-program-statistics.aspx

authorized for the purpose of retaining hydraulic mining debris and later for hydropower. The Corps is not aware of an example where Section 4(e) was used to add a *new* authorized purpose to an existing Corps facility.

3. <u>Water Resources Development Act (WRDA) of 1990, Section 306</u> (33 U.S.C. 2316) – As the BO notes, this is a general authority that directs the Secretary of the Army to include environmental protection as one of the primary missions of USACE in planning, designing, operating and maintaining water resources projects. However, this section did not modify the Corps' *existing* authorities. In other words, Section 306 could not be used, for example, to add a *new* authorized purpose to Englebright Dam. Section 306 states:

> (a) General rule
>
> The Secretary [of the Army] shall include environmental protection as one of the primary missions of the Corps of Engineers in planning, designing, constructing, operating, and maintaining water resources projects.
>
> (b) Limitation
>
> Nothing in this section affects—
>
> (1) existing Corps of Engineers' authorities, including its authorities with respect to navigation and flood control;
>
> (2) pending Corps of Engineers permit applications or pending lawsuits involving permits or water resources projects; or
>
> (3) the application of public interest review procedures for Corps of Engineers permits.

4. <u>Flood Control Act of 1962, Section 209</u> (Public Law 87-874) – Section 209 is a study authority that authorizes the Corps to:

> "cause surveys for flood control and allied purposes … in drainage areas of the United States…which include the following named localities: *Provided*, That after the regular or formal reports made on any survey are submitted to Congress, no supplemental or additional report or estimate shall be made unless authorized by law except that the Secretary of the Army may cause a review of any examination or survey to be made and a report thereon submitted to Congress, if such review is required by the national defense or by changed physical or economic conditions …
>
> Sacramento River Basin and streams in northern California draining into the Pacific Ocean

> for the purposes of developing, where feasible, multiple-purpose water resource projects…"

In the 1990s, the Corps used its authority under Section 209 to seek an appropriation to undertake a study of fish migration in the Sacramento River. Therefore, this authority may be applicable to one or more of the measures in the RPA that require the Corps to complete studies.

5. <u>Flood Control Act of 1970, Section 216</u> (33 U.S.C. 549a) – Section 216 is a study authority that allows the Secretary of the Army to review completed navigation, flood control and water supply projects. Englebright and Daguerre Point Dams are both navigation projects, therefore, this authority would allow the Corps to prepare a report to Congress regarding the need to modify the structures due to changed physical or economic conditions. Section 216 states:

   > The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due [*sic*] the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.

   The Corps has already taken the first steps in the process of conducting the review contemplated by Section 216. In 2005, the Corps completed an "initial appraisal report" regarding the federal interest in improving fish passage facilities at Daguerre Point Dam. Since 2005, the Corps has sought authorization and approval to initiate a reconnaissance study to explore fish passage improvement at both Englebright and Daguerre Point Dams. To date, Congress has not authorized or funded the reconnaissance study.

6. <u>Water Resources Development Act of 1986, as amended</u>

   a) <u>Section 105</u> (33 U.S.C. 2215) – Section 105 is a general provision that prohibits the Corps from undertaking feasibility studies unless a non-Federal entity has agreed to contribute 50% of the cost of the study.[4]
   b) <u>Section 729</u> (33 U.S.C. 2267a) – Section 729 is a study authority that allows the Secretary of the Army to "assess the water resources needs of river basins and watersheds of the United

[4] 33 U.S.C. 2215(a)(1)(A) states: "The Secretary [of the Army] shall not initiate any feasibility study for a water resources project after November 17, 1986, until appropriate non-Federal interests agree, by contract, to contribute 50 percent of the cost of the study."

States, including needs relating to ecosystem protection and restoration." (*33 U.S.C. 2267a(a)*). This authority does require the Secretary to give priority to ten specific watersheds "in selecting river basins and watersheds for assessment."[5] Finally, this authority has a non-federal cost share requirement of 25%. (*33 U.S.C. 2267a(f)*). Under this authority, the Corps can prepare an Initial Watershed Assessment using 100% federal funds (*Engineer Circular 1105-2-411, para. 7.b.(1)*). The Initial Watershed Assessment is typically funded at $100,000 with any costs in excess of $100,000 shared between the Corps and a non-federal entity (*Engineer Circular 1105-2-411, para. 7.b.(1)*). This authority may be useful for the measures in the RPA that require watershed or basin level studies.

c) Section 906(b)(1) (33 U.S.C. 2283(b)(1) – Section 906(b) authorizes the Secretary of the Army to "mitigate damages to fish and wildlife resulting from any water resources project…". However, this authority is not unlimited. Section 906(b)(1) states "[w]ith respect to any water resources project, the authority under this subsection shall not apply to measures that cost more than $7,500,000 or 10 percent of the cost of the project whichever is greater." (*33 U.S.C. 2283(b)(1)*). Furthermore, the Secretary may not obligate any more than $30,000,000 under this authority in any fiscal year. (*33 U.S.C. 2283(b)(1)*). Costs incurred under this authority are "allocated among authorized project purposes in accordance with applicable cost allocation procedures, and shall be subject to cost sharing or reimbursement to the same extent as such other project costs are shared or reimbursed…". (*33 U.S.C. 2283(c)*). The Corps believes this authority will allow us to move forward with some actions under the RPA, particularly actions related to the effects of Englebright Dam such as gravel augmentation.

d) Section 906(e) (33 U.S.C. 2283(e) – When the Secretary recommends fish and wildlife enhancement as part of a report to Congress, section 906(e) authorizes "first enhancement costs" to be a Federal cost in certain circumstances. Section 906(e) states:

---

[5] 33 U.S.C. 2267a(d) states:

In selecting river basins and watersheds for assessment under this section, the Secretary shall give priority to—

(1) the Delaware River basin;
(2) the Kentucky River basin;
(3) the Potomac River basin;
(4) the Susquehanna River basin;
(5) the Willamette River basin;
(6) Tuscarawas River Basin, Ohio;
(7) Sauk River Basin, Snohomish and Skagit Counties, Washington;
(8) Niagara River Basin, New York;
(9) Genesee River Basin, New York; and
(10) White River Basin, Arkansas and Missouri.

> In those cases when the Secretary, as part of any report to Congress, recommends activities to enhance fish and wildlife resources, the first costs of such enhancement shall be a Federal cost when—
>
> (1) such enhancement provides benefits that are determined to be national, including benefits to species that are identified by the National Marine Fisheries Service as of national economic importance, species that are subject to treaties or international convention to which the United States is a party, and anadromous fish;
>
> (2) such enhancement is designed to benefit species that have been listed as threatened or endangered by the Secretary of the Interior under the terms of the Endangered Species Act, as amended (16 U.S.C. 1531, et seq.), or
>
> (3) such activities are located on lands managed as a national wildlife refuge.
>
> When benefits of enhancement do not qualify under the preceding sentence, 25 percent of such first costs of enhancement shall be provided by non-Federal interests under a schedule of reimbursement determined by the Secretary. Not more than 80 percent of the non-Federal share of such first costs may be satisfied through in-kind contributions, including facilities, supplies, and services that are necessary to carry out the enhancement project. The non-Federal share of operation, maintenance, and rehabilitation of activities to enhance fish and wildlife resources shall be 25 percent.

The authority under 906(e) has been included in this list because it may be useful and applicable at a future time, when the Corps progresses to the point of submitting a final report to Congress. But this authority doesn't seem to have much applicability at this early stage.

e) <u>Section 1135</u> (33 U.S.C. 2309a) – Section 1135 is a study, design, and construction authority that allows the Secretary to "review water resources projects…to determine the need for modifications in the structures and operations of such project for the purpose of improving the quality of the environment in the public interest and to determine if the operation of such projects has contributed to the degradation of the quality of the environment." (*33 U.S.C. 2309a(a)*). There are certain limitations to this authority which were not addressed in the BO. A non-federal entity must agree to fund 25% of the costs of such modifications and "no more than $5,000,000 in Federal funds may be expended on any single modification or measure carried out or undertaken pursuant to this section." (*33 U.S.C. 2309a(d)*). Finally, the local sponsor must agree to pay 100% of any operation and maintenance costs associated with a project modification under Section 1135. (*Engineer Regulation 1165-2-501*).

7. Water Resources Development Act of 1996, Section 206 (33 U.S.C. 2330) – Section 206 is a general study, design and construction authority that allows the Corps to "carry out a project to restore and protect an aquatic ecosystem or estuary if the Secretary determine that the (i) project will improve the quality of the environment and is in the public interest; or (ii)will improve the element and features of an estuary…and is cost-effective." (*33 U.S.C. 2330(a)(1)*) Projects under section 206 can include dam removal. (*33 U.S.C. 2330(a)(2)*) . Projects under section 206 are subject to certain limitations which were not identified in NMFS' BO. For example, a non-federal entity must agree to fund 35% of the costs of such projects (*33 U.S.C. 2330(b)(1)*) and "no more than $5,000,000 in Federal funds may be allotted under this section for a project at any single locality." (*33 U.S.C. 2330(d)*). Finally, the local sponsor must agree to pay 100% of any operation and maintenance costs associated with a project under Section 206. (*33 U.S.C. 2330(c)(1)*).

8. Operation and Maintenance appropriation – The Corps receives appropriated funds, which are used for the operation and maintenance of completed projects and associated staff labor costs. Under this appropriation, the Corps is able to proceed immediately with implementing RPA measure NTFP 5 – Fish Passage at Daguerre Point Dam.

D. Technical/Scientific Concerns

The Corps has significant scientific and technical concerns with the data NMFS used to support its analysis in the BO that lead NMFS to conclude that the Corps' action is jeopardizing the continued existence of the three listed species and adversely modifying critical habitat. One example that the Corps is particularly concerned with is NMFS' analysis of effects to the Southern DPS of North American green sturgeon. The Corps' technical and scientific concerns are provided in Attachment 2, *Comments on NMFS February 29, 2012 Biological Opinion* prepared by HDR Engineering, Inc and Attachment 3, *Comments on NMFS Biological Opinion of Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir* prepared by Dr. Gregory B. Pasternack, Ph.D., M.ASCE.

E. Reasonable and Prudent Alternative

The BO seems to suggest that even if the RPA is implemented, the Corps cannot avoid jeopardy unless the dams are removed (*BO, pages 244 – 245*). Yet NMFS acknowledges that the Corps does not have the discretion or authority to remove the dams. This conundrum clearly illustrates that NFMS analysis of effects is focused on the existence of the dams (a non-discretionary action) rather than the Corps' actual action of ongoing operation and maintenance. As part of the Corps' operation and maintenance, we have proposed several conservation measures which are helping to improve conditions for listed species. The analysis of the conservation measures and their effects is fully described in the Corps' biological assessment.

The Corps is also concerned with the scope and breadth of the actions required, the timeline for accomplishing the actions and that several of the RPA actions are outside the Corps' existing authority[6]. The RPA contemplates that all actions would be completed in eight years, which is a fairly short timeframe to complete what the Corps estimates to be several hundred million dollars worth of work. Additionally, it appears that in developing the timeframe for completing the various actions, NMFS did not consider that the Corps has to comply with other environmental requirements, such as the National Environmental Policy Act and the Clean Water Act. Further, many of the RPA actions require Congressional action and funding before they can be implemented. Finally, some RPA actions are not related to any effect caused by the Corps' ongoing operation and maintenance of the dams.

Notwithstanding the fact that we disagree with the jeopardy and conclusion and believe that the conclusion is based on flawed assumptions regarding the nature of the Corps' action, we are attempting to move forward with the RPA to the extent we have the authority and funding to do so. Some of our concerns with the RPA actions are itemized below; however we intend to continue discussions with NMFS to refine the Corps' approach to the RPA actions. Additional concerns regarding the RPA actions are provided in Attachment 2, *Comments on NMFS February 29, 2012 Biological Opinion* prepared by HDR Engineering, Inc and Attachment 3, *Comments on NMFS Biological Opinion of Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir* prepared by Dr. Gregory B. Pasternack, Ph.D., M.ASCE.

1. Steering Committees – The RPA requires the Corps to establish the Yuba Interagency Fish Passage Steering Committee (*BO, pages 220 and 222*) and the Green Sturgeon Steering Committee (*BO, page 238*). The RPA specifies that the steering committees will be composed of federal, state and academic members and will be responsible for providing "policy and management advice" to the Corps regarding the

[6] 50 CFR § 402.04 requires the RPA to be "consistent with the scope of the Federal agency's legal authority and jurisdiction…".

implementation of the RPA. Furthermore, the RPA requires the Corps to fund the activities of the steering committees. The steering committees as described in the RPA could be considered advisory committees under the Federal Advisory Committee Act (FACA) (5 U.S.C. App. I) because they include non-federal participants. FACA defines an "advisory committee" as:

> …any committee, board, commission, council, conference, panel, task force, or other similar group, or any subcommittee or other subgroup thereof (hereafter in this paragraph referred to as "committee"), which is – …
>
> (C) established or utilized by one or more agencies, in the interest of obtaining advice or recommendations for the President or one or more agencies or officers of the Federal Government, except that such term excludes (i) any committee that is composed wholly of full-time, or permanent part-time, officers or employees of the Federal Government …

The Corps is willing to convene an interagency workgroup comprised of federal, state and academic participants; however, the Corps cannot fund the activities of the group nor can the Corps fund the participation of any individual member. Additionally, the Corps will not seek advice or recommendations from the workgroup or allow the workgroup to make management or policy decisions. Alternatively, it may be more efficient and beneficial for the Corps to join and participate on one or more of the existing groups involved in fish passage issues in the Yuba River watershed such as the River Management Team or the Yuba Salmon Forum. The Corps is already participating on the North Yuba Reintroduction Initiative organized by YCWA.

2. RPA 1, Yuba River Fish Passage Improvement Strategy and Plan (BO, pages 220 – 222) – RPA 1 requires the Corps to assess fish passage not only upstream of Englebright and Daguerre Point Dams, but also upstream of several dams over which the Corps has no control such as New Bullards Bar, Log Cabin, and Our House Dams. To the extent this action item requires the Corps to evaluate passage at dams it doesn't own, control, operate or maintain, it is outside the Corps' authority and does not seem calculated to address an effect of the Corps' action. This RPA also states that dam removal is the preferred option for fish passage. The Corps does not have authority to remove either Englebright or Daguerre Point Dam.

With respect to fish passage at Englebright Dam and improved fish passage at Daguerre Point Dam, the Corps has initiated the process for studying fish passage options. As NMFS is aware, the Corps has requested Congressional approval and funding of a reconnaissance study which is the first step in developing a plan for fish passage. A reconnaissance study typically takes one year to complete. If a non-federal sponsor is identified during the reconnaissance phase, the next step is to prepare a feasibility study and environmental impact statement. The Corps' current policy is to complete the feasibility phase within 3 years. After the feasibility report is completed, the Corps would be able to submit a report to Congress to obtain further authorization and funding for project implementation. More information about the typical Corps' Civil Works process is available at the following link: http://www.sac.usace.army.mil/?action=programs.six_steps

The RPA requires that the fish passage plan to reintroduce listed species above Daguerre and Englebright be developed and implemented by December 1, 2013. In light of the need to seek authorization and funding for this major federal action and complete the NEPA process, December 1, 2013 does not seem like a reasonable goal for implementation.

3. RPA 2, Near Term Fish Passage Actions (BO, pages 222 – 230) – RPA 2 is a suite of actions that provide for study of the condition and suitability of upstream habitats, development/implementation of a pilot reintroduction program, construction of fish collection and handling facilities, and other measures related to developing near-term volitional fish passage upstream of Englebright and Daguerre Point Dam. The first step for the Corps is to begin a reconnaissance study. As noted above, we are seeking the necessary approval and funding for that study.

   RPA 2 also contains measures designed to maintain the current fish passage facilities at Daguerre Point Dam (NTFP 5) and develop/implement improved fish passage facilities (NTFP 6). The Corps is currently implementing the actions under NTFP 5. As for NTFP 6, the RPA requires that the feasibility study and preliminary design for improved fish passage facilities be completed by November 21, 2012. This timeframe is not reasonable given the need for the Corps to seek authorization and funding for such a study and the requirement for the Corps to comply with NEPA and other applicable environmental laws.

4. RPA 3, Long Term Fish Passage Actions (BO, pages 231 – 233) – RPA 3 is a suite of actions that relate to providing long term fish passage upstream and downstream of Englebright Dam and upstream of Daguerre Point Dam. As noted above, the Corps has sought approval and funding to begin a reconnaissance study. The Corps proposes to include consideration of long term and near term fish passage options in the reconnaissance study.

5. RPA 4, Gravel Augmentation Program (BO, pages 233 – 234) – The Corps has already begun to implement portions of the gravel augmentation program. Specifically, the Corps plans to inject 5,000 tons of gravel in the Englebright Dam Reach in summer 2012 as part of its ongoing implementation of the Gravel Augmentation Implementation Plan (GAIP). The Corps is preparing a draft Environmental Assessment for this action which will be released for public review and comment in July 2012.

   In addition to implementing the GAIP, RPA 4 also requires the Corps to inject 15,000 tons of gravel annually into the Englebright Dam Reach. The Corps questions whether it is technically feasible to inject 15,000 tons annually into the Englebright Dam Reach given the work window and the limited locations where the Corps has access to place gravel. The Corps also has concerns about whether implementation of this action as described in the BO would successfully achieve the outcome NMFS desires. It would be better to adaptively plan annual gravel injections based on monitoring results from the previous year (see also Attachment 3, *Comments on NMFS Biological Opinion of Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir* prepared by Dr. Gregory B. Pasternack, Ph.D.) .

6. RPA 5, Channel Restoration Program (BO pages 234 – 236) – RPA 5 requires the Corps to develop and implement a plan for removing of shot-rock and recontouring the channel in the Englebright Dam Reach and the Narrows Reach. The channel restoration measures do not seem to be related to any effects of the Corps' ongoing operation and maintenance at Daguerre. Dr. Pasternack has studied this issue and concluded that the river degradation in the Englebright Dam Reach and Narrows Reach is primarily due to mechanized gold mining. Also, RPA 5 is identical to measures proposed by PG&E and the California Department of Water Resources under the Habitat Expansion Plan developed as part of an agreement with NMFS and other stakeholders in

four FERC relicensings on the Feather River. Given that PG&E is ready, willing, and able to undertake these measures and these measures don't relate to any effect of the Corps' action, it is inappropriate to assign this responsibility to the Corps.

7. RPA 6, Predator Control Program (BO, pages 236 – 237) – NMFS conclusions regarding predation do not seem to be supported by current science (see HDR comments, Attachment 2, Chapter 7). Additionally, given the need to comply with NEPA, the timeframe for completing this item is unreasonable. Notwithstanding this concern, the Corps is exploring opportunities and options for implementing this action.

8. RPA 7, Salmonid Monitoring and Adaptive Management Program (BO, pages 237 – 238) – RPA 7 is a set of actions focused on gathering information about the trends and status of salmonids in the Yuba River watershed. The scope of this program is unclear and seems to go beyond what would be required to address effects of the Corps' ongoing operation and maintenance of its facilities. In addition, a fisheries monitoring and evaluation program is already ongoing under the Lower Yuba River Accord (*Curt Aikens' letter to NMFS dated February 28, 2012, pages 8-12*).

9. RPA 8, Green Sturgeon Monitoring and Adaptive Management (BO, pages 238 – 242) – RPA 8 is focused on conserving green sturgeon in the Yuba River when the BO provides no evidence or support for the contention that green sturgeon are using the lower Yuba River for spawning, reproduction, and rearing. There is no current or historical evidence that green sturgeon used the Lower Yuba River up to Englebright Dam. There is also uncertainty about the amount of usable spawning habitat above Daguerre Point Dam and passage above Daguerre Point Dam might facilitate an increased presence of predator fish. Through this RPA action, NMFS also assigns responsibility to the Corps for determining water temperature and flows on the Yuba River. The Corps has no control over flows or temperatures on the Yuba River. Those issues are being addressed through the Lower Yuba River Accord process and should also be addressed through the ongoing FERC relicensing processes for hydro-power facilities on the Yuba River. The jeopardy conclusion and RPA action for this species seem inappropriate.

10. RPA 9, Training Walls (BO, pages 242 – 243) – The intent of this RPA action is unclear. The Corps has no ongoing operation and maintenance responsibility for the training walls, therefore an RPA action associated with the training walls seems unnecessary and inappropriate. Furthermore, identifying and mapping the original training walls will be impossible. The Corps does not have any historical data or technical information regarding the original location or extent of the training walls. The training walls were not designed or surveyed and "as-built" drawings were not produced after construction.

F. Economic and Technical Feasibility of the RPA

NMFS' BO concludes that the RPA actions are technically and economically feasible (*BO, pages 248 – 249*). The Corps questions whether or not this is true given the timeframe in which the BO requires the RPA actions to be accomplished. For example, the RPA requires near term fish passage actions to be implemented within the next one - two years[7] and long-term fish passage actions to be implemented in the next eight years (*BO, pages 219 – 233*). Assuming it is possible to construct a fish ladder at Englebright Dam, the Corps estimates such construction to cost approximately $400 million.[8] It is unlikely that a project of that scale could be studied, authorized, funded, designed and constructed in only eight years.

The RPA (*BO, page 248*) also discusses several examples where the Corps has modified projects for fish passage, and then assumes that because the Corps has not implemented fish passage on the Yuba River, the Corps is "reluctant to pursue funding to address environmental issues on the Yuba River." NMFS is well aware of the Corps' efforts to pursue funding for actions on the Yuba River. The Corps has sought and obtained funding for gravel augmentation which has been ongoing since 2010. Similarly, the Corps has sought and obtained funding to begin a large woody material management program. More importantly, the Corps has requested approval and funding for a reconnaissance study, which is the first step in beginning to study options for fish passage at the Corps' facilities on the Yuba River.

Under its discussion of economic feasibility, the BO specifically references the estimated cost of passage for green sturgeon at Daguerre Point Dam. NMFS estimates this cost to be $351,000. This figure is somewhat misleading given the RPA requirement to provide improved passage for all listed species. In a 2003 study by the Department of Water Resources and the Corps, the estimated cost of the most optimal alternative for improved passage at Daguerre Point Dam was approximately $17.5

[7] One of the near term fish passage actions (NTFP 6) requires preliminary design for improved passage at Daguerre be completed by November 2012.
[8] NMFS estimates the maximum cost of a fish ladder at Englebright is $100 million. The Corps believes this estimate is low.

million with operation and maintenance costs estimated to be $500,000 annually.[9] The Corps estimates the current cost of improved fish passage at Daguerre Point Dam for anadromous fish to be approximately $35 million.

One example the BO uses to demonstrate the Corps' ability to add fish passage facilities to a Corps project is the Howard Hanson Dam in Tacoma, Washington. Howard Hanson dam is an approximately 235 foot high earthen embankment dam that was originally authorized for flood control, downstream low-flow augmentation for fish, irrigation, and municipal and industrial water supply. The Howard Hanson Dam project is an excellent case study of the Corps' process for obtaining authorization and funding for project modifications and the timeline for that process. The process of modifying Howard Hanson Dam began in 1989 when the City of Tacoma requested the Corps to study how the dam could address water supply needs for Puget Sound residents. The City of Tacoma signed up to be a non-federal sponsor for the project and the Corps began the water supply study. In 1994, the Corps expanded the study to include ecosystem restoration. The Corps completed a feasibility study and environmental impact statement in 1998. Congress specifically authorized the project modifications in Section 101(b)(15) of the Water Resources and Development Act of 1999[10] subject to submission of a final Chief of Engineers' Report (Chief's Report). The Corps submitted a final Chief's Report to Congress in 1999 which described the Corps' proposal to construct upstream and downstream fish passage facilities, among other things. In July 2000, the Corps completed a Fish and Wildlife Mitigation and Restoration Conceptual Design Report. A Record of Decision for the Final EIS was signed in July 2001. Construction of the fish passage facility began in 2004 and was completed in 2009. More information about Howard Hanson Dam can be found at:

http://www.nws.usace.army.mil/PublicMenu/Menu.cfm?sitename=HHD_AWSP&pagename=fish_passage2

If fish passage improvements are to occur at Englebright and Daguerre Point dams in a manner consistent with the intent of the RPA, such improvements will require specific Congressional authorization and funding and a non-federal sponsor similar to what occurred for the facilities at Howard Hanson Dam.

G. Incidental Take Statement

Section 7(o)(2) of the Endangered Species Act (16 USC §1536(o)(2)) exempts any take that meets the terms and conditions of an incidental take statement (ITS) from the take prohibitions in Section 9 of the Act. To be exempt, an agency must

[9] Daguerre Point Dam Fish Passage Improvement Project Alternative Concepts Evaluation, September 2003 prepared by Wood Rodgers, Inc.

[10] The authorizing language in WRDA 1999 states "(15) HOWARD HANSON DAM, WASHINGTON.—The project for water supply and ecosystem restoration, Howard Hanson Dam, Washington, at a total cost of $75,600,000, with an estimated Federal cost of $36,900,000 and an estimated non-Federal cost of $38,700,000."

comply with the conservation measures described as part of the proposed action and the ITS' reasonable and prudent measures (RPMs) and associated terms and conditions (T&Cs). The BO includes an ITS (*BO, pages 249 – 267*) that authorizes a certain amount of take to occur as a result of the proposed action, as long as the Corps complies with the RPMs and T&Cs.

Many elements of the RPMs and T&Cs are the result of, and require the Corps to manage, activities and effects over which it has no discretionary authority or control. For example, RPM 5 and its associated T&Cs require the Corps to improve flow management on the Yuba River. Flow management issues are already being addressed by NMFS and other parties to the Lower Yuba River Accord (*Curt Aikens' letter to NMFS dated February 28, 2012, pages 8-12*). Minimum streamflows and a fisheries monitoring and evaluation program have already been established by parties participating in the Lower Yuba River Accord. Such issues should also be addressed through the ongoing FERC relicensing processes for the various hydropower facilities in the upper Yuba River.

The RPMs and T&Cs also mandate that the Corps plant a minimum of 30 acres of riparian vegetation annually downstream of Englebright Dam to the confluence of the Yuba River and the Feather River. There is no evidence to suggest that riparian vegetation is lacking in the Lower Yuba River. In fact evidence suggests that the presence of riparian vegetation has increased on the lower Yuba River over the last 60 years since Englebright Dam was constructed (see Attachment 3, *Comments on NMFS Biological Opinion of Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir* prepared by Dr. Gregory B. Pasternack, Ph.D., M.ASCE.). Even if the quantity of riparian vegetation had declined, there is no evidence to suggest that the Corps' operation and maintenance activities at Englebright Dam are the cause.

Additionally, some of the surrogates NMFS uses to measure take under the ITS are not related to the Corps' implementation of the RPMs and T&Cs. For example, one surrogate for take is the Corps' injection of 15,000 tons of gravel annually. Gravel injection is a conservation measure the Corps proposed and is an RPA action, but it is not included as one of the RPMs. Also, 15,000 tons is not an appropriate measure to use for "take". As noted in the discussion of RPA 4 above, 15,000 tons may not be achievable (or necessary) each year.

H. Conservation Recommendations

As recommended in the BO, the Corps will continue to work collaboratively with various stakeholders on the Yuba River to improve conditions for anadromous fish. However, as noted above, the Corps objects to NMFS' attempts throughout the BO (*see RPA 8 and RPM 5*) to assign responsibility to the Corps for managing water temperatures in the lower Yuba and Feather Rivers. The Corps has no control over flows and therefore no control over water temperatures.

IV. CONCLUSION

As described in detail above and in Attachments 2 and 3, the Corps believes the February 29, 2012 BO is deficient in many respects. Because NMFS has stated that the Corps' BO will become the baseline for future consultations, it is crucial that the inaccuracies and flaws in the BO be corrected. Ultimately, the Corps is concerned that the RPA and RPMs are based on flawed factual and scientific analyses that have led NMFS to impose requirements that the Corps has no legal authority to implement. Furthermore, the Corps is concerned the BO may have the unintended effect of impeding existing beneficial efforts being undertaken or proposed by other stakeholders on the Yuba River. The Corps requests that the BO be amended or supplemented to address the Corps' concerns.

Attachment 2

Comments on NMFS February 29, 2012 Biological Opinion

Prepared for the U.S. Army Corps of Engineers, Sacramento District

by HDR Engineering, Inc.

COMMENTS ON NMFS FEBRUARY 29, 2012 BIOLOGICAL OPINION

CONTINUED OPERATION AND MAINTENANCE OF ENGLEBRIGHT DAM AND RESERVOIR, DAGUERRE POINT DAM, AND RECREATIONAL FACILITIES ON AND AROUND ENGLEBRIGHT RESERVOIR

Prepared for:

US Army Corps of Engineers ®
Sacramento District

Prepared by:

HDR Engineering, Inc.

2365 Iron Point Road, Suite 300

Folsom, CA 95630

June 2012

TABLE OF CONTENTS

PAGE

List of Attachments

COMMENTS ON NMFS FEBRUARY 29, 2012 BIOLOGICAL OPINION

CONTINUED OPERATION AND MAINTENANCE OF ENGLEBRIGHT DAM AND RESERVOIR, DAGUERRE POINT DAM, AND RECREATIONAL FACILITIES ON AND AROUND ENGLEBRIGHT RESERVOIR

The National Marine Fisheries Service (NMFS) provided a copy of its Final Biological Opinion (BO) on the U.S. Army Corps of Engineers (Corps) Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir on February 29, 2012 (Final BO). This document provides comments on NMFS' Final BO. These comments, prepared for the Corps, were developed by HDR Engineering, Inc., who provided technical assistance to the Corps in the preparation of the Biological Assessment (BA) for the Ongoing Operation and Maintenance of Englebright Dam and Reservoir, and Daguerre Point Dam on the Lower Yuba River (Corps BA). Additional comments on statements in the Final BO regarding the topics of fluvial geomorphology, substrate and anadromous salmonid spawning habitat, large woody material, training walls and channel restoration are prepared separately by other technical experts for the Corps.

The Final BO is nearly 300 pages in length, and contains a substantial amount of technical information. Given the inherently complex issues associated with the listed species (i.e., spring-run Chinook salmon, steelhead, and green sturgeon) and their designated critical habitat in the lower Yuba River, these comments are organized by topical categories, including the following.

- ❑ **General Comments**. Effects assessment approach – viability and extinction risk of Yuba River anadromous salmonid populations.
- ❑ **Lower Yuba River Accord**. Flows, water temperatures, and habitat conditions associated with implementation of the Lower Yuba River Accord.
- ❑ **Genetic Considerations**. Spring-run Chinook salmon and steelhead.
- ❑ **Upper Yuba River Watershed Anadromous Salmonid Production, and Comparisons to the Lower Yuba River**. Issues pertaining to modeling habitat capacity and population productivity for spring-run Chinook salmon and steelhead in the Upper Yuba River Watershed, the manner in which the Final BO used RIPPLE model output to estimate production potential of the Yuba River Watershed upstream of Englebright Dam, and comparisons to the lower Yuba River.

- ❑ **Green Sturgeon Considerations**. Issues specific to green sturgeon.
- ❑ **Effects of the Proposed Action on Listed Species and Critical Habitat** (including Cumulative Effects associated with South Yuba/Brophy Diversion entrainment issues, flow and water temperature conditions).
- ❑ **Reasonable and Prudent Alternative (RPA) Actions**.
  - RPA Action No. 1. Yuba River Fish Passage Improvement Strategy and Plan – General fish passage considerations.
  - RPA Action No. 2. Near-term Fish Passage Actions – Distinct issues pertaining to both Englebright and Daguerre Point Dam.
  - RPA Action No. 3. Long-term Fish Passage Actions – Distinct issues pertaining to both Englebright and Daguerre Point Dam.
  - RPA Action No. 4. Gravel Augmentation Program.
  - RPA Action No. 5. Channel Restoration Program.
  - RPA Action No. 6. Predation and Predator Control Program.
  - RPA Action No. 7. Salmonid Monitoring and Adaptive Management Program (SMAMP) – Monitoring groups, organization membership and activities in the BO in consideration of other ongoing monitoring activities in the Yuba River Watershed.
- ❑ **Amount or Extent of Incidental Take**.

These comments recognize that NMFS prepared the Final BO under a restrictive timeline. If additional consultation meetings were able to have been held between NMFS and the Corps, it is anticipated that many of the following comments on the Final BO would not have been necessary. Consultation meetings between NMFS and the Corps would have facilitated NMFS inclusion of the best available scientific and commercial information, particularly regarding listed species and their habitats in the lower Yuba River, in the Final BO.

For example, the Final BO (pages 5 to 9) lists thirteen key consultation considerations. However, the Corps BA, which was prepared for consultation on the Proposed Action, was not identified as a key consultation consideration, nor was much of the relevant information contained therein incorporated into the Final BO. Also, many of the following comments are prepared in response to statements in the Final BO that attribute ongoing effects of the existence of Englebright Dam to the Proposed Action. This approach in the Final BO is contradictory to that which was described in the Corps BA.

1.0 General Comments

The Final BO contains numerous conclusionary statements that are not supported by analyses, citations or rationale, as well as contradictory information addressing specific issues. It also contains statements regarding the manner in which the effects assessment approach was conducted, although application of specific assessment approaches appear to deviate from the stated methodologies. Examples of these types of excursions from stated methodologies that pertain to viability and extinction risk of Yuba River anadromous salmonid populations are provided below, with emphasis added as underlined text.

1.1 Effects Assessment Approach

1.1.1 Viability and Extinction Risk of Yuba River Anadromous Salmonid Populations

The Final BO indicates that the extinction risk assessment pertains to populations, and that the Viable Salmonid Population (VSP) concept is applied to diversity group, Evolutionarily Significant Unit (ESU) or Distinct Population Segment (DPS) levels. Page 199 of the Final BO states "*…The criteria recommended for low risk of extinction for Pacific salmonids are intended to represent a species and populations…*" Page 200 of the Final BO states "*…the consequence of those effects is applied the VSP concept* [sic] *and used to establish risk to the diversity group, ESU, or DPS.*"

However, although the Final BO contains a considerable amount of discussion regarding VSP, it is unclear how NMFS actually applies the VSP concept and how the four VSP parameters of abundance, productivity, spatial structure, and diversity are used to determine viability of listed species ESU/DPS. Moreover, it is apparent that the extinction risk assessment criteria are not actually applied to the Yuba River anadromous salmonid populations. Provided below are excerpts of the analytical approach that NMFS describes in the Final BO, and comments on those excerpts.

FINAL BO STATEMENT (Pages 36 and 37)

"For the purposes of this analysis, NMFS equates a listed species' probability (or risk) of extinction with the likelihood of both the survival and recovery of the species in the wild for purposes of conducting jeopardy analyses under section 7(a)(2) of the ESA. In the case of listed salmonids, we use the Viable Salmonid Populations (VSP) framework (McElhany et al. 2000) as a bridge to the jeopardy standard."

COMMENT

The Final BO states that NMFS uses the VSP framework as "*a bridge to the jeopardy standard*." From an analytical perspective, it is unclear what is meant by the phrase "*a bridge to the jeopardy standard*" and how conceptual components of the VSP framework were specifically applied to assess the viability of listed species ESU/DPS. The Final BO (page 37) states that the VSP parameters of productivity, abundance, and population spatial structure are consistent with the "*reproduction, numbers, or distribution*" criteria found within the regulatory definition of jeopardy (50 CFR 402.02), and are used as surrogates for "*numbers, reproduction, and distribution*," although the specific application remains unclear.

FINAL BO STATEMENT (Page 37)

"NMFS is currently in the process of finalizing a recovery plan for the listed Central Valley salmon and steelhead species. During the drafting of the recovery plan a technical recovery team was established to assist in the effort. One of the technical recovery team products, Lindley et al. (2007), provides a "Framework for Assessing Viability of Threatened and Endangered Chinook Salmon and Steelhead in the Sacramento-San Joaquin Basin." …Lindley et al. (2007) was relied on to establish the current status of the listed Central Valley salmon and steelhead species, and both Lindley et al. (2007) and the Draft Recovery Plan were utilized to evaluate whether the proposed action does not "reduce appreciably the likelihood of survival and recovery."

COMMENT

The Final BO cites VSP-related information described in the Public Draft Recovery Plan (NMFS 2009), the 5-Year Status Review of Central Valley Spring-Run Chinook Salmon ESU (NMFS 2011a), and the 5-Year Status Review of Central Valley Steelhead DPS (NMFS 2011b). However, the Final BO does not present any information to indicate that quantitative assessments of extinction risk were conducted for anadromous salmonid populations in the lower Yuba River, nor does the Final BO follow the extinction risk methodology described in Lindley et al. (2007).

By contrast to the Final BO, the Corps BA conducts an independent assessment of spring-run Chinook salmon extinction risk in the lower Yuba River using available data following the methodology described in Lindley et al. (2007) to evaluate population size, population decline, rate and effect of catastrophe, and hatchery influence (see Section 5.1.7.2 of the Corps BA on pages 5-93 through 5-129). The Corps BA also examines available data in an effort to follow the methodology described in Lindley et al. (2007) to conduct an independent assessment of lower Yuba River steelhead extinction risk (see Section 5.2.7.2 of the Corps BA on pages 5-183 to 5-203), but concludes that the population is data deficient, as Lindley et al. (2007) also conclude.

FINAL BO STATEMENT (Page 69)

"Although Lindley et al. (2007) did not provide numerical goals for each population of Pacific salmonid to be categorized at low risk for extinction, they did provide various quantitative criteria to evaluate the risk of extinction (Table IV-c). A population must meet all the low-risk thresholds to be considered viable."

COMMENT

By contrast to the statement in the Final BO, Lindley et al. (2007) do not specify that all four criteria must be met in order for a population to be considered "viable." Rather, Lindley et al. (2007) refer to extinction risk, and state *"Populations are classified as "data deficient" when there are not enough data to classify them otherwise. It is possible to classify a population as "high" risk with incomplete data… but a low risk classification must be met with all criteria."*

1.1.1.1 Spring-run Chinook Salmon

The Final BO contains numerous statements concluding "high extinction risk" or "low viability" following a narrative discussion of a specific stressor, or suite of stressors. According to NMFS' own stated impact assessment approach (see above), it is not appropriate to conclude extinction risk level or viability based upon a single stressor or suite of stressors – rather, such assessments should incorporate evaluation of the four VSP parameters for an ESU/DPS, and specifically follow the extinction risk assessment methodology provided by Lindley et al. (2007) for the lower Yuba River populations.

FINAL BO STATEMENT (Page 153)

"*The Yuba River spring-run Chinook salmon population has low productivity and abundance and is at high risk of extinction. The population is limited by complete barriers to migration at Englebright Dam and its related hydropower facilities, impaired passage at Daguerre Point Dam, superimposition with fall-run Chinook salmon, introgression with hatchery stock, lack of suitable habitat for run separation, a deficiency of spawning gravels, high exposure to predation, sub-optimal flow and temperature conditions during critical life-history stages, entrainment and impingement, lack of suitable cover for rearing, unstable food source from fluctuating aquatic macroinvertebrate populations, and low exposure to marine-derived nutrients."*

COMMENT

The above statement serves as an example of the deviation from the stated methodology in the Final BO regarding extinction risk assessment of the lower Yuba River salmonid populations. The extinction risk conclusion apparently is based upon a list of stressors, not upon the extinction risk criteria and analyses specified by Lindley et al. (2007). Moreover, this alliteration of potential stressors contains technical inaccurracies, and inference of adverse effects that are not supported by studies or references, in support of the conclusionary statement of "high extinction risk".

Some examples of conclusionary statements regarding extinction risk not associated or supported with specific applications of the Lindley et al. (2007) extinction risk assessment methodology are provided below.

FINAL BO STATEMENT (Page 157)

"*When measured at the simplest measurable level, the population is not viable because of excessive hatchery introgression. On the Yuba River, the 5 percent tolerance threshold for low extinction risk (Lindley et al. 2007) is far exceeded in most years and puts the population at high risk of extinction."*

COMMENT

This statement in the BO apparently reflects confusion regarding viability versus extinction risk, and what specifically was provided in Lindley et al. (2007).

- The *"5 percent tolerance threshold"* is in reference to an assumption in Lindley et al. (2007, page 3) that "*a 5 percent risk of extinction in 100 years is an acceptably low extinction risk for populations*".
- Lindley et al. (2007) do not specify that there is a *"5 percent tolerance threshold"* that is applied every year, or "most" years. In fact, Lindley et al. (2007) describe that the fraction of naturally spawning fish of hatchery origin is the mean fraction over one to four generations.
- Lindley et al. (2007) state *"Extinction risk levels correspond[ing] to different amount, duration and source of hatchery strays."* Lindley et al. (2007) describe that if hatchery strays are from the same ESU and diversity group, and the hatchery employs "best management practices" (BMP), then a population would be at low extinction risk if hatchery strays contributed up to 15% of the population over one or two generations, 10% over three generations, or 5% over four generations.
- Further, if BMP hatchery strays are from the same ESU and diversity group, then a population would be at moderate extinction risk if hatchery strays contributed up to 50% of the population over one or two generations, 30% over three generations, or 15% over four generations.

Moreover, Lindley et al. (2007, page 6) indicate that extinction risk assessments can result *"in a low risk classification even with moderate amounts of straying from best-practices hatcheries, so long as other risk measures are acceptable."*

By contrast to the BO, the Corps BA evaluated the extinction risk level to the Yuba River spring-run Chinook salmon population associated with hatchery influence pursuant to the criteria established in Lindley et al. (2007) (Corps BA, pages 5-78 through 5-85, and pages 5-128 and 5-129). Over the last seven years, the percentage of adipose fin-clipped fish observed during the spring-run Chinook salmon migration period was 21.4% (and 14.5% excluding 2010, which was a year characterized by unusually high attraction flows in the lower Yuba River relative to the lower Feather River) which, according to NMFS own criteria, represents a moderate (or low) extinction risk.

FINAL BO STATEMENT (Page 201)

Regarding the Yuba River spring-run Chinook salmon population, a statement in the Final BO is *"…The population has low viability and a high risk of extinction (NMFS 2011a).*"

COMMENT

The cited document is NMFS Southwest Region's 2011 5-Year Status Review for the Central Valley Spring-Run Chinook Salmon ESU.

Examination of the document (NMFS 2011a) cited in the Final BO does not confirm the statement that the spring-run population in the lower Yuba River *"has low viability and a high risk of extinction."* In fact, the actual statement in NMFS (2011a) is *"…The Yuba River spring-run Chinook salmon population satisfies the moderate extinction risk criteria for abundance, but likely falls into the high risk category for hatchery influence."*

Further, this statement in the Final BO is speculative regarding the risk category from hatchery influence, and does not utilize available scientific information, particularly that available within the Corps BA. Moreover, the statement is one example where by NMFS does not apply the methods to evaluate extinction risk provided in Lindley et al. (2007).

1.1.1.2 Steelhead

The Final BO does not use available data regarding steelhead abundance that is provided in the Corps BA. Rather, the Final BO uses partial information regarding steelhead abundance and productivity in the lower Yuba River to support conclusions regarding the population's viability and extinction risk.

The Corps BA examines available data in an effort to follow the methodology described in Lindley et al. (2007) to conduct an independent assessment of lower Yuba River steelhead extinction risk (see Section 5.2.7.2 of the Corps BA on pages 5-183 to 5-203), but concludes that the population is data deficient, and extinction risk cannot be quantitatively evaluated.

The Corps BA (pages 5-198 and 5-199) states *"…it is not reasonable to consider data gathered prior to 2010/2011 to be reliable estimates of the annual number of adult steelhead passing* *upstream of Daguerre Point Dam."* The Corps BA further states that *"This suite of improvements to the VAKI Riverwatcher systems at Daguerre Point Dam have resulted in much more reliable estimates of steelhead passing the dam…"* and that *"Continued implementation of the improved VAKI Riverwatcher systems at Daguerre Point Dam is likely to obtain some of the data necessary to allow abundance estimation and productivity evaluation of steelhead in the lower Yuba River. However, presently the lack of multi-year abundance data precludes the provision of quantitative values associated with extinction risk assessment, addressing abundance and productivity, as was done for spring-run Chinook salmon in this BA."*

Lindley et al. (2007) also conclude that steelhead populations are data deficient and preclude quantitative evaluation of extinction risk. Nonetheless, Lindley et al. (2007) further state that qualitative information, including loss of historical habitat and suppression or loss of life history diversity, *"…does suggest that the Central Valley steelhead ESU is at a moderate or high risk of extinction."*

Clarification needs to be provided regarding statements of viability or extinction risk in the Final BO attributed to abundance or productivity trends of lower Yuba River steelhead.

FINAL BO STATEMENT (Page 80)

"*Good et al. (2005) also indicated the decline was continuing as evidenced by new information from Chipps Island trawl data. Central Valley steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates, and the future of Central Valley steelhead is tentative due to limited data concerning their status."*

COMMENT

The information from Chipps Island trawl data referenced in Good et al. (2005) as being "new" is presently over seven years old. Monitoring and data collection efforts regarding Chipps Island trawl data and steelhead in the Central Valley have been ongoing since 2005, yet this information does not appear to have been considered in the Final BO.

FINAL BO STATEMENT (Page 80)

"Lindley et al. (2007) concluded that there is sufficient evidence to suggest that the DPS is at moderate to high risk of extinction."

COMMENT

This citation in the Final BO is not technically correct. Lindley et al. (2007, page 19) state "*For Central Valley steelhead, there are insufficient data to assess the risk of any but a few populations, and therefore, we cannot assess the viability of this ESU* [sic] *using the quantitative approach described in this paper."* However, Lindley et al. (2007) further state that qualitative information, including loss of historical habitat and suppression or loss of life history diversity,

"…does suggest that the Central Valley steelhead ESU is at a moderate or high risk of extinction."

<u>FINAL BO STATEMENTS</u>

- **Page 161** – *"Infrared and videographic sampling on both ladders at Daguerre Point Dam since 2003 has provided estimates O. mykiss numbers migrating up the Yuba River (figure V-b). However, these estimates should be considered as minimum numbers, as periodic problems with the sampling equipment have caused periods when fish ascending the ladders were not counted... It is therefore likely that the true numbers of steelhead passing Daguerre Point Dam are higher than those reported in Figure V-b. It is also important to note that the data collected after February, 2007, has not yet been re-checked for quality and accuracy and should be considered preliminary at this time (CDFG unpublished data)."*
- **Page 162** – *"…the short time period in which this* [Vaki Riverwatcher] *device has been in operation, coupled with the two to four year life cycle of these fish, make it difficult to determine decisive trends in the steelhead population."*

COMMENT

The Final BO relies on unpublished CDFG data from 2003 to 2007, and does not include more recently available data from the VAKI Riverwatcher that extends through 2010, which has been reviewed by the Yuba Accord River Management Team (RMT) and is publicly available on the RMT's website. Further, it is unclear as to why data only to November 2007 is used, when data presented in the Corps BA extends through 2010.

1.1.2 Abundance and Productivity of Yuba River Anadromous Salmonid Populations

Similar to viability and extinction risk, the Final BO contains numerous statements concluding "low abundance" or "low productivity" associated with a narrative discussion of a specific stressor, or suite of stressors. The Final BO (pages 52 and 71) states *"McElhany et al. (2000) suggested a population's natural productivity should be sufficient to <u>maintain its abundance above the viable level (a stable or increasing population growth rate</u>). In the absence of numeric abundance targets, <u>this guideline is used</u>."* However, for lower Yuba River populations of anadromous salmonids, the Final BO does not appear to adhere to its own stated impact assessment approach, and does not evaluate abundance and productivity following the extinction risk assessment methodology provided by Lindley et al. (2007). In addition, the Final BO does not utilize data and analyses provided in the Corps BA that assessed abundance and productivity that followed the extinction risk assessment methodology provided by Lindley et al. (2007).

Examples of conclusionary statements in the Final BO not supported by data analyses are provided below.

1.1.2.1 Spring-run Chinook Salmon

Review of the Final BO found at least 9 conclusionary statements regarding abundance and productivity of spring-run Chinook salmon in the lower Yuba River that were not supported by data analyses.

FINAL BO STATEMENTS

- **Page 153** – *"The Yuba River spring-run Chinook salmon population has low productivity and abundance and is at high risk of extinction."*
- **Page 156** – *"…as the Yuba River spring-run Chinook salmon population continues to decline. The combination of low numbers…"*
- **Page 201** – *"The Yuba River population of the spring-run Chinook has low abundance, low productivity, limited spatial structure, and is a population sink for other populations (NMFS 2011a, Schick and Lindley 2007)."*
- **Page 201** – "*The prevention of access to habitat upstream of Englebright Dam coupled with the downstream impacts of predation, entrainment, lack of cover, lack of forage, and unprotected outmigration temperatures reduces the capacity of the Yuba River to maintain population abundance and productivity*."
- **Page 201** – *"Project effects continue the pattern of low abundance, variable/declining growth rate, insufficient spawning substrate, spatial structure overlaps with fall-run Chinook salmon, hatchery introgression, and lack of habitat diversity."*
- **Page 202** – *"The very poor condition of the Yuba River population, in combination with project effects that continue the patterns causing the population to be at risk of extinction, reduces the likelihood that the Northern Sierra Nevada Diversity Group can become viable."*
- **Page 202** – *"Without any recovery actions to stabilize the Yuba River population and allow it to contribute to the recovery of the species, both the survival and recovery of the species are measurably diminished by the proposed action."*
- **Pages 202 and 203** – *"These environmental consequences also reduce the survival of individuals and ultimately impairs the long-term survival and viability of the local population by continuing to drive low population abundance rates, variable and declining production rates…"*

- **Page 206** – *"The limited amount of spawning habitat on the lower Yuba River, high predation and entrainment, lack of LWM, lack of riparian cover, and depressed foraging conditions prevent the critical habitat from having productivity that would contribute to a viable population."*

COMMENT

The Corps BA (pages 5-105 through 5-121) provides extensive analyses of VAKI Riverwatcher data for the period extending from 2004-2010 and discussion regarding abundance and productivity of spring-run Chinook salmon in the lower Yuba River, following the extinction risk assessment methodology provided by Lindley et al. (2007).

Abundance

According to NMFS, populations with a low risk of extinction are those with a minimum total escapement of 2,500 spawners in 3 consecutive years (mean of 833 fish per year) and populations with a moderate risk of extinction are those with a minimum total escapement of not less than 250 spawners in 3 consecutive years (mean of 83 fish per year) (Lindley et al. 2007).

For the entire (hatchery and non-hatchery) lower Yuba River spring-run Chinook salmon population, the Corps BA (page 5-106) states *"For the past four years, the abundance of in-river spawning spring-run Chinook salmon has steadily increased."* The Corps BA also states *"For the last three consecutive years, an estimated total of 4,130 spring-run Chinook salmon have passed upstream of Daguerre Point Dam, with an average of 1,377 fish per year. As previously described by NMFS (2011a), populations with a low risk of extinction (less than 5% chance of extinction in 100 years) are those with a minimum total escapement of 2,500 spawners in 3 consecutive years (mean of 833 fish per year)."*

For the non-hatchery lower Yuba River spring-run Chinook salmon population, the Corps BA (page 5-112) states *"For the last three consecutive years, an estimated total of 2,080 non-hatchery origin spring-run Chinook salmon have passed upstream of Daguerre Point Dam, with an average of 693 fish per year. As previously described by NMFS (2011a), populations with a low risk of extinction (less than 5% chance of extinction in 100 years) are those with a minimum total escapement of 2,500 spawners in 3 consecutive years (mean of 833 fish per year), and populations with a moderate risk of extinction are those with a minimum total escapement of not less than 250 spawners in 3 consecutive years (mean of 83 fish per year) (Lindley et al. 2007)."*

Productivity

According to Lindley et al. (2007), population growth (or decline) rate is estimated from the slope of the natural logarithm of spawners versus time for the most recent 10 years of spawner count data.

For the entire (hatchery and non-hatchery) lower Yuba River spring-run Chinook salmon population, the Corps BA (page 5-106) states *"The statistical approach recommended by Lindley et al. (2007) was followed to examine whether the abundance of lower Yuba River spring-run*

Chinook salmon exhibited a statistically significant linear trend over time during the seven most recent years for which VAKI Riverwatcher data are available.” … “*Figure 5-10 demonstrates that the abundance of spring-run Chinook salmon in the lower Yuba River has exhibited a very slight increase over the seven years examined. However, the coefficient of determination is very weak (r^2 = 0.01) and the slope is not statistically significantly different from zero (P = 0.878), indicating that the positive trend is not significant… Nonetheless, the relationship indicates that the population over this time period is at least stable, and is not exhibiting a declining trend.”*

For the non-hatchery lower Yuba River spring-run Chinook salmon population, the Corps BA (page 5-113) states *“Figure 5-11 displays the antilogarithmic transformation of the estimated annual number of spring-run Chinook salmon of hatchery and non-hatchery origin passing upstream of Daguerre Point Dam from 2004-2010. Figure 5-11 demonstrates a slightly decreasing trend in the abundance of spring-run Chinook salmon of non-hatchery origin in the lower Yuba River over the 7 years examined. However, the coefficient of determination is very weak (r^2=0.05) and the slope is not statistically significantly different from zero (P=0.634), indicating that the slight decreasing trend is not significant.”*

The Corps BA (page 8-33) states *“The entire suite of information and analyses indicates that spring-run Chinook salmon in the lower Yuba River are a relatively stable population, with a low to moderate risk of extinction under the Environmental Baseline.”*

1.1.2.2 Steelhead

As previously discussed, the Corps BA (page 5-199) examines available lower Yuba River steelhead data and states *“presently the lack of multi-year abundance data precludes the provision of quantitative values associated with extinction risk assessment, addressing abundance and productivity, as was done for spring-run Chinook salmon in this BA.”* Thus, the following statements in the Final BO need to be clarified to indicate the basis for their conclusions.

FINAL BO STATEMENTS

- **Pages 160 and 161** – “*The Yuba River Central Valley steelhead population has low productivity and abundance and is at high risk of extinction*.”
- **Page 203 –**“*Project effects continue the pattern of low abundance, variable/declining growth rate…”*
- **Page 204 –** *“The very poor condition of the Yuba River population, in combination with project effects that continue the patterns causing the population to be at risk of extinction, reduces the likelihood that the Northern Sierra Nevada Diversity Group can become viable.”*

- **Page 207 –** *"Central Valley steelhead productivity is low in critical habitat in the Yuba River downstream to the Sacramento River."*
- **Page 207 –** *"Productivity is so low that global warming and climate change could cause the population to go extinct. The critical habitat from the lower Yuba River to the Feather River confluence with the Sacramento River does not support productivity of the DPS."*
- **Page 208 –** *"The Central Valley steelhead population downstream of Englebright Dam is too low, introgressed, and at risk extinction* [sic] *to support conservation of the DPS."*

1.1.3 Diversity "Stratum"

As previously discussed, according to NMFS' own stated impact assessment approach (see above), the Final BO suggests that the effects assessment incorporates evaluation of the four VSP parameters for an ESU/DPS, and specifically follows the extinction risk assessment methodology provided by Lindley et al. (2007) for the lower Yuba River populations. Therefore, it is difficult to try to interpret the manner in which the concept of "diversity strata" is, or is not, actually applied in the Final BO, and whether that is in conflict with the previously stated effects assessment approach. The following examples of statements in the Final BO reflect this apparent confusion. These and related statements regarding diversity stratum should be clarified.

FINAL BO STATEMENT (Page 38)

"NMFS uses a conceptual model of the species and its critical habitat to evaluate the impact of proposed actions. For this consultation, this conceptual model is structured around the listed spring-run Chinook salmon ESU, Central Valley steelhead DPS, green sturgeon Southern DPS, and critical habitat for these species… The guiding principle behind this conceptual model is that the likelihood of survival and recovery of a species is dependent on the likelihood of survival and recovery of populations which comprise the species (organized by diversity strata comprising the species, ESU, or DPS)…"

COMMENT

Regarding diversity stratum or strata, the Final BO cites the document Williams et al. (2007). Unfortunately, this document was not provided in the Literature Cited Section of the Final BO. A comprehensive search revealed: (1) Williams et al. (2006) NMFS Technical Memorandum titled *"Historical Population Structure of Coho Salmon in the Southern Oregon/Northern California Coasts Evolutionarily Significant Unit"*; (2) Williams et al. (2008) NMFS Technical Memorandum titled *"Framework for Assessing Viability of Threatened Coho Salmon in the Southern Oregon/Northern California Coast Evolutionarily Significant Unit"*; and (3) Williams et al. (2011) titled *"Status Review Update for Pacific Salmon and Steelhead Listed under the Endangered Species Act: Southwest."*

In the most recent document, Williams et al. (2011) define diversity strata as *"…groups of populations that likely exhibit genotypic and phenotypic similarity due to exposure to similar environmental conditions or common evolutionary history (Williams et al. 2006)."*

FINAL BO STATEMENTS

- **Page 52** – *"However, for the purposes of the jeopardy analysis, NMFS also assesses whether the proposed action is expected to reduce the likelihood of an affected diversity stratum contributing to the viability of the species by impacting the ability of one or more of the stratum's member populations to fulfill their intended role in stratum viability."*
- **Page 52** – *"The intended roles of all the populations in the ESU have not yet been defined through a recovery strategy for the species, however… the Northern Sierra Diversity Group of the spring-run Chinook salmon ESU will need at least four viable independent populations for the stratum to be viable."*

COMMENT

First, the foregoing statements in the Final BO apparently assume that diversity groups within the spring-run Chinook salmon ESU are synonymous with "diversity strata." However, given the definition of diversity strata provided by Williams et al. (2011), this assumption may be incorrect. The Final BO (page 37) states *"…both Lindley et al. (2007) and the Draft Recovery Plan were utilized to evaluate whether the proposed action does not "reduce appreciably the likelihood of survival and recovery."* The Draft Recovery Plan (NMFS 2009, pages 28 and 29) states "*…The only known streams that currently support viable populations of spring-run Chinook salmon in the Central Valley are Mill, Deer and Butte creeks (CDFG 1998)… these populations are genetically distinct from other populations classified as spring-run in the Central Valley (e.g., Feather River) (DWR 2004)."* Moreover, the Final BO (page 72) states that the Yuba River spring-run Chinook salmon population is "heavily impacted" by Feather River fish hatchery fish straying into the lower Yuba River. According to the Final BO and its relied upon documents, the Northern Sierra Nevada Diversity Group is not synonymous with diversity stratum, as defined.

Second, the statement that *"the Northern Sierra Diversity Group of the spring-run Chinook salmon ESU will need at least four viable independent populations for the stratum to be viable"* directly conflicts with the statement in the Public Draft Recovery Plan (page 99) that *"…In consideration of the foregoing, the recovery scenarios include the objectives of a minimum of two viable populations of spring-run Chinook salmon within each of the four spring-run Chinook salmon Diversity Groups"* and on page 73 that recovery would require *"…Three populations in the Northern Sierra Diversity Group (because of their geographic proximity, Mill and Deer Creek are considered part of the same meta population at low risk of extinction…"*

The apparent confusion in the Final BO regarding definition or consideration of diversity stratum as distinguished from diversity group, and the associated viability requirements for each structure (diversity stratum or diversity group) should be clarified. Further, in consideration of clarification of diversity stratum and diversity group as used to assess jeopardy, the Final BO should directly address how these clarifications affect the "*likelihood of survival and recovery*".

FINAL BO STATEMENT (Page 53)

"For the spring-run Chinook salmon ESU, steelhead DPS, and green sturgeon Southern DPS to be viable, each stratum must be viable (Williams et al. 2007). Following on the example above, if the effects of the proposed action reduce the likelihood that the Northern Sierra Nevada Diversity Group becomes viable through increases in the risk of extinction of one or more of its member populations, the likelihood that the Central Valley steelhead DPS could be viable is reduced based on the proposed viability criteria. Therefore, reductions in the likelihood of Northern Sierra Nevada Diversity Group achieving viability are also reasonably likely to reduce the likelihood the Central Valley steelhead DPS would achieve viability; which is to say that the likelihood of both the survival and recovery of the species would be appreciably reduced."

COMMENT

The foregoing paragraph includes a conclusionary statement regarding extinction risk which was not assessed using the stated effects assessment approach for Yuba River anadromous salmonid populations, apparent confusion regarding the specific viability criteria and how or if it was applied in the effects assessment, suppositional probability of outcome (*"reasonably likely to reduce the likelihood"*), and a purported logical rationale that the magnitude of viability of Yuba River populations is sufficient to affect the Northern Sierra Nevada Diversity Group which, in turn, is sufficient to affect the entire ESU/DPS to an undefined level in which *"both the survival and recovery of the species would be appreciably reduced."*

1.1.4 Spatial Structure

The Final BO includes numerous statements regarding the constriction of available habitat to anadromous salmonids (and green sturgeon) in the Central Valley today below impassable barriers, relative to historical available habitats. These statements correctly reflect that much of the historical habitat is no longer accessible due to construction of dams, including the Yuba River watershed and Englebright Dam. However, the Final BO does not use information available from the Corps BA regarding characterization of habitat and spatial structure in the lower Yuba River, and the analyses of that spatial structure and its ability to support listed species.

The Corps BA presents spatial structure analyses for the lower Yuba River on pages 5-87, 5-121, 5-122 to 5-124, 5-199, and 5-200. Spatial structure evaluations presented in the Corps BA include examination of maintenance of watershed processes and regulatory management practices to create and maintain suitable habitat for all freshwater lifestages of spring-run and fall-run Chinook salmon, and steelhead/rainbow trout. Spatial structure assessments in the lower Yuba River are based on morphological units, defined as topographic forms within the channel and floodplain that represent distinct form-process associations. The Corps BA describes evaluations to determine whether morphological units are spatially organized or randomly distributed by conducting a longitudinal distribution analysis, an adjacency probability analysis, and a lateral variability analysis. The Corps BA states that the sequence of morphological units in the lower Yuba River is non-random, indicating that the channel has been self-sustaining of sufficient duration to establish an ordered spatial structure. By contrast, highly disturbed systems often degrade into homogeneity or randomness.

In addition, the Final BO includes numerous statements regarding spatial structure that are unsupported by analyses or citation, and/or are confusing in nature and require clarification. Some examples of these types of statements are provided below.

FINAL BO STATEMENT (Page 201)

"The spatial structure of spring-run Chinook salmon spawning is limited to sparsely available of spawning substrate [sic]*, and superimposition pressure is high in some years. The river temperatures during outmigration may be too high in some years to allow for successful smoltification and outmigration. The lack of access to historical spawning habitat is the primary driver for the stressors of superimposition by fall-run Chinook salmon and low abundance relative to FRFH fish."*

COMMENT

First, the contention that spring-run Chinook salmon spawning in the lower Yuba River is limited to *"sparsely available of spawning substrate* [sic]" is technically incorrect, and is not supported by analyses in the Final BO. By contrast, the Corps BA provides thorough discussion regarding spawning gravel and habitat availability in the lower Yuba River and, with the exception of the Englebright Dam Reach where gravel augmentation is continuing, the lower Yuba River contains an abundance of suitable spawning gravel and spawning habitat does not appear to be limited by an inadequate supply of gravel.

Second, the statement that *"superimposition pressure is high in some years"* is not supported by any data analyses or reference demonstrating the rates of superimposition or types of years it might occur.

Third, the unsupported contention that water temperatures may exceed those suitable for smoltification and outmigration of juvenile spring-run Chinook salmon is technically incorrect (see comments below).

Fourth, careful review of the Final BO did not result in identifying any specific analyses relating abundance (annual escapement estimates) of spring-run Chinook salmon in the lower Yuba River to returns to the Feather River Fish Hatchery (FRFH).

<u>FINAL BO STATEMENT</u> <u>(Page 201)</u>

"The Yuba River population of the spring-run Chinook has low abundance, low productivity, <u>limited spatial structure...</u>"

COMMENT

This statement in the Final BO implies that spatial structure is limiting to the lower Yuba River population of spring-run Chinook salmon. However, review of the Final BO does not indicate that analyses were conducted assessing population abundance relative to habitat availability.

<u>FINAL BO STATEMENTS</u>

- **Page 208 –** *"The* [steelhead] *critical habitat from the lower Yuba River to the Feather River confluence with the Sacramento River does not support spatial structure of the DPS."*
- **Page 209 –** *"The* [green sturgeon] *habitat downstream of Daguerre Point Dam is too limited in flow, depth, and substrate to support a population that would support the spatial structure of the DPS."*

COMMENT

The intent or meaning of these statements is unclear.

1.1.5 Natural Flow Regime

The Final BO contains several statements discussing the concept of "natural flow regime." More specifically, the Final BO contains statements indicating that natural flow regime was used in the analysis of the effects of the Proposed Action. However, clarification should be provided how the natural flow regimes concepts were actually used in the analysis in the Final BO. Examples of statements in the Final BO regarding the natural flow regime are provided below.

<u>FINAL BO STATEMENT</u> <u>(Page 48)</u>

"*Throughout the sections of the biological opinion, NMFS uses the concepts of a natural flow regime to guide the analytical approach. The natural flow regime of a river is the characteristic pattern of flow quantity, timing, rate of change of hydrologic conditions, and variability across time scales (hours to years), all without the influence of human activities (Poff et al. 1997).*"

COMMENT

It would be helpful if NMFS could provide additional explanation of how the natural flow regime concepts described in Poff et al. (1997) were applied to the analytical approach used for the BO, including examples of how it was applied to evaluate potential effects of the Proposed Action.

FINAL BO STATEMENT (Pages 48 and 49)

"There are four components of a natural flow regime (NRC 2005): (1) Subsistence flow is the minimum flow needed during critical drought periods to maintain tolerable water-quality conditions and to provide minimal aquatic habitat space for the survival of aquatic species; (2) Base flow is the "normal" flow condition between storms; (3) High-flow pulses are short duration flows following storms; and (4) Overbank flow is an infrequent, high-flow event that breaches riverbanks."

COMMENT

Although this paragraph provides some description of components of the natural flow regime, it is unclear how the effects assessment in the Final BO uses or considers these components.

FINAL BO STATEMENT (Page 100)

"The current suitability of these flow requirements is almost entirely dependent on releases from Shasta Dam. High winter flows associated with the natural hydrograph do not occur within the section of the river utilized by green sturgeon with the frequency and duration that was seen in pre-dam conditions. Continued operations of the project are likely to further attenuate these high flow events. Rearrangement of the river channel and the formation of new pools and holes are unlikely to occur given the management of the river's discharge to prevent flooding downstream of the dam."

COMMENT

First, the Final BO speculates regarding dynamic fluvial geomorphology and habitat creation without conducting or referencing any specific analyses relating flow levels and habitat formations.

Second, and more importantly, it is unclear what is being referred to as "the project" – presumably Central Valley Project (CVP) operations at Shasta Dam. However, an important clarification is that the Proposed Action in this consultation is not *"likely to further attenuate these high flow events"* in the Sacramento River.

2.0 Lower Yuba River Accord

In numerous locations throughout the Final BO, statements were made regarding the inadequacy or unsuitability of flows and water temperatures in the lower Yuba River. Many of these types of conclusionary statements were not supported by analyses, citations or rationale. Some of these statements were technically incorrect, and others were contradicted within the Final BO itself. Of particular concern and in need of clarification is the manner in which implementation of the Yuba Accord, and resultant flows and water temperatures, was mischaracterized and inappropriately implied to result in stressors to listed species. Following are specific examples in the Final BO addressing inappropriate flow and water temperature-related statements.

2.1 Flow and Habitat Conditions

FINAL BO STATEMENTS

- **Pages 136 and 137** – "*…the flows under the Yuba Accord have improve*[d] *habitat in recent years, however, the flows in below average water years can be below the optimal depths for spawning and rearing spring-run Chinook salmon...*"
- **Page 148** – "*Flows are generally below optimal conditions for all life-history stages of salmon…*"
- **Page 202** – "*…juvenile rearing and outmigration conditions on the Yuba River are so poor*."
- **Page 207** – "*…in the Yuba River… Spawning and rearing conditions are so degraded for Central Valley steelhead that there may be cohort failure in some years.*"

COMMENT

These statements were unsupported by any analysis in the Final BO. By contrast, previous evaluations and documents (e.g., Lower Yuba River Accord Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) (YCWA et al. 2007) and the Corps BA) have examined the effects of flow conditions on all of the lifestages of anadromous salmonids in the lower Yuba River. These documents concluded that flow regimes resulting from the implementation of the Yuba Accord were protective of the public trust and aquatic resources of the lower Yuba River, including listed species, for all lifestages over the entire range of water year types and conditions. In fact, of the six flow schedules in the Yuba Accord, flow schedules 1 and 2 represent the upper and lower optimal flow schedules developed by the Yuba Accord Technical Team, and are estimated to occur with a 78% probability.

The Yuba Accord flow schedules were developed by the Lower Yuba River Accord Technical Team, which included NMFS (see pages 6-83 through 6-90 of Corps BA). On December 11, 2006 and on December 5, 2007, NMFS presented policy statements of support before the State Water Resources Control Board (SWRCB) regarding Yuba County Water Agency's (YCWA) petitions for the lower Yuba River Accord. As declared by NMFS in the 2007 Policy Statement:

- "*NMFS was actively engaged in development of the flow schedules, River Management Team provisions and biological studies program that are all key elements of the Yuba Accord package."*
- *"NMFS believes that implementation of the provisions of the Accord's Fisheries Agreement will provide a level of protection for salmonids and green sturgeon in the lower Yuba River that is equal to or greater than the provided under RD-1644. Key elements of the Accord such as implementation of flow schedules and funding of biological studies in the Lower Yuba River are important steps in the recovery of listed anadromous fish which occur the lower Yuba River*."
- *"In addition to the specific benefits of the Yuba Accord to Yuba River fisheries, NMFS believes that the basic concepts underlying the Accord and the cooperative process through which the Accord was developed represent a unique and important breakthrough in the critical interface of fisheries protection and water management in the State of California. We believe that successful implementation of the Yuba Accord could act as a template for future, similar agreements across the state resulting in significant benefits to both the fisheries resources and the water uses of California."*

Additionally, NMFS 2009 Draft Recovery Plan (pages 116 and 140) states: (1) *"In order to secure a viable independent population of spring-run Chinook salmon in the lower Yuba River, several key near-term and the long-term habitat restoration actions have been identified, including the following …Continue implementation of the Yuba Accord flow schedules to provide suitable habitat (flow and water temperature) conditions for all life stages"*; and (2) *"For currently occupied habitats between below Englebright Dam, it is unlikely that habitats can be restored to pre-dam conditions, but many of the processes and conditions that are necessary to support a population of steelhead can be improved with improvements to instream flow regimes, water temperatures, and habitat availability. Continued implementation of the Yuba Accord is expected to address these factors and considerably improve conditions in the lower Yuba River."*

2.2 Water Temperatures

In addition to the foregoing issues regarding flow and habitat conditions associated with implementation of the Yuba Accord, the Final BO includes several statements regarding water temperature effects on listed anadromous salmonids in the lower Yuba River, which merit specific comment.

FINAL BO STATEMENT (Page 147)

"*Due to the Yuba Accord flows, water temperatures during the summer months are generally colder than they would be under the natural hydrograph due to of cold water releases from New*

Bullards Bar Reservoir. While the lower Yuba River does have generally cool water temperatures, they are not consistently suitable for salmonids throughout the year."

COMMENT

Available evaluations and documents (e.g., Yuba Accord Draft EIR/EIS (YCWA et al. 2007), the Corps BA, and the Yuba Accord RMT's Lower Yuba River Water Temperature Objectives Technical Memorandum (RMT 2010)) have examined the effects of water temperature conditions resulting from implementation of the Yuba Accord on all of the lifestages of anadromous salmonids in the lower Yuba River. These documents concluded that water temperature regimes resulting from the implementation of the Yuba Accord were protective of the public trust and aquatic resources of the lower Yuba River, including listed species, for all lifestages over the entire range of water year types and conditions.

In particular, the RMT, comprised of representatives of NMFS, U. S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), California Department of Water Resources (DWR), YCWA, Pacific Gas and Electric Company (PG&E) and Non-governmental Organizations (NGOs) reviewed the appropriateness of the water temperature regime in the lower Yuba River associated with implementation of the Yuba Accord (RMT 2010). They concluded "…*Given the entire suite of considerations in this Technical Memorandum, the RMT concludes that implementation of the Yuba Accord provides a suitable thermal regime for target species* [spring-run Chinook salmon, steelhead, fall-run Chinook salmon, and green sturgeon] *in the lower Yuba River, and does not recommend water temperature-related operational or infrastructure modifications at this time."*

Moreover, the statement that water temperatures "*are not consistently suitable for salmonids throughout the year"* is contradictory to the statement on page 174 of the Final BO "…*During the summer months, temperatures in the lower Yuba River are generally colder than they would be under the natural hydrograph due to cold water releases from New Bullards Bar Reservoir. These colder temperatures provide optimal temperature conditions for spring-run Chinook salmon."*

FINAL BO STATEMENTS

- **Page 152** – *"If increased water deliveries lead to temperatures downstream of Daguerre Point Dam being over 55°F from December through March, both successful outmigration of spring-run Chinook salmon and attraction of green sturgeon for spawning will decline."*
- **Page 189** – *"A major potential thermal stressor in the lower Yuba River would be temperatures over* 55°F *during the spring-run Chinook salmon outmigration period. During normal and above normal water years, this thermal stressor is not likely to be of significant concern; however, the lower Yuba River, downstream of Daguerre Point Dam, does not provide cold enough temperatures in January and February for spring-*

run Chinook salmon smoltification in dry years (C. Mesick, pers. comm.). Some proportion of outmigrating spring-run Chinook salmon exposed to this stressor will die."

COMMENT

Comments on the Draft Biological Opinion on the U.S. Army Corps of Engineers Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir (Draft BO) were provided specifying that these statements were technically incorrect, speculative, and unsupported by any analyses. Not only were the comments on the Draft BO not addressed, the additional statement was made in the Final BO that "*Some proportion of outmigrating spring-run Chinook salmon exposed to this stressor will die."* Clarification should be provided as to why the previously submitted comments were not addressed, and particularly why the additional inflammatory speculation was included in the Final BO.

As previously provided to NMFS as a comment on the Draft BO, these statements were not supported. As thoroughly described in the Corps BA, anadromous salmonid outmigration periods extend over many months of the year. Other than a personal communication, no analyses or documentation were presented to support these conclusionary statements in the Final BO. In fact, results presented in the RMT (2010) document, which included NMFS and was available to NMFS in the preparation of the BO, did indicate that yearling + steelhead smolt emigration and spring-run Chinook salmon smolt emigration occurs during January and February. However, by contrast to the statement in the BO, the RMT (2010) reported that in the examination of water temperature model results over the period of record, including dry and critical years, 55°F would be exceeded with a 0% probability of occurrence from the Smartsville Gage in the upper section of the lower Yuba River all the way down to the Marysville Gage located approximately 5 miles upstream from the confluence of the lower Yuba River and the Feather River. Moreover, RMT (2010) presented actual data monitored since the Yuba Accord has been implemented (October 2006 to May 2010) (Figure 4 in RMT 2010), and that same figure was provided to NMFS as a comment on the Draft BO. That figure demonstrated that water temperatures at all of the three reported monitoring locations in the lower Yuba River (Smartsville, Daguerre Point Dam, Marysville) actually remained at about or below 50°F during January and February.

FINAL BO STATEMENT (Page 190)

"*The winter temperature standard of 63°F under the Yuba Accord is likely to result in reversal of smoltification of spring-run Chinook salmon and could result in a complete cohort-failure..."*

COMMENT

The above statement is incorrect. The Yuba Accord does not include a "winter temperature standard" at all. Further, the above statement does not accurately reflect water temperature evaluations conducted in the Yuba Accord Draft EIR/EIS (YCWA et al. 2007), the Corps 2012 BA, or the Yuba Accord RMT's Lower Yuba River Water Temperature Objectives Technical

Memorandum (RMT 2010). As demonstrated in the previous comment, the RMT (2010) reported that examination of water temperature model results over the period of record, including dry and critical years, 55°F would be exceeded with a 0% probability of occurrence throughout the lower Yuba River, and that since the Yuba Accord has been implemented (2006), water temperatures at any of the three reported monitoring locations in the lower Yuba River actually remained at about or below 50°F during January and February.

Moreover, inflammatory speculation regarding biologic impact (*"complete cohort-failure"*) based upon incorrect assumption or interpretation is particularly inappropriate, and requires clarification.

FINAL BO STATEMENT (Page 190)

"*Any winter temperature standard above 55°F does not contribute to the conservation of spring-run Chinook salmon*."

COMMENT

The above statement is incorrect. The Yuba Accord does not include a "winter temperature standard" at all.

FINAL BO STATEMENT (Page 201)

"High predation, entrainment, and lack of thermal protection for winter outmigrants all reduce the number of spring-run Chinook salmon that leave the river, enter the Delta, and forage in the marine environment."

COMMENT

This statement is not correct, particularly regarding "*lack of thermal protection for winter outmigrants."* See previous comments.

FINAL BO STATEMENT (Page 207)

"Temperatures below Daguerre Point Dam may cause residualization of Central Valley steelhead when outmigration would result in higher survivorship, particularly when Central Valley steelhead trout are exposed to unsuitable temperatures and an unstable prey base."

COMMENT

This statement is speculative and unsupported by any independent analyses or referenced literature or studies.

First, the speculation that "*Temperatures below Daguerre Point Dam may cause residualization of Central Valley steelhead"* is unsupported. In fact, this issue was addressed by RMT (2010), which included NMFS. The following excerpts are taken directly from RMT (2010).

> *"In general, Satterthwaite et al. (2010) do not predict that a warm summer with low food availability will strongly favor anadromy relative to a baseline condition, nor do they predict that a cool summer with high flow will strongly favor residency."*
>
> *"O. mykiss life history evolution is driven by an interacting network of growth rates, freshwater survival, and emigrant survival, along with limits on the asymptotic sizes achievable in freshwater (Satterthwaite et al. 2010). They state that it is difficult and perhaps misleading to try to summarize the effects of any one of multiple variables in isolation on predicted changes in steelhead life history in response to management actions."*

Second, the statement that *"outmigration would result in higher survivorship"* is speculative and unsupported by any independent analyses or referenced literature or studies.

Third, the statement that *"particularly when Central Valley steelhead trout are exposed to unsuitable temperatures,"* presumably in reference to the lower Yuba River, is not supported and, in fact, is technically incorrect as demonstrated in previous comments.

2.3 Yuba Accord and the NMFS Draft Recovery Plan

FINAL BO STATEMENT (Page 5)

"*These* [Yuba Accord] *improvements most certainly have increased protections for federally listed anadromous fish, but the NMFS Draft Recovery Plan recognizes that they may not be substantial enough to restore the viability of Yuba River anadromous fish populations*."

COMMENT

This citation in the Final BO is not technically correct. For clarification purposes, the NMFS Draft Recovery Plan (page 115 and page 140) states – "*For currently occupied habitats between below Englebright Dam, it is unlikely that habitats can be restored to pre-dam conditions, but many of the processes and conditions that are necessary to support a population of spring-run Chinook salmon* [page 115] / *steelhead* [page 140] *can be improved with improvements to instream flow regimes, water temperatures, and habitat availability. Continued implementation of the Yuba Accord is expected to address these factors and considerably improve conditions in the lower Yuba River. Additional habitat improvements and restoration actions are anticipated to be addressed in the forthcoming Yuba County Water Agency FERC relicensing process*."

3.0 Genetic Considerations

Several statements in the Final BO allege that effects of the Proposed Action will produce stressors and exacerbate genetic introgression of spring-run Chinook salmon and steelhead in the lower Yuba River. These statements range from concluding that the consequences would be to impair long-term survival and viability of the Yuba River populations to the *"…Yuba River population of spring-run Chinook salmon is not likely to survive the conditions perpetuated by the proposed action"* (Final BO, page 201). These statements imply that there are genetically distinct lower Yuba River spring-run Chinook salmon and steelhead populations that will be adversely affected by the Proposed Action. Following are some examples of these types of statements in the Final BO.

FINAL BO STATEMENTS

- **Page 201 –** *"Flow conditions in the Yuba River provide greater attraction flow than the Feather River during some years, causing spring-run Chinook salmon from the Feather River to be preferentially attracted into the Yuba River to spawn. This exacerbates baseline hatchery effects and genetic introgression, because it results in an increase in genetic mixing of Feather River wild and hatchery spring-run Chinook salmon with natal Yuba River spring-run Chinook salmon…The Yuba River population of spring-run Chinook salmon is not likely to survive the conditions perpetuated by the proposed action."*
- **Pages 202 and 203** – *"The proposed action is likely to produce stressors that adversely affect the environment of spring-run Chinook salmon* [and steelhead] *by …continued hybridization with fall-run Chinook salmon and FRFH salmon downstream from Englebright Dam… These environmental consequences also reduce the survival of individuals and ultimately impairs the long-term survival and viability of the local population by … impaired spatial and genetic diversity, and continued exposure to hatchery populations. Recognizing that the spring-run Chinook salmon ESU is currently at a moderate to high risk of extinction, any reduction in the viability to the Yuba River population is likely to reduce the viability and increase the extinction risk of the ESU."*

COMMENT

Comprehensive information and discussion regarding issues pertaining to genetic introgression and integrity of lower Yuba River anadromous salmonids, particularly spring-run Chinook salmon, was available to NMFS in the preparation of the Final BO in the Corps BA, and in the two documents submitted to the United States District Court for the Eastern District of California, Sacramento Division, Case 2:06-cv-02845-LKK-JFM titled: (1) *"Technical Memorandum: Lower Yuba River, California, Segregation Weir Considerations"* Exhibit 1 to the August 23, 2011 Declaration of Brian M. Mulvey (Corps 2011); and (2) *"Responses to the*

January 31, 2012 Letter from Environmental Advocates on behalf of the South Yuba River Citizens League to the National Marine Fisheries Service Regarding Comments on the Draft Biological Assessment for the United States Army Corps of Engineers Operations on the Yuba River" (HDR 2012).

As previously provided in these documents, the Corps BA goes to great lengths to describe the genetic considerations associated with Chinook salmon expressing the phenotypic characteristics of spring-run Chinook salmon in the lower Yuba River, as listed below.

- ❑ Pages 5-75 to 5-78 – Feather River Fish Hatchery Genetic Considerations
- ❑ Pages 5-78 to 5-82 – Straying into the Lower Yuba River
- ❑ Pages 5-83 to 5-85 – Lower Yuba River Genetic Considerations
- ❑ Pages 5-105 to 5-111 – Annual Separation of Spring-Run and Fall-Run Chinook Salmon
- ❑ Pages 5-111 to 5-117 – Abundance and Productivity of Spring-run Chinook Salmon Spawners of Natural and Hatchery Origin Upstream of Daguerre Point Dam

A summary of relevant information discussed in the above documents is provided below.

- ❑ A small spring-run Chinook salmon population historically occurred in the lower Yuba River, but the run virtually disappeared by 1959.
- ❑ By 1991, a small spring-run Chinook salmon population became reestablished in the lower Yuba River due to improved habitat conditions and due to recolonization by fish straying from the Feather River, fish previously and infrequently stocked from the FRFH, or possible production from a remnant population in the lower Yuba River.
- ❑ The phenotypic spring-run Chinook salmon in the lower Yuba River actually represents hybridization between spring- and fall-run Chinook salmon in the lower Yuba River, and hybridization with Feather River stocks including the FRFH spring-run Chinook salmon stock.
- ❑ The FRFH spring-run Chinook salmon stock itself represents a hybridization between Feather River fall- and spring-run Chinook salmon populations.

Straying of FRFH "spring-run" Chinook salmon, as well as hybridization between spring-run and fall-run Chinook salmon in the lower Yuba River, have oftentimes been suggested to represent an adverse effect on lower Yuba River "spring-run" Chinook salmon. It is reasonable to assume that these two phenomena would represent an impact if the lower Yuba River stock represented a genetically distinct, independent population. However, given the foregoing available information, spring-run Chinook salmon in the lower Yuba River do not represent a "pure" ancestral genome. Moreover, the continued and ongoing influx of FRFH-origin fish and hybridization between fall-run and spring-run Chinook salmon would represent an adverse effect if the management goal is to establish a genetically distinct, independent population of spring-run Chinook salmon in the lower Yuba River. However, as reported on page 5-85 of the Corps BA, it is questionable whether the phenotypic spring-run Chinook salmon in the lower Yuba River represents an independent population, or should be considered as a meta-population along with lower Feather River stocks. Regardless, it is unlikely, even after multiple generations, that it will be possible to reconstruct an ancestrally "pure" spring-run stock of Chinook salmon in the lower Yuba River.

In addition to the foregoing comment on issues associated with genetic structure of lower Yuba River anadromous salmonid populations that was available to NMFS in preparation of the Final BO, the Final BO also includes several statements regarding genetic issues, which merit specific comment.

FINAL BO STATEMENT (Page 192)

"*Some level of hybridization with hatchery O. mykiss from planted trout at Englebright Reservoir adversely affects spawning conditions of Central Valley steelhead in the lower Yuba River*."

COMMENT

This conclusionary statement is not supported by presentation of data or referenced citation, nor is it clear what is meant by *"adversely affects spawning conditions."*

FINAL BO STATEMENT (Page 203)

"The [steelhead] *population has very high hatchery introgression and is not genetically viable."*

COMMENT

It is unclear what metric or analyses are used in the Final BO to conclude that the lower Yuba River steelhead population is *"not genetically viable."* Clarification should be provided.

FINAL BO STATEMENT (Page 206)

"These environmental consequences also reduce the survival of individuals and ultimately impairs the local [green sturgeon] *population's long-term survival viability by …impaired spatial and genetic diversity, and continued exposure to hatchery populations. Recognizing that the green sturgeon DPS is currently at a moderate to high risk of extinction, any reduction in the viability to the Yuba River population is likely to reduce the viability and increase the extinction risk of the DPS."*

COMMENT

First, it is unclear what *"local population"* of green sturgeon in the lower Yuba River is being referred to in the above statement (see comments provided below).

Second, the Final BO does not provide evidence of *"impaired spatial diversity*," or whether green sturgeon ever historically even utilized habitat located above Daguerre Point Dam.

Third, this conclusionary statement appears to be an editorial mistake, copied from anadromous salmonid discussions, because there are no green sturgeon hatchery populations in the lower Yuba River, let alone the Central Valley.

4.0 Upper Yuba River Watershed Anadromous Salmonid Production, and Comparisons to the Lower Yuba River

To characterize potential habitat availability and production capacity for anadromous salmonids in the Upper Yuba River Watershed, NMFS relied on information and assumptions presented in two documents, including: (1) *"Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment"* (UYRSPST 2007); and (2) *"Modeling Habitat Capacity and Population Productivity for Spring-run Chinook Salmon and Steelhead in the Upper River Watershed"* (Stillwater Sciences 2012). The latter document relies upon output from a model referred to as "RIPPLE." Following are comments pertaining to specific statements in the Final BO regarding aquatic habitat and production capacity in the Upper Yuba River Watershed. **Attachment 1** to this document provides additional comments on the report titled *"Modeling Habitat Capacity and Population Productivity for Spring-run Chinook Salmon and Steelhead in the Upper River Watershed"* and application of the RIPPLE model.

A fundamental concern associated with potential misapplication or misinterpretation of the RIPPLE model results stems from the fact that it does not account for conditions that change over time, which is an inherently important consideration regarding abundance and productivity of anadromous salmonids. In fact, Stillwater Sciences (2012, page ES-2) state "*One of the guiding principles of RIPPLE is the assumption that physical processes and the resulting environment… are <u>essentially time invariant</u> compared with ecosystems and the animal and plant populations supported by these ecosystems."* Clearly, flow and water temperatures are not "*time invarian*t", but change year-to-year based on hydrologic and meteorological conditions. Model output presented in Stillwater Sciences (2012) does not account for abiotic variables that change over time (e.g., flows and water temperatures), does not address resultant variability in salmonid habitat availability and suitability, and consequently does not represent reliable long-term estimates of population production. Applications of model output inferring long-term habitat capacity or population production are, therefore, inappropriate.

Numerous assumptions are embedded in the Stillwater Sciences (2012) report that inject bias and result in higher estimates of habitat carrying capacity and population productivity in the South and Middle Yuba rivers, and in the North Yuba River below New Bullards Bar Dam, relative to the North Yuba River upstream of New Bullards Bar Reservoir.

Examples of these bias-inducing assumptions/approaches include:

- ❑ Relaxed ("expanded") water temperature suitability criteria (standard = 20°C (68°F), "relaxed" = 23.2°C (73.8°F) for the Middle Yuba River and 25.2°C (77.4°F) for the South Yuba River) for steelhead, which significantly increase the amounts of suitable habitat in the South and Middle Yuba rivers, and no relaxed water temperature criteria for the North Yuba River.
- ❑ "Augmented" flow conditions for the South and Middle Yuba rivers, and NBB, which represent speculative increased releases out of upstream storage facilities, to improve habitat conditions (particularly water temperature). By contrast, the North Yuba River above New Bullards Bar Reservoir is unimpaired, and most accurately represents a hydrologically undisturbed watershed, and no "augmented" releases are presented.
- ❑ Anadromous salmonid passage barriers, particularly barriers that block the upstream passage of fish during low-flow conditions, were assumed to either be nonexistent or some unidentified passage facilities provided on the South and Middle Yuba rivers, which vastly increases the estimated amount of habitat available and resultant population production. No such passage barriers exist on the North Yuba River upstream of New Bullards Bar Reservoir.
- ❑ Appropriate spawning gravels are not present in the North Yuba River downstream from New Bullards Bar Dam. In fact, this reach is characterized by very large boulders. However, a "gravel augmentation" assumption was made for this reach under the Alternative Management Scenarios, which transforms completely unsuitable spawning habitat into suitable and usable habitat in the comparison among reaches.

NMFS used the RIPPLE model as the basis for determining potential habitat availability and production capacity in the Upper Yuba River Watershed. In addition to questions regarding the veracity of the RIPPLE model itself and its current application to the Upper Yuba River Watershed, there appear to be several errors in the Final BO associated with incorporating statements from the separate RIPPLE document (Stillwater Sciences 2012).

FINAL BO STATEMENT (Page 160)

"Stillwater Sciences (2012) predicted that the holding capacity of the North Yuba River upstream of New Bullards Bar Reservoir is 17,500 spring-run Chinook salmon."

COMMENT

This statement appears to be factually incorrect. A thorough review of Stillwater Sciences (2012) did not locate reference to the North Yuba River having a spring-run Chinook salmon holding capacity of 17,500 under current conditions, or any other river in the Upper Yuba River Watershed, for that matter. Table 6-5 in Stillwater Sciences (2012, page 44) does provide a holding capacity value of 17,100, but that was for the Middle Yuba River under Alternative Management Scenario 2 (additional 100 cfs from Milton Dam).

The predicted holding capacity for spring-run Chinook salmon in the North Yuba River upstream of New Bullards Bar Reservoir under current conditions that is actually presented in Stillwater Sciences (2012, page 44) is 15,597. Clarification should be provided.

FINAL BO STATEMENT (Page 160)

"…the Middle Yuba River has a predicted holding capacity of 126 (Stillwater Sciences 2012)."

COMMENT

This statement appears to be factually incorrect. According to Table 6-5 in Stillwater Sciences (2012, page 44), the predicted holding capacity for spring-run Chinook salmon in the Middle Yuba River under current conditions is 2,613 – not 126 as presented in the BO. It is unclear how the value of 126 was determined for the Final BO, and clarification should be provided or inaccuracies corrected.

FINAL BO STATEMENT (Pages 164 and 165)

"…Middle Yuba River has a predicted summer capacity of 36,227 (Stillwater Sciences 2012)."

COMMENT

For the Middle Yuba River under current conditions, the predicted summer capacity estimate of 36,227 steelhead was identified using a "relaxed" 23.2°C (73.8°F) water temperature criterion. Application of the standard water temperature criterion of 20°C (68°F) presented in Stillwater Sciences (2012) resulted in a predicted summer capacity estimate of 17,077 steelhead (summer 1+), or a reduction of about 53% compared to the 36,227 value.

FINAL BO STATEMENT (Page 160)

"Although there are currently no spring-run Chinook salmon upstream of Englebright Dam, studies done in 2004, under slightly warmer conditions than today, the thermally suitable habitat for spring-run Chinook salmon was estimated to extend approximately 5.6 miles downstream of the natural barrier at RM 35.4. Within the 5.6 mile reach considered thermally suitable, 15 pools were identified with suitable holding habitat for adult spring-run Chinook salmon. Based on the

size and configuration of the available pools, a minimum of 750 to 1,500 adult spring-run Chinook salmon could hold in the habitat."

COMMENT

First, because no citation was provided, it is unclear what "studies done in 2004" are being referred to in the above statement. Presumably, the studies referred to in the Final BO are described in UYRSPST (2007), but clarification should be provided.

Second, it is unclear what area in the Upper Yuba River Watershed was being referred to in the Final BO statement that *"…a minimum of 750 to 1,500 adult spring-run Chinook salmon could hold in the habitat"*. Also, no reference to "*a minimum of 750 to 1,500"* adult spring-run Chinook salmon could be located in Stillwater Sciences (2012).

FINAL BO STATEMENT (Page 160)

"Holding conditions downstream of Daguerre Point Dam degrade rapidly, due to lack of riparian shading and from water diversions upstream of the Daguerre Point Dam pool."

COMMENT

No analyses were located in the Final BO to support these conclusionary statements. Regarding the abundance and distribution of riparian vegetation, see the attached comments provided by Dr. Pasternack. The lack of substantive effect on pool habitats downstream of Daguerre Point Dam associated with water diversions under the Cumulative Condition was thoroughly discussed in the Corps' BA (see Chapter 8). These two sources provide information and analyses that do not support these statements in the Final BO.

FINAL BO STATEMENT (Page 158)

"Lack of adequate habitat for juvenile rearing is a very high stressor for the Yuba River spring-run Chinook population, although suitable rearing habitat exists in the watershed. There are 46. 8 miles of suitable rearing habitat upstream of Englebright Dam…."

COMMENT

The Final BO does not provide evidence supporting the statement that juvenile spring-run Chinook salmon rearing habitat is "lacking" in the lower Yuba River. The statement then goes on to imply that there is much more suitable habitat available in the upper watershed than in the lower Yuba River. However, no evaluations of juvenile salmonid rearing habitat were undertaken in the Final BO for the lower Yuba River, and no comparative assessments were presented comparing the lower Yuba River and the Upper Yuba River Watershed.

<u>FINAL BO STATEMENT</u> <u>(Page 162)</u>

Regarding steelhead, the Final BO states *"…Stillwater Sciences …found that under current conditions: the South Yuba River could support 3,745 redds; the Middle Yuba River could support 3,284 redds; the North Yuba River could support 16,352 redds..."*

COMMENT

This representation in the Final BO of results in the Stillwater Sciences (2012) report is inaccurate and misleading. In the RIPPLE model, specific water temperature thresholds were used to identify the downstream extent of thermally suitable habitat for steelhead. Later in the document (page 25) Stillwater Sciences established a relaxed or "expanded" water temperature criterion for the Middle Yuba River (23.2°C), and 25.2°C for the South Yuba River, but not for the North Yuba River.

The Final BO statement that the "*South Yuba River could support 3,745 redds"* is referring to the model-predicted number resulting from the relaxed water temperature criteria. The actual estimate for the South Yuba River under current conditions is 393 redds (Stillwater Sciences 2012).

The Final BO statement that the "*Middle Yuba River could support 3,284 redds"* also is referring to the model-predicted number resulting from the relaxed water temperature criteria. The actual estimate for the Middle Yuba River under current conditions is 1,503 redds (Stillwater Sciences 2012).

Even the Final BO statement that the "*North Yuba River could support 16,352 redds"* appears to be incorrect because the actual estimate for the North Yuba River under current conditions is 15,626 redds (Stillwater Sciences 2012).

Not surprisingly, when these much more lenient water temperature criteria are applied to the South and Middle Yuba rivers (25.2°C and 23.2°C, versus 20°C), the estimated carrying capacity was significantly increased.

The utility of using the expanded criteria of 23.2°C on the Middle Yuba River and 25.2°C on the South Yuba River is of questionable value. Using different criteria on different reaches does not present an equitable basis of comparison of thermal suitability among rivers and reaches compared.

<u>FINAL BO STATEMENT</u> <u>(Page 163)</u>

"Lack of adequate habitat for juvenile rearing is a very high stressor for the Yuba River Central Valley steelhead population, although suitable rearing habitat exists in the watershed. There are 143.2 miles of suitable rearing habitat upstream of Englebright Dam..."

COMMENT

Similar to the previous comment regarding juvenile spring-run Chinook salmon rearing habitat, the Final BO does not provide evidence supporting the statement that juvenile steelhead rearing habitat is "lacking" in the lower Yuba River. The statement then goes on to imply that there is much more suitable habitat available in the upper watershed than in the lower Yuba River. However, no evaluations of juvenile salmonid rearing habitat were undertaken in the Final BO for the lower Yuba River, and no comparative assessments were presented comparing the lower Yuba River and the Upper Yuba River Watershed.

FINAL BO STATEMENT (Page 207)

"The very low Central Valley steelhead numbers in critical habitat on the lower Yuba River, compared to the high amount of occupied O. mykiss habitat in the upper Yuba River watershed, demonstrates that the critical habitat in the lower Yuba River contributes very little to Central Valley steelhead DPS abundance."

COMMENT

These conclusionary statements are unsupported by any analyses or citations in the Final BO.

5.0 Green Sturgeon Considerations

FINAL BO STATEMENTS (Pages 55, 58, 81)

COMMENT

In several locations of the Final BO (e.g., pages 55, 58, 81), the statement is made that successful spawning of green sturgeon occurs in the lower Feather River downstream of Oroville Dam, referencing documentation by DWR during spring of 2011. Although stated several times in the NMFS BO, NMFS does not provide a study reference to support the new finding that confirmed green sturgeon successfully spawn in the Feather River.

FINAL BO STATEMENT (Page 100)

"An adequate flow regime (i.e., magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) is necessary for normal behavior, growth, and survival of all life stages in the upper Sacramento River… Sufficient flow is also needed to reduce the incidence of fungal infestations of the eggs, and to flush silt and debris from cobble, gravel, and other substrate surfaces to prevent crevices from being filled in and to maintain surfaces for feeding. Successful migration of adult green sturgeon to and from spawning grounds is also dependent on sufficient water flow."

COMMENT

If the green sturgeon habitat requirements discussion in the Final BO is intended to serve the purpose of establishing a basis for effects assessment, then it would be helpful if some of the vagaries were further defined. For example, it is not clear what constitutes an "adequate" flow regime, "normal behavior," "sufficient flow," and "sufficient water flow" for adult migration. Additional specificity should be provided.

FINAL BO STATEMENT (Page 101)

Due to the temperature management of the releases from Keswick Dam for winter-run Chinook salmon in the upper Sacramento River, water temperatures in the river reaches utilized currently by green sturgeon appear to be suitable for proper egg development and larval and juvenile rearing. Suitable salinity levels range from fresh water (< 3 parts per thousand) for larvae and early juveniles [about 100 days post hatch (dph)] to brackish water (10 parts per thousand) for juveniles prior to their transition to salt water... Salinity levels are suitable for green sturgeon in the Sacramento River and freshwater portions of the Delta for early life history stages. Adequate levels of DO are needed to support oxygen consumption by early life stages (ranging from 61.78 to 76.06 mg O2 hr-1 kg-1 for juveniles, Allen and Cech 2007). Current mainstem DO levels are suitable to support the growth and migration of green sturgeon in the Sacramento River.

COMMENT

The above text is under a heading titled "*d. Freshwater Riverine Water Quality*", but the text is confusing because first water temperature is discussed, then salinity in the Delta is discussed, followed by a discussion of dissolved oxygen levels in the Sacramento River.

Further, it is unclear what analyses were conducted or are relied upon for NMFS' conclusion that water temperatures and dissolved oxygen levels in the Sacramento River and salinity conditions in the Sacramento River and the Delta are "suitable" for green sturgeon. Additional clarification should be provided.

FINAL BO STATEMENT (Page 107)

"…due to dam construction, access to 38 percent of all [steelhead] *spawning habitat has been lost as well as access to 80 percent of the historically available habitat. Green sturgeon populations have been similarly affected by these barriers and alterations to the natural hydrology."*

COMMENT

It is unclear what is meant by *"similarly affected,"* although the statement implies that similar amounts of historically available steelhead and green sturgeon habitat are no longer accessible due to dam construction. However, this statement appears to be in conflict with the previous statement in the Final BO (page 88) *"…While dams block only 9 percent of the species* [green sturgeon] *habitat, it is likely that the blocked areas contain relatively high amounts of spawning habitat due to their upstream location in the river systems."*

FINAL BO STATEMENT (Pages 127 and 128)

"Although no historical accounts exist for identified green sturgeon spawning occuring upstream of the current dam sites [including Daguerre Point Dam and Englebright Dam], *suitable spawning habitat existed and, based on habitat assessments done for Chinook salmon, the geographic extent of spawning has been reduced due to the impassable barriers constructed on the river. The narrows gorge provides optimal spawning conditions and it is likely that good spawning habitat existed in the upper Yuba River upstream of Englebright Dam. Lack of access to this habitat is likely to have depressed the local population of green sturgeon."*

COMMENT

There are several issues associated with this statement.

First, the statement speculating that green sturgeon habitat extended in the Yuba River upstream of Englebright Dam is in direct conflict with the previous statement in the Final BO (page 88) *"…Historically, the green sturgeon southern DPS likely spawned in the Sacramento, Feather, and San Joaquin rivers, judged upon the characteristics of the local habitats (Adams et al. 2007)... The total amount of habitat blocked includes Keswick Dam: 39 km +/- 14 km, Oroville Dam: 16 km +/- 4 km, Daguerre Point Dam: 4 +/- 2 km, and Friant Dam: 12 +/- 2 km."* From this statement, it seems clear that the Final BO acknowledges that historically green sturgeon spawning did not occur upstream of Englebright Dam.

Second, the Final BO does not provide information or cite references identifying what constitutes "optimal" green sturgeon habitat, or what surveys or studies were conducted to assess habitat upstream of Daguerre Point Dam or Englebright Dam in the lower Yuba River.

Third, the phrase *"Lack of access to this habitat* [upstream of Englebright Dam] *is likely to have depressed the local population of green sturgeon"* is speculative and unsupported. In fact, the Final BO (page 143) states *"…The lack of information on green sturgeon utilization of the Yuba River makes it difficult to determine how this* [Daguerre Point Dam] *blockage might affect green sturgeon…"* and on page 126 states *"…historical spawning records do not occur for green sturgeon in the upper Yuba River..."* No documentation is provided in the Final BO to support the suggestion that spawning may have occurred historically in the lower Yuba River, let alone in the areas upstream of Englebright Dam.

FINAL BO STATEMENT (Page 142)

"Green sturgeon occupy the lower Yuba River up to Daguerre Point Dam, and based on observations of green sturgeon at the dam and spawning behavior of adults during the spawning

season, green sturgeon currently use the lower Yuba River for spawning, reproduction, and rearing. Daguerre Point Dam blocks North American green sturgeon from accessing the area between Daguerre Point and Englebright Dams, where deep pools and colder water provide more suitable habitat for spawning and rearing of green sturgeon than the area below the dam."

COMMENT

The Corps provided comment on this identical statement in the Draft BO. The comment was not addressed, and therefore is repeated here.

The Final BO does not provide any analysis to support these statements. As described in the Corps BA (page 5-245), "*…over the many years of sampling and monitoring in the lower Yuba River, only one sighting of an adult green sturgeon was confirmed before 2011… sampling conducted during May 2011 with underwater videography indicates the presence of 4 to 5 adult green sturgeon just downstream of Daguerre Point Dam (Cramer Fish Sciences 2011).*"

In a memorandum dated June 7, 2011, Cramer Fish Sciences reported that roving underwater video surveys ranging from 33 to 109 minutes each were conducted immediately below Daguerre Point Dam on three days during May 2011. Cramer Fish Sciences (2011) state "*On two passes of the video camera, 2 sturgeon appeared to be exhibiting spawning behavior, and were holding in the current (facing upstream) next to one another on the gravel bar. Although no literature exists documenting the spawning behavior of green sturgeon, male sturgeon of a similar species, lake sturgeon Acipensar fulvescens, have been observed to swim alongside female sturgeon, facing against the current in preparation for spawning (Priegal and Wirth 1971).*"

Aside from the fact that Cramer Fish Sciences (2011) themselves admit that no literature is available to document the actual spawning behavior of green sturgeon, the field crew apparently made an assumption that fish were exhibiting "spawning behavior" because they were located in proximity to one another. Anecdotal observations and no documented accounts of spawning or rearing of green sturgeon in the lower Yuba River brings into question the appropriateness of the conclusion that "*green sturgeon currently use the lower Yuba River for spawning, reproduction, and rearing"*.

In addition to the foregoing comment, the above conclusion is contradictory to the statement provided in the Final BO (page 165*) "…The extremely limited information on North American green sturgeon on the lower Yuba River indicates that small numbers of adults occur sporadically below Daguerre Point Dam. Although spawning behavior was observed in 2011, it is not known whether green sturgeon spawning attempts are successful."*

Additionally, no comparative analyses are provided in the Final BO to support the statement that *"…between Daguerre Point and Englebright Dams …deep pools and colder water provide more suitable habitat for spawning and rearing of green sturgeon than the area below the dam…"*.

<u>FINAL BO STATEMENT</u> <u>(Page 148)</u>

"Green sturgeon hold in deep (> 5m), low velocity pools during the summer months (Erickson et al. 2002, Benson et al. 2007). Because the lower Yuba River is smaller than the Sacramento River or other rivers citing a depth criterion of > 5 meters (16.4 feet), use of that criterion may be overly restrictive and not account for local opportunistic habitat utilization by green sturgeon… However, green sturgeon adults prefer deep turbulent waters at the mouths of tributary streams. Monitoring of green sturgeon and behavior data in the Rogue River in Oregon suggests spawning occurs in sites at the base of riffles or rapids, where depths immediately increase from shallow to about 5 to 10 meters, water flow consists of moderate to deep turbulent or eddying water, and the bottom type is made up of cobble to boulder substrates (D. Erickson, ODFW, pers. comm. September 3, 2008 in NMFS 2009b). Currently accessible habitat that meets this description is limited to the Daguerre Point Dam plunge pool."

COMMENT

This statement appears to be somewhat contradictory and logically confining. First, the statement is made acknowledging the potential for green sturgeon local opportunistic habitat utilization in the lower Yuba River, taking into account differences between the lower Yuba River and the Sacramento River, where green sturgeon spawning is known to occur. This statement further implies that the only potentially suitable holding and spawning habitat for green sturgeon in the lower Yuba River is the area *"limited to the Daguerre Point Dam plunge pool."* In actuality, this specific location does not conform to the Rogue River habitat description, because this is not a location characterized as immediately downstream of a rapid or riffle, or the mouth of a tributary stream. Moreover, if the contention is that the description of habitat requirements based on Rogue River observations is necessary for green sturgeon in the lower Yuba River, then the statement further implies that there is no additional suitable habitat in the lower Yuba River downstream of Daguerre Point Dam. However, as stated on pages 5-213 and 5-214 of the Corps BA, green sturgeon critical habitat in the lower Yuba River extends from Daguerre Point Dam downstream to the confluence with the lower Feather River and primary constituent elements (PCEs) *"…present in the lower Yuba River include water flow, water quality, depths, and migratory corridors to support adult, and possibly sub-adult, migration."* By definition, therefore, green sturgeon critical habitat downstream of Daguerre Point Dam in the lower Yuba River *"…include sufficient habitat necessary for each riverine life stage"* (74 FR 52300).

<u>FINAL BO STATEMENT</u> <u>(Page 165)</u>

"The [green sturgeon] *spawning conditions are very poor below Daguerre Point Dam, but spawning behavior was observed during the high flows of 2011."*

COMMENT

First, the conclusionary statement that *"spawning behavior was observed"* is not actually supported, as indicated in foregoing comments.

Second, no analyses or evaluations are presented in the Final BO to support the conclusionary statement that *"The spawning conditions are very poor below Daguerre Point Dam."* In fact, the Final BO (page 148) recognizes the potential for green sturgeon local opportunistic habitat utilization in the lower Yuba River, and the analyses conducted in the Corps BA that identified 26 pool locations *"below Daguerre Point Dam with water depths greater than 10.0 feet deep at the nominal flow of 530 cfs at the Marysville Gage."* The conclusionary statement regarding *"very poor"* spawning conditions appears to be based on the foregoing contentions in the Final BO (page 148) regarding the requirement/preference for deep turbulent or eddying water at the base of riffles or rapids, or at the mouths of tributary streams – conditions which generally do not occur in the lower Yuba River under the Environmental Baseline.

FINAL BO STATEMENT (Page 166)

"A large amount of moderate to high quality spawning habitat exists upstream of Daguerre Point Dam. Daguerre Point Dam blocks access to this habitat and forces green sturgeon to spawn at the Daguerre Point Dam plunge pool."

COMMENT

First, the Final BO does not provide any analyses or citations specifying what constitutes moderate or high quality spawning habitat, or evaluations regarding the quantity of such habitat upstream of Daguerre Point Dam.

Second, the Final BO does not provide support for the conclusionary statement that green sturgeon are forced to spawn at the Daguerre Point Dam plunge pool (see previous comment).

FINAL BO STATEMENT (Page 166)

"Because green sturgeon are long lived, it will take years to determine a trend in the adult population; however, with a the largest observed sub-population of only five fish, and little to no suitable spawning habitat in most years, it is below levels that would be considered viable."

COMMENT

The Final BO does not provide analyses or documentation supporting the statement that the lower Yuba River provides *little to no suitable spawning habitat in most years."*

<u>FINAL BO STATEMENT (Page 194)</u>

"The Yuba River downstream of Daguerre Point Dam does not provide sufficient water flow rates for green sturgeon spawning and rearing under most water-year types. Water diverted out of the river and watershed is the primary reason for the insufficient flows. Only very wet years are likely to provide sufficient flows for spawning and rearing."

COMMENT

No analyses of evaluations are presented in the Final BO to support the conclusionary statement that flows are not sufficient for green sturgeon spawning and rearing under most water year types. It is particularly unclear what evaluation was conducted to support the conclusionary statement that *"Only very wet years are likely to provide sufficient flows for spawning and rearing."* Moreover, the Final BO does not utilize analyses of the areal extent and depth of pools conducted in the Corps BA (pages 8-80 to 8-90) evaluating green sturgeon habitat availability over range of water year types.

<u>FINAL BO STATEMENT (Page 205)</u>

"The Yuba River may be a population sink for the only population in the DPS. The combined impacts of the project and environmental baseline increase the risk of extinction of the DPS."

COMMENT

The negative implication that the lower Yuba River is a "population sink" for green sturgeon in the above text is unsupported by any technical analyses and in fact, is contradictory to other literature authored by NMFS on the Southern DPS of North American green sturgeon. For example, NMFS' Final Biological Report on the Designation of Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon (NMFS 2009a, page 50) states "*…although the Yuba River is part of the Sacramento River drainage basin, it is separated spatially from the current, single spawning population on the Sacramento River such that if a catastrophic mortality event were to occur in the Sacramento River, a Yuba River population could safeguard the species from extinction…".*

Also, page 206 of the Final BO states *"Recovery planning for green sturgeon recognizes that expanding the current range of spawning and reproduction to areas beyond the Sacramento River will be necessary to recover the species"*. This statement seems to be contradictory to the statement on page 205 of the Final BO.

<u>FINAL BO STATEMENTS</u>

- **Page 209** – "*The spawning, rearing, and foraging conditions in the Yuba River are too poor and degraded to support productivity of the* [green sturgeon] *DPS*."

- **Page 209 –** *"The poor condition of critical habitat on the Yuba River, combined with the very low green sturgeon population numbers indicates that this population is experiencing depensation and may be a population sink."*

COMMENT

As illustrated by the foregoing examples, the Final BO includes unsupported, conclusionary statements regarding the quality of aquatic habitat conditions in the lower Yuba River that may be used by green sturgeon, and resultant effects on the productivity of green sturgeon.

The Final BO does not indicate what analyses was conducted by NMFS that serves as the basis for these conclusions regarding flow and water temperature effects to green sturgeon, as well as the implication that the population is experiencing depensation and may be a population sink.

Additionally, the impact assessment presented in the Yuba Accord Draft EIR/EIS evaluated potential flow and water temperature effects on green sturgeon. The Yuba Accord Draft EIR/EIS is listed as a reference on page 298 of the Final BO. Clarification should be provided by referring to the analyses conducted for green sturgeon in the Yuba Accord Draft EIR/EIS and Chapter 8 of the Corps BA.

FINAL BO STATEMENT (Pages 214 and 215)

"*Poor fish passage at Daguerre Point Dam is another stressor, through delay of spring-run Chinook and steelhead, blockage of green sturgeon, and likely increased predation for downstream migrating juveniles. The continued operation of Englebright Dam has resulted in decreased productivity of spawning and rearing through interruption of ecosystem processes."*

COMMENT

Statements such as these are contradictory to other sections of the Final BO, as shown in the following example located on page 143 of the Final BO.

> "*The lack of information on green sturgeon utilization of the Yuba River makes it difficult to determine how this blockage might affect green sturgeon abundance, productivity, spatial structure and genetic diversity, but there is the potential that all of these viability factors could be improved if green sturgeon had access to the areas upstream of Daguerre Point Dam."*

FINAL BO STATEMENT (Page 243)

"*It is likely that Yuba River historically provided optimal spawning habitat for green sturgeon in areas both upstream of the dams and where reservoirs are today.*"

COMMENT

See previous comments regarding the lack of information regarding historical distribution and habitat utilization of green sturgeon in the lower Yuba River.

6.0 Effects of the Proposed Action on Listed Species and Critical Habitat

Many of the following comments are prepared in response to statements in the Final BO that attribute ongoing effects of the existence of Englebright Dam to the Proposed Action. This approach in the Final BO is contradictory to that which was described in the Corps BA.

FINAL BO STATEMENT (Page 166)

"*The purpose of the project is to maintain and perpetuate the existence of the Daguerre Point Dam with impaired fish passage (and no passage for green sturgeon) and Englebright Dam without fish passage. These dams are the primary drivers of baseline conditions that have resulted in the Yuba River populations of spring-run Chinook salmon, Central valley steelhead, and green sturgeon to be in the condition they are in today. Migration blockage and impairment, little to no access to refugia, high predation, extraordinarily poor conditions for reproduction, and a depauperate food web are all mortality factors resulting in low viability and high risk of local extinction of these species.*"

COMMENT

These statements concluding "*low viability and high risk of local extinction of these species*", presented as the conclusive statement of the effects analysis of the Proposed Action, are illustrative examples of the deviation from the stated methodology in the Final BO regarding viability and extinction risk assessment of the lower Yuba River populations.

According to NMFS' own stated effects assessment approach, viability and extinction risk assessment should not be based upon recitation of a suite of stressors. Rather, such assessments should incorporate evaluation of the four VSP parameters for an ESU/DPS, and specifically follow the extinction risk assessment methodology provided by Lindley et al. (2007) for the lower Yuba River populations.

Moreover, the assertions of "effect" in these statements are not supported in the Final BO by data analyses, and inappropriately conclude adverse conditions without supporting analyses or documentation. For example, the Final BO:

- Does not present conclusive evidence regarding predation rates.

- ❑ By contrast to the statement in the Final BO "*extraordinarily poor conditions for reproduction*", the Yuba Accord EIR/EIS, the Corps BA and other previously referenced documentation demonstrate that not only is there an abundance of spawning habitat for anadromous salmonids in the lower Yuba River, there also are numerous pools downstream of Daguerre Point Dam which could serve as green sturgeon spawning habitat.
- ❑ The statement "*little to no access to refugia*" is unclear. If the statement is in reference to coldwater refugia, then it has been clearly demonstrated in this document, and technically documented in the Yuba Accord EIR/EIS, RMT (2010) Water Temperature Objectives Memorandum, and the Corps BA, that water temperatures in the lower Yuba River are suitable for all lifestages of anadromous salmonids and green sturgeon. If the statement is in reference to predator escape refugia, then the Final BO did not present credible studies or analyses supporting the statement. By contrast, this statement is refuted by recent technical evaluations of the lower Yuba River (see Dr. Pasternack's comments on the Final BO).
- ❑ The statement regarding "*a depauperate food web*" is not supported in the Final BO. [NOTE: The Draft BO contained reference to a single anectdotal observation reporting a suspected macroinvertebrate mortality event. Comments on the Draft BO were provided to NMFS regarding the lack of substantiation, and that discussion appears to have been removed for the Final BO. However, the Final BO still includes several references (e.g., pages 175, 183, 184, 189, 205) alluding to a macroinvertebrate "die-off" occurring in the lower Yuba River, which should be removed and related conclusions revised appropriately.]

FINAL BO STATEMENT (Pages 167 and 168)

"Life stage-specific responses to specific stressors related to the proposed action are summarized in the last two columns of Tables VI-a, VI-b, and VI-c…"

COMMENT

Review of the Final BO demonstrates that not only does the Final BO not contain Tables VI-a, VI-b and VI-c, but no other tables in the Final BO provide the information referred to in this statement. Clarification and/or editorial revision is necessary.

6.1 Spring-Run Chinook Salmon

Previously presented comments on the Final BO that addressed technical issues that also arise in Chapter 5 of the Final BO – "Effects of the Action on Listed Species" are not repeated in this section of the technical review. Comments on statements in the Final BO regarding spring-run Chinook salmon that are unique to this chapter are presented below. Also, statements in Chapter

5 of the Final BO that address spring-run Chinook salmon and other species (e.g., steelhead and green sturgeon) are addressed below.

6.1.1 Lifestage-specific Effects of the Action

6.1.1.1 Adult Immigration and Holding

FINAL BO STATEMENT (Page 168)

"The purpose of the proposed action is to maintain Englebright Dam, and the proposed action does not provide access to suitable, historical habitat upstream of the dam that is important for the survival of the Yuba River populations of spring-run Chinook salmon and Central Valley steelhead."

COMMENT

This statement regarding the purpose of the Proposed Action is incomplete. As stated in the Corps BA (pages 3-1 and 3-3), the Proposed Action includes the Corps' continued operation and maintenance of Englebright and Daguerre Point dams on the lower Yuba River, and recreational facilities on and around Englebright Reservoir. Operations also include the issuance and administration of new and existing permits, licenses and easements. The Corps' responsibilities associated with ongoing maintenance of Englebright Dam infrastructure pertain to dam maintenance, safety and security. As presented in the Corps BA, the existence and ongoing effects of Englebright Dam are part of the Environmental Baseline, and are not attributable to the Proposed Action. Therefore, passage of anadromous salmonids above Englebright Dam was not proposed in the Corps BA as part of the Proposed Action.

FINAL BO STATEMENT (Page 168)

"*Migration barriers and false attraction flows constitute a very high risk to ability* [sic] *of spring-run Chinook salmon, Central Valley steelhead, and green sturgeon populations to survive in the Yuba River."*

COMMENT

First, the statement that migration barriers (presumably Englebright Dam, which is the only complete barrier to anadromous salmonid passage) constitute a very high risk to the survival of anadromous salmonids in the lower Yuba River is an over-statement. The lower Yuba River continues to support persistent populations of anadromous salmonids, although Englebright Dam has been in place since 1941.

Second, the statement in the Final BO regarding green sturgeon is unsupported and contradictory to statements elsewhere in the Final BO. The Final BO (page 143) states "*…The lack of* *information on green sturgeon utilization of the Yuba River makes it difficult to determine how this* [Daguerre Point Dam] *blockage might affect green sturgeon…"*. Further, the Final BO does not present any analysis or referenced citations regarding attraction flows and the relative distribution of green sturgeon among the lower Yuba River and lower Feather River.

FINAL BO STATEMENT (Page 169)

"The purpose and effect of the proposed action is to maintain Daguerre Point Dam into the future, and the proposed action will only partial remediate effects of the dam. Daguerre Point Dam presents stressors from the proposed action and from the continuation of baseline conditions."

COMMENT

This statement in the Final BO appropriately acknowledges that Daguerre Point Dam presents stressors from the continuation of baseline conditons. The Corps operations and maintenance activities at Daguerre Point Dam, as described in the Corps BA, are intended to alleviate stressors associated with Daguerre Point Dam. However, the effects assessment in the Final BO does not clearly separate effects of the Proposed Action from the ongoing effects of the Environmental Baseline.

FINAL BO STATEMENT (Page 169)

"Migration blockage and impairment during high and low flows, fish ladder operations that cannot overcome design deficiencies, inconsistent fish ladder maintenance, fall-back over the dam after exiting the fish ladder, dam design that leads to spring-run Chinook and Central Valley steelhead jumping into the dam apron all contribute to reduced individual survivorship and fitness of spring-run Chinook salmon and Central Valley steelhead. Flashboard placement, new ladder gate operations, and improved maintenance reduces the structural stressors from the dam, but inconsistent maintenance, directly and indirectly affects individual survival and fitness of spring-run Chinook salmon and Central Valley steelhead."

COMMENT

This statement in the Final BO acknowledges that inconsistent maintenance at Daguerre Point Dam could affect individual survival and fitness of spring-run Chinook salmon and Central Valley steelhead. As stated in the Corps BA, implementation of the protective measures included in the Proposed Action as components of the Daguerre Point Dam Flashboard Management Plan, the Fish Ladder Debris Monitoring and Operations Plan, and the Daguerre Point Dam Sediment Management Plan, in conjunction with minor modification of the fish passage facilities (e.g., fish ladder bay grate installation) improve the individual survival and fitness of spring-run Chinook salmon and steelhead in the lower Yuba River, relative to the Environmental Baseline.

<u>FINAL BO STATEMENT</u> <u>(Page 171)</u>

"The proposed action does not include a firm commitment to inspect the channel after a "high flow event."

COMMENT

This statement does not appear to be technically correct. The Proposed Action in the Corps BA (page 3-24) included a Fish Ladder Debris Monitoring and Operations Plan. That plan incorporated Interim Measure Nos. 3 and 4 in the Interim Remedy Order issued by the Court on July 25, 2011 that stated that the Corps is to conduct weekly manual inspections of the ladders for surface and subsurface debris during routine flows during the interim period until a new biological opinion is prepared by NMFS. During flows of 4,200 cfs or greater, the Corps is to conduct daily manual inspections. Upon discovering debris in the ladders, the Corps is required to remove it within twelve hours, even if the Corps determines that flow levels are adequate for fish passage. If conditions do not allow for safe immediate removal of the debris, the Corps must remove the debris within twelve hours after flows have returned to safe levels. The Proposed Action also stated that through coordination with CDFG and NMFS, the Corps will develop a protocol for clearing accumulated debris and blockages in the fish ladders at Daguerre Point Dam.

<u>FINAL BO STATEMENT</u> <u>(Page 171)</u>

"Impaired passage from inadequate or inconsistent fish ladder operations and management will force migrating spring-run Chinook salmon to spawn in sub-optimal habitat downstream of Daguerre Point Dam. This is likely to result in reproductive failure of spawning pairs through increased competition for spawning sites and increased superimposition with fall-run Chinook salmon…"

COMMENT

There are several issues associated with these statements.

First, spring-run Chinook salmon will not be "forced" to spawn downstream of Daguerre Point Dam. The Final BO (page 169 and 170) states that the Corps has not consistently maintained the fish ladders at Dagurre Point Dam. However, this baseline condition has not resulted in a lack of spawning upstream of Daguerre Point Dam. As stated in the Corps BA (pages 5-16 and 5-17) "*…the earliest spawning (presumed to be spring-run Chinook salmon) generally occurs in the upper reaches of the highest quality spawning habitat (i.e., below the Narrows pool) and progressively moves downstream throughout the fall-run Chinook salmon spawning season (NMFS 2007). Spring-run Chinook salmon spawning in the lower Yuba River is believed to occur upstream of Daguerre Point Dam. USFWS (2007) collected data from 168 Chinook salmon redds in the lower Yuba River on September 16-17, 2002 and September 23-26, 2002, considered to be spring-run Chinook salmon redds. The redds were all located above Daguerre*

Point Dam. During the pilot redd survey conducted from the fall of 2008 through spring of 2009, the Yuba Accord RMT (2010a) report that the vast majority (96%) of fresh Chinook salmon redds constructed by the first week of October 2008, potentially representing spring-run Chinook salmon, were observed upstream of Daguerre Point Dam."

The Corps BA (page 8-19) also states "*…during the extensive pilot redd survey conducted during 2008-2009 (RMT 2010a), 33% of all Chinook salmon redds were observed by the first week of October, compared with 37% of all Chinook salmon redds observed by the first week of October during the redd surveys conducted in 2009-2010 (Campos and Massa 2010). Moreover, 74% of all Chinook salmon redds were observed upstream of Daguerre Point Dam during the extensive pilot redd survey conducted during 2008-2009, and the same exact percentage (74%) of all Chinook salmon redds were observed upstream of Daguerre Point Dam during the redd surveys conducted in 2009-2010. The similar distribution in timing and the same percentage distribution of Chinook salmon redds located upstream of Daguerre Point Dam occurred despite considerable differences in flow (monthly average cfs) that occurred from late spring into fall of 2008 compared to flow during 2009."*

Second, the contention that spawning habitat downstream of Daguerre Point Dam is "sub-optimal" is not supported by any analyses or referenced citations in the Final BO. To the contrary, the Corps BA, the Yuba Accord EIR/EIS, and RMT studies have demonstrated the suitability of spawning habitat downstream of Daguerre Point Dam.

Third, the speculation of reproductive failure "*…through increased competition for spawning sites and increased superimposition with fall-run Chinook salmon…"* is not supported by any analyses or referenced citations in the Final BO.

FINAL BO STATEMENT (Page 172)

"Lack of free passage at the Daguerre Point Dam fish ladders leads to injury, delayed migration, and/or pre-spawning mortality. Delays resulting from adult spring-run Chinook salmon adult passage impediments are likely to weaken fish by requiring additional use of fat stores prior to spawning, and could potentially result in reduced spawning success (i.e., production) from reduced resistance to disease, increased pre-spawning mortality, and reduced egg viability."

COMMENT

These statements in the Final BO concluding biological effects associated with fish passage issues at Daguerre Point Dam are not supported by studies or literature referenced in the BO, and do not consider information and analyses presented in the Corps BA describing and evaluating potential effects of Daguerre Point Dam and fish passage issues. The Corps BA (pages 6-48 to 6-51, and 8-19 to 8-21) provides a thorough discussion of the potential biological effects on anadromous salmonids associated with fish passage issues at Daguerre Point Dam. As an example, an excerpt is provided below.

The Corps BA (pages 8-20 and 8-21) states "*Adult prespawning acute or latent mortality also could occur due to exposure to elevated water temperatures, which could also affect egg viability. The RMT (2010b) included evaluation of water temperatures at Daguerre Point Dam during the spring-run Chinook salmon adult upstream immigration and holding lifestage, which addressed considerations regarding both water temperature effects to pre-spawning adults and egg viability. They concluded that during this lifestage, characterized as extending from April through August, water temperatures at Daguerre Point Dam are suitable and remain below the lowest water temperature index value of 60°F at least 97% of the time over all water year types during these months. Thus, it is unlikely that this represents a significant source of mortality to spring-run Chinook salmon.*"

Moreover, a figure depicting actual data monitored since the Yuba Accord has been implemented (October 2006 to May 2010) was provided to NMFS as a comment on the Draft BO. That figure demonstrated that water temperatures at Daguerre Point Dam actually remained at about or below 60°F during the April through August period each of the three years.

FINAL BO STATEMENT (Page 191)

"…the Narrows I and Narrows II powerhouses provide false attraction flows that disrupt Yuba River spring-run Chinook salmon and Central Valley steelhead migration..."

COMMENT

First, this statement in the Final BO is based upon reported observations of Chinook salmon congregated near the Narrows II outlet. The Final BO does not provide evidence that "false attraction flows" lure adult spring-run Chinook salmon into the powerhouse outlet, nor does the Final BO address the frequency of occurrence of such a phenomenon. Moreover, Narrows II is designed to operate at up to 3,400 cfs, a flow rate associated with high velocity discharges that likely exceed suitable holding conditions for adult Chinook salmon.

Second, it is unclear what is meant by "*disrupt Yuba River spring-run Chinook salmon and Central Valley steelhead migration*" because the lower Yuba River only extends an additional 0.1 miles upstream of Narrows II to Englebright Dam, and that area does not provide suitable spawning habitat.

FINAL BO STATEMENT (Page 202)

"*The attraction flows presented by the Yuba River attract spring-run Chinook salmon from the Feather River.*"

COMMENT

This is a misleading statement, and does not reflect the extensive analyses presented in the Corps BA. The Corps BA (pages 5-79 to 5-82) thoroughly discusses the manner in which the available data extending from 2004 through 2010 were included in a regression analysis, which analyzed the relationship between the differences in weekly flows in the lower Yuba River and the lower Feather River, and the proportion of hatchery strays passing Daguerre Point Dam. The Corps BA found that the rate of straying of adipose fin-clipped spring-run Chinook salmon into the lower Yuba River (indicated by fish passing Daguerre Point Dam) during the spring-run adult Chinook salmon upstream migration period can be accounted for by the rate of lower Yuba River flow relative to the rate of lower Feather River flow. In other words, the rate of straying of adipose fin-clipped spring-run Chinook salmon into the lower Yuba River during the spring-run adult Chinook salmon upstream migration period may be associated with relatively high rates of flow in the lower Yuba River, or relatively low rates of flow in the lower Feather River.

FINAL BO STATEMENT (Page 175)

"The location and configuration of the Daguerre Point Dam fish ladders attract poachers. The existing design and configuration of the fish ladders also affects the holding behavior of migrating fish, exposing them to higher rates of poaching. The lower bays on the fish ladders at Daguerre Point Dam have not been covered, per recommendations from CDFG to reduce debris in the ladders during high flows; therefore, some level of poaching is likely to continue to occur. The biological assessment documented the ladder modifications in 2011, which are likely to have reduced this stressor. Poaching is likely to result in death to both Spring-run Chinook salmon..."

COMMENT

These statements are speculative and unsupported by information provided in the Final BO.

6.1.1.2 Spawning and Embryo Incubation

FINAL BO STATEMENT (Page 169)

"*Time spent by spring-run Chinook salmon and Central Valley steelhead attempting to enter project works will delay spawning. Delayed spawning is likely to force spring-run Chinook salmon and Central Valley steelhead to either spawn in suboptimal habitat near Englebright Dam, return downstream where they are not likely to find optimal spawning habitat or suitable mates, or remain in place and fail to spawn. Delayed spawning results in harm to individual spring-run Chinook salmon and Central Valley steelhead and a loss of genetic contribution to the populations. The Narrows I Powerhouse is a chronic, low-level stressor to Yuba River spring-run Chinook salmon and is likely to reduce the reproductive fitness of individual adult salmon that spend time attempting to migrate upstream through the project works. The Narrows II Project has greater attraction flow than the Narrows I Project; therefore, this is a chronic, medium-level stressor to Yuba River spring-run Chinook salmon that is likely to reduce the reproductive fitness of individual adult salmon that spend time attempting to migrate upstream through the project works."*

COMMENT

See previous comment.

FINAL BO STATEMENT (Page 176)

"The proposed action will continue to block spring-run Chinook salmon from access to 46.8 miles of suitable spawning habitat upstream of Englebright Dam …based on habitat availability modeled by Stillwater Sciences (2012)."

COMMENT

This statement in the Final BO is misleading. The quoted number of miles (46.8) of "suitable" spawning habitat is not correct. Spawning habitat consists of discrete patches of suitable substrate for spawning, and is not presented in terms of linear distance (miles). Review of Stillwater Sciences (2012) did report linear distances of entire sub-basins that would be thermally suitable for spawning, irrespective of substrate suitability. Review of Stillwater Sciences (2012) was unable to verify that even 46.8 miles of thermally suitable spring-run Chinook salmon spawning habitat is available upstream of Englebright Dam. Clarification, or correction, should be provided.

FINAL BO STATEMENT (Page 177)

"Lack of adequate spawning substrate presents a high risk to salmonids. The proposed action will continue to result in chronic spawning gravel deficiencies downstream from Englebright Dam."

COMMENT

The statement in the Final BO of "*lack of adequate spawning substrate*" and "*chronic spawning gravel deficiencies*" in the lower Yuba River are technically incorrect, and are not supported by analyses in the Final BO. By contrast, the Corps BA provides thorough discussion regarding spawning gravel and habitat availability in the lower Yuba River and, with the exception of the Englebright Dam Reach where gravel augmentation is continuing, the lower Yuba River contains an abundance of suitable spawning gravel and spawning habitat does not appear to be limited by an inadequate supply of gravel. Furthermore, see the attached comments by Dr. Pasternack.

FINAL BO STATEMENT (Page 179)

"The proposed action will ensure the impaired fish passage conditions that will perpetuate the baseline conditions that prevent and impair successful egg incubation and fry emergence of spring-run Chinook salmon and Central Valley steelhead."

COMMENT

It is unclear what baseline conditions are being refer to that allegedly "*prevent and impair successful egg incubation and fry emergence of spring-run Chinook salmon and Central Valley steelhead*". No explanation is provided in the Final BO. By contrast, this statement in the Final BO does not consider analyses and information presented in the Yuba Accord EIR/EIS, the Corps BA and the RMT (2010) documents that demonstrate the suitability of water temperatures for spawning and embryo incubation, including locations downstream of Daguerre Point Dam.

FINAL BO STATEMENT (Page 179)

"During low-flow years, spring-run Chinook salmon eggs downstream of Daguerre Point Dam are likely to be exposed to sub-optimal temperatures and increased disease rates."

COMMENT

This statement in the Final BO is technically incorrect, and does not consider analyses and information presented in the Yuba Accord EIR/EIS, the Corps BA and the RMT (2010) documents that demonstrate the suitability of water temperatures for spawning and embryo incubation, including locations downstream of Daguerre Point Dam.

FINAL BO STATEMENT (Page 180)

"Motorized land vehicles on spawning beds can have a deleterious effect on successful reproduction. BLM has seasonal closures to the affected areas where off-road vehicles enter the water; however, recreation and trespass on public lands can be difficult to control. Loss of spawning beds continues to be a threat to spring-run Chinook salmon and Central Valley steelhead adjacent to the Yuba Gold Fields."

COMMENT

The Final BO does not present any analyses or the results of surveys to estimate the magnitude of this potential stressor. Moreover, it is unclear how recreational vehicular activity on public lands is the result of the Proposed Action.

FINAL BO STATEMENT (Page 180)

"Stocking of hatchery trout is expected to have adverse effects on spring-run Chinook salmon through exposure to disease. …Even though listed salmonids are not currently found in Englebright Reservoir, flows from the reservoir to the river could expose the downstream spring-run Chinook salmon and Central Valley steelhead to disease, resulting in injury or death to eggs, larvae, and juvenile fish."

COMMENT

The Final BO does not present any analyses or the results of surveys to estimate the magnitude of this potential stressor. Moreover, it is unclear how stocking of hatchery trout in Englebright Reservoir is the result of the Proposed Action.

6.1.1.3 Juvenile Rearing

FINAL BO STATEMENTS

- **Page 184 –***"Recreational activities could introduce non-native species into the Yuba River. Recent threats in California are Quagga and zebra mussels, and New Zealand mud snails (CDFG 2008, CDFG 2011). If these non-native species become established in the Yuba River watershed, they would reduce the invertebrate prey of spring-run Chinook salmon... There is a moderate risk of mussels and mud snails entering the watershed, but a high risk to the fitness and reproductive capacity of spring-run Chinook salmon …if these organisms also enter the Yuba River watershed."*
- **Page 193 –** *"Lack of inspections of boats at Englebright Reservoir and no gear inspections at river accesses increases the threat of non-native invertebrates entering critical habitat on the lower Yuba River. Establishment New Zealand snails or quagga or zebra mussels could have catastrophic effects on the ability of the critical habitat to conserve spring-run Chinook salmon and Central Valley steelhead."*

COMMENT

The Final BO appropriately provides cautionary statements regarding the adverse effects associated with the introduction of non-native species. However, Table XI-a in the Final BO lists the key species stressors and associated short- and long-term actions in the RPA, and does not include introduction of non-native species at Englebright Reservoir.

6.1.1.4 Outmigration

FINAL BO STATEMENT (Pages 184 and 185)

"Outmigration mortality is estimated to be 55 percent of the annual outmigration of both the spring-run Chinook salmon and Central Valley steelhead at Daguerre Point Dam and the conjunctive use water diversions, based upon mortality calculations done on the RBDD (USFWS 1988)."

COMMENT

This statement in the Final BO is misleading and not supported by logical rationale. A thorough description of the inadequacy of this statement is presented in the comments later in this document in Section 8.6 – RPA Action No. 6, Predation and Predator Control Program.

FINAL BO STATEMENT (Pages 185 to 188)

Statements in the Final BO regarding the effects of the Hallwood-Cordua water diversion and the South Yuba/Brophy water diversion are addressed in comments on the cumulative effects in this document.

6.1.2 Effects of the Action on Critical Habitat

FINAL BO STATEMENT (Pages 178 and 179)

"Reduced flows downstream of Daguerre Point Dam, from water diversions, reduce the amount of available spawning and rearing habitat for spring-run Chinook salmon and Central Valley steelhead that do not pass upstream at the Daguerre Point Dam fish ladders. Although the downstream spawners are an unstudied part of the spring-run Chinook salmon and Central Valley steelhead populations, in years where there are maintenance problems on the fish ladders, downstream spawners represent a significant portion of the populations. Conditions downstream of Daguerre Point Dam are so inadequate for spring-run Chinook salmon and Central Valley steelhead that these fish are not likely to successfully contribute to the population."

COMMENT

These statements are an misrepresentation of anadromous salmonid spawning habitat conditions downstream of Daguerre Point Dam. Extensive discussion and disclosure of studies, analyses and results have been presented in previously completed documents that were available to NMFS at the time of preparation of the Final BO. A few examples of these documents include the Yuba Accord EIR/EIS, the RMT (2010) Water Tempeature Objectives Memorandum, the Corps BA and various RMT documents published on the public website - http://www.yubaaccordrmt.com. These statements warrant the following specific comments.

First, the statement that "*downstream spawners are an unstudied part of the spring-run Chinook salmon and Central Valley steelhead populations*" is not correct. The RMT has conducted Chinook salmon and steelhead redd surveys, including downstream of Daguerre Point Dam in the lower Yuba River, for the past four years. Related reports available on the RMT public website include: (1) 2008 Pilot Redd Survey Report; (2) Redd Report 2009-2010; (3) Redd Report 2010-2011.

Second, this statement is implying that there is a relationship between annual maintenance activities and the spatial distribution of spring-run Chinook salmon and steelhead spawning. No such relationship has been documented or presented in the Final BO, nor have any studies or reports been referenced that document such a relationship. Also, as presented in previous comments, the spatial distribution of Chinook salmon redds (upstream and downstream of Daguerre Point Dam) has been very similar during years of different flow conditions. The Corps BA (page 8-19) states "*…74% of all Chinook salmon redds were observed upstream of Daguerre Point Dam during the extensive pilot redd survey conducted during 2008-2009, and the same exact percentage (74%) of all Chinook salmon redds were observed upstream of Daguerre Point Dam during the redd surveys conducted in 2009-2010. The similar distribution in timing and the same percentage distribution of Chinook salmon redds located upstream of Daguerre Point Dam occurred despite considerable differences in flow (monthly average cfs) that occurred from late spring into fall of 2008 compared to flow during 2009.*"

Third, if "*downstream* [of Daguerre Point Dam] *spawners are an unstudied part of the spring-run Chinook salmon and Central Valley steelhead populations*", then how was it determined that "*downstream spawners represent a significant portion of the populations*"? Moreover, review of the Redd Survey Annual Reports demonstrated that 74%, 74%, and 81% of all Chinook salmon redds were located upstream of Daguerre Point Dam during 2008-2009, 2009-2010 and 2010-2011, respectively. Review of these reports also demonstrated that 65%, 93%, and 90% of all steelhead trout redds were located upstream of Daguerre Point Dam during 2008-2009, 2009-2010 and 2010-2011, respectively.

Fourth, the Final BO statement that "*Conditions downstream of Daguerre Point Dam are so inadequate for spring-run Chinook salmon and Central Valley steelhead that these fish are not likely to successfully contribute to the population*" is completely unfounded. All of the previous reference documents demonstrate the suitability of conditions downstream of Daguerre Point Dam.

FINAL BO STATEMENT (Page 152)

"Yuba County Water Agency is proposing to study effects of the fish screen at the existing Hallwood-Cordua diversion, to provide information for license renewal of the Narrows II Powerhouse in 2016. No studies are proposed for the effects of increase water deliveries through the South Yuba/Brophy diversion. If increased water deliveries lead to temperatures downstream of Daguerre Point Dam being over 55°F from December through March, both successful outmigration of spring-run Chinook salmon and attraction of green sturgeon for spawning will decline."

COMMENT

The statement on page 152 of the Final BO is not correct, is misleading and does not even reference the commitment made in the Corps BA to install a new screening diversion facility for the South Yuba/Brophy diversion by the year 2018.

As described in Chapter 3 of the Corps BA, and as a condition of the Corps' issuance of a long-term easement to YCWA (applicant), the Corps will require that YCWA construct, operate and maintain a fish screen and associated appurtenances for the South Yuba/Brophy diversion that is compliant with current NMFS and CDFG fish screening criteria or other criteria equally protective of the listed species acceptable to NMFS and CDFG prior to June 2018.

Second, potential impacts associated with the Wheatland Project were fully evaluated in the Yuba Accord EIR/EIS (YCWA et al. 2007), as described in Section 7.1.1.3 (pages 7-12 through 7-28). Supplemental analyses were conducted as part of the Cumulative Effects assessment in the Corps BA, and incorporated updated water demand projections (see previous comment on the Final BO statements. Additional information regarding the Wheatland Project was provided in Section 6.2.2.2 (pages 6-68 to 6-69) and Section 8.5.1.2 (pages 8-77 to 8-103) of the Corps BA.

Third, the statement that "*If increased water deliveries lead to temperatures downstream of Daguerre Point Dam being over 55°F from December through March, both successful outmigration of spring-run Chinook salmon and attraction of green sturgeon for spawning will decline*" is technically unsupported. As reported in Table 1 of the Lower Yuba River Water Temperature Objectives Technical Memorandum (RMT 2010), which was available to NMFS at the preparation of this Final BO, examination of water temperature model results over the period of record, including dry and critical years, 55°F would be exceeded with a 0% probability of occurrence from the Smartsville Gage in the upper section of the lower Yuba River all the way down to the Marysville Gage located approximately 5 miles upstream from the confluence of the lower Yuba River and the Feather River from December through March.

FINAL BO STATEMENT (Page 189)

"Critical habitat impacted by the proposed action includes the lower Yuba River and the Feather River from the confluence with the Yuba River to the confluence with the Sacramento River."

COMMENT

Review of the Final BO did not locate analyses demonstrating adverse affects to habitat in the lower Feather River from the confluence with the Yuba River to the confluence with the Sacramento River resulting from the Proposed Action.

FINAL BO STATEMENT (Pages 189 and 190)

"Critical habitat has been designated downstream of Englebright Dam, to include currently occupied areas. Extension of critical habitat upstream of Englebright Dam was deemed premature until recovery planning determines a need for these areas in the recovery of the spring-run Chinook salmon ESU …(September 2, 2005, 70 FR 190 52488)… Since the 2005 determination of critical habitat for spring-run Chinook salmon …draft recovery planning has identified habitat upstream of Englebright Dam as essential for the recovery of these species (NMFS 2009). The critical habitat designation has not been revised to reflect the outcome of recovery planning, so upstream habitat is not considered in this analysis."

COMMENT

The Final BO statement that habitats upstream of Englebright Dam are "*essential for the recovery of these species*" implicitly designates these reaches as critical habitats without any rulemaking proceeding, as required by ESA §4. In fact, according to the USFWS and NMFS ESA Consultation Handbook (1998), critical habitat for listed species consists *of "…specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species. [ESA §3 (5)(A)] Designated critical habitats are described in 50 CFR §17 and 226."*

FINAL BO STATEMENT (Page 190)

"Migratory habitat conditions for spring-run Chinook salmon and Central Valley steelhead are impaired by continuance of the proposed action."

COMMENT

This statement in the Final BO is not supported by any analyses or referenced citations, nor are migratory habitat conditions specifically characterized.

FINAL BO STATEMENT (Page 190)

"Daguerre Point dam limits the ability of the critical habitat to support spring-run Chinook salmon and Central Valley steelhead because they can be forced to spawn in unsuitable habitat downstream of Daguerre Point Dam or have reduced reproductive fitness resulting from migration delays while attempting to pass Daguerre Point Dam."

COMMENT

See the previous comments addressing the lack of supporting documentation regarding being "forced" to spawn downstream of Daguerre Point Dam, spawning conditions and reproductive fitness.

FINAL BO STATEMENT (Page 190)

"The winter temperature standard of 63 °F under the Yuba Accord is likely to result in reversal of smoltification of spring-run Chinook salmon and could result in a complete cohort-failure (Mesick pers. comm.). Any winter temperature standard above 55 °F does not contribute to the conservation of spring-run Chinook salmon."

COMMENT

As previously noted, these statements misrepresent the Yuba Accord, are technically incorrect, and do not support the conclusionary statement regarding conservation of species.

FINAL BO STATEMENT (Page 190)

"Under the proposed action, the freshwater migration corridors in the Yuba River will continue to be compromised by exposure of juvenile spring-run Chinook salmon and Central Valley steelhead to predator-rich diversion structures and dam features, incised channels that limit channel complexity, and water temperatures that may be physiologically lethal or sublethal."

COMMENT

These statements in the Final BO are not supported by technical analyses or referenced studies. Previous comments have addressed the lack of information supporting statements regarding the abundance of predators or predation rates in the lower Yuba River. Regarding the statement concluding channel incision, the attached comments by Dr. Pasternack actually include quantification and application of metrics that demonstrate that a general statement that the lower Yuba River channel is incised is not supported.

The Final BO statement that "*water temperatures that may be physiologically lethal or sublethal"* is unfounded. As previously noted, available evaluations and documents (e.g., Lower Yuba River Accord Draft EIR/EIS (YCWA et al. 2007), the Corps BA, and the Yuba Accord RMT's Lower Yuba River Water Temperature Objectives Technical Memorandum (RMT 2010)) have examined the effects of water temperature conditions resulting from implementation of the Yuba Accord on all of the lifestages of anadromous salmonids in the lower Yuba River, including juvenile outmigration, and found them to be suitable.

FINAL BO STATEMENT (Pages 190 and 191)

"Entrainment, impingement, and predation at the South Yuba/Brophy and Hallwood-Cordua diversions reduce the numbers of outmigrating juvenile spring-run Chinook salmon and outmigrating juvenile Central Valley steelhead by up to 229,800 individuals of each species annually…"

COMMENT

Comments regarding the inaccuracies associated with the estimates in the Final BO regarding entrainment, impingment and predation at the South Yuba/Brophy and Hallwood-Cordua diversions are presented below under Section 6.1.3 - Cumulative Effects. As noted in those comments, the estimation was for spring-run Chinook salmon only, and for the South Yuba/Brophy diversion only. It is unclear how that estimation of *"by up to 229,800 individuals"* (albeit technically incorrect) somehow also became applied to steelhead, and also became applied to the Hallwood-Cordua diversion, inclusive.

FINAL BO STATEMENT (Page 191)

"Interrelated and interdependent water deliver and hydropower actions lead to increases in Yuba River flows during the time period when Feather River flows are low. The "flow disconnect" between the Yuba and Feather rivers causes spring-run Chinook salmon from the Feather River to be preferentially attracted into the Yuba River. This results in migrating Feather River wild and hatchery spring-run Chinook salmon having reduced fitness, by exposing them to the poor reproductive conditions in the Yuba River, and it reduces the contribution of those individuals to the conservation of the ESU."

COMMENT

First, there is no "flow disconnect" between the Yuba and Feather rivers.

Second, spring-run Chinook salmon from the Feather River are not preferentially attracted into the Yuba River. Rather, as noted in previous comments, when lower Yuba River flows are low relative to the Feather River fish are not "attracted" into the lower Yuba River, and when flows in the lower Yuba River are high relative to the lower Feather River, an increased percentage of FRFH fish are attracted into the lower Yuba River.

Third, this statement alleges harm to Feather River wild and hatchery spring-run Chinook salmon that spawn in the lower Yuba River. This allegation is completely unsupported in the Final BO, and there is no documentation regarding "*poor reproductive conditions in the Yuba River"*. By contrast, as noted in previous comments, numerous previously prepared documents, available to NMFS at the time of preparation of the Final BO, demonstrated the suitability of conditions downstream of Daguerre Point Dam.

6.1.3 Cumulative Effects

Increased future diversions through the South Yuba/Brophy rock gabion associated with the Wheatland Project are characterized in the Final BO (page 196) as "*The total future projected annual agricultural water demand that could be served by the Wheatland Project is about 41,000 acre-feet."*

This characterization of increased future demands associated with the Wheatland Project is a remnant from NMFS (2007a). The Final BO did not use information provided in the Corps BA, which updated future demand characterizations, and was available to NMFS at the time of their preparation of the Final BO.

As described in the Corps BA (page 7-13) "*The 2007 NMFS BO characterized the Wheatland Project as part of the Cumulative Condition, with annual diversions of an additional 41,000 acre-feet more than the Environmental Baseline. Updated 2011 demand projections indicate that water deliveries to the Wheatland Project in the future are projected to increase up to about 35,000 to 36,000 acre-feet, depending on water year type, above the demands that were in place at the time that the 2007 NMFS BO was completed, as well as those demands presently in place under the Environmental Baseline*."

Following are comments on statements in the cumulative effects section of the Final BO that address increased levels of impingement and entrainment at the South Yuba/Brophy Diversion Facilities, and habitat conditions (i.e., flow and water temperature) expected to result from increased future diversions associated with the Wheatland Project. Supporting statements in other sections of the Final BO associated with these statements also are addressed below.

6.1.3.1 South Yuba/Brophy Facilities - Entrainment

FINAL BO STATEMENTS

- **Page 152 –** *"Water deliveries from the Daguerre Point Dam pool are expected to increase in the future. The historical and current conditions of entrainment and impingement are expected to increase."*
- **Page 187** – "*Outmigrating spring-run Chinook salmon and Central Valley steelhead that seek the cover of interstitial spaces along the rock weir are likely to be impinged within the weir and killed. Impingement at the South Yuba/Brophy rock weir is difficult to quantify, because the juvenile fish simply disappear into the gravel, so a metric is needed. Because mortality associated with fish screens has been studied, we used the established Hallwood-Cordua metric in this analysis."*
- **Page 197 – "***We therefore expect that the effects of stream flows associated with the Wheatland project lead to increased entrainment at the South Yuba-Brophy diversion that is expected to cause a reduction in survival of juvenile steelhead and spring-run Chinook salmon in the Yuba River."*
- **Page 197 –** "*The increase in diversion rates at the South Yuba-Brophy diversion associated with the proposed Wheatland project is likely to expose juvenile spring-run Chinook salmon to greater rates of predation and entrainment during the critical*

outmigration period. This potential increase in entrainment could be avoided if a fish screen meeting CDFG and NMFS screening criteria is installed."

COMMENT

The Final BO includes these qualitative statements regarding potential increased impingement and entrainment, although a thorough quantitative discussion was provided in the Corps BA and was available at the time of preparation of the Final BO.

The Corps BA (pages 8-68 to 8-75) presents a thorough evaluation of the potential increased entrainment and impingement of outmigrant juvenile spring-run Chinook salmon and steelhead associated with future Wheatland Project increased diversions. The Corps BA includes an updated assessment of the potential exposure of juvenile spring-run Chinook salmon and steelhead to increased rates of impingement and entrainment at the South Yuba/Brophy diversion facilities, based upon expected monthly rates of diversion through the rock gabion and the temporal distribution of juveniles based on rotary screw trapping (RST) data from the lower Yuba River.

The expected annual total increase in impingement and entrainment of juvenile Chinook salmon is 0.2%, and the estimate for juvenile spring-run Chinook salmon would be less than the estimates presented for all juvenile Chinook salmon, because juvenile spring-run Chinook salmon have an earlier outmigration season. The expected annual total increase of juvenile steelhead susceptible to impingement and entrainment is 3.0%. These estimates pertain to 2018, when modification of the South Yuba/Brophy Diversion Canal and Facilities fish screen and appurtenant facilities would be completed to meet NMFS and CDFG approval of screening, or other criteria equally protective of anadromous salmonids acceptable to NMFS and CDFG. The Corps BA concluded that these temporary conditions would not be expected to be of a magnitude that would reduce appreciably the likelihood of both the survival and recovery of steelhead in the lower Yuba River.

FINAL BO STATEMENTS

- **Page 159 –** *"Given that the length of the rock weir at the South Yuba/Brophy Diversion is 2.52 times longer than the Hallwood-Cordua fish screen, and absent any site specific information at South Yuba/Brophy we applied information from the Hallwood-Cordua entrainment study to estimate that between 90,900 and 229,800 outmigrating juvenile spring-run Chinook salmon are entrained, impinged, or preyed upon at the South Yuba/Brophy Diversion annually."*
- **Page 185 –** *"…The 1999-2000 entrainment study by CDFG of the Hallwood-Cordua fish screen (IFC Jones and Stokes 2008) estimated that 36,144 and 91,113 O. mykiss were entrained in 1999 and 2000 respectively. To estimate entrainment, the study used spring-run Chinook salmon juveniles from the FRFH to test the screen mortality and make entrainment estimations using a Chinook salmon model from a similar facility in*

Washington State. Considering that the model used Chinook salmon numbers to calculate O. mykiss numbers, it is therefore an excellent model for estimating for both spring-run Chinook salmon and Central Valley steelhead entrainment estimates."

- **Page 186 –** "*Given that the length of the rock weir at the South Yuba/Brophy Diversion is 2.52 times longer than the Hallwood-Cordua fish screen, we estimate that between 90,900 and 229,800 outmigrating juvenile spring-run Chinook salmon and between 90,900 and 229,800 outmigrating juvenile Central Valley steelhead are likely to be entrained, impinged, or preyed upon at the South Yuba/Brophy Diversion annually*."
- **Pages 190 and 191 –**"*Entrainment, impingement, and predation at the South Yuba/Brophy and Hallwood-Cordua diversions reduce the numbers of outmigrating juvenile spring-run Chinook salmon and outmigrating juvenile Central Valley steelhead by up to 229,800 individuals of each species annually. Increased water deliveries during the winter migration period, as a result of the interrelated Wheatland Project, exposes additional outmigrating juvenile spring-run Chinook salmon to entrainment, impingement, and predation."*
- **Page 197 –**"*The increase in diversion rates at the South Yuba-Brophy diversion associated with the proposed Wheatland project is likely to expose juvenile spring-run Chinook salmon to greater rates of predation and entrainment during the critical outmigration period. This potential increase in entrainment could be avoided if a fish screen meeting CDFG and NMFS screening criteria is installed."*

COMMENT

There are numerous technical errors associated with these statements in the Final BO.

First, the Final BO refers to (incorrect) estimates of entrainment at the South Yuba/Brophy diversion of between 90,900 and 229,800 outmigrating juvenile spring-run Chinook salmon and steelhead. Thereafter, references in the Final BO regarding effects of the Proposed Action are to entrainment of 229,800 outmigrating juvenile spring-run Chinook salmon and steelhead, and no longer incorporate the lower end of the range.

Second, the basis for the estimates of between 90,900 and 229,800 outmigrating juvenile spring-run Chinook salmon and steelhead entrained at the South Yuba/Brophy Diversion is fundamentally flawed, technically incorrect, and is a misinterpretation of the actual study (ICF Jones and Stokes 2008) upon which the estimates were based.

The Final BO (page 185) states *"The 1999-2000 entrainment study by CDFG of the Hallwood-Cordua fish screen (IFC Jones and Stokes 2008) estimated that 36,144 and 91,113 O. mykiss were entrained in 1999 and 2000 respectively.* On page 159, the final BO states *"Given that the length of the rock weir at the South Yuba/Brophy Diversion is 2.52 times longer than the Hallwood-Cordua fish screen, and absent any site specific information at South Yuba/Brophy we applied information from the Hallwood-Cordua entrainment study to estimate that between*

90,900 and 229,800 outmigrating juvenile spring-run Chinook salmon are entrained, impinged, or preyed upon at the South Yuba/Brophy Diversion annually."

All numeric estimates in the above statements are incorrect, for the following reasons (see Section 9.6.1 for further discussion).

- The 1999-2000 CDFG entrainment study in the literature review conducted by ICF Jones and Stokes (2008) did not estimate that 36,144 and 91,113 *O. mykiss* were entrained in 1999 and 2000, as stated in the Final BO.
- The 1999-2000 CDFG study (ICF Jones and Stokes 2008) reported the numbers of juvenile *O. mykiss* that were "salvaged" at the Hallwood-Cordua fish screen, which represent the number of fish that encountered the screen but were redirected into a bypass pipe and returned to the lower Yuba River. Review of ICF Jones and Stokes (2008) did not result in locating any substantiation of the statement "*To estimate entrainment, the study used spring-run Chinook salmon juveniles from the FRFH to test the screen mortality and make entrainment estimations…*".
- *O. mykiss* catch (i.e., "salvage") data at the Hallwood-Cordua screen was applied to regression equations developed for juvenile spring-run Chinook salmon entrainment rates at Prosser Dam located on the Yakima River, Washington. ICF Jones and Stokes (2008) used the regression equations to predict the total production (i.e., the total number of juvenile *O. mykiss* passing Daguerre Point Dam) based on entrainment rates (predicted by the percent of flow diverted into a canal relative to total river flow at Prosser Dam).
- Thus, the relatively low "salvage" numbers of *O. mykiss* at the Hallwood-Cordua fish screen were expanded by application of the regression equations (e.g., the estimated salvage during 2000 of 12,672 *O. mykiss* (Drury 2001) became an estimate of 91,113 *O. mykiss*).
- However, the estimate of 91,113 *O. mykiss* was not of entrained fish as stated in the Final BO. Rather, that estimate was of total production in the lower Yuba River passing Daguerre Point Dam.
- Thus, the Final BO misinterpreted the hypothetical total production (i.e., total number of juveniles) of *O. mykiss* passing Daguerre Point Dam as estimates of the total number entrained at the Hallwood-Cordua fish screen.
- Then, the Final BO used this incorrect misinterpretation of "entrainment" of *O. mykiss*, applied it to juvenile spring-run Chinook salmon, and stated that these numbers (actually representing total production) would be "*lost*".
- Finally, the Final BO stated that because the length of the rock weir at the South Yuba/Brophy Diversion is 2.52 times longer than the Hallwood-Cordua fish screen, and because no site-specific information was available for the South Yuba/Brophy Diversion, the (incorrectly) estimated entrainment numbers of 36,144 and 91,113 were multiplied by

2.52 to estimate that between 90,900 (36,144 X 2.52 = 90,900 [sic]) and 229,800 (91,113 X 2.52 = 229,800 [sic]) outmigrating juvenile spring-run Chinook salmon are entrained, impinged, "or preyed upon" at the South Yuba/Brophy Diversion annually. In addition to the technical inaccuracies identified in the foregoing comments, simple multiplication of screen length represents another technical inaccuracy because the length of the screen does not represent: (1) entrainment rates into an off-channel diversion structure; (2) rates of impingement, which are actually associated with approach and sweeping velocities; and (3) predation rates.

- Additionally, it should be noted that the phrase "or preyed upon" in this statement of the Final BO does not make sense given that the subject matter was entrainment.
- The statement that *"Considering that <u>the model used Chinook salmon numbers to calculate O. mykiss numbers, it is therefore an excellent model</u> for estimating for both spring-run Chinook salmon and Central Valley steelhead entrainment estimates."* is of particularly poignant interest, for the following reasons: (1) Chinook salmon "numbers" were not used to calculate *O. mykiss* entrainment. Rather, *O. mykiss* salvage estimates were applied to juvenile Chinook salmon-based regression relationships in order to estimate *O. mykiss* abundance; (2) the conclusion that "…*it is therefore an excellent model for… entrainment estimates*" appears to be based on a misunderstanding of what was actually used, and a further misunderstanding assuming that the regressions are predictors of entrainment, when they actually were used to predict total production passing a point and not entrainment; and (3) the conclusion of "an excellent model" appears to be entirely subjective, and not based on any actual evaluation of model performance (e.g., a residuals analysis of the differences between expected and observed estimations).

<u>**FINAL BO STATEMENT** (Pages 190 and 191)</u>

"Entrainment, impingement, and predation at the South Yuba/Brophy and Hallwood-Cordua diversions reduce the numbers of outmigrating juvenile spring-run Chinook salmon and outmigrating juvenile Central Valley steelhead by up to 229,800 individuals of each species annually. Increased water deliveries during the winter migration period, as a result of the interrelated Wheatland Project, exposes additional outmigrating juvenile spring-run Chinook salmon to entrainment, impingement, and predation. The Wheatland Project could result in the <u>cumulative loss of up to 321,720 outmigrating spring-run Chinook salmon</u> at the South Yuba/ Brophy diversion annually."

COMMENT

On page 151 of the February 27, 2012 Draft BO, the statement was made that "…*The changes in flow levels associated with implementation of the Wheatland project may be of sufficient magnitude, timing, or duration to adversely affect critical habitat and listed salmonids in the* *lower Yuba River. Limiting lower Yuba River flows to minimum Yuba Accord flows will it cause a net reduction in the quality of critical habitat within the Yuba River. The expected 40 percent increase in entrainment at the South Yuba/Brophy diversion is expected to cause a reduction in survival of juvenile steelhead and spring-run Chinook salmon in the Yuba River."*

On February 28, 2012, the Corps provided comments on the Draft BO. The comments included the following statement – "*Because the statement regarding an "expected 40 percent increase in entrainment at the South Yuba/Brophy diversion is expected to cause a reduction in survival of juvenile steelhead and spring-run Chinook salmon in the Yuba River" in the Draft BiOp was taken directly from the 2007 NMFS BiOp, it does not appear that NMFS considered new information and new analyses regarding Wheatland diversions presented in the Corps 2012 BA. The assumption that there would be an expected 40 percent increase in entrainment is not substantiated, pursuant to Chapter 8 of the BA, which was available to NMFS at the time of preparation of the Draft BiOp."*

The Final BO removed reference to a *"expected 40 percent increase in entrainment at the South Yuba/Brophy diversion"*. Therefore, it is curious why the Final BO removed the words, but used a 40 percent increase to the Final BO's (incorrectly) estimated present amount of entrainment at the South Yuba/Brophy diversion (229,800 fish X 1.4 = 321,720 fish).

FINAL BO STATEMENT (Page 187)

"Outmigrating spring-run Chinook salmon and Central Valley steelhead that seek the cover of interstitial spaces along the [South Yuba/Brophy] *rock weir are likely to be impinged within the weir and killed."*

COMMENT

This statement is not supported by any analyses or referenced studies in the Final BO. By contrast, the Corps BA (page 6-67) states "*On July 8, 2004, representatives of CDFG and NMFS made a series of water velocity measurements along the face of the permeable rock gabion that separates the lower Yuba River from the headgates for the South Yuba/Brophy diversion. The purpose of the flow measurements was to characterize the flow conditions along the upstream face of the rock gabion. The flow along the upstream face of the rock gabion appeared to be irregular and complex in all three components of the velocity measurements (NAFWB 2004). According to NAFWB (2004), this was probably due to roughness of the gravel/cobble surface, irregularities in the rock gabion profile, differences in the permeability along the length of the rock gabion, and variations in the plugging of the upstream face of the rock gabion. Approach velocities varied from -0.054 fps to 0.686 fps with mean velocity of 0.052 fps. One approach velocity measurement exceeded 0.33 fps. Sweeping velocities varied from -0.167 fps to 1.034 fps with mean velocity of 0.260 fps. Two sweeping velocity measurements exceeded 0.67 fps. The head loss across the rock gabion was approximately 0.9 feet on the day of the measurements (NAFWB 2004).*"

Further examination of NAFWB (2004) describing the field data collection at the South Yuba/Brophy rock gabion structure, in which NMFS participated, demonstrates that of the 32 approach velocity measurements taken, only one exceeded the NMFS and CDFG screening criterion approach velocity of 0.33 fps. This approach velocity criterion is intended to protect juvenile salmonids from impingement or entrainment at fish screens. Given the information provided in the Corps BA, and that only one of 32 approach velocity measurements exceeded the NMFS and CDFG criterion, it does not seem appropriate for the Final BO to state "*Outmigrating spring-run Chinook salmon and Central Valley steelhead that seek the cover of interstitial spaces along the* [South Yuba/Brophy] *rock weir <u>are likely to be impinged within the weir and killed</u>.*"

6.1.3.2 Wheatland Project

<u>**FINAL BO STATEMENTS**</u>

- **Page 148 –** "*The changes in flow levels associated with implementation of the Wheatland project is expected to be of sufficient magnitude, timing, or duration to adversely affect the survival of juvenile steelhead and spring-run Chinook salmon and the conservation value of certain critical habitat primary constituent elements (i.e., freshwater rearing and migration habitat).*"
- **Page 148 –** *"Increased water exports lead to a reduction in flows within the mainstem of the river, and reduction in flows exacerbates the impacts of inadequate water depth, lack of access to the floodplain."*
- **Page 187 –** "*Water diversion at the South Yuba/Brophy Diversion removes water from the Yuba River that would otherwise be utilized by spring-run Chinook salmon for basic life history behavior. Water diversions at Daguerre Point Dam reduce the amount of downstream outmigration habitat available for spring-run Chinook salmon and Central Valley steelhead.*"
- **Page 191** – "*Increased water deliveries during the winter migration period, as a result of the interrelated Wheatland Project… would also result in lower outmigration flows downstream of Daguerre Point Dam*."
- **Page 193 –** "*The changes in flow levels associated with implementation of the interrelated Wheatland project are of sufficient magnitude, timing, or duration to adversely affect freshwater rearing habitat for spring-run Chinook salmon and Central Valley steelhead in the lower Yuba River down to the confluence of the Feather River with the Sacramento River. The changes in flow levels associated with implementation of the Wheatland project is expected to be of sufficient magnitude, timing, or duration to adversely affect the survival of juvenile steelhead and spring-run Chinook salmon*"

- **Page 196 –**"*The Wheatland Project is expected increase water diversions from the Yuba River and to increase the level of impacts to listed salmonids associated with increased exposure to the South Yuba/Brophy diversion. Results of model simulations for changes in flows in the lower Yuba River for the reach from Englebright Dam to Daguerre Point Dam show that during many summer months, flows would be higher with the Wheatland Project due to increased storage releases from Englebright Reservoir for the additional irrigation diversion deliveries downstream. Flows throughout the river during the winter would be somewhat lower with the Wheatland Project during some occasions. This reduction in flows would occur because of delay or reduction in spill amounts caused by lower storage levels, which, in turn, are the result of increased summer releases (YCWA 2002).*"
- **Page 196 –**"*The new flow levels associated with the Wheatland project are expected to be of sufficient magnitude, timing, or duration to adversely affect critical habitat and listed salmonids in the lower Yuba River.*"

COMMENT

These statements regarding the potential impacts on habitat conditions in the lower Yuba River associated with increased future diversions resulting from implementation of the Wheatland Project are qualitative and are not supported by any data analyses or referenced studies in the Final BO. Nonetheless, the Final BO contains speculative results that the Wheatland Project would result in flows that "*are expected to be of sufficient magnitude, timing, or duration to adversely affect critical habitat and listed salmonids in the lower Yuba River.*" The Final BO, however, does not provide any information actually addressing or evaluating the "*magnitude, timing, or duration*" of flows. The only reference to an evaluation is a statement on page 196 of the Final BO referring to model output. However, that statement appears to be copied directly from the 2007 NMFS BO which itself was referencing modeling conducted in 2002.

By contrast, updated flow and water temperature modeling was conducted for the Corps BA. The Corps BA provided a detailed evaluation and analyses of flow and water temperature conditions, both upstream and downstream of Daguerre Point Dam, anticipated to occur as a result from future implementation of the Wheatland Project. This evaluation in the Corps BA encompassed 36 pages (pages 8-68 to 8-103), and included Appendix C of the Corps BA, which itself encompassed 172 pages describing the modeling that was conducted and presentation of model output. The Corps BA included lifestage-by-lifestage analyses and evaluations for both flow and water temperature, separately for spring-run Chinook salmon and steelhead, associated with future diversions for the Wheatland Project in the lower Yuba River. Separate analyses were conducted for green sturgeon. Based on these detailed, quantitative evaluations, the Corps BA concluded that future implementation of the Wheatland Project would not result in substantive impacts affecting any of the spring-run Chinook salmon, steelhead, or green sturgeon lifestages in the lower Yuba River.

6.1.4 Integration and Synthesis

The integration and synthesis section of the Final BO, for both spring-run Chinook salmon and steelhead, is intended to consider the effects of the Proposed Action in concert with the status of the species and their habitats resulting from the Environmental Baseline. However, the Final BO does not distinguish between ongoing effects of the existence of Englebright and Daguerre Point dams, and potential effects specifically attributable to the Proposed Action. In fact, numerous statements in the Final BO attribute ongoing effects of the existence of Englebright Dam to the Proposed Action. This approach in the Final BO is contradictory to that which was described in the Corps BA.

Regarding viability of the lower Yuba River populations of spring-run Chinook salmon and steelhead, as previously noted, the Final BO deviates from its stated methodology regarding extinction risk assessment of the lower Yuba River salmonid populations. The extinction risk conclusions are apparently based upon a list of stressors, not upon the extinction risk criteria and analyses specified by Lindley et al. (2007). Moreover, the reoccurring alliteration of potential stressors contains technical inaccurracies, and inference of adverse effects that are not supported by studies or references, in support of conclusionary statements of "high extinction risk".

The Final BO (page 202) states that "*Without any recovery actions to stabilize the Yuba River population and allow it to contribute to the recovery of the species, both the survival and recovery of the species are measurably diminished by the proposed action*." However, review of the Final BO did not indicate any integration and/or synthesis of quantitative estimation or measurement of diminishment attributable to the Proposed Action.

The Final BO (page 203) states "*The proposed action needs to provide adequate potential for recovery, or recovery is appreciably reduced*." The interpretation of this statement is unclear. Moreover, the Proposed Action does not "appreciably reduce" potential for recovery. By contrast, the Proposed Action including the conservation measures clearly described in the Corps BA, increase the potential for recovery relative to the Environmental Baseline.

6.2 Steelhead

Many of the comments addressing effects of the Proposed Action, cumulative effects and integration and synthesis of effects previously presented either address spring-run Chinook salmon and steelhead, or are redundant as specifically applied to steelhead. Thus, previous comments that are pertinent to steelhead are not repeated in this section of comments on the Final BO. Comments on statements that are unique to steelhead, or that substantially differ regarding steelhead, are addressed below.

6.2.1 Effects of the Action

FINAL BO STATEMENT (Page 176)

"The proposed action will continue to …block Central Valley steelhead from 143.2 miles of suitable spawning habitat upstream of Englebright Dam, based on habitat availability modeled by Stillwater Sciences (2012)."

COMMENT

This statement in the Final BO is misleading. The quoted number of miles (143.2) of "suitable" spawning habitat is not correct. Spawning habitat consists of discrete patches of suitable substrate for spawning, and is not presented in terms of linear distance (miles). Review of Stillwater Sciences (2012) did report linear distances of entire sub-basins that would be thermally suitable for spawning, irrespective of substrate suitability. Review of Stillwater Sciences (2012) was unable to verify that 143.2 miles of thermally suitable steelhead spawning habitat is available upstream of Englebright Dam. However, using the "relaxed" water temperature criteria for juvenile steelhead rearing in the South Yuba River (25.2°C) and Middle Yuba River (23.2°C), a modeled total linear distance of 143.7 miles was calculated. Clarification, or correction, of the statements in the Final BO should be provided.

6.3 Green Sturgeon

6.3.1 Lifestage-Specific Effects of the Action

6.3.1.1 Adult Immigration

FINAL BO STATEMENT (Page 173)

"Green sturgeon are exposed to low flow conditions in the lower Yuba River as a result of water exports that are a conjunctive use at Daguerre Point Dam. Water removed from the aquatic ecosystem, from interrelated and interdependent actions, reduces the flows and water depths in the river and reduces that number of years that the Yuba River could support green sturgeon migration. The suboptimal migration habitat conditions downstream of Daguerre Point Dam can be overcome in years with high, uncontrolled flows; however, increased water diversions associated with the proposed action are likely to further reduce the number of years that green sturgeon can successfully migrate up the Yuba River."

COMMENT

These statements in the Final BO are not supported by any analyses or referenced studies. In addition, the Final BO provides no analyses regarding "*number of years that the Yuba River could support green sturgeon migration*", does not describe what characterizes (e.g., water depths and velocities) green sturgeon migration habitat specific to the lower Yuba River, or how migration habitat changes with different flow levels.

FINAL BO STATEMENT (Page 173)

"Green sturgeon repeatedly leaping into the concrete apron at Daguerre Point dam are likely to be harmed by loss of energy reserves needed for reproduction or wounded by the dam."

COMMENT

Review of all available information on the lower Yuba River did not find any reference documenting, or even suggesting, that green sturgeon are "*repeatedly leaping into the concrete apron at Daguerre Point dam*".

FINAL BO STATEMENT (Page 174)

"Although these pools can be used by green sturgeon during migration, they are downstream from historic spawning habitats upstream of Daguerre Point Dam."

COMMENT

No documentation is provided in the Final BO to support the suggestion that spawning may have historically occurred upstream of Daguerre Point Dam in the lower Yuba River.

FINAL BO STATEMENT (Page 174)

"The recent returns of green sturgeon to the lower Yuba River are most likely the result of recent weather events and climatic conditions resulting in high flows, rather than prescribed management flows on the river. This response of green sturgeon to higher water flows is an indication of a positive biological response to relief from a habitat stressor."

COMMENT

The Final BO provides no evidence supporting the contention that recent observations of green sturgeon in the lower Yuba River below Daguerre Point Dam were associated with high flows. Moreover, this statement reflects a basic misunderstanding of instream flow requirements. The instream flow requirements associated with the Yuba Accord are minimum flow requirements based on indices of water availability, and previous analyses (e.g., 2007 Yuba Accord EIR/EIS) of the veracity of the instream flow requirements include recognition that higher flows would continue to occur associated with storm or runoff events. Finally, this statement implies that flows in the lower Yuba River represent a "stressor" to green sturgeon, which is not factually supported in the Final BO.

FINAL BO STATEMENT (Page 174)

"If sufficient flows are coming out of Waterway 13, they may attract green sturgeon into the Yuba Goldfields. There is no spawning or rearing habitat for green sturgeon in the Yuba Goldfields. Individual green sturgeon exposed to Waterway 13 may enter it and become disoriented as they follow Yuba River flows up into the Yuba Goldfields. Because there is no spawning or rearing habitat in the Yuba Goldfields, green sturgeon are likely to have reduced reproductive fitness as a result of migration delay. There is little to no food available to green sturgeon in the Yuba Goldfields, and individual green sturgeon will not find adequate nutrients to enhance or support spawning. If the Yuba river flows are reduced after green sturgeon enter Waterway 13, stranding and thermal stress are likely to result in death of individuals."

COMMENT

These statements in the Final BO provoke several comments.

First, review of all available information on the lower Yuba River did not find any reference documenting, or even suggesting, that green sturgeon enter the Yuba Goldfields or are attracted into Waterway 13 when the barrier has not been in place.

Second, as suggested in the Final BO, green sturgeon likely utilize the deep pools as a migration pathway from the lower Feather River upstream to Daguerre Point Dam. Thus, it would be equally likely to speculate that green sturgeon would not be migrating along the shoreline of the lower Yuba River and be attracted into the Waterway 13 entrance.

Third, these statements and discussion regarding green sturgeon in the Final BO are completely speculative and unfounded. For example, "…*If sufficient flows… may attract… may enter* [Waterway 13]… *likely to have reduced reproductive fitness… If the Yuba river flows are reduced… likely to result in death of individuals*".

This section of the Final BO should be modified to more accurately represent the potential for flows emanating from Waterway 13 to act as a stressor on green sturgeon reproduction.

FINAL BO STATEMENT (Page 175)

"The proposed action affects green sturgeon by supporting water diversions upstream of Daguerre Point Dam that result in lack of sufficient flows in the lower Yuba River. Interrelated and interdependent actions that include water exports throughout the Yuba River watershed result in insufficient flows to support successful holding of green sturgeon on the lower Yuba River."

COMMENT

Because the Final BO does not identify or characterize what flow levels are "*sufficient*" for green sturgeon holding in the lower Yuba River, it is unclear how this statement concludes a "*lack of sufficient flows*". The Final BO does not provide any analyses or cite studies that identify the quality of holding habitat with flow levels in the lower Yuba River. By contrast, the Corps BA (pages 8-88 to 8-90) includes a thorough discussion of pool habitat in the lower Yuba River downstream of Daguerre Point Dam, which potentially could be utilized by holding green sturgeon.

FINAL BO STATEMENT (Page 175)

"The cause of the macroinvertebrate die-offs in the lower Yuba River is unknown, but lack of sufficient food resources, combined with insufficient flows is likely to result in reduced reproductive fitness in the years that green sturgeon hold in the Yuba River."

COMMENT

Previous comments address the lack of substantiation associated with alleged macroinvertebrate "*die-offs*" in the lower Yuba River. Additionally, the foregoing comment addressed the lack of substantiation of "*insufficient flows*". Hence, the speculative conclusion of "*likely to result in reduced reproductive fitness"* is unfounded.

FINAL BO STATEMENT (Page 175)

"Poaching sturgeon in fish ladders is a common stressor on the Sacramento River, but the fish ladders at Daguerre Point Dam have not been shown to trap sturgeon; however, green sturgeon holding in the plunge pool at Daguerre Point Dam could be gaffed or speared by poachers, resulting in capture, death, wounding, or injury."

COMMENT

This statement in the Final BO is not supported by any reports of green sturgeon poaching in the lower Yuba River.

6.3.1.2 Spawning

FINAL BO STATEMENT (Page 179)

"The plunge pool downstream of Daguerre Point Dam provides suitable spawning habitat for green sturgeon spawning in some years, and a small number of green sturgeon are likely to utilize this pool for spawning. Although there are 26 pools that are deeper than 10 feet downstream of Daguerre Point Dam, 25 of these pools lack the features that green sturgeon prefer for spawning (e.g., turbulent or convergent river flows)."

COMMENT

First, it is unclear what is meant by the statement "in some years". The Final BO does not provide any analyses regarding water year types or specific flow conditions associated with spawning habitat for green sturgeon downstream of Daguerre Point Dam. By contrast, the Corps BA (pages 8-88 to 8-90) provides an analysis of changes in pool depth and areal extent associated with changes in flow downstream of Daguerre Point Dam in the lower Yuba River.

Second, the statement that "*25 of these pools* lack *the features that green sturgeon prefer for spawning (e.g., turbulent or convergent river flows)"* should not be interpreted to mean that suitable spawning habitat does not occur in the lower Yuba River downstream of Daguerre Point Dam. As stated in Chapter 7 of the Corps BA, according to NMFS (2009e), earlier papers suggested that spawning most likely occurs in fast, deep water (> 3 m deep) over substrates ranging from clean sand to bedrock, with preferences for cobble substrates (Emmett et al. 1991; Moyle et al. 1995). Recent studies have provided additional information. Monitoring of green sturgeon and behavior data in the Rogue River in Oregon suggests spawning occurs in sites at the base of riffles or rapids, where depths immediately increase from shallow to about 5 to 10 meters, water flow consists of moderate to deep turbulent or eddying water, and the bottom type is made up of cobble to boulder substrates (D. Erickson, ODFW, pers. comm. September 3, 2008 in NMFS 2009e). For the Sacramento River, NMFS (2009a) reports that adult green sturgeon prefer deep holes (≥ 5 m depth) at the mouths of tributary streams, where they spawn and rest on the bottom.

The statement in the Final BO infers a lack of "preferred" green sturgeon spawning habitat in the lower Yuba River downstream of Daguerre Point Dam, but does not acknowledge the potential for green sturgeon local opportunistic habitat utilization in the lower Yuba River, taking into account differences between the lower Yuba River and the Sacramento or Rogue rivers, where green sturgeon spawning is known to occur.

This statement further implies that the only potentially suitable holding and spawning habitat for green sturgeon in the lower Yuba River is the area limited to the Daguerre Point Dam plunge pool. In actuality, this specific location does not conform to the Rogue River or Sacramento River habitat descriptions, because this is not a location characterized as immediately downstream of a rapid or riffle, or the mouth of a tributary stream.

Moreover, as stated on pages 5-213 and 5-214 of the Corps BA, green sturgeon critical habitat in the lower Yuba River extends from Daguerre Point Dam downstream to the confluence with the lower Feather River and primary constituent elements (PCEs) *"…present in the lower Yuba River include water flow, water quality, depths, and migratory corridors to support adult, and possibly sub-adult, migration."* By definition, therefore, green sturgeon critical habitat downstream of Daguerre Point Dam in the lower Yuba River *"…include sufficient habitat necessary for each riverine life stage"* (74 FR 52300).

FINAL BO STATEMENT (Page 179)

"It is also possible that green sturgeon spawn in the Feather River and are then attracted by the cooler waters of the Yuba River to swim up to Daguerre Point Dam and over-summer while waiting for downstream temperatures to cool to the point that they can return to the ocean. Another possibility is that green sturgeon are attracted into the Yuba River to spawn, but do not find suitable habitat downstream of Daguerre Point Dam, and therefore do not spawn, or spawn with a reduced level of success."

COMMENT

This statement in the Final BO is speculative and not supported by analyses or reference studies. Moreover, this statement appears to contradict what was stated previously in the Final BO. One of the assumptions used in the Final BO (page 55) states: "*Based on the confirmed presence and observed spawning behavior of adult green sturgeon downstream of Daguerre Point Dam during the green sturgeon spawning season and the confirmed successful spawning of adult green sturgeon nearby in the Feather River, green sturgeon spawn in the Yuba River*."

FINAL BO STATEMENT (Page 179)

"The Yuba River alluvial fan provides substrate for the majority of pools downstream of Daguerre Point Dam. The lower Yuba River alluvial fan does not provide the substrate conditions or flow conditions of suitable green sturgeon spawning habitat."

COMMENT

This statement in the Final BO requires clarification. It appears to be in direct conflict with other statements in the Final BO. For example, on page 142 of the Final BO the statement is made that *"Green sturgeon occupy the lower Yuba River up to Daguerre Point Dam, and based on observations of green sturgeon at the dam and spawning behavior of adults during the spawning season, green sturgeon currently use the lower Yuba River for spawning, reproduction, and rearing."* Although the Final BO does not provide any evidence supporting the contention that green sturgeon "*currently use the lower Yuba River for spawning, reproduction, and rearing"*, the Final BO should be consistent regarding statements of habitat suitability and utilization by green sturgeon in the lower Yuba River.

FINAL BO STATEMENT (Page 181)

"At the one spawning location in the lower Yuba River thermal conditions are probably optimal during spawning and embryo incubation. Water temperatures directly downstream of Daguerre Point dam are controlled by the interrelated and interdependent with water diversions that will continue to be supported by the proposed action."

COMMENT

Although the Final BO contends that there is only one spawning location in the lower Yuba River (without any supporting analyses), the Final BO correctly notes that water temperatures are suitable for green sturgeon spawning and embryo incubation.

6.3.1.3 Juvenile Rearing

FINAL BO STATEMENT (Page 184)

"The lower Yuba River does not provide optimal conditions for juvenile green sturgeon rearing, because of low prey availability and lack of cover. Juvenile green sturgeon exposed to low prey availability and predation in the Yuba River downstream of Daguerre Point Dam are likely to be harmed or killed."

COMMENT

The Final BO does not provide any documentation supporting the contention that prey availability for juvenile green sturgeon is low in the lower Yuba River. Moreover, the Final BO also does not provide any documentation associated with juvenile green sturgeon predation in the lower Yuba River. Thus, the contention that juvenile green sturgeon downstream of Daguerre Point Dam "*are likely to be harmed or killed*" is an unsupported, subjective conclusionary statement.

6.3.1.4 Outmigration

FINAL BO STATEMENT (Page 189)

"The lower Yuba River does not provide optimal conditions for juvenile green sturgeon outmigration, because of low prey availability and lack of cover. Juvenile green sturgeon exposed to low prey availability and predation in the Yuba River downstream of Daguerre Point Dam are likely to be harmed or killed during outmigration."

COMMENT

See previous comment.

6.3.2 Effects of the Action on Critical Habitat

FINAL BO STATEMENT (Page 193)

"The proposed action and interrelated and interdependent actions are likely to reduce food availability for green sturgeon by perpetuating the conditions that have resulted in unstable invertebrate populations in the lower Yuba River."

COMMENT

First, it is unclear what is meant by "unstable" invertebrate populations.

Second, if this statement is building upon the previous contention in the Final BO regarding "macroinvertebrate die-offs", then previous comments have addressed the lack of substantiation regarding this contention.

6.3.3 Cumulative Effects

Review of the cumulative effects section of the Final BO did not find any reference to cumulative effects analysis on green sturgeon or their habitat in the lower Yuba River.

By contrast, the Corps BA conducted a cumulative effects analysis associated with future South Yuba/Brophy diversions at Daguerre Point Dam. The Corps BA (page 8-90) found that … "*flow reductions under the Cumulative Condition relative to the current conditions would be expected to result in minor reductions in pool depth averaging less than 1 inch (relative to a nominal depth of 10.0 feet) over the range of exceedance probabilities year-round. Also, the Cumulative Condition would be expected to result in minor decreases (reductions of between 0.1% and 0.3%) in the areal extent of pools located below Daguerre Point Dam. These minor flow-related changes under the Cumulative Condition relative to the current conditions indicate no substantive impacts affecting green sturgeon in the lower Yuba River*." The Corps BA (page 8-101) also found that "*Minor water temperature changes would occur under the Cumulative Condition relative to the current conditions. The foregoing evaluation of changes in water temperatures under the Cumulative Condition relative to the current conditions indicates no substantive impacts affecting any of the green sturgeon lifestages in the lower Yuba River*."

6.3.4 Integration and Synthesis

FINAL BO STATEMENT (Page 205)

"With only five green sturgeon detected in 2011 and infrequent historical sightings by anglers, the population is likely to have been low for some time, probably since construction of Daguerre Point Dam. Green sturgeon continue to be blocked from suitable spawning habitat by Daguerre

Point Dam and its impassable fish ladders. The population has a continued lack of habitat availability and diversity; perpetually blocked access to spawning habitat upstream from Daguerre Point Dam; lack of suitable spawning substrate, deep pools, and flows; potentially low food availability for juveniles, due to macroinvertebrate die-offs; and low viability and high risk of extinction."

COMMENT

Previous comments demonstrate the lack of substantiation of the list of stressors included in the foregoing statement in the Final BO.

FINAL BO STATEMENT (Page 205)

"The Yuba River may be a population sink for the only population in the DPS. The combined impacts of the project and environmental baseline increase the risk of extinction of the DPS. Without any recovery actions to stabilize the Yuba River population and allow it to contribute to the recovery of the species, both the survival and recovery of the DPS are measurably diminished by the proposed action. Any green sturgeon spawning in the Yuba River would contribute to the viability of the DPS because there are very few green sturgeon in the DPS and very little spawning habitat within the range of the DPS."

COMMENT

This statement in the Final BO is perplexing. First, it states that there is only one population in the entire DPS, which is in reference to the Sacramento River population. If the only population in the entire DPS is the Sacramento River population, then it is unclear why any statements or conclusions are made in the Final BO regarding a "Yuba River population".

Second, the basis for the speculation that the lower Yuba River "*may be a population sink"* is unclear. Presumably, this statement implies that green sturgeon would be drawn from the Sacraemento River into the lower Feather River, then from the lower Feather River into the lower Yuba River, due to flows in the lower Yuba River that are not part of the Proposed Action. It further implies that such green sturgeon would die in the lower Yuba River, ergo "*population sink*". This line of reasoning is of questionable logic.

Third, the statement in the Final BO that "*Without any recovery actions to stabilize the Yuba River population and allow it to contribute to the recovery of the species, both the survival and recovery of the species are measurably diminished by the proposed action*." However, review of the Final BO did not indicate any integration and/or synthesis of quantitative estimation or measurement of diminishment attributable to the Proposed Action.

<u>FINAL BO STATEMENT</u> <u>(Page 205)</u>

"The proposed action is likely to produce stressors that adversely affect the environment of green sturgeon by completely blocking upstream migration to historic spawning habitat related to the operations and maintenance of dams without fish passage, predation of juveniles downstream from Daguerre Point Dam, and continued degradation of adult holding, spawning and juvenile rearing habitat downstream from dams. Individuals that are exposed to one or more of these environmental stressors respond with adverse consequences called take, that occurs in the form of injury, death, or harm from habitat degradation that actually kills or injures individuals through significant impairment to their breeding, feeding, sheltering, migration, spawning."

COMMENT

First, the Final BO confuses effects associated with the Environmental Baseline with those of the Proposed Action, as described in the Corps BA.

Second, as previously noted, there is no documentation that spawning habitat historically occurred upstream of Daguerre Point Dam.

Third, previous comments on the Final BO have demonstrated the lack of substantiation for the contentions that "*continued degradation*" of habitat is occurring in the lower Yuba River for any of the listed lifestages.

Fourth, "*exposure*" of one or more lifestages to a "*stressor*" would not necessarily automatically result in "*take*".

<u>FINAL BO STATEMENT</u> <u>(Page 206)</u>

"These environmental consequences also reduce the survival of individuals and ultimately impairs the local population's long-term survival viability by continuing to drive low population abundance rates, variable and declining production rates, impaired spatial and genetic diversity, and continued exposure to hatchery populations. Recognizing that the green sturgeon DPS is currently at a moderate to high risk of extinction, any reduction in the viability to the Yuba River population is likely to reduce the viability and increase the extinction risk of the DPS."

COMMENT

Regarding the Final BO statement *"continuing to drive low population abundance rates, variable and declining production rates",* there are no established "abundance viability criteria" for green sturgeon, by contrast to the extinction risk criteria developed for anadromous salmonids (Lindley et al. 2007). Moreover, the Corps BA reported available information regarding abundance of the Southern DPS of green sturgeon, as well as for the lower Yuba River.

The Corps BA (pages 5-241 to 5-242) described that, currently, there are no reliable data on population sizes, and population trends are lacking for green sturgeon in the Central Valley (NMFS 2009d). There is insufficient information to evaluate the productivity of green sturgeon (NMFS 2009d), and recruitment data for green sturgeon are essentially nonexistent (NMFS 2009a). Essentially no information regarding these topics is available for the lower Yuba River. Hence, it is not practicable to attempt to apply the VSP concepts developed for salmonids to green sturgeon in the lower Yuba River. Moreover, the limited information pertaining to abundance, productivity, habitat utilization, life history and behavioral patterns in the lower Yuba River, due to infrequent sightings over the past several decades, does not provide the opportunity for reliable alternative methods of viability assessment of green sturgeon in the lower Yuba River (Corps BA page 5-246).

As discussed in a previous comment, the conclusionary statement in the Final BO regarding green sturgeon "*continued exposure to hatchery populations"*, appears to be an editorial mistake, copied from anadromous salmonid discussions, because there are no green sturgeon hatchery populations in the lower Yuba River, let alone the Central Valley.

FINAL BO STATEMENT (Page 209)

"The habitat downstream of Daguerre Point Dam is too limited in flow, depth, and substrate to support a population that would support the spatial structure of the DPS."

COMMENT

As previously noted, the Final BO does not provide scientific evidence regarding the alleged "*limited flow, depth and substrate*". Moreover, this contention in the Final BO directly contradicts NMFS' recent designation of green sturgeon critical habitat in the lower Yuba River downstream of Daguerre Point Dam. As stated on pages 5-213 and 5-214 of the Corps BA, green sturgeon critical habitat in the lower Yuba River extends from Daguerre Point Dam downstream to the confluence with the lower Feather River and PCEs *"…present in the lower Yuba River include water flow, water quality, depths, and migratory corridors to support adult, and possibly sub-adult, migration."* By definition, therefore, green sturgeon critical habitat downstream of Daguerre Point Dam in the lower Yuba River *"…include sufficient habitat necessary for each riverine life stage"* (74 FR 52300).

FINAL BO STATEMENT (Page 209)

"The poor condition of critical habitat on the Yuba River, combined with the very low green sturgeon population numbers indicates that this population is experiencing depensation and may be a population sink. The critical habitat cannot support the conservation of the DPS."

COMMENT

First, previous comments note the lack of substantiation for conclusionary statements regarding habitat conditions in the lower Yuba River.

Second, the statement in the Final BO that "*The critical habitat cannot support the conservation of the DPS"* seems to directly contradict statements in NMFS' designation of green sturgeon critical habitat. The NMFS document titled "*Designation of Critical Habitat for the Southern Distinct Population Segment of Green Sturgeon, Section 4(b)(2) Report*" (2008, page 19) report concludes that the lower Yuba River downstream of Daguerre Point Dam has a "Medium" conservation value rating. PCEs present in the lower Yuba River downstream of Daguerre Point Dam include water flow, water quality, depths, and migratory corridors to support adult, and possibly sub-adult, migration were identified in the NMFS document titled "*Proposed Designation of Critical Habitat for the Southern Distinct Population Segment of North American Green Sturgeon, Draft Biological Report*" (NMFS 2008a, page 22). It is interesting to note, however, that the discussion of PCEs does not include spawning. In fact, NMFS (2008a, page 23) states that *"Spawning is possible in the river, but has not been confirmed and is less likely to occur in the Yuba River than in the Feather River"*.

7.0 RPA Actions

FINAL BO STATEMENT (Page 214)

"There are a number of stressors associated with the Corps' operation and maintenance of Englebright Dam and reservoir, and Daguerre Point Dam. These include operation and maintenance of the dams which perpetuates the existence of the dams and the effects on ESA listed fish species."

COMMENT

As previously discussed, and as presented in the Corps BA, effects on listed species associated with the existence of Englebright and Daguerre Point dams are part of the Environmental Baseline and are not attributable to the Proposed Action.

FINAL BO STATEMENT (Page 215)

"This RPA is composed of numerous elements for each of the various project associated stressors and must be implemented in its entirety in order to avoid jeopardy and adverse modification."

COMMENT

This statement appears to be contradictory with text on the same page (see quoted text in the previous comment) that states "*rather than attempting to address every project stressor for each species or every PCE for critical habitat"*.

<u>FINAL BO STATEMENT (Page 217)</u>

Component of Table XI-a. Key species stressors and associated short- and long-term actions in the RPA.

Stressor	Actions	Short-term	Long-term
Lack of data and information to assess and monitor the condition of salmonids	*Monitor, compile, and assess salmonid information*	*X*	*X*
Lack of data and information to assess and monitor the condition of green sturgeon	*Monitor, compile, and assess green sturgeon information and implementation of adaptive management*	*X*	*X*

COMMENT

Regarding the last two items presented in Table XI-a, it is unclear how a "*lack of data and information to assess and monitor the condition of salmonids*" and a "l*ack of data and information to assess and monitor the condition of green sturgeon*" would constitute "*key species stressors and associated short- and long-term actions in the RPA*".

7.1 RPA Action No. 1 – Yuba River Fish Passage Improvement Strategy and Plan

<u>FINAL BO STATEMENT (Page 215)</u>

"NMFS' interest is in reducing the negative effects of the stressors in order for the Corps' proposed action to avoid jeopardizing the continued existence and impairing the viability of the ESA listed species. There may be several approaches that can address a stressor or multiple stressors. NMFS interest is that the approaches that are selected have a high likelihood of success in avoiding impairing ESA listed species' viability."

COMMENT

This statement in the RPA correctly indicates that there may be numerous approaches that can address existing stressors. NMFS' interest in selecting approaches that have a high likelihood of success of avoiding jeopardy and increasing the viability of the ESA listed species is appropriate. However, given this interest, the consideration of the RPA in the Final BO does not appear to explore the possibility that habitat improvement measures in the lower Yuba River may actually have a higher likelihood of success than speculative measures associated with reintroduction of anadromous salmonids into the Upper Yuba River Watershed.

Presently, it is uncertain as to whether spring-run Chinook salmon or steelhead could be successfully reintroduced into the Upper Yuba River Watershed. Moreover, it is presently uncertain whether reintroduced populations could be self-sustaining and how many individuals could be produced. These uncertainties are acknowledged in the Final BO. For example, on page

225 of the Final BO the statement is made that "*The extent to which habitats upstream of Englebright Dam can be successfully utilized for the survival and production of anadromous fish is currently unknown*." On page 223 of the Final BO, the additional statement is made that "*The location, quantity, and condition of habitat must be inventoried and assessed in order to evaluate the current carrying capacity and restoration potential*." Therefore, it is uncertain as to whether or not a reintroduction program could produce enough individuals to significantly contribute to the ESU/DPS and whether that contribution would be sufficient to "avoid jeopardy".

By contrast, an entire suite of habitat evaluations have been conducted regarding the ability of the lower Yuba River to support ESA listed species (see http://www.yubaaccordrmt.com) and numerous habitat improvement projects have been identified (e.g., see the DWR and PG&E Habitat Expansion Plan (www.water.ca.gov/environmentalservices/docs/habitat/Final_HEP_Nov2010.pdf) and continue to be developed through the Yuba Accord RMT.

In addition, the Final BO (page 216) states "*An RPA must avoid jeopardy to listed species in the short term, as well as the long term.*" It is likely that many of these habitat improvement actions on the lower Yuba River could be implemented in a timely fashion.

7.2 RPA Action No. 2 – Near-term Fish Passage Actions

FINAL BO STATEMENT (Page 222)

"In the near term, reestablishing wild populations of spring-run Chinook salmon and steelhead in the North Yuba River upstream of New Bullards Bar Dam prior to providing volitional fish passage at Englebright Dam would provide a reliable source stock for reestablishing wild populations in the various reaches upstream of Englebright Dam. Assisted fish passage is to be considered for near-term fish passage implementation upstream of Englebright Dam, and for the long-term in the event that volitional fish passage is not feasible."

COMMENT

Again, these statements in the Final BO clearly indicate a pre-decision regarding dam removal and volitional passage at Englebright Dam.

Also, on page 216 of the Final BO, NMFS defines the near-term as 1 to 5 years. It does not seem logistically feasible to be able to complete reestablishment of anadromous salmonids in the near-term duration of 1 to 5 years given the need to secure funding, conduct required studies and analyses, develop site specific engineering designs, complete National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) regulatory compliance requirements, and then construct the needed infrastructure components that would be necessary to implement an assisted fish passage option.

7.3 RPA Action No. 3 – Long-term Fish Passage Actions

FINAL BO STATEMENT (Page 222)

"*Ultimately, volitional fish passage at Englebright Dam and Daguerre Point Dam is the preferred approach for fully seeding historic salmonids habitats and reestablishing viable populations of spring-run Chinook salmon, steelhead, and green sturgeon in the Yuba River Watershed. Restoring volitional fish passage at Englebright Dam and Daguerre Point Dam and reestablishing viable populations will greatly contribute to the continued existence and restore the viability of all three of these species… dam removal is the most preferred approach because it provides unimpeded passage for numerous aquatic species and best restores the natural processes of the river ecosystem. Volitional passage through dam removal or modification of Englebright Dam and/or Daguerre Point Dam shall be addressed in the process to determine how to best achieve fish passage upstream of these dams. NMFS recognizes that volitional fish passage over dams the height of Englebright Dam have not previously been successful, thus short-term actions are included herein until long-term solutions that provide fish passage can be formulated.*"

COMMENT

First, this RPA action appears to be attributing the effects of the existence of Englebright Dam as part of the Proposed Action, which is not the case as presented in the Corps BA.

Second, the suggestion that "volitional" passage for anadromous salmonids at Englebright Dam via "*dam removal is the most preferred approach*" appears to be pre-decisional. If reintroduction of anadromous salmonids into the Upper Yuba River Watershed is the objective, then the appropriate process would be to identify a number of potential alternatives/components, potential effects resulting from implementation of various alternatives, and to identify the most efficacious means of accomplishing reintroduction in the Upper Yuba River Watershed.

Third, presently it is uncertain as to whether spring-run Chinook salmon or steelhead could be successfully reintroduced into the Upper Yuba River Basin Watershed. Moreover, it is presently uncertain whether reintroduced populations could be self-sustaining and how many individuals could be produced. Therefore, it is uncertain as to whether or not a reintroduction program could produce enough individuals to significantly contribute to the ESU/DPS and whether that contribution would be sufficient to "avoid jeopardy", as indicated in the Final BO.

Presently, there are several initiatives addressing the issues surrounding reintroduction of anadromous salmonids into the Upper Yuba River Watershed. These initiatives include preparation of the Final Recovery Plan, other efforts being undertaken by NMFS, and two multi-party/agency collaborative stakeholder groups – the Yuba Salmon Forum, and the North Yuba Reintroduction Initiative. Biological issues being examined include lifestage-specific water temperature suitability in upstream areas, migration barriers, adult holding habitat availability, spawning gravel availability and distribution, and rearing habitat availability. Clearly, to suggest at this time that "volitional" passage at Englebright Dam is required to "avoid jeopardy" without being informed regarding biological and other (e.g., infrastructure and technical feasibility) issues is inappropriately pre-deterministic.

7.4 RPA Action No. 4 – Gravel Augmentation Program

As previously discussed, and as presented in the Corps BA, effects on listed species associated with the existence of Englebright and Daguerre Point dams are part of the Environmental Baseline and are not attributable to the Proposed Action.

Specific comments regarding this RPA and statements in the Final BO regarding substrate and anadromous salmonid spawning habitat have been prepared by Dr. Pasternack.

7.5 RPA Action No. 5 – Channel Restoration Program

Specific comments regarding this RPA and statements in the Final BO regarding the topics of channel restoration and related considerations regarding fluvial geomorphology, substrate and anadromous salmonid spawning habitat, and large woody material have been prepared by Dr. Pasternack.

7.6 RPA Action No. 6 – Predation and Predator Control Program

Numerous statements are made throughout the Final BO regarding predation of juvenile anadromous salmonids. Following are statements, and comments in response to statements, throughout the Final BO followed by comments on RPA Action No. 6 – Predator Control Program.

7.6.1 Predation

Numerous statements are made in the Final BO regarding the magnitude of predation associated with Daguerre Point Dam or specific water diversion facilities near or at Daguerre Point Dam. The Final BO (page 151) acknowledges the statement in the Corps BA (page 5-74) that "*Predatory fish are known to congregate around structures in the water including dams, diversions and bridges, where their foraging efficiency is improved by shadows, turbulence and boundary edges (CDFG 1998).*" However, the Final BO includes several statements that require clarification. Examples of these types of statements follow.

FINAL BO STATEMENTS

- **Page 144 –** *"No predator control program is in place at the South Yuba/Brophy Diversion and salmonid loss at this facility is likely to have been a severe and chronic stressor on outmigrating salmonids."*
- **Page 151 –** *"…unnaturally high predation rates may also occur in the diversion channel associated with the South Yuba/Brophy diversion."*

COMMENT

These statements are speculative, do not define what is meant by "severe" and "unnaturally high", and are not supported by referenced literature. By contrast, the Corps BA (pages 6-64 to 6-68) reported all of the available studies that have previously been conducted regarding predation at the South Yuba/Brophy Diversion Facilities. As described in the Corps BA, previous attempts have been made to quantify predation rates at this location including CDFG (1988), USFWS (1990), Cramer (1992), Demko and Cramer (1993), and Cramer (2000). As reported in the Corps BA, "*...Cramer (2000) reviewed all studies performed at the South Yuba/Brophy diversion, and found that none of the research by USFWS, CDFG or fisheries consultants had indicated that juvenile Chinook became disoriented upon entering the diversion channel, or that abnormally high predation on juvenile Chinook salmon occurred in the diversion channel."*

FINAL BO STATEMENT (Page 151)

"*High-density predator fields are likely to occur at the South Yuba/Brophy Diversion rock weir and return channel, Hallwood-Cordua Diversion canal, Hallwood-Cordua fish return pipe, Daguerre Point Dam face and fish ladders, and the Browns Valley Diversion channel."*

COMMENT

This statement does not take into account the several different water diversion structures, differences among them that may influence predator abundance, and the distinction of "high-density". Further clarification should be provided regarding predatory densities at each of the specific facilities, or the statement should be modified appropriately.

FINAL BO STATEMENT (Page 151)

"*…native predators, such as the Sacramento pikeminnow are documented to forage heavily on salmonids approaching the Hallwood-Cordua fish screen."*

COMMENT

No literature is cited or documentation referenced supporting this statement.

FINAL BO STATEMENT (Page 164)

"*Similar entrainment studies in California have found that predation is a primary mortality factor at fish screens (JSA 2004, Vogel 2008). Given that the length of the rock weir at the South Yuba/Brophy Diversion is 2.52 times longer than the Hallwood-Cordua fish screen, we estimate that between 90,900 and 229,800 outmigrating juvenile and adult Central Valley steelhead are entrained, impinged, or preyed upon at the South Yuba/Brophy Diversion annually*."

COMMENT

The Final BO presents no discussion, evaluation, or analysis indicating that previous entrainment studies conducted elsewhere are applicable to the specific South Yuba/Brophy diversion. Moreover, the statement that *"and adult Central Valley steelhead are entrained, impinged, or preyed upon"* [emphases added] does not make sense.

FINAL BO STATEMENT (Page 179)

"Downstream spawning will also lead to higher rates of predation on spring-run Chinook salmon eggs, larvae, and juvenile fish, because downstream of Daguerre Point Dam lacks cover from predators and has enhanced predator habitat."

COMMENT

This conclusionary statement is speculative, and does not reflect the spatial distribution of spring-run Chinook salmon spawning provided in RMT reports, YCWA et al. (2007), or the Corps BA – all of which report that spring-run Chinook salmon spawning occurs upstream of Daguerre Point Dam. Moreover, it is not reasonable to suggest that incubating eggs and larvae within the substrate have the ability to utilize cover and escape from predators.

Also, it is unclear what is meant by the phrase "enhanced predator habitat"?

FINAL BO STATEMENTS

- **Page 185** – *"Based on studies at Red Bluff Diversion Dam (Vogel 1988), between 16 and 55 percent of Chinook salmon under the gates are killed. NMFS assumes that mortality at Daguerre Point Dam plunge pool is similar, due to disorientation of downstream migrants and the high predator field below the dam."*
- **Pages 184 and 185** – "*Outmigration mortality is estimated to be 55 percent of the annual outmigration of both the spring-run Chinook salmon and Central Valley steelhead at Daguerre Point Dam and the conjunctive use water diversions, based upon mortality calculations done on the RBDD (USFWS 1988)."*
- **Page 254** – *"Year round at the plunge pool downstream from Daguerre Point Dam through November 1, 2012. Up to 55 percent of individuals are expected to be killed*

through November 1, 2012. Upon NMFS-approval and Corps implementation of a predator reduction and monitoring plan on November 1, 2012, NMFS will review and modify the take exemption as necessary."

- **Page 257 –** *"Year round at the scour pool downstream from Daguerre Point Dam through November 1, 2012. Up to 55 percent of individuals are expected to be killed through November 2012. Upon NMFS-approval and Corps implementation of a predator reduction and monitoring plan on November 1, 2012, NMFS will extend the take exemption as necessary."*
- **Page 259 –** *"Year round at the scour pool downstream from Daguerre Point Dam through November 1, 2012. Up to 55 percent of* [green sturgeon] *individuals are expected to be killed through November 2012. Upon NMFS-approval and Corps implementation of* a predator reduction and monitoring plan on November 1, 2012, NMFS will extend the take exemption as necessary."

COMMENT

Several issues are associated with the foregoing statements.

First, the Final BO (page 185) initially refers to the citation of "*between 16 and 55 percent*" mortality at RBDD. Thereafter, all references in the Final BO are to an estimated 55 percent mortality, or up to 55 percent mortality at Daguerre Point Dam.

Second, the assumption in the Final BO that mortality at the pool located immediately downstream of Daguerre Point Dam is similar to predation and the RBDD gates due to "*disorientation of downstream migrants and the high predator field below the dam*" requires additional justification. The actual statement in USFWS (1988) is "*…disorientation of downstream migrants due to passage under the dam gates and through the Tehama-Colusa Canal headworks fish bypass system causes increased vulnerability to predators*." There are no gates at Daguerre Point Dam which juvenile anadromous outmigrant salmonids would pass under and thereby become disoriented. At Daguerre Point Dam, the potential for juvenile downstream migrant salmonids to become "disorientated" by passing over Daguerre Point Dam occurs when water is spilling over the dam – otherwise, juveniles pass through the fish ladders or around the dam through the Hallwood-Cordua diversion canal (which contains a fish bypass pipe) or the South Yuba/Brophy diversion canal (which does not contain a fish bypass pipe). This combination of passage routes does not inherently appear to be similar to passing under the diversion gates at RBDD. Also, the assumption in the Final BO would be further supported if a comparison of the abundance of pikeminnow was made between downstream of RBDD and downstream of Daguerre Point Dam.

Third, the statements in the Final BO reference Vogel (1988) and USFWS (1988). There is no Vogel (1988) in the Final BOs literature cited section, although there is a Vogel et al. (1988), which is the same report as USFWS (1988).

Fourth, the Final BO does not provide discussion regarding the similarities, or particularly the lack thereof, between the gates at RBDD and the plunge pool below Daguerre Point Dam.

FINAL BO STATEMENT (Pages 185 and 186)

"The estimated loss of between 36,144 and 91,113 juvenile spring-run Chinook salmon and between 36,144 and 91,113 juvenile Central Valley steelhead annually constitutes a long-term, high level stressor for the both the Yuba River spring-run Chinook salmon and Central Valley steelhead populations and measurably contributes to the risk of extinction of the Yuba River population."

COMMENT

See the foregoing comment regarding the manner in which mortality is estimated at the Hallwood-Cordua fish screen.

FINAL BO STATEMENT (Page 187)

"*The 300 to 600 cfs flows coming into the diversion pool, with only five cfs returning to the river, does not allow for sweeping flows to let the outmigrating juveniles pass."*

COMMENT

It is unclear what the basis is to "*only five cfs returning to the river*". In fact, the Corps BA (page 6-63) thoroughly describes conditions in the diversion channel, the situation that the 10 percent bypass flow (by agreement with CDFG) has not always been met historically (NMFS 2002) but that recently YCWA replaced the two 48-inch culverts located at the downstream terminus of the bypass channel with a concrete box culvert and then restored the site. The project was undertaken to improve water flow at various river stages, reduce debris loading, reduce maintenance and to accommodate new flow metering equipment to measure the flow returning to the Yuba River from the diversion channel.

FINAL BO STATEMENT (Page 187)

"*No predator control program is in place at the South Yuba/Brophy Diversion and salmonid loss at this facility is likely to have been a severe and chronic stressor on outmigrating salmonids."*

COMMENT

The statement above is speculative, does not define what is meant by "severe", and is not supported by referenced literature. By contrast, the Corps BA (pages 6-64 to 6-68) reported all of the available studies that have previously been conducted regarding predation at the South Yuba/Brophy Diversion Facilities. As described in a previous comment, the Corps BA reported that "*...Cramer (2000) reviewed all studies performed at the South Yuba/Brophy diversion, and found that none of the research by USFWS, CDFG or fisheries consultants had indicated that* *juvenile Chinook became disoriented upon entering the diversion channel, or that abnormally high predation on juvenile Chinook salmon occurred in the diversion channel."*

FINAL BO STATEMENT (Page 188)

"The diversion subjects salmonids to the high stressors of predation, impingement, and entrainment. Therefore, the South Yuba/Brophy diversion facility is a high stressor to spring-run Chinook salmon and Central Valley steelhead outmigrants."

COMMENT

See foregoing comments and recognition of lack of documentation supporting the actual magnitude of potential predation, impingement and entrainment. The contention that "*the South Yuba/Brophy diversion facility is a high stressor*" should be clarified, and put in appropriate context.

FINAL BO STATEMENT (Page 189)

"Juvenile green sturgeon exposed to low prey availability and predation in the Yuba River downstream of Daguerre Point Dam are likely to be harmed or killed during outmigration."

COMMENT

The Final BO does not provide independent study or reference to literature documenting "low prey availability" for outmigrant juvenile green sturgeon. The contention that they are "*likely to be harmed or killed during outmigration*" is speculative, contradictory and inconsistent with previous comments demonstrating a complete lack of evidence that juvenile green sturgeon occupy the lower Yuba River.

7.6.2 RPA Action No. 6 – Predator Control Program

FINAL BO STATEMENT (Pages 236 and 237)

Addressing a short-term predatory control plan, the Final BO states "*Five areas have been identified associated with Daguerre Point Dam that have populations of predators. These areas are: (a) just downstream of Daguerre Point Dam at the plunge pool; (b) at the South Yuba/Brophy diversion; (c) at the Hallwood-Cordua diversion canal and fish screens; (d) at the outlet of the Hallwood-Cordua fish screen fish return pipe, and just downstream; and (e) at the entrance of the Browns Valley Irrigation District diversion. The Corps shall provide a predator reduction and monitoring plan to NMFS for approval by September 1, 2012. The plan shall address the predator population monitoring, and timing and methods for predator reduction at the five locations. The Corps shall implement a predator reduction program by November 1, 2012. The predator reduction and monitoring plan shall be updated annually, by August 1 of*

<u>each year</u>. A <u>report will be provided to NMFS August 1 of each year</u> providing information about the predator population, and the results of the predator deduction efforts.

COMMENT

First, this component of the RPA is requiring the Corps to take action and implement programs associated with diversion facilities that are not part of the Proposed Action, as described in the Corps BA. Thorough discussions regarding diversions and diversion facilities and infrastructure are provided in Sections 3.3 and 6.0 of the Corps BA. For example, on page 3-30 of the Corps BA, it is stated that "*…The Proposed Action does not include operation and maintenance of the irrigation diversion facilities located at or in the vicinity of Daguerre Point Dam. Operation and maintenance responsibilities associated with each of the diversion facilities are, and will remain, the responsibility of each of the respective individual non-federal irrigation districts. The Corps is not responsible for continued operations and maintenance of these facilities*." From information provided in the Corps BA, it is questionable whether NMFS can direct the Corps to implement the stated predator control actions, particularly those involving the two locations identified associated with the Hallwood-Cordua diversion, and Browns Valley Irrigation District (BVID).

Second, to prepare a scientifically credible plan that would effectively address each of the three concerns identified by NMFS in the Final BO – "*predator population monitoring, and timing and methods for predator reduction"* and other technical issues, it would be difficult for the Corps to meet the date (September 2012) imposed by the Final BO.

Third, the Final BO states that the "*immediate predator control plan*" is to be updated annually, by August 1 of each year and a report is to be provided to NMFS by August 1 of each year. Therefore, it is unclear what the duration of this RPA action is intended to be, and how it would differ from or be integrated into RPA action PC 2. – Predator Control Plan, which requires a long-term plan be implemented by December 2013.

Fourth, the Final BO does not refer to or establish a date for development or review of the long-term predator control plan. Rather, the Final BO simply states that the long-term plan be implemented by December 2013.

<u>**FINAL BO STATEMENT** (Page 247)</u>

"Removal of predators at the South Yuba/Brophy Diversion rock weir and return channel, Hallwood-Cordua Diversion canal, Hallwood-Cordua fish return pipe, Daguerre Point Dam face and fish ladders, and the Browns Valley Diversion channel <u>is likely to reduce predation at these structures by between 90 and 95 percent</u>. This <u>reduction in predation could allow for survivorship of up to 250,000 outmigrating spring-run Chinook and Central Valley steelhead annually"</u>

COMMENT

This statement is particularly perplexing, due to lack of substantiation in the Final BO.

First, careful review of the Final BO did not discover any basis to speculate that a predator removal program at the specified locations would reduce predation by 90 to 95 percent.

Second, no reliable quantification of predation currently occurring at any of these structures is presently available.

Third, no discussion or assessment are provided in the Final BO regarding the potential effectiveness of a predator removal program.

Fourth, to suggest that a specific number of additional outmigrating juveniles (such as 250,000) would result from an unspecific action, with unknown potential effectiveness, addressing an un-quantified stressor provides a false sense of quantification that has no credible scientific basis, as presented in the Final BO.

7.7 RPA Action No. 7 - Salmonid Monitoring and Adaptive Management Program

Action number seven under the RPA requires the Corps to establish a Salmonid Monitoring and Adaptive Management Program (SMAMP). As presented in the Final BO (page 238) the program is comprised of two components – SMAMP 1 and SMAMP 2.

COMMENT

Clarification is required clearly distinguishing between SMAMP 1 and SMAMP 2. As written, the distinction between these two components of the SMAMP is not clear.

FINAL BO STATEMENTS

- **Page 221 –** *"NMFS also recognizes that the Yuba River Management Team (RMT) established in the Lower River Yuba Accord has been an effective forum for addressing fish issues in the lower Yuba River."*
- **Pages 237 and 238 –** *"Immediately after the issuance of this biological opinion the Corps shall establish this program. The program shall be staffed by the Corps and will be guided by the policy and management advice of an interagency steering committee. The steering committee will be comprised of salmonid experts and representative from the Corps, NMFS, USFWS, CDFG and academic or other agency science programs or steering committees. The program also shall establish a salmonid technical sub-committee. The committees may also have members from other organizations."*

COMMENT

In the above statements, the Final BO recognizes the effectiveness of the Yuba Accord RMT, which has been primarily funded by YCWA. YCWA is an applicant for this consultation. The manner in which composition of the steering committee as described appears to exclude YCWA. Clarification should be provided regarding this issue.

Moreover, additional clarification should be provided regarding the manner in which ongoing activities of the Yuba Accord RMT would be integrated/coordinated with the newly established SMAMP steering committee, the salmonid technical sub-committee, and ongoing data collection and analyses.

8.0 Amount or Extent of Incidental Take

This section of the review of the Final BO first provides comments on the introductory language for Section XII – Incidental Take Statement, then comments are provided on specific statements within the three tables (XII-a, XII-b, and XII-c), which provide a summary of the incidental take statement for spring-run Chinook salmon, steelhead and green sturgeon.

FINAL BO STATEMENT (Page 250)

"The expected effects of the proposed action in the Yuba River will result in potential death, injury, or harm to the freshwater life stages of spring-run Chinook salmon, Central Valley steelhead, and/or the Southern DPS of North American green sturgeon in the Yuba and occasionally the lower Feather River downstream from the confluence with the Yuba River. These effects are the result of continued operation of the proposed action."

COMMENT

First, the statement in the Final BO that the Proposed Action will occasionally "*result in potential death, injury, or harm*" to listed species in the lower Feather River downstream from the confluence with the Yuba River is not supported. Careful review of the Final BO did not locate analyses or discussion in the effects assessment of how the Proposed Action would kill, injure or harm listed species in the lower Feather River.

Second, the summaries of incidental take of spring-run Chinook salmon, steelhead and green sturgeon including the identified stressor, type of incidental take, and the amount or extent of take are mostly associated with the Environmental Baseline. As stated in the Corps BA (pages 3-1 and 3-3), the Proposed Action includes the Corps' continued operation and maintenance of Englebright and Daguerre Point dams on the lower Yuba River, and recreational facilities on and around Englebright Reservoir. Operations also include the issuance and administration of new and existing permits, licenses and easements. As presented in the Corps BA, the existence and ongoing effects of Englebright Dam, in particular, are part of the Environmental Baseline and are not attributable to the Proposed Action.

8.1 Spring-run Chinook Salmon

FINAL BO STATEMENT (Page 252)

Component from Table XII-a. Summary of incidental take of Central Valley spring-run Chinook salmon.

Life Stage	Stressor	Type of Incidental Take CV Spring-run Chinook Salmon	Amount or Extent of Take (Take Exemption)
Adult Migration and Holding	Englebright Dam and associated hydroelectric Facilities	Harm: Adult fish attempting to migrate upstream at Englebright Dam Hydroelectric Facilities. This significantly impairs normal migration behavior and prevents fish from reaching upstream migration corridors, spawning habitat and rearing habitat.	Up to 100 adult fish per year at Narrows II tailrace from February to August though year 2016. Once NMFS-approved assisted fish passage is implemented as described in the RPA, the exemption will be extended through January 31, 2020.

COMMENT

First, the potential harm referenced in this component of Table XII-a is based upon reported observations of Chinook salmon congregated near the Narrows II outlet in the lower Yuba River. Those observations did not specifically report that spring-run Chinook salmon were attempting to migrate into the powerhouse facilities.

Second, it is unclear what analyses or evaluation served as the basis to determine that "normal" migratory behavior would be "*significantly*" impaired.

Third, this issue is being studied as part of the Yuba River Development Project FERC relicensing process, which is undergoing a separate ESA consultation.

Fourth, as presented in the Corps BA, the existence and ongoing effects of Englebright Dam, in particular, are part of the Environmental Baseline and are not attributable to the Proposed Action. Under existing conditions, the lower Yuba River only extends an additional 0.1 mile upstream of Narrows II to Englebright Dam, and that area does not provide suitable spawning habitat.

FINAL BO STATEMENT (Page 253)

Component from Table XII-a. Summary of incidental take of Central Valley spring-run Chinook salmon.

Life Stage	Stressor	Type of Incidental Take CV Spring-run Chinook Salmon	Amount or Extent of Take (Take Exemption)
Spawning And Egg Incubation	Limited spawning habitat available downstream from Englebright Dam. Includes bedload and spawning gravel depletion, habitat compression and forced relocation of spawning adults downstream from Englebright Dam	Harm: Limited spawning habitat availability and reproductive failure downstream from Englebright Dam that significantly contributes to a reduction of available spawning habitat (reduces population abundance) and increased levels of redd superimposition (results in the death of incubating CV spring-run Chinook salmon eggs)	The annual number of adult fish that are affected by spawning gravel depletion and superimposition per year through the first seven years of the gravel augmentation action in the RPA. The physical indicator of take during this period is associated with the difference between the total spawning gravel depletion in the reach (60,000 – 100,000 tons) and the amount of gravel required in the RPA (15,000 tons per year). The exemption will be reviewed and extended by NMFS on an annual basis depending based on performance of RPA (i.e., placement of required gravel amounts). Once NMFS-approved assisted fish passage is implemented as described in the RPA, the exemption will be extended through January 31, 2020 as necessary.

COMMENT

The potential harm referenced in this component of Table XII-a is associated with the existence of Englebright Dam. As presented in the Corps BA, the existence and ongoing effects of Englebright Dam are part of the Environmental Baseline and are not attributable to the Proposed Action. Also, previous comments have demonstrated the abundance of suitable spawning habitat in the lower Yuba River, and also acknowledged that the relatively short (i.e., 0.89 mile) Englebright Dam Reach did not provide suitable spawning gravel, until the Corps initiated their gravel augmentation program. This and related issues are more fully addressed in comments provided by Dr. Pasternack.

FINAL BO STATEMENT (Page 254)

Component from Table XII-a. Summary of incidental take of Central Valley spring-run Chinook salmon.

Life Stage	Stressor	Type of Incidental Take CV Spring-run Chinook salmon	Amount or Extent of Take (Take Exemption)
Spawning And Egg Incubation	Limited spawning habitat available downstream from Englebright Dam Hybridization with fall-run Chinook salmon and hatchery Chinook salmon	Harm: Limited spawning habitat availability downstream from Englebright Dam also significantly contributes to increased levels of hybridization with fall-run Chinook salmon and Feather River hatchery salmon, which injures individuals by reducing their reproductive fitness and fecundity	91 percent of spawning adults in all years and water year types from Englebright dam downstream to Deer Creek, from September through November until 2018 when the NMFS-approved assisted fish passage is in place and implemented as implemented as described in the RPA. Once a NMFS-approved assisted fish passage is implemented as described in the RPA, the exemption will be extended through December 31, 2020.

COMMENT

It is unclear how "reduced reproductive fitness and fecundity" of individuals would result from hybridization, as suggested by the statement of harm referenced in this component of Table XII-a. It is also unclear what is meant by "*reproductive fitness*". Clarification should be provided.

It also is unclear how the amount of take referenced in this component of Table XII-a was determined. Review of the Final BO found the following two references regarding 91 percent of adults:

- **Page 177** – "*Introgression with all other populations of Chinook salmon has resulted in 91 percent hybridization (Barnett-Johnson el al. 2011), which diminishes the independent genetic contribution of the Yuba River population.*"
- **Page 202** – "*Given that an estimated 91 percent of spawning spring-run Chinook salmon in the Yuba River represent hatchery fish or wild spring-run Chinook salmon with natal origins outside of the Yuba River, these fish are not likely to contribute to the success of other populations in the Northern Sierra Diversity Group.*"

These references pertain to preliminary data resulting from microchemistry analyses of otoliths obtained from spawned-out Chinook salmon carcasses in the lower Yuba River during the fall of 2009. Because both phenotypic spring-run and fall-run Chinook salmon spawned during the fall, otoliths taken from the carcasses contained an unknown mixture of both runs. Therefore, it would be more accurate to state that for the one year of sampling, 91 percent of sampled Chinook salmon carcasses were determined to be of non-natal Yuba River origin.

Nonetheless, it is unclear how this information pertains to determination of the amount or extent of incidental take, and why the take statement specifically is restricted to the 0.89-mile reach extending from Englebright Dam downstream to Deer Creek, which represents a relatively small portion of the total spawning area in the lower Yuba River.

FINAL BO STATEMENT (Page 254)

Component from Table XII-a. Summary of incidental take of Central Valley spring-run Chinook salmon.

Life Stage	Stressor	Type of Incidental Take CV Spring-run Chinook salmon	Amount or Extent of Take (Take Exemption)
Juvenile rearing and downstream migration	Predation associated with Daguerre Point Dam	Death: Individuals are eaten and killed by predatory fish downstream from Daguerre Point Dam	Year round at the plunge pool downstream from Daguerre Point Dam through November 1, 2012. Up to 55 percent of individuals are expected to be killed through November 1, 2012. Upon NMFS-approval and Corps implementation of a predator reduction and monitoring plan on November 1, 2012, NMFS will review and modify the take exemption as necessary.

COMMENT

The amount or extent of take referenced in this component of Table XII-a is associated with predation at the plunge pool downstream of Daguerre Point Dam. As stated in the Final BO (page 251) "*Specific predation rates are not available at Daguerre, so predation rates from RBDD prior to gate management improvements were applied with the assumption that they are similar.*"

The need for additional justification for the amount of 55 percent of all spring-run Chinook salmon juveniles included in this take statement is described in a previous comment. In summary, the actual statement in USFWS (1988) is "*…disorientation of downstream migrants due to passage under the dam gates and through the Tehama-Colusa Canal headworks fish bypass system causes increased vulnerability to predators*." There are no gates at Daguerre Point Dam which juvenile anadromous outmigrant salmonids would pass under and thereby become disoriented. At Daguerre Point Dam, the potential for juvenile downstream migrant salmonids to become "disorientated" by passing over Daguerre Point Dam occurs when water is spilling over the dam – otherwise, juveniles pass through the fish ladders or around the dam through the Hallwood-Cordua diversion canal (which contains a fish bypass pipe) or the South Yuba/Brophy diversion canal (which does not contain a fish bypass pipe). This combination of passage routes does not inherently appear to be similar to passing under the diversion gates at RBDD. Also, the Final BO does not provide discussion regarding the similarities, or particularly the lack thereof, between the gates at RBDD and the plunge pool below Daguerre Point Dam.

8.2 Steelhead

FINAL BO STATEMENT (Pages 255 through 257)

Table XII-b, "*Summary of incidental take of California Central Valley steelhead*", is essentially the same as Table XII-a that summarized incidental take for spring-run Chinook salmon. Hence, the foregoing comments on the summary of spring-run Chinook salmon incidental take also pertain to steelhead. The one notable exception regards the amount or extent of take of spawning and egg incubation, where 91 percent of all spawning adults was specified for spring-run Chinook salmon, by contrast to all steelhead adults.

8.3 Green Sturgeon

<u>**FINAL BO STATEMENT** (Page 258)</u>

The title of Table XII-c is "*Summary of incidental take of green sturgeon. The table is organized by life stage <u>then by the number of populations affected</u> by a particular stressor*." [emphasis added]

COMMENT

It is unclear why the table indicates that a number of green sturgeon populations are potentially affected by a particular stressor associated with the Proposed Action. Further, contents of the table do not address multiple populations of green sturgeon. Clarification should be provided.

<u>**FINAL BO STATEMENT** (Page 258)</u>

Component from Table XII-c. Summary of incidental take of green sturgeon. The table is organized by life stage then by the number of populations affected by a particular stressor.

Life Stage	Stressor	Type of Incidental Take of Green Sturgeon	Amount or Extent of Take (Take Exemption)
Adult Migration	Blocked upstream passage at Daguerre Point Dam	Injury: Wounded individuals that leap onto the concrete dam apron of Daguerre Point Dam or unsuccessfully attempt to migrate through the fish ladders Harm: Access to historic upstream habitat is blocked by Daguerre Point Dam. Adult fish are not able to ascend the ladder or swim over the dam. This significantly impairs essential behaviors including upstream migration, and spawning	Annual between March and June through 2018 when fish passage improvements are approved by NMFS and implemented pursuant to the RPA, upon which time NMFS will review and amend the take exemptions as necessary.

COMMENT

Previous comments noted that no documentation or reports exist of green sturgeon leaping onto the concrete apron at Daguerre Point Dam, or attempting to enter the fish ladders. Previous comments also have documented that there have been no historical accounts of green sturgeon spawning in the lower Yuba River, particularly upstream of Daguerre Point Dam. Clarification should be provided.

FINAL BO STATEMENT (Page 258)

Component from Table XII-c. Summary of incidental take of green sturgeon.

Life Stage	Stressor	Type of Incidental Take of Green Sturgeon	Amount or Extent of Take (Take Exemption)
Holding	Impacts to quantity and quality of holding habitat related to flow and habitat diversity and lack of preferred habitat in the lower Yuba River.	Harm: Degradation of holding habitat from flows that minimizes the holding habitat availability of post-spawned adults downstream from Daguerre Point Dam.	Annual between June and November downstream from Daguerre Point Dam, until 2015, when fish passage improvements described in the RPA are met. Upon NMFS approval of the fish passage improvement plan and its implementation, the take exemption will be reviewed and extended as necessary.

COMMENT

First, it is unclear how the expected effects of the Proposed Action include lack of "preferred" habitat in the lower Yuba River. Previous comments have noted that reference to "preferred" green sturgeon habitat include moderate to deep turbulent or eddying water, and deep holes (≥ 5 m depth) at the mouths of tributary streams. Clarification should be provided how the Proposed Action potentially affects these conditions.

Second, the potential harm referenced in this component of Table XII-c infers that the Final BO conducted some analyses relating holding habitat to flow rates. However, no such analyses were found in the Final BO. By contrast, as previously noted, the Corps BA did conduct an analysis of the relationship between pool depth (and pool areal extent), water temperature and flow rates in the lower Yuba River and found (page 8-90) that the Cumulative Condition would result in minor changes in pool depth, areal extent or water temperature over a range of exceedance probabilities year-round, and would not result in substantive impacts affecting green sturgeon in the lower Yuba River.

FINAL BO STATEMENT (Page 259)

Component from Table XII-c. Summary of incidental take of green sturgeon.

Life Stage	Stressor	Type of Incidental Take of Green Sturgeon	Amount or Extent of Take (Take Exemption)
Spawning	Impacts to quantity and quality of spawning habitat	Harm: Degradation of spawning habitat from flows that minimize the holding habitat availability of post-spawned adults downstream from Daguerre Point Dam.	Annual between March and June downstream from Daguerre Point Dam, until 2015, when fish passage improvements described in the RPA are met. Upon NMFS approval of the fish passage improvement plan and its implementation, the take exemption will be reviewed and extended as necessary

COMMENT

First, the potential harm statement in this component of Table XII-c appears to be a copying error from the previous component, referencing post-spawned adults rather than spawning.

Second, the previous comment pertains to this component as well.

FINAL BO STATEMENT (Page 259)

Component from Table XII-c. Summary of incidental take of green sturgeon.

Life Stage	Stressor	Type of Incidental Take of Green Sturgeon	Amount or Extent of Take (Take Exemption)
Juvenile rearing and downstream migration	Predation downstream from Daguerre Point Dam	Death: Individuals are eaten and killed by predatory fish downstream from Daguerre Point Dam.	Year round at the scour pool downstream from Daguerre Point Dam through November 1, 2012. Up to 55 percent of individuals are expected to be killed through November 2012. Upon NMFS-approval and Corps implementation of a predator reduction and monitoring plan on November 1, 2012, NMFS will extend the take exemption as necessary.

COMMENT

It is recognized that it is difficult to quantify or estimate predation rates on green sturgeon juveniles in the lower Yuba River, particularly in consideration that they have never been observed or documented in the river. On page 251 of the Final BO, the statement is made that "*Specific predation rates are not available at Daguerre, so predation rates from RBDD prior to gate management improvements were applied with the assumption that they are similar. Also, absent predation rates specific to green sturgeon, we applied the salmonid predation rates from RBDD.*"

However, clarification and/or modification of the amount or extent of take of green sturgeon juveniles due to predation should be provided because green sturgeon do not occur upstream of Daguerre Point Dam, and therefore it may not be appropriate to assume anadromous salmonid predation rates associated with potential disorientation from passing through, over or around a dam.

9.0 Literature Cited

Barnett-Johnson, R., D. Massa, J. Bergman, T. Johnson, and G. Whitman. 2011. One Fish, Two Fish, Where Fish, Stray Fish: Natal Origins of Adult Chinook Salmon on the Yuba River. Yuba River Symposium. July 2011.

CDFG. 1988. Memorandum from Deborah Konoff at CDFG to Fred Meyer Regarding the South-Yuba Brophy Study. November 18, 1988.

CDFG. 1998. Report to the Fish and Game Commission: A Status Review of the Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*) in the Sacramento River Drainage. Candidate Species Status Report 98-01. June 1998.

Corps. 2011. Technical Memorandum: Lower Yuba River, California, Segregation Weir Considerations. Exhibit 1 to the August 23, 2011 Declaration of Brian M. Mulvey. United States District Court for the Eastern District of California, Sacramento Division, Case 2:06-cv-02845-LKK-JFM.

Corps. 2012. Biological Assessment for the U. S. Army Corps of Engineers Ongoing Operation and Maintenance of Englebright Dam and Reservoir, and Daguerre Point Dam on the Lower Yuba River. U. S. Army Corps of Engineers, Sacramento District. January 2012.

Corps. 2012a. General Comments on NMFS Biological Opinion for the U.S. Army Corps of Engineers Operation and Maintenance of Englebright Reservoir on the Yuba River. February 28, 2012.

Cramer Fish Sciences. 2011. Memo: Green Sturgeon Observations at Daguerre Point Dam, Yuba River, CA. Prepared for the USFWS AFRP (Grant No. 813329G011). Prepared by P. Bergman, J. Merz, and B. Rook. June 7, 2011.

Cramer, S. P. 1992. Written Testimony of Steven P. Cramer. Public Hearing of Fishery and Water Right Issues on the Lower Yuba River. Before the State Water Resources Control Board Division of Water Rights. February 10, 11, and 13, 1992.

Cramer, S. P. 2000. Evaluation of Juvenile Chinook Entrainment at the South Yuba-Brophy Diversion Headworks. South Yuba Water District, Exhibit 2. Final Report. Prepared by S.P. Cramer & Associates, Inc. Prepared for South Yuba-Brothy and Yuba County Water Agency.

Demko, D. B. and S. P. Cramer. 1993. Evaluation of Juvenile Chinook Entrainment at the South Yuba-Brothy Diversion Headworks. Final Report. Prepared by S.P. Cramer & Associates, Inc. Prepared for South Yuba-Brothy and Yuba County Water Agency.

Drury, I. 2001. Lower Yuba River Juvenile Chinook Salmon, *Oncorhynchus tshawytscha*, and Juvenile Steelhead Trout, *Oncorhynchus mykiss*, Salvage at the Hallwood-Cordua Water Diversion Fish Screen, 2000. California Department of Fish and Game, Sacramento Valley and Central Sierra Region.

Emmett, R. L., S. A. Hinton, S. L. Stone, and M. E. Monaco. 1991. Distribution and Abundance of Fishes and Invertebrates in West Coast Estuaries. Volume II: Species Life History Summaries. ELMR Report No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, Maryland.

Federal Register. 2009. NMFS. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. 74 FR 52300.

Good, T. P., R. S. Waples, and P. Adams. 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-66. June 2005.

HDR. 2012. Responses to the January 31, 2012 Letter from Environmental Advocates on Behalf of the South Yuba River Citizens League to the National Marine Fisheries Service Regarding Comments on the Draft Biological Assessment for the United States Army Corps of Engineers Operations on the Yuba River. February 23, 2012.

ICF Jones & Stokes. 2008. Literature Search and Data Analysis of Fish Loss at Unscreened Diversions in California's Central Valley. Final Study Report. Prepared for U.S. Fish and Wildlife Service. November 26, 2008.

Lindley, S. T., R .S. Schick, E. Mora, P. B. Adams, J. J. Anderson, S. Greene, C. Hanson, B. P. May, D. McEwan, R. B. MacFarlane, C. Swanson, and J. G. Williams. 2007. Framework for Assessing Viability of Threatened and Endangered Chinook Salmon and Steelhead in the Sacramento-San Joaquin Basin. San Francisco Estuary and Watershed Science. Volume 5(1): Article 4.

Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish Species of Special Concern in California. 2nd Edition. California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, California.

NAFWB. 2004. Memorandum from NAFWB to B. Curtis Regarding Water Velocity Measurements at Gravel Dike, South Yuba Brophy Diversion, Yuba River.

NMFS. 2002. Biological Opinion on the Effects of the Corps' Operation of Englebright Dam and Daguerre Point Dam on the Yuba River, in Yuba and Nevada Counties, California, on the Threatened Central Valley Spring-Run Chinook Salmon (*Oncorhynchus tshawtscha*), the Central Valley Steelhead (*0. mykiss*) and Their Respective Designated Critical Habitats.

NMFS. 2007. Policy Statement of NOAA's National Marine Fisheries Service Regarding the Yuba County Water Agency's Petitions for the Lower Yuba River Accord Before the California State Water Resources Control Board. December 5, 2007.

NMFS. 2007a. Final Biological Opinion on the Effects of Operation of Englebright and Daguerre Point Dams on the Yuba River, California, on Threatened Central Valley Steelhead, the Respective Designated Critical Habitats for these Salmonid Species, and the Threatened Southern Distinct Population Segment of North American Green Sturgeon. November 21, 2007.

NMFS. 2008. Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species October 1, 2006 – September 30, 2008. Prepared by the Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. U.S. Department of Commerce.

NMFS. 2008a. Proposed Designation of Critical Habitat for the Southern Distinct Population Segment of North American Green Sturgeon. Draft Biological Report. September 2008.

NMFS. 2009. Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon, and the Distinct Population Segment of Central Valley Steelhead. National Marine Fisheries Service, Southwest Regional Office, Sacramento, California. October 2009.

NMFS. 2009a. Final Biological Report: Designation of Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. National Marine Fisheries Service, Southwest Region Protected Resources Division. October 2009.

NMFS. 2009b. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project.

NMFS. 2009d. Draft Biological and Conference Opinion for the Federal Energy Regulatory Commission's Relicensing of the California Department of Water Resources Oroville Facilities (FERC Project No. 2100-134). July 2, 2009.

NMFS. 2009e. Designation of Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Biological Report. October 2009.

NMFS. 2011a. 5-Year Review: Summary and Evaluation of Central Valley Spring-Run Chinook Salmon ESU. Central Valley Recovery Domain. National Marine Fisheries Service, Southwest Region.

NMFS. 2011b. 5-Year Review: Summary and Evaluation of Central Valley Steelhead DPS. Central Valley Recovery Domain. National Marine Fisheries Service, Southwest Region.

NMFS. 2012. Final Biological Opinion on the U.S. Army Corps of Engineers Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir. February 29, 2012.

NMFS. 2012a. Draft Biological Opinion on the U.S. Army Corps of Engineers Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir. February 28, 2012.

Poff, N. L., J. D. Allan, M. B. Bain, J. R. Karr, K. L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. The Natural Flow Regime; A Paradigm for River Conservation and Restoration. BioScience. Volume 47: 769 – 784.

RMT. 2010. Technical Memorandum: Lower Yuba River Water Temperature Objectives. November 2010.

Stillwater Sciences. 2012. Modeling Habitat Capacity and Population Productivity for Spring-run Chinook Salmon and Steelhead in the Upper Yuba River Watershed. Technical Report. Prepared for National Marine Fisheries Service. February 2012.

USFWS. 1988. Fish Passage Action Program for Red Bluff Diversion Dam. Final Report on Fishery Investigations. U. S. Fish and Wildlife Service Report No. FR1/FAO-88-19. October 1988.

USFWS. 1990. An Analysis of Fish and Wildlife Impact of Shasta Dam Water Temperature Control Alternatives. Fish and Wildlife Coordination Act Report. U.S. Fish and Wildlife Service, Region 1. December 1990.

USFWS. 2010a. Flow-Habitat Relationships for Spring and Fall-run Chinook Salmon and Steelhead/Rainbow Trout Spawning in the Yuba River. U. S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Energy Planning and Instream Flow Branch. August 26, 2010.

USFWS. 2010b. Flow-Habitat Relationships for Juvenile Fall/Spring-run Chinook Salmon and Steelhead/Rainbow Trout Rearing in the Yuba River. U. S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office. Energy Planning and Instream Flow Branch. October 8, 2010.

USFWS. 2010c. Relationships Between Flow Fluctuations and Redd Dewatering and Juvenile Stranding for Chinook Salmon and Steelhead/Rainbow Trout in the Yuba River. U. S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Energy Planning and Instream Flow Branch. September 15, 2010.

USFWS and NMFS. 1998. Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. Final. March 1998.

UYRSPST. 2007. Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared for California Department of Water Resources Prepared by Upper Yuba River Studies Program Study Team. November 2007.

Vogel, D. A. 2006. Assessment of Adult Anadromous Salmonid Migration Barriers and Holding Habitats in the Upper Yuba River. Prepared by Natural Resource Scientists, Inc., Red Bluff, California for CH2MHill, Sacramento, California. Appendix C in Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared by UYRSPST for California Department of Water Resources, Sacramento, California.

Williams, T. H., E. P. Bjorkstedt, W. G. Duffy, D. Hillemeier, G. Kautsky, T. E. Lisle, M. McCain, M. Rode, R. G. Szerlong, R. S. Schick, M. N. Goslin, and A. Agrawal. 2006. Historical Population Structure of Coho Salmon in the Southern Oregon/Northern California Coasts Evolutionarily Significant Unit. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-390. June 2006.

Williams, T. H., B. C. Spence, W. Duffy, D. Hillemeier, G. Kautsky, T. E. Lisle, M. McCain, T. E. Nickelson, E. Mora, and T. Pearson. 2008. Framework for Assessing Viability of

Threatened Coho Salmon in the Southern Oregon/Northern California Coast Evolutionarily Significant Unit. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-432. December 2008.

Williams T. H., S. T. Lindley, B. C. Spence, and D. A. Boughton. 2011. Status Review Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Southwest. National Marine Fisheries Service, Southwest Fisheries Science Center, Fisheries Ecology Division. Update to January 5, 2011, Report. May 20, 2011.

YCWA, DWR, and Reclamation. 2007. Draft Environmental Impact Report/Environmental Impact Statement for the Proposed Lower Yuba River Accord. State Clearinghouse (SCH) No: 2005062111. Prepared by HDR|Surface Water Resources, Inc. June 2007.

ATTACHMENT 1

TECHNICAL REPORT REVIEW

MODELING HABITAT CAPACITY AND POPULATION PRODUCTIVITY FOR SPRING-RUN CHINOOK SALMON AND STEELHEAD IN THE UPPER YUBA RIVER WATERSHED (STILLWATER SCIENCES 2012)

Prepared by:

HDR Engineering, Inc.

2365 Iron Point Road, Suite 300

Folsom, CA 95630

June 2012

1.0 Overview

The National Marine Fisheries Service (NMFS) contracted Stillwater Sciences to develop an exploratory application of a model, referred to as RIPPLE, to quantify habitat carrying capacity and freshwater productivity potential for spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) in the Upper Yuba River Watershed. This effort was conducted as part of the Habitat Assessment and Reintroduction Implementation Plan for Central Valley spring-run Chinook salmon and steelhead (Stillwater Sciences 2012). The culmination of this effort resulted in a report titled "*Modeling Habitat Capacity and Population Productivity for Spring-run Chinook Salmon and Steelhead in the Upper Yuba River Watershed*" prepared by Stillwater Sciences (2012). This document provides a technical review of the Stillwater Sciences (2012) report.

Stillwater Sciences made an intrepid effort to develop a spatially explicit model to quantify species-specific habitat carrying capacity and freshwater productivity potential in the Yuba River Watershed upstream of Englebright Dam. As stated by Stillwater Sciences (2012), the RIPPLE model application for the Upper Yuba River Watershed is best suited to explore watershed-scale habitat conditions. Considerable effort was expended to develop and parameterize the RIPPLE model. However, the model is constrained by the limited availability of empirical data to parameterize the model, and by assumed model inputs.

One of the major concerns associated with Stillwater Sciences (2012) is the potential for inappropriate application or interpretation of the results presented. For example, Stillwater Sciences (2012, page ES-1) provide a cautionary note by referring to their report as "*an <u>exploratory application</u> of the spatially explicit model, RIPPLE, to quantify habitat carrying capacity and freshwater productivity potential for these two salmonid species in the upper Yuba River watershed*." Undue specificity should not be attributed to model results, nor should the results be relied upon as accurate predictions of habitat carrying capacity or productivity. Rather, if the various assumptions and inputs to the RIPPLE model are consistently applied among rivers and reaches examined, then the results could provide initial relative indications of carrying capacity and productivity among areas compared, and help inform the decision-making process. However, as stated by NMFS in their February 29, 2012 Biological Opinion on the U.S. Army Corps of Engineers Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir (NMFS 2012, page 223) *"The location, quantity, and condition of habitat must be inventoried and assessed in order to evaluate the current carrying capacity and restoration potential. This information is essential to determine where passage and reintroduction are most likely to improve reproductive success for listed fish."*

A fundamental concern associated with the potential misapplication or misinterpretation of the RIPPLE model results stems from the fact that it does not account for conditions that change over time, which is an inherently important consideration regarding abundance and productivity of anadromous salmonids. In fact, Stillwater Sciences (2012, page ES-2) state "*One of the guiding principles of RIPPLE is the assumption that physical processes and the resulting environment… are essentially time invariant compared with ecosystems and the animal and plant populations supported by these ecosystems.*" [emphasis added] Clearly, flow and water temperatures are not "*time invarian*t", but change year-to-year based on hydrologic and meteorological conditions. Model output presented in Stillwater Sciences (2012) does not account for abiotic variables that change over time (e.g., flows and water temperatures), does not address resultant variability in salmonid habitat availability and suitability, and consequently does not represent reliable long-term estimates of population production. Applications of model output inferring long-term population production, or the veracity of a long-term reintroduction program into the Upper Yuba River Watershed are, therefore, inappropriate.

Comments on Stillwater Sciences (2012) are provided below. The following comments are organized to address general categories first, followed by specific comments.

Numerous assumptions are embedded in the Stillwater Sciences (2012) report that inject bias and result in higher estimates of habitat carrying capacity and population productivity in the South and Middle Yuba rivers, and in the North Yuba River below New Bullards Bar Dam, relative to the North Yuba River upstream of New Bullards Bar Reservoir. Examples of these bias-inducing assumptions/approaches include:

- ❑ Relaxed ("expanded") water temperature suitability criteria for steelhead in the South and Middle Yuba rivers, which significantly increase the amounts of potentially suitable habitat, and no relaxed water temperature criteria for the North Yuba River.
- ❑ "Augmented" flow conditions for the South and Middle Yuba rivers, which represent speculative increased releases out of upstream storage facilities, to improve habitat conditions (particularly water temperature). By contrast, the North Yuba River above New Bullards Bar Reservoir is unimpaired, and most accurately represents a hydrologically undisturbed watershed, and no "augmented" releases are presented.
- ❑ Anadromous salmonid passage barriers, particularly barriers that block the upstream passage of fish during low-flow conditions, were assumed to either be nonexistent or some unidentified passage facilities provided on the South and Middle Yuba rivers, which vastly increases the estimated amount of habitat available and resultant population production. No such passage barriers exist on the North Yuba River upstream of New Bullards Bar Reservoir.
- ❑ Appropriate spawning gravels are not present in the North Yuba River downstream from New Bullards Bar Dam. In fact, this reach is characterized by very large boulders. However, a "gravel augmentation" assumption was made for this reach, which transforms unsuitable spawning habitat into suitable and usable habitat in the comparison among reaches.

2.0 General Comments

Stillwater Sciences (2012) state "*The upstream and downstream extent of potential habitat under each modeled scenario was defined for modeling purposes by applying four criteria: (1) known natural barriers (Yoshiyama el al. (2001) and Vogel (2006), (2) channel gradient thresholds, (3) channel width thresholds, and (4) water temperature thresholds*."

The following issues and comments pertain to information presented in Stillwater Sciences (2012), and the manner in which the longitudinal extent of potential habitat was estimated for each of the rivers and reaches evaluated through application of the four criteria.

2.1 Longitudinal Extent of Potential Habitat – Four Criteria

2.1.1 Natural Barrier Criteria

ISSUE

Stillwater Sciences (2012, page ES-3) state "*For purposes of this assessment it was assumed that passage by salmon and steelhead would be possible in the mainstem reaches of each sub-basin up to existing natural passage barriers…"* Stillwater Sciences (2012, page 16) also state *"The current upstream extent of accessible habitat in the mainstem North Yuba, Middle Yuba, and South Yuba rivers is defined by existing natural fish passage barriers (Table 4-2). As discussed previously, all modeling scenarios, including current conditions, assumed that upstream and downstream passage would be provided up to these absolute barriers."*

COMMENT

Stillwater Sciences (2012) state that the river miles of potential habitat available in the South, Middle and North Yuba rivers represent the location of natural barriers to migration based on Vogel (2006) and Yoshiyama et al. (2001). However, the locations provided in Stillwater Sciences (2012) do not represent all of the salient information provided in the referenced documents. Rather, Stillwater Sciences (2012) used the most upstream located barriers represented as absolute barriers to fish passage.

Stillwater Sciences (2012) did not consider that some of the barriers have been reported to be flow-dependent. The documents referenced by Stillwater Sciences (2012) were reviewed for historical accounts of migration barriers in the Upper Yuba River Watershed, including Yoshiyama et al. (2001) and the Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment Technical Report (DWR 2007), to which Vogel (2006) is an appendix. This review yielded the following information regarding flow-dependent migration barriers. [Note: As acknowledged in Stillwater Sciences (2012, page 13), river mile numbering is not consistent among reports.]

- South Yuba River. Yoshiyama et al. (2001) consider a cascade, with at least a 12-foot drop, located 0.5 miles below the juncture of Humbug Creek as essentially the historical upstream limit of salmon during most years of natural streamflows. This cascade is located at approximately river mile 19.6. According to Yoshiyama et al. (2001), steelhead may have been able to ascend upstream as far as the confluence with Poorman Creek located at approximately river mile 28.5, near the present town of Washington (Yoshiyama et al. 2001). DWR (2007) considered 3 sites to be barriers under low-flow (< approx. 100-200 cfs) conditions, and 12 sites to be total barriers at both low and high river flows. The most downstream low-flow barriers are located at approximately 5.1 and 5.9 river miles upstream from the confluence with the North Yuba River (DWR 2007). The most downstream located total barrier is at approximately river mile 35.4.

  Stillwater Sciences (2012) did not address the issue that a barrier to upstream migration is located as far downstream as river mile 5.1 on the South Yuba River during low-flow conditions. Given that upstream habitats are not accessible under low-flow conditions, and that habitat inaccessibility will prohibit functional carrying capacity with a certain probability of occurrence associated with hydrologic variation, results presented in Stillwater Sciences (2012) do not represent long-term habitat availability or population productivity. It is not possible to estimate long-term population abundance and trends in abundance (in the POP sub-model) without addressing these limitations.

- Middle Yuba River. Yoshiyama et al. (2001) concluded that direct information was lacking on historic abundance and distribution of salmon, and they conservatively considered the 10-foot falls located 1.5 miles above the mouth of the Middle Yuba River as the effective upstream limit of salmon distribution, although steelhead may have been able to ascend upstream as far as the mouth of Bloody Run Creek. DWR (2007) considered 6 sites to be barriers to upstream passage only during low-flow (< approx. 100-200 cfs) conditions, and 2 additional sites to be total barriers, regardless of flow conditions. The most downstream located low-flow barrier is at approximately 0.4 river miles upstream from the mouth of the Middle Yuba River (DWR 2007). The most downstream located total barrier is at approximately river mile 12.

  See the above comment regarding limitations associated with long-term population productivity.

- North Yuba River. Yoshiyama et al. (2001) reported that there were no natural barriers above the New Bullards Bar Dam site, so Chinook salmon and steelhead presumably had been able to ascend upstream potentially as far as Downieville at the mouth of the Downie River. Yoshiyama et al. (2001) further suggest that: (1) there were no natural obstructions from Downieville upstream to Sierra City, where Salmon Creek enters, and

> spring-run Chinook salmon and steelhead most likely were able to traverse that distance; (2) spring-run Chinook salmon and steelhead probably ascended the higher-gradient reaches up to about two miles above the juncture of Salmon Creek; and (3) the absolute upstream limit on the North Yuba River would have been Loves Falls for spring-run Chinook salmon and steelhead. The Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment Technical Report (DWR 2007) did not investigate the North Yuba River. However, NMFS (2011) states that a potential natural barrier to upstream migration of anadromous salmonids is considered to be Love's Falls, located approximately 1 mile upstream of the Haypress Creek confluence, resulting in 35 miles of potential salmonid habitat accessible along the mainstem of the North Yuba River above New Bullards Bar Reservoir.

The fact that barriers in the South and Middle Yuba rivers would prohibit upstream migration of anadromous salmonids during low-flow conditions is particularly relevant to steelhead. For example, Stillwater Sciences (2012, page 8) report that adult steelhead migrate upstream during summer, fall and winter months, and that for the Sacramento River, steelhead migration begins in July and peaks during September. Stillwater Sciences (2012) (Figure 1-1, page 4) also demonstrate, however, that low-flow conditions occur from July through mid-November. Thus, results presented in Stillwater Sciences (2012) do not account for the more downstream-located low-flow barriers and the resultant limitations on long-term habitat availability and population productivity.

ISSUE

Stillwater Sciences (2012, page 20) states "*For modeling purposes it was assumed that a passage solution would be provided to facilitate upstream and downstream fish passage past the small dam at the mouth of Canyon Creek* [tributary to the South Yuba River]."

COMMENT

Similar to the unstated assumption that anadromous salmonid upstream adult passage would always occur at low-flow barriers in the South and Middle Yuba rivers, the foregoing assumption is speculative and biases the amount of habitat availability and population productivity for this tributary to the South Yuba River.

2.1.2 Channel Gradient Threshold Criteria

ISSUE

Stillwater Sciences (2012, page 16) state "*It was assumed that adult spring-run Chinook salmon migrating to holding areas in the spring and early summer could not pass any portion of the* *channel network with a gradient of 12% or greater, or with a sustained (> 300 m) gradient of 8% or greater (CDFG 2003).”*

Additionally, Stillwater Sciences (2012, page 38) state “*Gradients greater than 12% were not considered passable by spring-run Chinook salmon or steelhead and therefore were not included in the modeled channel network*.”

COMMENT

First, Stillwater Sciences (2012) reference CDFG (2003) as the basis for establishing any portion of a stream with a gradient of 12% or greater as impassible for spring-run Chinook salmon. However, review of CDFG (2003) does not support this criterion. No reference to 12% as a passage criterion was found in CDFG (2003). Stillwater Sciences (2012) does not provide any basis for using 12% as a fish passage criterion for adult spring-run Chinook salmon or steelhead.

Second, Stillwater Sciences (2012) reference CDFG (2003) as the basis for establishing any portion of a stream with a sustained (> 300 m [984 ft]) gradient of 8% or greater as impassible for spring-run Chinook salmon. CDFG (2003, page IX-45) states “*...define the upper limit of anadromous habitat when the channel exceeds a sustained eight to ten percent slope for approximately 1,000 feet*.” However, CDFG (2003) does not provide any rationale or referenced studies or literature to support this statement. Additional support for this criterion application in the RIPPLE model should be provided.

ISSUE

Stillwater Sciences (2012, page 18) state *“To define the upstream extent of modeled steelhead habitat in tributaries in each sub-basin it was assumed that adult steelhead migrating to spawning areas in the winter and spring could not pass any portion of the channel network with a gradient of 20% or greater, or with a sustained (> 300 m [984 ft]) gradient of 8% or greater (CDFG 2003).”*

COMMENT

First, Stillwater Sciences (2012) reference CDFG (2003) as the basis for establishing any portion of a stream with a gradient of 20% or greater as impassible for steelhead. However, review of CDFG (2003) does not necessarily support this criterion. Rather, CDFG (2003) actually refers to resident trout or “fish”, not steelhead, and use a gradient of 20% to define resident trout habitat or reaches, not a criterion for steelhead passage, according to the following:

- CDFG (2003, page IX-45) states “*Upper limits of resident fish habitat may include channel reaches with slopes up to 20 percent.”*
- CDFG (2003, page IX-8) states “*Resident trout reaches are defined as channels with gradients up to 20 percent (Robison et al. 2000, SSHEAR 1998)*.”

Second, Stillwater Sciences (2012) reference CDFG (2003) as the basis for establishing any portion of a stream with a sustained (> 300 m [984 ft]) gradient of 8% or greater as impassible for steelhead. See above comment.

ISSUE

Stillwater Sciences (2012, page 55) state "*Although rearing can occur at gradients up to 12%, we assumed steelhead spawning did not occur in reaches with gradients > 8%.*"

COMMENT

No basis for this assumption was located in Stillwater Sciences (2012).

2.1.3 Channel Width Threshold Criteria

ISSUE

Stillwater Sciences (2012, page 16) state "*Channels with a summer low-flow width less than 8.5 m (28 ft) were assumed to be too narrow to provide* [spring-run Chinook salmon] *holding pools with suitable depth (≥ 1.2–2.4 m [4–8 ft]; Grimes 1983, Airola and Marcotte 1985, as cited in Vogel 2006) or spawning habitat. This assumption was based on the channel dimensions in the upper portions of the North and South forks of Antelope Creek where holding spring-run Chinook salmon are commonly observed (C. Harvey Arrison, CDFG, Red Bluff, California, pers. comm., 21 June 2011). This channel width also corresponds with the upstream-most spawning location in Butte Creek (Quartz Bowl) (McReynolds et al. 2005, Stillwater Sciences 2007a).*"

COMMENT

Application of the 28-foot minimum channel width criterion to provide pools with suitable depth (greater than or equal to 4-8 feet) for holding spring-run Chinook salmon does not appear to be justified. Stillwater Sciences (2012) did not provide any rationale or discussion regarding the applicability of Antelope Creek channel dimensions (width-to-depth ratios) to the Upper Yuba River Watershed, and the identical application of those dimensions to the different rivers and reaches in the Upper Yuba River Watershed, which themselves differ. In fact, Stillwater Sciences (2012) does not provide any information suggesting that a channel must be at least 28 feet wide to provide a depth of 4 to 8 feet in any river or reach of the Upper Yuba River Watershed. Also, it should be noted that justifying the 28-foot width criterion by stating that it "… *also corresponds with the upstream-most spawning location in Butte Creek (Quartz Bowl)*" is questionable, because Quartz Bowl represents a barrier to spring-run Chinook salmon upstream passage, with the exception of high flow years.

ISSUE

Stillwater Sciences (2012, page 18) state *"Channels with a winter baseflow width less than 2 m (6.6 ft) were assumed to be too narrow to provide suitable steelhead spawning habitat. This minimum spawning width threshold was based on professional judgment and unpublished observations."*

COMMENT

Stillwater Sciences (2012) did not provide any rationale or discussion regarding the applicability of the assumed 6.6 ft winter baseflow width steelhead spawning criterion. Given the importance of this criterion in establishing the upstream limit for steelhead habitat, additional support should be provided. At a minimum, the report should describe the bases for "*professional judgment and unpublished observations.*"

2.1.4 Water Temperature Threshold Criteria

2.1.4.1 Application of 2009 Model Output and 2010 Monitoring Data

To determine the downstream extent of thermally suitable habitat for spring-run Chinook salmon and steelhead in the South and Middle Yuba rivers, modeled mean daily water temperatures obtained from the Hydrocomp Forecast and Analysis Modeling (HFAM) water temperature model during 2009 summer months (i.e., June through the end of September) were used in the RIPPLE model.

By contrast to the South and Middle Yuba rivers where 2009 modeled water temperature output was applied, monitored data collected during the summer of 2010 (from July through mid-October) were applied for the North Yuba River.

COMMENT 1

Hydrologic conditions (i.e., critical, dry, below normal, normal, above normal, wet) and meteorological conditions (hot, warm, cool) in the Yuba River Watershed vary inter-annually. However, the current RIPPLE application was based on only one year of summer water temperatures. Consequently, results presented in Stillwater Sciences (2012) do not address the inter-annual variation in the downstream extent of thermally suitable habitat for Chinook salmon and steelhead in the South, Middle and North Yuba rivers. Therefore, results presented in Stillwater Sciences (2012) provide, at best, a "snapshot" of potentially suitable thermal conditions for the specific hydrologic and meteorological conditions evaluated, and do not necessarily reflect thermal suitabilities over a range of conditions that would be expected to occur in the watershed.

COMMENT 2

The extent of the thermally suitable habitats for spring-run Chinook salmon and steelhead under current conditions in the South and Middle Yuba rivers are not directly comparable to those in the North Yuba River. For the South and Middle Yuba rivers, 2009 model output were used in the evaluation, although 2010 monitoring data were used for the North Yuba River. These datasets are not comparable. Stillwater Sciences (2012, page 17) appropriately acknowledge that "*…2009 was a year with relatively high air temperatures and low stream flows…*" and "*…2010 was a year with above average stream flow and slightly cooler than average air temperatures…"*

2.1.4.2 HFAM Water Temperature Modeling

Review of Stillwater Sciences (2012), and in particular Appendix B, which presents water temperature model output for the South and Middle Yuba rivers, is insufficient to determine what specific water temperature model output was actually utilized. Simply stating that HFAM model output was used is inadequate, due to the fact that the referenced HFAM model developed by Pacific Gas and Electric Company (PG&E) and Nevada Irrigation District (NID) actually includes eight different models and complicated interactions among them to characterize specific scenarios. Given the information provided, it is not possible to identify the specific water temperature model output data used to characterize the current condition, or each of the Alternative Management Scenarios. [Additional discussion regarding the Alternative Management Scenarios is provided below.]

2.1.4.3 Application of Species-Specific Water Temperature Criteria

Of particular concern in assessing thermally suitable habitat is the manner in which water temperature is analyzed and/or reported. Stillwater Sciences (2012) report water temperature criteria for spring-run Chinook salmon (Table 2-1) and steelhead (Table 2-2) for the Upper Yuba River Watershed. These criteria are presented according to the categories of "*optimal*", "*suboptimal*" and "*chronic and acute stress*". It is inferred that the "chronic and acute stress" water temperatures would be appropriate to characterize the upper water temperature values characterizing some level of suitability for each of the species and lifestage-specific considerations. However, this does not appear to be the case, as demonstrated by the following observations.

- ❑ Review of the Stillwater Sciences (2012) did not yield an evaluation of the thermal suitability for the upstream migration lifestage of spring-run Chinook salmon, although criteria for this lifestage are presented in Table 2-1.
- ❑ It is unclear how potential spring-run Chinook salmon spawning habitat was evaluated associated with water temperature suitability. Spring-run Chinook salmon spawning water temperature criteria (15.6°C) are presented in Table 2-1. However, Stillwater

Sciences (2012, page 17) state "*The downstream extent of spring-run Chinook salmon spawning habitat was modeled to extend a fixed distance* [3 mi] *downstream from holding habitat*." Based on the narrative presented in Stillwater Sciences (2012), it is unclear how spawning thermal suitability evaluations were conducted for spring-run Chinook salmon.

- ❑ Stillwater Sciences (2012, page 17) report that for RIPPLE modeling purposes 19°C was used to define the extent of thermally suitable habitat for rearing juvenile spring-run Chinook salmon instead of 18.3°C which was recommended in a previous report by Stillwater Sciences (2006b). Stillwater Sciences (2012, page 17) recognize that the use of 19°C as a threshold "*likely result*[ing] *in an overestimate of juvenile rearing habitat*" and that "*…may help account for the effect of cold water refugia from groundwater or tributary inputs…*" that… "*can allow successful rearing in reaches that would otherwise be deemed too warm*."

  The justification is speculative in the sense that no information is provided in Stillwater Sciences (2012) documenting the occurrence of coldwater refugia. In fact, surveys conducted during the summer of 2011 in the North Fork Yuba River found that water temperature vertical stratification in pools did not occur, nor did "coldwater refugia" occur at tributary mouths (see Yuba Salmon Forum Habitat Reports).

- ❑ Stillwater Sciences (2012, page 20) state that tributaries to the Middle Yuba River and the South Yuba River (with the exception of Canyon Creek) "*…were not considered potential habitat for spring-run Chinook salmon due to channel gradient, channel width, water temperature, or a combination of these factors.*" However, it is not apparent in the report what analyses were conducted or which of these factors contributed to this "lack of suitability." Regarding water temperature, it is curious why tributary water temperatures apparently were evaluated for steelhead, but not for spring-run Chinook salmon.

- ❑ Review of the Stillwater Sciences (2012) did not yield an evaluation of the thermal suitability for the adult upstream migration lifestages of spring-run Chinook salmon and steelhead, although criteria for these lifestages are presented in Tables 2-1 and 2-2.

- ❑ Stillwater Sciences (2012, pages ES-4 and 19) states "*The downstream extent of potential spawning habitat in the SY, MY, and NY sub-basins under current conditions was assumed to be the same as the downstream extent of rearing habitat*." If this assumption was actually applied to develop results, then the results would be illogical because Stillwater Sciences (2012, page 9) report that "*…During spawning and egg incubation, steelhead require water temperatures less than 12.8°C to ensure successful embryonic development*" whereas Stillwater Sciences (2012, page 10) state "*Juvenile steelhead generally require water temperatures lower than 20°C to avoid physiological stress.*"

- ❑ Stillwater Sciences (2012, page 21) states "*Based on …the target MWAT for steelhead spawning and rearing of ≤ 20°C…*" This is an illogical statement because in Table 2-2 on page 9, a water temperature of 12.8°C is listed as providing "chronic to acute stress" for steelhead spawning and egg incubation. It should be clarified that a water temperature criterion of ≤ 20°C was not used to identify suitable steelhead spawning habitat, because 20°C would be lethal to steelhead eggs.

- ❑ When describing the downstream extent of thermally suitable habitat for steelhead juvenile rearing habitat under current conditions Stillwater Sciences (2012, page 18) state "*The downstream extent of potential steelhead rearing habitat under current conditions was defined by a water temperature suitability limit of ≤ 20°C MWAT…"* Later in the document (page 25) Stillwater Sciences established a relaxed or "expanded" water temperature criterion for potential juvenile steelhead rearing habitat based on observations of resident rainbow trout distribution during summer 2004 (Gast et al. 2005) in the Middle Yuba River (23.2°C), and 25.2°C on the South Yuba River.

  The utility of using the "expanded" criteria of 23.2°C on the Middle Yuba River and 25.2°C on the South Yuba River is of questionable value. Using different criteria on different reaches does not present an equitable basis of comparison of thermal suitability among rivers and reaches compared.

  Not surprisingly, when these much more lenient water temperature criteria are applied to the South and Middle Yuba rivers (25.2°C and 23.2°C, versus 20°C), the reported linear extent of suitable juvenile steelhead rearing habitat was significantly increased.

- ❑ Statements in Stillwater Sciences (2012) regarding results associated with the "expanded" water temperature criteria for the South and Middle Yuba rivers (25.2°C and 23.2°C, versus 20°C) are particularly confusing because these criteria pertain to juvenile steelhead rearing, yet appear to be applied to spawning (redds). For example:

  - Stillwater Sciences (2012, page 64) states "*In the SY sub-basin under current conditions, the number of steelhead redds predicted using the <u>25.2°C</u> temperature criterion was <u>approximately 10 times higher</u> than the more conservative estimate using the 20°C temperature criterion."*

  - Stillwater Sciences (2012, pages 64 and 65) states "*In the MY sub-basin under current conditions, the predicted number of steelhead <u>redds</u> based on the <u>23.2°C</u> temperature criterion was about <u>twice as high</u> as under the more conservative 20°C temperature criterion."*

- ❑ Stillwater Sciences (2012) identify the downstream extent of thermally suitable habitat as the location in each sub-basin where the Mean Weekly Average Temperature (MWAT) was measured or predicted to exceed a specified value.

  The MWAT is found by calculating the mathematical mean of multiple, equally spaced, daily water temperatures over a 7-day consecutive period. The MWAT is defined as the highest value calculated for all possible 7-day periods (the maximum 7-day running average of daily mean temperature) over a given time period, which usually extends over the summer or is commensurate to the duration of a salmonid lifestage.

Water temperature data used in the RIPPLE evaluations are presented in Appendix B, Figures B-1 and B-2 as HFAM water temperature model output plotted as the 7-day average of the daily average temperature for the South and Middle Yuba rivers. Similarly, water temperature data for the North Yuba River are presented in Figure C-1 as the 7-day average of the daily average temperature. However, MWAT is not specified in these figures in the sense that for any given day, it is not clear what 7-day period that specific value represents.

Also, the use of a single water temperature measurement such as MWAT is convenient from a monitoring and regulatory standpoint, but oversimplifies the complex interactions between water temperature regimes and fish health that are affected by the duration of peak and daily average temperatures.

- Stillwater Sciences (2012, page 18) – "*For modeling purposes it was assumed that all tributaries are thermally suitable for steelhead rearing...*"

  By contrast, a review of Stillwater Sciences (2012) did not find any similar statement regarding the thermal suitability of tributaries for spring-run Chinook salmon rearing. It is unclear why the above assumption of thermal suitability for steelhead rearing also was not made for spring-run Chinook salmon. The only indication in the report were statements on pages 20 and 21 that, in general, tributaries to the South and Middle Yuba rivers and small tributaries to the New Bullards Bar sub-basin were not considered potential habitat for spring-run Chinook salmon due to channel gradient, channel width, water temperature, or a combination of these factors. However, the report does not indicate which of these factors limit potential habitat. Clarification should be provided.

2.2 Alternative Management Scenarios

ISSUE

As described in Stillwater Sciences (2012, page 14), *"Alternative management scenarios were developed based on the ability of water storage projects (Yuba River Development Project [YRDP] and the Yuba Bear/Drum Spaulding [YBDS] Project) to alter instream flow releases to improve habitat for anadromous salmonids. …The alternative management scenarios were [therefore] targeted toward reducing water temperatures in the critical summer months through additional instream flow releases below Project dams..."*

COMMENT

The comments provided below generally pertain to the methodology and assumptions that Stillwater Sciences (2012) used to define and model the RIPPLE alternative management scenarios "Alternative Scenario 1" and "Alternative Scenario 2".

The manner in which the Alternative Management Scenarios are presented in Stillwater Sciences (2012) is particularly perplexing. Stillwater Sciences (2012, page 35) "*In the MY sub-basin, Alternative Management Scenarios 1 and 2 were assumed to represent increased summer releases from Milton Dam of 50 and 100 cfs, respectively. In the SY sub-basin, Alternative Management Scenario 1 was assumed to represent increased summer releases of 50 cfs from Spaulding Dam and 50 cfs from Bowman Dam, equating to an increase of 100 cfs in the South Yuba River downstream of Canyon Creek. Alternative Management Scenario 2 was assumed to represent increased summer releases of 100 cfs from Spaulding Dam and 100 cfs from Bowman Dam, equating to a total increase of 200 cfs in the South Yuba River downstream of Canyon Creek.*"

From the preceding statements, it is unclear how these Alternative Management Scenarios were developed. From the text, it appears as if Stillwater Sciences (2012) used output from a sensitivity analysis that was conducted for PG&E and NID, identified downstream locations for specific water temperature values based upon that analysis, then used those results and assumed specific, constant rates of increased releases year-round from the upstream projects of the amounts specified in the sensitivity analysis. There are several concerns with this approach.

First, Stillwater Sciences (2012) is indirectly stating that it is irrelevant what the "augmented" flow releases actually are and, instead, simply assumed that target water temperatures are achieved at downstream locations. This is an unrealistic operational assumption.

Second, the apparent utilization of a sensitivity analysis included an assumption that the upstream reservoirs are full at the beginning of every water year as an annual boundary condition, which may not be correct. The "augmented" rates of releases would result in carryover storage conditions less than full on frequent occasions.

Third, assumed releases at the "augmented" rates would deplete reservoir storage and could result in zero storage over a multi-year time series. This, in turn, would prohibit achieving the downstream water temperature targets due to a diminished coldwater pool that was not taken into account in the "sensitivity analyses".

<u>ISSUE</u>

Stillwater Sciences (2012, page 21) state *"The small tributaries in this sub-basin <u>were not suitable</u> for spring-run Chinook salmon <u>due to</u> channel gradient, channel width, <u>water temperature</u>, or a combination of these factors. Under this scenario <u>it was assumed that water</u>*

<u>*temperature would be suitable for all life stages*</u> *of spring-run Chinook salmon at all times of year."*

COMMENT

The foregoing statement regarding water temperature suitability for spring-run Chinook salmon in the New Bullards Bar sub-basin under Scenario 1 is contradictory, and clarification should be provided.

Moreover, review of the Stillwater Sciences (2012) report was unable to find the location of the point in the tributaries at which suitability or unsuitability was identified, nor the reason for such a determination.

<u>ISSUE</u>

Stillwater Sciences (2012, page 15) state *"Alternative Management Scenario 2 approaches a reasonable upper limit on the extent of habitat that could be usable under optimal conditions."*

COMMENT

This conclusionary statement regarding the "reasonableness" of Alternative Management Scenario 2 is not supported in Stillwater Sciences (2012). In fact, the "reasonableness" of Alternative Management Scenario 2 is very much in question [see previous comments regarding the ability to sustain the assumed flow release rates, reservoir storage depletion, and inability to achieve downstream target water temperatures].

<u>ISSUE</u>

When presenting the expected effects of Alternative Management Scenario 1 on the downstream extent of thermally suitable habitat for steelhead spawning and summer rearing in the South Yuba sub-basin, Stillwater Sciences (2012, page 21) state that Scenario 1 "…*would provide thermally suitable habitat in 11.0 miles of the mainstem South Yuba River*", and describe the method used by stating *"A 'warming rate' (°C/river mile) was used to determine the downstream extent of suitable steelhead summer rearing in the mainstem. The downstream extent of spring-run Chinook salmon holding under Alternative Management Scenario 1 was used as a starting point. Based on the target MWAT for spring-run Chinook salmon holding of ≤ 19°C and the target MWAT for steelhead spawning and rearing of ≤ 20°C, the warming rate was used to determine the mainstem location downstream of the spring-run Chinook salmon holding extent where a 1°C increase in MWAT would occur. The warming rate for Alternative Management Scenario 1 was calculated using the HFAM water temperature model output on August 1, 2009 (the date on which the approximate annual daily maximum occurred) at upstream and downstream model nodes."*

COMMENT

Besides the foregoing general statements, Stillwater Sciences (2012) does not actually describe the methodology that was used to determine the downstream extent of thermally suitable habitat for spring-run Chinook salmon under Alternative Management Scenario 1 and Alternative Management Scenario 2. Nor does Stillwater Sciences (2012) describe methodology used to determine the downstream extent of thermally suitable habitat for steelhead under Alternative Management Scenario 1 and Alternative Management Scenario 2.

ISSUE

As described in Stillwater Sciences (2012, page 14), *"In the NBB sub-basin, the alternative management scenarios also include augmenting spawning gravel, which is currently limited below New Bullards Bar Dam (Nikirk and Mesick 2006)."*

Stillwater Sciences (2012, page ES-4) states *"In the NBB sub-basin, the alternative management scenarios also include augmenting spawning gravel, which is currently limited below New Bullards Bar Dam.."*.

Stillwater Sciences (2012, page 21) states *"Scenario 1 also assumes that a gravel augmentation program would be implemented to restore spawning habitat to approximately 50% of its unimpaired extent… approximated based on the usable spawning habitat fraction calculated from the total spawning gravel area in the SY and MY sub-basins. It was assumed that the fraction of suitable spawning habitat in the SY and MY sub-basins provides a reasonable approximation of the spawning gravel that would be available in the mainstem river in the NBB sub-basin following gravel augmentation."*

COMMENT

The gravel augmentation program for the North Yuba River downstream of New Bullards Bar Dam evaluated in Stillwater Sciences (2012) is speculative, and unsupported. Stillwater Sciences (2012) assume that the Alternative Management Scenarios include a gravel augmentation program, assume that it would be implemented by an unidentified agency, assume a value of "*approximately 50% of its unimpaired extent*", which was assumed to be equivalent to the usable spawning habitat fraction (of total spawning gravel area) in the South Yuba and Middle Yuba rivers. Moreover, it was assumed that the introduction of gravel would result in spawning habitat, although this reach is characterized by very large boulders which may necessitate sculpting and restructuring of the streambed to actually provide spawning habitat.

3.0 Specific Comments

In addition to the major concerns presented above, review of Stillwater Sciences (2012) identified numerous specific comments. Specific comments are provided below, generally organized by sections provided in the Stillwater Sciences (2012) report.

3.1 Hydraulic Geometry in the North Yuba River Sub-basin

ISSUE

Stillwater Sciences (2012, page 30) state that the GEO module hydraulic geometry relationships for the North Yuba sub-basin under current conditions were developed "*from channel widths and depths at 25 sites in the NY sub-basin (Appendix D and Appendix E).*" The relationships developed for the North Yuba sub-basin were presented in Table 5-1 and Figures 5-1, 5-2 and 5-3. These relationships were based on the calculated drainage areas (km^2), and the widths and depths (m) of 25 sites measured under bankfull and summer low flow conditions displayed in Table D-1 (Appendix D). Table E-1 (Appendix E) displays mean daily flows (cfs), drainage areas (km^2), GIS slopes, surveyed reach length (m), the widths and depths under bankfull and summer low flow condition and habitat type characteristics for a subset of 12 sites out of the 25 sites displayed in Table D-1.

COMMENT

First, for the North Yuba sub-basin, Stillwater Sciences (2012) does not explain the basis for selecting the subset of 12 sites as a subsample from the 25 sites. Such an explanation should be provided.

Second, the 12 reach sites displayed in Table E-1 are a subset from the 25 sites reported in Table D-1 (the sites with an ID beginning in H). However, the reach lengths of those sites displayed in Table D-1 do not coincide with the measured reach lengths displayed in Table E-1. Clarification should be provided regarding these differences.

Third, it is unclear what length measurements were used to estimate the percent of length for pools, riffles and runs, which are displayed in Table E-1.

ISSUE

Stillwater Sciences (2012, page 30) explain that "*Surveys did not include estimates of width or depth at winter baseflow. Winter baseflow width at the NY survey sites was therefore estimated by scaling the bankfull width by 0.85, the ratio of winter baseflow width and bankful width at the NY gage site below Goodyear's Bar (USGS gage # 11413000).*"

COMMENT

Examination of Table E-1 indicates a rather large variation in bankfull widths among sites in the North Yuba sub-basin, particularly between the tributary sites and the mainstem sites. Stillwater Sciences (2012) does not provide any information regarding the appropriateness of applying the ratio at the North Yuba gage site below Goodyear's Bar to all sites in the North Yuba River. Such an explanation should be provided.

Also, Table D-2 displays model flows and drainage area for USGS gage #11413000 but it does not display the baseflow and bankfull widths. The values of the baseflow and bankfull widths at USGS gage #11413000 should be provided.

3.2 Hydraulic Geometry in the Middle and South Yuba River Sub-basins under Current Conditions

ISSUE

Stillwater Sciences (2012, page 32) state "*Channel widths and depths at the model flows were predicted at each of the 12 survey sites in the MY and SY using best fit power law regressions relating reported widths and depths to modeled discharges at a cross section within each site (USGS unpubl. data) (Appendix D, Table D-4)*."

COMMENT

The coefficients α and β of these power relationships ($W = \alpha\ Q^{\beta}$ and $D = \alpha\ Q^{\beta}$) were displayed in Table D-4. However, the coefficients of determination and levels of significance for the "*best fit power law regressions*" of the 12 South and Middle River sites in Table D-4 were not provided. They should be provided in order to evaluate these predictive relationships.

ISSUE

Stillwater Sciences (2012, page 32) explain that "*Channel widths and depths at the model flows were predicted at each of the 12 survey sites in the MY and SY using best fit power law regressions relating reported widths and depths to modeled discharges at a cross section within each site (USGS unpubl. data). Bankfull hydraulic geometry relationships for the MY and SY sub-basins were then developed from best fit power law functions relating drainage area to estimated bankfull widths and depths <u>at the 12 MY and SY sites, as well as seven small drainage area sites in the NY sub-basin surveyed by NMFS</u> (Appendix D, Table D-1). Data from the NY sub-basin were included in the bankfull hydraulic geometry relationships for the MY and SY sub-basins because these NY sites have small drainage areas typical of unimpaired tributaries throughout the upper Yuba project area.*"

COMMENT

First, inclusion of North Yuba River sites with those of the South and Middle Yuba rivers is of questionable appropriateness given that the data from the 7 North Yuba River sites were measured depths and widths, whereas the South and Middle Yuba river sites were depths and widths derived from regression equations.

Second, inclusion of the North Yuba River sites in the predicted equations for the South and Middle Yuba rivers changes the relationship predicting bankfull width (response variable) from drainage area (explanatory variable). **Figure 1** below, generated using the data presented in Tables D-1, D-2, D3 and D-4, illustrates the importance of the added data from the 7 North Yuba River sites to the 12 South and Middle Yuba river sites in the best fit power law function relating bankfull widths to drainage area in the South and Middle Yuba rivers.

In Figure 1, the red line is the best fit power law function obtained with the addition of the 7 North Yuba River sites (akin to the line represented in Figure 5-4 of Stillwater Sciences (2012)).

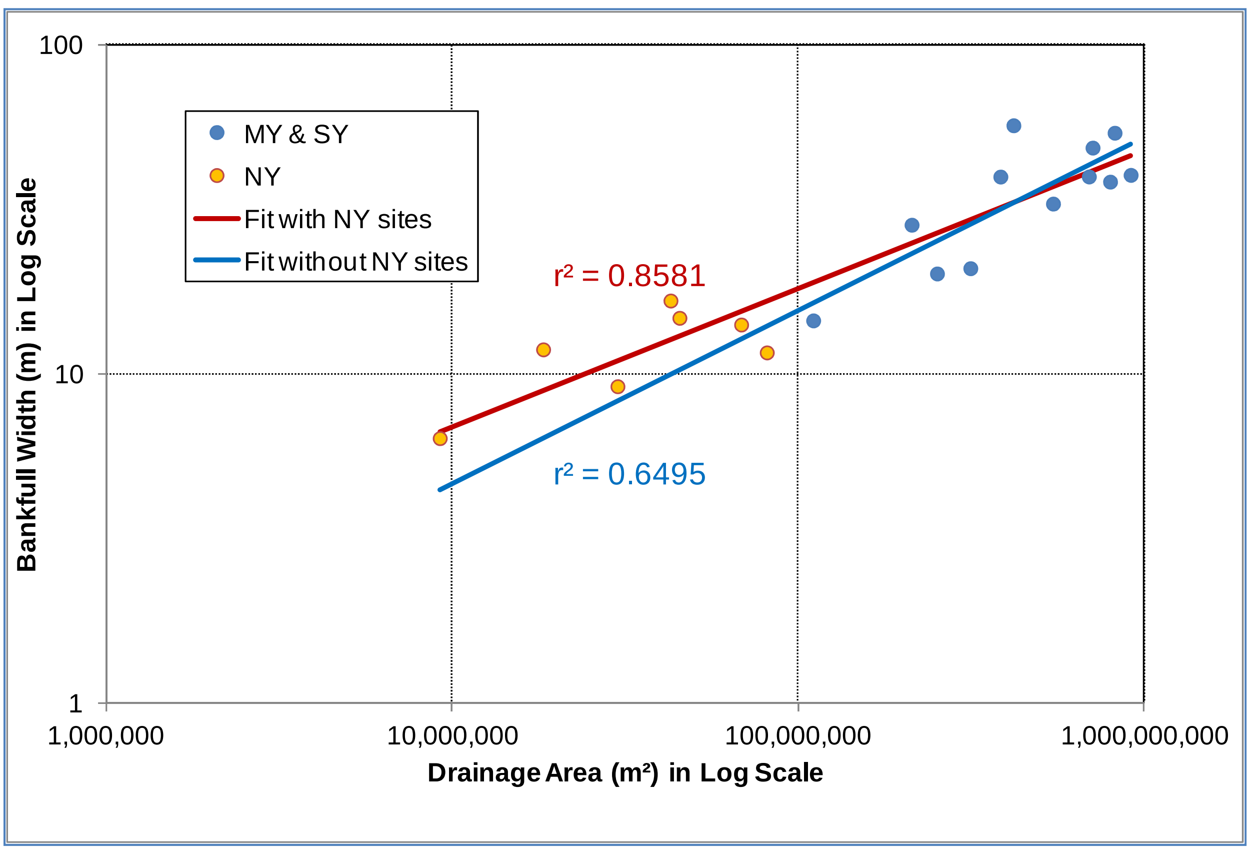

Figure 1. Relationships of bankfull width expressed as function of drainage area obtained from data for 12 Middle Yuba and South Yuba sites (blue circles, blue line) and with the addition of 7 North Yuba sites (orange circles, red line).

<u>ISSUE</u>

Stillwater Sciences (2012, page 32) states *"Linear functions were developed to relate hydraulic geometry at winter baseflow and summer low flow to that at bankfull flow (Table 5-1 and Figures 5-5 and 5-6)."*

COMMENT

First, the methodology in Stillwater Sciences (2012) appears to be inconsistent. By contrast to the regressions estimating bankfull widths and depth to drainage area, where the 7 North Yuba River sites were added to the 12 South and Middle Yuba River sites, the North Yuba River sites were not included in the linear regressions estimating: (1) winter baseflow and summer low flow widths (response variables) from bankfull width (explanatory variable) (Figure 5-5 in Stillwater Sciences (2012)); and (2) summer low flow depths (response variables) from bankfull depth (explanatory variable) (Figure 5-6 in Stillwater Sciences (2012)). Stillwater Sciences (2012) does not provide any explanation regarding this apparent discrepancy.

Second, the linear functions relating winter baseflow and summer low flow widths to bankfull width (Figure 5-5 in Stillwater Sciences (2012)) and those relating summer low flow depth to bankfull depth (Figure 5-6 in Stillwater Sciences (2012)) were based on only 11 South and Middle Yuba river sites. Stillwater Sciences (2012) provides no explanation addressing why a data point was dropped for the analyses.

- ❑ What was the reason for dropping one data point from the calculations that resulted in the regressions illustrated in Figure 5-5 and Figure 5-6?
- ❑ What site was dropped from the regression calculations?
- ❑ Did the authors evaluate the implications of such action on the RIPPLE model's predictions of spring-run Chinook salmon holding and juvenile rearing habitats and steelhead spawning and juvenile rearing habitats in the South and Middle Yuba sub-basins?

Figure 2 was created to illustrate some issues associated with dropping one site from the data used to estimate the linear relationship between summer low flow width and bankfull width in the South Yuba and Middle Yuba sub-basins. To generate Figure 2, it was assumed that data from the Jones Bar Gage site in the South Yuba River was excluded from the regression calculation. This assumption is supported by taking the summer low flow and bankfull flow values presented in Table D-3 and applying the regressing equations in Table D-4 for all of the 12 sites, then identifying which one was excluded from Figure 5-5 in Stillwater Sciences (2012). In Figure 2, the blue line represents the linear relationship between summer low flow width and bankfull width that would be expected from using the data for all 12 sites, whereas the red line represents the linear relationship obtained from using data from only 11 sites akin to the regression used in the current implementation of the RIPPLE model (Figure 5-5).

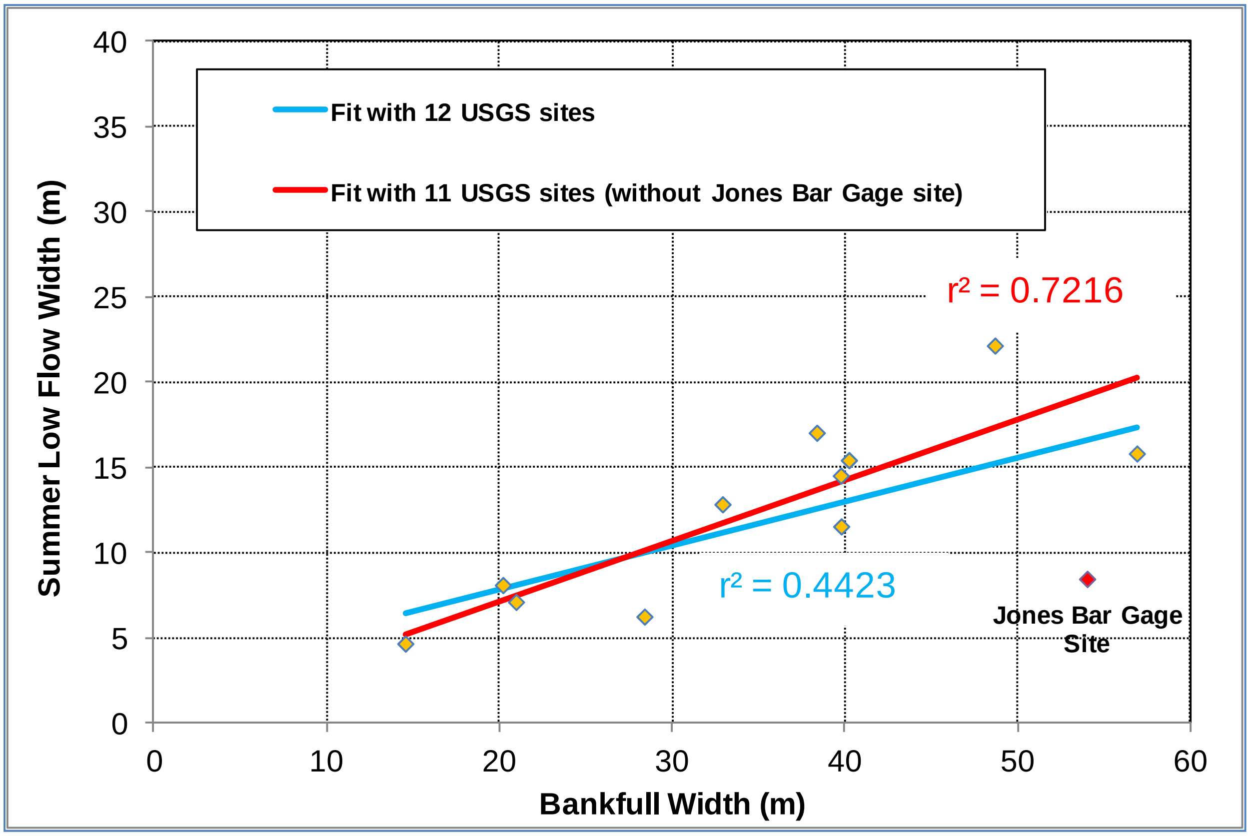

Figure 2. Relationships of summer low flow width expressed as function of bankfull width obtained with data from 12 Middle Yuba River and South Yuba River sites (blue line) and with data from only 11 sites (red line).

The Stillwater Sciences (2012) exclusion of the one data point increased the coefficient of determination (r^2) by 28%. In other words, using all 12 data points only 44% of the variation in summer low flow width could be accounted for by bankfull width, by contrast to exclusion of the Jones Bar Gage site whereby 72% of the variation in summer low flow width could be accounted for by bankfull width. In regression analyses, some data points identified as outliers can be excluded from the estimation, but only after careful consideration of its impact on the resulting regression line and for reasons other than those purely statistical (*e.g.*, suspected bad measurement). No explanation, statistical or otherwise, is provided in Stillwater Sciences (2012) for the exclusion of one data point from the regressions in Figure 5-5 or Figure 5-6.

The implications of Stillwater Sciences (2012) using the 11-point regression line rather than the 12-point regression line can be inferred by comparing the summer low flow widths predicted by both regressions (see Figure 2). The 11-point regression line predicts narrower summer low flow widths than the 12-point regression line for bankfull widths less than 29.6 m. Therefore, under current conditions, Stillwater Sciences (2012) use of the 11-point regression line influences the RIPPLE model's habitat predictions. Relative to the full (12-point) data set, the Stillwater Sciences (2012) regression equation predicts narrower summer low flow widths for bankfull widths less than 29.6 m, and predicts wider summer low flow widths for bankfull widths more than 29.6 m. One example of the implications of using the Stillwater Sciences (2012) regression is that the prediction of narrower summer low flow widths (for areas with bankfull widths less than 29.6 m) may eliminate some areas of suitable habitat, because the RIPPLE model assumes that channels with summer low flow widths less than 8.5 m are too narrow to provide holding pools with suitable depths or spawning habitat for spring-run Chinook salmon (Stillwater Sciences 2012, page 16).

3.3 Hydraulic Geometry in the Middle and South Yuba River Sub-basins under Alternative Management Scenarios

ISSUE

Stillwater Sciences (2012, page 34) state "*to model the potential benefits of Alternative Management Scenarios 1 and 2 on aquatic habitat in the mainstem Middle Yuba and South Yuba rivers using RIPPLE, unique hydraulic geometry relationships were developed for augmented summer low flows at the 12 USGS survey sites located in the MY and SY sub-basins (Appendix D, Table D-6).*" Table D-6 was reproduced in **Table 1** below. The values for the estimated summer low flow discharges corresponding to the table columns labeled "+50 cfs", "+100 cfs" and "+200 cfs" were calculated as the summer low flows under current conditions plus additional 50 cfs, 100 cfs and 200 cfs. The estimated summer low flow widths were then calculated by applying the power relationships in Table D-4 in Stillwater Sciences (2012) to the estimated summer low flow discharges. Linear functions relating width and depth at summer low flow to bankfull width and depth were then developed for use in the RIPPLE model (Figure 5-7 and Figure 5-8 in Stillwater Sciences (2012)).

COMMENT

First, there are errors in Table D-6 in Stillwater Sciences (2012) (see area highlighted in yellow in Table 1).

Second, the methodology in Stillwater Sciences (2012) appears to be inconsistent. By contrast to the regressions that regulate the hydraulic geometry relationships in the South and Middle Yuba sub-basins under current conditions based upon 11 data points, 12 data points were used to develop the linear functions relating width and depth at summer low flow to bankfull width and depth under Alternative Management Scenarios (Figure 5-7 and Figure 5-8 in Stillwater Sciences (2012)). Stillwater Sciences (2012) does not provide any explanation regarding this discrepancy.

Table 1. Estimated summer low flow discharge and corresponding channel width at 12 USGS survey sites under current conditions (CC) and for the additional flow releases specified under Alternative Management Scenarios 1 and 2. Source: Table D-6 in Stillwater Sciences (2012).

Cross section locations	Sub-basin	Estimated summer low discharge (cfs)				Estimated summer low width (m)			
		CC	+50 cfs	+100 cfs	+200 cfs	CC	+50 cfs	+100 cfs	+200 cfs
Laing's Crossing	SY	18	68	118	218	7.1	9.8	11.1	12.9
Lower Golden Quartz Picnic Ground	SY	23	73	123	223	14.6	18.9	21.2	24.2
Downstream of Humbug Creek	SY	41	141	241	241	11.6	14.4	16.3	18.8
Edwards Crossing below Kenebek Creek	SY	42	142	242	242	22.2	25.4	27.4	30.1
Upstream of Hwy 49 above Hoyt Crossing	SY	47	147	247	247	17.1	19.4	21.0	23.0
Jones Bar Gage	SY	48	148	248	248	8.5	11.4	13.5	16.6
Below Bridgeport	SY	54	154	254	254	15.5	17.8	19.3	21.5
Downstream of Milton Reservoir (#1)	MY	12	62	112	212	4.7	7.3	8.6	10.2
Upstream of Gates of Antipodes (#1)	MY	23	73	123	223	6.3	9.5	11.5	14.3
Gold Canyon at Seven Spot Mine	MY	27	77	127	227	8.1	10.2	11.4	12.9
Upstream of Oregon Creek	MY	45	95	145	245	15.8	19.9	22.7	26.6
Upstream of MY confluence	MY	59	109	159	259	12.9	14.8	16.1	18.0

This discrepancy introduced bias in the estimated summer low flow widths and depths of the different mainstem reaches of the South Yuba River, Canyon Creek and Middle Yuba River under current conditions, compared to the Alternative Management Scenarios. Under the Alternative Management Scenarios, using the three regression lines that were derived using 12 data points can be expected to predict relatively wider summer flow widths for bankfull widths less than 29.6 m relative to those that would have been obtained from using 11-point regression lines.

Third, the modeling of the Alternative Management Scenarios assumes that the additional releases from upstream reservoir storage remain constant over the entire longitudinal distribution of each river/reaches evaluated without taking into account depletion (e.g., bank storage, etc.). This assumption overestimates stream width in downstream areas, and thereby overestimates habitat availability.

3.4 Habitat Module (HAB)

3.4.1 Stratification of HAB Parameters by Gradient Class

ISSUE

Five gradient classes (0-1%, 1-2%, 2-4%, 4-8% and 8-12%) were used to stratify the HAB model parameters and model habitat for both spring-run Chinook salon and steelhead. Stillwater

Sciences (2012, page 38) state that gradients greater than 12% were not included in the modeled channel network because "*gradients greater than 12% were not considered passable by spring-run Chinook salmon <u>or steelhead</u>.*" [emphasis added]

COMMENT

First, the ranges of gradients for the five gradient classes are different – smaller for the first two classes and larger for the last gradient class. Clarification should be provided regarding the basis for the selection of these particular five gradient classes.

Second, the explanation that gradients greater than 12% were not included in the modeled channel network because "*gradients greater than 12% were not considered passable by spring-run Chinook salmon or <u>steelhead</u>*" is not consistent with the explanations provided earlier in Stillwater Sciences (2012, page 18) where it is stated that "*to define the upstream extent of modeled steelhead habitat in tributaries in each sub-basin it was assumed that adult steelhead migrating to spawning areas in the winter and spring could not pass any portion of the channel network with a gradient of 20% or greater, or with a sustained (> 300 m [984 ft]) gradient of 8% or greater (CDFG 2003).*" Clarification should be provided regarding why a gradient class of 12-20% apparently was not used to model the channel network for steelhead.

3.4.2 Habitat Type Fractions for the South and Middle Yuba River Sub-basins

<u>ISSUE</u>

Stillwater Sciences (2012, page 38) state that "*habitat typing data collected in the upper Yuba River basin were used to calculate habitat type fraction as parameters for each model sub-basin*" and present the resulting habitat type fractions per gradient class in Appendix F (Table F-1). The values in Table F-1 were used to parameterize the HAB module for both spring-run Chinook salmon and steelhead under the current conditions and both Alternative Management Scenarios.

Stillwater Sciences (2012, page 38) state that "*for the SY and MY sub-basins, remotely derived and field-verified habitat typing data collected as part of the UYRSP rearing habitat assessment from approximately 69 km (43 mi) of mainstem South Yuba River and 73 km (45 mi) of the mainstem Middle Yuba River (Stillwater Sciences 2006b) were used to parameterize habitat type fraction.*"

In Stillwater Sciences (2006b) it is stated that the assessment was based on aerial photographs taken on October 16, 2002 and on digital aerial video taken during helicopter overflights on October 22, 23, and 24, 2002 when river flows were low (42 cfs in the South Yuba River at Jones Bar and 32 cfs in the Middle Yuba River below Our House Dam). Furthermore, Stillwater Sciences (2006b) state that the office-based habitat assessment resulted in approximately 1,100 unique habitat units each for the South Yuba and Middle Yuba rivers and provide a table (Table

1) indicating the 20 attributes recorded for each channel segment. These 20 attributes do not include measures of elevation or gradient.

COMMENT

First, it is unclear how many of the South Yuba and Middle Yuba mainstem reaches for which Stillwater Sciences (2006b) provided habitat typing data were actually used for the current RIPPLE application. Did the South Yuba and Middle Yuba mainstem reach demarcation in Stillwater Sciences (2006b) coincide with that used in the current RIPPLE application?

Second, given that elevation or gradient was not among the 20 attributes recorded for each of the approximately 1,100 unique habitat units identified by Stillwater Sciences (2006b) in the South Yuba and Middle Yuba mainstems, how were these habitat units stratified into the five gradient classes used by the current RIPPLE application to generate the habitat type fractions displayed in Table F-1?

Third, given that Stillwater Sciences (2006b) did not present tables or appendices summarizing the information for the approximately 1,100 habitat units each identified in the South Yuba and Middle Yuba mainstems, why did the current RIPPLE report not include a table or tables summarizing the relevant South Yuba and Middle Yuba habitat type information, as was done for the information on the North Yuba sub-basin (e.g., Table E-1)?

Fourth, Stillwater Sciences (2006b) assessed habitat type in approximately 69 km of the mainstem South Yuba River and in approximately 73 km of the mainstem Middle Yuba River. Map 3 in Stillwater Sciences (2012) indicates that most reaches along the South Yuba and Middle Yuba mainstem have low gradients (0-2%) while the South Yuba and Middle Yuba tributaries have gradients greater than 2%. Were the South Yuba and Middle Yuba habitat type fractions per gradient class in Table F-1 used to parameterize habitat type fractions in tributary reaches of the South and Middle Yuba? If so, wouldn't the habitat type fractions in Table F-1 in Stillwater Sciences (2012) that were based on the sampling of South Yuba and Middle Yuba mainstem reaches be unreliable to parameterize the habitat type fractions in South Yuba and Middle Yuba tributary reaches?

3.4.3 Habitat Type Fractions for the North Yuba River Sub-basin

ISSUE

Stillwater Sciences (2012, page 38) state "*for the NY sub-basin, habitat typing data collected by NMFS in fall 2010 were used to parameterize the HAB module*." The NMFS data consisted of 12 sites, each with 10 to 15 habitat units selected specially for the present RIPPLE study from a range of North Yuba drainage areas and gradient classes (0 to 8%). The surveyed sites did not include sites with gradients higher than 8%.

The data for the 12 North Yuba sites was summarized in Table E-1 in Stillwater Sciences (2012), while Tables E-2 to E-13 provided site-specific information. The resulting North Yuba habitat type fractions per gradient class were displayed in Table F-1. As a note to Table F-1, Stillwater Sciences (2012, page F-1) state that "*NMFS did not collect data at sites with gradients greater than 8% in the NY; therefore combined MY and SY data were used*" to represent the North Yuba habitat type fractions for the 8-12% gradient class.

COMMENT

The 12 North Yuba sites summarized in Table E-1 consist of 7 mainstem sites and 5 tributary sites, 3 sites per gradient class with the exception of the 8-12% gradient class.

- ❑ What procedure was used for the selection of the 12 sites (e.g., simple random selection, random selection stratified by gradient class, random selection stratified by general location – mainstem vs. tributaries)?
- ❑ Were all reaches included in the selection or only those logistically more accessible?

ISSUE

The North Yuba habitat fractions displayed in Table F-1 were based on information from the 12 North Yuba sites summarized in Table E-1. The 12 surveyed sites corresponded to a total sampled length of 5.4 km (4.0 km in the mainstem and 1.4 km in tributaries). Stillwater Sciences (2012, page 38) used the assessment of approximately 69 km of mainstem South Yuba River and 73 km of mainstem Middle Yuba River to generate the South Yuba and Middle Yuba habitat fractions displayed in Table F-1. All the habitat fractions in Table F-1 are expressed as percent channel length.

COMMENT

Given that such a small percentage of the entire North Yuba River was surveyed, by contrast to the large area used to estimate habitat fractions for the South and Middle Yuba rivers as indicated in Stillwater Sciences (2012), was any assessment conducted to determine whether this biased the results?

ISSUE

Table E-1 displays the habitat type fractions for pool, riffle and run expressed as percent length (and percent area) for each of the 12 North Yuba sites surveyed by NMFS. Table F-1 displays the North Yuba habitat type fractions as percent length for pool, riffle, run and cascade for the gradient classes 0-1%, 1-2%, 2-4% and 4-8%. The values in Table F-1 are not the simple average per gradient class of the habitat type fractions in Table E-1.

COMMENT

Stillwater Sciences (2012) does not provide an explanation of the methods of how the fractions in Table F-1 may have been generated from those in Table E-1.

What procedure was used? Were the fractions in Table E-1 scaled by the length of the corresponding gradient class for the entire sub-basin? Explanation should be provided.

ISSUE

As a note to Table F-1, Stillwater Sciences (2012) state that "*NMFS did not collect data at sites with gradients greater than 8% in the NY; therefore combined MY and SY data were used*" to represent the North Yuba habitat type fractions for the 8-12% gradient class.

COMMENT

Stillwater Sciences (2012) does not provide an explanation of the methods of how the Middle Yuba and South Yuba habitat typing data was "combined".

What procedure (e.g., average, weighted average) was used to "combine" the Middle Yuba and South Yuba habitat typing data to produce the North Yuba habitat type fractions displayed in Table F-1 for the 8-12% gradient class?

ISSUE

In Table E-1, the Upper Lavezolla Creek habitat type fractions (by length) are 27.1%, 59.1% and 13.8% for pool, riffle and run, respectively. Table E-2 displays the detailed information for Upper Lavezolla Creek that presumably was used to obtain the percentages in Table E-1. Calculations based on the lengths of the Upper Lavezolla Creek habitat units in Table E-2 produced habitat type fractions of 24.0%, 43.9% and 32.1% for pool, riffle and run, respectively. Additional habitat type fraction calculation discrepancies occur in other reaches, in addition to Upper Lavezolla Creek.

COMMENT

Why were the Upper Lavezolla Creek habitat type fractions presented in Table E-1 as 27.1%, 59.1% and 13.8% for pool, riffle and run, respectively, when the detailed data (Table E-2) yield fractions of 24.0%, 43.9% and 32.1%, respectively?

Are the percentages in Table E-1 just a typographical error, or an error that was passed on and affected the habitat type fractions of the North Yuba sub-basin in Table F-1?

If the habitat type fractions in Table E-1 are erroneous and were passed on to Table F-1, wouldn't other subsequent calculations and the HAB results also be erroneous?

3.4.4 Habitat Type Fractions for the New Bullards Bar Sub-basin

ISSUE

Stillwater Sciences (2012, page 38) state "*for the NBB sub-basin, habitat typing data provided by HDR/DTA from field survey of approximately 1.6 km (1 mi) upstream and downstream of Colgate Powerhouse were utilized (K. Peacock, HDR/DTA, Bellingham, Washington, pers. comm., 1 December 2010)*." Stillwater Sciences (2012, page 38) state that because the New Bullards Bar data were not gradient class-specific, equal fractions of each habitat type (pool = 0.496, riffle = 0.163, run = 0.341 and cascade = 0) were assigned to the five gradient categories in Table F-1.

COMMENT

Why were equal fractions of each habitat type assigned to the five gradient categories? Was it not possible to estimate the location of the habitat units and derive the local gradient?

The New Bullards Bar habitat typing data came from a field survey approximately 1 mile upstream and downstream of Colgate Powerhouse. Based on Map 3, this surveyed habitat units likely corresponded to the gradient classes 0-1% or 1-2%. Consequently, the assumption that the five gradient classes have the same habitat type fractions is questionable. The current New Bullards Bar habitat type fractions (pool = 0.496, riffle = 0.163, run = 0.341 and cascade = 0) are likely appropriate for the 0-2% gradient classes, but may not be appropriate for gradient classes greater than 2%.

3.5 Spring-Run Chinook Salmon Densities and Usable Fractions

3.5.1 Holding Density and Usable Fraction

ISSUE

Stillwater Sciences (2012, page 38) state "…*Spring-run Chinook salmon holding density values were parameterized based on examination of photographs of spring-run Chinook salmon holding at high density in Butte Creek, California. From these photographs, it was our professional judgment that spring-run Chinook salmon can hold at densities ranging from 0.5–1.5 fish/m2 (Stillwater Sciences 2003).*"

COMMENT

Stillwater Sciences (2012) should describe or provide an explanation of the basis for "professional judgment" in assumed holding densities. Examination of the referenced document (Stillwater Sciences 2003) did not yield any additional discussion of specific methodology to support the assumed holding densities. Were the photographs overlayed by a grid, and densities calculated? Was the total pool area estimated and the total number of fish counted to derive holding density? Explanation should be provided.

ISSUE

Stillwater Sciences (2012, page 38) state "*…The portion of each holding pool suitable for holding was then calculated by applying a scaling factor*." Stillwater Sciences (2012) further state "*The suitable area of each holding pool was assumed to be, on average, 50% under current conditions and 75% under the two alternative management scenarios (Scenarios 1 and 2)… it was assumed that increased flow would provide more substantial increases in pool depth, the extent of the bubble curtain and whitewater at the pool head, the length of the pool tail, and the concentration of dissolved oxygen. All of these factors could increase the amount of suitable holding habitat in each pool. Holding pool area was therefore multiplied by 0.5 (for current conditions) or 0.75 (for the two alternative management scenarios) to derive the total amount of holding habitat in the MY and SY sub-basins (Appendix F, Table F-2)*." [emphasis added]

COMMENT

First, the assumption that increased flow would provide more substantial increases in pool depth (relative to pool area) is not necessarily a valid assumption. Pool depth can change very little with change in flow.

Second, Stillwater Sciences (2012) acknowledge that the "scaling factors" were based on a series of assumptions that are not supported by data analyses or referenced documents. However, the assumed scaling factor (0.75) for the Alternative Management Scenarios increased the estimates of suitable spring-run Chinook salmon holding habitat by an additional 50%, relative to the current condition (0.75/0.5 = 1.5). Thus, not only do these assumptions increase holding habitat by an additional 50% in the Middle and South Yuba rivers under the Alternative Management Scenarios compared to the current conditions, these assumptions also inflate habitat values in the Middle and South Yuba rivers relative to the North Yuba River.

ISSUE

Stillwater Sciences (2012) state that for the mainstem Middle Yuba and South Yuba rivers the fraction of usable holding habitat was determined "*by comparing the number of suitable holding pools (Vogel 2006) to the total number of pools (Stillwater Sciences 2006b) located in the mainstem Middle Yuba and South Yuba rivers*." The intermediate and final values in the calculation of the usable fraction of pools in South Yuba and Middle Yuba reaches under current conditions and the two alternative scenarios were displayed in Table F-2 (see **Table 2**, below).

Stillwater Sciences (2012, page 39) state "*No data on the number of holding pools were available for the NY or NBB sub-basins; therefore data from the SY and MY were stratified by gradient category and used to derive usable holding fraction parameters for the NY and NBB sub-basins (Appendix F, Table F-3). Additional detail on the methods and results of the usable fraction analysis for holding habitat are provided in Appendix F, Tables F-2 and F-3*." Table F-3 is reproduced below as **Table 3**.

COMMENT

There are several concerns associated with calculation and representation of "usable fractions" of spring-run Chinook salmon holding habitat, particularly in the North Yuba River.

First, Stillwater Sciences (2012) statement that no data on the number of holding pools were available for the North Yuba River is not correct. As part of the Yuba Salmon Forum process, a draft habitat mapping report titled "*Study 1.0 Yuba River Salmon Forum Studies Habitat Mapping Report*" was available as of September 2011 (YCWA 2011a), in advance of Stillwater Sciences (2012) report which was issued during February 2012.

Second, methods used in Stillwater Sciences (2012) for the Middle and South Yuba rivers appear to be different than the methods used for the North Yuba River and New Bullards Bar sub-basin. Consequently, it is questionable whether the resulting spring-run Chinook salmon holding carrying capacities among these river/reaches can be compared.

The method presented in Stillwater Sciences (2012) to derive the usable fractions of pools applied to the South Yuba and Middle Yuba sub-basins (Table F-2 in Stillwater Sciences (2012), reproduced as Table 2 below) is not comparable to the method used to derive the usable fractions of pools applied to the North Yuba and New Bullards Bar sub-basins (Table F-3 in Stillwater Sciences (2012), reproduced as Table 3 below).

- ❑ Why were the usable fractions of pools applied to the South Yuba and Middle Yuba sub-basins (see Table 2) derived from the number of holding pools and total pools that are "thermally suitable for holding", by contrast to the North Yuba and New Bullards Bar sub-basins where it does not appear that this was done?
- ❑ Why weren't the usable fractions of pools in Table 2 stratified by gradient class for application in the South Yuba and Middle Yuba sub-basins, as was done for the North Yuba and New Bullards Bar sub-basins? Does this inconsistency influence the resulting estimates of spring-run Chinook salmon holding capacity?
- ❑ Do the usable fractions of pools in Table 3 represent the usable holding fraction in the New Bullards Bar sub-basin under current conditions only? Was some other estimate of usable fraction of pools used for the New Bullards Bar sub-basin under the Alternative Management Scenarios?

Table 2. Usable fraction data and calculations for spring-run Chinook salmon holding habitat in the MY and SY sub-basins under each alternative scenario. The values in the last column were used to parameterize the RIPPLE HAB module for the SY and MY sub-basins. The same usable fraction values were applied to each gradient class since the data reflect the actual number of holding pools documented in each SY and MY reach. Source: Table F-2 in Stillwater Sciences (2012).

Sub-basin	Scenario[a]	River miles thermally suitable for holding[b]	Number of holding pools[c]	Number of total pools[d]	Fraction of pools that are holding pools	Fraction of each holding pool usable for holding	Usable fraction of pools in reach
SY	S1	7.0	7	57	0.12	0.75	0.09
SY	S2	15.3	12	117	0.10	0.75	0.08
MY	CC	2.3	12	32	0.38	0.50	0.19
MY	S1	11.9	17	117	0.15	0.75	0.11
MY	S2	22.5	21	209	0.10	0.75	0.08

[a] No habitat would be thermally suitable for holding in the SY under current conditions.

[b] Mainstem channels only.

[c] Source: Vogel (2006)

[d] Source: Stillwarer Sciences (2006b)

Table 3. Usable fraction of and calculations for spring-run Chinook salmon holding habitat for each channel gradient category in the SY and MY sub-basins. The values in the last column were used to parameterize the RIPPLE HAB module for the NY and NBB sub-basins. No data on the number of holding pools were available for the NY or NBB sub-basins; therefore data from the SY and MY were stratified by gradient category and used to derive usable holding fraction parameters for the NY and NBB sub-basins. Source: Table F-3 in Stillwater Sciences (2012).

Gradient Category	Number of holding pools in SY and MY	Number of total pools in SY and MY	Fraction of pools that are holding pools	Fraction of each holding pool usable for holding	Usable fraction of pools
0-1%	16	158	0.10	0.50	0.051
1-2%	25	348	0.07	0.50	0.036
2-4%	40	235	0.17	0.50	0.085
4-8%	14	83	0.17	0.50	0.084
8+%	5	16	0.31	0.50	0.156

3.5.2 Spawning Density and Usable Fraction

ISSUE

Stillwater Sciences (2012, page 39) state that "*spawning density data from the upper Yuba River basin were not available; therefore spawning density was calculated based on the mean redd size measured in the McKenzie River, Oregon: 5.4 m² (Stillwater Sciences 2006c).*" The report then goes on to justify the use of this value for mean redd size by stating *"... The redd size value of 5.4 m^2 was comparable to the mean redd size reported for spring-run Chinook salmon in a variety of published and unpublished sources (Table 6-2).*"

COMMENT

In July 2010 correspondence from Stillwater Sciences to NMFS regarding lower Yuba River components of the Habitat Expansion Plan, Stillwater Sciences state that an appropriate mean redd size estimate for spring-run Chinook salmon in the lower Yuba River would be derived "*…from a Sacramento River tributary with a spawning population of SRCS. The average size of SRCS redds in Mill Creek is 9.7 sq. m (C. Harvey, as cited in Ward et al. 2003).*"

As part of the Yuba Accord Monitoring and Evaluation (M&E) Program, the Yuba Accord River Management Team (RMT) has performed redd surveys in the lower Yuba River that included measurement of Chinook salmon redd sizes. Why weren't redd sizes obtained from these redd surveys in the lower Yuba River used to derive the spawning density estimate?

Also, it seems inconsistent that Stillwater Sciences would infer that a mean redd size of 9.7 m^2 should be assumed for the Habitat Expansion Plan, and then actually use a value of 5.4 m^2 to estimate carrying capacity of the Upper Yuba River Watershed. Clarification should be provided.

ISSUE

Stillwater Sciences (2012, page 40) state "*The estimated amount of spawning gravel area in 0–4% gradients was then apportioned among habitat types by assuming 80% of spawning gravel is in pools, 10% in riffles, 10% in runs, and 0% in cascades. This assumption was based on professional opinion and evidence from the literature that most spawning occurs in pool tails (Barnhart 1991, CDFG 1998a, b)."*

COMMENT

Definition of what constitutes spawning habitat is extremely important in the eventual estimation of carrying capacity. Stillwater Sciences (2012) assumption that "*…80% of spawning gravel is in pools, 10% in riffles, 10% in runs, and 0% in cascades"* was attributed to professional opinion and evidence from the literature that <u>most spawning occurs in pool tails</u> (Barnhart 1991, CDFG 1998a, b).

In this review of Stillwater Sciences (2012), Barnhart (1991) was not available. However, from the reference section provided in Stillwater Sciences (2012, page 70) it appears that the reference document addresses steelhead.

- Barnhart, R. A. 1991. Steelhead *Oncorhynchus mykiss*. Pages 324–336 in J. Stolz and J. Schnell, editors. The Wildlife Series: Trout. Stackpole Books. Harrisburg, Pennsylvania.

The "evidence" provided in CDFG (1998a) actually referred to a previous document as follows…*"Spawning occurs in gravel beds that are often located at tails of holding pools (USFWS 1995a)."* Review of USFWS (1995a) provided no additional evidence, data, reference to specific surveys or other information, but simply includes this exact quotation. Hence, this document does not state that most spawning occurs in pool tails – rather that spawning gravel beds are often located at the tails of holding pools.

Review of CDFG (1998b) resulted in identifying no reference to spring-run Chinook salmon spawning habitat.

Moreover, Stillwater Sciences (2012) does not provide scientific basis or rationale for assuming in their calculations that "*…80% of spawning gravel is in pools, 10% in riffles, 10% in runs, and 0% in cascades*" – quantifications that influence subsequent estimation of carrying capacity.

ISSUE

Stillwater Sciences (2012, page 40) state "*We assumed spring-run Chinook salmon spawning did not occur in riffles or runs with gradients ≥ 4%."*

COMMENT

Clarification should be provided regarding the basis for the assumption that spring-run Chinook salmon spawning did not occur in cascades and in rifles or runs with gradients greater or equal to 4% (Stillwater Sciences 2012, page 40 and Tables F-4 and F-5).

ISSUE

Stillwater Sciences (2012, pages 39 and 40) describe how the spring-run Chinook salmon spawning usable fractions displayed in Table F-4 were derived.

COMMENT

The explanation provided by Stillwater Sciences (2012) is not very clear particularly with respect to:

- The type of information contained in the gravel data collected by Nikirk and Mesick (2006) in the South Yuba, Middle Yuba and New Bullards Bar that was actually used in the calculations of spawning usable fractions (e.g., number of surveyed sites, measured variables per site, spawning area per site, etc).
- The procedure used to allocate the gravel data collected by Nikirk and Mesick (2006) in the South Yuba, Middle Yuba and New Bullards Bar sub-basins into the four gradient classes, three sub-basins and three habitat types in Table F-4.

3.5.3 Juvenile Rearing Density and Usable Fraction

ISSUE

Stillwater Sciences (2012) display the spring-run Chinook salmon summer juvenile densities and juvenile rearing usable fractions for each habitat type and channel gradient combination in Table F-6 (reproduced below as **Table 4**).

Stillwater Sciences (2012, page 40 through 41 and footnote to Table F-6) explain that, to obtain the juvenile densities in Table F-6, "…*juvenile spring-run Chinook salmon densities reported by Everest and Chapman (1972) (1.8 fish/m² and 0.5 fish/m² in 0-1% and 1-2% gradients, respectively) were apportioned by habitat type in proportion to mean habitat-specific (i.e., pool, riffle, and run) densities of juvenile spring-run Chinook salmon in 22 Idaho streams reported by Bjornn and Reiser (1991) (mean pool densities = 0.215 fish/m²; mean riffle densities = 0.030 fish/m²; mean run densities = 0.130 fish/m²).*"

Table 4. Spring-run Chinook salmon juvenile summer rearing density and usable fraction values for each habitat type and channel gradient combination used to parameterize the RIPPLE HAB module for all sub-basins and scenarios. Source: Table F-6 in Stillwater Sciences (2012).

Gradient Category	Pool		Riffle		Runs	
	Density (fish/m^2)[a]	Usable fraction[2]	Density (fish/m^2)[a]	Usable fraction[2]	Density (fish/m^2)[a]	Usable fraction[b]
0-1%	2.829	1	0.395	1	1.711	1
1-2%	0.772	1	0.108	1	0.467	1
2-4%	0.772	0.75	0.108	0.75	0.467	0.75
4-8%	0.772	0.25	0.108	0.25	0.467	0.25

[a] Juvenile spring-run Chinook salmon densities reported by Everest and Chapman (1972) (1.8 fish/m^2 and 0.5 fish/m^2 in 0-1% and 1-2% gradients, respectively) were apportioned by habitat type in proportion to mean habitat-specific (i.e., pool, riffle, and run) densities of juvenile spring-run Chinook salmon in 22 Idaho streams reported by Bjornn and Reiser (1991) (mean pool densities = 0.215 fish/m^2; mean riffle densities = 0.030 fish/m^2; mean run densities = 0.130 fish/m^2).

[b] The 2–4% and 4–8% gradient classes were parameterized with the same density values as the 1–2% gradient class, but usable fractions were lowered to 0.75 and 0.25, respectively, to reflect the lower carrying capacity expected at higher gradients. Juvenile rearing densities and usable fractions were not changed between model scenarios.

COMMENT

Bjornn and Reiser (1991) reported the densities of juvenile spring-run Chinook salmon in four habitat types (pools, runs, pocket water and riffles) as a bar figure (Figure 4.35). The y-axis of this figure was scaled in units of 0.02 fish/m², and each bar indicates the average juvenile density and number of habitat units surveyed for each habitat type sampled in 1985 and 1986.

- ❑ Were the mean habitat-specific juvenile densities (mean pool densities = 0.215 fish/m²; mean riffle densities = 0.030 fish/m²; mean run densities = 0.130 fish/m²) used to calculate the juvenile densities in Table F-6 derived by approximating the values displayed in Figure 4.35 of Bjornn and Reiser (1991), or by processing the original data in Bjornn and Reiser's paper?
- ❑ In either case, were the mean juvenile spring-run Chinook salmon densities reported by Bjornn and Reiser (1991) for pocket water used in the calculation of the juvenile densities in Table F-6?
- ❑ Stillwater Sciences (2012) explained that the juvenile densities in Table F-6 were calculated by "*apportioning*" the 1.8 fish/m² and 0.5 fish/m² of 0-1% and 1-2% gradients from Everest and Chapman (1972) by habitat type (i.e., pool, run and riffle) in proportion to the mean habitat-specific densities obtained from Bjornn and Reiser (1991). Stillwater Sciences (2012) does not explain the methods associated with this "apportioning".
- ❑ The methodology in Stillwater Sciences (2012) of using the gradient-specific juvenile rearing densities from Johnson Creek, Idaho (Everest and Chapman 1972), "apportioned" by habitat type (i.e., pool, run and riffle) in proportion to the mean habitat-specific densities obtained from Bjornn and Reiser (1991) from 22 streams in Idaho, results in very high densities applied in the RIPPLE HAB module. This brings into question whether the carrying capacity estimates for the Upper Yuba River Watershed are overestimated. For example, examination of Table 6-3 in Stillwater Sciences (2012, page 41) demonstrates that the juvenile rearing densities (fish/m^2) used by Stillwater Sciences (2012) for the Upper Yuba River Watershed greatly exceed those of the 22 streams in Idaho – in fact, the values used for low gradient (0-1%) in the Upper Yuba River Watershed are 10 times higher for each habitat type than those in the referenced 22 Idaho streams.

ISSUE

Stillwater Sciences (2012, page 41) state "*The 2–4% and 4–8% gradient classes were parameterized with the same density values as the 1–2% gradient class, but usable fractions were lowered to 0.75 and 0.25, respectively, to reflect the lower carrying capacity expected at higher gradients (Appendix F, Table F-6). Higher gradient reaches have higher water velocities, thus reducing usability by juvenile Chinook salmon, especially those of smaller size (Everest and Chapman 1972).*"

COMMENT

Other than the qualitative statement referenced in Everest and Chapman (1972), no basis is provided in Stillwater Sciences (2012) why the specific usable fractions of 0.75 and 0.25 are used for the higher gradient classes. Specifically, what is the basis for assuming that the usable fraction in a 2-4% gradient class is ¾th of the lower gradient class, and that the usable fraction in a 4-8% gradient class is ¼th of the lower gradient class. At a minimum Stillwater Sciences (2012) should provide some explanation of that relative representation.

ISSUE

Stillwater Sciences (2012, page 41) state the Johnson Creek juvenile density data were selected…"*The Johnson Creek juvenile spring-run Chinook salmon summer densities reported by Everest and Chapman (1972) are within the range of those from other river systems containing high quality summer habitat (Table 6-3)*."

COMMENT

This statement does not appear to be correct. Review of Table 6-3 indicates that of the 17 juvenile spring-run Chinook salmon rearing densities reported, the density for Johnson Creek (1.80 fish/m2) was the highest of all reported densities and, therefore, was not "*within the range of those from other river systems containing high quality summer habitat.*"

ISSUE

Stillwater Sciences (2012, page 41) state "*The Johnson Creek juvenile density data were selected for two reasons: (1) the data presumably represent fully-seeded, high quality summer rearing habitat in a river system containing both juvenile Chinook salmon and steelhead and with a summer base flow similar in magnitude to the North Yuba River (~150 cfs), and (2) we could not locate gradient-stratified summer juvenile density data for northern California spring-run Chinook salmon that could be considered to represent fully-seeded rearing habitat conditions in the upper Yuba River watershed*."

COMMENT

Examination of the juvenile spring-run Chinook salmon rearing densities reported in Table 6-3 in Stillwater Sciences (2012, page 41) demonstrates that at least three other stream/gradient combinations provided densities from "fully-seeded" reaches. Stillwater Sciences (2012) does not provide any explanation as to why these other reaches were not used in the assuming juvenile rearing densities.

3.5.4 Carrying Capacity Estimates

ISSUE

Carrying capacity estimates are presented on pages 43 to 46 in Stillwater Sciences (2012). Given the various assumptions and inputs to the model, and issues previously discussed, the results of the model should be considered as gross relative indications of carrying capacity among areas compared. Undue specificity should not be attributed to predictions of habitat carrying capacity.

Stillwater Sciences (2012, page 44) presents predicted habitat carrying capacities of spring-run Chinook salmon holding, spawning (redds), and summer rearing lifestages for each modeled sub-basin and scenario in the Upper Yuba River Watershed in Table 6-5.

Stillwater Sciences (2012, page 44) states "…*when adult female escapement to freshwater and survival during holding are high enough to produce female spawners in excess of the redd carrying capacity, the quantity of spawning habitat likely limits production of juvenile and smolt emigrants from the upper Yuba River watershed*."

COMMENT

As previously discussed, the Alternative Management Scenarios may represent unrealistic operational assumptions associated with the ability to sustain the assumed flow release rates, reservoir storage depletion, and inability to achieve downstream target water temperatures. Hence, the speculative nature of the Alternative Management Scenarios restricts the utility of habitat carrying capacity estimates among scenarios. The most appropriate comparisons would be among rivers/reaches under the current conditions although, even under current conditions, the estimated carrying capacities for the various sub-basins are questionable given all of the previously mentioned issues.

Examination of Table 6-5 (page 44) indicates that under current conditions, redd carrying capacity is 0 for the South Yuba River, 123 for the North Yuba River downstream of New Bullards Bar Dam, 126 for the Middle Yuba River, and 2,696 for the North Yuba River upstream of New Bullards Bar Reservoir. Given all of the assumptions and methods employed by Stillwater Sciences (2012) the North Yuba River upstream of New Bullards Bar Reservoir provides about 21 to 22 times the carrying capacity than the Middle Yuba River and the North Yuba River downstream of New Bullards Bar Dam.

In addition, given all of the assumptions and methods employed by Stillwater Sciences (2012), the predicted juvenile summer rearing carrying capacity for the North Yuba River greatly exceeds the other sub-basins. Examination of Table 6-5 (page 44) indicates that under current conditions, juvenile summer rearing carrying capacity is 0 for the South Yuba River, 282,393 for the North Yuba River downstream of New Bullards Bar Dam, 8,493 for the Middle Yuba River, and 766,391 for the North Yuba River upstream of New Bullards Bar Reservoir. Hence, according to Stillwater Sciences (2012) the North Yuba River upstream of New Bullards Bar Reservoir provides about 90 times the carrying capacity than the Middle Yuba River, and about 2.7 times the carrying capacity of the North Yuba River downstream of New Bullards Bar Dam.

However, the estimated juvenile rearing spring-run Chinook salmon carrying capacity for the New Bullards Bar sub-basin may be erroneously overestimated. The predicted habitat carrying capacities of spring-run Chinook salmon summer rearing carrying capacity estimates in Table 6-

5 (page 44) are based on the habitat availabilities presented in Table 4-3 (page 15) (along with the estimated usable densities and usable fractions). Stillwater Sciences (2012, page ES-4) state "*For modeling purposes we assumed that rearing only occurs downstream of spawning. In the NBB sub-basin, potential spawning habitat in the mainstem Yuba River under current conditions was assumed to be present only downstream of New Colgate Powerhouse because of a lack of spawning gravel from New Bullards Bar Dam downstream to the powerhouse."* Stillwater Sciences (2012, pages ES-5 and 15) state that under current conditions, in the New Bullards Bar sub-basin, 3.2 miles of the mainstem North Yuba River was identified as suitable summer rearing habitat for spring-run Chinook salmon. The distribution of juvenile spring-run Chinook salmon summer rearing habitat is depicted in Map 4 of Stillwater Sciences (2012). Examination of Map 4 indicates that the 3.2 mile area included as suitable juvenile spring-run Chinook salmon holding and summer rearing habitat includes about 1.2 miles immediately downstream of New Bullards Bar Dam. However, this depicted juvenile spring-run Chinook salmon summer rearing habitat is several miles upstream of suitable spawning habitat. Therefore, if "*rearing only occurs downstream of spawning",* then this area should not be depicted as suitable juvenile summer rearing habitat, and the estimated juvenile rearing spring-run Chinook salmon carrying capacity for the New Bullards Bar sub-basin may be overestimated.

3.6 Chinook Salmon Population Dynamics (POP)

Stillwater Sciences (2012, page ES-3) report that the RIPPLE model includes a population dynamics module ("POP") that employs biological parameters and stock-production relationships to estimate equilibrium population sizes at variable spatial scales and locations throughout the Upper Yuba River Watershed. Stillwater Sciences (2012, page 46) state that "*the POP module uses reach-specific carrying capacity (K) values for holding, spawning, and summer rearing in conjunction with biological input parameters and life stage-specific stock-production curves, to estimate equilibrium population sizes for individual channel arcs and the entire watershed. The equilibrium population is reached after multiple iterations of the model are run and a stable, long-term average population structure is reached.*"

In Figure 6-2, Stillwater Sciences (2012, page 47) display a schematic diagram showing the relationships between each lifestage in the POP and the point at which each carrying capacity (K) is applied to the population over 7 brood years and 3 spatial areas, including: Upper Yuba Basin, Lower River through Estuary, and Ocean. The lifestages represented in the spring-run Chinook salmon POP module are defined in Table 6-6, with brief explanations on the modeled relationships between lifestages provided in pages 48 through 49.

In Appendix G (Table G-1), Stillwater Sciences (2012) provide the names, definitions and values for the various biological parameters input into the spring-run Chinook salmon POP module, together with the sources or rationale used for each selected value.

Stillwater Sciences (2012, page 52) state that the accuracy of model projections is affected by how data availability, data quality and model structure affect the degree of uncertainty in model parameters. With respect to the POP module however, the description of the various module components and the parameterization process presented in Stillwater Sciences (2012) do not provide sufficient information to allow a reader to understand: (1) how the various technical components of the POP module structure are integrated; or (2) how each of the lifestage-specific biological parameters for Chinook salmon were applied as inputs to the POP module, and more specifically, how they were used to obtain resultant model outputs. Therefore, the comments presented below on the topic of Chinook salmon and steelhead population dynamics primarily focus on the underlying assumptions and analytical methodologies described for the POP module in Stillwater Sciences (2012), rather than on the species and lifestage-specific results generated by the POP module for each of the rivers/reaches under current conditions and the Alternative Management Scenarios. Moreover, the following comments do not unduly emphasize the results generated by the POP module because of the foregoing comments regarding assumptions, inputs and methodologies pertaining to the GEO and HAB modules.

3.6.1 Lifestage-specific Stock-Production Curves

ISSUE

The descriptions of the methodology actually used in the POP module, as well as descriptions of POP module parameterization, do not provide the reader with sufficient information. For example, the statement (page 46) that "*the POP module uses reach-specific carrying capacity (K) values for holding, spawning, and summer rearing in conjunction with biological input parameters and life stage-specific stock-production curves*" does not clearly indicate where stock-production curves are applied. Review of Figure 6-2 (page 47) indicates that there are three lifestage-specific stock-production curves used in conjunction with carrying capacity estimates in the spring-run Chinook salmon POP module:

(1) The relationship between ***escape*** (*i.e.*, total number of immature adults of all ages leaving the ocean to search for holding habitat) and ***holder*** (*i.e.*, the number of male and female adults occupying holding habitat) that uses the holding carrying capacities estimated through the HAB module.

(2) The relationship between ***spawner*** (*i.e.*, total number of females leaving holding habitat in search of spawning habitat) and ***redd*** (*i.e.*, the effective number of redds that contribute to egg production after accounting for the effects of superimposition) that uses the spawning carrying capacities estimated through the HAB module and assumes 1 redd per female.

(3) The relationship between ***summer0*** (*i.e.*, juvenile population that remain in the channel network to rear during the summer) and ***winter1*** (*i.e.*, the number of juveniles that found

over-summering habitat) that uses the summer juvenile rearing carrying capacities estimated through the HAB module.

COMMENT

In a footnote on page 46 Stillwater Sciences (2012) state that only two stock-production functions are currently used in the Chinook model: (1) the "hockey-stick function" and (2) the "Skellam function". For a starting population $\boldsymbol{x}$, and ending population $\boldsymbol{y}$, a carrying capacity $\boldsymbol{K}$ and a density-independent survivorship $\boldsymbol{r}$, Stillwater Sciences (2012) define the "hockey stick function" as: $\boldsymbol{y} = \begin{cases} \boldsymbol{r} \times \boldsymbol{x} & \text{if } \boldsymbol{r} \times \boldsymbol{x} \le \boldsymbol{K} \\ \boldsymbol{K} & \text{if } \boldsymbol{r} \times \boldsymbol{x} > \boldsymbol{K} \end{cases}$. Stillwater Sciences (2012) define the "Skellam function" as: $\boldsymbol{y} = \boldsymbol{K} \times \left(1 - \exp\left(\frac{\boldsymbol{r} \times \boldsymbol{x}}{\boldsymbol{K}}\right)\right)$ adding that "*the Skellam function is used only for calculating superimposition losses*" and that "*all other density-dependent mortality calculations in the model use hockey-stick functions.*" The following questions arise from the provided information and explanations.

- ❑ Stillwater Sciences (2012) provides no explanation as to why the "hockey-stick" function and the "Skellam" function were selected as stock-production functions. Why were no other commonly used stock-production functions (e.g., Beverton and Holt) selected for model application?
- ❑ What is meant by "*calculating superimposition losses"*? Stillwater Sciences (2012) provides no explanation of how "superimposition losses" were actually calculated. The formula of the "Skellam function" as cited in Stillwater Sciences (2012) returns negative redd values. Is this an error? Should the formula have been written as $\boldsymbol{y} = \boldsymbol{K} \times \left(1 - \exp\left(\frac{-\boldsymbol{r} \times \boldsymbol{x}}{\boldsymbol{K}}\right)\right)$ to provide positive redd values? How were the results of this function applied to the number of females in order to estimate the effective number of redds?
- ❑ Although Stillwater Sciences (2012, page 48) refers to Appendix G for a description of each parameter and values provided as input to the POP model, the presentation is unclear and difficult to ascertain. For example, the lifestage-specific stock-production functions implemented for the Chinook salmon POP module (i.e., presumably the relationships between ***escape*** and **holder,** and between ***spawner*** and ***redd***, and ***summer0*** and ***winter1***) require values for the density-independent survivorship ***r***. However, the ***r*** values are not clearly presented for any of the stock-production models, which limits the ability to evaluate POP module performance.

3.6.2 POP Module Assumptions and Results

ISSUE

Stillwater Sciences (2012) state that the POP module *"estimate equilibrium population sizes for individual channel arcs and the entire watershed. The equilibrium population is reached after multiple iterations of the model are run and a stable, long-term average population structure is reached.*" Interpretation of Figure 6-2 (page 47) and the explanation provided in Stillwater Sciences (2012, page 48) indicate that each model iteration starts with a particular value of escapement (i.e., the total number of adults of all ages leaving the ocean to search for holding habitat) that, after passing through the POP module calculations, generates numbers of ***esmolt0***, ***smolt0*** and ***smolt1*** for each sub-basin. These smolt values after being multiplied by specific smolt-to-adult survival rates (i.e., 0.01 for ***esmolt0*** and ***smolt0***, and 0.05 for ***smolt1***) originate the values for the escapement in the next iteration.

COMMENT

With respect to the iterative process of the model described above:

- What was the initial (or starting) escapement value?
- How many iterations were required to achieve "*a stable, long-term average population structure*"?
- What was the criterion used to measure that "*a stable, long-term average population structure*" had been achieved?
- At what population lifestage was the criterion applied (e.g., smolt lifestages, escapement)?

ISSUE

Stillwater Sciences (2012, page 49) states "*Notably, spawning habitat, which is more limiting than holding habitat, was fully seeded in all model runs*."

COMMENT

This statement does not appear to technically be correct. Examination of Table 6-5 (page 44) demonstrates that the North Yuba River estimated redd capacity is 2,696. However, POP module results presented in Table 6-7 (page 49) indicate predicted equilibrium redds of 2,591. Clarification should be provided.

ISSUE

As previously noted, Stillwater Sciences (2012, page 49) states "*Notably, spawning habitat, which is more limiting than holding habitat, was fully seeded in all model runs*."

COMMENT

Review of Table 6-7 in Stillwater Sciences (2012, pages 49 and 50) indicates that the RIPPLE model is producing results which predict that spawning habitat carrying capacity is limiting for all model runs. This is a particularly poignant model result, which appears to be counter to anticipated outcomes.

In July 2010 correspondence from Stillwater Sciences to NMFS regarding lower Yuba River components of the Habitat Expansion Plan, Stillwater Sciences emphasize the importance of juvenile rearing habitat, by contrast to spawning habitat, with the statement "*…more often than not, it is the absence of adequate rearing habitat that limits a population's production rather than the absence of spawning habitat.*" It is unclear why this specific application of the RIPPLE model produces these apparently unusual results. Discussion addressing this issue should be provided.

<u>ISSUE</u>

Stillwater Sciences (2012, page 53) state "*Model results are also particularly sensitive to smolt-to-adult survival parameters. For example, very poor delta and ocean conditions could result in escapement levels lower than that required to fully seed spawning habitat in all years. …Refinement of adult escapement estimates will be possible following additional modeling outside of RIPPLE to simulate more realistic survival estimates downstream of Englebright Dam.*"

COMMENT

This statement brings into question why the RIPPLE model is predicting such high adult return rates, which are a function of smolt-to-adult return survival rates.

Biological parameters input into the POP module are provided in Table G-1 of Stillwater Sciences (2012). These parameters include:

- ❑ An assumed 1% *Smolt0* to adult survival, which includes the fraction of *smolt0* that survive from Englebright Dam to adult return to freshwater, and the fraction of *esmolt0* that survive from the estuary until adult return to freshwater. The assumed 1% survival was based on survival values of smolt-0-sized juvenile Chinook salmon released at Coleman and Nimbus hatcheries from 1968–1970.
- ❑ An assumed 5% *Smolt1* to adult survival, which includes the fraction of *smolt1* that survive from Englebright Dam to adult return to freshwater. The assumed 5% survival was based on survival values of smolt-1-sized juvenile Chinook salmon released at Feather River Hatchery from 1967–1970 and Nimbus Hatchery in 1955.

Although it is recognized that there is a relative paucity of reliable smolt outmigration to adult return survival rate information, the rates used in the RIPPLE model may be unrealistically high. The assumed rates were based on data from 1955 and 1967 to 1970. Since then, conditions have changed considerably due to increased development and water diversions in the Central Valley, Delta pumping, and variable ocean conditions, all of which would contribute to lower smolt-to-adult returning survival rates.

Climate and its impact on ocean currents and temperatures is so important to salmon survival, particularly during their vulnerable first year in the ocean, that NOAA's Northwest Fisheries Science Center can predict adult salmon returns to the Columbia River based on the ocean conditions the year they migrated out to sea. For the past three years, the system has been a very good predictor of returning adult fish (http://www.salmonrecovery.gov/RME/Ocean.aspx). NMFS (2011a, pages 25 and 26) state *"Ocean conditions, such as sea-surface temperatures and upwelling are major factors influencing west coast salmon populations (Wells et al. 2008), including those from the Central Valley (Lindley et al. 2009)."*

Given the foregoing comments, the appropriateness of the assumed smolt-to-adult return survival rates should be examined.

ISSUE

Stillwater Sciences (2012, page 53) state that "*...preliminary model gaming suggests there would be sufficient adult escapement to fully seed available spawning habitat at much lower smolt-to-adult survival values than those used; thus estimates of smolt and juvenile production potential are deemed reliable."*

COMMENT

First, no details are provided regarding "preliminary model gaming".

Second, it is logically unclear as to how smolt-to-adult survival values lower than those used in the RIPPLE model result in the conclusion regarding the reliability of smolt and juvenile production estimates.

ISSUE

Stillwater Sciences (2012, page ES-3) state "*For purposes of this assessment it was assumed that passage by salmon and steelhead would be possible in the mainstem reaches of each sub-basin up to existing natural passage barriers, and in smaller tributaries upstream to a point at which either channel gradient is too steep for passage or the channel is too narrow to provide suitable habitat*."

As a future model refinement, Stillwater Sciences (2012, page 69) identify the need to "*Conduct a literature review to provide estimates of trap and truck mortality associated with the specific* *operations proposed for fish passage in the upper Yuba River watershed. Refine outmigrant survival estimates accordingly*."

COMMENT

Review of Stillwater Sciences (2012) indicates that other than the statements above, no assumptions regarding volitional or assisted passage at Englebright Dam on the lower Yuba River, New Bullards Bar Dam on the North Yuba River, or Our House Dam on the Middle Yuba River are provided in the document.

Presumably, the RIPPLE model does not consider the very real issues associated with passage at these facilities, and assumes no passage-related mortality of either upstream migrating adults or outmigrating juveniles. Clearly, high stress and mortality can be expected to be associated with the capture, loading, transport, and release of upstream migrating adults, and the same mechanisms (plus predation) affecting downstream migrating juveniles. Consequently, the POP module results must be viewed with some skepticism regarding numeric estimation.

ISSUE

Stillwater Sciences (2012, page ES-7) reference a statistical model that is used to model Chinook salmon survival downstream of Englebright Dam in several sections of the document, as follows: (1) page ES-7 states "*The model results and discussion will serve as data inputs to a statistical model downstream of Englebright Dam to characterize Delta and ocean conditions*"; (2) page 2 states that one of the study goals and objectives is to "*Couple juvenile production potential generated by RIPPLE to a statistical model of downstream survival*"; and (3) page 52 states "*The model results and discussion will serve as data inputs to a statistical model downstream of Englebright Dam to characterize Delta and ocean conditions*."

COMMENT

It is unclear what statistical model downstream of Englebright Dam is being referred to by the above statements, and whether it is separate from the POP module. If so, it does not appear that a statistical model downstream of Englebright Dam is described in Stillwater Sciences (2012), and clarification should be provided. Moreover, if a statistical model is to be used to evaluate outmigrant to returning adult survival, then it additionally brings into question the utility of the POP module.

ISSUE

Stillwater Sciences (2012, page 68) identity one of the model challenges as "…*Downstream (i.e., lower river, estuary, ocean) survival of spring-run Chinook salmon and steelhead. These largely unknown parameters will be simulated by additional modeling downstream of Englebright Dam*."

COMMENT

Given the importance of characterizing the number of returning fish (i.e., the total number of all ages of adults leaving the ocean to search for holding habitat, as represented by the “escape” lifestage in Figure 6-2) appropriately in the POP module, and if simulations of aquatic habitat conditions downstream of Englebright Dam (i.e., in-river, estuary and ocean) are to be performed by a subsequent statistical model (status unknown), then this seems to be a major issue of the POP module and poses concerns regarding the reliability of results estimating Chinook salmon production potential.

ISSUE

As previously discussed, the most appropriate comparisons of model results would be among rivers/reaches under the current conditions. However, given the challenges associated with parameterization of biological inputs, in addition to those presented for carrying capacity estimation, even under current conditions the estimated carrying capacities and production potential for the various sub-basins are uncertain. For example, Stillwater Sciences (2012, page 52) appropriately acknowledge that “*…The adult escapement estimates (“escape”) generated by the POP module (Table 6-7) provide only a rough estimate of the number of adults that likely to return to each sub-basin under equilibrium population conditions.”* Given all of the limitations associated with lifestage-specific numeric estimation and quantification, the following comment is provided.

COMMENT

Examination of Table 6-7 (pages 49 and 50) indicates that under current conditions, no (0) individuals for any lifestage are predicted for the South Yuba River. Given all of the assumptions and methods employed by Stillwater Sciences (2012), the North Yuba River upstream of New Bullards Bar Reservoir provides about 31 times the equilibrium number of annually returning adults than the Middle Yuba River, and about 14 times that of the North Yuba River downstream of New Bullards Bar Dam. Note, however, that the predicted estimate for North Yuba River downstream of New Bullards Bar Dam may be erroneously inflated given the comment provided on page 37 of this document addressing a potential error in the estimated juvenile rearing spring-run Chinook salmon carrying capacity for the New Bullards Bar sub-basin.

3.7 Steelhead

Comments previously provided in this document that pertain to the GEO or HAB modules, or the input parameters and assumptions that are pertinent to both spring-run Chinook salmon and steelhead are not repeated here. Following are additional comments specific to the manner in which steelhead are assessed in the RIPPLE model.

<u>ISSUE</u>

Stillwater Sciences (2012 pages 53 and 54) state "*We made the simplifying assumption that juvenile habitat for age 1+ would be more limiting than age-0 juvenile habitat in both seasons… in the winter, smaller age-0 fish can utilize a wider range of substrate sizes for refuge. For this reason, in the winter, habitat is expected to become unsuitable for age 1+ steelhead at lower magnitudes of sedimentation than for age-0 steelhead."*

COMMENT

This discussion implies that substrate size and "sedimentation" for all habitat types in all rivers/reaches was evaluated and/or considered in RIPPLE application for steelhead, but no descriptions of such considerations were located in the RIPPLE report, particularly regarding substrate size metrics for "refuge", or specifically how they may have been applied. This discussion appears to be irrelevant to that which was actually done in the steelhead carrying capacity estimation process.

<u>ISSUE</u>

Stillwater Sciences (2012, page 54) state that *"…we made the simplifying assumption for the model that the majority of the steelhead population in the upper Yuba River watershed will emigrate as 2-year-olds following their second winter in freshwater."*

COMMENT

Review of Stillwater Sciences (2012) did not reveal specifically what "the majority" represented (e.g., percentage) or how it was applied in the modeling exercise.

3.7.1 Channel Gradient and Habitat Type Composition

<u>ISSUE</u>

Stillwater Sciences (2012, page 54) states "*Table 6-1 describes the HAB module input parameters required for steelhead*." The additional statement was made that "*The same habitat type fraction values used for the spring-run Chinook salmon model were also used to parameterize the steelhead model for each sub-basin. Section 6.2.1.1 describes the methods used to derive habitat type fraction values and Appendix F, Table F-1 shows the values used*."

COMMENT

There are several concerns regarding these statements.

First, Table 6-1 on page 37 narratively describes the HAB module input parameters used for the upper Yuba River RIPPLE model, but does not provide any specific values.

Second, the statement that "*The same habitat type fraction values used for the spring-run Chinook salmon model were also used to parameterize the steelhead model for each sub-basin…",* appears to contradict the discussion on page 55 "*We omitted all gravel patches with median grain size less than 10 mm and greater than 50 mm from estimates, assuming they were unsuitable for steelhead spawning (Kondolf and Wolman 1993).*" Thus, it is unclear what actually was used to model steelhead spawning habitat.

Third, Stillwater Sciences (2012) state "*Section 6.2.1.1 describes the methods used to derive habitat type fraction values.*" However, review of Stillwater Sciences (2012) demonstrated that there is no Section 6.2.1.1 included in the report.

3.7.2 Steelhead Spawning Density and Usable Fractions

ISSUE

In Stillwater Sciences (2012), the first lifestage density and usable fraction discussion begins on page 55 titled "Spawning density and usable fraction".

COMMENT

It is unclear why Stillwater Sciences (2012) ignore the holding lifestage for steelhead in description of densities. This is particularly perplexing because in the description of physical habitat thresholds for steelhead (page 59), Stillwater Sciences state "*As described in Section 6.2.1.5, physical thresholds can be used in the HAB module to identify channel reaches suitable for holding, spawning, and rearing and exclude all other reaches*." [emphasis added].

ISSUE

Stillwater Sciences (2012, page 55) describe the methods to derive the values for steelhead spawning density and fraction of the channel usable for spawning that are displayed in Table H-1. Stillwater Sciences (2012, page 55) state "*In contrast to the methods used to calculate spring-run Chinook salmon spawning gravel area, we included gravel area measured on the floodplain adjacent to pools, which was expected to be inundated during the steelhead spawning season. The estimated amount of spawning gravel area was then apportioned among habitat types in the 0–4% gradient classes by assuming 80% of spawning gravel was in pools, 10% in riffles, 10% in runs, and 0% in cascades. This assumption was based on professional opinion and evidence from the literature that most spawning occurs in pool tails (Barnhart 1991, CDFG 1998a, b) in lower gradient reaches. In gradients of 4–8% we assumed 100% of spawning occurs in pools.*"

COMMENT

These assumptions directly influence dependent estimates of steelhead spawning carrying capacity. However, these assumptions are not supported in Stillwater Sciences (2012).

Barnhart (1991) was not available for this review of Stillwater Sciences (2012). However, review of CDFG (1998b) resulted in identifying no reference to steelhead spawning in pools or pool tails. The "evidence" provided in CDFG (1998a) actually referred to a previous document as follows…*"Spawning occurs in gravel beds that are often located at tails of holding pools (USFWS 1995a)."* However, this was in reference to spring-run Chinook salmon, not steelhead. Review of USFWS (1995a) provided no additional evidence, data, reference to specific surveys or other information, but simply includes this exact quotation. Hence, this document does not state that most spawning occurs in pool tails – rather that spawning gravel beds are often located at the tails of holding pools.

Moreover, Stillwater Sciences (2012) do not provide scientific basis or rationale for assuming in their calculations that "…*in the 0–4% gradient classes …80% of spawning gravel was in pools, 10% in riffles, 10% in runs, and 0% in cascades." In gradients of 4–8% we assumed 100% of spawning occurs in pools."* Also, it is unclear how assumptions regarding percentage spawning in certain pool types became translated into percentage distribution of spawning gravels.

Stillwater Sciences (2012) provide no support for the assumption that *"we included gravel area measured on the floodplain adjacent to pools, which was expected to be inundated during the steelhead spawning season."* Apparently, analyses were not conducted to determine the probability that floodplains would be inundated, or the duration of inundation and concomitant usability for spawning. This assumption has the potential to result in an overestimate of carrying capacity. In addition, it is unclear as to how floodplain habitat was incorporated, because: (1) it is unclear if gravel size surveys were conducted in the floodplains; and (2) if "*The estimated amount of spawning gravel area was then apportioned among habitat types…",* then this would imply that habitat typing occurred within the extent of the floodplains, which is not clear in the report.

ISSUE

Stillwater Sciences (2012, page 55) state "*Since spawning habitat data were not available for the North Yuba, the usable fraction values calculated from South and Middle Yuba spawning habitat data were applied to the North Yuba*."

COMMENT

The Stillwater Sciences (2012) report is dated February 2012. This report was prepared for NMFS. NMFS has been a participant in the Yuba Salmon Forum (YSF). A YSF report on spawning habitat in the North Yuba River upstream of New Bullards Bar Reservoir was available to YSF participants, including NMFS, during November 2011 (YCWA 2011b).

<u>ISSUE</u>

Stillwater Sciences (2012, page 55) state *"Alternative Management Scenarios 1 and 2 assume gravel augmentation would take place in the Yuba River below New Bullards Bar Dam."*

COMMENT

As previously discussed for spring-run Chinook salmon, the gravel augmentation program for the North Yuba River downstream of New Bullards Bar Dam evaluated in Stillwater Sciences (2012) is speculative, does not address the venue, cost, jurisdictional authorities, responsible parties or implementing agencies.

3.7.3 Steelhead Summer Juvenile Rearing Density and Usable Fraction

<u>ISSUE</u>

Stillwater Sciences (2012, pages 56 and 57) explain the derivation of the juvenile rearing density values for pools, riffles and runs in channel gradient classes 0-1% and 1-2% that were used in the calculations of carrying capacity for summer juvenile rearing of age 1+ steelhead. The resulting densities were 0.085, 0.157 and 0.149 fish/m², for pools, riffles and runs, respectively (Table H-3).

Stillwater Sciences (2012) explain that these values were the result of "*apportioning*" the average fish density (0.121 fish/m²) from seven electrofishing surveys conducted in the upper Yuba River (two in the South Yuba, three in the Middle Yuba and 2 in the North Yuba) during the summer of 2008 (NID and PG&E 2009, as cited in Stillwater Sciences 2012) by habitat type, by applying the proportion of the mean habitat-specific density values of 4-8" *O. mykiss* from Gast et al. (2005) snorkel data for the South Yuba and Middle Yuba rivers (mean of pool densities = 0.013 fish/m², mean of riffle densities = 0.023 fish/m², mean of run densities = 0.022 fish/m²).

COMMENT

Stillwater Sciences (2012) explained that the juvenile rearing density values for pools, riffles and runs in channel gradient classes 0-1% and 1-2% were calculated by "*apportioning*" 0.121 fish/m² by habitat type (i.e., pool, run and riffle) in proportion to the mean habitat-specific densities obtained from Gast et al. (2005) snorkel data. However, Stillwater Sciences (2012) does not explicitly state the manner in which "*apportioning*" was actually conducted.

ISSUE

Stillwater Sciences (2012) mention that the NID and PG&E (2009, as cited in Stillwater Sciences 2012) electrofishing data presented considerable variation among sub-basins (North Yuba average density 0.310 fish/m², South Yuba and Middle Yuba combined average density 0.045 fish/m²) and state that the overall mean density of the seven electrofishing sites was used because they had "*no basis by which to determine whether the differences among sub-basins* [density means] *were truly representative of different carrying capacities or rather were anomalies resulting from low sample sizes, relatively poor spatial coverage of each sub-basin, and a single year of data.*"

COMMENT

Stillwater Sciences (2012) rationalized that the procedure they selected was appropriate because there was no basis to determine whether density means among sub-basins reflected different carrying capacities or were anomalous due to sampling.

The procedure used by Stillwater Sciences (2012) to calculate juvenile steelhead summer rearing densities resulted in the exact same density values, by gradient class, for the South, Middle, North and New Bullards Bar sub-basins. The result of using the same values among sub-basins completely eliminates sub-basin specific population values or habitat-abundance relationships, which may actually be reflective of the suitability and/or carrying capacities of each individual sub-basin.

Stillwater Sciences (2012) could have used an alternative procedure that is equally justifiable given the rationale that there was no basis to determine whether density means among sub-basins reflected different carrying capacities or were anomalous due to sampling. For example:

- ❑ The average electrofishing density of the two South Yuba River sites in NID and PG&E (2009, as cited in Stillwater Sciences 2012) could have been "apportioned" by habitat type using Gast et al. (2005) habitat-specific snorkel mean density for the South Yuba sub-basin (pool = 0.020 fish/m², riffle = 0.017 fish/m², run = 0.022 fish/m²).
- ❑ The average electrofishing density of the three Middle Yuba River sites in NID and PG&E (2009, as cited in Stillwater Sciences 2012) could have been "apportioned" by habitat type using Gast et al. (2005) habitat-specific snorkel mean density for the Middle Yuba sub-basin (pool = 0.006 fish/m², riffle = 0.030 fish/m², run = 0.022 fish/m²).
- ❑ The average electrofishing density of the two North Yuba River sites in NID and PG&E (2009, as cited in Stillwater Sciences 2012) could have been "apportioned" by habitat type using Gast et al. (2005) habitat-specific snorkel mean density for the Middle Yuba and South Yuba sub-basins combined (pool = 0.013 fish/m², riffle = 0.023 fish/m², run = 0.022 fish/m²).

In fact, this alternative approach is analogous to that which Stillwater Sciences (2012) used when trying to apply sub-basin specific biological information regarding water temperature tolerance thresholds. As reported in Stillwater Sciences (2012, Section 2.2.1 and page 64), the locations and the temperatures at which juvenile *O. mykiss* were observed were different in the South and Middle Yuba rivers, and therefore used different water temperatures to define tolerance thresholds independently for each of the two sub-basins.

3.7.4 Carrying Capacity Estimates

ISSUE

Stillwater Sciences (2012, page 62) presents predicted habitat carrying capacities of steelhead spawning (redds), and summer 1+ and winter 1+ rearing lifestages for each modeled sub-basin and scenario in the Upper Yuba River Watershed in Table 7-4.

COMMENT

As previously discussed for spring-run Chinook salmon, the Alternative Management Scenarios may represent unrealistic operational assumptions. Hence, the speculative nature of the Alternative Management Scenarios restricts the utility of habitat carrying capacity estimates among scenarios, and even under current conditions, given all of the previously mentioned issues.

Examination of Table 7-4 (page 62) indicates that under current conditions, steelhead redd carrying capacity is 393 for the South Yuba River, 1,503 for the Middle Yuba River, and 121 for the North Yuba River downstream of New Bullards Bar Dam, and 15,626 for the North Yuba River upstream of New Bullards Bar Reservoir. Given all of the assumptions and methods employed by Stillwater Sciences (2012), the North Yuba River upstream of New Bullards Bar Reservoir provides about 40, 10, and 129 times the carrying capacity of the South Yuba River, the Middle Yuba River, and the North Yuba River downstream of New Bullards Bar Dam, respectively.

In addition, given all of the assumptions and methods employed by Stillwater Sciences (2012), the predicted juvenile summer 1+ rearing carrying capacity for the North Yuba River upstream of New Bullards Bar Reservoir under current conditions greatly exceeds the other sub-basins, providing approximately 26, 12, and 11 times the carrying capacity of the South Yuba River, the Middle Yuba River, and the North Yuba River downstream of New Bullards Bar Dam, respectively.

However, as for spring-run Chinook salmon, the estimated juvenile steelhead summer rearing carrying capacity for the New Bullards Bar sub-basin may be erroneously overestimated. Stillwater Sciences (2012, page ES-4) states "*For modeling purposes we assumed that rearing only occurs downstream of spawning.*" In the New Bullards Bar sub-basin, Stillwater Sciences

(2012, page 55) state that because suitable steelhead spawning habitat does not occur in the New Bullards Bar reach upstream of the Middle Yuba confluence, spawning capacity of this reach was set to zero for current conditions.

Stillwater Sciences (2012, page 16) state that under current conditions, in the New Bullards Bar sub-basin, 3.7 miles were identified as suitable summer rearing habitat for steelhead. The distribution of juvenile steelhead summer rearing habitat is depicted in Map 5 of Stillwater Sciences (2012). Examination of Map 5 indicates that the 3.7 mile area included as suitable juvenile steelhead summer rearing habitat includes about 1.2 miles immediately downstream of New Bullards Bar Dam. However, this depicted juvenile steelhead summer rearing habitat is several miles upstream of suitable spawning habitat. Therefore, if "*rearing only occurs downstream of spawning",* then this area should not be depicted as suitable juvenile steelhead summer rearing habitat, and the estimated juvenile rearing steelhead carrying capacity for the New Bullards Bar sub-basin may be overestimated.

ISSUE

Stillwater Sciences (2012, page 62) state "*Results of the RIPPLE HAB module indicate that, for each model sub-basin and scenario, assuming sufficient adult spawning escapement, there was ample spawning habitat (redd carrying capacity) to fully seed the thermally suitable age 1+ juvenile summer rearing habitat (Table 7-4).*"

COMMENT

This statement actually encompasses the series of assumptions that: (1) adult spawning escapement is sufficient to fully seed the redd carrying capacity; (2) the redd carrying capacity is sufficient to fully seed summer age-0 carrying capacity; (3) summer age-0 carrying capacity is sufficient to fully seed winter age-0 carrying capacity; (4) winter age-0 carrying capacity is sufficient to fully seed summer 1+ carrying capacity. This litany of assumptions is not fully justified or rationalized in Stillwater Sciences (2012). In particular, Stillwater Sciences (2012) does not provide explanation or justification that an annual return rate of 35,286 adult steelhead (given the model estimated redd carrying capacity and assuming 2 fish per redd, which is a minimalist assumption) under current conditions could actually occur, or is a reasonable assumption.

ISSUE

Stillwater Sciences (2012, page 62) demonstrate modeled carrying capacity for steelhead lifestages in Table 7-4. For the North Yuba River, the model estimates 15,626 steelhead redds but only estimated 2,696 spring-run Chinook salmon redds (Table 6-5). Clearly, there is a large difference between the estimated carrying capacity for steelhead redds versus spring-run Chinook salmon redds in the North Yuba River.

COMMENT

The tremendous discrepancy in the carrying capacity of steelhead redds versus spring-run Chinook salmon redds (in the North Yuba River) can partially be explained by the assumed area required per redd for the two different species. For spring-run Chinook salmon, each redd was assumed to encompass 5.4 m^2. For steelhead, each redd was assumed to encompass 2.0 m^2 in low gradient sections and 1.5 m^2 in high gradient sections. Consequently, according to the assumptions in Stillwater Sciences (2012), spring-run Chinook salmon redds require 2.7 to 3.6 times the area that steelhead redds require. However, the carrying capacity for steelhead redds is 5.8 times higher than that for spring-run Chinook salmon. Additional investigation should be conducted to determine why such a relatively high carrying capacity for the number of steelhead redds is predicted, relative to spring-run Chinook salmon redds.

ISSUE

Stillwater Sciences (2012, page 62) report model carrying capacity estimates for redds, summer age 1+ and winter age 1+ juvenile rearing in Table 7-4 for the current condition and Alternative Management Scenarios 1 and 2.

COMMENT

Examination of Table 7-4 demonstrates that the carrying capacity estimates for winter age 1+ juvenile rearing does not change between the current condition and Alternative Management Scenario 1 or Alternative Management Scenario 2 for the South and Middle Yuba rivers. This is not an intuitive result, given that: (1) Alternative Management Scenarios 1 and 2 were assumed to represent an increased summer release of 50 cfs and 100 cfs, respectively, in the Middle Yuba River; and (2) Alternative Management Scenarios 1 and 2 were assumed to represent an increased summer release of 100 cfs and 200 cfs, respectively, in the South Yuba River. Additional investigation should be conducted to determine why no change occurs in carrying capacity of winter age 1+ steelhead among scenarios, and if the model is operating as intended.

4.0 Literature Cited

Barnhart, R. A. 1991. Steelhead *Oncorhynchus mykiss*. Pages 324–336 in J. Stolz and J. Schnell, editors. The Wildlife Series: Trout. Stackpole Books. Harrisburg, Pennsylvania.

Bjornn, T. C. and D. W. Reiser. 1991. Habitat Requirements of Salmonids in Streams. Chapter 4 in Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitat. American Fisheries Society Special Publication 19: 83-138.

CDFG. 1998a. A Status Review of the Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) in the Sacramento River Drainage. Report to the Fish and Game Commission, Candidate Species Status Report 98-01. CDFG, Sacramento.

CDFG. 1998b. Central Valley Anadromous Fish-habitat Evaluations: October 1996 through September 1997. Stream Evaluation Program, Technical Report No. 98-4. Prepared by CDFG, Environmental Services Division, Stream Flow and Habitat Evaluation Program for U. S. Fish and Wildlife Service, Central Valley Anadromous Fish Restoration Program.

CDFG. 2003. Fish Passage Evaluation at Stream Crossings. California Department of Fish and Game, Sacramento, California.

DWR. 2007. Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared by Upper Yuba River Studies Program Study Team for California Department of Water Resources, Sacramento, California.

Everest, F. H., and D. W. Chapman. 1972. Habitat Selection and Spatial Interaction by Juvenile Chinook Salmon and Steelhead Trout in Two Idaho Streams. Journal of the Fisheries Research Board of Canada 29: 91–100.

Gast, T., M. Allen, and S. Riley. 2005. Middle and South Yuba Rainbow Trout (*Oncorhynchus mykiss*) Distribution and Abundance Dive Counts August 2004. Final Draft. Prepared by Thomas R. Payne and Associates, Arcata, California. Appendix G in Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared by UYRSPST for California Department of Water Resources, Sacramento, California.

NID and PG&E. 2009. Stream Fish Population. 2008 Progress Report. Technical Memorandum 3-1.

Nikirk, N., and C. Mesick. 2006. Spawning Habitat Evaluation. Prepared by CH2M Hill, Sacramento, California and U.S. Fish and Wildlife Service, Sacramento, California for Upper Yuba River Studies Program Study Team, Sacramento, California. Appendix D in Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared by UYRSPST for California Department of Water Resources, Sacramento, California.

NMFS. 2011. North Yuba River Temperature Monitoring Program. Technical Memorandum. Habitat Conservation Division, Sacramento, CA. January 2011.

NMFS. 2011a. 5-Year Review: Summary and Evaluation of Central Valley Spring-Run Chinook Salmon ESU. Central Valley Recovery Domain. National Marine Fisheries Service, Southwest Region.

NMFS. 2012. Final Biological Opinion on the U.S. Army Corps of Engineers Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir. February 29, 2012.

Stillwater Sciences. 2003. Draft Restoration Strategies for the San Joaquin River. Prepared for Friant Water Users Authority and Natural Resources Defense Council. February 2003.

Stillwater Sciences. 2006b. Upper Yuba River Chinook Salmon and Steelhead Rearing Habitat Assessment. Technical Appendix. Prepared by Stillwater Sciences, Berkeley, California for CH2M Hill, Sacramento, California. Appendix E in Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared by UYRSPST for California Department of Water Resources, Sacramento, California.

Stillwater Sciences. 2010. E-mail Correspondence from AJ Keith (Stillwater Sciences) to Rick Wantuck (National Marine Fisheries Service). July 2010.

Stillwater Sciences. 2012. Modeling Habitat Capacity and Population Productivity for Spring-run Chinook Salmon and Steelhead in the Upper Yuba River Watershed. Technical Report. Prepared by Stillwater Sciences, Berkeley, California for National Marine Fisheries Service, Santa Rosa, California

USFWS. 1995a. Sacramento-San Joaquin Delta Native Fishes Recovery Plan. U. S. Department of the Interior Fish and Wildlife Service Region 1, Portland, Oregon.

Vogel, D. A. 2006. Assessment of Adult Anadromous Salmonid Migration Barriers and Holding Habitats in the Upper Yuba River. Prepared by Natural Resource Scientists, Inc., Red Bluff, California for CH2M Hill, Sacramento, California. Appendix C in Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment. Technical Report. Prepared by UYRSPST for California Department of Water Resources, Sacramento, California.

YCWA. 2011a. Study 1.0. Yuba River Salmon Forum Studies Habitat Mapping Report. Draft. September 2011.

YCWA. 2011b. Study 1.3. North Yuba Spawning Habitat Evaluation. Yuba River Salmon Forum Studies. Draft. November 2011.

Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 2001. Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California. Pages 71–176 in R.L. Brown, editor. Contributions to the Biology of Central Valley Salmonids. California Department of Fish and Game Bulletin 179.

Attachment 3

Comments on NMFS Biological Opinion of Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir

Prepared for the U.S. Army Corps of Engineers, Sacramento District

by Dr. Gregory B. Pasternack, Ph.D.

Assessment of Geomorphology and Habitat Related Statements in the NMFS Biological Opinion of Continued Operation and Maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and Recreational Facilities On and Around Englebright Reservoir

(31 photos of ubiquitous large woody material occurring on the lower Yuba River)

Prepared By

Dr. Gregory B. Pasternack, Ph.D., AM.ASCE

Prepared for the United States Army Corps of Engineers
Sacramento District, Englebright/Marlis Creek Lakes

May 09, 2012

EXECUTIVE SUMMARY

In this report I provide evidence-driven professional expert commentary regarding a set of specific statements made in the National Marine Fisheries Service's (NMFS) Biological Opinion (BO) on continued operation and maintenance of Englebright Dam and Reservoir, Daguerre Point Dam, and recreational facilities on and around Englebright Reservoir. My comments are limited to just some of the text of the BO, but that should not be taken to mean that I agree or disagree with anything else in the document. In my review, I found that NMFS used little reference to previously published documents about the geomorphology of the lower Yuba River (LYR) and did not access data and analyses at their disposal as participants in the Yuba Accord River Management Team (RMT) to address the topics they covered in the BO. In my review I found that the statements in the BO do not accurately characterize the fluvial geomorphology of the LYR. I found examples of specific concepts about unrelated and inappropriate reference types of rivers applied to the LYR. In other instances I found statements that blend and apply generic concepts about diverse types of rivers in diverse settings to the LYR in a dogmatic fashion that did not account for the specific evidence available for the LYR. The most egregious problem is the unsupported conjecture in the BO that the LYR channel and floodplain are disconnected. Building on that false claim, the BO envisions a long chain of ecological problems that are also not substantiated by data. Instead, an abundance of evidence shows that in fact the LYR has a strong connection between its bankfull channel and its floodplain. Furthermore, the evidence shows that the hydrology of the LYR involves more frequent floodplain inundation on this regulated river than is commonly reported even for pristine temperate rivers and significantly more so than reported for other semi-arid rivers. Numerous other false statements that are obviously contrary to available data and conclusions of peer-reviewed literature exist throughout the reviewed BO statements and are addressed in this report. In contrast, to the extent possible, the claims made in this report are substantiated with numerous data, analyses, citations, and photographs.

The headers of key sections of the BO related to fluvial geomorphology and habitat as well as the associated text of those sections include incorrect statements. For instance, contrary to the headers, there is in fact a systemic abundance of (1) spawning substrates, (2) natural river morphology, processes, and functions, (3) habitat complexity consistent with the river's landscape position, (4) large woody materials, (5) cobble and boulder cover, and (6) riparian vegetation, especially stream-side vegetation, in the LYR. For example, along the banks in the 1,000 to 5,000 cfs inundation band, the river has 3.54 million square feet of vegetation (excluding the Narrows Reach). Bank-side vegetation averages 12-35’ high (downstream of SR20 where there exists LiDAR data to estimate canopy height), depending on reach. Further, the alluvial valley within the 42,200 cfs inundation zone is 25% vegetated, with the geomorphic Daguerre Reach being 33% vegetated in that same inundation zone. The height of this vegetation in the 42,200 cfs inundation area varies by reach, but is not insignificant, with reach-scale averages between 17.5 to 33.6’ (downstream of SR20 where there exists LiDAR data to estimate canopy height) and individual tree heights up to a maximum of ~150 feet. Given the preponderance and mixture of sandbar willow and cottonwood, the reach-scale average heights are in the range expected of a blended mature canopy. These heights were found to generate shade cover in aerial images of the river, as illustrated in the report. Preliminary historical analysis found that the amount of riparian cover appears to have increased significantly since 1942 and there is good reason to think that the growth in vegetated cover will keep increasing.

Contrary to the statements in the BO, the LYR is moving along on a path of natural, self-driven ecological recovery that is directly attributable to the existence of Englebright Dam. Englebright Dam protects the river from the vast wastes of a degraded watershed blocked upstream. Downstream, training berms protect the river from breaking out into the Yuba Goldfields wasteland; flowing through that region would ruin the river. It is imperative to establish an ecological baseline consistent with the landscape position of the LYR and not amalgamate idealized attributes of rivers from around the world spanning mountaintop to ocean. Despite the fact that virtually all of the BO statements commented on below were found to be wrong, there are opportunities to improve the LYR, such as carrying out the USACE’s gravel augmentation implementation plan, rehabilitating the lower half of the Englebright Dam Reach, and other potential river rehabilitation schemes under consideration by the RMT.

FLUVIAL GEOMORPHOLOGY

BO STATEMENT (Pages 136 and 137)

The Yuba River below Englebright Dam still experiences a dynamic flood regime because uncontrolled winter and spring flows (Moir and Pasternack 2008) in above normal and normal water years, and the flows under the Yuba Accord have improve habitat in recent years, however, the flows in below average water years can be below the optimal depths for spawning and rearing spring-run Chinook salmon, as demonstrated by the flow habitat relationships modeled by Gallagher and Gard (1999).

COMMENT

The claim that "the flows in below average water years can be below the optimal depths for spawning and rearing spring-run Chinook salmon" is incorrect based on the extensive data for the lower Yuba River (LYR). It would have been better had the statement isolated spawning and rearing independently to be clear and specific as to exactly which one was impacted by which conditions. As a conjunctive sentence, the statement requires that both life stages are impacted for this to be true. Unfortunately, the biological opinion cites Gallagher and Gard (1999), but does not list it in the references section to allow readers to find out what that is and how it relates to an evaluation of the LYR. A literature search found a study of Chinook salmon by those authors that addressed the lower American and Merced Rivers, but it is not about the lower Yuba River (LYR). Considering that there have been several studies evaluating Chinook salmon spawning on the LYR directly (as well as a couple on rearing), it is peculiar that the Biological Opinion (BO) would not reference the spawning-related information in those studies when evaluating spawning conditions. These available studies include Beak Consultants, Inc. (1989), CDFG (1991), Pasternack (2008), Moir and Pasternack (2008), Moir and Pasternack (2010), and the RMT's annual redd survey reports for 2009-2010 and 2010-2011.

According to the Yuba Accord flow schedule, in below-average and drier water years, the instream flow requirement at the Smartville Gage (schedule B) that covers the corridor upstream of Daguerre Point Dam (DPD) is 500-600 cfs for the entire potential spawning period of September-March. Meanwhile, for the corridor downstream of DPD, the Accord provides for flows of 400-500 cfs for September-March in below-average water years (schedules 4 and 5) and 350 cfs for September-March in the driest years (schedule 6). Therefore, the claim involves assessing what the water depths are like in those flows and how those depths relate to the depth range requires for Chinook salmon spawning. The claim should have been assessed using Yuba data and flow-habitat relationships, both of which exist and were available to NMFS.

In 2009-2011, the RMT developed and validated a 2D hydrodynamic model of the entire LYR, excluding the inaccessible Narrows Reach. Several reports and presentations about the model have been provided to members of the RMT, including NMFS. Table 1 below provides the reach-average water depths for the LYR, excluding the Englebright Dam and Narrows Reach that have little gravel or spawning at this time. The reach-average depth is computed by averaging the water depth in all wet 3'x3' cells in the reach at a given flow, so it is a near- census of depths, not a limited sampling such as performed in the past by all previous studies on the LYR. The minimum reach-average depth is 1.8'. Figure 1 below provides three depth habitat suitability curves (HSCs) for Chinook salmon spawners (including spring run) from three different studies relevant to the lower Yuba River. According to the Gard curve, the optimal depth for Chinook salmon spawning is ~1.5', while for the other curves there is a range of optimal depths spanning from at least 1-2'. Combining the depth table and the HSC plots, none of the reaches have average depths that are "below the optimal depth" for Chinook salmon spawning for their spawning period of the year. This evidence-based finding drawing on a near-census of the river, not a highly limited sampling of a few sites, is contrary to the claim in the biological opinion. Based on a review of depths in the LYR considering the full spatial pattern of depths in the 2D model over the range of flows shown in Table 1, the optimal range of ~1-2' is widely available for Chinook salmon spawners during below-average and drier water years. Looking beyond the data to the past literature, there is no evidence that insufficient depth is a problem facing Chinook salmon spawners in below-average water years on the LYR under the Yuba Accord flow schedule.

In terms of Chinook salmon rearing, the BO does not directly state what the desired depths should be, but there is information from Beak Consultants, Inc. (1989). According to that LYR study, "Fry were observed in water depths that averaged 1.22 ft… Juvenile chinook salmon used an average water depth of 1.06 ft". According to Table 1, none of the low flows associated with below-average or drier conditions have reach-average depths below those values. Depths of ~1-1.2' are actually widespread around the periphery of the wetted channel at any flow on the LYR, including these low flows. As explained in a comments below, those 1-1.2' deep areas along the wetted periphery are adjacent to vegetation for ~20-35% of the streambank area (zone between 1,000 to 5,000 cfs). Further, as illustrated below in Figures 10-13 and explained in the associated text, streambank vegetation is typically tall and dense enough to provide shading and it has enough roots in the water to provide in-stream cover. The near-bank wetted area in the Marysville Reach contains a significant abundance of large wood that also serves as cover, as illustrated in comments below.

A more detailed assessment of Chinook salmon spawning conditions on the LYR that includes not only depth, but also velocity and substrate, was recently done by the RMT. According to the 2009-2010 and 2010-2011 Yuba Accord River Management Team (RMT) redd survey annual reports that have been accessible to NMFS, 74.2% and 81.3% of redds in those respective years occurred above DPD. Meanwhile, for the spawning period each year that yields the vast majority of redds (October-November), the flow is 600 cfs. According to the RMT's preliminary 2D microhabitat analysis of Chinook salmon spawning on the LYR (which was presented to NMFS in January and February 2012), the peak weighted usable area (WUA) for the LYR is at 600 cfs. At this flow, the census-based analysis yields an estimate of >3.39 million ft^2 of spawning habitat on the lower Yuba River, again accounting for the joint distribution of substrate, depth, and velocity.

Table 1. Reach-average water depth (ft) computed using the RMT's LYR 2D model.

	Above Daguerre Point Dam			Below Daguerre Point Dam		
Flow (cfs)	TBR	PBR	DCR	DPDR	HR	MR
350	2.8	1.9	1.9	1.8	2.0	5.0
400	2.8	1.9	2.0	1.9	2.1	5.1
450	2.9	2.0	2.0	2.0	2.2	5.1
530	2.9	2.1	2.1	2.1	2.3	5.2
600	3.0	2.2	2.1	2.2	2.4	5.2

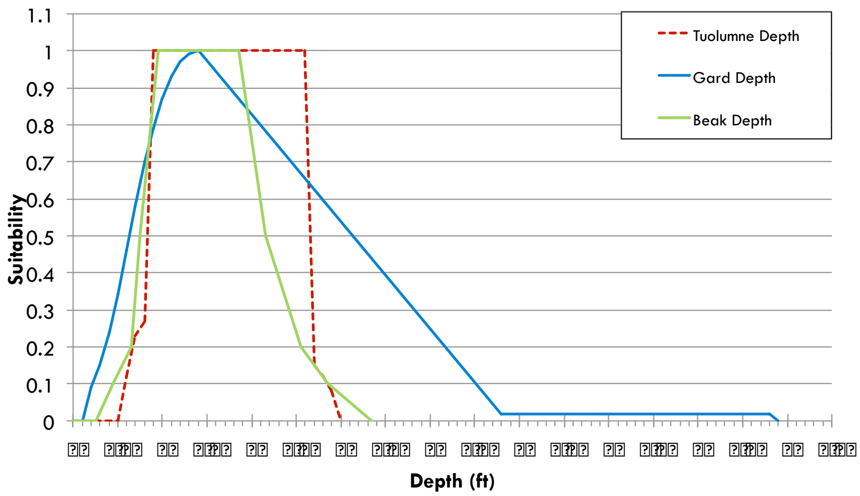

Figure 1. Three of the habitat suitability curves (HSCs) that have been evaluated for use on the Lower Yuba River.

References:

Beak Consultants, Inc. 1989. Yuba River Fisheries Investigations, 1986-88, Summary Report Of Technical Studies On The Lower Yuba River, California.

CDFG. 1991. The Lower Yuba River Fisheries Management Plan Final Report. The Resources Agency, CDFG, Stream Evaluation Report No. 91-1. February 1991.

Moir, H. J. and Pasternack, G. B. 2008. Relationships between mesoscale morphological units, stream hydraulics and Chinook salmon (Oncorhynchus tshawytscha) spawning habitat on the Lower Yuba River, California. Geomorphology 100:527-548

Moir, H. J. and Pasternack, G. B. 2010. Substrate requirements of spawning Chinook salmon (Oncorhynchus tshawytscha) are dependent on local channel hydraulics. River Research and Applications 26:456-468.

Pasternack, G. B. 2008. SHIRA-Based River analysis and field-based manipulative sediment transport experiments to balance habitat and geomorphic goals on the lower Yuba River. Cooperative Ecosystems Studies Unit (CESU) 81332 6 J002 Final Report, University of California at Davis, Davis, CA, 569pp.

BO STATEMENT (Page 137)

Managed river flows also reduce the amount of rearing habitat available for both spring-run Chinook salmon and Central Valley steelhead. The low flows disconnect the river from the *floodplain rearing habitat reducing juvenile survival by decreasing cover and food availability and increasing competition and predation.*

COMMENT

According to this statement, (1) the channel and floodplain are disconnected from each other by "low flows" caused by management of the river and (2) rearing habitat exists on the floodplain where there is cover and food availability. Wyrick and Pasternack made available to NMFS and all other RMT participants a Google Earth .kml file with a map of the LYR's morphological units for both in-channel and overbank areas. Further, at any time, the freeware HEC-SSP may be used to compute the widely used statistical metric for bankfull discharge (Q1.5) for either the Smartville or Marysville USGS flow gages. Therefore, complete information was available to NMFS by autumn 2011 to assess the status of floodplain connectivity, yet there is no indication that these tools were actually employed to produce this conjecture in the biological opinion. To be clear a *floodplain* is commonly defined as *a low-lying, overbank, depositional surface*. Thus, the questions arises as to whether the LYR has such an area with those conditions that we might deem it a floodplain?

By definition, alluvial river corridors such as exists for the majority of the LYR (excluding Englebright Dam and Narrows reaches) consist of in-channel areas and overbank areas. The channel itself is a geometric shape carved by water. Classic geomorphic literature demonstrated that channels are sized to accommodate a flow termed the "bankfull discharge". There are numerous methods to identify what this discharge is for any river reach, but the most commonly used ones are (1) geometric indicators observable in the field, (2) a statistical metric obtain from flood frequency analysis of a multi-decadal daily discharge record from the river, and (3) regional regression equations. According to classic fluvial geomorphology, floodplains are normally inundated every ~1.5-2 years in a humid, temperate climate and every ~2-5 years in a semi-arid climate. Pasternack (2008) investigated geometric bankfull indicators associated with (a) overtopping river banks and (b) inundating islands in Timbuctoo Bend. As shown in Figure 2 below, banks and islands in Timbuctoo Bend are inundated by ~5000 cfs, and in some locations banks are inundated at a lower discharge. Pasternack (2008) also reported a statistically determined bankfull ($Q_{1.5}$) discharge estimate of ~5600 cfs using the 1971-2004 peak annual discharge series for the Smartville USGS flow gage. Subsequently, Wyrick and Pasternack (2011) used the LYR 2D hydrodynamic model to determine, map, and analyze the areas of inundation for a representative baseflow (880cfs above DPD and 530 cfs below DPD), a representative bankfull flow (5000 cfs), and a representative floodplain filling flow (21,100 cfs). These inundation maps provide the topographic evidence necessary to evaluate BO claims.

One thing that LYR topographic and inundation analysis has found is that there exist "swales" within the 5000 cfs inundation level, where a swale is a topographic bench out of the geometric channel that inundates at a significantly lower discharge than the overbank floodplain (Wyrick and Pasternack, 2011). These could be ideal rearing areas, because they are inundated frequently, adjacent to the main channel (and accessible to fish), and they are moderately vegetated. The LYR has an estimated 3.56 million ft^2 of swales, and of that total area, 34 % is covered with vegetation. It is highly likely that swales play a prominent role in fish rearing, and that deserves further investigation.

Given a well-established threshold of ~5000 cfs to begin to inundate the floodplain, the question comes down to how often does that occur on the LYR relative to what occurs in non-regulated rivers? According to classic literature, floodplains of natural rivers do not normally flood every year. By definition, floodplains are sedimentary surfaces that inundate only every ~1.5 to 5 years, depending on climate. Therefore, for the biological opinion statement to be correct, the managed flows on the LYR must yield overbank flows less frequently than natural. That is easy to assess. According to HEC-SSP analysis of the 1970-2010 annual peak discharge series for flows at the Marysville gage, there is an 80% change in any given year that discharge will exceed 5,612 cfs and a 50% chance that discharge will exceed 16,464 cfs. Therefore, the exact discharge at which flow spills out of the channel is unimportant, because in any given year there is a 50:50 chance that a flow of >16,000 cfs will occur, and that flow is more than sufficient to not only go overbank, but to actually inundate a large amount of the floodplain. For the Smartville gage, the same 80% and 50% exceedence flows are 4,085 and 12,343 cfs, respectively. Once again, the 50% value is well above the geometric bankfull threshold indicating high probability in any given year. Thus, the topographic and hydrologic evidence shows that the LYR experiences floodplain inundating flows at least as frequently as expected for a natural river.

By definition, when a river's floodplain is disconnected from its channel, a river is "***entrenched***". The BO states therefore that the LYR is entrenched. According to Rosgen (1996), the "entrenchment ratio" (ER) of a river is the ratio of the floodprone width to the bankfull width. The floodprone width is defined as the width of the river at a discharge that yields a water depth that is twice bankfull depth. The *lower* ER is, the *more entrenched* a channel is. Rosgen (1996) termed any river with an ER <1.4 to be an entrenched river. Therefore, it is possible to test the conjecture in the BO using the data available to RMT participants. According to Pasternack (2008) and Wyrick and Pasternack (2011), flows of >5000 cfs fully inundate the LYR's channel and already spill out of that and onto swales at a lower flow. Wyrick and Pasternack stationed the river's centerline with cross-sections every 20' using ArcGIS and clipped the cross-sections to the wetted-area boundary for 5000 cfs to obtain the longitudinal distribution of wetted width for the river at this flow. This was also done for every other flow the RMT analyzed. The mean depth of all 3'x3' wetted cells in the whole LYR was computed using 2D model results for 5,000 cfs and found to be 4.67'. Doubling that value, it was found that the discharge of 42,200 cfs previously simulated with the 2D model yielded a depth very close to double the bankfull depth and could be used to represent the floodprone condition. Therefore, Wyrick and Pasternack (2011) stationed the river's centerline with cross-sections every 20' using ArcGIS and clipped the cross-sections to the wetted-area boundary for 42,200 cfs to obtain the longitudinal distribution of wetted width for the river at this flow. Although the next step was not done in that report, the data was available to RMT members, so Wyrick and I went ahead and analyzed the ER. The ER was computed for every stationed cross-section using the width ratio for 42,200 cfs and 5,000 cfs. That yielded a longitudinal distribution of ER. Finally, the reach-averaged ER value was computed to determine if any reach is entrenched (i.e. ER<1.4). *Based on this dataset using data available to RMT participants since summer 2011, no reaches in the LYR are entrenched*.

On the basis of topographic, hydrologic, and entrenchment analysis of the LYR, there is no evidence whatsoever that the LYR's floodplain is disconnected from its channel. The geometric channel is shaped to allow water to spill out onto swales at flows in the 1000-5000 cfs range, flows on the LYR easily exceed the geometric threshold to inundate floodplains more often than expected in nature, and the entrenchment ratio shows that the reaches of the LYR are not entrenched.

The second part of the conjecture in this BO statement is that the floodplain provides rearing habitat with cover and food availability. The conjecture further states that without access to the floodplain, there is decreased cover for rearing fish. Gard (2008) sampled 32,095 feet of near-bank stream length and 7,496 feet of mid-channel stream length. The key result from the study was that out of the 468 locations where young-of-the-year Chinook salmon and steelhead/rainbow trout were observed, all but 8 (that is 98.3%) occurred near riverbanks. The explanation is that dense vegetation exists as a polyline on the channel bank and swales at an elevation between baseflow and bankfull as well as around slackwaters in embayments and partially connected side channels with only a downstream connection to the mainstem, limiting the velocity there. Figure 3 shows an underwater photo of a juvenile fish using riverbank habitat- note the abundance of small plant material characteristic of the microhabitat. The significance of this evidence is salmonids rearing in the LYR prefer vegetated areas, such as riverbank habitat, and that dense cover is widely available in the bankfull channel along the banks. Considering the bank area between the baseflow and bankfull flow (1,000 to 5,000 cfs inundation band), analysis of the RMT's vegetation map finds that there exists 3.54 million ft^2 of vegetation, which covers 28% of that bank area for the whole LYR. Unfortunately, I do not have linear estimate right along the baseflow water's edge, so this number is deflated relative to a linear estimate.

The question arises as to whether the LYR's floodplain is also vegetated and thus potentially providing a lot of habitat when inundated? Because of unprecedented amounts of hydraulic mining sediment filling the LYR's river corridor and dredgers reworking that sediment, the LYR's floodplain consists of vast, partially vegetated, unconsolidated sediment. Based on the RMT's vegetation map, there exists 23.2 million square feet of vegetation within the 42,200 cfs inundation zone, which covers 25% of the surface. White (2010) analyzed where vegetation occurs in Timbuctoo Bend and reported that lines of vegetation (primarily sandbar willow) on the floodplain exist because those are the pathways of previously inundated channels (what Wyrick and Pasternack (2011) define as "flood runners"). Thus, the majority of vegetation on the floodplain of Timbuctoo Bend is associated with modern or recently abandoned channels. Visual inspection of the rest of the LYR found this same phenomenon to hold systemically-vegetation predominantly occurs in lines along modern and recently abandoned channels or around protected slackwaters. A vegetation map of the whole LYR (excluding Narrows) has been available to the RMT since spring 2011.

Combining the evidence from the rearing study and simple vegetation analysis, river banks, not floodplains constitute the optimal fish rearing habitat on the LYR, because that is where the densest and most abundant cover exists and because depths and velocities are low there. It is also proximal to the aquatic insects that the fish eat. Studies of remarkable fish rearing on the "agriplains" of the Yolo Bypass and Cosumnes River (e.g. Sommer et al., 2001) have shown that floodplains can be important rearing habitat. However, a comparison of landscape position shows that those sites are much farther downstream close to the Sacramento-San Joaquin Delta where the valley floor has a lower slope and more stagnant conditions. Also, historical mining debris and dredging operations pre-Englebright Dam rendered the floodplain of the LYR totally different from those lush settings (Fig. 4). We do not know what the overbank area was like prior to those impacts, but given the proximity of the valley walls upstream of DPD, it is unlikely that wide off-channel rearing areas existed there. It is imperative that NMFS establish a sensible environmental baseline relative to the LYR's landscape position. For the LYR, rearing fish get the most abundance and frequency of cover along the riverbanks and on vegetated swales, not on the floodplain. During floods when rearing fish move onto the floodplain, they would likely find refuge in the polylines of vegetation lining flood runners, among other locations.

In conclusion, data and literature accessible to NMFS in 2011 show that this BO statement is incorrect. Floodplains are not disconnected from the channel, rearing fish can get out onto vegetated swales and the floodplain in more years than expected in pristine semi-arid river conditions, but the floodplains may not optimal fish rearing habitat, as that is associated with a different landscape position close to the estuary. Instead, riverbanks inundated between 1000-5000 cfs are the optimal rearing habitat, because they have abundant and dense vegetation, which is the cover that rearing fish have been observed to seek on the LYR.

Figure 2. February 2004 photo of the apex of Timbuctoo Bend showing inundated island and banks at a flow of 5000 cfs.

Figure 3. October 7, 2007 photo taken in the submerged vegetation along the river bank by snorkeler Aaron Fulton showing a juvenile fish using low-velocity cover habitat.

Figure 4. An example of one location where the river lacks a vegetated floodplain. Opposite the floodplain is a steep hillside that is a source for large boulders, which are evident all along that bank on the left side of the photo. Boulders provide cover for rearing.

References:

Gard, M. 2008a. Flow-habitat relationships for juvenile spring/fall-run Chinook salmon and steelhead/rainbow trout rearing in the Yuba River. Draft report prepared by the Energy Planning and Instream Flow Branch of the U.S. Fish and Wildlife Service, Sacramento, CA, dated August 12, 2008.

Rosgen, D. 1996. Applied river morphology. Wildlife Hydrology, Pagosa Springs, CO.

Sommer TR, Harrell WC, Nobriga ML, Brown R, Moyle PB, Kimmerer WJ, Schemel L. 2001. California's Yolo Bypass: evidence that flood control can be compatible with fisheries, wetlands, wildlife, and agriculture. Fisheries 26: 6–16.

White, J. Q., Pasternack, G. B., and Moir, H. J. 2010. Valley width variation influences riffle-pool location and persistence on a rapidly incising gravel-bed river. Geomorphology 121:206-221.

BO STATEMENT (Page 137)

Downcutting in the Yuba River, by as much as 30 feet, disconnects the river from a dynamic interaction with the floodplain by lowering the water table and reducing the amount of water available for the roots of riparian vegetation.

COMMENT

Pasternack (2010a) reviewed the LYR literature about geomorphic change. It is true that the LYR has been and continues to downcut, which is defined as a lowering in elevation. It is also true that the presence of Englebright Dam is responsible for causing the downcutting, because in fact that is exactly what the purpose of the dam is- to block the passage of hydraulic mining sediment into the LYR corridor and beyond, which would be devastating to the environment and society if it was allowed to pass unabated. That is where the facts of the BO statement end. The BO then claims that downcutting is disconnecting the river from a dynamic interaction with the floodplain, lowering the water table, and reducing water available for the roots of riparian vegetation. Given this chain of logic, if it can be shown that the channel and floodplain are not disconnecting, then the rest of the statement is also falsified.

As already demonstrated above using analysis of the entrenchment ratio, no reaches in the LYR are entrenched. Furthermore, as previously demonstrated, the river floods onto the floodplain with a >50% chance in any given year. These lines of evidence demonstrate that the downcutting is not disconnecting the floodplain from the channel. How can that be?

Yes the LYR is downcutting, but no, the river is not disconnected or disconnecting from its floodplain. The idea that downcutting necessitates disconnection is wrong. The reason is that rivers, including the LYR, exhibit processes that allow them to remove all material in the river corridor, not just from within the channel. Processes such as lateral migration, avulsion, vegetation stripping, and overbank flooding are responsible for downcutting on the floodplain. These processes are all occurring on the LYR. How do we know? Pasternack (2008) performed digital elevation model (DEM) differencing for Timbuctoo Bend for 1999-2006 and showed that the floodplain is lowering there. Subsequently, Carley et al. (submitted) did a complete census of decadal channel change on the LYR, producing a map of scour and deposition as well as a report. This RMT-sponsored report has been available to all RMT participants since spring 2011. In the decadal change map, there are areas of floodplain scour associated with fore-mentioned processes. In fact, the data show that relative to the LYR's channel in 1999, overbank areas experienced a net of ~200,000 m^3 of scour, while the channel itself experienced a net of 141,000 m^3 of fill. Consequently, the data from the last decade show that as a whole, the river channel is filling in and the area that was overbank in 1999 is downcutting. *Avulsion*- the process by which the river breaks out of its current channel and carves a new one down the floodplain- and lateral migration are key to rapid downcutting of the overbank area. Overall, there is a net export of sediment out of the LYR, but internally, sediment is being redistributed with deposition focused in the channel, below Daguerre Point Dam, and in vegetation.

The conclusion is that the BO statement is wrong, because three lines of evidence- entrenchment ratio analysis, hydrological analysis, and 1999-2009 DEM differencing all show that the floodplain is connected to the river. Given that this first part of the statement is false, then the rest of it has to be false too, because it is conditional on the false concept that the floodplain is disconnected from the channel.

References:

Carley, J. K., Pasternack, G. B., Wyrick, J. R., Barker, J. R., Bratovich, P. M., Massa, D. A., Reedy, G. D., Johnson, T. R. submitted. Accounting for uncertainty in topographic change detection between contour maps and point cloud models. Geomorphology.

Pasternack, G.B. 2010a. Existing information attachment: fluvial geomorphology downstream of USACE's Englebright Dam. Prepared for Yuba County Water Agency, Yuba River Development Project, FERC Project No. 2246.

BO STATEMENT (Page 146)

"Other important components of habitat structure at the micro-scale include large boulders, coarse substrate, undercut banks and overhanging vegetation. These habitat elements offer juvenile salmonids concealment from predators, shelter from fast current, feeding stations and nutrient inputs. At the macro-scale, streams and rivers with high channel sinuosity, multiple channels and sloughs, beaver impoundments or backwaters typically provide high-quality rearing and refugia habitats (Spence et al. 1996). The lower Yuba River can be generally characterized as lacking an abundance of such features."

COMMENT

Rivers come in an extremely diverse array of morphologies. Under pristine natural conditions, there are rivers that are (a) straight, meandering, braided, or anastomosing, (b) have any size substrate from clay to boulder as well as any mixture of sizes, (c) have any degree of entrenchment, and (d) have any slope, sinuosity, or width/depth ratio. The BO statement claims that at the macro-scale, streams lacking certain characteristics do not provide high-quality rearing and refugia habitat. That is wrong. Anadromous salmonids have used many different types of rivers with and without those macro-scale attributes. The idea that all salmonid streams should have or be re-engineered to have the exact same macro-scale properties is wrong and misguided. Each river should be evaluated for its own unique attributes to determine what its physical structure and processes are as well as its ecological functions. One aspect of diversity is to ensure that each river have a unique set of attributes and functions, not exist as clones all fixed to one idealization of a salmon stream.

There is very little evidence about what the LYR was like before the gold mining era, and what is available is disputed as biased anecdote and imagery intended to present a false advertisement to entice pioneers and settlers. The scientific evidence that is available about historical conditions comes from Gilbert (1917) and James (2005, 2009). Evidence about current landforms comes from Pasternack (2008) and Wyrick and Pasternack (2011).

Let us look at what is known about the macro-scale attributes of the LYR, in contrast to the conjecture of the BO statement. According to Wyrick and Pasternack (2011), the LYR does contain slackwaters, vegetated swales, and backswamps that can serve as rearing habitat along with the forementioned optimal rearing zone at the vegetated riverbanks. Wyrick and Pasternack recently used the available baseflow thalweg polyline and valley centerline to compute the river's sinuosity as an additional analysis to characterize reach-scale attributes of the LYR. It is true that on average the river does have low sinuosity, but the sinuosities of reaches above DPD are largely constrained by the natural valley walls. Also, the river exhibits multiple channels in some stretches, including at the confluence with Dry Creek. In the Marysville Reach, sinuosity is limited by flood levees. In the remaining reaches, sinuosity exists and is increasing, but the rate of increase is is limited by training berms and the northern valley wall. Studies by Allan James reported that the LYR prehistorically had multiple channels going to the south, but the hydraulic mining sediment, dredging, and river training ended that. The average bed channel slope of the LYR thalweg from the upstream end of Timbuctoo Bend to the confluence with the Feather River is 0.16%. This value is relatively high, because it is far upstream (~100 miles) from the ocean, so it cannot be expected to have attributes of low-lying coastal rivers, such as many diverse sloughs. The LYR has been reported to have some have beaver activity and impoundments, but it has not been investigated systematically. Regionally, beavers were decimated long before Englebright Dam was built: According to Tappe (1942), "Much of the early exploration of California was done by traders and trappers in their search for new areas in which to take beavers. The intensive and continued trapping by these men soon led to a great decrease in the beaver population. Although there was relatively little trapping done in the last half of the nineteenth century, the beaver population remained at a comparatively low level; the population even became so reduced that the animal for a time was threatened with extinction." Thus, there is no reason to expect the LYR to have beaver impoundments, regardless of USACE facilities, flows, hydraulic mining debris, or other local anthropogenic factors. Overall, the LYR does have many macro-scale features beneficial to salmonid rearing, but its landscape position yields a relatively high slope and long sections of valley-constrained, gently meandering channels. Not all rivers can or should have identical macro-scale attributes. Many pristine rivers are straight or transitional between straight and meandering.

In terms of micro-scale attributes, the BO statement opines that the LYR is generally lacking an abundance of large boulders, coarse substrate, undercut banks and overhanging vegetation. The BO statement provides no evidence or citations related to these features for the LYR and no benchmark values as to what would constitute abundant features. Without a benchmark for "abundant", it comes down to professional judgment, perhaps based on maps and observations of the river, but the BO provides no indication that any surveys of these features was undertaken. In contrast, I have nine years of experience of working on the LYR and I have evaluated the presence of such features as part of my expertise on assessing and rehabilitating salmonid microhabitat. Large in-channel boulders are nearly ubiquitous throughout the LYR. As shown in Figure 4, wherever the hillside contacts the wetted channel, large boulders fall in, and such contacts are widespread in the LYR. The bedrock adjacent to the LYR consists of highly friable basic metavolcanic rocks, which explains why there are so many boulders along the river bank where it contacts the hillside. Even downstream of Daguerre Point Dam where there is no bedrock contact, there are a lot of submerged boulders, perhaps because large floods can transport them downstream. In terms of overhanging vegetation, it has already been explained that there exists a significant amount of vegetation along riverbanks. This creates substantial overhanging vegetation. The extent of overhanging vegetation is easily determined by intersecting the vegetation map with the wetted area map for any specific flow. Considering the bank area between the baseflow and bankfull flow (1,000 to 5,000 cfs inundation band), there exists 3.54 million ft^2 of vegetation, which covers 28% of that bank area for the whole LYR. That analysis shows a large amount of overhanging area, recognizing that the river is highly dynamic, changing its channel pattern every ~7-10 years. In terms of undercut banks, these generally require either erodible but strong bedrock or highly cohesive alluvium. As Figure 4 illustrates, there are many places where there is bedrock on the bank and there are undercuts, but because the bedrock is so friable, it may not be possible for undercuts to be as widespread as in rivers with different geology. That is a natural characteristic of the LYR. Undercuts do exist downstream of DPD where there are steep cutbanks. Wyrick and Pasternack (2011) mapped and analyzed cutbanks in the LYR. In terms of coarse substrate, the RMT did a census of substrate in the LYR in 2010 and produced a map. Pasternack (2008) did a longitudinal survey of substrates in Timbuctoo Bend. Fine sediment is defined as sand, silt and clay sizes (i.e. < 2mm), while coarse substrate is defined as gravel, cobble, and boulder sizes (>2 mm). According to the RMT's substrate map, the LYR has nearly ubiquitous gravel and cobble-sized substrates.

In conclusion, the evidence shows that the LYR has an abundance of micro-scale habitat features, including large boulders, coarse sediment, and overhanging vegetation. The quantity of these features is consistent with the landscape position, proximity of valley walls, dynamic flood regime, and history of deposition of hydraulic mining sediment. There is a high degree of certainty that salmonid rearing in the LYR is not stressed or limited by an inadequate supply of these elements, as they are widespread, and this habitat evidence is substantiated by the actual observations of outmigrant salmon reported in rotary screw trap surveys. Although the macro-scale attributes of the LYR may naturally deviate from one perspective on what a perfect salmonid rearing river ought to be, Wyrick and Pasternack (2011) found that the LYR does have an abundance and diversity of natural macro-scale landforms at the reach and morphological-unit scales. There may be opportunities to expand off-channel habitats in the LYR beyond what is available, but that should be done with careful geomorphic analysis of the resilience of such projects in light of the river's dynamic flood regime. The BO statement presents no evidence and is wrong about the macro- and micro-habitat conditions in the LYR.

References:

Gilbert, G.K., 1917, Hydraulic-Mining Debris in the Sierra Nevada: U.S. Geological Survey Professional Paper 105, 154 p.

James, L.A.. 2005. Sediment from Hydraulic Mining Detained by Englebright and Small Dams in the Yuba Basin. Geomorphology 71: 202-226.

James, L.A., Singer, M.B., Ghoshal, S., and Megison, M., 2009, Historical channel changes in the lower Yuba and Feather Rivers, California: Long-term effects of contrasting river-management strategies, in James, L.A., Rathburn, S.L., and Whittecar, G.R., eds., Management and Restoration of Fluvial Systems with Broad Historical Changes and Human Impacts: Geological Society of America Special Paper 451, p. 57–81, doi: 10.1130/2008.2451(04).

Tappe, D.T. 1942, The Status of Beavers in California. Department of Natural Resources, Division of Fish and Game, Sacramento, CA.

BO STATEMENT (Page 146)

"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, a decrease in the quantity and quality of juvenile rearing habitat. This primary stressor category includes the effect that dams have on the aquatic invertebrate species composition and distribution, which may have an effect on the quality and quantity of food resources available to juvenile salmonids."

COMMENT

It was already shown through topographic, hydrologic, entrenchment, and DEM differencing analyses that the LYR's in-channel and floodway landforms are all in good connection with each other. Now the BO makes a statement about loss of natural river morphology and function as well as a decrease in riverine complexity, and these are attributed to the effect of the dams in the LYR. Again, these conjectures are made without supporting evidence or citations, despite a large amount of data and reports covering this topic. Let's look at the conjecture about river morphology first and riverine habitat complexity second.

Wyrick and Pasternack (2011) conducted a complete census of river morphology in the LYR (except for the bedrock Narrows Reach, but the river morphology there was assessed by Pasternack, 2010b). They found that (1) the LYR river corridor contains 31 distinct morphological units, (2) in-channel and floodway units do not have random abundances, (3) in-channel units have a natural (i.e. not man-made) and organized, non-random structure, (4) in-channel units show affinity and avoidance in terms of be adjacent to one another, (5) point bars are spaced every 11.7 channel widths, which matches the expectation from classical meander wavelength datasets, (6) swales are naturally spaced to occur in conjunction with roughly every other riffle-induced backwater, (7) riffles are somewhat more abundant on the LYR than in classic literature datasets, and (8) there are an average of 9 morphological units across the channel at 20'-spaced cross-section down the river. These eight conclusions yield a detailed perspective on the landforms of the LYR. Based on this evidence, it is concluded that the LYR has a diversity of landforms and they are distributed to yield abundant lateral and longitudinal diversity.

Contrary to the BO statement, the LYR has a natural river morphology in which the landforms are adjusted to flow, sediment supply, and topography. The river has a natural river morphology, because it has natural river processes and functions. Specifically, Pasternack (2008), White et al. (2010), Sawyer et al. (2010), and Carley et al. (submitted) reported natural processes on the LYR, including lateral migration, avulsion, vegetation stripping, vegetation capture of sediment, overbank flooding, knickpoint migration, natural levee formation, and flow convergence routing. Thus, even though the river was bounded with training berms historically, the river exhibits a remarkable degree of self-determined, natural fluvial dynamism that has resulted in morphological diversity.

The claim in the BO statement that the river is unnaturally confined is only partially correct. It is true that in the past the river was able to have anastomosing channels farther to the south and now training berms block that route. However, Tables 3-4 and Figure 15 of Wyrick and Pasternack (2011) present information about active alluvial valley width and floodway width (i.e. inundated by flows up to 21,100 cfs) for the whole LYR corridor (excluding the Narrows Reach). Those tables and plot show that the LYR's active alluvial valley and floodway are actually widest in the region of the Yuba Goldfields where the training berms are present. Therefore, relative to the other reaches lacking artificial berms, there is more opportunity for meandering and floodplain dynamism than elsewhere in the LYR corridor. Thus, while the Yuba Goldfields do bound the active river corridor, the bounds are so wide that there is a lot of opportunity for dynamic fluvial geomorphology and complex habitat development. That is something that has been under-reported and under-investigated until recent geomorphic studies by the RMT.

In terms of riverine habitat complexity, that can be addressed by looking at three spatial scales in decreasing size- reach, morphological unit, and hydraulic unit. At the reach scale, Wyrick and Pasternack (2011) reported that there are 8 different LYR reaches, with significant different attributes. Bankfull width varies from 169-427', while floodway width varies from 237-1028'. Bed slope ranges over a factor of six from 0.052-0.31%. The Dry Creek Reach has multiple channels and a large backwater complex with beaver activity and impoundment. The Daguerre Point Dam Reach has an actively meandering mainstem channel as well as a ~2 mile long parallel side channel that activates at flows somewhere between 10,000-20,000 cfs, which can occur in any given year with a ~40-50% chance. Marysville Reach is narrow and deeper, with pools and slackwater landforms that have a lot of tall bank vegetation on the levees, while Englebright Dam reach is a narrow bedrock/boulder section with a lot of pool, slackwater, and run landforms. Each of the eight reaches is really quite distinct, indicative of significant reach-scale diversity over a relatively short distance of ~24.5 miles.

At the morphological-unit scale, the previous summary of morphological units provides abundant evidence that there is diverse and complex habitat. For example, the census by Wyrick and Pasternack (2011) found that there is an average of 9 morphological units across the channel at any cross-section. An example lateral pattern would be lateral bar, slackwater, slow glide, riffle, chute, riffle, slackwater, slow glide, lateral bar. Another would be lateral bar, slackwater, pool, fast glide, slow glide, slackwater, swale. Figure 5 shows one section of the river that has three different patterns of cross-channel landforms with different densities of morphological units. When considered at the morphological-unit scale, conditions suitable for ecological functions are termed meso-habitat. Meso-habitat is sensitive to flow, whereas morphological units are independent of flow; they are the landforms under the flow. Each morphological unit is indicative of at least one meso-habitat type at low flow, but as flow increases, longitudinally distributed hydraulics tend to even out and habitat conditions become more uniform (a characteristic of most rivers), but lateral meso-habitat conditions become more diverse. This is the case for the LYR, as illustrated by Pasternack (2008) and Sawyer et al. (2010). It also holds for the whole LYR, based on the RMT's 2D model simulations for flows ranging from 300-110,400 cfs. The morphological-unit evidence for the LYR shows that there is an abundance of morphological units and meso-habitats at all flows as well as an abundance of meso-habitat complexity in the LYR.

At the micro-habitat scale, it was already explained that the LYR has diverse and abundant boulders, large substrates, and overhanging vegetation. Notably, on page 146 the BO makes a statement that the LYR in the Yuba Goldfields region is dominated by cobble-dominated bars, so this other statement in the BO is in direct contradiction to the BO statement being made here. In addition, the LYR has diverse hydraulics over a range of flows in terms of depths and velocities. There are widespread depths in the 0-6' range and widespread velocities in the 0-4 ft/s range, which is the common range for many salmonid lifestages.

Notably, if juvenile rearing habitat had "decreased" due to the USACE's operation and maintenance of Englebright and Daguerre Point Dams and Englebright Reservoir on the Yuba River, then that could only be determined in relation to an understanding of pre-existing better conditions. However, as illustrated in Figure 6, habitat complexity was at an all-time low prior to Englebright Dam due to the suffocation imposed by vast volumes of hydraulic mining debris, whereas after 70 years of restorative sediment blockage and river-valley downcutting, there does now exist abundant habitat complexity. We may never know what the condition of the river was prior to the gold-mining era, but based on reports by Gilbert (1917), Adler (1980), Pasternack (2008), James et al. (2009), Pasternack (2010a), and Carley (submitted), we know that the river has been on a trajectory toward geomorphically recovering its historical longitudinal profile. Although the river is channelized and confined now, it is highly dynamic and its landforms are self-organized within the available river corridor.

In conclusion, the evidence about river morphology and habitat complexity for the LYR shows that the river has natural, self-determined fluvial landforms with abundant, diverse, and distinct landforms providing diverse meso-habitat conditions. If there is a case to be made that the LYR lacks habitat complexity in terms of some key factor, then this BO statement fails to make it. I am aware of an interest to have stagnant off-channel conditions, such as exists on the lowest floodplains near estuaries, but that is not appropriate for the landscape position of the LYR. Further, there is no evidence of a worsening of conditions associated with USACE's operation and maintenance of Englebright and Daguerre Point Dams and Englebright Reservoir on the Yuba River, whereas in contrast there is substantial evidence that the facilities have promoted geomorphic recovery. Because the conjecture about river morphology and habitat complexity is wrong, the chain of logic falls apart and the remaining conjecture about decreased quantity and quality of juvenile rearing habitat is unsubstantiated and conjecture about food resources is unsubstantiated.

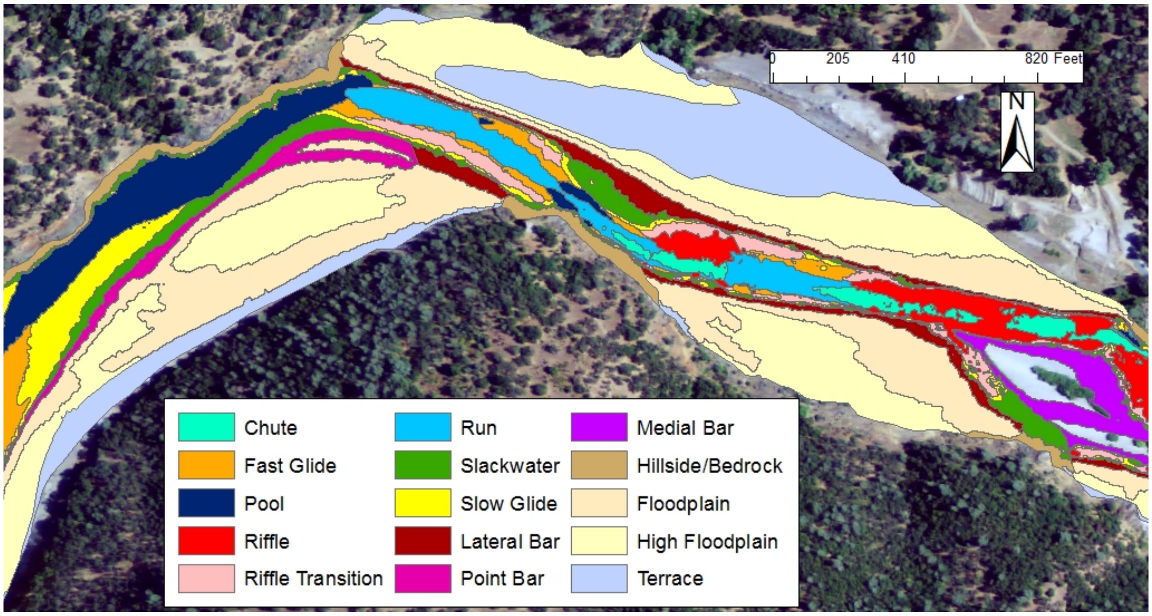

Figure 5. Example section of the LYR morphological unit map for the whole alluvial river corridor. The area on the left of the photo shows some larger landforms where there is a lower diversity with 6 bankfull-channel landforms cross-channel, while the area in the middle of the photo shows highly complex landforms with ~8-10 landforms cross-channel. At the right side there is any island-riffle complex. Thus, in this one view there is a large amount of channel complexity, providing diverse meso-scale habitat options for anadromous salmonids in different lifestages.

Figure 6. Comparison of (left) 1905 photo of the LYR showing lower river diversity caused by hydraulic mining sediment overwhelming the valley prior to construction of Englebright Dam and (right) 2011 photo of the LYR showing high channel diversity today (e.g. large woody material and submerged aquatic vegetation as well slackwater, chute, and riffle morphological units) after 70 years of sediment blockage and restorative river downcutting due to Englebright Dam.

References:

Adler, L.L. 1980. Adjustment of the Yuba River, California, to the influx of hydraulic mining debris, 1849-1970. MA Thesis, University of California, Los Angeles.

Pasternack, G.B. 2010b. Estimate Of The Number Of Spring-Run Chinook Salmon Supportable By River Rehabilitation in the Narrows Reach Of The Lower Yuba River. Prepared for the PG&E and DWR Habitat Evaluation Agreement Steering Committee.

Sawyer, A. M., Pasternack, G. B., Moir, H. J., Fulton, A. A. 2010. Riffle-Pool Maintenance and Flow Convergence Routing Confirmed on a Large Gravel Bed River. Geomorphology 114:143-160.

BO STATEMENT (Page 146)

"Attenuated peak flows and controlled flow regimes have altered the lower Yuba River's geomorphology and have affected the natural meandering of the river downstream of Englebright Dam (NMFS 2009). The channel is incised over 20 feet in some areas on the low Yuba River. Planned and unplanned flow reductions may cause side channels and backwaters of the lower Yuba River to become disconnected from the main channel."

COMMENT

As explained above, a large amount of evidence from topographic, hydrologic, DEM differencing, and entrenchment ratio analyses prove this BO statement to be wrong.

The BO statement claims that the rivers is "incised over 20' in some areas", presumably indicating the regulated flows are disconnected between channel and floodplain. This topic was covered extensively above and the conclusion of all the evidence is that the LYR's floodplain and channel are not disconnected.

This BO statement attributes an effect on natural meandering to flow regulation. In fact it is dredging, river training, and leveeing that confined the river corridor where those activities were done, and that direct channel intervention largely occurred prior to and independent of Englebright Dam and flow regulation. In other reaches the river is naturally confined by narrow and undulating valley walls. There is no evidence that flow regulation has harmed river meandering, and in fact several lines of evidence demonstrate that the river is actively meandering. DEM differencing of the river corridor for 1999-2009 shows lateral migration in many places as well as 312,000 m^3 of sediment removed from tailing berms in just 10 years. Newspapers and technical reports have documented that the LYR is meandering at such a rapid rate through training berms that it is jeopardizing the lowlands outside the berms. This is all driven by a dynamic flood regime with overbank floods having a ~70-80% chance of occurrence in any given year and larger floodplain filling floods >21,000 cfs having a ~40% chance of occurrence in any given year. These statistics based on historical data since 1970 account for the role of New Bullards Bar as well, so even with that facility's large storage capacity, the LYR still exhibits frequent overbank flows.

In contrast to this BO statement, the morphology of the LYR is self-determined, dynamic, and increasing habitat complexity over time due to the restorative role of Englebright Dam relative to the vast reservoir and continuing influx of hydraulic mining waste upstream of that barrier. It is true that the LYR's morphology is altering, but all the evidence indicates that the alterations are beneficial, not harmful, and are driven by understandable and beneficial natural processes. The LYR exhibits self-determined lateral migration and avulsion commonly along its length caused by extensive and frequent flooding as well as topographic steering induced by multiple scales of landform heterogeneity that drive the process of stage-dependent flow convergence routing (Pasternack, 2008; White et al. (2010); Sawyer et al. (2010); Carley et al. (submitted)). Historical aerial photo analysis and reports (e.g. Adler (1980), Beak Consultants, Inc. (1989), and White et al. (2010)) show that since 1942 the LYR river corridor has increased its vegetation abundance and habitat complexity. For example, in the Daguerre Point Dam reach, there is a long parallel channel named Daguerre Alley that is being scrutinized by the RMT. Historical photos from before 1960 show that this section was devoid of vegetation. However, over time aerial photos show increasing vegetation in Daguerre Alley and today there is a large region of swamp-like condition including submerged vegetation and riparian vegetation. Similarly, aerial photos of Timbuctoo Bend published in White et al. (2010) show that from 1952 to 2006, the amount of vegetation in the reach increased significantly.

The BO statement also claims that, "planned and unplanned flow reductions may cause side channels and backwaters of the lower Yuba River to become disconnected from the main channel". However, Englebright Dam cannot hold back any of the flow that normally overtop the LYR's banks. Englebright Dam has a limited storage capacity and its controlled releases do not exceed 4,500 cfs. However, in any given year there is >77.5% chance that a flow higher than 4,500 cfs will overtop Englebright Dam. In addition to that water, there is also the significant contributions from Dry Creek and Deer Creek that yield substantially higher flows to overtop the LYR's banks than what comes from upstream of Englebright Dam. According to the USGS annual peak flow record for the Smartville gage below Englebright Dam, between 1993 and 2011, the flow exceeded 4,500 cfs in 15 out of 19 years. Thus, the evidence is that overbank floods can and do occur nearly annually, inundating floodway landforms.

Backwaters and side channels may be conceived of consisting of perennially inundated areas within the bankfull channel and/or overbank areas inundated naturally during floods, which was previously defined as occurring less than once ever 1.5-5 years according to classic literature. LYR floodway features that might be interpreted as being those entities would be flood runner and backswamp. The previous hydrological analysis demonstrates that these two floodway landforms flood nearly annually. For in-channel features, these would include slackwater and swale. These landforms are within the inundation zone subjected to regular to perennial flow as part of the regulated regime specified by the Yuba Accord. The stage-dependent hydraulics of these in-channel units has been calculated and analyzed for flows ranging from 300-5000 cfs, but that has not yet been written up. Any potential affects of flow regulation on these morphological unit at this time is not evidence based, but just speculative, except for the single issue of true disconnection of the units. The one fact that is certain about the inundation of these units is that the water entering partially isolated slackwater and swale units not only comes in from the open connection, but is also coming from abundant hyporheic inflow that emerges at the top and sides of these units. Anecdotal reports (including my own direct observations) suggest that such hyporheic inflows are commonly in the ~1-10 cfs range. I have personally observed adult Chinook salmon spawning in the currents generated by these inflows. Further, where these units are located adjacent to training berms with mining ponds on the other side, there is such much lateral hyporheic inflow that it sounds like a torrent. At one such site in Daguerre Alley, I measured the temperature of the inflowing hyporheic water and found it to be measurably cooler. Consequently, the evaluation of hydraulic conditions in these morphologic units requires detailed analysis and careful interpretation. Speculation based on experience in other rivers lacking such hyporheic influx or rote recitation of literature is not appropriate. The conclusion from direct observation of the LYR is that partially isolated slackwaters in the bankfull channel, also referred to as backwaters by others, do not completely disconnect from the river under commonly occurring low flows, because the hyporheic inflow supplies enough water to keep the downstream connection open. Whether there is some extremely low flow below which such disconnection occurs has not been investigated as of yet.

BO STATEMENT (Page 146)

"In the lower Yuba River, controlled flows and decreases in peak flows has reduced the frequency of floodplain inundation resulting in a separation of the river channel from its natural floodplain."

COMMENT

This BO statement conjectures that there is a controlling relation between peak flow and frequency of floodplain inundation. That is not true. It is possible to rarely or never have enormous floods (say >100·Qbf) and still have many, many overbank floods that connect the channel and floodplain. Frequency of floodplain inundation is a different hydrologic metric from magnitude of peak flows, especially on the lower Yuba River where the hydrologic data show that overbank floods occur in almost every year, with a 77.5% chance of having an overbank flood in any given year. This is a high frequency that is higher than normal for semi-arid rivers, which are normally thought to only flood overbank every 2-5 years.

The BO statement conjectures that controlled flows have reduced frequency of floodplain inundation. However, it was previously explained that Englebright Dam has little impact on flows >5,000 cfs that come out of the watershed, so no such control exists. New Bullards Bar can have an impact, but as already reported, the flood data show that there is a 77.5% chance of an overbank flood in any given year and in fact from 1993-2011 the river did flood overbank in 15 out of 19 years. Again, by definition, a semi-arid river is only supposed to naturally flood overbank every 2-5 years, so the fact that the LYR is doing much more frequently than that natural baseline suggests that flow regulation has not hurt fluvial geomorphology. Previously explained evidence showed that the channel is not separated from its floodplain.

In many other rivers draining the Sierra Nevada and around the semi-arid and arid western United States, dams have a big negative impact on rivers. It seems that NMFS assumes that is the same for the LYR. That generalization is wrong. There are many reasons for that. First, two of the three major tributaries entering Englebright Reservoir have unabated winter floods. Second, Englebright Dam has little water storage capacity, so floods overtop the dam almost every year. Third, the channel in the lower Yuba River is not entrenched or oversized, so water can spill out of the channel. The lack of entrenchment is likely due to (a) the large amount of unconsolidated sediment in the river corridor, which makes the sediment easy for the water to push around and remove from across the whole corridor width, (b) the high slope and width/depth ratio associated with the unconsolidated sediment that helps prevent entrenchment and floodplain disconnection, and (c) the role of approximately decadal large (>20·Qbf) overbank floods in causing avulsions and ripping out bank vegetation, thereby preventing channel constriction by vegetation (for example, as reported for the Trinity River below Lewiston in northern California).

In conclusion, the evidence shows that the LYR's flood regime provides floodplain inundation at a higher frequency than expected for natural flood conditions and the channel and floodplain are not disconnected.

BO STATEMENT (Page 146)

"Within the Yuba Goldfields area (RM 8–14), confinement of the river by massive deposits of cobble and gravel derived from hydraulic and dredge mining activities resulted in a relatively simple river corridor dominated by a single main channel and large cobble-dominated bars, with little riparian and floodplain habitat (DWR and PG&E 2010)."

COMMENT

In the Yuba Goldfields region of the LYR, the normal river corridor (excluding events that break through training berms) is bounded by training berms composed of mine tailings. However, the claim that river confinement in that region has resulted in "a relatively simple river corridor dominated by a single main channel and large cobble-dominated bars, with little riparian and floodplain habitat" is only partially correct. Prior to addressing this claim, it is notable that earlier in this report there was a BO statement review that said that the LYR was lacking in an abundance of micro-habitat attributes, including large substrate, but now the BO claims that there is an excess of cobble-dominated bars. The fact is that the river has an abundance of surficial cobble, as quantified by the RMT's substrate survey and map.

It is true that there are alluvial bars in the bankfull channel and on the floodplain with a surface veneer of cobble on them (e.g. Fig. 4). That is the part of the BO statement that is confirmed by the RMT's substrate survey and map. However, Pasternack (2008) reported data from digging down into cobble-topped bars as well as visual evidence from cutbanks. In both setting, the evidence showed that underlying the surface the sediment is well-mixed with gravel, sand, and silt, as presented in the report. Specifically, three large McNeil core samples were collected by Dr. Hamish Moir as part of the Pasternack (2008) study. The combined grain size distribution for those samples yielded a mixture with 47% of particles < 32 mm and an additional 30% of particles between 32-64 mm, so 77 % of material was < 64 mm. The presence of cobbles >65 mm creates a strong visual impression to the casual observer, but the data tells a different story: the alluvial bars on the LYR are rich with diverse particle sizes, including large cobble, gravel, and other relevant sizes. The one think lacking is sufficient clay to create cohesion, but that is beyond what the BO statement claims. With respect to the BO claim of cobble-dominated bars, the statement is only partially correct and in fact the structure of the bars is dominated by material <64 mm.

At the time the DWR and PG&E (2010) report was written, the RMT was in the midst of modeling and analyzing the LYR's landforms and an independent overview of conditions in the region from Highway 20 down to DPD was underway by CBEC et al. (2010). Consequently, that study did not have the scope of detailed information available to NMFS for writing the BO in 2011 and 2012. In direct contrast to the BO statement that the river is confined in the Yuba Goldfields, it has already been explained that Wyrick and Pasternack (2011) provided the actual evidence, which in fact shows that the alluvial river valley and floodway in the LYR are at their widest in the Yuba Goldfields region, despite being bounded by training berms. Thus, although the berms do provide confinement in order to protect the floodway from interaction with the ruined Yuba Goldfields lands dating to pre-1942 cumulative impacts unassociated with flow regulation and dam impoundment, the river exhibits fluvial dynamism within the available wide corridor. The DEM-differencing study by Carley et al. (submitted) demonstrated that the floodplains have received substantial deposition downstream of DPD since 1999, indicative of both (a) geomorphically significant floodplain inundation and (b) deposition of non-cobble grain sizes that were being transported over the floodplain.

According to CBEC et al. (2010) and Wyrick and Pasternack (2011), there is significant channel floodplain, slackwater, backswamp, and swale habitat as well as reach-scale and morphological-unit scale channel complexity in the Dry Creek Reach, which is in the Yuba Goldfield area. Furthermore, downstream in the Daguerre Point Dam Reach, which is entirely within the Yuba Goldfields region, Wyrick and Pasternack (2010) identified a ~2-mile parallel area outside the main channel, now called Daguerre Alley, that has significant and abundant baseflow habitat complexity as well as a large floodplain and flood runner that inundates at some discharge between 10,000-20,000 cfs. Notably, Daguerre Alley runs almost the full length of the Yuba Goldfields that is downstream of DPD. Figure 7 illustrates the morphological units in a small part of the DPD Reach, including a small section of Daguerre Alley. Besides these two major areas, there is also a wide region of complex islands and multiple channels just upstream of DPD that is highly dynamic during floods and there is a divided channel at Long Bar up at the onset of the Yuba Goldfields area. Taken together, these four areas show that majority of the LYR in the Yuba Goldfields region is actually much more diver and complex than NMFS is aware of.

In addition, on the basis of sets of historical areal photos of the LYR, all of these areas of channel and floodway complexity within the Yuba Goldfields area have experienced an increase in abundance of riparian vegetation since 1942. The lower section of Daguerre Alley is particularly dense with riparian vegetation and swamp-like conditions.

One of the systemic problems in the BO and in the understanding that some people seem to have about the LYR is that they have chosen to render final judgments about a river without reading the available literature or actually conducting the necessary research to evaluate their ideas. This incorrect BO statement is the perfect example. The evidence now shows that within the Yuba Goldfields area the LYR is actually abundantly diverse and complex, including a bifurcated, perennially inundated channel, two areas of multiple channels that change during frequent floods, and a long parallel floodplain-flood runner complex. These are the facts about the LYR that have come to light due to the extensive geomorphic research that has been undertaken by the RMT since 2008.

In conclusion, the evidence shows that the LYR in the Yuba Goldfields area is not simple, not dominated by a single main channel, not lacking in hydrologically connected floodplains, and not having alluvial bars whose composition is dominated by large cobble. There is no baseline to compare what the river would be like if the Yuba Goldfields was not present, but within the wide bounds presented by the training berms, the LYR exhibits dynamic fluvial processes and abundant, diverse, and organized fluvial landforms.

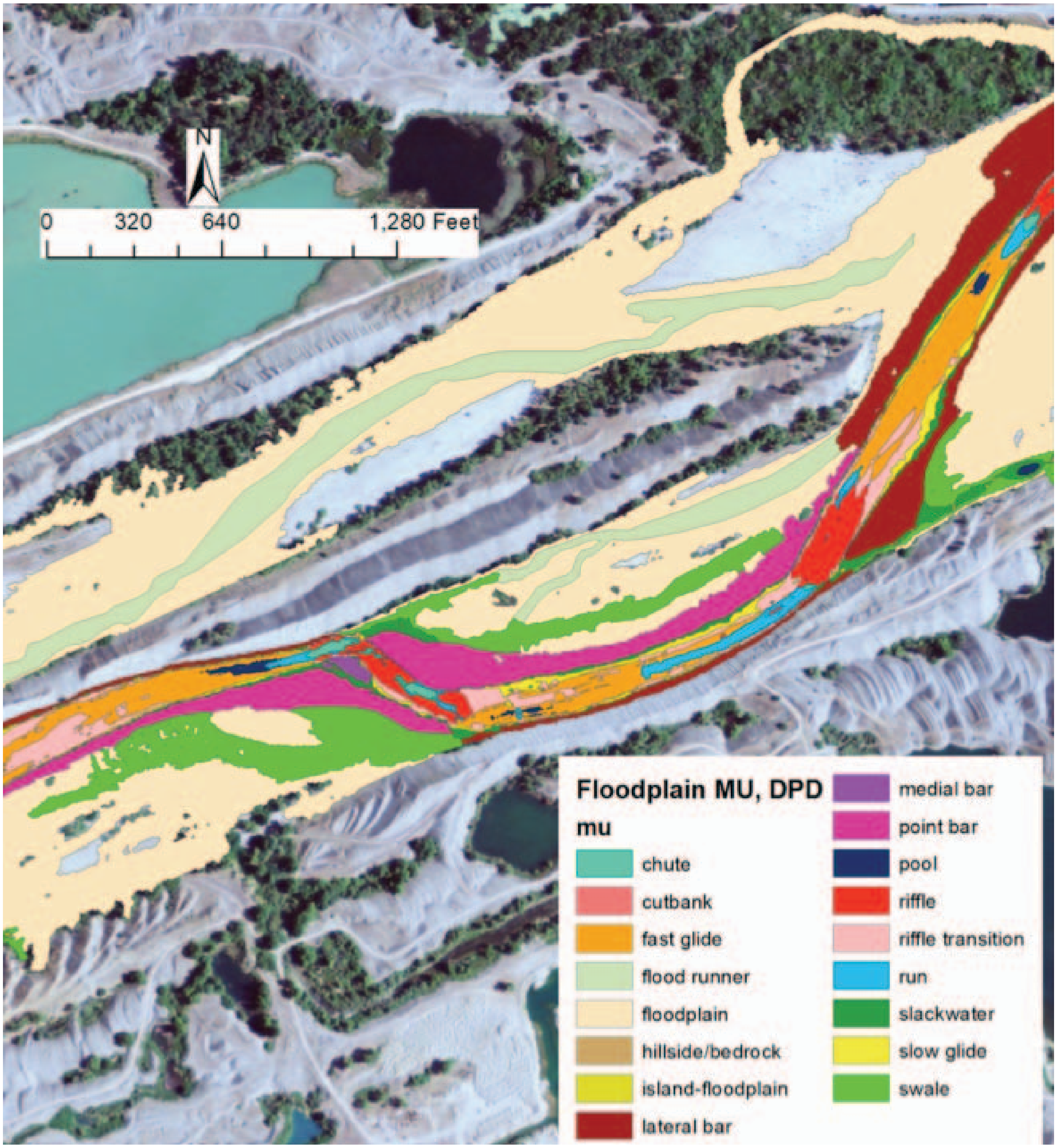

Figure 7. Morphological-unit map for a small part of the DPD Reach, including a small section of the Daguerre Alley parallel floodplain-flood runner region. Note the high lateral landform complexity in the mainstem channel as well, include diverse features such as flood runner, swale, slackwater, medial bar, point bar, and riffle units.

References:

CBEC, Inc., South Yuba River Citizens League, and McBain & Trush, Inc. 2010. Rehabilitation concepts for the Parks Bar to Hammon Bar reach of the lower Yuba River. Funded by the USFWS-Anadromous Fish Restoration Program.

BO STATEMENT (Page 146)

"Above 20,000 cfs the only exposed alluvial surfaces in the river valley are terraces and artificial berms."

COMMENT

Wyrick and Pasternack (2011) investigated and mapped the alluvial river-valley morphological units beyond the 21,100 cfs floodway. There are ten such units, including terrace, high floodplain, island-high floodplain, levee, hillside/bedrock, bank, cutbank, agriplain, tailings, and tributary delta. Notably, the high floodplain, island-high floodplain, and agriplain units are areas that would provide potential habitat and refugia during large floods. The difference between a terrace and these plains has to do with the presence of a vertical topographic riser evident in the LYR's topographic map that distinguishes terraces. The plains lack that topographic feature and are simply differentiated from the floodplains inundated by 21,100 cfs by their higher elevation.

BO STATEMENT (Page 184)

"Controlled flows and decreases in peak flows will continue to reduce the frequency of floodplain inundation and separation of the river channel from its natural floodplain."

COMMENT

This is a repeat conjecture that was already addressed earlier in this report. The statement is false.

BO STATEMENT (Page 193)

"The proposed action and interrelated and interdependent actions perpetuate the flow conditions that result in lack of connectivity with the floodplain, perpetuate the existence of the training walls that separate the Yuba River from its flood plain and cause further down-cutting

of the river, and make LWM contributions that are insufficient to relieve the stressor of lack of food resources."

COMMENT

This is largely a repeat conjecture that was already shown to be false earlier in this report, but there are further corollary conjectures that need to be addressed here. There is no lack of connectivity between channel and floodplain. There is a significant floodplain within the training berms, with a peak floodway width of ~1750'. It is true that prior to the berms, the lowland valley was wider- James (2005) and James et al. (2009) addressed that, but somehow the BO does not cite any research or publications by James, including these, so the relevance of that information to the BO was not characterized. The training berms have lost 312,000 m^3 of sediment in the last decade due to flow-induced scour. The channel is meandering through the berms via lateral migration at several of the channel's outer bends. One berm between the main channel and Daguerre Alley is only ~120' wide at this time, while one narrow berm on the opposite side of the river is only ~140' wide. There exist reports about this process as well as widely available historical aerial photos that could have been analyzed directly by NMFS to address the river's processes. Left to its own natural dynamism without any future intervention, the LYR will successfully cut through the berms. However, there is no environmental benefit to that under the current landscape condition given the extremely degraded state of the Yuba Goldfields, which has nothing to do with the USACE's operation and maintenance of Englebright and Daguerre Point Dams and Englebright Reservoir on the Yuba River.

The BO statement says that there will be further downcutting in the LYR. To the extent the statement relates to NMFS' incorrect conclusion that the river in entrenched, the statement is wrong. However, based on the evidence, it is highly beneficial to the environment and society that the LYR continue to downcut its river valley (while retaining strong floodplain-channel connectivity), as that is the natural restorative dynamic necessary and desirable. This is the reason Englebright Dam was built- to hold back the vast deposits and continuing supply of wastes and allow the LYR to recover itself. At present, I do not know what the LYR will look like decades into the future if left to its own continued rehabilitation, so I see it as an imperative goal for NMFS and other stakeholders to collaborate to establish a viable vision for the river consistent with its landscape position, valley topography, sediment supply, and flow regime (among other "genetic" controls).

The BO statement says that there will be insufficient contributions of large wood materials (LWM). LWM is scientifically defined as wood pieces or assemblages >1 m long and >10 cm in diameter (Senter and Pasternack, 2010). I have reconnoitered LWM on the LYR. Contrary to the BO statement, in my professional judgment LWM is not only abundant on the LYR at present, but ubiquitous, as exemplified by Figure 8. The reasons why there is so much LWM present is explained by these factors: (a) LWM is abundantly stored in the Middle and South Yuba River tributaries due to natural sources and land uses, such as logging, (b) the supply of LWM from those tributaries is transported to Englebright Lake during winter floods and perhaps during spring snowmelt (yet to be quantified), (c) by the time discharge is sufficient to inundate, entrain, and transport LWM to Englebright Lake, the reservoir is very likely to already be full and spilling over Englebright Dam, because the reservoir's storage is so limited, (d) LWM easily passes over Englebright Dam and transport through the narrows into the alluvial valley of the LYR. In my experience, LWM in the LYR exists ubiquitously racked behind flow obstructions, racked throughout vegetation patches, lining the water's edge demarking peak flood stages (especially those from 2006 and 1997 floods), scattered widely all over floodway morphological units, and along the banks in the Hallwood and Marysville Reaches. According to LWM literature, in order to form a massive jam of LWM, it is necessary for there to be LWM pieces sized at about the channel width. However, as previously reported, reach-average bankfull and floodway widths are 169-427' and 237-1028, respectively. These dimensions are simply too large to allow channel or floodway spanning jams to form, no matter what the volume of LWM could be in the absence of any potential upstream channel barriers. Unfortunately, there is little to no information about what LWM was like in the major rivers draining the western Sierra Nevada prior to any post-European settlement logging and stream impacts. Thus, the BO statement that LWM is decreased and insufficient is unsubstantiated relative to the available evidence. Pending and on-going LWM studies on the LYR will go further to clarifying the details of LWM conditions and processes in the Yuba watershed and on the LYR.

In conclusion, the BO's characterization of current conditions and the conjecture about future condition associated with the proposed action and interrelated and interdependent actions in this BO statement is incorrect. The evidence shows that the LYR is dynamic, connected, and complex. In the absence of further direct intervention outside the scope of the USACE's operation and maintenance of Englebright and Daguerre Point Dams and Englebright Reservoir on the Yuba River, the LYR will break out of its training berms and expand its domain into the Yuba Goldfields and beyond.

Figure 8. Collage of photos showing 31 different locations of LWM on the LYR.

References:

Senter, A. E. and Pasternack, G. B. 2010. Large wood aids spawning Chinook salmon (Oncorhynchus tshawytscha) in marginal habitat on a regulated river in California. River Research and Applications, DOI: 10.1002/rra.1388.

GRAVEL AND ANADROMOUS SALMONID SPAWNING HABITAT

BO STATEMENT (Page 56)

"Gravel availability is a limiting factor for salmon reproduction in the Yuba River downstream of Englebright Dam (Pasternack 2010a). Because the Yuba River downstream of Englebright Dam, down to Deer Creek, is devoid of spawning gravel (other than that placed by the Corps), and the Timbuctoo Bend reach is cutting down, spawning gravel is a limiting factor in the Englebright Dam reach, and a concern in other reaches."

COMMENT

As a result of RMT's 2010 survey of substrate and the resulting data and map, there is no longer any concern about the availability of anadromous salmonid spawning habitat beginning at the entrance of Timbuctoo Bend and going further downstream all the way to the confluence with the Feather River. As documented above, the RMT's recent analysis presented to NMFS and other RMT participants report that at 600 cfs there exists >3.39 million ft^2 of spawning habitat on the lower Yuba River. Spawning habitat for *O. mykiss* is still under investigation by the RMT, but smaller substrates in the preferred size range of these fish are available and as reported by Moir and Pasternack (2010), sufficient and diverse velocities are available to assist fish in creating egg pockets. The only concern regarding Chinook salmon spawning habitat has to do with the little abundance of it in the Englebright Dam and Narrows Reaches. Fish have been observed in those reaches attempting to spawn on bedrock. All activity related to addressing Chinook spawning habitat should be focused solely on those reach from this time forward.

BO STATEMENT (Page 145)

"The existing condition of salmonid spawning gravel is depleted downstream of Englebright Dam to the Highway 20 reach. The reach immediately downstream of Englebright Dam is devoid of spawning substrate. Downstream of Deer Creek, the channel is actively incising. This lack of spawning substrate limits spawning habitat and fish production. There has been a general coarsening of bed material. Lack of adequate spawning substrate presents a high risk to salmonids."

COMMENT

The BO statement that the LYR is devoid of salmonid spawning gravel between Englebright Dam and Highway 20 is false. Pasternack (2008), Moir and Pasternack, (2008), and Moir and Pasternack (2010) presented substantial data, analyses, and conclusions on this matter. Surprisingly, the BO does not cite either work co-authored by Moir in relation to spawning habitat (only the 2008 article is cited and only pertaining to the hydrology of the LYR). Those studies reported that there is abundant spawning habitat in Timbuctoo Bend. According to the RMT's annual redd survey reports for 2009-2010 and 2010-2011, 34.1% and 42.2% of all redds found on the LYR (in those years respectively) occurred in the Timbuctoo Bend Reach. Further, the RMT's substrate map shows ample gravel abundance on the bed surface in the Timbuctoo Bend Reach. Finally, the RMT's preliminary microhabitat analysis of this reach considering depth, velocity, and substrate combined found that there is > 800,000 ft^2 of Chinook spawning habitat at just 300 cfs, with a peak of >940,000 ft^2 of it at 700 cfs. These abundances exceed the amount necessary for the population of adult Chinook salmon entering the LYR each year, a fact also corroborated by the healthy spawner:redd ratio of 4:1 reported for this reach by Pasternack (2008).

With regard to the claim that the river is incising, that has already been addressed. However, in this specific context of a BO statement regarding spawning, consider the following text from Pasternack (2008): “The Timbuctoo Bend Reach is downcutting, there is absolutely no question about that. It is systematically incising, but even though it is incising, it is self-sustaining its morphological units over decades, renewing its substrates, and maintaining its level of ecological functionality.” Further, as explained by Pasternack (2008), incision is not a problem with respect to the availability of preferred spawning substrate, and is in fact a significant environmental benefit, because the river is incising into gravel-rich material that is optimal for spawning. As quantified earlier in this report, tests by Moir found that 77 % of subsurface material was < 64 mm in size. Pasternack (2008) reported that riffle morphological units were the predominant landforms used by Chinook spawners, and this has also been found in the RMT’s recent annual redd surveys. Has incision hurt the riffles in Timbuctoo Bend where much of the spawning takes place? White et al. (2010), another important LYR geomorphic study that was not cited in the BO, answered this question using a historical aerial photo analysis. They found that despite incision in Timbuctoo Bend, the reach has several persistent riffle complexes going back at least to 1984, very likely to 1952, and possibly to 1937 (with the uncertainty due to georeferencing limitations for those older images). The persistence of these riffle complexes is explained by the dominant controlling influence of valley wall undulations steering the dynamic flow regime via the mechanism of stage-dependent flow convergence routing, which Sawyer et al. (2010) demonstrated mechanistically exists in Timbuctoo Bend. Therefore, the negative implications of incision with respect to spawning habitat on the LYR conjectured by the BO statement contradict the science that has been done. In fact, the conclusion by Pasternack (2008) is even more certain now than before: Timbuctoo Bend is self-sustaining its morphological units, renewing its abundant salmon spawning substrates, and maintaining its level of ecological functionality. This last phrase of the conclusion is based on the results of the journal article evaluating the ecological functionality of flows in Timbuctoo Bend by Escobar-Arias and Pasternack (2011), another relevant study that was not cited by NMFS in the BO. This significant study includes the following relevant conclusion: “the lower Yuba River also presents geomorphic functionality that is complemented by a hydrologic functionality that comes from ample flow availability for an optimal combination of hydrologic and geomorphologic conditions for ecological functionality.”

The BO statement says that there has been a general coarsening of bed material, but provides no evidence. Pasternack (2008) reported that there is ~8-21 million yds^3 of sediment filling the TBR corridor at this time. As previously explained, this fill material is composed of a large percentage of preferred spawning gravel/cobble. Therefore, the BO statement is unsubstantiated and contrary to evidence about Timbuctoo Bend.

In conclusion, the claims in this BO statement and the conjecture that there is a dangerous lack of spawning substrate is false. The only evidence-based statement that can be made and should be made is that Englebright Dam and Narrows Reaches are severely limited in their spawning substrate, Timbuctoo Bend has no such limitation whatsoever.

References:

Escobar-Arias, M. I. and Pasternack, G. B. 2011. Differences in River Ecological Functions Due to Rapid Channel Alteration Processes in Two California Rivers Using the Functional Flows Model, Part 2: Model Applications. River Research and Applications 27:1-22, doi: 10.1002/rra.1335.

BO STATEMENT (Pages 176 and 177)

"Englebright Dam was designed to hold back sediment and gravel. The existence of the dam retains spawning gravel, causing the lower Yuba River to be gravel-deficient downstream of Englebright Dam to the Highway 20 reach. This lack of spawning substrate limits spawning habitat and fish production. There has been a general coarsening of bed material. Lack of adequate spawning substrate presents a high risk to salmonids. The proposed action will continue to result in chronic spawning gravel deficiencies downstream from Englebright Dam."

COMMENT

Figure 41 of Pasternack (2008) shows that Englebright Dam holds back an estimated 61,600 yds^3 of gravel/cobble each year. Taken alone and relative to conditions on other regulated rivers, this might commonly be interpreted to mean that there is a gravel deficit downstream of Englebright Dam to Highway 20 (note that there is no such thing as the "Highway 20 reach" according to any study I know that has delineated geomorphic reaches for the LYR). However, the fact is that the LYR river corridor stores vast quantities of coarse sediment. As mentioned above, Pasternack (2008) reported that Timbuctoo Bend alone holds an estimated ~8-21 million yds^3 of sediment filling the TBR corridor at this time. Furthermore, as previously explained, this fill material is composed of a large percentage of preferred spawning gravel/cobble. Therefore, beginning at the entrance to the Timbuctoo Bend Reach, there is no such gravel deficiency whatsoever and no temporal or longitudinal coarsening. The BO statement is wrong on this point.

The only domain where Englebright's barrier to sediment passage harms the LYR at this time is in the Englebright Dam and Narrows Reaches (Pasternack, 2008). This is being addressed through the USACE's gravel augmentation implementation plan (GAIP) and the Habitat Expansion Plan (HEP) proposed by DWR and PG&E.

BO STATEMENT (Pages 176 and 177)

"This area has a deficit of 63,000 to 101,000 tons of spawning gravel (Pasternack 2010a). Gravel augmentation under the proposed action has provided a small incremental improvement above the baseline conditions that Englebright Dam is designed to maintain. As of October 6, 2011, PSMFC staff has identified 16 Chinook salmon redds in the Englebright Dam Reach where previously suitable spawning gravels did not exist prior to the Corps' 2010 gravel injection program."

COMMENT

The deficit referred to in the BO statement only relates to the Englebright Dam Reach. There is no estimate of a spawning gravel/cobble deficit for the Narrows Reach, because there is presently no topographic map and 2D model of that reach.

In 2007 USACE injected 500 short tons of gravel/cobble and in 2010-2011 they injected another 5000 short tons of it. This represents a mere 5.4-8.7 % of the deficit. Further, in winter and spring 2011 high flows moved all of the injected material out of the local injection area as desired and virtually none of it moved out of the reach, so it was retained and available. The design hypotheses related to spawning habitat in the GAIP have to do with habitat formed in the injection area when no such high flows occur. Formation of significant spawning habitat downstream of that area but still within EDR would require filling a significant percentage of the storage deficit, not a mere 5-9 %.

Let me clarify this expectation with a simple example that contrasts the difference between gravel volume and surface area of habitat. Imagine a vast, deep hole in a river. One could dump millions of tons of gravel into that and get zero habitat. Conversely, imagine a shallow glide. One could place a few tens of tons of gravel/cobble on that and get lots of spawning habitat. This example illustrates the concept of "gravel efficiency" in river rehabilitation, which is a metric consisting of the ratio of the area of surficial spawning of habitat created by gravel addition to the volume of gravel added. Gravel volume does not make habitat; surficial gravel area does. Filling holes has low gravel efficiency, while converting glides to riffles has a high gravel efficiency. In the case of the Englebright Dam Reach, Wyrick and Pasternack (2011) reported that 40.8% of the baseflow wetted area consists of bedrock pools. Figure 122 of Pasternack (2008) shows the locations of 3 large pools that were predicted to trap the majority of the injected sediment. Pasternack (2008) concluded that the remaining residual of injected material would get caught up by roughness elements in the reach, and that is exactly what has happened. Thus, until the volume of these holes in the river is filled in, there cannot be sizable gravel/cobble landforms, and without the appropriate landforms, there cannot be habitat for salmonids (other than holding in the pools).

The BO's judgment about spawning on a small fraction of preliminarily injected and flushed gravel/cobble augmented in the deep Englebright Dam Reach is invalid. There was no expectation that the first injection of transported gravel/cobble would yield substantial spawning habitat, but that such habitat would only exist if no flood redistributed the injected sediment within the reach. Had 2011 been a dry winter and spring, the material would have stayed as one riffle in the injection zone according to the Area A and B fills presented in the design in the GAIP. There was no problem with the material redistributing downstream within the reach, but that did affect the gravel efficiency outcome, with most of the material going into deep water, not shallow water. The outcome of the 2010-2011 pilot injection has thus far yielded the expected outcomes, especially given the lessons learned from the 2007 injection. The GAIP includes a long-term plan and until the gravel deficit of the reach is filled, there should be limited expectations of habitat, because spawning habitat is not a direct function of gravel volume, but instead a function of gravel surface area. It is necessary to stick with the GAIP's injection regime and conduct the GAIP's stated monitoring before any judgments about spawning habitat value should be made.

BO STATEMENT (Pages 177)

"The proposed gravel augmentation would be a short-term increase in the ability of the proposed action to enhance the reproductive fitness of Central spring-run Chinook salmon and Central Valley steelhead, because, as the gravel moves through the system, the level of spawning habitat available will diminish, eventually returning to baseline conditions."

COMMENT

This statement is false. Gravel augmentation is to occur in perpetuity. This is a small price to pay compared to the tremendous environmental and societal benefits of Englebright Dam, which is promoting passive river rehabilitation in the LYR and holding back a vast anthropogenically created hazard that could devastate the ~100 miles of lowlands downstream of the Dam.

According to the long-term plan articulated in the GAIP, once the gravel deficit in the Englebright Dam Reach is eliminated, then the USACE will monitor to determine annual losses and will add gravel to maintain the required gravel volume in the reach. If this plan is followed, there will never be a return to baseline post-dam conditions. Several reports including Pasternack (2008) and the GAIP itself state that flood will not evacuate sediment from EDR, because downstream in the vicinity of Sinoro Bar and the confluence with Deer Creek the canyon widens substantially and gravel/cobble naturally deposits on the inside of the bend. Deer Creek floods also present a hydraulic jet barrier to sediment transport in the mainstem Yuba at the confluence.

Pasternack (2008) showed that sediment has been present in this location for over 100 years and has persisted there for the entire duration since gravel/cobble supply was cut off, even with many floods >50,000 cfs. Pasternack (2010b) analyzed the history of sediment in the Narrows Reach and reported that sediment has also persisted in the wide upper half of that reach as well for the whole duration since supply was cut off. Further, although the mean water temperature at this landscape position in the watershed is naturally warm in the late summer when groundwater flow drops, this is an area that the USGS has mapped as having a lot of local springs that could have provided sufficiently cold conditions for spring-run salmon to hold and then spawn when it cooled off in the fall. Spring-fed holding microhabitats are known to be utilized for this purpose in California.

In conclusion, the BO statement is wrong, because sediment natural holds in the two bedrock reaches regardless of flows and continuity of sediment supply and because the GAIP calls for gravel augmentation in perpetuity.

BO STATEMENT (Pages 177)

"Daguerre Point Dam does not appreciably affect gravel transport, because the pool is full of gravel and dredging is needed to keep the ladders and diversions clear; however, ladder maintenance and dredging that does not return gravel to the Yuba River downstream of Daguerre Point Dam would affect gravel transport. Spawning gravels downstream of Daguerre Point Dam are not a consideration, because the gradient of the river allows for gravel retention."

COMMENT

A run-of-the-river dam is one with no water storage capacity. Daguerre Point Dam is a run-of-the-river dam. The primary geomorphic function of DPD not to provide a reservoir to store sediment, but rather to hold together the longitudinal profile of the river by establishing and maintaining a base-level elevation. In light of this information, the concept in the BO statement that "the pool is full" does not make much sense geomorphically. It is feasible to clear a pool in the immediate vicinity of the dam, but the rest of the river upstream of DPD is either adjusted to or adjusting to the base level set by DPD (Pasternack, 2008), so there should not be a large pool there. Rather than thinking of DPD has having a little water reservoir that fills in with sediment, one should think of DPD as holding back the volume of the entire longitudinal profile of coarse sediment upstream of the dam down to the elevation that the river would grade to in the absence of the dam. This is the purpose and function of DPD. How sediment pulses are naturally responding to the presence of DPD appears to be somewhat complex, as reported by Carley et al. (submitted), and requires further study.

The BO claim that the failure to return the sediment dredged out of the ladders and in the pool immediately upstream of the dam affects gravel transport is predominantly not true. According to the RMT's data used in Carley et al. (submitted), the river upstream of DPD sends an average of ~80,000 m^3 of sediment per year past DPD. A few hundred to a few thousand m^3 are moved around in operations at the dam itself every few years, which is below ~1-10% of the annual flux. When floods are moving sediment past DPD, there is virtually nothing that could be done with the dredged material that would affect sediment transport or geomorphic processes. Also, the amount of material is too small to affect the sediment budget appreciably. The overall LYR sediment budget consists of ~2.52 million m^3 of scour and 2.46 million m^3 of fill, so relative to that, DPD gravel/cobble operations are inconsequential.

Not only does the lower gradient of the river downstream of DPD promote retention, but so too do the higher reach-scale bankfull and floodway widths.

BO STATEMENT (Page 233)

"GAP 3. The Corps shall place a minimum of 15,000 short tons of graded and washed gravel and cobble into the Englebright Dam Reach annually. This will continue until the gravel/cobble deficit (estimated at 63,077 to 100,923 short tons in the GAIP) for the Englebright Dam Reach is eliminated. Thereafter, gravel placement will be made to replace gravel that has moved downstream out of the placement areas. Gravel deposits will be placed at a time and manner each year as approved by NMFS."

COMMENT

Much of this statement is consistent with the GAIP, except the initial annual injection volume and the constraint on timing and manner of injection. I appreciate the intent to push gravel augmentation at the highest rate conceivable and with more NMFS control, but there are problems with these specifications. First, the gravel sluicing method piloted in 2010-2011 took 2 months to inject 5,000 tons, and that was facilitated by (a) flood flows during injection that cleared additional space for gravel addition at the single injection point and (b) the use of a gravel mixture specified by USFWS that was significantly undersized for the LYR, which made it easier to sluice. On the basis of that pilot effort, many lessons were learned and the system will be improved to be faster. However, the sediment mixture will also likely change to reflect the advancement in knowledge of spawning substrates for the Yuba since the original mixture was specified and it is very unlikely that floods will occur at the times NMFS chooses to allow injection to occur (i.e. late summer). I have not calculated it out yet, but I am concerned about the appropriateness of injecting a plug of 15,000 short tons into the upper EDR in one short period each year. I have raised these concerns with NMFS and others already.

Overall, there needs to be flexibility in volume, timing, and manner of injection to enable safe and effective implementation, and the BO statement confounds that. Incremental technological and scientific improvements are coming with each new effort and these are being documented in reports. On the basis of each new report, a team of those involved should collaborate with NMFS to review best practices for the volume, timing, and manner of injection for subsequent years. A multidisciplinary, team-based approach involving NMFS, those performing the work, and those having the expertise about the LYR is the best management approach over having some one who has never been to the site or used any of these methods dictate what should happen.

BO STATEMENT (Page 234)

"The operations and maintenance of Englebright Dam perpetuates the interruption of the movement of gravel in the Yuba River. The Corps have identified that the deficit of gravel in the reach downstream of Englebright Dam (Englebright Dam to Deer Creek) is between 63,077 to 100,923 short tons. It is expected that high flows will cause gravel to move downstream of the Englebright Dam reach, and it will be necessary to replenish the gravel that leaves the Englebright Dam reach. NMFS believes placement of gravel in the reach downstream of Englebright Dam will improve the viability of spring-run Chinook salmon, steelhead, and possibly green sturgeon. Similarly, the area in the Yuba River around the confluence of Deer Creek provides some opportunities to improve habitat and through those habitat improvements, improve spring-run Chinook salmon and steelhead viability."

COMMENT

In pointing out that Englebright Dam blocks gravel transport, the BO statement should recognize that (a) the present volume of sediment supplied to Englebright Lake from the watershed, including the gravel fraction, is unnaturally excessive due to the degraded state of the watershed associated with the cumulative impacts of historic and modern anthropogenic activities and (b) the gravel entering the lake is mixed in with all the other sediment sizes stored behind the Dam and would not be transmitted to the LYR or stored there in the absence of the vast abundance of finer sediment. As of 2003 data, Englebright Dam actually holds back a total volume of ~21.9 million m^3 (~25.6 million metric tons or ~28.2 million short tons) of mixed sediment sizes. Given the 61 year history of the dam (1942-2003), the average annual flux of sediment is ~359,000 m^3 (~462,000 short tons). These are daunting abundances that remind us of the importance of having Englebright Dam in light of the persistence of a degraded watershed upstream of it. The BO should not use the modern annual supply of any sediment fraction into Englebright Lake as representative of what the supply for the LYR should be or what it was prior to the gold mining era.

As already explained, since Englebright Dam was built, notable deposits of gravel/cobble substrates have stayed in the Englebright Dam and Narrows Reaches where the canyon is wider and where there are flow obstructions. Therefore, gravel/cobble can and does persist. Nevertheless, more alluvial landforms are possible than just those; creating and sustaining many potential areas of fish spawning habitat will require a perpetual gravel augmentation program.

LARGE WOODY MATERIAL

BO STATEMENT (Page 138)

"Few pieces of large wood are found within the reach of the lower Yuba River extending from Parks Bar to Hammon Bar, largely due to upstream dams disrupting downstream transport from the upper watershed and the overall lack of supply and available inventory along the riparian corridor of the river downstream of Englebright Dam (cbec et al. 2010)."

COMMENT

This BO statement is false. CBEC et al. (2010) provided planning-level conjecture, not evidence-based data and analysis. Figure 8 above shows 31 examples of locations where there are pieces of large wood. As explained earlier, LWM is ubiquitous in the LYR river corridor and there is an abundant supply of LWM to the LYR. In addition, downstream of DPD in the Hallwood and Marysville Reaches, the riparian corridor contributes LWM to the channel.

Scientific studies are needed to quantify the LWM budget, composition, and processes in the Yuba watershed, including the LYR.

BO STATEMENT (Page 144)

"The lower Yuba River has an outstanding deficiency of LWM, with only a handful of large pieces of LWM known to occur at Hammond Bar. The rest of the lower Yuba River is devoid of LWM.

…little instream woody material occurs in the lower Yuba River because upstream dams reduces the downstream transport of woody material, and because of the general paucity of riparian vegetation throughout much of the lower Yuba River.

During uncontrolled spill events, accumulated woody material spills over the Englebright Dam. These are typically small in diameter and pass through the system rapidly, because there is lack of riparian vegetation to capture or anchor woody material and a lack connectivity of the lower Yuba River with its floodplain where woody material can strand or anchor."

COMMENT

This BO statement is false. Figure 8 above shows 31 examples of locations where there are pieces of large wood. As explained earlier, LWM is ubiquitous in the LYR river corridor and there is an abundant supply of LWM to the LYR. In addition, downstream of DPD, the riparian corridor contributes LWM to the channel. The floodplain is not disconnected from the channel and there is a large amount of LWM on the floodplain. In terms of large-diameter pieces, I have observed many such tree trunks throughout the LYR.

This BO statement claims that there is a "lack of riparian vegetation". There is no evidence or citations in the BO statement to substantiate this. In 2008 the RMT did a LiDAR survey of the LYR from highway 20 to the confluence and by 2011 the RMT had both a topographic map of the land surface as well as a canopy height map. In addition, the RMT digitized the patches of vegetation in recent aerial imagery of Timbuctoo Bend and EDR. These data and maps could have been analyzed by NMFS alone as well as together with other data, such as the RMT's 2D model results to actually characterize the riparian zone. I have gone ahead and done that full analysis to yield the real evidence characterizing the conditions on the river. Based on the RMT's vegetation map, there exists 23.2 million square feet of vegetation within the 42,200 cfs inundation zone, which covers 25% of the surface. The Daguerre Reach beginning at DPD has the highest vegetated abundance at the reach scale, with 33 % vegetation coverage. Of the alluvial reaches, Timbuctoo Bend has the least vegetation (9%), but it is also naturally valley-constricted and still systemically downcutting relative to the DPD base level (Pasternack, 2008), so there is no reason why it should be heavily vegetated on its floodplain. Overall, both data and observations demonstrate that the BO statement is false and there is significantly more vegetation in the floodway that just a "general paucity".

In terms of having sufficient riparian vegetation to provide ecological functionality (to address the "lack" statement in the BO), there are two lines of evidence suggesting that the coverage is significant and functional. First, the RMT has conducted paired hydrodynamic modeling of the LYR in which one set of models lacks vegetation and the other represents the actual LYR vegetation pattern and height as best as possible. As shown at the 2011 LYR Symposium and in presentations at RMT meetings, vegetation was found to significantly affect the hydraulics of the river, and thus may be deemed present in a significant quantity relative to that functionality. Second, there are accounts of LYR observations that LWM is abundantly trapped in the vegetated patches lining the bankfull channel and scattered out on the floodway, especially in the vegetated patches. I have performed a recon of the river to verify this and in the effort I made a photo database showing many examples demonstrating this to be the case. Formal LWM mapping is being undertaken in relicensing, so more data is yet to come.

I appreciate that the BO aims to explain controls and impacts on LWM for the LYR, but the explanation is wrong. Scientific studies are needed to quantify the LWM budget, composition, and processes in the Yuba watershed, including the LYR. In my preliminary professional judgment regarding this matter, here is what I offer so as to not just be critical, but to offer a better explanation: Far and away, the #1 predominant control on the geomorphology of the LYR, including LWM patterns and processes, is the vast deposit of unconsolidated hydraulic mining sediment that filled the LYR valley. This deposit has strongly influenced every reach-scale hydraulic variable from the onset of Timbuctoo Bend to the confluence with the Feather River, such as reach-average slope, bankfull and floodway width, channel width/depth ratio, and strong connectivity between floodplain and channel. Every aspect of channel pattern is influenced by what this pile of unconsolidated alluvium can hold together. On top of that and contrary to statements in the BO, the LYR's flood regime is highly dynamic with the frequency of overbank floods exceeding the natural expectation for a semi-arid climate. This flow regime has been found to be capable of reworking the mining fill and is moving it downstream over time. With respect to LWM, no matter how big the tree trunks are that wash over Englebright Dam, the fact that the floodway is so wide means that on the falling limb of the flood the wood gets scattered over a vast area, with disproportionate concentrations racked behind flow obstructions, racked throughout vegetation patches, and lining the water's edge demarking peak flood stages. I have walked the line of the 1997 flood stage in Timbuctoo Bend and there is a lot of large streamwood tree trunks at that line. There is ample roughness along the fringe to catch very large wood pieces, but the situation is that the river is so wide and deep in flood that the wood cannot produce jams relative to the scale of the system. I can think of ways to change the functionality of the river, but the fact is that none of this has anything to do with the USACE's operation and maintenance of Englebright and Daguerre Point Dams and Englebright Reservoir on the Yuba River. I am not sure what the baseline or reference functionality is or ought to be for the LYR- simply aiming for "complexity" everywhere is naïve application of theoretical dogma; it is mindless of the true diversity of rivers, which includes many types of homogeneous reaches as well as heterogeneous ones. The LYR should not be compared to a lowland coastal river or a low-slope, sand-bedded river with miles of wood jams. Neither NMFS nor any one else has performed a comprehensive comparative analysis of the LYR to develop a meaningful and appropriate baseline for what the river's unimpaired baseline ought to be.

BO STATEMENT (Page 145)

"In the lower Yuba River, mature riparian vegetation is scattered intermittently, leaving much of the banks devoid of LWM and unshaded. This lack of cover affects components that are essential to the health and survival of the freshwater lifestages of salmonids and their prey.

COMMENT

This BO statement is wrong. There are two issues here, (1) height and maturity of LYR vegetation and (2) abundance and distribution. First, the canopy height map of the LYR easily provides the data regarding the actual heights from SR20 to the terminus of the river to analyze where tall trees occur and in what abundance. The data shows that the height of the vegetation in the 42,200 cfs inundation area varies by reach, but is not insignificant, with reach-scale averages between 17.5 to 33.6 feet and individual tree heights up to a maximum of ~150 feet. The literature states that mature sandbar willows (*Salix exigua*) range in height from ~12-25', and in my experience using the LYR canopy height map and incorporating vegetation into 2D models of the LYR, willow patches of that height are widespread on the LYR. Also, tall cottonwoods and oaks are present in backwater areas, especially when there are recently abandoned channels or floodrunners at the outer margin of the floodway as well as in the lower section of Daguerre Alley. Figure 9 illustrates what happens to tall trees in the naturally valley-constricted Timbuctoo Bend during even a small flood with just a ~2.5-3 year recurrence interval. Given the aggressive flood regime in the LYR, there is no reason to expect anything other than r-type rapid colonizers, such as willows, to persist as a population along the bankfull channel. The recovery time for mature willow patches is less than the recurrence interval of the floods that disturb them, whereas the recovery times for cottonwood and oak patches are too long.

In terms of streambank vegetation, in the 1,000 to 5,000 cfs inundation band, the river has 3.54 million square feet of vegetation, comprising 28% of the bank area along the whole LYR (excluding the Narrows Reach). The Daguerre and Hallwood Reaches below DPD have the highest abundances, with >33 % vegetation coverage in the streambank area. Even Timbuctoo Bend manages to have 20% of its streambank area vegetated. Because these are areal estimates and not linear bank length estimates, let's consider some individual sites to further evaluate the presence and height of vegetation along the banks. Figure 10 below illustrates (a) dense vegetation lining the bankfull channel in Timbuctoo Bend, (b) effective floodplain-channel connectivity, and (c) the entire length of channel-adjacent vegetation is producing shading against the rising sun. Figure 3 shows a juvenile fish using exactly this kind of cover in Timbuctoo Bend. Figure 11 shows the same situation in the Marysville Reach, and it visually evident in that photo that the riparian vegetation lining the Marysville reach is quite tall. In terms of the data, the average tree height in the Marysville Reach within the 1,000 cfs inundation zone is 34.7', while in Timbuctoo Bend it is 11.9'. A simple effort of viewing the LYR in Google Earth is enough for any person to visually confirm that long sections of the LYR has significant riparian vegetation providing shading and cover.

In conclusion, there is far more riparian vegetation in the LYR corridor than the "general paucity" cited in the BO and the vegetation is providing hydraulic (e.g. flow deflection, flow-focusing, and turbulence generation), geomorphic (sediment trapping), and ecological (streamwood trapping) functions. In addition, there is a preponderance of vegetated riverbanks in the LYR and this vegetation does provide shading and cover. Since 1942, the abundance of vegetation in the LYR has increased, but the nature and abundance of the hydraulic mining sediment in the river corridor asserts a primary control on riparian vegetation and LWM.

Figure 9. Photo of Timbuctoo Bend apex at ~26,000 cfs during the May 2005 flood showing a tree on a submerged medial bar near the center of the photo. After the flood the tree was gone, but the island was actually bigger (Sawyer et al., 2010). Meanwhile, the sandbar willows shown in the upper left of the photo returned in the years after this flood and the subsequent larger New Years 2006 flood.

Figure 10. Aerial image of part of Timbuctoo Bend on 6/26/2011 when mean daily discharge was 9027 cfs and the water is clearly overbank with a lot of inundated vegetation. Vegetation lines all alluvial banks in the photo. There is also a sizable backwater area at top center. All along the channel bank on the bottom of the photo (east side), the rising sunlight is hitting the vegetation lining the channel and producing visible shading in the water.

Figure 11. Aerial image of part of the Marysville Reach on 6/26/2011 when mean daily discharge was 9027 cfs and the water is overbank with a lot of inundated vegetation. All along the channel bank on the bottom of the photo (east side), the rising sunlight is hitting the vegetation lining the channel and producing visible shading in the water.

BO STATEMENT (Page 145)

The Yuba Goldfields section near Daguerre Point Dam is largely devoid of streamside vegetation (CALFED and YCWA 2005).

COMMENT

This statement is wrong. According to the LiDAR data, the reach below DPD has the greatest areal abundance of vegetation within the 42,200 cfs inundation zone among reaches on the LYR. Meanwhile, the Dry Creek Reach just upstream of DPD has the second highest areal abundance. Figure 12 shows the upper half of the area in question, just above DPD. Nearly the entire length of water's edge on either river bank as well as much of the water's edge on the medial bar is covered with vegetation. Anyone who looks at this photo would conclude that there is an abundance of streamwide vegetation, not a deficit of it. Although not shown, the matching area just downstream of DPD also has streamside vegetation, with the first bar and floodplain on the south bank ~50% vegetated and the north bank >50% vegetated. Figure 13 shows the abundance of vegetation a little further downstream of DPD in the Goldfields area. It is not largely devoid of streamside vegetation.

Figure 12. Aerial image of the upper Goldfields section of the LYR just upstream of DPD on 6/27/2012 showing abundant streamside vegetation and overbank inundation.

Figure 13. Aerial image of part of the lower Goldfields section of the LYR downstream of DPD on 6/27/2012 showing abundant streamside vegetation and overbank inundation.

BO STATEMENT (Page 145)

Englebright Dam continues to inhibit regeneration of riparian vegetation by preventing the transport of any new fine sediment, woody debris, and nutrients from upstream sources to the lower river.

Subsequently, mature riparian vegetation is sparse and intermittent along the lower Yuba River, leaving much of the bank areas unshaded and lacking in LWM. This loss of riparian cover has greatly diminished the value of the habitat in this area.

COMMENT

Taking the second sentence first, that BO statement has already been refuted in the text above.

Addressing the first sentence, Englebright Dam is not a barrier for fine sediment carried as washload and is only a partial barrier for suspended load. This is evidenced by high turbidity during floods that overtop the dam. The dam is not a barrier for LWM, as evidenced by the 31 photos of LWM presented in Figure 8. The dam is not a barrier to dissolved nutrients or particulate organic carbon. According to the literature, a river's washload is rich with nutrients, metal, and organic carbon. Also, for the supply of useful materials that are actually blocked, the fact is that if the barrier was not there, the consequences would be environmental and economic devastation for the ~100 miles of downstream lowlands as well as for the estuary beyond. The question is how to quantify, characterize, and mitigate the negative effects, while still obtaining the positive ones.

The conjecture that a supply of fine sediment, woody debris, and nutrients would promote regeneration of riparian vegetation is wrong. First, it has already been stated that since 1942 the abundance of vegetation in the LYR has been increasing. A historical characterization of vegetation growth is needed prior to making a biological opinion about what the actual regeneration rates are with the dams and operations present and what they otherwise might or should be. Second, availability of these materials, which is not as limited as stated anyway, is not the primary stressor on riparian vegetation growth. This BO statement does not account for the fact that the LYR is systematically lowering as part of its recovery to a devastating historical disturbance in the form of hydraulic mining sediment smothering. Against the power of the flood regime driving the downward trajectory of river corridor, establishing a completely forested floodplain with stable soils on an artificially elevated platform is a misguided and inappropriate reference. The LYR has a moderately high slope and strong floodplain-channel connectivity, so it behaves as an active pioneer setting across its whole floodway. This setting is not unique, but does exist worldwide, and in such place one finds that the ecology is commonly dominated by r-type rapid colonizers, as previously mentioned. The BO should provide an appropriate and transparent baseline as to what the target is for the LYR to be. The idea that it should be a highly sinuous, extremely complex, completely forested river sounds more like a low-slope, sand-bedded, single-threaded river like the lower Mississippi River, Athafalaya River delta or perhaps the lowermost Cosumnes River at the confluence with the Mokelumne River in the Sacramento-San Joaquin Delta. There ought to be a semi-arid, moderate slope, gravel/cobble bed, valley-confined, active flood regime reference used, but that is lacking.

BO STATEMENT (Page 192)

"Loss of LWM in the Yuba River directly affects the ability of the river to retain spawning gravels and indirectly affects the ability of the river to establish a riparian overstory.

COMMENT

Based on the information provided above, this BO statement is not true. The LYR has nearly ubiquitous spawning gravels and is not exporting much at all. LWM is not "lost" by the upstream facilities, except New Bullard Bar, but passes to the LYR where there is an abundance of LWM.

BO STATEMENT (Page 247)

"In addition, Englebright Dam impedes and reduces the frequency of LWM delivered and deposited in the reach, which further decreases gravel retention and channel complexity."

COMMENT

There is no evidence or literature cited to support this false claim. In a previous response above I explained what is known about this topic and why this statement is false. Further, USACE plans to conduct a LWM study to reduce the uncertainty in what is known.

TRAINING WALLS

BO STATEMENT (Page 136)

"The training walls channelize the lower Yuba River and may have been the primary driver for the river downcutting and separating the Yuba River from its floodplain."

COMMENT

The facts provided earlier in this report demonstrate that the channel and floodplain and not only not disconnected, but are actually strongly connected. Floods that spill overbank and inundate the floodplain occur at a higher frequency on the LYR than anticipated for pristine semi-arid rivers.

The training walls do not channelize the river in the sense of defining and controlling the geometric shape of the bankfull channel. The north flank of the river is mostly up against the valley wall, so the training berms on that side are not very consequential. On the south side the berms do temporarily block the river's ability to move to the south, but the bankfull channel is migrating through the training walls very quickly; left to its own progress, the river will move into the Yuba Goldfields, which adds no environmental benefits and grave environmental and societal hazards. The idea from the BO statement that if the training walls were removed, the river would be better off is not correct. The training walls are not there in support of Englebright and Daguerre Dams. They are there as a lowland flood control measure and to save the river ecosystem from that wasteland.

BO STATEMENT (Page 181)

"Rearing habitat is adversely impacted by water diversions associated with the project and by the training walls disconnecting the Yuba River from its floodplain and disrupting hydrogeomorphic function. The interrelated and interdependent conjunctive uses of water delivery and energy production prevent or reduce the types of releases from Englebright Dam that would stimulate natural hydrogeomorphic processes and reconnect the Yuba River with its the floodplain. River channelization and downcutting exacerbate this problem."

COMMENT

These claims are all wrong. Throughout the Yuba Goldfields region, the training walls do not separate the active river corridor from a floodplain, they separate it from a hazardous wasteland. Removal of the training berms would be disastrous. Meanwhile, within the available river corridor, the river has a strong connection between channel and floodplain. River downcutting is not exacerbating any problem, but is the natural, beneficial process of ecological recovery that is being facilitated by Englebright Dam.

As previous explained, the LYR is well known to have natural fluvial landforms and the evidence thus far in several publications and presentations is that the natural organization of landforms in the LYR exists because the river has an active flood regime, dynamic channel changes, and a whole suite of self-driven geomorphic processes.

Controlled releases from Englebright Dam cannot exceed 4,500 cfs and do not need to, because the river naturally floods right over the dam when the watershed generates sufficient flow, which occurs more frequently than is common for pristine semi-arid rivers. Although it is not possible to provide a tightly controlled recession from 10,000 cfs down to 4,500 cfs, even if there was such a control, a hydrological analysis of water availability raises the question as to whether there is sufficient water in the spring snowmelt recession to facilitate cottonwood recruitment without otherwise using up the supply needed for other ecological functions later in summer and fall. More studies are needed to assess stressors on riparian recruitment on the LYR, especially given that vegetation abundance has been increasing on the LYR over time.

BO STATEMENT (Page 184)

"The proposed action and interrelated and interdependent actions perpetuate the flow conditions that result in lack of connectivity with the floodplain, perpetuate the existence of the training walls that separate the Yuba River from its flood plain and cause further down-cutting of the river, and hold back LWM contributions that would relieve the stressor of lack of food resources.

The training walls upstream of Daguerre Point Dam prevent juvenile spring-run Chinook and Central Valley steelhead from being sheltered from fast currents and is likely to expose them to *increased predation. The river confinement caused by the training walls adjacent to the Yuba Goldfields decreases riverine habitat complexity and results in a decrease in the quantity and quality of juvenile rearing habitat. The channel will continue to incise some areas on the lower Yuba River, increasing the severity of this stressor."*

COMMENT

All of these statements have already been refuted above. The most important thing to restate is the river's overall downcutting is not a stressor, but a natural method of ecological recovery to a terrible unnatural disturbance. As illustrated by Pasternack (2008), White et al. (2010), Sawyer et al. (2010), and Wyrick and Pasternack (2011), despite systemic downcutting, the river maintains a natural suite of organized fluvial landforms by way of a suite of natural geomorphic processes. These geomorphic dynamics support ecological functions, such as salmonid rearing.

BO STATEMENT (Page 243)

"The Corps' training walls affect natural riverine processes through constriction of the river channel and limiting the areas in which riparian vegetation can become established."

COMMENT

Based on the evidence provided above, this BO statement has already been refuted.

CHANNEL RESTORATION

BO STATEMENT (Page 235)

"CR 1. The Corp shall develop a Channel Restoration Plan for the Englebright Dam Reach, and upper portions of the Narrows Reach (extending from Deer Creek confluence to 1,000 ft downstream) of the Lower Yuba River, CA by December 2012. Specific areas to be included in the Channel Restoration Plan include Sinoro Bar, the mid-channel bar adjacent to the downstream end of Sinoro Bar at the Deer Creek confluence, and potentially other suitable depositions areas or surfaces that no longer function properly due to armoring or deposition of shot-rock. The Channel Restoration Plan will include conceptual level plans for design that identify areas where shot-rock needs to be removed, where channel recontouring should occur, locations for installment of potential flow obstructions, identify areas where local/site specific gravel additions are warranted, and identify sources of shot-rock in the vicinity of Englebright Dam that can be stabilized. At a minimum the Channel Restoration Plan will include shot-rock removal at Sinoro Bar and the mid-channel bar at the entrance to Narrows Gateway, recontouring of these bars, addition of at least eight flow obstruction structures that may potentially be part of the large wood augmentation program, and stabilization of shot-rock sources in the vicinity of Englebright Dam. Localized gravel augmentation at the recontoured bars and hydraulic structures will also be included, specific amounts will be determined as part

of the design process and potentially partially accounted for with the annual gravel augmentation supplied at the top if the EDR. An implementation schedule will also be part of this plan. The Channel Restoration Plan shall be submitted to NMFS for approval by December 2012."

COMMENT

Pasternack (2008), Pasternack (2010c), and Pasternack et al. (2010) reported that the primary cause of river degradation in the lower half of the Englebright Dam Reach and upper section of the Narrows Reach was mechanized gold mining. In addition to that activity that started ~1960, I have learned and gathered evidence that government regulators have required the local landowners to re-channelize portions of that area from time to time since 1970. Therefore, this proposed action has nothing to do with mitigating the effects of USACE facilities. I strongly support the goal of having this rehabilitation done, but I have no professional opinion as to who ought to do it, as that is ultimately not a scientific question, but a political one. If the rehabilitation was tied to causative responsibility, then the Bo does not make sense, but my understanding from NMFS is that there is no intended causative link in terms of responsibility by the Corps for how the channel got degraded.

References:

Pasternack, G.B. 2010c. Estimate Of The Number Of SpringRun Chinook Salmon That Could Be Supported By Spawning Habitat Rehabilitation At Sinoro Bar On The Lower Yuba River. Prepared for the PG&E and DWR Habitat Evaluation Agreement Steering Committee.

Pasternack, G. B., Fulton, A. A., and Morford, S. L. 2010. Yuba River analysis aims to aid spring-run Chinook salmon habitat rehabilitation. California Agriculture 64:2:69-77.