

Technical Memo

**Effects of Implementation of the
Bay Delta Conservation Plan**

**As Evaluated in the Draft Environmental Impact
Report/Environmental Impact Statement**

on

**Central Valley Steelhead and Fall-run Chinook Salmon
in the Lower American River**

Prepared for Placer County Water Agency

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Table of Contents

	Page
1.0 Introduction.....	1
2.0 Adverse Impacts to Central Valley Steelhead and Fall-Run Chinook Salmon in the Lower American River	1
2.1. Lower American River Setting.....	2
2.2. Status of Central Valley Steelhead.....	4
2.3. Status of Fall-Run Chinook Salmon	4
2.4. Key Life History Information and Temperature Requirements	5
2.5. Existing Habitat Conditions	6
2.6. Habitat Conditions under BDCP Future Conditions	6
2.7. BDCP Temperature Significance Criteria	8
3.0 Conclusion	9
4.0 References.....	10

1.0 INTRODUCTION

This technical memo provides an evaluation of the effects of implementation of the Bay Delta Conservation Plan (BDCP), as evaluated in the December 2013 Draft Environmental Impact Report/Environmental Impact Statement (Draft EIR/EIS), on Central Valley (CV) steelhead (*Onchorhynchus mykiss*) (Federally Threatened, 71 Federal Register [FR] 834) and fall-run Chinook salmon (*O. tshawytscha*) (Federal Species of Concern, 69 FR 19975) in the Lower American River (LAR). The evaluation focuses on Folsom Reservoir operations and resulting physical habitat/temperature conditions for CV steelhead and Chinook salmon in the LAR.

The effects analysis in the Draft EIR/EIS is fundamentally flawed and fails to disclose significant adverse impacts on CV steelhead and fall-run Chinook salmon and their habitat in the LAR (critical CV steelhead and non-natal spring-run Chinook salmon critical habitat, 70 FR 52488, Sept. 2, 2005, and Essential Fish Habitat for Chinook salmon, 73 FR 60987, Oct. 15, 2008). If properly evaluated, the information provided in the Draft EIR/EIS would result in National Marine Fisheries Service (NMFS) issuing a jeopardy opinion under the Federal Endangered Species Act (ESA) for the BDCP effects on CV steelhead in the LAR based on the modeled Folsom Reservoir and LAR operations. Similarly, significant unmitigated impacts under California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) would exist for both CV steelhead and fall-run Chinook salmon in the LAR.

By failing to disclose impacts from implementation of the BDCP on anadromous fish in the LAR, the Draft EIR/EIS does not comply with CEQA (California Public Resources Code §21000 et seq.), or NEPA (42 U.S.C. 4321 et seq.). To comply with CEQA and NEPA, the underlying modeling assumptions, alternatives analysis, and impact analysis in the Draft EIR/EIS requires substantial modification such that re-circulation of the document is necessary.

The following discussion identifies adverse impacts to CV steelhead and fall-run Chinook salmon in the LAR under future operations of the Central Valley Project (CVP)/State Water Project (SWP).

2.0 ADVERSE IMPACTS TO CENTRAL VALLEY STEELHEAD AND FALL-RUN CHINOOK SALMON IN THE LOWER AMERICAN RIVER

The following identifies impacts to CV steelhead and fall-run Chinook salmon in the LAR under operations of the CVP/SWP, as modeled in the Draft EIR/EIS. The impacts are based on comparing modeled existing and future BDCP habitat and water temperature conditions. The discussion first describes the LAR setting, summarizes the current status of CV steelhead and fall-run Chinook salmon, describes key life history information and temperature requirements, reviews existing habitat conditions in the LAR (including key environmental stressors), and discusses the BDCP temperature significance criteria in the Draft EIR/EIS. The discussion then characterizes habitat conditions in the LAR under future BDCP operations of the CVP/SWP compared to existing conditions and identifies the resulting adverse impacts to CV steelhead and fall-run Chinook salmon.

2.1. LOWER AMERICAN RIVER SETTING

The American River is a major tributary to the Sacramento River. Historically, it provided over 125 miles of anadromous salmonid habitat (CV steelhead, Chinook salmon). The majority of the historical spawning and rearing habitat existed upstream of present-day Nimbus and Folsom dams (NMFS 2009; Yoshiyama et al. 2001). Since 1955, after construction of Folsom and Nimbus dams, use of the American River by anadromous fish has been limited to the lowest 22.5 miles of river downstream of Nimbus Dam (LAR). The Nimbus Fish Hatchery was built immediately downstream of Nimbus Dam in 1955 to mitigate for lost anadromous fish habitat due to construction of the Folsom-Nimbus Project (the adjacent American River Trout Hatchery was constructed in 1968 to rear resident salmonids).

Historically, summer and early fall habitat conditions in the LAR were relatively unsuitable for cold water salmonids due to naturally low flows and high water temperatures in the summer – fall (as high as 75-80°F) (Gerstung 1971). The Folsom-Nimbus Project modified the hydrology of the LAR. Currently, winter/spring flows in the LAR are much lower than historical flows and summer – fall flows are much higher (NMFS 2009). Folsom Reservoir provides a source of summer cold water for the LAR from the hypolimnion of the reservoir. However, the LAR is on the Central Valley floor at an elevation of approximately 100 feet (ft) above sea level. Summer and early fall air temperatures are very warm, with peak daily temperatures frequently above 100°F. Under existing conditions, water temperature in the LAR is colder in the summer – early fall, but warmer in the late-fall – winter than historical water temperatures (Reclamation 2008; NMFS 2009).

Extensive effort has been made to provide and maintain water temperatures in the LAR suitable for the remaining CV steelhead and fall-run Chinook salmon habitat and the two cold water fish hatcheries. Most of the cold water rearing and spawning habitat in the LAR occurs in the upper 13-mile portion (Nimbus Dam downstream to Watt Avenue [River Mile (RM) 9.4]), because the downstream portion of the river is generally too warm, in spite of, the cold hypolimnetic releases from Folsom Reservoir. Selective withdrawal shutters have been installed on the three powerhouse intakes and the municipal water intake at Folsom Dam to provide cold water management capability for the LAR. Detailed temperature modeling and reservoir operations scheduling are performed each year to obtain the best summer temperature conditions for CV steelhead, fall temperature conditions for fall-run Chinook salmon, and summer/fall temperature conditions for the hatcheries.

Water temperature management of the LAR is challenging and water temperatures are impaired for cold water fish under existing conditions, particularly in drier/low storage years due to high summer/fall temperatures (NMFS 2009; Reclamation 2008; Water Forum 2005; CDFW 2001). In addition to management for LAR water temperature (salmonid species and the fish hatcheries), Folsom Reservoir storage is also managed to meet Delta water quality objectives and deliveries to municipal and industrial (M&I) and agricultural water users. LAR water temperature is severely constrained by the limited amount of storage available in Folsom Reservoir. The amount of cold water pool available for release to the LAR is directly related to

the amount of storage in the reservoir at the beginning of the summer when reservoir stratification occurs. In drier years and/or when the storage in Folsom Reservoir is drawn down heavily to meet downstream demands (e.g., Delta water quality requirements, water exports, etc.), the cold water pool is not large enough to provide sufficient cold water releases for CV steelhead juvenile rearing (June – September), fall-run Chinook salmon spawning (October – December), and summer/fall hatchery operations. Water temperature management for both CV steelhead and fall-run Chinook salmon, particularly in low Folsom storage years, requires tradeoffs between releasing cool water in the summer for CV steelhead rearing or saving some cool water until the fall for fall-run Chinook spawning/incubation.

The Nimbus and American River fish hatcheries at the top of the LAR reach obtain their 20-60 cubic feet per second (cfs) water supply from the Nimbus Dam. Water temperatures are typically within the suitable range for Chinook salmon and CV steelhead, except in the summer – fall. When water temperatures exceed 60°F, fish are treated with chemicals to prevent disease. As temperatures continue to increase, treatment becomes difficult and water temperatures become increasingly dangerous to fish. Hatchery personnel and Reclamation routinely meet to determine a compromise for operations of Folsom Dam to release cooler water. If water temperatures exceed 70°F, the fish may have to be released or moved to another hatchery (Reclamation 2008). In an unprecedented operation this year, 2014, due to anticipated warm water temperatures, California Department of Fish and Wildlife (CDFW) determined in June that it was necessary to release all CV steelhead juveniles early from the Nimbus Fish Hatchery (released at a small size and much lower survival potential) and moved all trout from the American River Trout Hatchery rather than risk potential mortality to fish due to warm summer water temperatures.

Reclamation is required each year to prepare a draft Operations Forecast and Temperature Management Plan for Folsom Reservoir and the LAR and submit it to NMFS for review by May 1 and a final plan by May 15. The plan can be updated, but requires NMFS approval for deviations. The NMFS biological opinion temperature requirement is 65°F (daily average) in the LAR at Watt Avenue from May 15 through October 31 for CV juvenile steelhead rearing. If this temperature is exceeded for three consecutive days, or is exceeded by more than 3°F for a single day, Reclamation is required to notify NMFS in writing and convene the American River Group (ARG) to make recommendations regarding potential cold water management alternatives to improve water temperature, including potential power bypasses. If the May Operations Forecast and Temperature Management Plan identifies that Reclamation cannot meet the 65°F NMFS requirement because of insufficient cold water pool in the reservoir, after taking all actions within its authority, then the target daily average water temperature schedule¹ at Watt Avenue may be increased incrementally (i.e., no more than 1°F every 12 hours) to as high as 68°F. The priority for use of the temperature control shutters at Folsom Dam is to achieve the water temperature requirement for CV steelhead and, thereafter, may also be used to provide cold water for fall-run Chinook salmon spawning (RPA Action II.1, NMFS 2011).

¹ Automated temperature selection procedure schedules are identified in the LAR Flow Management Standard.

2.2. STATUS OF CENTRAL VALLEY STEELHEAD

CV steelhead have been extirpated from most of their historical range and their numbers are a fraction of their historical abundance due to blockage of freshwater habitats (e.g., dams), habitat degradation/destruction, water allocation, and possibly genetic introgression with hatchery fish. It has been estimated that CV steelhead habitat has been reduced from 6,000 miles historically to 300 miles currently. In 1996, NMFS estimated that fewer than 10,000 CV steelhead existed throughout its present-day range (from a combination of dam counts, hatchery returns, and spawning surveys).

CV steelhead were listed as threatened in 1998 (reaffirmed in 2006), including naturally spawned CV steelhead in the American River. The Nimbus Fish Hatchery population in the American River was not listed because it was originally derived from out of basin fish, however, recent genetic information suggests that the status of the Nimbus Fish Hatchery population should be reconsidered (NMFS 2011). Critical CV steelhead habitat was designated in 2005, including all of the American River below Nimbus Dam.

One of the primary goals of the CV steelhead recovery plan (NMFS 2009) is to secure and improve all extant populations. In the American River, the extant CV steelhead population is confined to the LAR; however, 100% of the historical spawning habitat (located upstream of Nimbus Dam) is no longer accessible. Only a few hundred fish currently spawn naturally in the LAR (NMFS 2009). A relatively small percentage of CV steelhead redds are from natural spawned fish (i.e., non-hatchery fish without adipose clips) (Hannon and Deason 2008). In 2014, 112 CV steelhead redds were observed in the LAR (American River Group, Meeting Notes April 17, 2014). Currently, rearing and spawning habitat primarily exists in the upper 13 miles of the LAR. Ninety percent of spawning occurs above Watt Avenue (RM 9.4) (Hannon and Deason 2008). CV steelhead rearing habitat during the summer is particularly limited in the LAR due to warm summer water temperature (see below) and most juvenile rearing, similar to spawning habitat, occurs upstream of Watt Avenue.

Nimbus Fish Hatchery currently produces about 430,000 steelhead annually. The hatchery steelhead population is operated as a “segregated population” to mitigate for recreational fishery losses from the dam and is not used to enhance natural CV steelhead. The hatchery is operated to the extent possible to minimize effects on the limited natural population (California HSRG 2012).

2.3. STATUS OF FALL-RUN CHINOOK SALMON

Four seasonal runs of Chinook salmon occur in the Sacramento-San Joaquin River system. The runs are named after the upstream migration season – winter, spring, fall, and late-fall. Central Valley fall/late fall-run Chinook salmon were lumped together and jointly classified as a Federal Species of Concern in 2004. These two runs are separate runs, however, with the late-fall run occurring primarily only in the Sacramento River (Moyle et al. 2008), whereas, fall-run Chinook salmon occur throughout the Central Valley. Fall-run Chinook salmon are the only Chinook salmon run extant in the American River. Spring-run Chinook (listed as threatened 1996) were

extirpated from the American River historically and it is uncertain whether or not a late fall-run existed in the American River (Yoshiyama et al. 2001). Approximately 70% of the historical spawning habitat used by Chinook salmon in the American River was blocked by the Folsom-Nimbus Project.

CV fall-run Chinook salmon are currently and were historically the most abundant Chinook salmon run in the Central Valley (Moyle 2002; Williamson 2006). Since the 1950's escapement has been relatively robust with various cycles of years with low escapement of <100,000 fish (e.g., 1990 and 2007-2009) and years with high escapement >400,000 fish (e.g., 1999-2005 and 2013). The CV fall-run Chinook salmon in the LAR have similar abundance cycles to those of the larger population in the Central Valley. On average 17% of the total Central Valley escapement (48,000 fish) occurs in the LAR and, on average, 75% of the LAR escapement occurs in-river and 25% enters Nimbus Fish Hatchery (CDFW GrandTab data, 1952-2013).

Similar to CV steelhead, the majority of CV fall-run Chinook salmon spawning occurs in the upper portion of the LAR. Both spawning gravels and suitable fall water temperature (<58 to 60°F) are most prevalent above Watt Avenue. Warm water temperature in the fall delays spawning and affects adult mortality and in-vivo egg mortality. For example, in 2001 due to warm fall water temperature, a large portion of fall-run Chinook salmon died before spawning (Water Forum 2005).

Nimbus Fish Hatchery currently produces about 4 million Chinook salmon annually. The hatchery production helps fulfill mitigation requirements for construction of the Folsom-Nimbus Project. However, hatchery production and release of fish in the Carquinez Straits (in the estuary) has been implicated as part of the cause of lack of genetic structure and prevalence of straying in CV fall-run Chinook salmon (California HSRG 2012).

2.4. KEY LIFE HISTORY INFORMATION AND TEMPERATURE REQUIREMENTS

Adult CV steelhead generally migrate from the ocean from August through April and spawn from December through April, with a peak in the LAR from February to early March (Hannon and Deason 2008; OCAP pg 104). Egg incubation occurs between December and May. Most juvenile fish emigrate as fry or rear for approximately a year (through one summer) before emigrating. Emigration typically occurs January through June (SWRI 2001; Sogard et al. 2012). In the LAR, water temperature in the summer is the primary CV steelhead stressor. Marginally acceptable CV steelhead rearing water temperature for short duration (e.g., weeks) is <70°F, with an upper long-term tolerance temperature of approximately 68°F. The upper range of optimal rearing temperature is 65°F (e.g., Cech and Myrick 1999; Bratovich et al. 2011).

Adult fall-run Chinook salmon generally migrate from the ocean in late summer, with migration peaking mid-October through November. Spawning in the LAR occurs between October and December (peak spawning in November). Fry emergence usually begins in mid- to late-January, with peak emergence usually mid- to late-February. Juvenile emigration occurs after emergence from January through June (e.g., SWRI 2001). In the LAR, water temperature in the fall is a primary factor affecting migrating/spawning fall-run Chinook salmon. Spawning does

not occur until temperatures are <58-60°F and delayed spawning and warm temperatures can result in adult and in-vivo egg mortality. Acceptable Chinook salmon spawning/incubation water temperature is <58°F (e.g., USFWS 1999; NMFS 2002; Reclamation 2008; Bratovich et al. 2011).

2.5. EXISTING HABITAT CONDITIONS

There are a number of potential environmental stressors for CV steelhead and fall-run Chinook salmon, however, the key environmental stressor in the LAR under existing conditions (and future conditions) is water temperature in drier years with low Folsom Reservoir storage. Water temperature in the summer (CV steelhead rearing) and fall (Chinook salmon spawning) currently exceeds threshold tolerances for critical life stages in drier years (Figure 1). Frequently, only the upper portion of the river provides suitable water temperatures for CV steelhead and Chinook salmon (Figures 2 and 3).

Over the 1922-2003 period of record analyzed in the effects analysis in the Draft EIR/EIS, water temperature at Watt Avenue in August under modeled existing conditions is 69-71°F; at the upper end of the acceptable range for CV steelhead rearing (Figures 4a and b). In drier years, daily measured water temperatures have reached 75°F at Watt Avenue in the summer (Reclamation 2008) (Figures 1 and 2). Water temperature at Watt Avenue in November under modeled existing conditions is 56-57°F (Figures 4a and b), at the upper end of the suitable range for Chinook salmon spawning temperatures.

The primary factor that is responsible for warm water temperature in the LAR is the limited storage/cold water pool in Folsom Reservoir in drier years. Any CVP/SWP operations (or BDCP operations) that reduce storage in drier years for whatever reason (sea level rise, climate change, Delta water quality standards, exports, etc.) directly and negatively impact water temperature conditions for CV steelhead and Chinook salmon in the LAR.

2.6. HABITAT CONDITIONS UNDER BDCP FUTURE CONDITIONS

The Draft EIR/EIS attempts to use the NAA as the baseline for the analysis. Below we show that the NAA is a radical departure from existing habitat conditions and has large, significant, unmitigated impacts on anadromous fish in the LAR compared to existing conditions. The NAA would likely cause age class failures in drier years and eventual local extinction of the small natural rearing CV steelhead population in the LAR. The NAA would result in large scale fall-run Chinook salmon fish kills in the fall of the drier years.

The operation of the CVP/SWP as modeled in the NAA with the sea level rise, climate change, and future demand assumptions results in much lower Folsom Reservoir storage elevations compared to existing conditions (Figures 5a and b) and greatly increased LAR water temperature. The frequency of Folsom Reservoir being at low storage levels (e.g., <350 thousand acre-feet [TAF]) would increase substantially in July and August under the NAA compared to existing conditions (increases from about 10% of the time under existing conditions to about 30% of the time under the NAA) (Figure 5a). In critical years, mean monthly

Folsom Reservoir storage would be 119 TAF, 105 TAF, and 81 TAF lower in July, August, and September, respectively, than under existing conditions (down to 210 TAF, 165 TAF, and 159 TAF, respectively, under the NAA). Mean monthly storage in drier years would drop to less than 350 TAF in August and September under the NAA (>440 TAF under existing conditions) (Figure 5b). Further, the frequency of which Folsom Reservoir would be drained to dead pool storage would increase by about 10% (DWR et al. 2013; p. 5-61). This would result in greatly increased water temperatures in the LAR.

Higher American River summer temperature schedules occur when Folsom Reservoir storage drops, particularly as storage falls below 350 TAF in July. Figure 6 shows a relationship between the Folsom Reservoir storage in July and LAR water temperature schedules². Figure 7 shows relatively large increases in fall water temperature below Nimbus Dam at low Folsom Reservoir water levels as reported in the BDCP EIR/EIS (and the associated Folsom Reservoir storage) under the NAA operations. These changes are most pronounced in drier years.

The marginally acceptable CV steelhead rearing water temperature is <70°F, with an upper long-term tolerance temperature of approximately 68°F (see above). Under the NAA, LAR water temperature increases during summer rearing would have a significant adverse impact on CV steelhead (Figures 4a and b). Mean monthly summer (August) water temperatures increase from the modeled existing condition of 69-71°F to 73-77°F (average and critical water years) under the NAA (Figures 4a and b). Over the 1922-2003 period of record, mean monthly water temperatures at Watt Avenue reach 70°F in 9% more of the July months, 13% more of the August months (90% of all August months), and 34% more of the September months (60% of all September months) under the NAA compared to existing conditions. The assumed CVP/SWP operations in the NAA would significantly impact CV steelhead and would result in take of CV steelhead in the LAR. More significantly, entire year classes of CV steelhead juveniles would be lost and, most likely, a complete loss of the LAR naturally spawning CV steelhead population would occur.

In the critically dry years, for example, average monthly August water temperatures under NAA (and the Proposed Action Alternative) for the entire LAR are ≥76°F (DWR et al. 2013; Appendix 11C). This would kill all over-summering juvenile CV steelhead. Critically dry years occur 15% of the time. Often critically dry years are sequenced back-to-back (e.g., 1976-1977) and sequenced with multiple dry years. Dry years (22% of the years) have entire LAR August water temperatures ≥72°F. Large scale mortality would occur in these years. It is easy to conceive of a sequence of years under NAA (and the Proposed Project) where the naturally occurring CV steelhead population sequential year mortality coupled with the current low abundance would result in the loss of the natural population. The historic sequence of years from 1987 to 1991 (dry, critically dry, dry, critically dry, critically dry, respectively) (DWR et al 2013; Section 5.5) would result in the loss of the LAR CV steelhead population.

Similarly, projected changes in water temperature under the NAA would have large adverse impacts on Chinook salmon spawning in the LAR. Mean monthly fall water temperature

² Automated temperature selection procedure schedules are identified in the LAR Flow Management Standard.

(November) in the LAR would increase from existing conditions (modeling) of 56-57°F to 60°F under the NAA. Acceptable Chinook salmon spawning/incubation water temperature is <58°F (see above). These assumed operations in the NAA would result in significant adverse impacts to Chinook salmon in the LAR (Figures 4a and b). Likely large fish kills of pre-spawning fall-run Chinook salmon would occur due to the extreme delays in spawning similar to pre-spawn mortality that happened in 2001 (Water Forum 2005). Monthly average November water temperatures in the NAA (and Proposed Action Alternative) are 3-4°F higher than the existing conditions that have caused mortality.

2.7. BDCP TEMPERATURE SIGNIFICANCE CRITERIA

Under current CVP/SWP operations, LAR water temperatures exceed threshold tolerances for anadromous fish during critical life stages (as discussed in the preceding sections). Because the populations are already in stressful temperature conditions, even small increases in water temperature above the current CVP/SWP operations would result in adverse impacts to these species. The BDCP significance criterion do not consider the current condition of the sensitive species and habitat with respect to water temperature in the LAR. For example, significant impacts in the BDCP EIR/EIS were determined as follows:

"Physical modeling outputs each month and water year type were compared for between model scenarios at multiple locations to determine whether there were differences between scenarios at each location. A "difference" was defined as a >5% difference between the pair of model scenarios in at least one water year type in at least 1 month." (DWR et al. 2013, p. 11-102).

The significance criteria in the Draft EIR/EIS are inadequate and incapable of identifying significant impacts. A <5% increase in mean monthly water temperature in the summer months (July-September) during CV steelhead rearing and/or in the fall during fall-run Chinook salmon spawning (primarily in November) would result in significant adverse impacts to these species. For example, a <5% water temperature change with existing summer temperatures at 68°F results in an increase of approximately 3.4°F, which would result in temperatures of approximately 71.4°F, well above the long-term upper tolerance limit for steelhead juvenile rearing (e.g., Cech and Myrick 1999; Bratovich et al. 2011). Similarly, a <5% temperature change in the existing fall-run Chinook salmon spawning temperature at 60°F results in an increase of approximately 3.0°F, which would result in temperatures of approximately 63.0°F, well above the spawning threshold and mortality water temperature threshold for incubating eggs (e.g., USFWS 1999; NMFS 2002; Reclamation 2008; Bratovich et al. 2011). Figures 4a and b shows the modeled 1922-2003 average monthly water temperatures. Under existing conditions, water temperatures are below 68°F in July and September, except in Critical years, and between 60-70°F in August of all water year types, except Critical years. Although the temperature significance criteria were not exceeded in the BDCP EIS/EIR analysis, water temperatures under the No Action Alternative (NAA) and Proposed Action Alternative are above the threshold criteria for CV steelhead and Chinook salmon survival, particularly in the drier years (>74°F in late summer months), and greatly exceed existing conditions.

3.0 CONCLUSION

The fatal flaw in the Draft EIR/EIS impact analysis is that under the NAA (which includes sea level rise, climate change, and future demand), the modeled CVP/SWP operations resulted in significant adverse effects to upstream resources, including CV steelhead and fall-run Chinook salmon in the LAR relative to the existing conditions (environment). These modeled operations are not reasonable or a proxy for future operations that would be allowed under the ESA.

The Draft EIR/EIS acknowledges that the CVP/SWP operations would need to change from those depicted. For example, on page 5-61 in DWR et al. (2013), the Draft EIR/EIS discusses operational changes that may need to occur to avoid dead pool conditions:

“Adaption measures would need to be implemented on upstream operations to manage coldwater pool storage levels under future sea level rise and climate change conditions. As described in the methods section, model results when storages are at or near dead pool may not be representative of actual future conditions because changes in assumed operations may be implemented to avoid these conditions.” (DWR et al. 2013; p. 5-61)

Further, the Draft EIR/EIS clearly states that future CVP/SWP operations would be different than the operations used for evaluating impacts of the BDCP:

“The CALSIM II simulations do not consider future climate change adaptation which may manage the SWP and CVP system in a different manner than today to reduce climate impacts. For example, future changes in reservoir flood control reservation to better accommodate a seasonally changing hydrograph may be considered under future programs, but are not considered under the BDCP. Thus, the CALSIM II BDCP results represent the risks to operations, water users, and the environment in the absence of dynamic adaptation for climate change.” (DWR et al. 2013; pg. 5A.A23)

The modeling developed for the Draft EIR/EIS, by their own admission, failed to address climate change and sea level rise in a manner that is reasonable, prudent, or representative of future hydrologic conditions in the upstream systems, including Folsom operations and resulting hydrology in the LAR. The Folsom operations in the NAA would jeopardize the continued existence of CV steelhead and fall-run Chinook salmon in the LAR. By comparing the environmental conditions in the Existing Condition and NAA, it is apparent that future CVP/SWP operations under climate change and sea level rise, as modeled, are unrealistic. Therefore, a revised operations model must be developed under the NAA that addresses climate change and sea level in a manner that is protective of upstream resources, including CV steelhead and Chinook salmon in the LAR.

The conclusions in the Draft EIR/EIS impact analysis are invalid because they are based on modeling that is not representative of future conditions and do not incorporate climate change adaptations in the CVP/SWP operations. The impact analysis was based on comparison of the NAA to Project alternatives under modeled operations that in all cases result in significant impacts to CV steelhead and Chinook salmon in the LAR compared to the existing condition. The fundamental error in the impact analysis is that it totally ignores these impacts. The analysis assumes that conditions in the NAA are representative of future conditions and compounds this error by modeling the Project alternatives using the same faulty operations. It

is not surprising that the impact analysis concluded that there would be no significant impacts to CV steelhead and fall-run Chinook salmon in the LAR – the environmental conditions under the NAA have already jeopardized the continued existence of the species. The conclusions in the alternatives analysis do not disclose impacts of the Project as required under NEPA and CEQA. It is solely the responsibility of the lead agency to ensure that the basis for comparison in the impact analysis is reasonable and an accurate representation of future conditions. Basing the impact analysis on unrealistic modeling for the CVP/SWP and ignoring the associated adverse effects on CV steelhead and fall-run Chinook salmon in the LAR fails to inform the public of the BDCP’s probable environmental impacts.

Further, the impact analysis fails to disclose the impacts of the Project because it co-mingles the effects of climate change, sea level rise, future demand, and implementation of the Project. In the analysis, the Draft EIR/EIS concludes:

“These results are primarily caused by four factors: differences in sea level rise, differences in climate change, future water demands, and implementation of the alternative. The analysis described above comparing Existing Conditions to Alternative 1A [used for Alternative 4 as well] does not partition the effect of implementation of the alternative from those of sea level rise, climate change and future water demands using the model simulation results presented in this chapter.” (DWR et al. 2013; pp. 11-405; 11-411; 11-445; 11-455; 11-518).

Therefore, the Draft EIR/EIS is inadequate and does not provide sufficient information to evaluate Project effects on CV steelhead and fall-run Chinook salmon in the LAR. To comply with NEPA and CEQA, the impacts analysis must be revised to disclose project impacts.

4.0 REFERENCES

- Bratovich, P., C. Addley, D. Simodynes, and H. Bowen. 2011. Water Temperature Considerations for Yuba River Basin Anadromous Salmonid Reintroduction Evaluations. Prepared for Yuba Salmon Forum Technical Working Group. November 2011.
- California Department of Fish and Wildlife (CDFW). 2001. Evaluation of effects of flow fluctuations on the anadromous fish populations in the lower American River. Prepared for U.S. Bureau of Reclamation. Stream Evaluation Program Technical Report No. 01-2.
- California Department of Water Resources (DWR). 2013. Bay Delta Conservation Plan. Public Draft. November. Sacramento, CA. Prepared by ICF International (ICF 00343, 12), Sacramento, CA.
- California Department of Water Resources (DWR), U.S. Bureau of Reclamation (Reclamation); U.S. Department of Fish and Wildlife Service (USFWS); and National Marine Fisheries Service (NMFS). 2013. Draft Environmental Impact Report/Environmental Impact Statement Bay Delta Conservation Plan. November 2013.

- California Hatchery Scientific Review Group (California HSRG). 2012. California Hatchery Review Report. Prepared for the US Fish and Wildlife Service and Pacific States Marine Fisheries Commission. June 2012. 100 pgs.
- Cech, J. J. and C. A. Myrick. 1999. Steelhead and Chinook Salmon Bioenergetics: Temperature, Ration, and Genetic Effects. Technical Completion Report- Project No. UCAL-WRC-W-885. University of California Water Resources Center.
- Federal Register. 1981. Council on Environmental Quality's Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations; published in the Federal Register, Vol. 46, March 23, 1981.
- Federal Register. 2004. Endangered and Threatened Species; Establishment of Species of Concern List, Addition of Species to Species of Concern List, Description of Factors for Identifying Species of Concern, and Revision of Candidate Species List Under the Endangered Species Act; published in the Federal Register, Vol. 69, No. 73, April 15, 2004.
- Federal Register. 2005. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule published in the Federal Register, Vol. 70, No. 170, September 2, 2005.
- Federal Register. 2006. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead published in Federal Register Vol 71, No. 3, January 5, 2006.
- Federal Register. 2008. Fisheries Off West Coast States; West Coast Salmon Fisheries; Amendment 14; Essential Fish Habitat Descriptions for Pacific Salmon" published in the Federal Register, Vol. 73, No. 200, October 15, 2008.
- Gerstung, E.R. 1971. Fish and wildlife resources of the American River. Department of Fish and Game, Technical Report.
- Hannon, J. and B. Deason. 2008. American River Steelhead (*Oncorhynchus mykiss*) Spawning 2001-2007. US Bureau of Reclamation, Central Valley Project, American River, California, Mid-Pacific Region.
- National Marine Fisheries Service (NMFS). 2011. Central Valley Recovery Domain 5-Year Review: Summary and Evaluation of Central Valley Steelhead DPS. 34 pg.
- Moyle, P. B., J. A. Israel, and S. E. Purdy. 2008. Salmon, Steelhead, and Trout in California: Status of an Emblematic Fauna. A Report Commissioned by California Trout. 361 pg.
- National Marine Fisheries Service (NMFS). 2002. Biological Opinion on Interim Operations of the Central Valley Project and State Water Project Between April 1, 2002 and March 31, 2004, on Federally Listed Threatened Central Valley Spring-Run Chinook Salmon and

Threatened Central Valley Steelhead in Accordance With Section 7 of the Endangered Species Act of 1973, As Amended. Long Beach: National Marine Fisheries Service, Southwest Region.

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, CA.

Surface Water Resources, Inc (SWRI). 2001. Aquatic Resources of the Lower American River: Baseline Report. Prepared for: Lower American River Fisheries and Instream Habitat (FISH) Working Group.

Sogard, S. M., J. E. Merz, W. H. Satterthwaite, M. P. Beakes, D. R. Swank, E. M. Collins, R. G. Titus, and M. Mangle. Contrasts in Habitat Characteristics and Life History Patterns of *Oncorhynchus mykiss* in California's Central Coast and Central Valley. *Trans. Am. Fish. Soc.* 141:747-760.

United States (U.S.) Department of the Interior, Bureau of Reclamation (Reclamation). 2008. Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment. May 2008.

United States Fish and Wildlife Service (USFWS). 1999. Effect of Temperature on Early-Life Survival of Sacramento River Fall- and Winter-Run Chinook Salmon. Final Report.

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. Brown, ed. Contributions to the biology of Central Valley salmonids. CDFG Fish Bulletin 179. 106 pp.

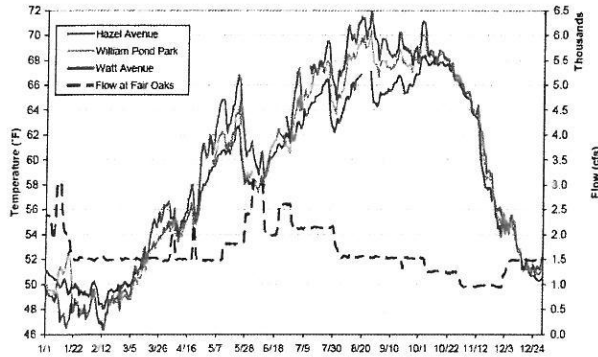
Water Forum 2005. Lower American River State of the River Report. Final Report.

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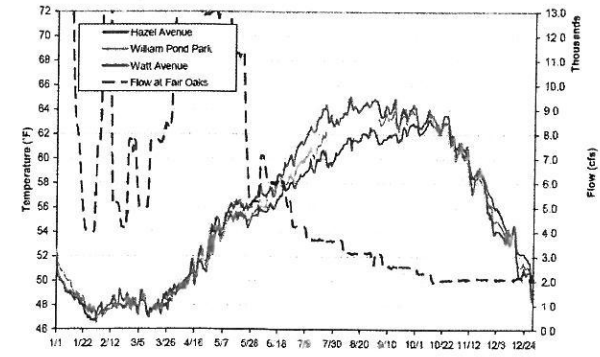


Figure 1. American River Water Temperature and Flow at Monitoring Sites on the Lower American River in Dry and Wet Years.

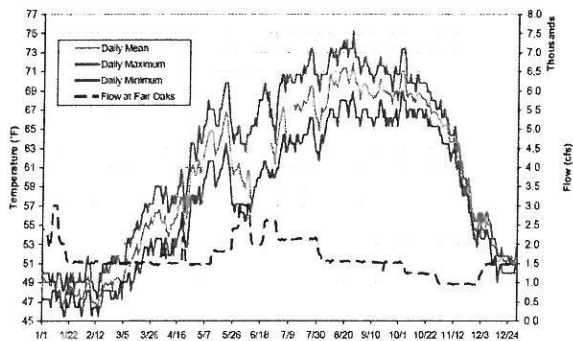
Dry year, measured daily average water temperatures (2001).



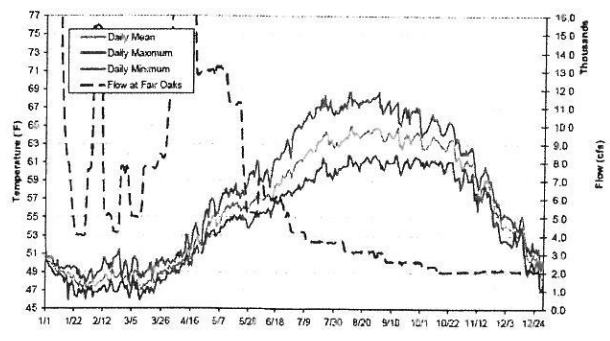
Wet year, measured daily average water temperatures (2006).



American River at Watt Avenue, Dry year, daily average minimum and maximum water temperatures (2001).

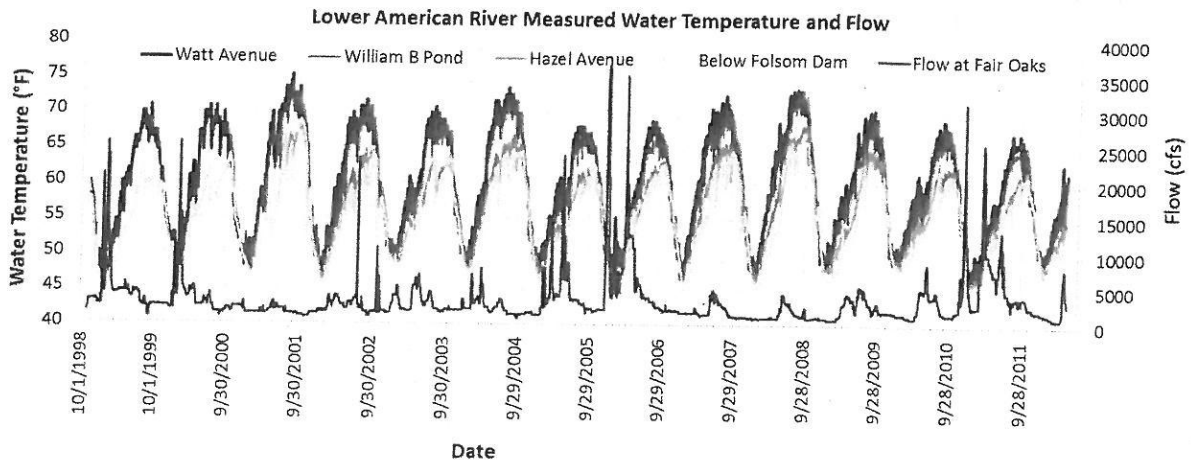


American River at Watt Avenue, Wet year, daily average minimum and maximum water temperatures (2006).



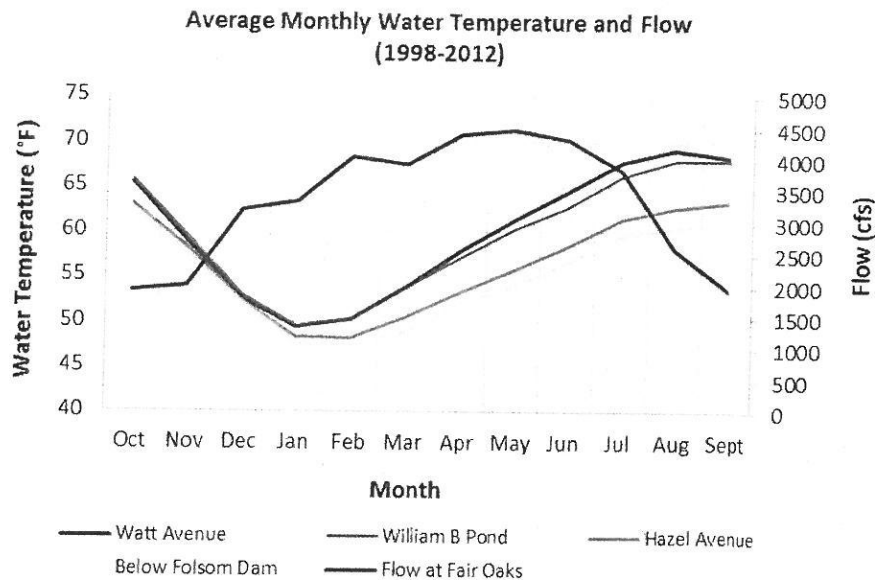
Source: Figures 11-16 to 11-19 in Reclamation 2008.

Figure 2. Measured Lower American River Daily Average Water Temperatures below Folsom Dam, at Hazel Avenue, William B. Pond Park, and Watt Avenue and Flow at Fair Oaks Avenue (1998-2012).



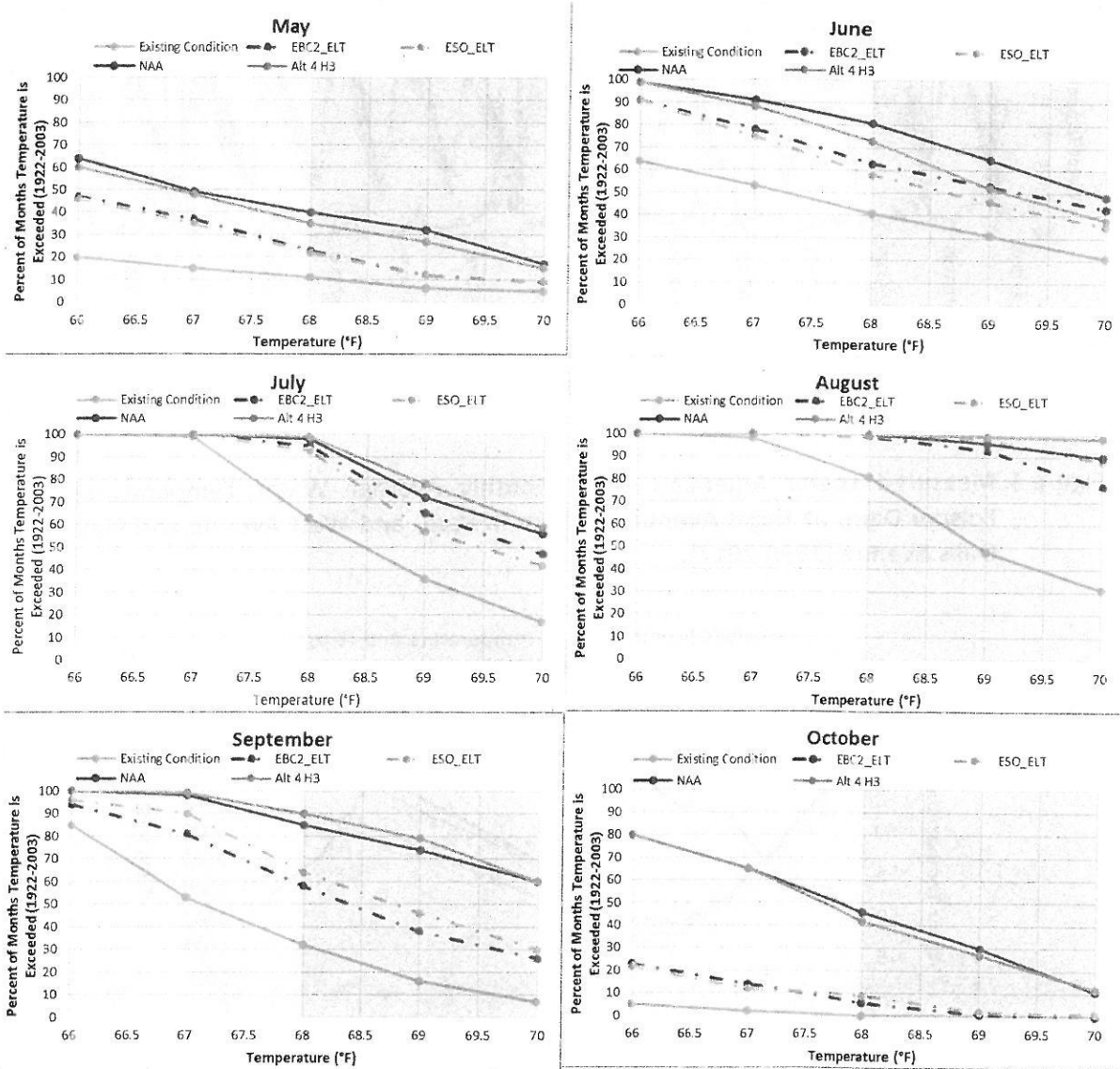
CDEC temperature gages at Below Folsom Dam (CDEC-AFD), Hazel Ave (CDEC-AHZ), William B Pond Park (CDEC-AWP), and Watt Avenue (CDEC-AWB) (average daily temperatures); Average daily flow at CDEC

Figure 3. Measured Lower American River Monthly Average Water Temperatures below Folsom Dam, at Hazel Avenue, William B. Park, and Watt Avenue and Flow at Fair Oaks Avenue (1998-2012).



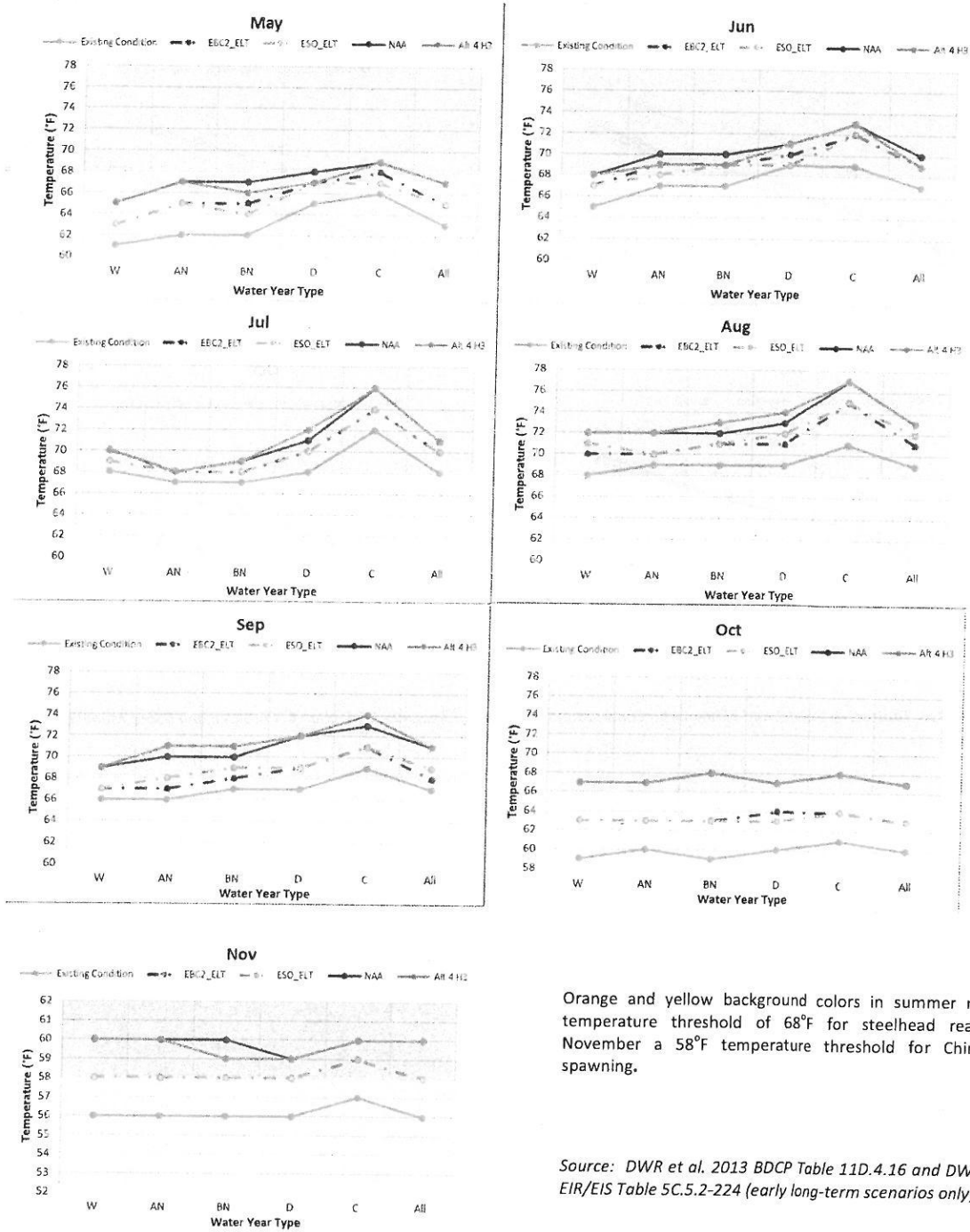
CDEC temperature gages at Below Folsom Dam (CDEC-AFD), Hazel Ave (CDEC-AHZ), William B Pond Park (CDEC-AWP), and Watt Avenue (CDEC-AWB) (average daily temperatures); Average daily flow at CDEC Fair Oaks gage (CDEC-AFO)

Figure 4a. Percent of Months during 1922-2003 Period during which Mean Monthly Water Temperatures under the Existing Condition, No Action Alternative, and Preferred Alternative (Alternative 4, H3) Scenarios (Early and Late Long-term) in the Lower American River at Watt Avenue Exceeded Temperature Thresholds, May through October.



Source: DWR 2013. Table 5C.5.2-237. Orange and yellow background colors in summer months show temperature threshold of 68°F for steelhead rearing.

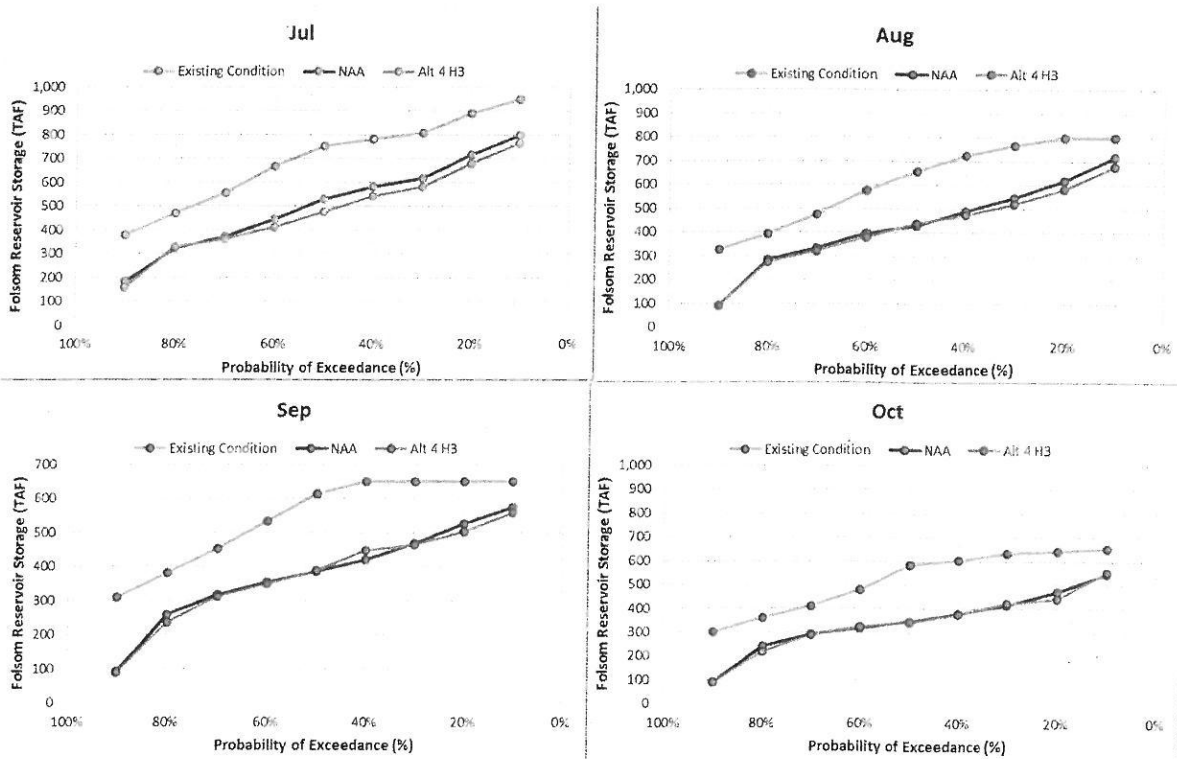
Figure 4b. Mean Monthly Water Temperature (°F) in the American River at Watt Avenue under the Existing Condition, No Action Alternative, and Preferred Alternative (Alternative 4, H3) (Early and Late Long-term).



Orange and yellow background colors in summer months show temperature threshold of 68°F for steelhead rearing and in November a 58°F temperature threshold for Chinook salmon spawning.

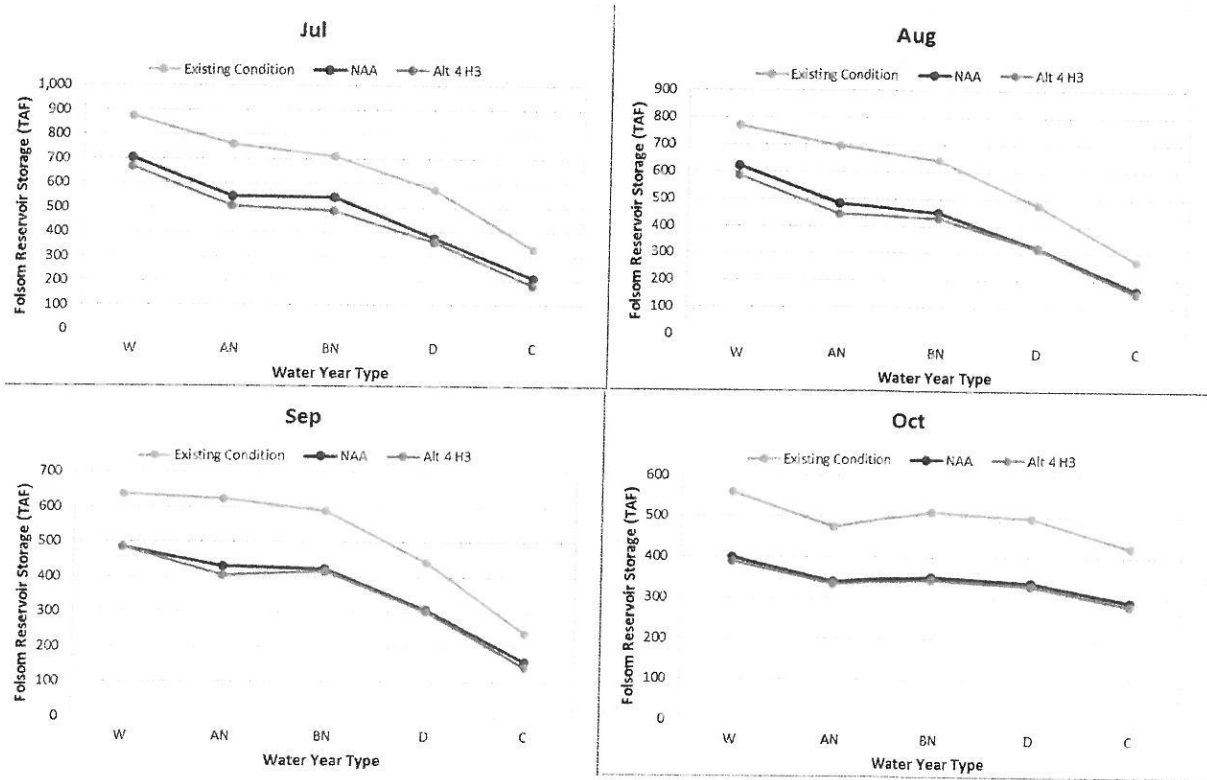
Source: DWR et al. 2013 BDCP Table 11D.4.16 and DWR et al. 2013 EIR/EIS Table 5C.5.2-224 (early long-term scenarios only).

Figure 5a. Summer (July - October) Monthly Mean End-of-Month of Storage Folsom Reservoir Storage (TAF) under the Existing Condition, No Action Alternative, and Preferred Alternative (Alternative 4).



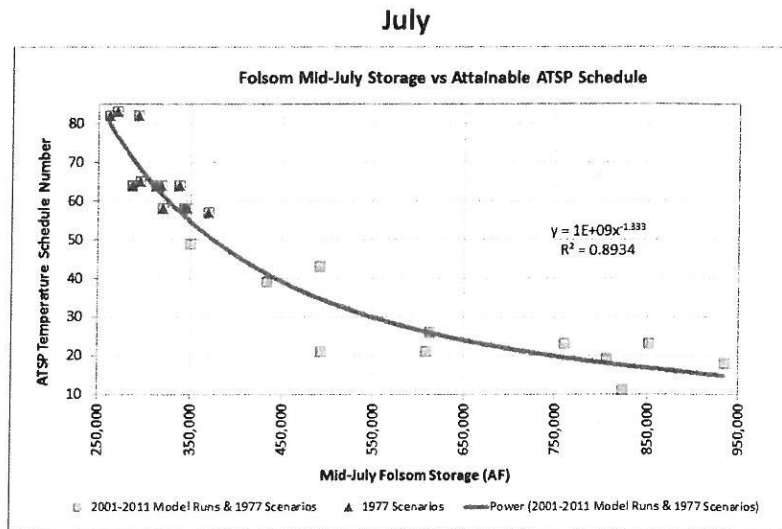
Source: DWR 2013. Tables C-4-1 and 2 and 7; Bay-Delta Conservation Plan EIR/EIS Appendix 5A Section C: CALSIM II and DSM2 Modeling Results

Figure 5b. Summer (July - October) Monthly Mean End-of-Month of Storage Folsom Reservoir Storage (TAF) under the Existing Condition, No Action Alternative, and Preferred Alternative (Alternative 4) by Water Year Type.



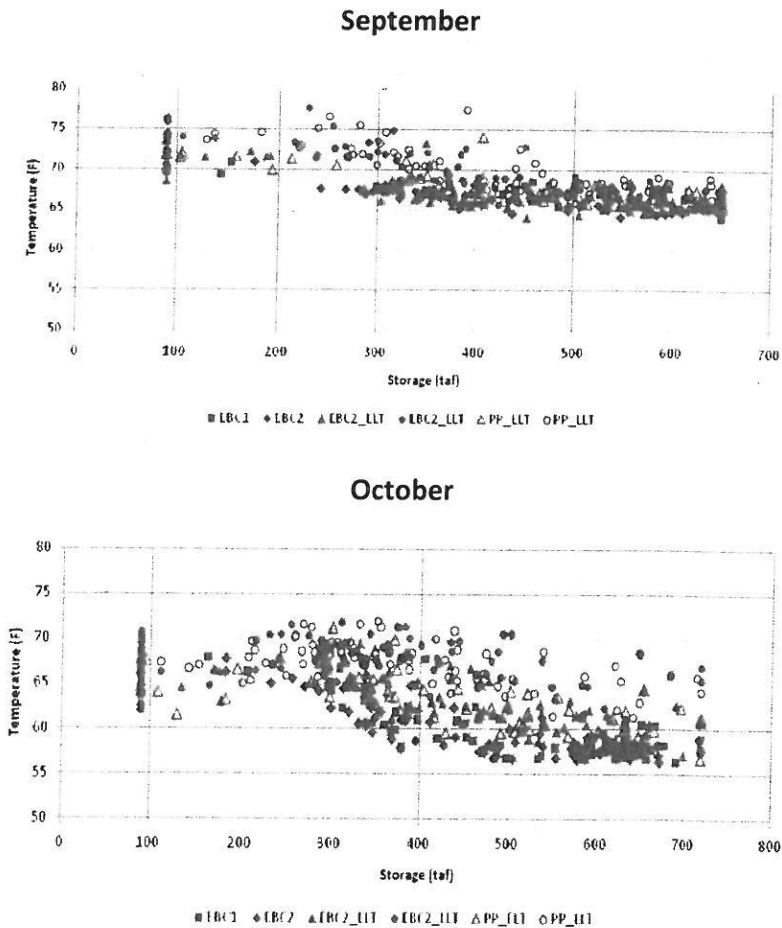
Source: DWR 2013. Tables C-4-1 and 2 and 7; Bay-Delta Conservation Plan EIR/EIS Appendix 5A Section C: CALSIM II and DSM2 Modeling Results

Figure 6. Folsom Reservoir Storage (TAF) in Relation to ATSP Temperature Schedule¹. Higher ATSP Schedules Correspond to Warmer Summer Temperatures. All Schedules Larger than 55 Exceed Summer Temperatures of 70°F.



¹ ATSP (Automated Temperature Selection Procedure); Lower ATSP schedules equal colder water temperatures; as identified in the lower American River Flow Management Standard

Figure 7. Folsom Reservoir Storage (TAF) in Relation to Water Temperature (°F) at Nimbus Dam (September and October) under the Existing Condition (EBC1), No Action Alternative (EBC2_LL), and Preferred Alternative 4, H3 (PP_LL).



Source: Modified from: Reclamation et al. 2013; Figures Appendix 29C-17a and b. The same data are also included in Figures 5.A.2.5-24 and 25. 70°F red line added; acceptable rearing habitat is <70°F.

ELT = Early Long-term 2025; LLT = Late long-term (2060); EBC = Existing Biological Condition; PP = Proposed/Preferred Project as defined in DWR 2013.

