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SENT VIA EMAIL/FIRST-CLASS MAIL

May 23, 2011

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1011 I Street
Sacramento, CA 95814
commentletters@waterboards.ca.gov

RE: Comments of the San Joaquin Tributaries Association to the April 1, 2011 Revised Notice of Preparation and Notice of Additional Scoping Meeting

Dear Ms. Townsend:

The attached comments are filed on behalf of the San Joaquin Tributaries Association (Oakdale Irrigation District, South San Joaquin Irrigation District, Turlock Irrigation District, Modesto Irrigation District and Merced Irrigation District) ("SJTA"). The comments are broken into three sections: Fish biology, salinity, and process.

We will be participating in the Workshop scheduled for June 6, 2011, and request 30 minutes to make our presentation.

Very truly yours,

O'LAUGHLIN & PARIS LLP

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TO/tb
Attachments

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Comments pertaining to the "Revised Notice of Preparation and Notice of Additional Scoping Meeting to provide additional information regarding the State Water Resources Control Board's current review of the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary"

Prepared by

Doug Demko, Shaara Ainsley, and Michele Palmer

On behalf of

San Joaquin Tributaries Association

May 15, 2011

Comments pertaining to the "Revised Notice of Preparation and Notice of Additional Scoping Meeting to provide additional information regarding the State Water Resources Control Board's current review of the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary"

This document presents comments, submitted on behalf of the San Joaquin Tributaries Association (SJTA), regarding the *Revised Notice of Preparation and Notice of Additional Scoping Meeting to provide additional information regarding the State Water Resources Control Board's current review of the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* distributed by the State Water Resources Control Board (State Water Board) on April 1, 2011. Comments are limited to information presented in "Attachment 2: Draft San Joaquin River Fish and Wildlife Flow Objectives and Program of Implementation."

Our comments include the following key points, which are described in individual sections below:

(1) The Narrative Objective should not include the Anadromous Fish Restoration Program doubling goal

(2) The Narrative Objective should not include the term "viable native" because there are few, if any, native salmonid populations in the San Joaquin River basin

(3) Objective period should be March 15-May 15, not February through June

(4) The Natural Flow Regime is not applicable to a highly, physically altered basin and should not be considered. Non-flood flows in the San Joaquin Basin will not accomplish natural flow regime benefits such as supporting native fish communities and natural food web, habitat connectivity, floodplain inundation, fluvial hydrogeomorphological processes, and improved temperatures.

(5) Given the overwhelming evidence that predation is a major threat to salmon and steelhead juvenile survival and the lack of support for flow as the principal influence on survival, population control of non-native predators should be considered a primary management tool

1. The Narrative Objective should not include the Anadromous Fish Restoration Program doubling goal

In Attachment 2, Table 3, page 1 of 6, (State Water Board 2011), the "Narrative Objective" section states,

> flow conditions shall be maintained, together with other reasonably controllable measures in the San Joaquin River watershed, sufficient to support a ***doubling of natural production of Chinook salmon from the average production of 1967-1991***, consistent with the provisions of State and federal law. (emphasis added)

This passage from the State Water Board (2011) refers to the United States Fish and Wildlife Anadromous Fish Restoration Program (AFRP) doubling goal. We have previously submitted evidence as to why the AFRP doubling goal analysis presented to the State Water Board is inadequate and does not represent the best available science (See excerpts from previous comments submitted on pages A1-A2 in Appendix A). The doubling goal itself is an arbitrary standard that was developed based on highly subjective escapement data generated during the baseline period (i.e., 1967-1991). It is likely that escapement during the baseline period represented a large proportion of hatchery fish since there was no constant fractional marking program during the baseline period to ascertain this information. Also, most escapement estimates were made using methods that are not recommended due to bias and unreliability (Parsons and Skalski 2010). In addition to the arbitrary nature of the doubling goal, there is no evidence to support that any instream management actions or habitat improvements will allow us to achieve this arbitrary doubling goal.

The AFRP natural production estimate provides an approximation of how many adults would have returned to the river to spawn in the absence of harvest (ocean and in river) in any given year, but does not inform managers as to the potential increase in population growth rate due to the corresponding increase in spawner abundance. Without adequate data on the origins of fish (natural or hatchery), age structure of natural spawners, and measurement error in escapement surveys, it is difficult to estimate the current spawner-recruitment relationship in natural spawning areas of the Central Valley, let alone estimate the potential population growth rate. Thus, it does not provide agencies and management with an adequate tool to evaluate how soon the doubling goals might be reached in the absence of harvest.

Although no instream actions have been demonstrated to result in reaching this arbitary goal, this goal could be met in the near term if ocean harvest was eliminated for several years to allow the largest number of adult salmon possible to return to their natal rivers for spawning. In the long-term, ocean harvest may be reinstated at much reduced levels as long as the number of fish returning continue to produce enough progeny to meet the doubling goal.

Therefore, we reiterate that the AFRP doubling goal should not be considered by the State Water Board for setting water quality objectives.

2. The Narrative Objective should not include the term "viable native" because there are few, if any, native salmonid populations in the San Joaquin River basin

In Attachment 2, Table 3, page 1 of 6, (State Water Board 2011), the "Narrative Objective" section states,

> ...support and maintain the natural production of ***viable native*** San Joaquin River watershed fish populations...Indicators of viability include abundance, spatial extent or distribution, ***genetic and life history diversity***, migratory pathways, and productivity. (emphasis added).

Evidence indicates there are few, if any, native salmonids in the San Joaquin River basin. Recent research described below indicates alterations in the genetic makeup of native salmon and steelhead due to interbreeding with stocked strains. A considerable portion of the in-river fall-run Chinook salmon spawning in the San Joaquin Basin is by hatchery-origin salmon; therefore, it is misleading to indicate that any management actions will support ***native*** stocks and ***genetic diversity*** cannot be considered an indicator of viability.

According to the Joint Committee Final Report (California Department of Fish and Game and National Marine Fisheries Service 2001; page 12-13), "the genetic hazards posed by large numbers of straying hatchery fish in natural spawning areas . . . are extremely serious, since they include extirpation of natural stocks and loss of significant genetic diversity, consequences that are not easily reversible." There are several Central Valley hatcheries that release anadromous fish off site (rivers down stream from the hatchery, in the Sacramento-San Joaquin Delta and in the San Pablo or San Francisco bays) in order to improve the survival and reduce potential for competitive interactions with wild fish in the rivers (California Department of Fish and Game and National Marine Fisheries Service 2001). The EIR/EIS reported that "Annual releases of fall-run Chinook salmon to the estuary from Feather River, Nimbus, and Mokelumne River Hatcheries averaged 9.0, 4.4, and 3.0 million smolts, respectively, in 2004–2008" (ICF Jones & Stokes 2010; page

4-143). The Mokelumne River Hatchery has even released fish into other bays along the Central California coast (Avila, Monterey, Santa Cruz and Tiburon) as part of an enhancement program.

Although studies have established benefits to these off-site releases (i.e. higher survival), there are many drawbacks. Since 19th century researchers have described the process by which salmonids use sequential olfactory cues to "imprint" on their home rivers and allow them to navigate back later in life (Williams 2006). At the hatcheries, fish are raised in waters from their natal stream; however, when the fish are trucked to a release site downstream they are not exposed to the water conditions along the way, increasing the likelihood that these fish will stray when they return from the ocean to spawn. When salmonids stray to non-natal streams and spawn with local salmon they threaten the genetic integrity of the locally adapted populations. The question of whether or not to truck hatchery fish to the Delta is hotly debated, and reflects "skepticism regarding the importance of conserving (or attempting to restore) genetic diversity among the remaining Central Valley natural fall-run populations as well as a reluctance to make changes to hatchery operations that would likely reduce their effectiveness in preserving the salmon fishing industry" (California Department of Fish and Game and National Marine Fisheries Service 2001; page 15). Those in favor of trucking argued that there is little to no genetic variability in fall run, thus there is no diversity to preserve. However, those against off site releases argue that despite the uncertainty regarding the risks, it is not in keeping with a goal of "maintaining the genetic integrity of all identifiable stocks of salmon." According to the EIS/EIR, the current release strategies have the potential to cause "significant and unavoidable" impacts.

The observed numbers of ad-clipped fish in Central Valley tributaries suggest substantial straying. High rates of ad-clipped fish (likely hatchery origin) were observed in 2010 at the Stanislaus River weir (25.0% of adult in-river returns as of 2/7/11) and the Tuolumne River weir (32.7% of adult in-river as of 11/30/10) (FISHBIO unpublished). Given that roughly 75% of hatchery fish are not clipped in 2007, it is likely that quite a few un-clipped hatchery fish also entered these two rivers in 2010. Since neither the Stanislaus nor the Tuolumne have hatcheries, and no hatchery releases have been conducted into these tributaries since 2006, these data demonstrate that a considerable portion of the in-river spawning in the San Joaquin Basin is by hatchery-origin salmon. In San Pablo Bay, straying from other locations into the Bay has been estimated to be as high as 70% (California Department of Fish and Game and National Marine Fisheries Service 2001).

ICF Jones & Stokes conducted independent assessments of stray indices, which they calculated based on the number of tagged adults recovered not at the hatchery divided by the total number of tagged adults recovered (strays plus fish recovered at the hatchery), using coded-wire tag data (CWT) from the Regional Mark Information System. Their assessment of Central Valley spring-run Chinook (1987–2007) found that over 98% of spring-run released in the Feather river returned to the river; however, 85% of those released in San Francisco Bay returned to the Feather River, and even less (28%) to the hatchery. For this reason, the Feather River Hatchery stocks are viewed as "a major threat to the genetic integrity of the remaining wild, spring-run Chinook salmon populations" (Good et al. 2005; page 155).

The independent assessment of fall-run Chinook indicated that that off-site releases have considerably higher rates of straying and that the rates vary by hatchery. The results for the Feather River indicated that nearly 97% of those released into the river from the hatchery returned (just under half of those were recovered at the hatchery), while only 28-41% of the fish released in the Sacramento River below the Feather River confluence, in San Francisco or Suisun Bay, or in the Mokelumne River were recovered at the hatchery. However, at Nimbus Hatchery, where all fish are released in to the bays, nearly all the tag recoveries (97%) occurred inside the American River with less than 1% occurring in each of several other tributaries (Battle and Butte creeks and the Feather, Merced, Mokelumne, Sacramento, Stanislaus, Tuolumne and Yuba rivers). Mokelumne River hatchery fish showed a high propensity for straying; "Only 6.5% of the tags from San Francisco Bay releases were recovered in the Mokelumne River, and only half of these fish were recovered at the hatchery. Other watersheds receiving strays from off-site releases of Mokelumne River Hatchery fall-run Chinook included the American River (31%), the Merced River (20%), the Stanislaus River (15%), the Tuolumne River (11%), the Feather River (10%), Clear Creek (4%), Battle Creek (2%), and Butte Creek (1%)"(ICF Jones & Stokes 2010; page 4-186). Similarly, "Less than half (48%) of the tagged Merced River Fish Facility fall-run Chinook released into the San Joaquin River were recovered in the Merced River, with sizeable recoveries occurring in the Tuolumne River (22%), the Stanislaus River (10%), the American River (8%), the Feather River (8%), the Sacramento River (2%), the Mokelumne River (2%), and Butte Creek (1%)" (ICF Jones & Stokes 2010; page 4-187).

Most DFG operated programs are integrated (Coleman, Feather, American, Merced), meaning the program includes wild stock in the hatchery brood with the intention of driving adaptation and fitness through the inclusion of the natural environment (ICF Jones & Stokes 2010). Conversely segregated or isolated programs intentionally exclude wild brood stock in order to keep the population reproductively isolated and minimize genetic impacts on the wild stock. In theory, "When hatchery-origin fish spawn and reproduce successfully in the natural environment, genetic risks of properly-integrated hatchery programs are expected to be less than those from segregated programs for the same level of gene flow from a hatchery program to a natural population" (Hatchery Scientific Review Group 2006; page 38). However, "Even small contributions from segregated hatchery populations to small natural populations can lead to a significant loss of fitness" (page 40) and harvest programs conducted under these circumstances will pose a "high risk" to naturally spawning fish. Hatchery programs are only appropriate where it is reasonable to hypothesize that "the increased population abundance derived from well-managed integrated or segregated hatchery programs can outweigh the associated fitness losses" (Hatchery Scientific Review Group 2006; page 38).

The Central Valley fall-run Chinook are considered genetically homogenized (Williamson and May 2005), in part due to the long history of hatchery production and off-site releases, and the stray rates discussed above. Williamson and May (2005) did not observe genetic separation of the populations, even between the Sacramento and San Joaquin Basin, indicating that extensive gene flow has lead to the spatial and temporal homogenization of the genetic diversity, which has almost certainly constrained the ability of the fall-run Chinook salmon to respond to environmental variability (Moyle et al. 2008). This is in contrast to other major Pacific salmonid regions Alaska, British Columbia, and the Pacific Northwest, where basin scale population diversity has been demonstrated. The lack of genetic and phenotypic diversity in the Central Valley has been compared to an undiversified financial portfolio. With the Californian salmon fishery heavily reliant on one particular stock (i.e., Central Valley hatchery Chinook), there is no buffer against a fluctuating 'market' to minimize the economic and ecological risks (Lindley et al. 2009, Carlson and Satterthwaite 2010).

3. Objective period should be March 15-May 15, not February through June

In Attachment 2, page 1 of 6, (State Water Board 2011), the "Implementation of Flows from February through June" section states,

> The State Water Board has determined that more flow of a more natural pattern is needed from ***February through June*** from the San Joaquin River watershed to Vernalis to achieve the narrative San Joaquin River flow objective. (emphasis added).

This passage from the State Water Board (2011) refers to a period of time where flow objectives would be established to assist juvenile salmonid fry and smolt outmigration through the South Delta. We have previously submitted evidence as to the seasonal occurrence of juvenile salmonid migration, whereby the majority of fry have migrated by mid-March and all juveniles (fry, parr, and smolts) have migrated from the tributaries by May 15 (i.e., 95-97%; see excerpts from previous comments submitted on pages A-2 to A-8 in Appendix A). Our previous comments also indicated that, although fry can migrate in response to winter run-off events, this cue to migrate is associated with increased turbidity related to run-off and there is not as strong a response to reservoir managed pulse flows that do not have concomitant increases in turbidity. Therefore, there is no need for flow management actions prior to mid-March or after mid-May.

4. The Natural Flow Regime is not applicable to a highly, physically altered basin and should not be considered. Non-flood flows in the San Joaquin Basin will not accomplish natural flow regime benefits such

as supporting native fish communities and natural food web, habitat connectivity, floodplain inundation, fluvial hydrogeomorphological processes, and improved temperatures.

In Attachment 2, Table 3, page 1 of 6, (State Water Board 2011), the "Narrative Objective" section states,

> Flow conditions that reasonably contribute toward maintaining viable native migratory San Joaquin River fish populations include, but may not be limited to, ***flows that mimic the natural hydrographic conditions*** to which native fish species are adapted, including the relative magnitude, duration, timing, and spatial extent of flows as they would naturally occur. Indicators of viability include abundance, spatial extent or distribution, genetic and life history diversity, migratory pathways, and productivity.

And, in Attachment 2, page 1 of 6, (State Water Board 2011), the "Implementation of Flows from February through June" section states,

> The State Water Board has determined that more flow of a ***more natural pattern*** is needed from February through June from the San Joaquin River watershed to Vernalis to achieve the narrative San Joaquin River flow objective. Specifically, more flow is needed from the existing salmon and steelhead bearing tributaries in the San Joaquin River watershed down to Vernalis in ***order to provide for connectivity with the Delta*** and ***more closely mimic the natural hydrographic conditions*** to which native migratory fish are adapted. Salmon bearing tributaries to the San Joaquin River currently include the Merced, Tuolumne, and Stanislaus Rivers.[1]

Both of these passages from the State Water Board (2011) pertain to the proposed need for implementing the natural flow regime concept as described by the State Water Board (2010). We have previously submitted evidence as to why the natural flow regime concept is not applicable to such a highly, physically altered system as the Delta (See excerpts from previous comments submitted on pages A-8 to A-31 in Appendix A). Also, salmonids are known to adapt to manipulated flow regimes and to flows that are less than the natural magnitude of flows (e.g., less than 20% of annual flow). (Moyle 2005 a, b)

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[1]Currently, the San Joaquin River does not support salmon runs upstream of the Merced River confluence (upper San Joaquin River). However, pursuant to the San Joaquin River Restoration Program (SJRRP), spring-run Chinook salmon are planned to be reintroduced to the upper San Joaquin River no later than December 31, 2012. Flows needed to support this reintroduction are being determined and provided through the SJRRP. During the next review of the Bay-Delta Plan, the State Water Board will consider information made available through the SJRRP process, and any other pertinent sources of information, in evaluating the need for any additional flows from the upper San Joaquin River Basin to contribute to the narrative San Joaquin River flow objective.

Considering their adaptability and given that flows based on a natural flow regime will not provide all the purported benefits in the San Joaquin River as it would on a large, non-leveed, river-floodplain system, it is important to only manage available water supplies in ways that will benefit salmonids and not to provide flows when there will be no tangible benefits (e.g., to inundate floodplains that no longer exist or to provide channel maintenance when flood control levees prevent channel mobilization). Therefore, we reiterate that the natural flow regime concept should not be considered by the State Water Board for setting water quality objectives.

5. Given the overwhelming evidence that predation is a major threat to salmon and steelhead juvenile survival and the lack of support for flow as the principal influence on survival, population control of non-native predators should be considered a primary management tool

In Attachment 2, page 6 of 6, the "Actions by Other Agencies" sections states,

> To be developed. Should include actions such as: habitat restoration actions (floodplain restoration, gravel enhancement, riparian vegetation management, passage etc.), hatchery management, predator control, water quality measures, ocean/riverine harvest measures, recommendations for changes to flood control curves, barrier operations, others.

This section of the State Water Board's (2011) current review of the 2006 Bay-Delta Plan has not been developed yet; however, this section of the State Water Board document will contain the most important elements that can influence juvenile salmonid survival through the South Delta, particularly predator suppression and control. We have previously submitted evidence as to why flow does not explain low survival of juvenile Chinook observed in the South Delta since 2003 (see excerpts from previous comments submitted on page A-31 in Appendix A). During this period, even flood flows of up to approximately 25,000 cfs during outmigration did not increase survival to anywhere near the levels when flows were moderately high (5,700 cfs) in 2000. It is unclear why smolt survival has been so low, but recent San Joaquin Basin VAMP acoustic tagging studies have found evidence of high predation rates on Chinook salmon in the lower San Joaquin River and South Delta (see excerpts from previous comments submitted on pages A-31 to A-36 in Appendix A). Despite overwhelming evidence that predation by striped bass and other non-native predators are the major threat to salmon and steelhead survival, the State Water Board (2011) continues to focus on flow and does not consider that reducing predation may benefit salmon more than increasing flows. Therefore, we reiterate that predator control be considered by the State Water Board as one of the primary management tools for meeting water quality objectives.

References

California Department of Fish and Game and National Marine Fisheries Service. 2001. Final Report on Anadromous Salmonid Fish Hatcheries in California. California Department of Fish and Game.

Carlson, S. M. and W. H. Satterthwaite. 2010. Weakened Portfolio Effects in California's Recently Collapsed Central Valley Fall-Run Chinook Salmon.*in* 28th Annual Salmonid Restoration Conference and the 44th Annual American Fisheries Society Cal-Neva Conference: fisheries restoration and science in a changing climate, Redding, CA. March 10-13th, 2010.

Good, T. P., R. S. Waples, and P. B. Adams. 2005. Updated Status of Federally Listed Esus of West Coast Salmon and Steelhead. U.S. Department of Commerce. Seattle, WA.

Hatchery Scientific Review Group. 2006. Hatchery Reform Report to Congress. Puget Sound and Coastal Washington Hatchery Reform Project. Seattle, WA. March 2006.

ICF Jones & Stokes. 2010. Hatchery and Stocking Program Environmental Impact Report/Environmental Impact Statement. Final. January. (Icf J&S 00264.08) (Sch #2008082025). Prepared for the California Department of Fish and Game and U.S. Fish and Wildlife Service. Sacramento, CA.

Lindley, S. T., C. B. Grimes, M. S. Mohr, W. Peterson, J. Stein, J. T. Anderson, L. W. Botsford, D. L. Bottom, C. A. Busack, T.K. Collier, J. Ferguson, J. C. Garza, A. M. Grover, D. G. Hankin, R. G. Kope, P. W. Lawson, A. Low, R. B. MacFarlane, K. Moore, M. Palmer-Zwahlen, F. B. Schwing, J. Smith, C. Tracy, R. Webb, B. K. Wells, and T. H. Williams. 2009. What Caused the Sacramento River Fall Chinook Stock Collapse? , National Marine Fisheries Service, NOAA Technical Memorandum NMFS 447 447. Santa Cruz, CA. July 2009.

Moyle, P. B., J. A. Israel, and S. E. Purdy. 2008. Salmon, Steelhead, and Trout in California: Status of an Emblematic Fauna. Center for Watershed Sciences. Davis, CA.

Moyle, P. 2005a. Expert Report of Professor Peter B. Moyle, Ph.D. San Joaquin Restoration Program Pre-Settlement Agreement, August 15, 2005. http://www.restoresjr.net/program_library/05-Pre-Settlement/Expert%20Reports/Original/P.Moyle%20Expert%20Report%20(FINAL%208.15.05).pdf

Moyle, P. 2005b. Rebuttal Expert Report of Professor Peter B. Moyle, Ph.D. San Joaquin Restoration Program Pre-Settlement Agreement, September 18, 2005. http://www.restoresjr.net/program_library/05-Pre-

Settlement/Expert%20Reports/NRDC%20Supplemental/Moyle%20Rebuttal%20Report %20FINAL9.18.05.pdf

O'Farrell, M. R., M. S. Mohr, M. L. Palmer-Zwahlen, and A. M. Grover. 2008. Agenda Item D.1.A, Attachment 2: The Sacramento Index. PFMC Briefing Book. Pacific Fishery Management Council. Portland, OR. November 2008.

Pacific Fishery Management Council. 2009. Preseason Report I: Stock Abundance Analysis for 2009 Ocean Salmon Fisheries. Pacific Fishery Management Council. Portland, OR.

Pacific Fishery Management Council. 2010. Preseason Report I: Stock Abundance Analysis for 2010 Ocean Salmon Fisheries. Pacific Fishery Management Council. Portland, OR.

Pacific Fishery Management Council. 2011. Preseason Report I: Stock Abundance Analysis and Environmental Assessment Part 1 for 2011 Ocean Salmon Fishery Regulations. (Document prepared for the Council and its advisory entities.) Pacific Fishery Management Council. Portland, OR.

Parsons, A. L., and J. R. Skalski. 2010. Quantitative assessment of salmonid escapement. *Reviews in Fisheries Science*, 18(4): 301-314.

Williams, J. G. 2006. Central Valley Salmon: A Perspective on Chinook and Steelhead in the Central Valley of California. San Francisco Estuary and Watershed Science 4:Article 2.

Williamson, K. S. and B. May. 2005. Homogenization of Fall-Run Chinook Salmon Gene Pools in the Central Valley of California, USA. North American Journal of Fisheries Management 25:993-1009.

Appendix A

Excerpts from previous comments prepared by

Demko et al. 2010

(Demko, D., M. Palmer, S. Snider, A. Fuller, S. Ainsley, M. Allen, and T. Payne. 2010. Comments pertaining to the "Scientific Basis for Developing Alternate San Joaquin River Delta Inflow Objectives" described in the State Water Resources Control Board's October 29, 2010, *Draft Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives. Submitted to the* State Water Resources Control Board on behalf fan Joaquin River Group Authority, December 6, 2010)

Comment 1. The Narrative Objective should not include the Anadromous Fish Restoration Program doubling goal

Applicable excerpt from page 2 of Demko et al. (2010):

> ***Establishing flow criteria to achieve doubling of historical abundance is not warranted because historical abundance has little to no relevance following the Delta regime shift that occurred in about 2000-2001 (Bennett and Moyle 2010).***
>
> There have been major, anthropogenic changes to the Delta ecosystem resulting in a regime shift in about 2000-2001. To some degree, these changes are irreversible (Bennett and Moyle 2010) and likely preclude the ability to meet or exceed historical abundances. These changes have led biologists to conclude that "Delta policies relying on historical abundances as baselines, or targets for restoration of desired species have little relevance in this new regime" (Bennett and Moyle 2010). Efforts to increase the abundance of native species, such as anadromous salmonids, should therefore focus on what is achievable under current altered (or feasibly restored) conditions.

Applicable excerpt from pages7-9 of Demko et al. (2010):

> ## AFRP Doubling Goal Analysis Found To Be Inadequate and Does Not Represent The Best Available Science
>
> ***AFRP Doubling Goal Issue 1. The approach taken by the AFRP (2005) has not been peer-reviewed and is subject to many of the same criticisms as analyses conducted by DFG. In other words, their findings are not based on the best available science, do not represent new or additional pieces of evidence for the effects of flow on survival, and are therefore inappropriate for setting management recommendations.***
>
> The streamflow recommendations for doubling salmon production presented in AFRP (2005) are based on salmon production models attributed to Mesick (2005). We were unable to find this particular reference; however, the AFRP (2005) outlines the approach used by Mesick (2005).
>
> The AFRP (2005) appears to have utilized a linear regression model to assess the affects of average spring flows at Vernalis (April-May) on recruitment in each of the tributaries to the SJR. This approach is very similar to what has already been presented by DFG (2005a and 2009). The primary difference is in the specification of the dependent variable; in AFRP (2005) the dependent variable used to parameterize the regression equations was recruits per spawner (Draft Report 2010, page 59). The AFRP (2005) recommendations are based on salmon production models for each of the three main tributaries (the Merced, Tuolumne, and Stanislaus rivers) that are based on regression analyses of recruits per spawner and April through

May Vernalis Flows. Note that their analysis also limited the period under study to the April-May time period in order to specifically target smolts and to target the time period when water temperatures begin to increase.

Using simple linear regression to predict fish abundance from average spring flow at Vernalis is the same approach taken by DFG in their escapement model. This method is clearly flawed (Lorden and Bartroff 2010 in Appendix 1), and predictions made using this method are not acceptable or based on the best available science. The use of linear regressions to assess these effects is too simple an approach given the clear importance of other environmental factors (e.g., temperature), the tendency for other factors to be correlated with each other, and other violations of simple linear regression that were not addressed in the AFRP report (Lorden and Bartroff 2010 in Appendix 1). Also, here, as in DFG's analysis and in TBI/NRDC's analysis (discussed in next section), the model only included average spring flows, which may mask biologically important variations in flow (Lorden and Bartroff 2010 in Appendix 1).

Flows deemed necessary for doubling salmon production were then estimated using the linear production models described above, as follows (Draft Report 2010, page 59):

> The model combines the above individual recruitment equations to estimate the flows needed at Vernalis during the February through May period to double salmon production in the SJR basin. The flows (Table 2, AFRP 2005) recommended at Vernalis range from 1,744 cfs in February of critically dry years to a maximum of 17,369 cfs in May of wet years and generally increase from February through May to mimic the natural flow regime (natural peak flow in May). Estimates of flows needed on each tributary to double salmon production range from 51 to 97 percent of unimpaired flow; with a greater percentage of unimpaired flow needed in drier years than wet years (AFRP 2005).

Due to the fact that this estimate is based on flawed production models, the results are invalid. It should also be noted that the AFRP Doubling Goal Analysis has not been peer-reviewed.

Comment 3. Objective period should be March 15-May 15, not February through June

Applicable excerpts from pages13-18 of Demko et al. (2010):

> ## Fry and Smolt Outmigration
>
> According to the Draft Report (2010), fry "generally begin migrating in the early spring", and "late winter/early spring, increased flows provide improved transport

downstream for salmon migrating as fry." Additionally the Draft Report (2010) states that, there are three functions of late winter and spring flows that affect smolt outmigration including "later in the season, higher inflows function as an ***environmental cue to trigger migration*** of smolts and ***facilitate transport of fish*** downstream, and ***improve migration corridor conditions*** (DOI 2010)" [Emphasis added; Page 48]. Our comments regarding the factors influencing fry and smolt outmigration that were both considered, and not considered, by the Draft Report are summarized under the next ten (10) Outmigration Issue statements.

Outmigration Issue 1. The Draft Report (2010) erroneously identifies that fry migration occurs in early spring and does not take into account the influence of turbidity on fry survival.

The report describes fry migration from the tributaries as occurring in the early spring and specifically during early flow events. This description is unnecessarily vague and confusing. The timing of fry migration from the San Joaquin tributaries is well documented by historical and ongoing outmigration monitoring efforts (USFWS 2006, Fuller 2008, Palmer and Sonke 2008, SJRGA 2008, FISHBIO 2009, SJRGA 2009, Palmer and Sonke 2010) and is described as occurring during January-March with peak migration in February. Referring to this timing as "early spring" is confusing since the first day of spring is March 20 and most fry have emigrated by this time. The timing of fry migration would more appropriately be described as occurring during winter.

While it is clear from recent and historical outmigrant monitoring efforts (i.e. current rotary screw traps, and Mossdale trawls in the 30's and 40's) that winter run-off events can cue fry migration from tributaries to the San Joaquin River, this is a tributary function and very little is known about the factors influencing fry survival once they reach the South Delta. The Draft Report acknowledges that cueing migration is a tributary function on page 48 stating that "delays in precipitation producing flows may result in delayed emigration which may result in increased susceptibility to ***in-river*** [emphasis added] mortality from predation and other poor habitat conditions (DFG 2010d)." But, the Draft Report fails to mention that these run-off events consist of both increased flows and elevated turbidity, and decoupling these functions is difficult. Flows from run-off events can be simulated with reservoir releases, but turbidity cannot, and the cue to migrate does not appear to be as strong in response to managed high pulse flows in absence of turbidity (FISHBIO, unpublished data).

The question of whether it is desirable/effective, in terms of production, to cue fry migration from the tributaries has not been resolved, and the Draft Report presents no discussion or information regarding the potential positive and negative effects of moving fry into the lower SJR and South Delta. There is also no discussion of how many fry move, the percentage of fry to smolts, the contribution of fry to escapement, or quantitative analysis of how functions in the South Delta relate to fry survival. Management has long focused on smolts, with the belief that fry are lost in the Delta and do not contribute to adult escapement. This belief appears to have been based on conclusions drawn from coded-wire tag (CWT) studies during 1980-1987 (Brandes and McLain 2001) on the Sacramento River, a system that differs greatly from the San Joaquin River in hydrology and runoff patterns, and on the interpretation of relationship between spring SJR flow and escapement.

While the Sacramento CWT studies indicated that survival of fry released in the Sacramento River near the edge of the Delta was an order of magnitude lower than for smolts, this information was not interpreted in the context of the relative abundance of fry and smolt outmigrants. Studies were reinitiated in 2000 and each year paired groups of fry were released on the Sacramento River just below the Red Bluff Diversion Dam (RBDD) and in the North Delta at Clarksburg (USFWS 2006, USFWS 2007).The index of survival was calculated for each release group by dividing the number of expanded ocean recoveries by the number released. Although release groups are not directly comparable, the ocean recovery rates for fry between 2001 and 2003 are much lower than for smolts during the same time period (USFWS 2007). However, similar to previous studies, the ocean recovery rate for fry released just below RBDD was much greater than the rate for the fry released in the North Delta, demonstrating that estimates of fry survival can vary greatly by release location. While it may appear from these low survival rates that fry may not contribute to adult escapement, it is important to consider that the abundance of fry outmigrants leaving the tributaries is often much greater than the abundance of smolts (Williams 2001, Pyper and Justice 2006), and that the survival of fry leaving the Sacramento River through the North Delta will not necessarily be comparable to that of fry passing through the lower San Joaquin River and South Delta.

The disregard for fry contributions may have been falsely attributed to the belief that increased spring flows lead to increased smolt survival, because high winter flows are often followed by high spring flows, which affect the same brood. Until recently, the possibility that fry may contribute to escapement has been speculative. However, results published this year from otolith microchemistry analyses of fish which emigrated during 2003 and 2004 revealed that samples were comprised of individuals that emigrated as parr (mean = 48%), followed by smolts (32%) and fry (20%; Miller et al. 2010). Since these proportions are based on entry into brackish waters of the Bay, rather than the transition from tributary to Delta, then the parr (or smolt) percentages above may also include fry (or parr) that migrated out of the tributaries and reared in the Delta. In light of the fact that any of the *smolts entering the Bay* may represent fry or parr migrants from the tributaries, the percentage of *fry leaving thetributaries* that contribute to the escapement is likely higher than 20%. Regardless, based on 2003 and 2004, which were below normal (BN) and dry (D) years, information suggests that fry may contribute even under low Delta outflow conditions.

Outmigration Issue 2. The Draft Report (2010) erroneously identifies that spring flows in the South Delta serve as cues to migration, and provides no evidence that

'triggering migration' provides any measurable benefit to either juvenile survival or adult return rates.

As stated in the Draft Report (2010, page 34), "[t]he focus of this review is on SJR flows at Vernalis. . . Other SJR flows, including tributary flows, will be the focus of future State Water Board activities"(page 34). In general, smolts are rearing in the tributaries; therefore, any migration cues associated with flow would occur above Vernalis, which is outside the geographical extent of the State Water Board's review.

Although juvenile Chinook migration out of the upper tributaries is ***temporarily*** stimulated by *changes* in flow, long duration pulse flows do not "flush" fish out of the tributaries. Juvenile migration from the tributaries typically begins in January and nearly all juveniles migrate out of the tributaries by May 15 (i.e., 95-97% prior to May 15; SJRGA 2007-2010; Deas et al. 2004;Demko et al. 1999, 2000a, 2000b, 2001a, and 2001b;FISHBIO 2007; Fuller et al. 2006-2007; Fuller 2005; Palmer and Sonke 2008-2009; SPCA 2001; Watry et al. 2008). The Draft Report fails to mention that juvenile Chinook migration from the tributaries can be triggered by a ***decrease*** in flow just as easily as by an increase in flow, and that the stimulatory effect is short lived (i.e., a few days) and only affects fish that are ready to migrate (Kjelson et al. 19981, Demko et al. 2001a, 2000a; Demko and Cramer 1995, 1996). Although the Draft Report (2010) does note that migration can be stimulated by a variety of factors, including "inherited behavior, habitat availability, flows, competition for space and food, water temperature (Jones and Stokes 2005), increasing turbidity from runoff, and changes in day length," none of the non-flow factors or their relative influence for stimulating migration were considered while developing flow recommendations. While flow pulses are one factor that can influence the initial migration movements, it is one of a complex suite of interacting factors.

Outmigration Issue 3. The Draft Report (2010) does not present any evidence that higher spring flows "facilitate transport," or present any potential mechanisms by which "facilitation" could be measured.

The term "facilitate transport" is undefined in the Draft Report (2010) and is too vague to evaluate adequately.Although the Draft Report cites DOI's comments to the State Water Board (DOI 2010) for this function, there is no reference to "facilitate transport" anywhere in the DOI (2010) text. Therefore, it is unclear by what mechanisms spring flows facilitate transport of smolts, what the benefits are, and how the benefits may be influenced by factors such as flow level, duration, turbidity, etc. Without a more detailed description of mechanisms by which juvenile Chinook allegedly benefit from higher spring flows in the South Delta, we cannot provide a thorough assessment.

Nonetheless, the Draft Report (2010) may be suggesting that increased flowsresult in increased velocity, which may lead to decreased juvenile salmonid travel time through the region, thus 'facilitating transport'. A reference was cited by the Draft Technical Report from an early USFWS exhibit to the State Water Board (USFWS

1987) in support of the hypothesis that increased San Joaquin River flows are positively related to smolt migration rates, "with smolt migration rates more than doubling as inflow increased from 2,000 to 7,000 cfs." However, the original reference does not specify how and when these data were gathered and analyzed. Presumably these data are part of the work conducted by the USFWS as part of the Interagency Ecological Program for the Sacramento-San Joaquin Delta (IEP). As in other documents related to these IEP and other early studies, data have often been misinterpreted, or there were factors not considered such as the potential for different sized fish to be released (different sized fish behave differently giving the appearance that migration rates were influenced by flows).

In 2001, four years after the 1987 USFWS exhibit, this hypotheses regarding flow and migration rates was already in question as evidenced by Baker and Morhardt (2001) which stated that

> "initially it seems intuitively reasonable that increased flows entering the Delta from the San Joaquin River at Vernalis would decrease travel times and speed passage, with concomitant benefits to survival. The data, however, show otherwise."

Baker and Morhardt (2001) examined the relationship between mean smolt migration times from three locations (one above and two below the Head of the Old River to Chipps Island) and San Joaquin flow (average for the seven days following release) and found no significant relationships at the 95% confidence level, and a significant relationship at the 90% confidence level for only Old River releases.

Although flows were not found to facilitate transport, there was evidence of an increase in smolt migration rate with increasing size of released smolts (Baker and Morhardt 2001), which again highlights the limitation of the "black box approach" and emphasizes a need for a better understanding of the mechanisms underlying the relationship of survival and flow.

This increase in migration rate with increasing size may be explained by the one factor that definitely helps facilitate the transport of salmon through the Delta: the salmon itself. Juvenile salmonids are actively swimming, rather than moving passively with the flow, as they migrate towards the ocean (Cramer Decl., Case 1:09-cv-01053-OWW-DLB Document 167, Peake McKinley 1998), and the movements of juvenile salmonids depend on their species and size, water temperature and local hydrology, and many other factors (Cramer Decl., Case 1:09-cv-01053-OWW-DLB Document 167). Baker and Morhardt (2001) provide an example of a study which compared the speed of smolt passage to that of tracer particles (particle tracking model - PTM), "in which 80% of the smolts were estimated to have been recovered after two weeks, but only 0.55% of the tracer particles were recovered after two months." According to documents filed in the Consolidated Salmon Cases (Cramer Decl., Case 1:09-cv-01053-OWW-DLB Document 167), simulations of PTM were compared to actual mark and recapture CWT data for Chinook salmon released at

Mossdale on the San Joaquin River, and it was found that smolts traveled to Chipps Island 3.5 times faster than the modeled particles, with a significant difference in the time to first arrival ($df=76$, $T=9.92$, $p<0.001$).

In recent years, VAMP has used acoustic tags to monitor smolt outmigration survival, therefore more detailed travel times have been estimated for the various SJR and South Delta reaches. Results have generally shown short travel times between reaches, suggesting active swimming. In 2009, the average travel times were reported for each reach, and all were under 2.5 days (SJRGA 2009). For example, the average travel time between Lathrop and Stockton was only 2.29 days.

In addition, while modeling suggests that velocities at the Head of Old River may increase by about 1 ft/s with an additional 6,000 cfs San Joaquin River flow, the model predicts little to no change in velocity (<0.5 ft/s) at other stations in the South Delta (Paulsen et al. 2008 in Appendix 2). Thus, increased flows may increase velocity near the boundary of the Delta, but do not substantially increase velocity through the Delta.

Outmigration Issue 4. The term "improve migration corridor conditions" is poorly defined; no specifics on how higher inflows will "improve" the corridor for fish, or how those improvements will provide measurable benefits to juvenile Chinook.

The statement "improve migration corridor conditions" is vague and the supporting citation (DOI 2010) does not specifically reference the function. The Draft Report (2010) does not present any analysis or interpretation of how spring flows "improve" migration corridors, or what metrics could be used to judge an improvement.

Outmigration Issue 5. Research over the last decade has demonstrated that the Head of Old River Barrier (HORB) is an important factor influencing juvenile Chinook survival in the SJR, yet this aspect of the HORB does not appear to factor into the Draft Report (2010) flow considerations.

Although the Draft Report (2010 page 51) mentioned that the HORB has shown "survival is improved via the barrier because of the shorter migration path, but also because it increases the flows down the main-stem SJR (Brandes and McLain 2001)" and that the majority of flow enters the Old River instead of continuing downstream in the San Joaquin when the HORB is not installed, the lack of a barrier is not considered. Due to delta smelt concerns, it is unlikely that the HORB will be installed during the spring salmonid outmigration period, which will reduce the migration suitability for salmonids regardless of tributary flows.

A non-physical barrier (Bio-Acoustic Fish Fence = BAFF) is currently being tested, but it is unclear how this will affect survival of migrating fish. The BAFF was designed to prevent fish from entering the Old River without deflecting flow down the SJR, since it is the reduced flow that was the concern for Delta smelt. During the first two years, results have been inconclusive. In the first year of installation, 2009, the BAFF was effective at discouraging fish from entering the Old River, and when the BAFF was operating, the deterrence rate was 81.4% (Bowen et al. 2009). However, there was evidence of high predation associated with a scour hole just past the HOR. DIDSON monitoring documented large schools of predatory fish holding near the barrier's infrastructure. Striped bass were seen swimming in looping patterns displaying patrolling behavior throughout the HOR area. The final report stated that "[t]he predation rate was so high in fact that the Protection Efficiency was not statistically different between barrier off and barrier on. The data suggest that much of the gains accomplished by the BAFF's deterrent of smolts is offset by the predators in the scour hole." In 2010 the configuration of the BAFF was changed to guide fish away from the scour hole. At the OCAP Review meeting in early November (2010) Mark Bowen presented the 2010 results. This year, the deterrence rate declined, but the protection efficiency was much higher (43.1%). Bowen hypothesized that the higher flow rates (higher water velocity) in 2010 lead to faster transit times (Chinook travel speeds) and less opportunities for predators to encounter prey, thus increasing protection efficiency. However, higher water velocities and travel speeds also meant the fish approached the barrier at a much faster rate and had less time to respond to the BAFF. Since it appears that an alternative to the non-physical HORB will likely be installed in the future, additional studies are necessary to understand how the BAFF affects fish outmigration behavior and survival.

Comment 4. The Natural Flow Regime is not applicable to a highly, physically altered basin and should not be considered. Non-flood flows in the San Joaquin Basin will not accomplish natural flow regime benefits such as supporting native fish communities and natural food web, habitat connectivity, floodplain inundation, fluvial hydrogeomorphological processes, and improved temperatures

Applicable excerpts from pages23-46 of Demko et al. (2010):

Salmonid Rearing Habitat

The Draft Report (2010) makes numerous references to the potential benefits of increased SJR flows, including the inundation of floodplain and associated riparian habitat and its effects on growth and survival of outmigrating anadromous salmonids. While the Draft Report (2010) lists a wide variety of potential benefits from floodplain inundation, this review will focus only on the potential effects on outmigrating Chinook salmon and steelhead.

The Draft Report (2010) specifically states that increased flows and inundation of floodplains and associated vegetation will directly benefit anadromous salmonids by providing increased overhead shading and instream cover, greater protection from larger piscivorous predators, warmer early-season water temperatures, and increased production of fish food organisms – all of which are expected to produce faster growing juveniles that may exit the Delta sooner than smaller individuals and enjoy greater survival. Our comments regarding these assertions are provided in the following ten (10) Rearing Habitat Issue statements.

Rearing Habitat Issue 1. Historical floodplain locations, and presumably functions, between the Sacramento River and San Joaquin River not directly comparable.

Historically, the Sacramento River and the SJR basins both possessed vast areas of floodplain habitat that was annually inundated by high winter and spring streamflows, each encompassing areas up to 1,000 mi^2 or more (TBI 1998). However, most of the SJR basin floodplains existed in the upper basin upstream of the Merced River, and relatively little floodplain habitat occurred in the lower SJR until entering the Delta (TBI 1998, Figure G6). This is in contrast to the Sacramento River Basin, where the majority of historical floodplain existed in the lower river downstream of present day Hamilton City (TBI 1998, Figure G4).

Rearing Habitat Issue 2. As evidence of the benefits of floodplain habitat to salmonids, the Draft Report (2010) improperly relies on generic literature reviews (not actual research studies), data collected outside the United States, and two locations (Sacramento River Yolo Bypass and Cosumnes River Preserve) in California that share little resemblance or characteristics with SJR habitat.

The majority of the citations listed in the Draft Report (2010) are simply other literature reviews, often based on data from other continents. The bulk of California-specific information used to support these expected benefits come from studies conducted in two locations: the Sacramento River Yolo Bypass and the Cosumnes River Preserve. Whereas both of these locations have produced evidence supporting increased growth of migrant juvenile Chinook salmon, the Yolo Bypass is vastly different than floodplain areas surrounding the SJR or the South Delta, and the Cosumnes River Preserve is a very small wetland/river system that has provided a limited amount of comparable data. Also, the historic runoff patterns in these areas, and thus the inundation durations and timing, were likely very different than run-off patterns in the San Joaquin Basin.

Rearing Habitat Issue 3. Evidence of improved growth of juvenile Chinook conducted on the large, flat, relatively shallow floodplains of the Yolo Bypass and Cosumnes Preserve are not directly applicable to the SJR Basin and South Delta, and should not be used to infer similar benefits of floodplain habitat in the SJR and South Delta.

TBI (1998; Figure 7) described the SJR channel below the Merced River as a highly sinuous pattern of rapid channel meander migration with a rich complex of oxbow lakes, backwater sloughs, ponds, and sand bars. This is in contrast to the wide, flat floodplain areas surrounding the Sacramento River. When flooded, the Yolo Bypass, which is the source of most data emphasizing floodplain benefits to salmon, is characterized as a wide, shallow, slow-moving water body that is comparatively warmer and more productive than the adjacent Sacramento River (Sommer et al. 2001a, 2004). Although the Yolo Bypass studies do not emphasize the occasional flooded pond habitats, some such habitats do exist but generally were found to be less productive for juvenile salmon than were the shallower cultivated areas (Feyrer et al. 2004). Likewise, the limited studies in the Cosumnes River Preserve found that growth of juvenile Chinook was slower in flooded pond areas than in the adjacent flooded pastures and woodlands (Jeffries et al. 2008).

The Yolo Bypass studies have revealed that it is the large expanse of shallow (mostly <1 m), slow velocity (mostly <0.3 mps) water that yields increased productivity of fish food organisms and increased growth of juvenile Chinook salmon (Sommer et al. 2001a,b). Inundated floodplains in the SJR, by contrast, are likely to be more comprised of deeper water, due to the natural confinement of the adjacent lowlands and to the frequent presence of oxbow features. Floodplains within the SJR are also likely to be swifter than floodplains in the Yolo Bypass, and may not provide any food or cover when they are inundated (Figure 8). Consequently, the amount of habitat suitable for juvenile Chinook, which strongly prefer shallow, slow-velocity habitat, may be limited to a relatively small portion of the inundation zones described in an analysis by Campbell et al. (2010).

Although the majority of historical floodplain habitat has disappeared in both basins, the Sacramento River still supports large areas of periodically inundated, shallow water floodplains in the Sutter Bypass (~15,500 acres) and the Yolo Bypass (~60,000 acres). Historically, the South Delta was similar to the Yolo Bypass; however, extensive (mechanical) channel modifications have changed the shallow tidal marsh environment in ways that cannot be re-established by flow management. Instead, habitat restoration is required to improve conditions, which can then be followed by evaluations to determine whether managed flows influence the functionality of restored habitats.

Rearing Habitat Issue 4. No studies of salmonid use of floodplain habitat have ever been conducted in the lower SJR or South Delta and increasing flows could lead to increases in juvenile stranding.

The oxbow channel features characteristic of the lower SJR may not provide ideal rearing habitat for outmigrating salmonids. Flooded oxbows are likely to result in significant stranding of juvenile salmon. In the Yolo Bypass, where ponds are relatively rare and the Bypass is gradually sloped into a parallel toe drain, the incidence of stranding was not described as being significant, yet over 120,000 Chinook may have been stranded during that study (Sommer et al. 2005). Besides the obvious and potentially significant impact of stranding within the numerous SJR oxbows, the presence of high densities of piscivorous fish in the perennial oxbows would likely result in heavy mortality of juvenile salmonids that entered the flooded oxbow areas (see Rearing Habitat Issues #5 and #9 below).

Rearing Habitat Issue 5. The Draft Report (2010) does not provide any evidence that increased flows will increase floodplain habitat in the SJR.

From Vernalis to Mossdale (11 river miles), the SJR has a defined low flow channel. From Mossdale downstream (60 river miles), there is no defined low flow channel, as the water elevation goes bank to bank.

A recent assessment of potential floodplain habitat in the SJR downstream of the Merced River showed progressively less floodplain inundation in the downstream direction over a streamflow range of 1,000-25,000 cfs (cbec 2010 in Appendix 4, Figures 9-11).

At a flow of 16,000 cfs, which represents approximate bank-full flow in the SJR downstream of the Stanislaus River and is 2-3X bank-full flow in the mainstem downstream of the Merced River, the estimated amount of inundated floodplain ranges from a maximum of 6,884 acres between the Tuolumne and Merced rivers, to a low of 908 acres from the Stanislaus River downstream to Mossdale (cbec 2010 in Appendix 4, Table 5). In the Stanislaus to Mossdale reach (17 river miles), the extent of inundated floodplain only exceeds 2,000 acres at the maximum modeled flow of 25,000 cfs.

Although the range of alternative flows are not specified in the Draft Report, 60% of unimpaired flows will exceed 10,000 cfs under many wet years, but proposed release flows during dry years will likely be much lower. The cbec (2010 in Appendix 4) analysis shows that virtually no floodplain is inundated at flows <5,000 cfs; whereas, further gain in floodplain acreage declines above 15,000 cfs (cbec 2010 in Appendix 4, Figure 14). Much of the inundated floodplain habitat at intermediate flows are associated with oxbow features, many of which appear to retain water year-round and are known to be predatory fish habitat.

Because the lower SJR is more constrained by elevated valley topography than is the Sacramento River (TBI 1998), the estimates of floodplain inundation conducted by cbec (2010 in Appendix 4) may suggest relatively greater habitat for outmigrating salmon than is actually available because inundation areas are likely to be deeper and swifter than those preferred by salmon.

Rearing Habitat Issue 6. The Draft Report (2010) does not provide any evidence that increased flows will increase floodplain habitat in the South Delta.

While the cbec analysis (cbec 2010 in Appendix 4) did not extend farther into the Delta than Mossdale, conventional wisdom is that the extensive levee systems in the Delta severely constrain all flows within narrow corridors (except for flooded islands), and therefore the potential functions associated with floodplain inundation are not applicable to the South and Central Delta waters.

Rearing Habitat Issue 7. The Draft Report (2010) incorrectly and without evidence asserts that floodplain habitat improvements that benefit Chinook will also benefit steelhead.

Steelhead smolts characteristically utilize deeper and faster microhabitats than do juvenile Chinook, and steelhead are not known to rear as fry (or as smolts) in floodplain habitats to any great degree (Hartman & Brown 1987, Swales & Levings 1989, Brown 2002). Steelhead, in contrast to Chinook, typically rear to smolt size in upstream rearing habitats and only pass through the lower SJR and South Delta during outmigration as smolts.

The Draft Report states that "tidal marsh areas allow steelhead juveniles to grow faster, which in turn requires a shorter period in freshwater before smoltification occurs" (pg 45). While studies support the use of small coastal estuaries by steelhead and increased growth opportunities therein (Bond 2006, Hayes et al. 2008), steelhead in the San Joaquin Basin generally do not enter the lower SJR or South Delta as fry and are not expected to utilize these areas for rearing. Also, there is little remaining tidal marsh in the Delta and, to our knowledge, none occurs in the lower SJR and South Delta.

The typical lack of rearing by fry or smolt steelhead in lower river floodplains is illustrated by an abundance of literature from the Pacific Northwest, and by the rare observation of steelhead in either the Yolo Bypass or the Cosumnes River floodplains. Moyle et al. 2007 focused on the Preserve and surrounding habitats and did record the presence of *O. mykiss* in an adjacent mainstem reach in 3 of 5 years of sampling, and in the floodplain itself in one year. However, the rarity of *O. mykiss* in floodplain habitats led the authors to conclude that this species was an "inadvertent user" that was not adapted for floodplain use, and was further assumed to have been "carried onto the floodplain by accident". Thus, the available data from California supports conclusions from northwestern states and suggests that outmigrating steelhead smolts do not require, and would be unlikely to reside within, inundated floodplain habitat even if it was available in the lower SJR.

Rearing Habitat Issue 8. There is no evidence that higher flows will increase the amount of instream cover via flooding of riparian vegetation, particularly since the banks of the lower San Joaquin River and South Delta are intentionally maintained with minimal vegetation for flood control.

The Draft Report (2010) states that higher flows will increase the amount of instream cover by flooding riparian vegetation, which will benefit juvenile rearing, but no evidence was presented that higher flows will increase flooded riparian vegetation, or that this would benefit fish. The lower SJR is a confined channel with levees on both sides that consist largely of steep rip-rapped banks with limited to no vegetation (e.g. trees and large shrubs) and intentionally maintained in this denuded state for flood control purposes (Figure 9). Expecting high flows to create floodplain and riparian habitat in the lower SJR and South Delta without extensive long-term restoration and shift in flood control policies is highly unrealistic.

Rearing Habitat Issue 9. Evidence indicates that higher flows in the San Joaquin River may improve habitat for non-native predators (e.g., largemouth bass) and increase potential for Chinook predation.

Numerous papers have described the invasion and establishment of non-native species in the Central Valley, including the SJR and Delta (Saiki 1984, Brown 2000, Moyle 2002, Feyrer & Healey 2003, Nobriga at al. 2005).

In the Delta, the primary piscivorous species are the Sacramento pikeminnow, the striped bass, and the largemouth bass (Nobriga & Feyrer 2007). Although all three species are considered sight feeders, the largemouth bass is not considered a pelagic, open water species like striped bass, but rather more of an ambush predator closely associated with shallow, instream structure (Nobriga et al 2005, Nobriga & Feyrer 2007). Studies have shown that ambush predators are more efficient at capturing prey in complex habitat and in turbid conditions than are more open-water predators (Greenberg et al. 1995). Studies in the Delta have also confirmed that largemouth bass are highly piscivorous and opportunistic predators, and they appear to switch from invertebrate prey to fish prey at a smaller size than do pikeminnows and striped bass (Nobriga and Feyrer 2007). Largemouth bass and other centrarchid predators (e.g., green sunfish, crappie) in the Delta are also closely associated with dense instream cover and other elements characteristic of sloughs and oxbows (Grimaldo et al. 2000, Feyrer & Healey 2003).

Unlike the Delta and SJR, the Sacramento River is not known to harbor significant numbers of largemouth bass, but does contain abundant pikeminnows and striped bass. The findings that the Yolo Bypass presents a refuge from large predators is probably a result of the more open-water, pelagic nature of those two species, which are less likely to invade shallow, cover-rich habitats such as the inundated fields of the Yolo Bypass. In contrast, the largemouth bass throughout its range appears to show strong preference for shallow, cover-rich habitats (i.e. invasive aquatic weeds), which are extremely abundant in the South Delta (Figure 10). As a result, the Delta has become a world-class fishery for largemouth bass and is the host of dozens of bass tournaments, including the major national bass-fishing organizations. Although most attention is devoted to the Delta waters, largemouth bass are also very abundant in the SJR (Saiki 1984, Brown 2000), probably due to the low gradient, generally slow velocities, presence of numerous oxbow ponds, and abundance of submerged riparian and aquatic vegetation (mostly invasive aquatic weeds).

A graphic illustration of this fact took place this summer when a major national bass tournament was held in the Delta (**http://www.bassfan.com/news_article.asp?id=3645**). At that June tournament, two boats easily bested a field of over 100 top bass anglers by leaving the greater Delta and boating upstream into the lower SJR where they fished in a barely connected oxbow pond and proceeded to catch daily limits of largemouth averaging over four pounds, including fish up to seven pounds. Although only perennial oxbow ponds can harbor such heavy populations of large bass, numerous permanent ponds are present within the SJR "floodplain", and the SJR itself contains an abundance of bass.

The point of the preceding arguments is that the SJR and any associated floodplain habitat may provide abundant habitat for the highly piscivorous largemouth bass, especially in slow velocity areas such as oxbow ponds. Although flooding riparian vegetation has the potential to slightly increase refuge habitat for juvenile salmonids from open-water predators such as pikeminnows and striped bass, this will also increase habitat for shallow, cover-oriented predator species such as largemouth bass, and thus may serve to increase predation on salmonids.

Rearing Habitat Issue 10. The Draft Report does not provide any evidence that outmigrating Chinook smolts are food limited during their 3-15 day migration through the lower SJR below Vernalis and the South Delta.

The Draft Report (2010) purports that increased flows in the early spring will improve food production for early spring salmon rearing (p. 60):

> These early spring flows also provide for increased and improved edge habitat (generally inundated areas with vegetation) and food production for salmon remaining in the river to rear during the early spring.

The Draft Report (2010) provides evidence that, in other systems, unregulated rivers have more and better food resources that regulated rivers (p. 63). However, the report does not provide any evidence that increasing flows in an already highly degraded system has the capability to return primary and secondary production quantity and quality to its pre-regulated state. Furthermore, the Draft Report (2010) does not define how it would measure changes in food production (quality or quantity) or the mechanisms thought to drive food production in response to short-term increases in flow.

The Draft Report (2010) also does not explain temporal and spatial scales under consideration for food production. Based on acoustic VAMP studies in 2008, Holbrook et al. (2009) found that smolts took 3-15 days (median 6-9 days) for migration through the lower San Joaquin and South Delta, so the need for food production over such a short duration is questionable. Increases in primary and secondary production that occur due to restoration or changes in management likely occur over longer periods of time, rather than that targeted by short-term pulse flows. Spatial scale is important too, as impacts to food resources are generated at different rates and via different processes depending on where they are located in the river continuum.

Physical Habitat and Transport

The Draft Report (2010) states that "higher inflows of various magnitudes during the spring support a variety of functions including ***maintenance of channel habitat*** and ***transport of sediment, biota, and nutrients*** [emphases added](Junk et al. 1989)." These concepts are based on mechanisms that occur in unmodified, relatively pristine, large river-floodplain systems that do not apply to the highly modified and channelized San Joaquin River system occurring downstream of Vernalis, which is supposed to be the focus of the Draft Report. The Draft Report (2010) also presents several ideas regarding the "Natural Flow Regime" concept as follows [emphases added]:

(1) "Specific ecosystem attributes that a more ***natural flow regime*** should improve include: 1) support of native fish communities; 2) support of the natural food web; 3) habitat connectivity; 4) fluvial hydrogeomorphological processes; and 5) improved temperatures." (Page 61)

(2) "Using a river's ***natural flow regime*** as a foundation for determining ecosystem flow requirements is well supported by the current scientific literature (Poff et al. 1997, Tennant 1976, Orth and Maughan 1981, Marchetti and Moyle 2001, and Mazvimavi et al. 2007). In addition, major regulatory programs in Texas, Florida, Australia and South Africa have developed flow prescriptions based on the natural flow regime in order to enhance or protect aquatic ecosystems (Arthington et al. 1992, Arthington et al. 2004, NRDC 2005, Florida Administrative Code 2010), and the World Bank now uses a framework for ecosystem flows based on the natural quality, quantity, and timing of water flows (Hirji and Davis 2009). Poff et al. (1997)describes the ***natural flow regime***as the "master variable"that regulates the ecologicalintegrity of rivers." (Page 60)

Our comments regarding assertions related to the functions of high flows and to the natural flow regime are provided in the following six (6) Physical Habitat Issue and two (2) Physical Transport Issue statements.

Physical Habitat

Physical Habitat Issue 1.The physical habitat for Delta fishes has been substantially reduced and altered, which has led to invasive species expansions.

Diverse habitats historically available in the Delta have been simplified and reduced by development of the watershed (Lindley et al. 2009), and 95% of tidal wetlands were lost to levee construction and agricultural conversion since the mid 1800's (Williams 2006). Major change in system includes loss of shallow rearing habitat (Lindley et al. 2009).

Current habitat structure benefits introduced predators more than natives (Brown 2003). The proliferation of non-native aquatic weeds, such as *Egeriadensa* (Brazilian waterweed), has increased habitat and abundance of largemouth bass and other invasive predators (Baxter et al. 2008; Figure 10). The area near the CVP intake has significant amounts of *E. densa* (Baxter et al. 2008). *Egeria* has strong influence on results of habitat alterations as different fish communities are found in its presence (Brown 2003)

Physical Habitat Issue 2. The Draft Report (2010) cites the 'Flood Pulse Concept' by Junk et al. (1989) in support of the assertion that higher flows provide maintenance of channel habitat andtransport of sediment, biota and nutrients; however, this concept was developed for large, pristine river-floodplain systems and is not applicable to the present-day lower San Joaquin River and South Delta.

The Draft Report (2010) states that "higher inflows of various magnitudes during the spring support a variety of functions including ***maintenance of channel habitat*** and ***transport of sediment, biota, and nutrients*** (Junk et al. 1989)". These physical transport and geomorphological functions are attributed to the 'Flood Pulse Concept' described in Junk et al. (1989), which is a concept based on the authors' experience in unmodified, relatively pristine, rain-fed (rather than snow fed), large river-floodplain systems in the neotropics, Southeast Asia and Upper Mississippi River and in published literature, that is predicated upon the relationships between a river channel and its floodplain. Junk et al. (1989) describe how the "[l]ength, amplitude, frequency, timing, and predictability of the flood pulse determine occurrences, life cycles, and abundances of primary and secondary producers and decomposers," emphasizing the importance of the *natural flow regime* in maintaining the dynamic equilibrium of river-floodplain systems. However, as described previously in this document, the physical habitat characteristics of the SJR floodplain areas are very different from those in the rivers described in Junk et al. (1989), therefore the "Flood Pulse Concept" is not applicable to the highly altered and leveed lower San Joaquin River and South Delta.

Physical Habitat Issue 3.Significant changes have occurred that have altered the historic "natural" physical habitat conditions in the San Joaquin River and South Delta.

In its natural state the South Delta could have been described as pristine, large river-floodplain systems. Although the natural San Joaquin River lacked the extensive, depressed flood basin habitat of the lower Sacramento River (which extended ~1,000 square miles), it consisted of a network of oxbow lakes, backwater sloughs, tule marshes, ponds, and sand bars bordered the river downstream of Merced (Bay Institute 1998). The SJR's natural flow meandered through the floodplain habitat and formed short (~6ft) natural depositional levees along the river banks (Bay Institute 1998). In the San Joaquin Basin, wetlands (tule marshes) existed alongside the sloughs, though not to the degree of the Sacramento River, and their extent depended upon the precipitation and runoff. During floods in the SJR, flood waters spread out from the river channel over the floodplain sloughs and marshes along the river. TBI (1998) also reported that approximately "150 square miles of land above the Head of

Old River were subject to frequent inundation, and the entire region became a reservoir of slowly moving waters during floods (Rose et al. 1895, Hall 1880)."

Before development, the Sacramento and San Joaquin Rivers drained into a complex, extensive tule-dominated marsh and tidal wetland. "[T]he swamp was alternately inundated and exposed as a result of changes in tides, precipitation, and discharge from the lowland rivers" (Bay Institute 1998). Intertidal wetlands that dominated the South Delta were made up of pools, lakes, open waters, mud flats, and subtidal waterways, and this habitat diversity was reflected in the varied plant assemblage (Bay Institute 1998). The historic South Delta was similar to the present day Yolo Bypass, in that it offered shallow, slow moving areas of water that likely provided similar rearing benefits to outmigrating Chinook fry.

However, the lower San Joaquin River and South Delta presently bears little resemblance to the delta system described above; the natural channels are now narrow and deep with steep, armored sides (levees), which constrain the meanders to the established channels (Figures 11 & 12). These channels are often choked with non-native water weeds (Figure 13), which provide habitat for non-native predators. Mechanical alterations to the lower San Joaquin and South Delta have greatly reduced any of the habitats previously mentioned (i.e., oxbow lakes, backwater sloughs, tule marshes, ponds, and sand bars), significantly altering the habitat which native species historically used.

Physical Habitat Issue 4. References were improperly cited in support for the natural flow concept.

The Draft Report (2010) states that "[u]sing a river's natural flow regime as a foundation for determining ecosystem flow requirements is well supported by the current scientific literature (Poff et al. 1997, Tennant 1976, Orth and Maughan 1981, Marchetti and Moyle 2001, and Mazvimavi et al. 2007)." However, This statement is either not supported by most of the cited references or the cited references are not directly applicable to the hydrology and ecology of the San Joaquin River. The methods of Tennant (1976) and Orth and Maughan (1981) are 30-35 years old (not "current") and both studies recommend a percentage of average annual flow in six-month periods, which is not a "natural flow regime". Orth and Maughan (1981) concluded that "This method should be useful for preliminary instream flow assessments in Oklahoma." Where more detailed instream flow studies are available, their method would be superseded. Marchetti and Moyle (2001) evaluated native and non-native fish populations in Putah Creek, which is below a major reservoir and does not have a remotely "natural" flow regime. They compared fish population structure and distribution during drought years (when the stream was often dry due to riparian pumping by the UC Davis Russell Ranch) to those during wetter years when the stream did not go dry, so extrapolating their conclusions to the San Joaquin River system is not reasonable or relevant. The Mazvimavi et al. (2007) study used a method developed for the "climatological, physiographic and hydrological conditions similar to some basins in South Africa" (which are not in the least similar to the San

Joaquin River), and also only recommended a percentage of average annual flow (not a natural flow regime).

The article by Poff et al. (1997) titled "The Natural Flow Regime: a paradigm for river conservation and restoration" does recommend that managed river flow regimes should mimic components of natural hydrology. Implementation of the natural flow paradigm, however, has been sporadic, lacking in standards, and linked to the specific objectives of river management, which are rarely defined and currently absent in the San Joaquin River. Where the authors recognize that full flow restoration is not possible, they recommend reproducing geomorphic processes that may result in the desired ecological benefits (Poff et al. 1997). They do not recommend natural flows (or a percentage thereof) either in a vacuum or as an end in itself, but as a "foundation for determining ecosystem flow requirements."

Furthermore, a series of "major regulatory programs" were cited as having developed flow prescriptions based on the natural flow regime "to enhance or protect aquatic ecosystems," however, all of these papers reference river systems with completely different hydrologic regimes than the San Joaquin River. These systems are generally in rainfall dominated watersheds, which experience extreme natural flow fluctuation, or else the flow prescriptions were intended for use in highly complex, virtually unstudied ecosystems. The San Joaquin River contains relatively few aquatic species (in comparison to the southeastern U.S., eastern Australia, South Africa, and tropical Africa and Asia), and, like most California rivers, is typically managed for either salmonids or other listed endangered species. The habitat needs of California species are subject to intense research and their habitat needs are relatively well known, which allows for direct species restoration through flow management in lieu of a catch-all "nature-knows-best" flow management.

Physical Habitat Issue 5. The natural flow paradigm assumes that channel formation and maintenance is directly influenced and modified by flow, which is generally true under natural conditions; however, leveed rivers can be nearly independent of flow.

Poff et al. (1997, page 770), identify "five critical components of the ["natural," i.e., unaltered by humans] flow regime that regulate ecological processesin river ecosystems: the magnitude, frequency, duration, timing, and rate of change of hydrologic conditions (Poff and Ward 1989, Richter et al. 1996, Walker et al.1995)." The authors also recognize that most rivers are highly modified and allude to the possibility that restoration of a natural flow regime may be limited "depending on the present extent of human intervention and flow alteration affecting a particular river (Poff et al. 1997, Page 780)." The natural flow paradigm assumes that channel form is directly influenced and modified by flow, which is generally true under natural conditions (a potential exception being a bedrock controlled channel); however, the morphology of a highly engineered river (e.g., levees) can be practically independent of flow (Jacobson and Galat 2006). In such a system, flow-related factors like timing of floods, water temperature, and turbidity may be managed; but, in absence of a "naturalized morphology, or flow capable of maintaining channel-forming processes, the hydrologic pulses will not be realized in habitat availability."

With minimal floodplains remaining due to land use changes, higher flows do not necessarily provide the channel maintenance that would occur under natural conditions.

In these leveed systems, true channel mobilization flows are not possible because of flood control. In some instances, higher flows can actually result in increased detrimental incision in upstream tributary areas like the Stanislaus River where existing riparian encroachment is armored and cannot be removed by high flow events, which limits "river migration and sediment transport processes" (Kondolf et al. 2001, page 39). In addition, the ability to provide a more natural flow regime is hampered by "urban and agricultural developments that have encroached down to the 8,000 cfs line," which effectively limit the highest flows to no more than the allowable flood control (i.e., 8,000 cfs) (Kondolf et al. 2001, page 46) Also, in the case of the Stanislaus River, there is limited opportunity to provide mechanical restoration of floodplains due to private landowners and flood control. As mentioned previously in instances where flood pulses can no longer provide functions such as ***maintenance of channel habitat***, Poff et al. (1997) states, "mimicking certain geomorphic processes may provide some ecological benefits [e.g., gravel augmentation, stimulate recruitment of riparian trees like cottonwoods with irrigation]."

Physical Habitat Issue 6. In absence of floodplain connectivity, the functions attributed to higher "pulse flows" cannot be achieved as described by the Flood Pulse Concept (FPC) (Junk et al. 1989; Junk and Wantzen 2003).

Under natural conditions, the San Joaquin River was a river channel connected with its floodplain. Flood pulses in the winter and spring would have provided the functions identified by Junk et al. (1989) and by Junk and Wantzen (2003). However, anthropomorphic changes in the lower river (e.g., levees), particularly below Vernalis (the focus of the Draft Technical Report), have substantially reduced this floodplain connectivity and the region is can no longer be considered a "large river-floodplain system." As described previously in this document, the extent of inundated floodplain in the Stanislaus to Mossdale reach only exceeds 2,000 acres at the maximum modeled flow of 25,000 cfs (cbec 2010 in Appendix 4).

Physical Transport

Physical Transport Issue 1.According to Junk et al. (1989) the transport of sediment, biota, and nutrients is directly related to the floodplains of a river-floodplain complex; the majority of the floodplain in the lower San Joaquin River has been eliminated and any remaining floodplain is isolated behind levees.

Junk et al. (1989) originally proposed the FPC, stating "that the pulsing of the river discharge, the flood pulse, is the major force controlling biota in river floodplains. . . We postulate that in ***unaltered large river systems with floodplains*** in the temperate, subtropical, or tropical belt, the overwhelming bulk of the riverine animal biomass derives directly or indirectly from production within the floodplains and not from downstream transport of organic matter produced elsewhere in the basin." According to Junk and Wantzen (2003), the FPC:

> focuses on the lateral exchange of water, nutrients and organisms between the ***river channel and theconnected floodplain***. It considers the importance of the hydrology and hydrochemistry of the parent river, but focuses on their impact on the organisms and the specific processes in the floodplain. Periodic inundation and drought (flood pulse) is the driving force in the river-floodplain system. The ***floodplain is considered as an integral part of the system***. . . [emphases added]

As mentioned previously there are many assumptions of the FPC that are likely not met in the South Delta and lower San Joaquin River, including "a large part of the primary and secondary production occurs in the floodplain, whereas the river is mainly the transport vehicle for water and dissolved and suspended matter" (Junk and Wantzen 2003). Based on statements above, the "maintenance of channel habitat and transport of sediment, biota, and nutrients" is directly related to the floodplains of a river-floodplain complex, which has nearly been eliminated from the lower San Joaquin River and its tributaries (cbec 2010 in Appendix 4; Williams 2006). Junk et al. (1989) recognized that this might be the case in altered systems stating, "[o]f course, former floodplains now behind manmade levees will remain isolated from the river, assuming no long-term changes in flood stages or flood protection policy."

Physical Transport Issue 2. The transport of sediment, biota, and nutrients differs between the large river-floodplain systems described by Junk et al. (1989), and the anthropogenic, leveed river channels of the South Delta.

During natural processes, sediments would have been brought downstream from the upper tributaries, but now, the numerous dams on tributaries limit natural sediment inputs such as gravels (Schoellhamer et al. 2007). Further, many human activities such as mining, urbanization and agriculture have increased erosion and the supply of fine river sediments (Schoellhamer et al. 2007).

Additionally, according toSchoellhamer et al. (2007), the present day modified system, "would tend to transport more sediment to the Delta because 1) the flood basins were a sink for fine sediments, and 2) the leveed channels will experience greater bed shear stress because more flow is kept in the channel. . . It follows that levee setbacks and floodplain restoration would tend to decrease sediment supply to the Delta by promoting floodplain deposition along upstream reaches."

In the SJR, sediments would normally have been deposited and exchanged between floodplains and the river channel, but they now travel through areas of the South Delta where no floodplain exists. Sediments that stay in suspension and are transported in the water column can have negative effects in the South Delta, through reduced light (and photosynthesis), which can reduce primary production and impact the South Delta food web. Most of the sediment supplied to the Delta is now episodic, through large flood pulses from the Sacramento River. Any sediment inputs into the South Delta from the SJR are the result of increases in suspended sediments in response to run-off events and are generally not associated with managed flow pulses (SJRG 2004).

Water Quality

The Draft Report states, "Higher inflows also provide better water quality conditions by reducing temperatures, increasing dissolved oxygen levels, and reducing contaminant concentrations."Our comments regarding these assertions are provided in the following two (2) Water Temperature Issue, six (6) Dissolve Oxygen Issue, and four (4) Contaminant Issue statements.

Water Temperature

Water Temperature Issue 1. The Draft Report provides no evidence or citation to demonstrate a need to decrease water temperatures in the Delta for salmonids.

The Draft Technical Report states, "Higher inflows also provide better water quality conditions *by reducing temperatures*, increasing dissolved oxygen levels, and reducing contaminant concentrations" (Emphasis added; pages 48-49, 60-61), however no evidence is provided to support the implicit claim that Delta temperatures for juvenile salmonid rearing and migration need to be reduced or maintained through June. The Draft Technical Report also does not specify temperature objectives for Chinook salmon in the Delta or discuss the biological significance of the existing thermal regime relative to a regime with "reduced" temperatures, assuming they could be achieved.

Seven day average daily maximum temperatures are generally ≤20°C (68°F) at Vernalis through May 15, andnearly all juvenile salmonids migrate from the San Joaquin Basin prior to May 15, with <3-5% migrating after May 15 (SJRGA 2007-2010; Deas et al. 2004;Demko et al. 1999, 2000a, 2000b, 2001a, and 2001b;FISHBIO 2007; Fuller et al. 2006-2007; Fuller 2005; Palmer and Sonke 2008-2009; SPCA 2001; Watry et al. 2008).Water temperatures up to 22.8°C were found to have at most, a slightly negative effect on juvenile salmon survival (Newman 2008), and studies evaluating the relationship between growth and temperature of Central Valley Chinook found no difference in growth rates between 13-16°C (55-61°F) and 17-20°C (63-68°F) (Marine 1997), suggesting that reducing water temperatures would not be expected to enhance growth rates of juvenile salmon rearing in the Delta.

Water Temperature Issue 2. The Draft Report provides no evidence or citation to support the statement that higher inflows will decrease water temperatures in the Delta.

Flows have little if any effect on spring water temperatures in the Delta (AD Consultants and others 2009), and by the end of May, water temperatures at Vernalis range between 65°F and 70°F regardless of flow levels between 3,000 cfs and 30,000 cfs (SRFG 2004).Average monthly flows and average maximum water temperatures recorded at Vernalis during 1973-2006 illustrate that water temperatures can only be reduced by increasing flows up to approximately 3,000-5,000 cfs (Figure 14). Increasing flows beyond this point does not result in further reduction in water temperatures.

The restoration of the San Joaquin River upstream of the Merced River will have future implications to flow and temperature management that were not considered in the Technical Report.

Dissolved Oxygen

Dissolved Oxygen Issue 1.Existing dissolved oxygen concentrations do not prevent juvenile salmon and steelhead migration.

The Draft Technical Report states, "Higher inflows also provide better water quality conditions by reducing temperatures, ***increasing dissolved oxygen levels***, and reducing contaminant concentrations" (Emphasis added; pages 48 & 49), however the report does not provide any references or further discussion to support this statement.

Dissolved oxygen issues have been studied and discussed for over a decade in the San Joaquin River, particularly since 1998 when the State Water Resources Control Board (State Water Board) placed the San Joaquin River Deep Water Ship Channel (DWSC), located downstream from the City of Stockton, on the Clean Water Act (CWA) Section 303(d) list. The State Water Board then established a Total Maximum Daily Load (TMDL) that has been implemented since 2005, which established several measures to reduce excess net oxygen demand including "Actions Addressing Sources of Oxygen Demanding Substances and their Precursors," and "Actions Addressing Non-Load Related Contributing Factors" (i.e., DWSC geometry and reduced flows through the DWSC). Concerns have focused on June through October, which is primarily outside of the February to June period covered by the Draft Report (2010).

Since improvements at the City of Stockton Regional Wastewater Control Facility (RWCF) were complete in 2007, there have been few instances during the February through June period when dissolved oxygen has declined below 5 mg/L. There were a few 1-2 day periods in June 2008 and June 2009 and a seven-day period in May 2009 where DO declined to as low as 4.7. It is unlikely that these DO levels would prevent juvenile salmonid migration, particularly those in June since there are few juveniles migrating during that period (i.e., <3-5% after May 15; SJRGA 2007-2010; Deas et al. 2004;Demko et al. 1999, 2000a, 2000b, 2001a, and 2001b;FISHBIO 2007; Fuller et al. 2006-2007; Fuller 2005; Palmer and Sonke 2008-2009; SPCA 2001; Watry et al. 2008). Also, the duration of occurrences when DO was below 5 mg/L was very short and the levels were not far below 5 mg/L and nowhere near the EPA national recommended 1-day minimum which is 4 mg/L (EPA 1986), indicating that few individuals would be exposed and potential impacts are likely to be minimal, if any. In addition, there is no evidence from smolt survival experiments that juvenile salmon survival is correlated with existing dissolved oxygen concentrations. (SRFG 2004; SJRGA 2002 and 2003).

Dissolved Oxygen Issue 2.Potential for low dissolved oxygen (DO) concentrations are primarily limited to the Deep Water Ship Channel (DWSC) during June through October and are primarily a result of altered channel geometry, with some contribution from loads of oxygen demanding resources and reduced flows.

The DWSC, starting at the Port of Stockton where the San Joaquin River (SJR) drops from 8-10 feet deep to 35-40 feet deep, is a major factor in DO depletion below the existing water quality objectives. The critical reach of the SJR DWSC for low DO problems is approximately the seven miles just downstream of the Port to Turner Cut. (Lee and Jones-Lee 2003, page viii).

The highest frequency that DO declines below 5.0 mg/L in the DWSC (at Rough and Ready Island gage [RRI]) occurs from June to October (CVRWQCB 2005, pages 20-21), a time with minimal impacts to both juvenile (see Dissolved Oxygen Issue 1) and adult (adult lifestage not covered in the Draft Report [2010]) salmonids. It appears that declines in DO have occurred less often after September 2007 due to reductions of ammonia discharged from the City of Stockton's Regional Wastewater Control Facility (RWCF)(RRI data from California Data Exchange Center).

According to CVRWQCB (2005, pages 27-28),

> Numerous studies over the last several years have provided significant data and information on the causes of the DO impairment. Most of these studies were peer-reviewed in June 2002 by an independent science panel and summarized or referenced in the Synthesis Report (Lee and Jones-Lee, 2003). CVRWQCB has concluded from these studies that the three main contributing factors to the DO impairment are as follows:
>
> - The DWSC geometry impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.
> - Loads of oxygen demanding substances from upstream sources [RWCF and others] react by numerous chemical, biological, and physical mechanisms to remove dissolved oxygen from the

water column in the DWSC.

- Reduced flow through the DWSC impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.

The DWSC is primarily responsible. If the DWSC did not exist, there would be few, if any, low-DO problems in the channel (Lee and Jones-Lee 2003, page ix).

Algae/oxygen demands that are discharged by Mud and Salt Sloughs to the SJR continue to develop in the SJR, ultimately leading to greatly elevated planktonic algal chlorophyll *a* and BOD concentrations and loads at Mossdale. At times, 50 to 80 percent of the Mossdale loads of BOD originate from the Mud and Salt Slough discharges to the SJR and the SJR upstream of Lander Avenue (Lee and Jones-Lee 2003, page xiii). The westside tributaries (except Mud and Salt Sloughs), such as Los Banos Creek, Orestimba Creek and Spanish Grant Drain, have been found to contribute a small part of the oxygen demand load and chlorophyll *a* to the SJR that ultimately are present in the SJR at Mossdale.

Wastewater discharges and stormwater runoff from the large municipalities in the SJR watershed upstream of Mossdale are not normally major sources of oxygen demand that cause DO depletion in the DWSC during the summer and fall months (Lee and Jones-Lee 2003, page xiv).

The eastside rivers (Tuolumne, Stanislaus and Merced) have been found to discharge high-quality Sierra Nevada water to the SJR which has low planktonic algal content and oxygen demand, and are not a major source of oxygen demand contributing to the low DO problem in the DWSC (Lee and Jones-Lee 2003, page xiii).

There are substantial municipal and agricultural diversions of SJR water upstream of the DWSC. These diversions decrease the amount of SJR flow through the DWSC (Lee and Jones-Lee 2003, page xiv).

Examination of the SJR at Vernalis flows during 2002 and 2003 shows that the low flows of the SJR through the DWSC were not due to low SJR at Vernalis flows, but were due to diversion of most of the SJR flow at Vernalis down Old River for export through the CVP and SWP (Lee and Jones-Lee 2003, page xv).

Dissolved Oxygen Issue 3. Dissolved oxygen concentrations in the DWSC are influenced by Delta exports, but can be ameliorated by installation of the Head of Old River Barrier (HORB).

Lee (2003, page 4) states that SJR flows through the DWSC "less than about 500 cfs can (and generally does) lead to DO concentrations below the water quality objective," which applies year-round. Low flow levels generally occur as a result of exports in absence of the HORB and "it is also now clear from the 1999 to present data [i.e., 2003] that, if the SJR at Vernalis flow had been allowed to largely pass through the DWSC before export from the Delta [i.e., the HORB was in place], the low-DO problems and the fish kill that occurred in February 2003 would not have occurred" (Lee 2003, page 5).

The Head of Old River Barrier (HORB) is installed to improve DO levels in fall but, since 2007, it has not been installed during the spring because of delta smelt concerns. The inability to operate the HORB during the spring when juveniles salmonids are migrating precludes managing DO with flow.

South Delta water exports artificially change the flows in the South Delta, which, in absence of the HORB, results in a higher proportion of the San Joaquin River going through Old River. These Old River diversions can "significantly reduce the SJR flow through the DWSC, thereby directly contributing to the low-DO problem in the DWSC" (Lee and Jones-Lee 2003). As an example of what can occur, South Delta exports from mid-January through mid-February 2003 led to very low SJR flow through the DWSC (less than 200 cfs, even though there were flows of at least 1,500 cfs at Vernalis). These low flows were related to severe low-DO problems in the DWSC that led to a fish kill (Lee and Jones-Lee 2003, page xv).

ICF (2010 Page ES-1) states that a 2-3 mg/L increase in dissolved oxygen has been observed with the HORB in place since 2000.Additional info in # 6.

Dissolved Oxygen Issue 4.There is no evidence that higher flows dilute oxygen-depleting substances from upstream sources, and previous published papers have identified that the relationship between flow and DO is complex.

Although the idea that San Joaquin River flows greater than 2,000 cfs could dilute oxygen-depleting substances and transport them quickly through the DWSC was presented by Jones and Stokes (2004), Lee (2005) clarified that

> the dilution of oxygen demand applies only to city of Stockton ammonia; it does not apply to upstream-derived algal oxygen demand. Under conditions of ***elevated flows***, the loads of oxygen demand to the DWSC is ***increased*** [emphasis added].

Van Nieuwenhuyse (2002) indicatesthe relationship between flow and DO is complex and that increasing net flow (1) reduces hydraulic residence time, (2) increases natural aeration but also increases the amount of artificial aeration required to achieve a unit increase in DO, (3) increases the loading rate of algal biomass or other organic matter from upstream, and (4) may merely displace the most DO-depleted zone of the ship channel a few miles or less downstream of its usual position near Rough and Ready Island.

According to Van Nieuwenhuyse (2002, pages 16 and 17), modeling indicated that within the range of flows considered (i.e., estimated monthly average values from 1983-2001, page 5),

> the beneficial effects of decreased residence timeare more than offset by the increased amount of artificial oxygenation required to raise DO in the ship and by the negative effects associated with increased loading of algal biomass or other oxygen-consuming material from upstream. This finding has important management implications.
>
> As a management action, the "boost flow" alternative ("D" in Table 5) called for maintaining Q_{vern}at its historical median level (the "2-year return flow in Jones & Stokes 2001). In a dry year (say, Q_{vern}at its 10th percentile value), this management action would require the release of some 500,000 ac-ft of stored water from eastside tributaries (or the equivalent amount of auxiliary pumping via Grant Line Canal) just for the months of June through October. And yet, the average improvement in CDOD would be only 20% over the "No Action" alternative (Table 5). Such a modest return on such a large investment would make little ecologic oreconomic sense and would presumably be challenged under the "waste not" doctrine of California water law. More modest levels of flow enhancement may, however, prove beneficial if combined with other management actions.

More recent modeling by Jassby and Van Nieuwenhuyse (2005, Page 1) indicates

> over the recent historical range (1983–2003), wastewater ammonium and river phytoplankton have played a similar role in the monthly variability of the dissolved oxygen deficit, but river discharge has the strongest effect [assuming the HORB is in place]. Model scenarios imply that control of either river phytoplankton or wastewater ammonium load alone would be insufficient to eliminate hypoxia. Both must be strongly reduced, or reduction of one must be combined with increases in net discharge to the Ship Channel. Model scenarios imply that preventing discharge down Old River [i.e., with HORB in place] with a barrier markedly reduces hypoxia in the Ship Channel.

Also, Jassby and Van Nieuwenhuyse (2005, page 31) states that

> the model for dissolved oxygen contains lags of up to two months, representing the memory of loading in the recent past, which at least in principle could overwhelm any positive increment in current discharge. The scenario in which river discharge is restored to full natural flow resolves this question: the trade-off between early and late summer is reversed, but the net effect on frequency of hypoxia remains about the same. The barrier at the head of Old River appears to have much more importance for historical dissolved oxygen conditions than the difference between unimpaired and actual flows upstream of Old River.

All of these examples point to the complex interaction between flow and other factors, which indicates that setting a flow criteria is not the best approach for achieving a DO objective. Instead, the DO TMDL that is already in place provides the mechanism for achieving the DO objective.

Dissolved Oxygen Issue 5. Wastewater effluent from the City of Stockton Regional Wastewater Control Facility (RWCF) previously contributed 10-90% of oxygen demand load, but facility modifications have led to improvements.

According to Lee and Jones-Lee Synthesis report (2003), wastewater effluent discharges from the City of Stockton's RWCF were found to contribute between 10-90% of the total oxygen demand load to the DWSC, where highest percentages were generally associated with high ammonia concentrations (>25 mg/L) discharged during low San Joaquin River flows through the DWSC. In 2002, the CVRWQCB approved a NPDES wastewater discharge permit (CVRWQCB Order No. 5-02-083) for the RWCF that limits the monthly average ammonia concentration in the effluent to 2 mg/L and the daily maximum to 5 mg/l. Three years later, the CVRWQCB assigned 30% as a waste load allocation for excess net oxygen demand to the RWCF (CVRWQCB 2005).

In order to meet the NPDES requirements, the "RWCF constructed enhanced wetlands and nitrifying biotowers which went into operation in 2006, with startup operations stabilized in 2007" (City of Stockton 2010). It is unclear exactly when these improvements became entirely functional but low DO (< 5 mg/L) was observed from June through September 2007. According to the CVRWQCB (2010), treatment upgrades at Lodi, Manteca, Stockton, and Tracy have "significantly reduced the oxygen demand on Delta waters" and that "since Stockton began removing ammonia, the extremely low dissolved oxygen events have not occurred." Although extreme low DO events have not occurred since September 2007, there have still been some instances where DO values have declined below the minimum of 5 mg/L at RRI, including a few instances during the February-June period of 2008 and 2009 (see # 5).

According to the City of Stockton (2010),

> since installation and startup of the new treatment facilities in 2007, (1) the current RWCF ammonia discharge has been reduced to 1/10th of the previous discharge, and (2) ambient ammonia levels in the receiving water have never exceeded the USEPA acute or chronic ammonia criterion and typically have not exceeded the USEPA acute or chronic criterion for freshwater aquatic life in the period prior to installation of the new nitrification facilities, with the exception of a brief period in early 2004.

The City of Stockton also maintains that there is a "lack of [any] current or historic impact[s] to beneficial uses due to ammonia levels in treated effluent from Stockton's

RWCF." Most recently, discharge from their facility was found to be within water quality parameter limits set forth in their NPDES permit and did not result in mortality of tagged fish observed in the vicinity of the railroad bridge in May 2007 (RBI 2007), and it also did not result in any measurable negative impacts to juvenile Chinook salmon held adjacent to the RWCF outfall in net pens for 40 hours in 2009 (SJRGA 2010).

Dissolved Oxygen Issue 6. DO objective for DWSC is inconsistent with the United States Environmental Protection Agency's (EPA 1986) national standard.

The 5 mg/L water quality objective during the February to June timeframe is similar to the EPA's (1986) national water quality criterion for DO. However, the national criterion allows for averaging and for low DO concentrations to occur near the sediment water interface; whereas, the Basin Plan does not. There is no evidence to support this deviation from the national standard.

Contaminants

Contaminant Issue 1. The Draft Report provides no evidence or citation to support the statement that higher inflows reduce contaminant concentrations.

The Draft Report states, "Higher inflows also provide better water quality conditions by reducing temperatures, increasing dissolved oxygen levels, and ***reducing contaminant concentrations***" (Emphasis added; pages 48 & 49), however the report does not provide any references or further discussion to support this statement. The Draft Report may be inferring that higher flows would act to dilute already suspended contaminants. However, the influence of higher flows on contaminant concentrations is variable; dilution may occur in some instances but increases may occur in others (see Issue Statement 2).

Contaminant Issue 2. The Draft Report failed to mention that higher flows may also lead to increased suspended contaminant concentrations.

The Draft Report neglects to mention that high flows can also lead to increases in contaminant concentrations resulting form the resuspension of contaminants located in riverbed sediments. Contaminants in suspended sediments may affect the ecosystem differently from dissolved contaminants, since filter feeding organisms consume suspended sediments and organic material (allowing the contaminants in the sediments to enter into the food web) and may have longer residence times in the rivers and estuaries in comparison with water (Bergamaschi et al. 1997). Research has begun to focus on relationship between freshwater flow and contaminant transport to and through the Delta.

Although increased flows can result in reduced dissolved or suspended sediment concentrations of some contaminants, they can also lead to increased pesticide loading. In a study conducted just downstream of Vernalis, the USGS examined the concentrations of organic contaminants in surface water sites along the San Joaquin River and in the Old River before, during and after the VAMP month-long pulse flow (Orlando and Kuivila 2005)[2]. Of the 13 total pesticides detected, diazinon and three herbicides (metolachlor, simazine, and trifluralin) were found in every sample. Although it might be expected that the higher flows would dilute the contaminants, the results were mixed. Diazinon and Simazine were highest at SJR and OR sites before VAMP (4/2/01 and 4/6/01), showed intermediate values during the VAMP period (5/14/01 and 5/18/01) and then reached lowest values during the post-VAMP period (5/31/01 and 6/4/01). Metolachlor showed the opposite trend at SJR and OR sites and increased throughout the three periods. Trifluralin showed a peak during the VAMP period for most sites. Suspended sediments were highest in SJR during VAMP; however, the opposite was true for the Old River, suspended sediments were lower during VAMP compared to just before and after the VAMP period. This was likely influenced by the operations of the Head of the Old River Barrier (HORB), which was installed during the 2001 VAMP period. All six culvert slide gates were open from April 26 to May 26, allowing some water to pass into the Old River. Suspended sediment concentrations generally increase with increasing streamflow, but there are likely nonlinear relationships between streamflow, suspended sediment concentration, and contaminant concentration. Limited conclusions can be drawn from a study with such a narrow spatial and temporal scope, however it is clear that increased flows do not necessarily lead to reduced contaminant concentrations. Undoubtedly, more research is needed to clarify this process.

Furthermore, the relationship between flow and contaminants is not obvious above Vernalis. As summarized in the Background Report for the San Joaquin River Restoration Study (McBain and Trush, Inc 2002), while higher flows may dilute some contaminants, such as selenium, mercury and DDT, contaminants in the bottom sediments of the San Joaquin River could also be remobilized during higher flows. McBain and Trush (2002) found that "although water quality conditions on the San Joaquin River relating to conservative ions, (e.g., salt and boron), and some nutrients are likely to improve under increased flow conditions, it is unclear how these and other potential restoration actions will impact many of the current TMDL programs and existing contaminant load estimates. This is most true of constituents with complex oxidation reduction chemistry, and sediment/water/biota compartmentalization (e.g., pesticides, trace metals)…Perhaps the greatest risks to potential restoration actions within the San Joaquin River study reaches relate to uncertainties regarding remobilization of past deposits of organochlorine pesticides, i.e., DDT and mercury."

[2]This study was done in conjunction with a caging study of salmon smolts conducted by University of California at Davis, which tested fish for acetylcholinesterase activity, DNA strand breaks, cytochrome P450 expression, and stress protein expression. This aspect of the study may help to clarify what effects the exposure to pesticides may have on juvenile salmon passing through the system. Unfortunately, the results of the salmon exposure study do not appear to be available (CalFed Bay-Delta Grant –Evaluation of the Decreased Survival of Chinook Salmon Smolts in Old River: Biological Responses to Toxicants).

Contaminant Issue 3. It remains unknown whether, or to what extent, migrating salmonids may be affected by suspended contaminants.

It is generally recognized that contaminants can have a negative affect on aquatic ecosystems, however despite the extensive studies conducted in field of toxicology, the direct ('acute toxicity' leading to death; or 'chronic' or 'sublethal toxicity' leading to decreased physical health; NMFS 2009) and indirect effects (reduction of invertebrate prey sources, reducing energetically favorable prey species relative to less energetically profitable or palatable prey; Macneale et al. 2010) of pollutants on salmon in the wild are not well understood.

Despite concerns over the threat contaminants may pose to threatened and endangered salmonid species, little is known regarding the effects of these contaminants on the health and survival of juvenile Chinook salmon in the Delta and its tributaries (Orlando et al. 2005). In a small scale, pilot study of contaminant concentrations in fish from the Delta and lower San Joaquin Rivers, resident species were tested for some of the contaminants listed above, however no salmonid species were tested (Davis 2000). The study found that 11 out of 19 adult largemouth bass sampled exceeded the mercury screening values, with a general pattern of lower concentrations down stream in the SJR toward the central Delta. DDT concentrations were exceeded in 6 of 11 white catfish, but only 1 of 19 largemouth bass. All samples above the DDT screening value were obtained from the South Delta or lower San Joaquin River watershed, indicating that the South Delta is still influenced by historic DDT use in the San Joaquin River basin. Two of the listed organophosphate pesticides were measured; diazinon was not detected in any sample and chlorpyrifos was detected in 11 of 47 samples analyzed, but at concentrations well below the screening value. With regards to salmonids, however, it is important to consider that resident fish may experience chronic exposure to these chemicals, while outmigrating Chinook smolts pass through the South Delta in a relatively short period of time.

A study by Meador et al. (2002) focused on estimating threshold PCB concentrations for juvenile Chinook salmon migrating through urban estuaries. PCBs were a concern because they had been shown to alter thyroid hormones important for the process of smoltification. During smoltification salmonids tend to show declines in muscle lipids, the main lipid storage organ for salmonids, causing the PCBs to be redistributed to, and concentrated in, other organs (Meador et al. 2002). Results of this study indicate that tissue concentrations below 2.4 mg PCB g^{-1} lipid should protect juvenile salmon migrating through urban estuaries from adverse effects specifically due to PCB exposure. This does not take into account any affects of other contaminants likely to also be in estuarine waters such as the Delta.

Contaminant Issue 4. Bioaccumulation, rather than exposure to dissolved contaminants, is likely the main concern for migrating juvenile Chinook.

Pesticides in the water column may be dissolved contaminants or they may accumulate in suspended sediments associated with organic matter. Dissolved contaminants can be absorbed through the gills or skin and this uptake may show more variability than the other exposure routes depending on concentrations, temperature and stress (Meador et al. 2002). Contaminants that accumulate in riverbed sediments may be resuspended (Pereira et al. 1996), and enter the food chain through filter-feeding benthic or pelagic organisms, such as Corbicula clams. In turn fish, such as carp and catfish, that are bottom feeders consume filter feeding invertebrates (Brown 1997). This process leads to bioaccumulation of the contaminants up the food chain. Bioaccumulation, rather than exposure to dissolved contaminants, is likely the main concern for migrating juvenile Chinook (Meadnor et al. 2002). Factors that affect bioaccumulation include: variable uptake and elimination rates, reduced bioavailability, reduced exposure, and insufficient time for sediment–water partitioning or tissue steady state can affect (Meador et al. 2002).

Comment 5. Given the overwhelming evidence that predation is a major threat to salmon and steelhead juvenile survival and the lack of support for flow as the principal influence on survival, population control of non-native predators should be considered a primary management tool

Applicable excerpt from pages1-2 of Demko et al. (2010):

Flow does not explain low survival of juvenile Chinook observed in the South Delta since 2003, so more flow is unlikely the solution.

South Delta survival has been low since 2003. During this period, even flood flows of approximately 10,000 cfs and 25,000 cfs during outmigration in two years (2005 and 2006) did not increase survival to anywhere near levels when flows were moderately high (5,700 cfs) in 2000. It is unclear why smolt survival between 2003 and 2006 has been so low (SJRGA 2007), but these unexpectedly low Smolt survival observations during 2003-2006 were far lower than historical data. Models based on historical data that do not accurately represent recent conditions (such as Newman 2008 and others) should not be used to predict future scenarios (VAMP Tech. Team 2009).

Applicable excerpts from pages18-23 of Demko et al. (2010):

Outmigration Issue 6. The Draft Report (2010) incorrectly assumes higher flows will reduce predation by "displacing" non-native species.

Non-native species have become more abundant than native species in the South Delta (Figure 1). According to the Draft Report (2010),

> seasonal flow events may be beneficial for native species in the south Delta by… displacing nonnative species (Marchetti and Moyle 2001), and by providing suboptimal spawning and rearing conditions for some non-native species (Marchetti and Moyle 2001, Brown & Ford 2002)(Feyrer and Healey 2003).

However, there is evidence that striped bass (*Morone saxatilis*) are also positively associated with higher river flows (Feyrer and Healey 2003). Therefore, while an increase in spring flows could benefit native species such as tule perch (*Hysterocarpus traski*) and Sacramento sucker (*Catostomus occidentalis*), it would also benefit a predator of salmonids, the striped bass.

Outmigration Issue 7. Despite overwhelming evidence that predation by striped bass and other non-native predators are the major threat to salmon and steelhead survival, the Draft Report(2010) does not consider that reducing predation may benefit salmon more than increasing flows.

Several studies have documented that non-native predator species, especially striped bass, prey upon juvenile salmon in the Sacramento-San Joaquin complex (Shapovalov 1936, Stevens 1966, Thomas 1967, Pickard et al. 1982, Merz 1994, Gingras 1997, Nobrigra and Feyrer 2007, Miranda et. al. 2010), and, to a lesser extent, on steelhead (Edwards 1997, Figure 3). Statistical models have examined the effects of striped bass predation on winter-run Chinook salmon extinction risk and predicted that increased predation by striped bass would substantially impact this endangered population (Lindley and Mohr 2003). According to DFG (2009), there are roughly one (1) million adult striped bass in the Delta and their abundance remains relatively high despite curtailment of a stocking program in 1992 (DFG 2009). This estimate does not account for Age 1 and Age 2 striped bass, which were estimated by Hanson (2009a) as part of a bioenergetic analysis to be 4,796,850 and 1,199,212 fish, respectively. Based on this bioenergetic analysis, Hanson (2009a) concluded that

> striped bass predation is a major cause, if not the greatest cause, of mortality to juvenile winter-run and spring-run Chinook salmon in the Delta system.

Despite these findings, other studies have reported low rates of predation by non-native species in the Central Valley (Edwards 1997, Nobriga and Feyrer 2007, Tucker et al. 1998) or argued that removing specific non-native predators (i.e., striped bass) simply makes room for other predators to proliferate (Nobriga 2009). However, in concert with extensive habitat loss (Yoshiyama 2001) and serious declines in salmon stocks, even low levels of predation on salmonid early life stages are suspected to contribute to the decline of California's native fisheries and should be addressed through non-native predator reduction (Rea 2010).

Outmigration Issue 8. The Draft Report(2010) ignored evidence that striped bass in the San Joaquin River and South Delta prey on juvenile Chinook to such an extent

that they significantly reduce the number of Chinook returning to the San Joaquin Basin.

High predation losses at the State Water Project (SWP) are particularly detrimental to San Joaquin Chinook salmon populations since over 50% of juvenile salmon from the San Joaquin travel through Old River on their way to the ocean, exposing them to predation at Clifton Court Forebay (CCF) and causing substantially reduced survival.Predation rates in CCF are as high as 66-99% of salmon smolts (Gingras 1997; Buell 2003; Kimmerer and Brown 2006). Striped bass are generally associated with the bulk of predation in CCF since their estimated populations have ranged between 30,000 and 905,000 (Healey 1997; Cohen and Moyle 2004); however, studies indicate that six additional invasive predators occur in the CCF (i.e., white catfish, black crappie, largemouth bass, smallmouth bass, spotted bass, redeye bass) with white catfish being the most numerous, having estimated populations of 67,000 to 246,000 (Kano 1990). Yoshiyama et al. (1998) noted that "[S]uch heavy predation, if it extends over large portions of the Delta and lower rivers, may call into question current plans to restore striped bass to the high population levels of previous decades, particularly if the numerical restoration goal for striped bass (2.5 to 3 million adults; USFWS 1995; CALFED 1997) is more than double the number of all naturally produced Central Valley Chinook salmon (990,000 adults, all runs combined; USFWS 1995)."In 2005,Churchwell and Hanson (2006) presented results of a pilot investigation of predation on acoustically tagged steelhead (ranging from 221-275 mm) and estimated that 22 of 30 (73%) were preyed upon.Nobriga and Feyrer (2007) state:

> Striped bass likely remains the most significant predator of Chinook salmon, *Oncorhyncus tschawytscha* (Lindley and Mohr 2003), and threatened Delta smelt, *Hypomesus transpacificus* (Stevens 1966), due to its ubiquitousdistribution in the Estuary and its tendency to aggregate around water diversion structures where these fishes are frequently entrained (Brown et al. 1996).

Similarly, predators congregate around the numerous smaller underwater structures in the lower San Joaquin River and South Delta including bridge pilings, barriers, and pump platforms (Hanson 2009b, Miranda 2010, Vogel 2010).

Outmigration Issue 9. Recent San Joaquin Basin VAMP studies support high predation rates by striped bass on Chinook salmon in the lower San Joaquin River and South Delta.

In 2006 and 2007, the first two years of an acoustic tag monitoring study were conducted to evaluate survival of salmon smolts emigrating from the San Joaquin River through the South and Central Delta (SJRGA 2008). In 2006, results indicated that without the, "Head of Old River Barrier in place and during high-flow conditions many (half or more) of the acoustic-tagged fish, released near Mossdale, migrated into Old River."

In 2007, a total of 970 juvenile salmon were tagged with acoustic transmitters and were detected by a combination of receivers including mobile tracking and stationary detections. Mobile tracking found that 20% of released fish (n=192) were potentially consumed by predators at three "hotspots" located near Stockton Treatment Plant (n=116), just upstream of the Tracy Fish Facility trashracks (n=57), and at the head of Old River flow split downstream of Mossdale (n=19). Stationary detections indicated an average 45% loss, potentially attributable to predation, that does not account for losses at the largest "hotspot" at Stockton Treatment Plant, nor in the greater Delta past Stockton and Hwy 4.

In 2008 and 2009, it became apparent that the issue of predation could greatly affect the estimates of smolt survival through the South and Central Delta. First, some tagged smolts were showing 'predator-like behaviors', which lead researchers to believe that these tags were actually predators that had consumed the tagged smolts (SJRGA 2009; Vogel 2010a; Vogel 2010b and Buchanan et al. 2010 in Appendix 3). As a result, several alternative data analysis approaches were designed in order to minimize any bias in the survival estimate associated with predation (SJRGA 2009). When both "smolt type" and "predator type" detections were included in the survival model, survival was estimated to be 0.34 (95%CI=0.29-0.57), which was much higher than the survival estimate based on smolt only detections of 0.06 (95%CI=0.04-0.10). Secondly, during the pilot study of the BAFF to prevent fish from entering the Old River, researchers found that many of the fish that passed the barrier and stayed in the SJR were apparently eaten by predators at the large scour hole downstream of the HORB (Bowen et al. 2009). Predation rates at the barrier ranged from 11.8 to 40% (mean=27.5%). These two key results of the recent acoustic telemetry studies highlight the potential management implications of ignoring the issue of predation on study fish, and the importance of developing new telemetry technology that can differentiate a tag in a live fish from a tag in a consumed fish (Vogel 2010a; Vogel 2010b and Buchanan et al. 2010 in Appendix 3).

Outmigration Issue 10. The Draft Report(2010) ignored the fact that the overwhelming majority of predation on juvenile Chinook is the result of non-native predators that were intentionally stocked by DFG, and whose abundance can be reduced to minimize the impacts on Chinook.

Most of the non-native fish species (69%) in California, including major predators, were intentionally stocked by DFG for recreation and consumption beginning in the 1870's (Figures 5 and 6). All of the top predators responsible for preying on native fish are currently managed to maintain or increase their abundance. Historically, the Delta consisted of approximately 29 native fish species, none of which were significant predators. Today, 12 of these original species are either eliminated from the Delta or threatened with extinction, and the Delta and lower tributaries are full of large non-native predators such as striped bass that feed "voraciously" throughout long annual freshwater stays (McGinnis 2006). Lee (2000) found a remarkable increase in the number of black bass tournaments and angler effort devoted to catching bass in the Delta over the last 15 years. According to Nobriga and Feyrer (2007), "largemouth bass likely have the highest per capita impact on nearshore fishes, including native fishes," and "shallow water piscivores are widespread in the Delta and generally respond in a density-dependent manner to seasonal changes in prey availability."The impacts of the two recent invaders—spotted bass (*Micropterus punctulatus*) and redeye bass (*M. coosae*)—remain undetermined; however, redeye bass "devastated the native fish fauna of the Cosumnes River basin" (Moyle *et al.* 2003 as cited by Cohen and Moyle 2004). Black crappie were responsible for a high level of predation during a 1966/67 DFG study with as many as 87 recognizable fish removed from the stomach of a single crappie, and counts of 40 to 50 were common. Most of the fish were undigested; hence, they were not in the stomachs for very long. Therefore, an individual crappie could presumably eat several times the observed number in one day, perhaps 100 or 150 fish; while, the average numbers for striped bass could be 200 to 300 fish, on the conservative side.

Agencies along the West Coast are beginning to recognize the significance of predation on ESA listed salmon runs. In the Columbia River Basin, there is a Northern Pikeminnow Sport Fishery program that rewards anglers for catching predatory pikeminnows. The pikeminnow reduction program was estimated to reduce potential predation to 40% of pre-program levels in 2009 (Porter 2009).

In California, the Sacramento Bee (Weiser 2010) reported that DFG has been aware of some of the direct effects of non-native predation on native species for over a decade:

> A 1999 report by Fish and Game estimated stripers may eat as much as 6 percent of some salmon runs. Evidence uncovered by the lawsuit indicates state officials have known for years that it may be a bigger problem, according to documents the coalition obtained as part of the lawsuit.
>
> "Last night a chill ran down my spine imagining that Delta smelt go extinct … while we have done nothing proactive to address predation by striped bass," Marty Gingras, supervising biologist for Fish and Game's Bay Delta Region, wrote in a February 2007 e-mail. "I'm again thinking we should propose revising the striped bass policy to consider them a 'weed' like pigs or a similar pest."
>
> The e-mail was labeled "Confidential" and sent to Gingras' boss, Chuck Armor, who replied, "I share your concern."
>
> In a subsequent deposition, the coalition's attorney pressed Gingras to estimate how many juvenile salmon are eaten by striped bass. Because no one knows for sure, he gave a range of 5 percent to 25 percent.

The Department of Water Resources is also now examining the effects of predation on salvaged fish that are released into the Delta at specific release sites, to determine how to alter practices to increase the survival of salvaged salmonids (Miranda et al. 2010).

Earlier this year, in a letter addressed to the President of the California Fish and Game Commission, the Sacramento Area Office NMFS Supervisor (Rea 2010) stated,

> The public draft recovery plan for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, andCentral Valley steelhead has identified non-native predation as a key factor contributing to the precarious status of these species (see executive summary page 2; pages 4, 19, 36, 48, and 157 in the main document, and pages 33-35 and 40 in Appendix B)…NMFS has concluded that striped bass predation on salmon and steelhead is an important stressor warranting action. . . Actions to address stressors such as Delta water withdrawals and ocean harvest are being taken. We believe it is necessary to address the full range of stressors if we are to recover these species, including a concentrated effort to reduce predation by non-native species.

And, in a recent editorial in the Sacramento Bee (McCamman 2010), the director of DFG stated that

> many other factors may be addressed in the Bay-Delta Conservation Plan planning effort, including wastewater discharge and its effect on nutrients in the Delta, agricultural and urban storm runoff, and the role of introduced plant and animal species, including ***predatory fish species such as black bass and striped bass*** [emphasis added].

From these examples of predator suppression programs, evaluations into local predation potential (i.e., salvage release sites), and recent quotations by various state and federal agencies, it is clear that natural resource managers and biologists along the West Coast recognize the role of predation as an important stressor on ESA listed salmon runs. It is also apparent that predation is a stressor that can be successfully reduced, as evidenced by a predator suppression program in the Pacific Northwest (Porter 2009).

References

AD Consultants, Resource Management Associates, Inc., and Watercourse Engineering, Inc. 2009. San Joaquin River Basin water temperature modeling and analysis. Prepared for CALFED, ERP-06D-S20. Moraga, California. October 2009.

AFRP [Anadromous Fish Restoration Program]. 2005. Recommended streamflow schedules to meet the AFRP doubling goal in the San Joaquin River Basin. 27 September 2005.

Arthington, A.H., J.M. King, and J.H. O'Keffe. 1992. Development of an holistic approach for assessing environmental flow requirements of riverine ecosystems. Pages 69–76 In Proceedings of an International Seminar and Workshop on Water Allocation for the Environment, Pigram JJ, Hooper BP (eds). Centre for Water Policy Research: University of New England.

Arthington, A.H., R.E. Tharme, S.O. Brizga, B.J. Pusey, and M.J. Kennard. 2004. Environmental flow assessment with emphasis on holistic methodologies. Pages 37-65 In: R. Welcomme and T. Petr, editors. *Proceedings of the Second International Symposium on the Management of Large Rivers for Fisheries Volume II.* RAP Publication 2004/17. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand. http://www.fao.org/docrep/007/ad526e/ad526e07.htm

Baker P. F. and J. E. Morhardt. 2001. Survival of Chinook salmon smolts in the Sacramento-San Joaquin Delta and Pacific Ocean. In: Brown RL, editor. *Fish Bulletin* 179: *Contributions to the biology of Central Valley salmonids*. Volume 2. Sacramento (CA): California Department of Fish and Game. www.stillwatersci.com/resources/2001BakerMorhardt.pdf

Baxter, R., R. Breuer, L. Brown, M. Chotkowski, F. Feyrer, M. Gingras, B. Herbold, A. Mueller-Solger, M. Nobriga, T. Sommer, and K. Souza. 2008. Pelagic organism decline progress report: 2007 synthesis of results. Interagency Ecological Program for the San Francisco Estuary. http://www/science.calwater.ca.gov/pdf/workshops/POD/IEP_POD_2007_synthesis_report_031408.pdf

Bennett, W.A. and P.B. Moyle. 2010. Presentation abstract: Application of dynamic regime theory to assess the extent of estuarine ecosystem change: Oh, you don't know the shape I'm in. Delta Science Conference. 27 September 2010.

Bergamaschi, B. A., K.L. Crepeau, and K.M. Kuivila 1997. Pesticides associated with suspended sediments in the San Francisco Bay Estuary, California U.S. Geological Survey Open-File Report 97-24.

Bond, M.H. 2006. Importance of estuarine rearing to Central California steelhead (*Oncorhynchus mykiss*) growth and marine survival. M.A. Thesis, University of California, Santa Cruz, Santa Cruz, CA.

Bowen, M.D., S. Hiebert, C. Hueth, and V. Maisonneuve. 2009. 2009 Effectiveness of a non-physical fish barrier at the divergence of the Old and San Joaquin Rivers (CA). U.S. Department of the Interior Technical Memorandum 86-68290-09-05.

Bowen, M. 2010. Review OCAP Reasonable and Prudent Alternatives' Actions. Park Tower Conference Center, Sacramento, CA. 8 November 2010.

Brandes, P.L. and J.S. McLain. 2001. Juvenile Chinook salmon abundance, distribution, and survival in the Sacramento-San Joaquin Estuary. In: R.L. Brown, editor, Contributions to the biology of Central Valley salmonids. Volume 2. *California Department of Fish and Game Fish Bulletin* 179:39-136.

Brown, T.G. 2002. Floodplains, flooding, and salmon rearing habitats in British Columbia: A review. Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Research Document 2002/007.

Brown, R.T. 2003. Evaluation of aeration technology for the Stockton Deep Water Ship Channel. Report prepared for San Joaquin River DO TMDL Steering Committee and TAC, by Jones & Stokes, Sacramento, CA. Available from: www.sjrtmdl.org.

Brown, L.R. 2000. Fish communities and their associations with environmental variables, lower San Joaquin River drainage, California. *Environmental Biology of Fishes* 57:251-269.

Brown, L.R. 1997. Concentrations of chlorinated organic compounds in biota and bed sediment in streams of the San Joaquin Valley, California. *Archives of Environmental Contamination and Toxicology* 33:357-368.

Brown, L.R. and T. Ford. 2002. Effects of flow on the fish communities of a regulated California river: Implications for managing native fishes. *River Research and Applications* 18: 331–342.

Brown, R., S. Greene, P. Coulston, S. Barrow. 1996. An evaluation of the effectiveness of fish salvage operations at the intake of the California Aqueduct, 1979-1993. In: Hollibaugh, JT, editor. *San Francisco Bay: The Ecosystem. San Francisco (CA). Pacific Division of the American Association for the Advancement of Science* 497-518.

Buchanan, R., J. Skalski, D. Vogel, and P. Brandes. 2010. Survival and route selection of juvenile Chinook salmon in the southern Sacramento-San Joaquin River Delta, 2009.Presentation given at 6th Biennial Bay-Delta Science Conference 2010□Ecosystem Sustainability: Focusing Science on Managing California's Water Future, September 27-29, 2010, Sacramento, CA.

http://www.deltacouncil.ca.gov/delta_science_program/pdf/conferences/sci_conf_2010/abstracts_oral/Fish%20Migration%20and%20Survival.PDF

Buell, J. 2003. Predation losses in CCF [Clifton Court Forebay]. South Delta Fish Facilities Forum Meeting: Summary and Action Items. Resources Building, Sacramento, CA. 2 April 2003.

CALFED. 1997. Ecosystem Restoration Program Plan. Volumes 1, 2. Ecological zone visions. Review draft (28 July 1997), CALFED Bay–Delta Program, Sacramento, California.

cbec. 2010. San Joaquin Floodplain inundation mapping. cbec, Inc, Sacramento, California. 24pp.Report provided in Appendix 4 of this document.

Churchwell, R. and C. Hanson. 2006. 2005 Pilot-Scale Investigation of Predation on Steelhead within Clifton Court Forebay. In W. Kimmerer and R. Brown (eds.), A Summary of the June 22 -23, 2005 Predation Workshop, Including the Expert Panel Final Report.

City of Stockton. 2010. City of Stockton's written summary in response to the key issue and associated questions for the Delta Flow Criteria Informational Proceeding. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/exhibits/stockton/cos_summary.pdf

Cohen, A. N. and P. B. Moyle. 2004. Summary of data and analyses indicating that exotic species have impaired the beneficial uses of certain California waters. Oakland, San Francisco Estuary Institute.

CVRWQCB [Central Valley Region Regional Water Quality Control Board]. 2010. Letter from Pamela C. Creedon, Executive Officer, CVRWQCB to Senator Darrell Steinberg regarding Sacramento Regional County Sanitation District Proposed NPDES Permit. CVRWQCB Rancho Cordova, CA.

CVRWQCB. 2005. Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the control program for factors contributing to the dissolved oxygen impairment in the Stockton Deep Water Ship Channel, Final Staff Report. California Regional Water QualityControl Board, Central Valley Region. Sacramento, CA.

Dauble, D., D. Hankin, J.J. Pizzimentieti, and P. Smith. 2010. The Vernalis Adaptive Management Program (VAMP): Report of the 2010 Review Panel. May 2010.

Davis, J.A., M.D. May, G. Ichikawa, and D. Crane. 2000. Contaminant concentrations in fish from the Sacramento-San Joaquin Delta and Lower San Joaquin River, 1998. San Francisco Estuary Institute, Richmond, CA

Deas, M., J. Bartholow, C. Hanson, C. Myrick. 2004. Peer Review of Water Temperature Objectives Used as Evaluation Criteria for the Stanislaus – Lower San Joaquin River Water Temperature Modeling and Analysis. Prepared for AD Consultants under CALFED – CBDA Project Number: ERP-02-P08. June.

Demko, D.B., A. Phillips and S.P. Cramer. 2001a. Effects of pulse flows on juvenile Chinook migration in the Stanislaus River. Annual Report for 2000. Prepared by S.P. Cramer & Associates for the Tri-Dam Project.

Demko, D.B.,A. Phillips and S.P. Cramer. 2001b. Outmigrant trapping of juvenile salmonids in the lower Stanislaus River Caswell State Park site 2000. Final report to U.S. Fish and Wildlife Service.

Demko, D.B.,A. Phillips and S.P. Cramer. 2000a. Effects of pulse flows on juvenile Chinook migration in the Stanislaus River. Annual Report for 1999. Prepared by S.P. Cramer & Associates for the Tri-Dam Project.

Demko, D.B., C. Gemperle, A. Phillips, and S.P. Cramer. 2000b. Outmigrant trapping of juvenile salmonids in the lower Stanislaus River Caswell State Park Site 1999. Prepared by S.P. Cramer & Associates for the U.S. Fish and Wildlife Service under subcontract to CH2M Hill.

Demko D.B., C. Gemperle, S.P. Cramer, and A. Phillips. 1999. Outmigrant trapping of juvenile salmonids in the lower Stanislaus River Caswell State Park site 1998. Prepared for the U.S. Fish and Wildlife Service, Anadromous Fish Restoration Program under contract with CH2M Hill.

Demko, D.B. and S.P. Cramer. 1996. Effects of pulse flows on juvenile Chinook migration in the Stanislaus River. Annual Report for 1996. Prepared by S.P. Cramer & Associates, Inc. for the Oakdale Irrigation District, Oakdale, CA, and South San Joaquin Irrigation District, Manteca, CA.

Demko, D.B. and S.P. Cramer. 1995. Effects of pulse flows on juvenile Chinook migration in the Stanislaus River. Annual Report for 1995. Prepared by S.P. Cramer & Associates, Inc. for the Oakdale Irrigation District, Oakdale, CA, and South San Joaquin Irrigation District, Manteca, CA.

DFG [California Department of Fish and Game]. 2010a. California Department of Fish and Game flows needed in the Delta to restore anadromous salmonid passage from the San Joaquin River at Vernalis to Chipps Island. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/exhibits/dfg/dfg_exh3.pdf

DFG. 2010b. Effects of water temperature on anadromous salmonids in the San Joaquin River Basin.

DFG. 2010c. Status of Central Valley Chinook salmon populations: 2009 annual spawning escapement update. June 2010.

DFG. 2010d. Effects of Delta inflow and outflow on several native, recreational, and commercial species. De Moor, F.C. 1986. Invertebrates of the lower Vaal River, with emphasis on the Simuliidae. Pages 135-142 In B.R. Davies and K.F. Walker (eds.), The Ecology of River Systems. D.R. Junk, Publishers, Dordrecht.

DFG. 2009a. San Joaquin River Fall-run Chinook salmon population model version 1.6. Report to the State Water Resources Control Board. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/comments040609/comments040609/dfg051509.pdf

DFG. 2009b. Fisheries Branch Anadromous Assessment. California Central Valley Sacramento and San Joaquin River Systems Chinook Salmon Escapement: Hatcheries and Natural Areas. GrandTab.

DFG. 2009c. California Endangered Species Act Incidental Take Permit No. 2081-2009-001-03, Department of Water Resources, California State Water Project Delta Facilities and Operations.

DFG. 2005a. California Department of Fish and Game supplemental comments and recommendations on the Vernalis flow and salmon doubling objectives in the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/1995wqcp/exhibits/dfg/dfg-exh-10.pdf

DFG. 2005b. San Joaquin River Fall-Run Chinook salmon population model. Report to the State Water Resources Control Board. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/sds_srjf/sjr/docs/sjrf_fallrun_chinooksalmon.pdf

DFG. 1999. Conservation plan for the California Department of Fish and Game Striped Bass Management Program prepared as part of an application for incidental take permits pursuant to Section 10(a)(1)(B) of the Endangered Species Act. Submitted to National Marine Fisheries Service by CDFG, Sacramento.

DOI [U.S. Department of the Interior]. 2010. Comments regarding the California State Water Resources Control Board notice of public informational proceeding to develop Delta flow criteria for the Delta ecosystem necessary to protect public trust resources (Exhibit 1).

Draft Report. 2010. Draft Technical Report on the scientific basis for alternative San Joaquin River flow and southern Delta salinity objectives. Prepared by the State Water Resources Control Board California Environmental Protection Agency, October 29, 2010, Sacramento, CA.

Feyrer, F., T.R. Sommer, S.C. Zeug, G. O'Leary, and W. Harrell. 2004. Fish assemblages of perennial floodplain ponds of the Sacramento River, California (USA), with implications for the conservation of native fishes. *Fisheries Management and Ecology* 11:335-344.

Feyrer, F., and M. Healey. 2003. Fish community structure and environmental correlates in the highly altered southern Sacramento-San Joaquin Delta. *Environmental Biology of Fishes* 66:123-132.

FISHBIO. 2009. 2008 Stanislaus River supplemental data report – Final data. Submitted to Tri-Dam. February 2009.

FISHBIO. 2007. 2007 Stanislaus River data report, final data. July 2007. http://www.fws.gov/stockton/afrp/documents/2007_Stanislaus_River_Data_Report.pdf

Florida Administrative Code. Rule 40D-8.041. Effective July 12, 2010.

Fuller, A.N. 2008. Outmigrant trapping of juvenile salmonids in the Lower Tuolumne River, 2007 – Final Report. Submitted to Turlock and Modesto Irrigation Districts. March 2008.

Fuller, A.N., C.L. Sonke, and M. Palmer. 2007. Outmigrant trapping of juvenile salmonids in the Lower Tuolumne River, 2006. Prepared by FISHBIO Environmental for Turlock and Modesto Irrigation Districts. 30 pp.

Fuller, A.N., C.L. Sonke, and M. Palmer. 2006. Outmigrant trapping of juvenile salmonids in the Lower Tuolumne River at Grayson, 2005. Prepared by S.P. Cramer & Associates for Turlock and Modesto Irrigation Districts.

Fuller, A.. 2005. Outmigrant trapping of juvenile salmonids in the Lower Tuolumne River at Grayson, 2004. Prepared by S.P. Cramer & Associates for Turlock and Modesto Irrigation Districts. 20 pp.

Gingras, M. 1997. Mark/Recapture experiments at Clifton Court Forebay to estimate pre-screening loss to juvenile fishes: 1976-1993. Interagency Ecological Program for the San Francisco Bay/Delta Estuary Technical Report 55. http://198.31.87.66/pdf/workshops/SP_workshop_predation_M.Gingra.pdf

Greenberg, L.A., C.A. Paszkowski, W.M. Tonn. 1995. Effects of prey species composition and habitat structure on foraging by two functionally distinct piscivores. *Oikos* 74:522-532.

Grimaldo, L., C. Peregrin, and R.M. Miller. 2000. Examining the relative predation risks of juvenile Chinook salmon in shallow water habitat: the effects of submerged aquatic vegetation. Interagency Ecological Program for the Sacramento-San Joaquin Estuary, *IEP Newsletter* 13(1):57-61.

Hall, W.H. 1880. Drainage of the valleys and the improvement of the navigation of river. Report of the State Engineer to the Legislature of the State of California, Session of 1880.

Hanson, C.H. 2009a. Rebuttal and supplemental expert report. *Coalition for a Sustainable Delta et al. v. Koch*, E.D. Cal. Case No. CV 08-397-OWW. November 20, 2009. 14 pp.

Hanson, C.H. 2009b. Striped bass predation on listed fish within the Bay-Delta estuary and tributary rivers: Expert Report - *Coalition for a Sustainable Delta et al. v. Koch*, E.D. Cal. Case No. CV 08-397-OWW. October 9, 2009. 63pp.

Hartman, G.F., and T.G. Brown. 1987. Use of small, temporary, floodplain tributaries by juvenile salmonids in a west coast rain-forest drainage basin, Carnation Creek, British Columbia. *Canadian Journal of Fisheries and Aquatic Sciences* 44:262-270.

Hayes, S. A., M.H. Bond, C.V. Hanson, E.V. Freund, J.J. Smith, E.C. Anderson, A.J.Ammann, R.B. MacFarlane. 2008. Steelhead growth in a small central California watershed: Upstream and estuarine rearing patterns. *Transactions of the American Fisheries Society* 137(1):114-128.

Healey, M. P. 1997. Estimates of sub-adult and adult striped bass abundance in Clifton Court Forebay: 1992-1994. DRAFT. http://www.science.calwater.ca.gov/pdf/workshops/SP_workshop_predation_Food_Hab.pdf

Healey, M.C. 1991. Life history of Chinook salmon (*Oncorhynchus tshawytscha*). In Pacific salmon life history (Edited by C. Groot and L. Margolis). UBC Press, Vancouver: 313-393.

Hirji, R., and R. Davis. 2009. Environmental flows in water resources policies, plans, and projects: Findings and recommendations. The World Bank. 192 pages. ICF (2010 Page ES-1)

Holbrook, C.M., R.W. Perry, and N.S. Adams 2009. Distribution and joint fish-tag survival of juvenile Chinook salmon migrating through the Sacramento-San Joaquin River Delta, California, 2008: U.S. Geological Survey Open-File Report 2009-1204, 30 pp.

Jacobson, R.B. and D.L Galat. 2006. Flow and form in rehabilitation of large-river ecosystems: An example from the Lower Missouri River. *Geomorphology* 77 (2006)

249–269

Jassby, A., and E. Van Nieuwenhuyse. 2005. Low dissolved oxygen in an estuarine channel (San Joaquin River, California): mechanisms and models based on long-term time series. *San Francisco Estuary and Watershed Science* 3(2).

Jeffres, C.A., J.J. Opperman, and P.B. Moyle. 2008. Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook salmon in a California river. *Environmental Biology of Fishes* 83:449-458

Jones and Stokes. 2005. South Delta Improvement Program Draft Environmental Impact Statement/ Environmental Impact Report. http://sdip.water.ca.gov/documents/final_eis_eir.cfm

Jones & Stokes. 2004. Aeration technology feasibility report for the San Joaquin River deep water ship channel: Final. October. (J&S 03-405.)Sacramento, CA. Prepared for the California Bay-Delta Authority, Sacramento,CA.

Junk, W.J., and K.M. Wantzen. 2003. The flood pulse concept: New aspects, approachesand applications - an update. Proceedings of the Second International Symposium on the Management of Large Rivers for Fisheries: Volume II. 23 pp. http://www.fao.org/docrep/007/ad526e/ad526e0c.htm

Junk, W.J., P.B. Bayley, and R.E. Sparks. 1989. The flood pulse concept in river floodplain systems. Special publication. *Canadian Journal of Fisheries and Aquatic Science* 106:110–127

Kano, R.M. 1990. Occurrence and abundance of predator fish in Clifton Court Forebay, California. Interagency Ecological Studies Program for the Sacramento-San Joaquin Estuary. Technical Report 24, FF/BIO-IATR/90-24. http://library.ceres.ca.gov/cgi-bin/doc_home?elib_id=600

Kimmerer, W., and R. Brown. 2006. Final Report - Fish losses due to predation at the State Water Project and Central Valley Project Delta intakes: A summary of the June 22 - 23, 2005 Predation Workshop, including the expert panel final report. Prepared for Johnnie Moore, CALFED Lead Scientist. Sponsored by CALFED Bay-Delta Program's Science Program and California Department of Water Resource. http://198.31.87.66/pdf/workshops/SP_workshop_predation_report_final_052706.pdf

Kjelson, M.A., P.F. Raquel, and F.W. Fisher. 1982. Life history of fall-run juvenile Chinook salmon, *Oncorhynchus tshawystscha* in the Sacramento-San Joaquin Estuary, California. In: V.S. Kennedy (editor) *Estuarine Comparisons*. pp. 393-411. Academic Press Inc.

Kjelson, M.A., P.F. Raquel, and F.W. Fisher. 1981. Influences of freshwater inflow on Chinook salmon (*Oncorhynchus tshawytscha*) in the Sacramento-San Joaquin Estuary.

In: P.D. Cross and D.L. Williams (editors), *Proceedings of the National Symposium on Freshwater Inflow to Estuaries*, pp. 88-108. U.S. Fish and Wildlife Service, FWS/OBS-81-04.

Kondolf, G.M., A. Falzone, and K.S. Schneider. 2001. Reconnaissance-level assessment of channel change and spawning habitat on the Stanislaus River below Goodwin Dam. USFWS, March, 2002.

Kramer, S., S.Wilcox, B. Orr, and F. Ligon. 2001. Proposal: Effects of predation dynamics on outmigrating salmon in the Delta. Prepared for CALFED Ecosystem Restoration Program Prepared by Stillwater Sciences, Berkeley, CA.

Lee, G.F. 2005. Comments on the Draft San Joaquin River Deep Water Ship Channel Demonstration DissolvedOxygen Aeration Facility Initial Study/Mitigated Negative Declaration that was prepared by Jones and Stokes, Sacramento, CA, dated February 2005.

Lee, G. F. and A. Jones-Lee. 2003. Synthesis and discussion of findings on the causes and factors influencing low DO in the San Joaquin River Deep Water Ship Channel Near Stockton, CA: Including 2002 data. Report Submitted to SJR DO TMDL Steering Committee and CALFED Bay-Delta Program, by G. Fred Lee & Associates, El Macero, CA, March 2003. http://www.gfredlee.com/SynthesisRpt3-21-03.pdf

Lee, G. F. and A. Jones-Lee. 2000. Issues in developing the San Joaquin River Deep Water Ship Channel DO TMDL. Report to Central Valley Regional Water Quality Board, Sacramento, CA, August 2000.

Lee, G. F. and A. Jones-Lee. 2003. Summary of findings on the causes and factors influencing low do in the San Joaquin River Deep Water Ship Channel near Stockton, CA. Report of G. Fred Lee & Associates, El Macero, CA, March 2003. http://www.gfredlee.com/psjriv2.htm

Lindley, S.T., C.B. Grimes, M.S. Mohr, W. Peterson, J. Stein, J.T. Anderson, L.W. Botsford, D.L. Buttom, C.A. Busack, T.K. Collier, J. Ferguson, J.C. Garza, A.M. Grover, D.G. Hankin, R.G. Kope, P.W. Lawson, A. Low, R.B. MacFarlane, K. Moore, M. Palmer-Zwahlen, F.B. Schwing, J. Smith, C. Tracy, R. Webb, B.K. Wells, and T.H. Williams. 2009. What caused the Sacramento River Fall Chinook stock collapse? Pacific Fishery Management Council. March 18, 2009.

Lindley, S.T. and M.S. Mohr. 2003. Modeling the effect of striped bass (*Morone saxatilis*) on the population viability of Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*). *Fishery Bulletin* 101(2): 321–331.

Lindley, S., and M. Mohr. 1999. The effect of striped bass predation on recovery of the endangered Sacramento River winter Chinook: a Bayesian population viability analysis. Pages 177-181 *in* Management implications of co-occurring native and introduced fishes:

proceedings of the workshop. October 27-28, Portland, Oregon. Available from: National Marine Fisheries Service, 525 N. E. Oregon St., Suite 510, Portland, OR 97232.

Lorden, G. and J. Bartroff. 2010. Report on flow vs. escapement model and environmental data: Lordenstats, December 1, 2010. Report provided in Appendix 1 of this document.

Macneale, K.H., P.M. Kiffney, and N.L. Scholz. 2010. Pesticides, aquatic food webs, and the conservation of Pacific salmon. *Front Ecol Environ* 8(9): 475–482

Marchetti, M.P., and P.B. Moyle. 2001. Effects of flow regime on fish assemblages in a regulated California stream. *Ecological Applications* 11: 530-539.

Marine, K.M. 1997. Effects of elevated water temperature on some aspects of the physiological and ecological performance of juvenile chinook salmon (*Oncorhynchus tshawytscha*): implications for management of California's Central Valley salmon stocks. Masters Thesis. University of California, Davis.

Maslin, P. E, M. Lennox, J and W. R McKinney. 1997. Intermittent streams as rearing habitat for Sacramento River Chinook salmon.1997 Update.

Maslin, P. E, M. Lennox, J and W. R McKinney. 1998. Intermittent streams as rearing habitat for Sacramento River Chinook salmon.1998 Update.

Maslin, P., J. Kindopp, and M. Lennox. 1999. Intermittent streams as rearing habitat for Sacramento River Chinook salmon (*Oncorhynchus tshawytscha*): 1999 Update.

Mazvimavi, D., E. Madamombe, and H. Makurira. 2007. Assessment of environmental flow requirements for river basin planning in Zimbabwe. *Physics and Chemistry of the Earth* 32: 995-1006.

McBain and Trush, Inc. editor. 2002. San Joaquin River Restoration Study background report. Prepared for Friant Water Users Authority. Lindsay, California and Natural Resources Defense Council, San Francisco California. Arcata, California. December 2002. http://www.restoresjr.net/program_library/05-Pre-Settlement/index.html

McGinnis, S.M. 2006. Field Guide to Freshwater Fishes of California. UC Press Berkeley, CA.

Meador, J.P., T.K. Collier, and J.E. Stein. 2002. Use of tissue and sediment-based threshold concentrations of polychlorinated biphenyls (PCBs) to protect juvenile salmonids listed under the US Endangered Species Act. *Aquatic Conservation:Marine and Freshwater Ecosystems* 12: 493–516

Merz, J.E. 1994. Striped bass predation on juvenile salmonids at the Woodbridge Dam afterbay, Mokelumne River, California. East Bay Municipal Utility District.

Mesick, C.F., J.S. McLain, D. Marston, and T. Heyne. 2008. Limiting factor analyses & recommended studies for Fall-Run Chinook salmon and rainbow trout in the Tuolumne River. California Department of Fish and Game. Prepared for the U. S. Fish and Wildlife Service. Draft Report.

Mesick, C.F., and D. Marston. 2007. Provisional draft: Relationships between Fall-Run Chinook salmon recruitment to the major San Joaquin River Tributaries and stream flow, Delta exports, the head of the Old River barrier, and tributary restoration projects from the early 1980s to 2003.

Miranda, J., Padilla, R., Morinaka, J., DuBois, J., and M. Horn. 2010. Release Site Predation Study. California Natural Resources Agency, Department of Water Resources. May 2010. 189p
http://baydeltaoffice.water.ca.gov/announcement/Element2FinalReport5-2010.pdf

Moore, T. L. 1997. Condition and feeding of juvenile Chinook salmon in selected intermittent tributaries of the upper Sacramento River. Masters. California State University, Chico.

Moyle, P.B. 2002. Inland Fishes of California, 2nd Edition. University of California Press. Berkeley, CA. 502pp.

Moyle, P.B., P.K. Crain, K. Whitener, and J.F. Mount. 2003. Alien fishes in natural streams: fish distribution, assemblage structure, and conservation in the Cosumnes River, California, USA. *Environmental Biology of Fishes* 68: 143-162.

Newman, K.B. 2008. An evaluation of four Sacramento-San Joaquin River Delta juvenile salmon survival studies. CalFed Science Program. Source:
http://www.science.calwater.ca.gov/pdf/psp/PSP_2004_final/PSP_CalFed_FWS_salmon_studies_final_033108.pdf

National Marine Fisheries Service (NMFS). 2009. Biological opinion and conference opinion on the long-term operations of the Central Valley Project and State Water Projects. NMFS Endangered Species Act, Section 7 Consultation. 844pp.

Noble, H. 2008. A statistical model of Central Valley Chinook incorporating uncertainty: Description of Oncorhynchus Bayesian ANalysis (OBAN) for winter run Chinook. Prepared byR2 Resource Consultants, Inc., Redmond, Washington.
http://www.r2usa.com/oban/

Noble, H., R. Hilborn, R. Lessard, and A. Punt. 2008. A statistical model of Central Valley Chinook incorporating uncertainty: Oncorhynchus Bayesian ANalysis (OBAN). Presentation provided at a CALFED Science Program Brown Bag Series.

Nobriga, M.L. and F. Feyrer. 2007. Shallow-water piscivore-prey dynamics in California's Sacramento-San Joaquin Delta. *San Francisco Estuary and Watershed Science* 5(2): Article 4. NRDC 2005

Nobriga, M.L., F. Feyrer, R.D. Baxter, and M. Chotkowski. 2005. Fish community ecology in an altered river delta: spatial patterns in species composition, life history strategies, and biomass. *Estuaries* 28:776-785.

Orlando, J.L., and K.M. Kuivila. 2005. Concentrations of organic contaminants detected during managed flow conditions, San Joaquin River and Old River, California, 2001: U.S. Geological Survey Data Series 120, 13 p.

Orth, D.J., and O.E. Maughan. 1981. Evaluation of the "Montana Method" for recommending instream flows in Oklahoma streams. *Proceedings of the Oklahoma Academy of Science* 61: 62-66.

Palmer, M.L. and C.L. Sonke. 2010. Outmigrant trapping of juvenile salmonids in the Lower Tuolumne River, 2009. Submitted to Turlock Irrigation District and Modesto Irrigation District. February 2010. http://www.tuolumnerivertac.com/Documents/Tuolumne%20RST%20Annual%20Report%202009_final.pdf

Palmer, M.L. and C.L. Sonke. 2009. Outmigrant trapping of juvenile salmonids in the Lower Tuolumne River, 2009. Prepared by FISHBIO Environmental for Turlock and Modesto Irrigation
Districts. 61 pp.

Palmer, M.L. and C.L. Sonke. 2008. Outmigrant trapping of juvenile salmonids in the Lower Tuolumne River, 2008 – Final Report. Submitted to Turlock Irrigation District and Modesto Irrigation District. December 2008. http://www.tuolumnerivertac.com/Documents/2008%20Tuolumne%20Annual%20RST%20Report_FINAL.pdf

Paulsen, S and E.J. List. 2008. Effect of increased flow in the San Joaquin River on stage, velocity, and water fate, Water Years 1964 and 1988. Prepared by Flow Science, Inc., for San Joaquin River Group Authority. 107 pages.Report provided in Appendix 2 of this document.

Peake, S. and R.S. McKinley. 1998. A re-evaluation of swimming performance in juvenile salmonids relative to downstream migration. *Canadian Journal of Fisheries and Aquatic Sciences* 55: 682-687.

Pereira, W.E., J.L. Domagalski, F.D. Hostettler, L.R. Brown and J.B. Rapp. 1996. Occurrence and accumulation of pesticides and organic contaminants in river sediment, water and clam tissues from the San Joaquin River and tributaries, California. *Environmental Toxicology and Chemistry* 15(2):172-180.

Pickard, A., A. Grover, and F.A. Hall, Jr. 1982. An evaluation of predator composition at three locations on the Sacramento River. Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. Technical Report 2.

Poff, N.L., J.K. 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. *Bioscience* 47: 769-784.

Poff N.L. and J.V. Ward. 1989. Implications of streamflow variability and predictability for lotic community structure - a regional-analysis of streamflow patterns. *Canadian Journal of Fisheriesand Aquatic Sciences* 46:1805-1818.

Porter, R. 2009. Report on the predation index, predator control fisheries, and program evaluation for the Columbia River Basin experimental Northern Pikeminnow Management Program: 2009 Annual Report. Prepared for: U.S. Department of Energy, Bonneville Power Administration. Project Number 199007700. http://www.pikeminnow.org/reports.html

Pyper, B. and C. Justice. 2006. Analyses of rotary screw trap sampling of migrating juvenile Chinook salmon in the Stanislaus River, 1996-2005. August 2006.

Radtke, H.D., C.N. Carter, and S.W. Davis. 2004. Economic evaluation of the Northern Pikeminnow Management Program. Prepared for Pacific States Marine Fisheries Commission. June 2004.

Rea, M. 2010. Letter from Maria Rea, Sacramento Area Office Supervisor, National Marine Fisheries Service to Jim Kellogg, President, California Fish and Game Commission regarding striped bass sport fishing regulations. May 13, 2010.

Richter, B.D., J.V. Baumgartner, J. Powell, and D.P. Braun. 1996. A method for assessing hydrologic alteration within ecosystems. *Conservation Biology* 10: 1163-1174. Blackwell Publishing Ltd. (RBI 2007)

Rose, A.H., M. Manson and C.E. Grunsky. 1895. Report of the Commissioner of Public Works to the Governor of California. State Printing Office, Sacramento, CA.

Saiki, M.K. 1984. Environmental conditions and fish faunas in low elevation rivers on the irrigated San Joaquin Valley Floor, California. *California Fish and Game* 70(3):145-157.

Schoellhamer, D., S. Wright, J. Drexler and M. Stacy. 2007. Sedimentation conceptual model. Sacramento, (CA): Delta Regional Ecosystem Restoration Implementation Plan.

Shapovalov, L. 1936. Food of Striped Bass. *California Fish and Game* 22(4): 261-271.

SJRGA [San Joaquin River Group Authority]. 2010. 2009 Annual Technical Report: On implementation and monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan. pg.128. Source: http://www.sjrg.org/technicalreport/2009/2009-SJRGA-Annual-Technical-Report.pdf

SJRGA. 2009. 2008 Annual Technical Report: On implementation and monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan. pg. 58. Source: http://www.sjrg.org/technicalreport/2008/complete-2008.pdf

SJRGA. 2008. 2007 Annual Technical Report on the implementation and monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan. January 2008. 127 pgs. Source: http://www.sjrg.org/technicalreport/default.htm

SJRGA. 2007. 2006 Annual Technical Report on the implementation and monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan. January 2007. 137 pgs. Source: http://www.sjrg.org/technicalreport/default.htm

SJRGA. 2003. 2002 Annual Technical Report on the implementation and monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan. January 2003. 125 pgs. Source: http://www.sjrg.org/technicalreport/2002/2002_sjrg_report.pdf

SJRGA. 2002. 2001 Annual Technical Report on the implementation and monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan. January 2002. 125 pgs. Source: http://www.sjrg.org/technicalreport/default.htm

SJRTC [San Joaquin River Technical Committee]. 2008. Summary report of the Vernalis Adaptive Management Plan (VAMP) for 2000-2008. Report prepared for the Advisory Panel Review conducted by the Delta Science Program. 22 December 2008.

Sommer, T.R., W.C. Harrell, and M.L. Nobriga. 2005. Habitat use and stranding risk of juvenile Chinook salmon on a seasonal floodplain. *North American Journal of Fisheries Management* 25:1493-1504.

Sommer, T.R., W.C. Harrell, A.M. Solger, B. Tom, and W. Kimmerer. 2004. Effects of flow variation on channel and floodplain biota and habitats of the Sacramento River, California, USA. *Aquatic Conservation: Marine and Freshwater Ecosystems* 14:247-261.

Sommer, T.R., M.L. Nobriga, W.C. Harrell, W. Batham, and W.J. Kimmerer. 2001. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58: 325-333.

SPCA [S.P. Cramer & Associates]. 2001. 2001 Stanislaus River data report, final data. http://www.fws.gov/stockton/afrp/documents/2001_Stan_Data_Report.pdf

Stanislaus River Fish Group (SRFG). 2004. A summary of fisheries research in the Lower Stanislaus River (Working Draft), 10 March 2004. Source: http://www.delta.dfg.ca.gov/srfg/restplan/Fisheries_Research_03-08-04.doc

[State Water Board] [State Water Resources Control Board]. 2010, Development of flow criteria for the Sacramento-San Joaquin Delta Ecosystem. August 3, 2010.

Stevens, D.E. 1966. Food habits of striped bass, *Roccus saxatilis*, in the Sacramento-San Joaquin Delta. Pages 68-96 in Turner JL, Kelley DW (eds). Ecological studies of the Sacramento-San Joaquin Delta, part II, fishes of the Delta. *California Department of Fish and Game Fish Bulletin* 136. http://content.cdlib.org/xtf/view?docId=kt8h4nb2t8&doc.view=frames&chunk.id=d0e1592&toc.depth=1&toc.id=d0e1592&brand=calisphere

Swales, S., and C.D. Levings. 1989. Role of off-channel ponds in the life cycle of coho salmon (*Oncorhynchus kisutch*) and other juvenile salmonids in the Coldwater River, British Columbia. *Canadian Journal of Fisheries and Aquatic Sciences* 46:232-242.

Tennant, D.L. 1976. Instream flow regimens for fish, wildlife, recreation and related environmental resources. *Fisheries* 1: 6-10.

TBI [The Bay Institute]. 1998. From the Sierra to the sea. The ecological history of the San Francisco Bay-Delta watershed. The Bay Institute of San Francisco, San Francisco, California.

TBI/NRDC [The Bay Institute and Natural Resources Defense Council]. 2010a. Exhibit 1 - Written Testimony of Jonathan Rosenfield, Ph.D., Christina Swanson, Ph.D., John Cain, and Carson Cox Regarding General Analytical Framework.

TBI/NRDC. 2010b. Exhibit 3 - Written Testimony of Christina Swanson, Ph.D., John Cain, Jeff Opperman, Ph.D., and Mark Tompkins, Ph.D. Regarding Delta Inflows.

Thomas, J. L. 1967. The diet of juvenile and adult striped bass, *Roccus saxatilis*, in the Sacramento-San Joaquin river system. *California Fish and Game* 53:49–62.

Tucker, M.E., C.M. Williams, and R.R. Johnson. 1998. Abundance, food habits and life history aspects of Sacramento squawfish and striped bass at the Red Bluff Diversion Complex, including the Research Pumping Plant, Sacramento River, California, 1994-1996.Red Bluff Research Pumping Plant Report Series, Volume 4, United States Department of the Interior, Fish and Wildlife Service and Bureau of Reclamation, Red Bluff, California. 63 pp. http://www.usbr.gov/pmts/tech_services/tracy_research////redbluff/redbluffreport/Red%20Bluff%20Volume%2004.pdf

USFWS [U.S. Fish and Wildlife Service]. 1987. Exhibit 31: The needs of Chinook salmon, *Oncorhyncus tshawytscha*, in the Sacramento-San Joaquin Estuary. Entered by the U.S. Fish and Wildlife Service for the State Water Resources Control Board, 1987 Water Quality/Water Rights Proceeding on the San Francisco Bay/Sacramento-San Joaquin Delta.

USFWS. 1995. Working Paper on restoration needs: habitat restoration actions to double natural production of anadromous fish in the Central Valley of California. Volume 3. May 9, 1995. Prepared for the U.S. Fish and Wildlife Services under the direction of the Anadromous Fish Restoration Program Core Group. Stockton, CA.

USFWS. 2007. Abundance and survival of juvenile Chinook salmon in the Sacramento-San Joaquin Estuary: 2001-2005 annual progress report. Stockton fish and Wildlife Office. U.S. Fish and Wildlife Service. Stockton, CA. August 2007.

USFWS. 2006. Abundance and survival of juvenile Chinook salmon in the Sacramento-San Joaquin Estuary: 2000 annual progress Report. Stockton fish and Wildlife Office. U.S. Fish and Wildlife Service. Stockton, CA. November 2006.

VAMP Technical Team. 2009. Summary report for the Vernalis Adaptive Management Plan (VAMP) for the experimental determination of juvenile Chinook salmon survival within the lower san Joaquin River in response to river flow and State Water Project (SWP) and Central Valley Project (CVP) exports (2000-2008).

Van Nieuwenhuyse, E.E. 2002. Statistical model of dissolved oxygen concentration in the San Joaquin River Stockton Deepwater Channel at Rough and Ready Island, 1983-2001. Draft Technical Memorandum submitted to the San Joaquin DO TMDL Steering Committee TAC, US Bureau of Reclamation, Sacramento, CA, March 2002.

Vogel, D. 2010a. Evaluation of acoustic-tagged juvenile Chinook salmon movements in the Sacrament-San Joaquin Delta during the 2009 Vernalis Adaptive Management Program. Prepared by Natural Resources Scientists, Inc., Red Bluff, CA.

Vogel, D. 2010. Presentation Abstract: A synthesis of 22 telemetry studies to evaluate Chinook salmon smolt migration and mortality in California's Sacramento – San Joaquin Delta.Presentation given at 6th Biennial Bay-Delta Science Conference 2010□Ecosystem Sustainability: Focusing Science on Managing California's Water Future, September 27-29, 2010, Sacramento, CA.
http://www.deltacouncil.ca.gov/delta_science_program/pdf/conferences/sci_conf_2010/abstracts_oral/Fish%20Migration%20and%20Survival.PDF

Walker, K.F., F. Sheldon, and J.T. Puckridge. 1995. A perspective on dryland river ecosystems. *Regulated Rivers* 11:85-104.

Watry, C.B., A. Gray, J. Montgomery, C. Justice, and J.E. Merz. 2008. Juvenile salmonid out-migration monitoring at Caswell Memorial State Park in the Lower Stanislaus River, California. 2008 annual data report. Prepared for the U.S. Fish and Wildlife Service Anadromous Fish Restoration Program.

Williams, J. G. 2006. Central Valley Salmon: A perspective on Chinook and Steelhead in the Central Valley of California. *San Francisco Estuary and Watershed Science*, 4.

Williams, P. 2001. Restoring physical processes in tidal wetlands. *Journal of Coastal Research, special issue* 27, p. 149-161.

Weiser, M. 2010. Lawsuit: Striped bass to blame for California's salmon decline. Sacramento Bee. 27 February 2010.

Yoshiyama, R.M., E.R. Gerstung, F.W. Fisher, and P.B. Moyle. 1998. Historical and present distribution of Chinook salmon in the Central Valley Drainage of California. In: D.C. Erman, (ed.) *Sierra Nevada Ecosystem Project: final report to Congress. Vol. III. Assessments, commissioned reports, and background information.* Pp. 309-362 Davis, CA.

Figures

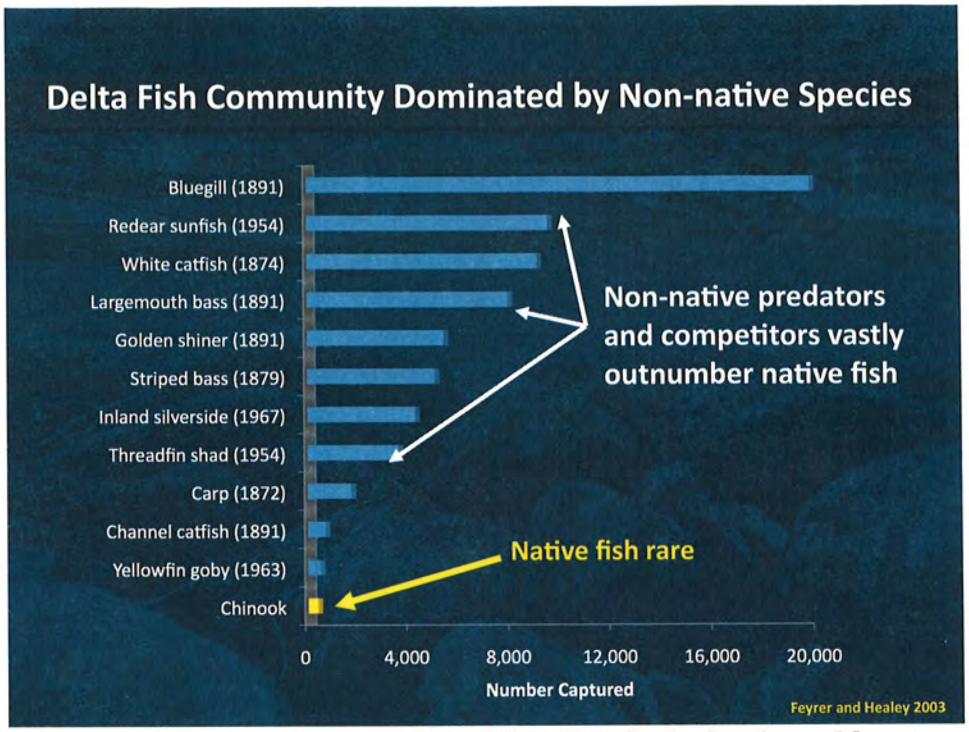

Figure 1. The fish community of the South Delta is dominated by non-native species (Feyrer and Healey 2003).

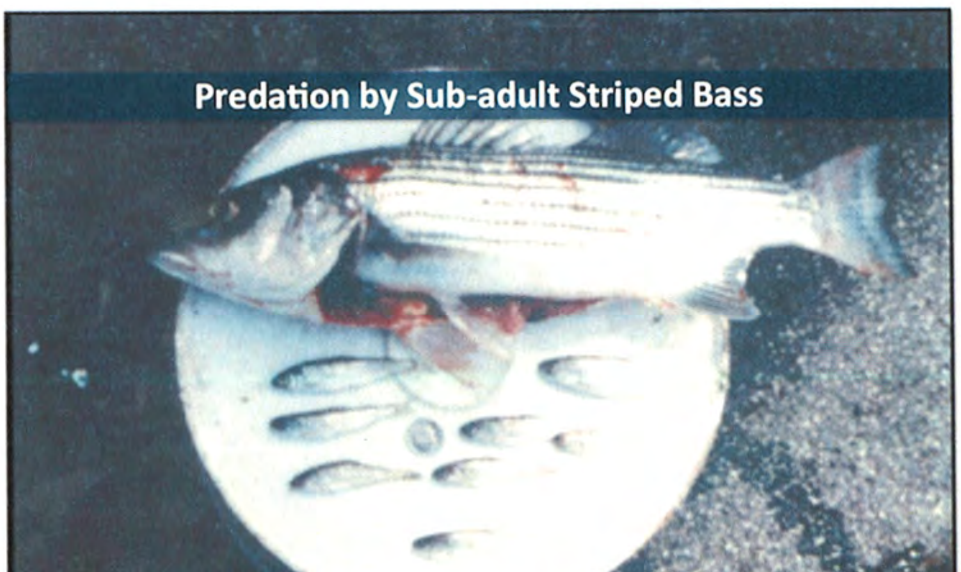

Figure 2. Sub-adult striped bass prey on Chinook smolts. Photo source:Hayes, D. 2005. SWP and CVP Fish Protective Facilities. Predation Workshop. http://science.calwater.ca.gov/pdf/workshops/SP_workshop_predation_Hayes_052805.pdf

Figure 3. Striped bass in the Stanislaus River with an *O. mykiss* smolt in its stomach. Photo source: Jack Alpers (OID).

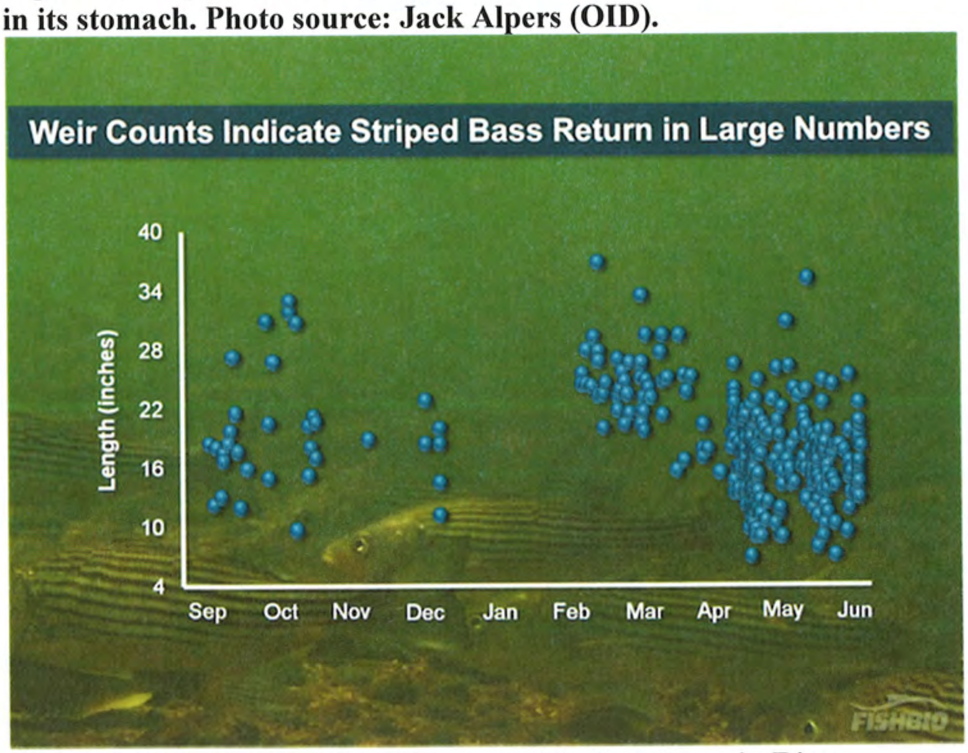

Figure 4. Large striped bass are present in San Joaquin River tributaries year round, with an increased presence in the spring (April-June). Data Source: Stanislaus River weir from 2003-2009 (n=378).

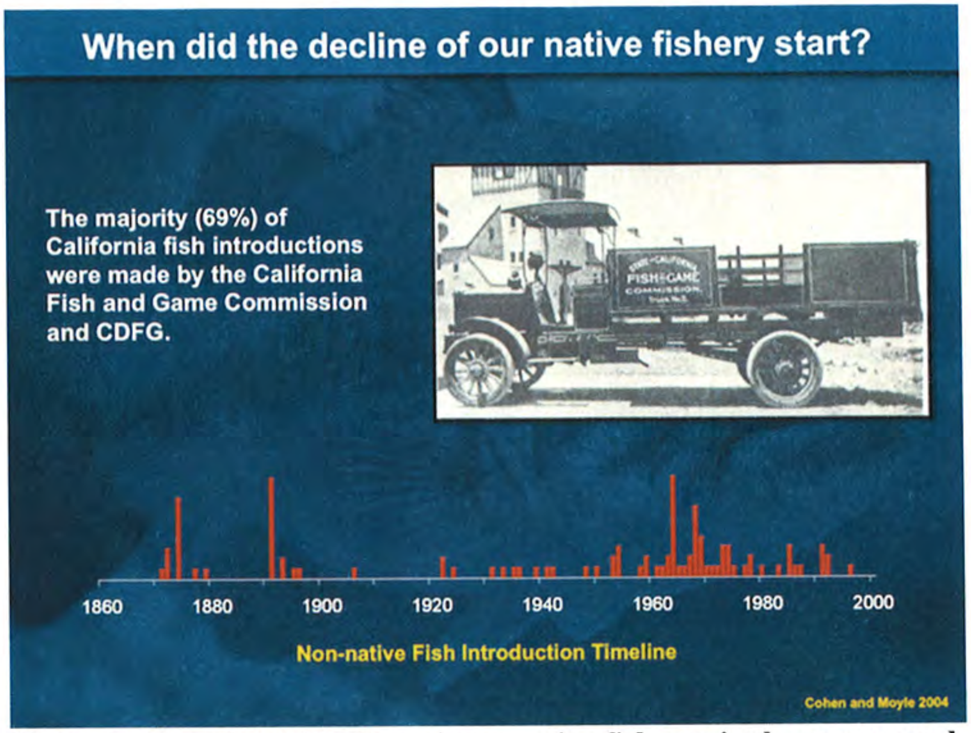

Figure 5. Many introductions of non-native fish species have occurred intentionally over the last 150 years (Cohen and Moyle 2004).

Figure 6. Several of the intentionally introduced sport fish species are predators.

Figure 7. The San Joaquin River contains a complex of oxbow lakes, backwater sloughs, ponds, and sand bars that become isolated when flow subsides.

Figure 8. Potential side channel devoid of terrestrial vegetation. These channels may not provide food and cover for outmigration smolts when they become inundated.

Figure 9. An example of the steep, rip-rapped banks of the lower San Joaquin River with limited or no vegetation.

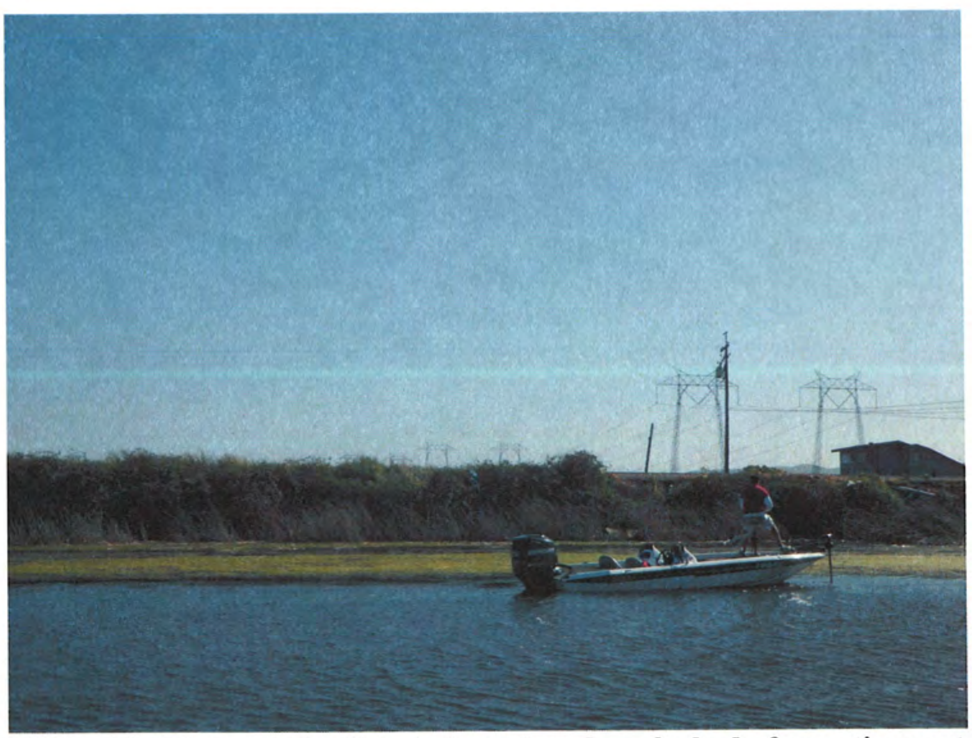

Figure 10. A bass angler fishes along the edge of a bed of aquatic vegetation in a slough in the South Delta. This habitat is often associated with largemouth bass.

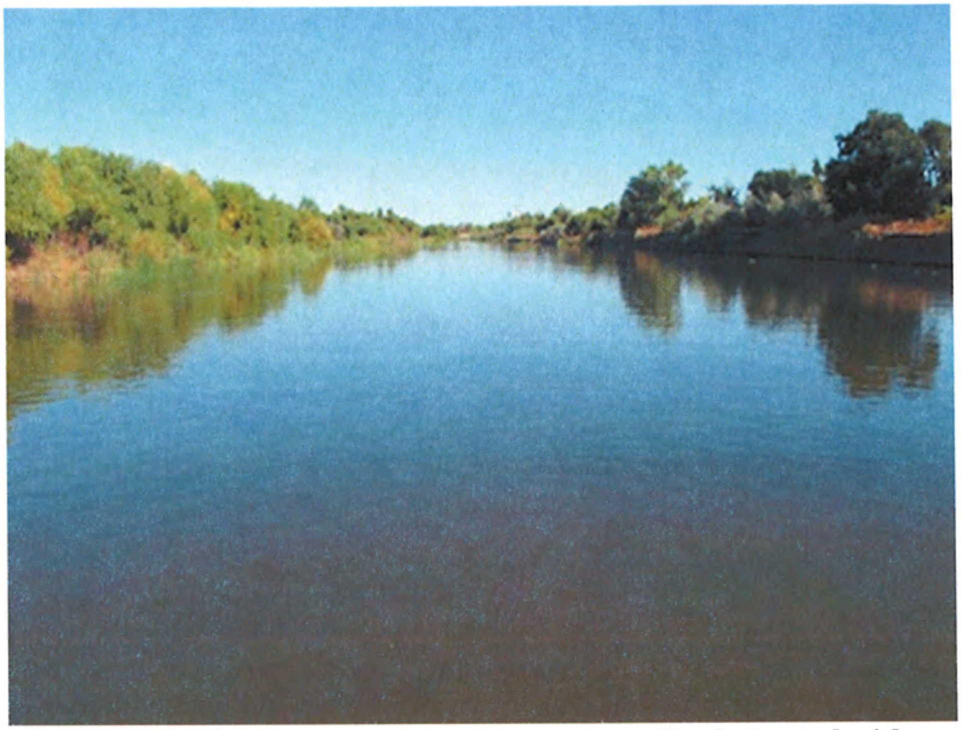

Figure 11. The lower San Joaquin River is a confined channel with steep levees on both sides.

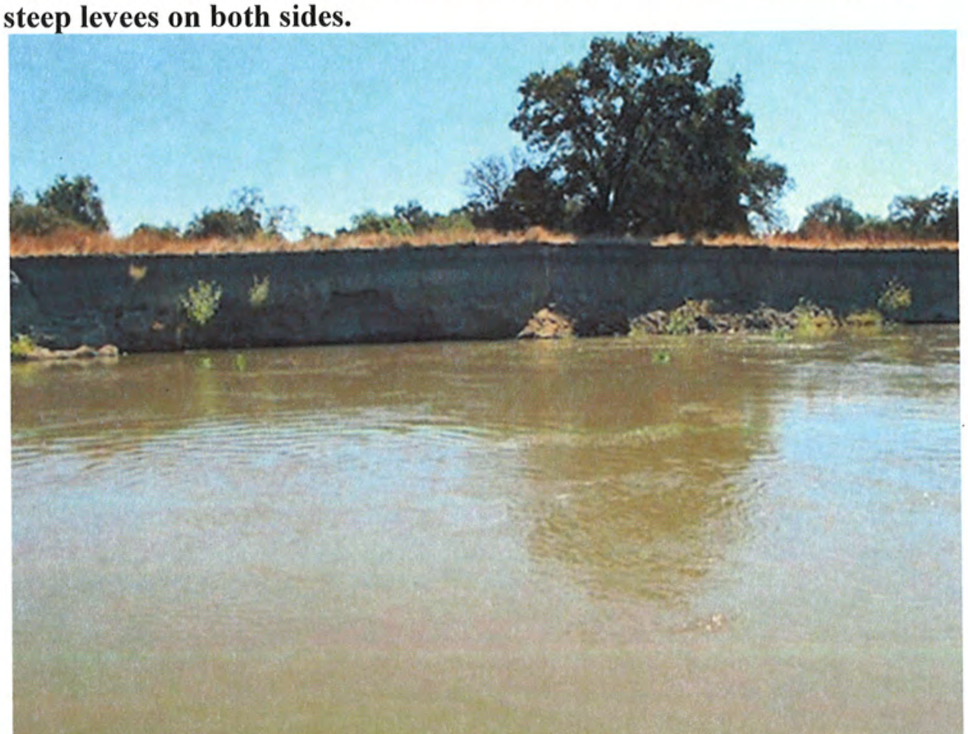

Figure 12. In some areas of the lower San Joaquin River, the steep levees have begun to erode.

Figure 13. A channel choked with non-native aquatic weeds.

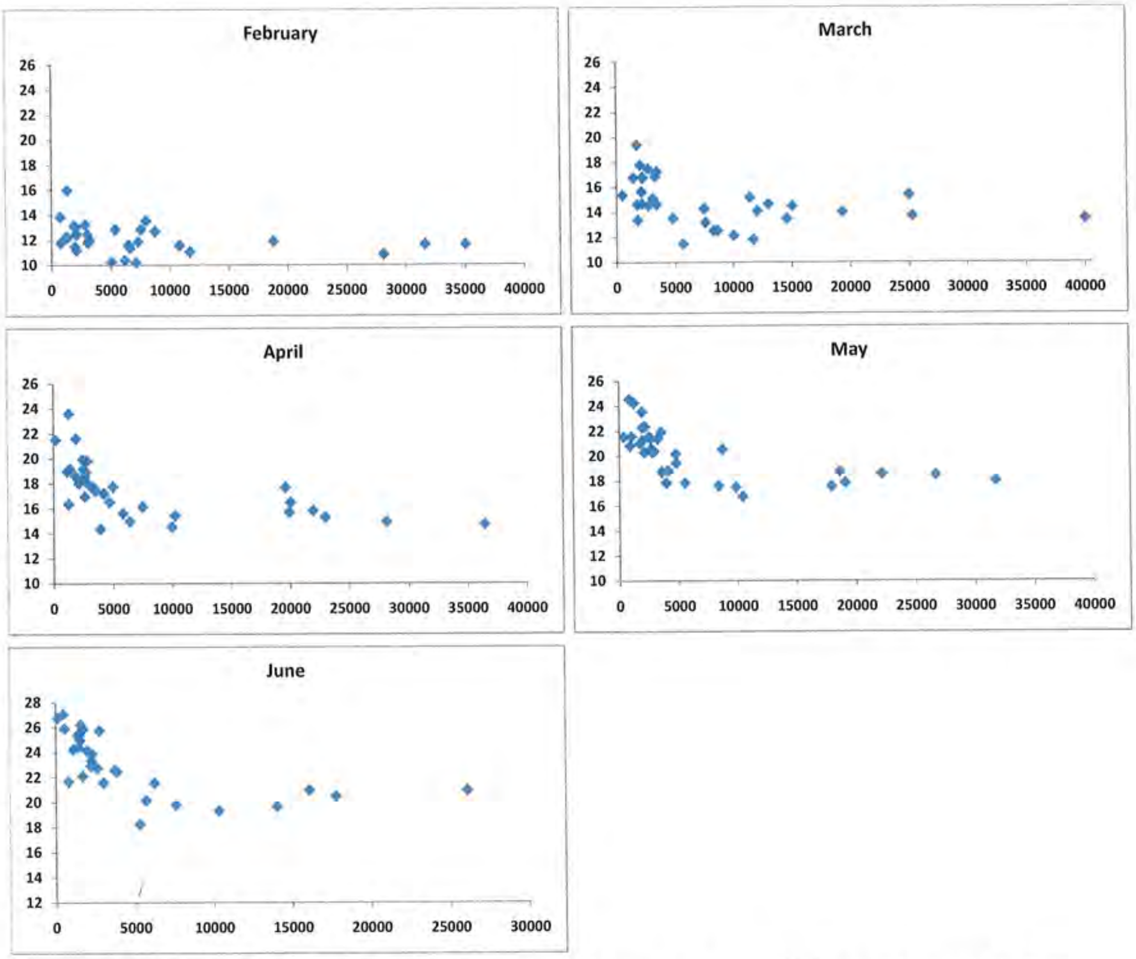

Figure 14. Monthly average flows (cfs) and average monthly maximum water temperatures (°C) at Vernalis, 1973-2006.

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Attorneys at Law

SENT VIA EMAIL/FIRST CLASS MAIL

May 23, 2011

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814
(commentletters@waterboards.ca.gov)

Re: Comment Letter-Southern Delta Ag and SJR Flow Revised NOP

Dear Ms. Townsend:

The following comments are submitted on behalf of the San Joaquin Tributaries Association, comprised of the Oakdale Irrigation District, South San Joaquin Irrigation District, Turlock Irrigation District, Modesto Irrigation District and Merced Irrigation District ("SJTA") for the Draft Southern Delta Water Quality Objectives for Agricultural Beneficial Uses. One or more additional comment letters will be submitted addressing other issues in the Revised Notice of Preparation ("Revised NOP").

Our comments are summarized here with more detailed explanations contained in the attachment to this letter.

1. Basic Science Has Been Ignored

The Strategic Workplan for the Bay-Delta consistently sought the use of "sound science" in future actions. (SWRCB 2008) The Revised NOP offers no explanation as to how or why the numeric values for the Proposed Electrical Conductivity ("EC") Objectives were chosen. Based on a review of the Proposed EC Objectives themselves, it is impossible to see where science (or logic) played any role. Both have clearly been ignored and disregarded.

2. Vernalis Objective is Inconsistent with Federal Law

The Vernalis Salinity Objective, as described and presented in Attachment 3 of the Revised NOP and Notice of Additional Scoping Meetings, is apparently set to provide assimilative capacity or dilution of waste streams downstream of Vernalis. Setting the objective to provide assimilative capacity is not consistent with federal law (Clean Water Act).

3. Waste Load Assessments Have Not Been Conducted

Neither the SWRCB's January 2011 Draft San Joaquin River Flow & Salinity Technical Report (SWRCB 2010a) ("Draft Technical Report") or the Revised NOP analyzes salt loads entering from within the South Delta and how these loads affect water quality and the agricultural irrigation beneficial use. Such an analysis is required if the objective is not being met and the state and regional boards are required to prepare a Total Maximum Daily Load ("TMDL") for that water quality limited segment. None has been prepared.

The Draft Technical Report actually showed, through regression. equations that degradation moving downstream from Vernalis to the interior measuring points is in the range of 5-7 percent from all sources of discharge and water use in the Southern Delta. The present proposal to provide assimilative capacity however appears to allow for a downstream degradation of 35-38 percent greater than Vernalis. Thus, it can only be assumed that the State Water Board is asking upstream water users to provide additional flows to allow for increased salt discharges in the Delta without conducting any waste load assessments, waste load allocations or restrictions on salt loading from in-Delta sources. Under the present scenario, there is unequal treatment under the law, as the State Water Board is proposing, to continue to restrict salt discharges and thus development, upstream of Vernalis in order to provide for unrestricted discharges of salt downstream of Vernalis.

4. The Proposed Vernalis Salinity Objective Provides an Inconsistent Message on Basin-wide Salt Management

By establishing a year-round water quality objective at Vernalis for protecting South Delta irrigated agricultural beneficial uses, even in periods when no known irrigation is taking place or in periods when the science shows that a higher limitation is justified, the Proposed EC Objective effectively imposes a load cap on further salt loading in the San Joaquin River Basin upstream of Vernalis. Thus this places a cap on further development in the San Joaquin River Basin in order to provide assimilative capacity for unrestricted discharges of salt downstream of Vernalis. This entire effort to establish an objective at Vernalis should be delayed until the Central Valley Regional Water Quality Control Board ("CVRWQCB") and the State Water Resources Control Board ("State Water Board") can determine what is needed in the San Joaquin River Basin as a whole, a task that should be accomplished through the CV-SALTS program the State Water Board asked the SJRGA to participate in.

5. The Draft Technical Report is incomplete

The State Water Board's staff's Draft Technical Report for the January 2011 workshop described the conclusions of the Hoffman Report and addressed other issues related to South Delta salinity. The Draft Technical Report has not been finalized and there has been no response to its failure to address the many issues critical to establishing salinity objectives for the Southern Delta and a program of implementation for such objectives. Proposed EC Objectives are premature until the Draft Technical Report is finalized and its many criticisms addressed.

6. There is No Explanation for the Proposed Objectives

There is currently no explanation as to how the Proposed EC Objectives' values were developed. An analysis establishing factors such as representative crops, reasonable precipitation and leaching fractions must come first. These are the most significant factors affecting crop salinity tolerance in the Southern Delta. The interaction of these factors, in addition to feasibility factors, determines the range of potential criteria used and for objectives.

7. Proposed EC Objectives Should Specify Compliance in deciSiemens per meter (dS/m)

The Draft Technical Report, "In keeping with the literature on crop response to salinity," used numerical values for EC in dS/m wherever possible, as opposed to the "now outmoded" unit of measure of millimhos per centimeter ("mmhos/cm"). The SJTA recommends that the State Water Board, in keeping with the scientific literature on crop response to salinity, use dS/m whenever possible, as opposed to the now outmoded unit of measure of mmhos/cm.

8. The Draft Objective Values Chosen are Inconsistent and Unsupported by Science

The proposed water quality objectives at Vernalis were not set based on the science provided in the Hoffman Report. The SJTA cannot determine the basis for the values used for the Proposed EC Objectives, because there is no consistent relationship between the Proposed EC Objectives and any of the thresholds or other values provided in the Hoffman Report and Draft Technical Report. The non-use of science is contrary to good public policy.

9. Vernalis and the Interior South Delta Should Have the Same Objective

The Proposed EC Objectives for Vernalis are different than those proposed for the Interior South Delta, but nothing in the Hoffman Report or Draft Technical Report suggests that crops, precipitation, leaching fraction, or other factors at Vernalis differ from those in the Interior South Delta. If the factors are the same, then the salt tolerance of crops should be the same and so should the salinity objective.

Additional assimilative capacity at Vernalis should not be a basis for an objective. Premising the Interior South Delta objectives in part on additional assimilative at Vernalis limits the discretion to use such methods and the degree to which they may be used effectively. The SJTA therefore recommends that the State Water Board address the use of additional flow/assimilative capacity at Vernalis as one of several possible implementation actions within the program of implementation; not as a basis for the objective.

The salinity between Vernalis and the three Interior locations has yet to be adequately described. Given that the September-March Interior South Delta Proposed EC Objective remains a range of potential criteria, it is clear that the necessary regression equations have neither been developed nor applied. If they had, then the Proposed EC Objective at Vernalis would reflect the proposed range of objectives for the Interior. First choosing a proposed Draft Objective necessary for reasonable protection of irrigated agricultural beneficial uses in the South Delta, the State Water Board would have then applied the regression equation and determined what would then be necessary at Vernalis. However, since there is no corresponding range of objectives for Vernalis, this analysis clearly did not occur and the proposed September-March Draft Objective for Vernalis has nothing to do with the proposed September-March Draft Objective for the Interior South Delta.

Under section 303(d) of the Clean Water Act, for all waters identified as not meeting objectives, the State Water Board must establish the total maximum daily load necessary to implement the objectives. (33 U.S.C. §1313(d)(1)(C).) The State Water Board cannot determine the amount of assimilative capacity required at Vernalis until it establishes a TMDL, assesses the salt loads, and determines the amount of assimilative capacity necessary to offset the load. However, using the Vernalis Salinity Objective as a measure of necessary assimilative capacity makes it more like a TMDL target than an objective.

Before requiring assimilative capacity at Vernalis as a method of implementing the Interior South Delta salinity objectives, the State Water Board should consider other methods, especially since such an implementation action could inevitably impose responsibility on upstream water users, even those with prior rights. Many parties responsible for the causes of salinity in the Interior South Delta, such as the Central Valley Project ("CVP"), State Water Project ("SWP"), and in-Delta discharges of salt have junior rights (or in some cases no rights), but if the Vernalis Salinity Objective cannot be implemented by upstream junior appropriators alone, the State Water Board would have to look to senior appropriators, even though physical solutions cannot unreasonably and adversely affect a prior appropriator's vested right or compel a prior appropriator to incur any expense in order to accommodate a junior appropriator. In addition, it would shift responsibility away from junior appropriators, who would be free to reduced assimilative capacity through consumptive use and the discharge of salts

10. Delete Objective for Southern Delta Water Levels and Circulation; Retain in Implementation and Water Right Conditions.

The narrative water level and circulation objective is intended to prevent "poor flow/circulation patterns in the southern Delta waterways" from causing localized increases in salinity concentration. (Revised NOP, p. 3.) The narrative water level and circulation objective therefore is not criteria directly providing reasonable protection of South Delta irrigated agriculture, but a method of implementing Interior South Delta Salinity Objectives. The narrative objective suffers not only from problems inherent in using an implementation action as an objective or in basing an objective on an implementation action (discussed *supra*); it suffers from other problems as well.

It potentially creates a new right for Interior South Delta diverters. Furthermore, even under "natural" conditions, there was inadequate flow to fully support Southern Delta agricultural beneficial uses. D-1641 determined, using unimpaired flow as a surrogate for natural flow, that only Wet year types, about 33 percent of years, had adequate year-round flow to fully support Southern Delta agricultural beneficial uses. In all other years, Southern Delta agricultural beneficial uses were less than fully supported, because adequate natural flow was not always available.

A better approach would be to eliminate the narrative water level and circulation objective as an objective and retain it in the program of implementation, with a discussion that the Department of Water Resources ("DWR") and U.S. Bureau of Reclamation ("USBR") are currently responsible for mitigating for the impacts on water levels and circulation caused by the activities of the CVP and SWP.

11. CEQA Requires the Evaluation of a Reasonable Range of Alternatives; so far There Are No "Alternatives"

As lead agency, the State Water Board has the duty to identify and evaluate a reasonable range of project alternatives for the Substitute Environmental Document ("SED"). (Laurel Heights Improvement Assoc. of S.F. v. Regents of the University of Cal. (1988) 47 Cal.3d 376, 406; Citizens of Goleta Valley v. Bd. of Supervisors of Santa Barbara County (1990)52 Cal.3d 553, 568.) There are a multitude of potential alternatives based on season, leaching fraction, precipitation, and other factors. Developing and proposing a reasonable range of alternatives should be no problem.

12. Recommended Alternatives For Consideration

Based on the modeling conducted in the Hoffman Report with exponential crop water uptake distributions, L=0.20, and again using beans and alfalfa as representative crops, a salinity water quality objective of 1.1 dS/m would protect agricultural beneficial uses in the Southern Delta from April through August. In September, bean irrigation sometimes continues, but, because it is more salt tolerant due to lower temperatures, the objective could be higher and still protect Southern Delta agricultural beneficial uses. From mid-March and through mid-October, the primary salt-sensitive crop irrigated is alfalfa, which, even in some of the worst leaching fractions in the Southern Delta and with minimal precipitation, would still produce yields unimpeded at 1.7 dS/m. (*see* **Error! Reference source not found.**, **Error! Reference source not found.**) A lower objective, such as 0.7 dS/m, may be desirable in the early part of the irrigation season, April 1 through June 15, to accommodate the risk of crop damage due to rapid evapotranspiration during early growth stages. Since no representative crop described in the Hoffman Report is irrigated from late October through early March, and no other beneficial uses have been identified for that part of the year, no objective has been recommended.

Very truly yours,

O'LAUGHLIN & PARIS LLP

Kenneth Petruzzelli

KENNETH PETRUZZELLI
Attorneys for San Joaquin Tributaries Association

KP/tb
Attachment

Attachment to Comment Letter – Southern Delta Agriculture and San Joaquin River Flow Revised NOP

1. Basic Science Has Been Ignored

The Strategic Workplan for the Bay-Delta consistently sought the use of "sound science" in future actions. (SWRCB 2008) To this end, the SWRCB contracted Dr. Glenn Hoffman, a preeminent expert in irrigation salinity management, to review the existing science and make recommendations on salinity tolerance of crops grown in the South Delta. The SJRGA, the State Water Contractors and the San Luis Delta Mendota Water Authority even stepped in to help fund the completion of Dr Hoffman's report in the hopes (and understanding) that the report would serve as a basis for salinity objectives based on sound, modern science. Comments were submitted in response to the report and two workshops were held during the report preparation. Dr Hoffman's final report, entitled *Tolerance of Crops in the Southern Sacramento-San Joaquin Delta* ("Hoffman Report"), describes the science of the salt tolerance of crops in the Southern Sacramento-San Joaquin Delta. This report was finalized over a year ago in January 2010(Hoffman 2010). The fundamental science described in the Hoffman Report was not disputed. The report's general conclusions were later summarized in a Draft Technical Report for San Joaquin River Flow and Salinity and described in a January 2011 workshop before the SWRCB. (SWRCB 2010a, p. 75-76.) During the January 2011 workshop, no significant disagreements with the science were voiced by any of the panel members you asked to comment on the report. Although the Hoffman Report carefully avoided saying exactly what a water quality objectives should be, the report states "the results of this report give adequate justification for the State Board to change the water quality objective." (Hoffman 2010, p. 113.) Surprisingly, the Revised NOP has recommended changes for the "Interior South Delta" (Brandt Bride, Old River at Middle River, and Old River at Tracy Road Bridge), but no change to the objective at Vernalis.

The Revised NOP offers no explanation as to how or why the numeric values for the Proposed EC Objectives were chosen. The SJTA has attempted to "reverse engineer" the Draft Objective values using the scientific principles in the Hoffman Report, albeit without the computer modeling, but can discern no consistency with the science described in the Hoffman Report and Draft Technical Report, let alone with any science and neither are the Proposed EC Objectives themselves logically consistent. Based on a review of the Proposed EC Objectives themselves it is impossible to see where science (or logic) played any role. Both have clearly been ignored and disregarded.

2. Vernalis Objective Violates Federal Law

The Vernalis objective as described and presented in Attachment 3 of the Revised NOP and Notice of Additional Scoping Meetings is apparently set to provide assimilative capacity or dilution of waste streams downstream of Vernalis. The main implementation action is the use of *increased inflows of low salinity water from upstream of Vernalis*. Thus this action is defining a beneficial use of San Joaquin River water upstream of Vernalis for waste assimilation. This action appears to be contrary to US EPA Regulation 40 CFR 131.10(a) which states "*In no case* *shall a State adopt waste transport or waste assimilation as a designated use for any waters of the United States.*"

Water quality objectives are set to protect a beneficial use. Since waste assimilation cannot be designated as a use, setting the objective to provide assimilative capacity is not consistent with federal law (Clean Water Act). If additional flow is needed to maintain assimilative capacity, this is evaluated through a waste load assessment (a TMDL or equivalent) and a water rights process.

3. Waste Load Assessments Have Not Been Conducted.

Under federal and state law, a water quality objective is set to protect the designated beneficial uses. If the objective is not being met, then the SWRCB and CVRWQCB are required to list that segment as a water quality limited segment on the 303(d) list of impaired water bodies and schedule the preparation of a Total Maximum Daily Load (TMDL) for that water quality limited segment. In preparing the TMDL, the CVRWQCB is required to assess and assign a load to all types of dischargers and other factors involved in causing the water quality objective exceedence. These load assignments distribute the stream's assimilative capacity to all dischargers along with an adequate margin of safety. No such analysis has been prepared for the San Joaquin River downstream of Vernalis.

A Salt and Boron TMDL was prepared by the CVRWQCB and approved by the SWRCB in 2005 for compliance with the salinity water quality objective for San Joaquin River at Vernalis. The area of consideration for this TMDL was loadings upstream of Vernalis to ensure the Vernalis objective was being met on a continuous basis. The basis for the objective at Vernalis, as analyzed in the TMDL, was protecting agricultural beneficial use. No such analysis has been conducted downstream of Vernalis to determine if load limitations are needed in order to protect the agricultural irrigation beneficial use within the Delta. The attachments in the Revised NOP simply call for additional flow from upstream to dilute waste loads downstream.

The Draft Technical Report has no analysis of the loads entering from within the South Delta and how these loads affect water quality and the agricultural irrigation beneficial use. The result is that the upstream dischargers and water users are being asked to limit loads through the Salt and Boron TMDL and provide additional flow of high quality water to dilute unrestricted discharges downstream of Vernalis. This requirement to provide for waste assimilation without a TMDL being conducted downstream is inconsistent with present federal law (40 CFR § 131.10(a).)

In the Revised NOP attachments it is implied that this assimilative capacity is needed for consumptive use of water within the Delta, but no analysis has ever confirmed this, whether the consumptive use of water requires the level of objective proposed for Vernalis, or how much consumptive use of water in the Southern Delta occurs in compliance with valid water rights. In addition, during testimony at previous workshops, water users downstream of Vernalis have asserted that they experience a high groundwater table and that this high groundwater moves into the crop root zone on a twice diurnal basis and must be discharged. Thus, it is unclear whether assimilative capacity is being provided for consumptive use, for the discharge of subsurface drainage water or to maintain irrigated agriculture in a tidal zone.

The Draft Technical Report actually showed, through regression equations, that degradation moving downstream from Vernalis to the interior measuring points is in the range of 5-7% from all sources of discharge and water use in the Southern Delta. (SWRCB 2010a, p. 70-72.) The present proposal to provide assimilative capacity, however, appears to allow for a downstream degradation of 35-38% greater than Vernalis. Thus, it can only be assumed that the SWRCB is requiring upstream water users to provide additional flows to allow for increased salt discharges in the Delta without conducting any waste load assessments, waste load allocations, or restrictions on salt loading from in-Delta sources. Regardless, under the present scenario, there is unequal treatment under the law as the SWRCB is proposing to continue to restrict salt discharges upstream of Vernalis in order to provide for unrestricted discharges of salt downstream of Vernalis.

4. The Proposed Vernalis Salinity Objective Provides an Inconsistent Message on Basin-wide Salt Management

The Salt and Boron TMDL for areas upstream of Vernalis calls for restrictions on salt loading from all sources, including consumptive use, irrigation return flows, municipal and industrial wastewater, high groundwater from crop root zones (agricultural subsurface drainage) and groundwater in-seepage. By establishing a year-round water quality objective at Vernalis to protect Southern Delta agricultural beneficial uses, even in periods when no known irrigation is taking place or in periods when the science shows that a higher limitation is justified, effectively places a load cap on further salt loading in the San Joaquin River Basin upstream of Vernalis. Thus this places a cap on further development in the San Joaquin River Basin in order to provide assimilative capacity for unrestricted discharges of salt downstream of Vernalis. This disparity and fragmentation of policy direction is frustrating all efforts to develop a salt management system that provides equity to all water users. The present proposal described in the Revised NOP is a disconnect between CVRWQCB efforts upstream to limit loading (TMDL limits) while allowing unrestricted and undocumented discharges downstream of Vernalis.

The upstream TMDL places a load limitation on all sources, including the high-quality eastside tributaries. The SWRCB's direction to the CVRWQCB in the 1995 Bay-Delta Plan and subsequent 2006 Bay-Delta Plan was to shift the salt loads coming from upstream of Vernalis to the higher flow periods when assimilative capacity appeared to be available. This direction was to focus on salt management as an integral component of water supply and river management. The proposal described in the Revised NOP effectively ruins any effort to do this by having unreasonable objectives for the protection of the South Delta irrigated agricultural beneficial uses in the higher flow periods, and especially when no surface water is being diverted for irrigation. The only alternative based upon the objectives proposed in the Revised NOP is to discharge salts during the spring pulse flow periods. This is the very time salts are not wanted in the system, because it is the most sensitive time for crop germination and early seedling growth and the most critical time for fish out-migration from the basin.

The entire effort to establish an objective at Vernalis should be delayed until the CVRWQCB and the SWRCB can determine what is needed in the entire San Joaquin River Basin as a whole. At present, the proposed water quality objectives for salinity at Vernalis provide an inconsistent message on how to develop a salt management plan for the San Joaquin River Basin and the

Central Valley. It restricts salt discharges when no known beneficial uses would be impacted and it then will redirect this salt loads to the groundwater basin and to storage of salt in the basin. This cannot continue long-term and also makes eventual salt management all the more difficult. It is unclear how the CV-SALTS effort, that the SJTA and many other stakeholders were told would provide that coordination, now applies and whether it can accomplish its goals.

One primary principal when considering salinity management, that appears to have been ignored in the Revised NOP, is that salinity and salt management is a basin-wide water management issue encompassing both surface and groundwater. For example, for the valley floor portion of the San Joaquin River Basin salt management must consider the impact of water transfers out of the basin, water importation into the basin, periodic dry and critically dry conditions and the impact of salt loads now coming from foothill development which is now becoming the responsibility of the valley floor water users.

Salinity management often does not conform to the standard discharge limitation approach that is used in the federal Clean Water Act and California's Porter Cologne Water Quality Control Act. For example, increased efficiency often means the return flows and waste water will carry a higher salinity concentration but in a smaller volume of return water or wastewater. There is no increase in salt introduced to the system; it is simply in a more concentrated form. Finding ways to manage this into the present water resource system and provide for salt export is critical to maintaining both the surface and groundwater quality of the San Joaquin River Basin. The present objective at Vernalis may mean that much of the San Joaquin River Basin salt becomes stored in the groundwater system while surface water is being used to provide dilution water for unrestricted discharges in the South Delta. Both areas need to deal with salt and somehow the SWRCB efforts need to be more focused on clear policy decisions on how to do this, not the present piecemeal effort.

5. The Draft Technical Report is Incomplete.

The report entitled *Tolerance of Crops in the Southern Sacramento-San Joaquin Delta* ("Hoffman Report"), describes the science of the salt tolerance of crops in the Southern Sacramento-San Joaquin Delta. This report was finalized over a year ago in January 2010. After public comments, two workshops by Dr. Hoffman himself, and a final report, the fundamental science was not disputed. The SWRCB staff Draft Technical Report for the January 2011 workshop described the conclusions of the Hoffman Report. As well the report addressed other issues related to South Delta salinity, such as water quality degradation between Vernalis and the Interior South Delta, but ignored many others, such as the impacts of agricultural runoff, both salts and sediments, channel hydrodynamics, barriers, and CVP and SWP pumping. The purpose of the information and tools described in the Technical Report were "intended to provide the Board with the scientific information and tools needed to establish SJR flow and southern Delta salinity objectives, and a program of implementation to achieve these objectives." Since a final report has not been issued, the Technical Report's information and tools remain in draft. The Draft Technical Report has not been finalized and there has been no response to its failure to address the many issues critical to establishing salinity objectives for the Southern Delta and a program of implementation for such objectives. (SJRGA 2010.)

6. There is No Explanation for the Proposed Objectives.

Tolerance of Crops in the Southern Sacramento-San Joaquin Delta ("Hoffman Report"), supports ranges of EC as potential salinity objectives, depending on the model used (steady state or transient), water uptake distribution (40-30-30 or exponential), leaching fraction, crop type, season, and other factors. (Hoffman 2010, p. 100-101.) However, there is currently no explanation as to how the Proposed EC Objectives in the Revised NOP were developed. There is no discussion of the leaching fractions used, the model, the crop water uptake distribution, or of any other factors and why such factors were selected as representative of South Delta conditions for the purposes of developing water quality objectives. It is impossible to know, for example, why the Draft Objective for the San Joaquin River between Vernalis and Brandt Bridge for April through August is 1.0 mmhos/cm, as opposed to 0.9 mmhos/cm, 1.1 mmhos/cm, or some other number, why the objective for the irrigation season is April through August, as opposed to some other period, or why the Proposed EC Objectives still rely on mmhos/cm as a measure of EC, even though the Draft Technical Report dispensed with this unit of measure and recommended against its continued use on the basis that it is now "outmoded."

An analysis establishing factors such as representative crops and reasonable precipitation and leaching fractions must come first. These are the most significant factors affecting crop salinity tolerance in the Southern Delta. The interaction of these factors, in addition to feasibility issues, determines the range of potential criteria used for developing water quality objectives. An explanation now, provided in response to comments, would inevitably become post-hoc analysis working backwards from criteria already recommended, as opposed to first selecting the determinative factors, such as reasonable leaching fractions and annual precipitation, and then developing criteria from those factors.

7. The Proposed EC Objectives Description Should Specify Compliance in deciSiemens per meter (dS/m)

The Draft Technical Report, "In keeping with the literature on crop response to salinity," used numerical values for EC in dS/m wherever possible, as opposed to the "now outmoded" unit of measure of millimhos per centimeter ("mmhos/cm").[1] The SJTA therefore recommends that the SWRCB, in keeping with the scientific literature on crop response to salinity, use dS/m whenever possible, as opposed to the now "outmoded" unit of measure of mmhos/cm.

Since other water quality control plans may still use mmhos/cm, it may be useful to add a footnote describing the unit conversion and directing applicable regional water quality control boards to update their applicable water quality control plans accordingly, if they have not already done so.[2]

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[1] Nowhere is the ignorance of science more evident than where the Proposed EC Objectives ignore such a simple recommendation from the Staff's own Draft Technical Report. Previous scientific efforts have clearly been ignored, forgotten, and disregarded.

[2] According to the Draft Technical Report, "EC values are sometimes also presented as microSiemens per centimeter (μS/cm) or micromhos per centimeter (μmho/cm), which are both 1000 times larger than numerical values in units of dS/m." (SWRCB 2010a, p. 69.)

8. The Draft Objective Values Chosen are Inconsistent and Unsupported by Science.

a. There is no discernible scientific basis for the Proposed EC Objectives.

The Proposed EC Objectives at Vernalis were not set based on the science provided in the Hoffman Report and were not set to protect existing crop production in the South Delta. Lacking an explanation as to the scientific basis for the Proposed EC Objectives, the SJTA attempted to "reverse engineer" them, but it can discern no scientific basis and no consistently logical relationship between the Proposed EC Objectives and any of the thresholds, values, or other factors described in the Hoffman Report whose interaction determines a crop's salt tolerance.[3]

At the conclusion of the January 2011 SWRCB workshop, the open questions were whether the science was complete and whether a peer review panel would accept the approach described by Hoffman. After the peer review, then a description of how to use the science would be put forward to the public for discussion. Neither step has been completed. They should be.

The open question is whether the science is complete to establish a water quality objective for the protection of the irrigation beneficial use? The SJTA feels it is. The SWRCB commissioned a study and report (Hoffman Report) that showed sufficient information to refine the water quality criteria for the irrigation beneficial use. The Hoffman Report also showed that some advanced data and models were unavailable, so conservative approaches had to be applied. The report was the subject of a review panel in front of the SWRCB (January 2011 Workshop) and the consensus on the panel was that the Hoffman approach was valid and the best science available.

The Draft Technical Report (staff report for the January 2011 Workshop) based on the Hoffman Report has not been finalized, despite significant public comments. Therefore it is only a guess at what the scientific basis of the proposed objectives in the Revised NOP is supposed to be. This lack of explanation leads us to wonder what the basis for the water quality objectives at Vernalis was. It was our understanding that the Hoffman Report was "*intended to provide the Board with the scientific information and tools needed to establish SJR flow and southern Delta salinity objectives, and a program of implementation to achieve these objectives.*" The Draft Technical Report, which was based on the Hoffman Report, needs to be completed. Until then the SWRCB lacks the scientific information and tools necessary to establish South Delta EC objectives and a program of implementation to achieve those objectives.

At the January 2011 workshop it was described that the Draft Technical Report would be peer reviewed. At was assumed that this effort would be used to peer review the Hoffman Report

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[3] Since there is no explanation as to how or why the values for the Proposed EC Objectives were chosen, the SJRGA can only speculate from the Hoffman Report and Draft Technical Report. The Hoffman Report was not intended to provide exhaustive modeling of salinity objective alternatives, but rather to establish a methodology that could be used later to model alternatives. As a result, the modeling so far has been limited. For example, while beans were modeled with leaching fractions of 15 and 20 percent, they were not modeled at 18 percent. (Hoffman 2010, p. 84.) Similarly, the modeling modeled relative bean yield and median and minimum precipitation, but not at any precipitation amounts in between. (Id.) The SJRGA's attempt at "reverse engineering" has therefore been conducted without the model itself and primarily with information available in the Hoffman Report.

as well the crop tolerance portion of the Draft Technical Report that was based on the Hoffman Report. Has the approach described in the Hoffman Report been peer reviewed and is additional peer review needed? The SJTA feels the Hoffman Report approach has received adequate peer review. The SJTA also feels the crop tolerance portion of the Draft Technical Report has received adequate peer review.

The University of California provided comments on the report that supported the approach but warned the SWRCB that the approach likely was conservative and would over-estimate the impacts of salinity. The SWRCB staff was provided with a peer-reviewed journal paper that evaluated the approach that Hoffman recommended. This review was provided by scientists from the University of California ("UC"), UC Water Resources Center, and the United States Department of Agriculture ("USDA") Agriculture Research Service Salinity Laboratory. Their conclusions were:

1. The approach suggested in the Hoffman Report is valid and has been used successfully for years;
2. Recent information shows the approach suggested is very conservative and likely over-predicts the salinity impacts; and
3. Recommends developing transient models to better simulate field conditions and limitations as time and money permits.

(Letey 2011, pp. 502-506.)

Based on this peer review of the Hoffman Report approach, the SJTA feels the present crop tolerance information is adequate to proceed, provides an adequate margin of safety as it over predicts salinity impacts and that there is really no need to subject this to further peer review. The Draft Technical Report should be finalized for the crop tolerance portion and made part of the record.

As for the Revised NOP, the SJTA can find no discernible scientific basis for the Proposed EC Objectives. There is no explanation for the proposed objectives. The Hoffman Report, supports ranges of electrical conductivity ("EC") as potential salinity objectives, depending on the model used (steady state or transient), water uptake distribution (40-30-30 or exponential), leaching fraction, crop, season, and other factors. (Hoffman 2010, p. 100-101.) However, there is no discussion in the Revised NOP of the leaching fraction used, the model, the crop water uptake distribution, or of any other factor. It is impossible to know, for example, why the Draft Objective for the San Joaquin River between Vernalis and Brandt Bridge for April through August is 1.0 mmhos/cm, as opposed to some other number or why the objective is April through August, as opposed to some other period.

In attempting to "reverse-engineer" the Proposed EC Objectives, it is apparent that values chosen are inconsistent and unsupported by science. There is no consistent relationship between the Proposed EC Objectives and any of the thresholds or other values provided in the Hoffman

Report and Draft Technical Report.[4] The non-use of science is contrary to good public policy. The Proposed EC Objectives are for surface water and the beneficial use protected is irrigated Southern Delta agriculture. Application of the Proposed EC Objectives must correspond to times of the year when representative crops are irrigated with surface water. Representative crops evaluated in the Hoffman Report were the dry bean, because it is the most salt sensitive crop in the South Delta with any significant acreage, alfalfa, a perennial crop, to establish a value for the time of year not governed by bean, and almond, because it was the most salt-sensitive perennial tree crop. (Hoffman 2010, p. 68.)

The values for the Proposed EC Objectives do not correspond to times of the year when these representative crops are irrigated. Beans are irrigated from April through September, although they become more salt tolerant in September when temperatures cool. (Hoffman 2010, p. 68, 80; SWRCB 1995, p. 29.) Similarly, almonds and other tree and vine crops are not irrigated in the winter between October and March. (Hoffman 2010, p. 38.) Finally, alfalfa has a growing season through winter, but normally goes dormant during periods of extended cold weather and is only irrigated from mid-March through mid-October. (Hoffman 2010, p. 68.) None of the representative crops evaluated in the Hoffman Report are irrigated from November through February. (*see* Table 1 **Error! Reference source not found.Error! Reference source not found.**.) To the degree irrigation occurs in March and September, it is for more salt tolerant crops. (Id.)

Water quality objectives are set to protect a beneficial use and it appears that no such beneficial use exists between November and March when no irrigation is occurring. Based on this, the only conclusion that can be found for the recommended water quality objective during the winter period is for dilution of waste discharges downstream. This is inconsistent with federal law which states "*In no case shall a State adopt waste transport or waste assimilation as a designated use for any waters of the United States.*" (40 CFR §131.10(a)) and is inconsistent with state law which calls for the making the maximum beneficial use of good quality supplies and not providing assimilative capacity to unrestricted and undocumented discharges. In the Water Quality Control Plan for the Sacramento River and San Joaquin River Basin ("Basin Plan") it states that "*Beneficial uses do not include all of the reasonable uses of water. For example, disposal of wastewaters is not included as a beneficial use. This is not to say that disposal of wastewaters is a prohibited use of waters of the State; it is merely a use which cannot be satisfied to the detriment of beneficial uses. Similarly, the use of water for the dilution of salts is not a beneficial use although it may* (be a reasonable use), *in some cases*".

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[4] Again, since there is no explanation as to how or why the values for the Proposed EC Objectives were chosen, the SJRGA can only speculate from the Hoffman Report and Draft Technical Report. In addition, the Hoffman Report was not intended to provide exhaustive modeling of salinity objective alternatives, but rather to establish a methodology that could be used later to model alternatives. As a result, the modeling so far has been limited. For example, while beans were modeled with leaching fractions of 15 and 20 percent, they were not modeled at 18 percent. (Hoffman 2010, p. 84.) Similarly, the modeling modeled relative bean yield and median and minimum precipitation, but not at any precipitation amounts in between. (Id.)

Table 1. Irrigation Seasons of Crops Modeled in the Hoffman Report.

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beans[5]				Yes	Yes	Yes	Yes	Yes	Yes[6]			
Alfalfa			Yes[7]	Yes	Yes	Yes	Yes	Yes	Yes	Yes[8,]**Error! Bookmark not defined.**		
Tree/vine[9]				Yes	Yes	Yes	Yes	Yes				

The open question remains how should the science described in the Hoffman Report should be used to set an EC objective for protection of the irrigated agricultural beneficial use in the Southern Delta. The science defined in the Hoffman Report and the Draft Staff Report for the January 2011 workshop shows that South Delta irrigated agriculture would be reasonably protected with an EC of 1.1 dS/m and, with good management, even higher.

For irrigation managers, the most critical time for salinity and crop production is during pre-planting, planting, germination, early seedling growth, and initial periods of growth when the crop has a limited root from which to draw water. (Hoffman 2010, p. 22.) This critical period is based on four factors that must be consider in establishing a salinity objective for water applied for irrigation; water salinity level (EC), crop sensitivity to salinity, leaching and the evapotranspiration rate.

1. Water salinity level (EC): This is the point we are trying to get to. The Hoffman report shows that we can manage quite well with an EC of 1.0 dS/m.
2. Crop sensitivity to salinity: The Hoffman report shows that the most sensitive crops (beans and alfalfa) can achieve maximum production with an EC of 1.0 dS/m.
3. Leaching: The present leaching achieved in the South Delta will allow continued production of all crop types with an EC of 1.0 dS/m. Based on what was proposed, it appears that a LF in the range of 0.10 to 0.15 was assumed in preparing the proposed salinity objectives. Achieving irrigation efficiencies necessary for such leaching fractions would call for extensive modifications in the irrigation technology presently used in the South Delta. Changes in irrigation technology in the Southern Delta are not likely with the present cropping pattern and irrigation needs. In addition, based on comments received from the University of California and the peer review paper cited earlier, the higher the efficiency of irrigation (needed to achieve LF = 0.10), the more conservative the recommended approach by Hoffman becomes. The review stated that as irrigation efficiency improves, the salinity impact overestimation becomes larger and more

[5] Beans are planted as early as April 1 and as late as mid-June. (Hoffman 2010, p. 68.) Beans planted April 1 are harvested by the end of July and beans planted in mid-June are harvested by the end of September. (Id.)

[6] Beans, in addition to other summer crops, are less salt-sensitive in September and October due to the cooler weather and shorter days than they are earlier in the summer. (SWRCB 1995, p. 29.)

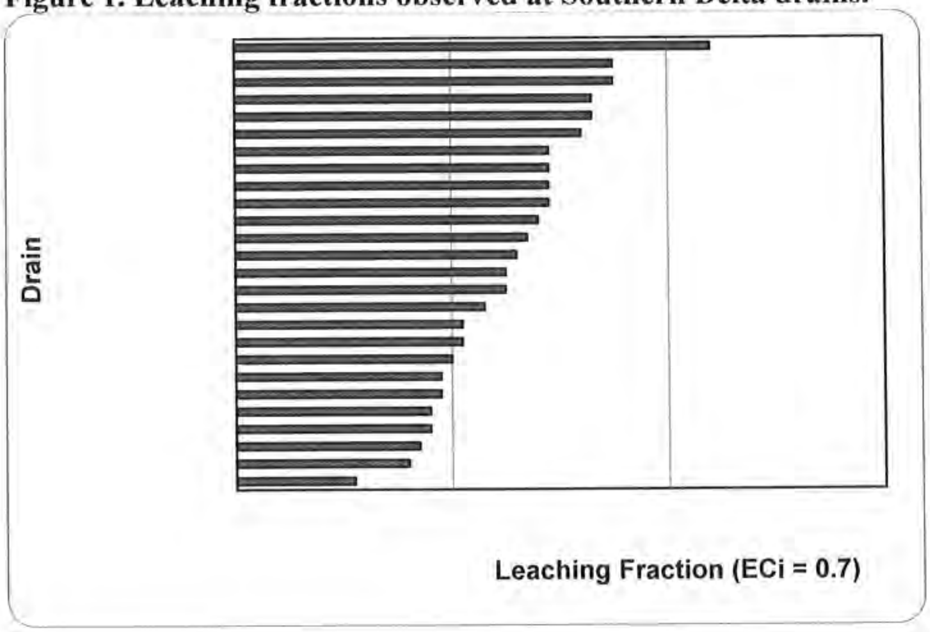
[7] Occurs March 15th, at the earliest. (Hoffman 2010, p. 68.)

[8] Last irrigation usually first week of October. (Hoffman 2010, p. 68.)

[9] Tree and vine crops such as almonds, apricots, and walnuts, although perennial, are not irrigated in the winter. (Hoffman 2010, p. 38.)

pronounced as this improved technology will likely be achieved by more frequent irrigations with small amounts of water and this allows for use of higher salinity water. This is unlikely to occur in the Southern Delta due to water availability and irrigation technology, neither of which is expected to change in the near future. According to the Hoffman Report, Southern Delta, leaching fractions generally range from 0.21 to 0.27. (SWRCB 2010a, p. 76.) With few exceptions, observed leaching fractions were 0.20 or higher (figure 1). Based on the Hoffman Report, this level of leaching should be assumed as changes to higher-cost irrigation technology for the salt sensitive crop identified (beans and alfalfa) are unlikely to occur in the foreseeable future.

Figure 1. Leaching fractions observed at Southern Delta drains.



4. Evapotranspiration rate: This is the one limiting factor that cannot be controlled or estimated. The most sensitive period of crop growth is during planting, germination, early seedling growth and initial periods of growth when the crop has a limited root zone from which to draw water. (Hoffman 2010, p. 22.) A small root zone limits the ability of the plant to respond to rapid changes in water demand or stress such as during hot temperatures, dry winds, low humidity, etc. Part of the process of minimizing crop water stress is that during high evaporative demands, the crop takes water from various places within its root system. As the plant takes up water, the salt that was in that water remains behind. Thus, during water uptake, the plant must also allow the salt that remains behind near the root (most salts do not enter the root during water uptake) to diffuse away from the root. This salt diffusion process takes time. If crop-water demand is too rapid, the salt does not have time to diffuse away, the plant cannot find low salt water, and water stress occurs. Pre-plant irrigation is a method commonly used to reduce the impact of rapid evapotransiration on crops during emergence and early growth

stages. Generally, the risk of crop damage from rapid evapotranspiration disappears after June 15. (Hoffman 2010, p. 72-74.)

The Hoffman Report shows that the first three factors (irrigation water EC, crop salt sensitivity, and leaching fraction) can be mitigated with a water salinity of 1.1 dS/m or less. The fourth factor is most uncertain. It cannot be measured, but cropping history in the South Delta shows that farmers have done extremely well during this germination and early growth period with a salinity of 0.7 dS/m.

b. Specific proposed numeric criteria are logically and scientifically inconsistent.

The Revised NOP offers no explanation as to how or why the numeric values for the Proposed EC Objectives were chosen. The SJTA has attempted to "reverse engineer" the Draft Objective values using the scientific principles in the Hoffman Report, albeit without the computer modeling, but can discern no consistency with the science described in the Hoffman Report and Draft Technical Report, let alone with any science and neither are the Proposed EC Objectives themselves logically consistent.

Based on the Hoffman Report, precipitation, crop type, and leaching fraction appear to be the dominant factors influencing crop salt tolerance in the South Delta. The interaction of these factors determines the salt tolerance of the crop. (*see* Table 2.)

Table 2. Summary of salt tolerance modeling in Hoffman Report.[10]

Crop	Minimum Precipitation		Median Precipitation	
	LF = 0.15	LF = 0.20	LF = 0.15	LF = 0.20
Bean	0.8	1.1	1.0	1.4
Alfalfa	1.7		1.9	
Almond	1.3		1.5	

The 0.7 mmhos/cm EC Proposed objective for Vernalis for April through August appear to correspond to the following -

- 100 percent yield of beans with L=0.20, minimum precipitation, and a 40-30-30 crop water uptake distribution. (Hoffman 2010, p. 84.) However, use of the 40-30-30 crop water uptake distribution is outdated and not recommended by either the Hoffman Report or the Draft Technical Report.
- 100 percent yield of almonds with L=0.10, regardless of precipitation and regardless of whether an exponential or 40-30-30 crop water uptake distribution is used. (Hoffman 2010, p. 92.) However, L=0.10 does not occur in the Southern Delta and is not representative of Southern Delta conditions.

The 1.0 mmhos/cm EC value for April through August for Vernalis appears to correspond to the following –

[10] Hoffman 2010, p. 84, 90, 95.

- 100 percent yield of beans with L=0.15, median precipitation, and an exponential crop water uptake distribution. (Hoffman 2010, p. 84, 100.) However, L=0.15 is uncharacteristically low for the Southern Delta and is not representative of Southern Delta conditions.
- 100 percent almond yield with L=0.10, median precipitation, and an exponential crop water uptake distribution. (Hoffman 2010, p. 90.) However, L=0.10 does not occur in the Southern Delta and is not representative of Southern Delta conditions.

The 1.0 mmhos/cm EC value for September through March for the Interior South Delta appears to correspond to the following –

- 100 percent alfalfa yield with L=0.10, minimum precipitation, and a 40-30-30 crop water uptake distribution. (Hoffman 2010, p. 90.) However, L=0.10 does not occur in the Southern Delta and is not representative of Southern Delta conditions. In addition, use of the 40-30-30 crop water uptake distribution is both outdated and not recommended by the Hoffman Report or by the Draft Technical Report.

The 1.4 mmhos/cm EC value for September through March does not correspond to any combination of values in the Hoffman Report.

The only Draft Objective value corresponding to any value in the Hoffman Report that appears marginally justifiable is 1.0 mmhos/cm EC value for April through August for the Interior locations, corresponding to 100 percent yield of beans with L=0.15, median precipitation, and an exponential crop water uptake distribution. (Hoffman 2010, p. 84, 100) Putting aside the fact that LF=0.15 is uncharacteristically low for the Southern Delta and unrepresentative of conditions, if L=0.15 is the leaching fraction that should apply throughout the Southern Delta and median precipitation is the precipitation that should apply, if the value at Vernalis for April through August is also based on the salt tolerance of beans, as it has been historically, then the Draft Objective value should also be 1.0 mmhos/cm.

9. Vernalis and the Interior South Delta Should Have the Same Objective

a. Science does not support different objectives for Vernalis and for the interior South Delta.

The Proposed EC Objectives for Vernalis are different than those proposed for the Interior South Delta, but nothing in the Hoffman Report or Draft Technical Report suggests that crops, precipitation, leaching fraction, or other factors at Vernalis differ from those in the Interior South Delta. If the factors did not differ, then the salt tolerance of crops should be the same and so should the salinity objective.

b. Additional assimilative capacity at Vernalis should not be a basis for an objective.

Premising the objectives on a method of implementation is fraught with problems. The SWRCB must implement the water quality objective in its water quality control plans. (St. Water

Resources Control Bd. Cases (2006) 136 Cal.App.4th 674, 735.) As a result, when the SWRCB has established objectives based in part on an assumed method of implementation in the past, problems have arisen when the method of implementation could not occur. For example, the SWRCB established salinity objectives in the Interior South Delta in the 1995 Bay-Delta Plan assuming that, by 1997, DWR, the USBR, and the South Delta Water Agency would have a contract, permanent barriers (also referred to as "permanent operable gates") would be built, or equivalent measures would be in place. (SWRCB 1995a, p. 17.) Although the objectives did not specify implementation using permanent operable gates, the permanent solution to South Delta water quality and supply problems had long been the "construction of physical facilities to provide better circulation and substitute supplies." (U.S. v. St. Water Resources Control Bd. (1987) 182 Cal.App.3d 82, 121.) D-1641 changed the timeline to 2005 and, until then, allowed for implementation of different objectives (0.7 mmhos/cm April-August and 1.0 mmhos/cm the rest of the year). (SWRCB Cases, *supra* 136 Cal.App.4th at 735.) When 2005 came and permanent operable barriers were not constructed and no other method was readily available, the SWRCB issued a cease and desist order, Order WR 2006-0006, ordering the USBR and DWR to report on its progress in constructing the permanent operable gates and take various actions to implement the objectives. (SWRCB 2010b.) Then, in 2010, NMFS issued its biological opinion prohibiting construction of the permanent operable gates and the SWRCB had to issue a follow-up order to the USBR and DWR, Order WR 2010-0002, ordering the USBR and DWR to investigate and develop other potential methods of implementing the objectives, with no guarantee that any proposed potential method would be effective or even feasible. (Id.)

In the 2006 Bay-Delta Plan, the SWRCB maintained its conclusion in D-1641 that "Water quality in the southern Delta downstream of Vernalis is influenced by San Joaquin River inflow; tidal action; diversions of water by the SWP, CVP, and local water users; agricultural return flows; and channel capacity." (SWRCB 2000a, p. 86; SWRCB 2006, p. 27.) San Joaquin River assimilative capacity is just one part of the South Delta salinity equation. Other actions, such as modified SWP and CVP operations and regulating local water users can contribute to meeting the objectives, possibly more effectively than additional assimilative capacity at Vernalis. However, premising the Interior South Delta objectives in part on additional assimilative at Vernalis limits the discretion to use such methods and the degree to which they may be used effectively. The SJTA therefore recommends that the SWRCB not repeat the mistake it made in 1995 and leave issues such as assimilative capacity to the water right proceeding.

c. The degradation relationship between Vernalis and the Interior South Delta has not been accurately described.

The salinity between Vernalis and the three Interior locations has yet to be adequately described. The Draft Technical Report assumes conditions from 1993 through 2009 have not changed, but the regression equation before 2008 is different from the equation after 2008. (SJRGA 2010, p. 3-7.) If conditions have changed and the correct regression equation was not used in developing the values for Proposed EC Objectives, then compliance may not occur. (SJRGA 2010, p. 24.) The regression equations also fail to adequately account for the effect of local sources of salinity. The regression equation for Old River at Tracy Road Bridge is significantly different than the equations for Union Island and Brandt Bridge, suggesting influence of local sources. (*see* SJRGA 2010, p. 3-7) In addition, although the Draft Staff Report concludes the influence of point source discharges is insignificant, the SWRCB has determined otherwise and concluded that point-source discharges, such as those from the City of Tracy Wastewater Treatment Plant, have a reasonable potential to cause or contribute to an excursion above water quality standards. (SWRCB 2009, p. 5.) Moreover, the Draft Technical Report only addressed the insignificance (again, incorrectly) of point source discharges. It ignored the potential impacts of salinity from agriculture activities and groundwater accretions. (SWRCB 2010a, p. 73.) The importance of the local salinity sources and especially the non-relationship at the Tracy Road Bridge was emphasized by many of the panel members in the 2001 SWRCB workshop. Since there has been no response to comments on the Draft Technical Report and the Draft Technical Report has not been finalized, there have been no responses to these issues, and since the Revised NOP does not explain how the numeric Proposed EC Objectives were determined, it is unclear whether these factors have been considered.

Regardless, given that the September-March Interior South Delta Draft Objective remains a range of potential criteria, it is clear that the necessary regression equations have neither been developed nor applied. If they had, then the Draft Objective at Vernalis would reflect the proposed range of objectives for the Interior. First choosing a proposed Draft Objective necessary for reasonable protection of irrigated agricultural beneficial uses in the South Delta, the SWRCB would have then applied the regression equation and determined what would then be necessary at Vernalis. However, since there is no corresponding range of objectives for Vernalis, this analysis clearly did not occur and the proposed September-March Draft Objective for Vernalis has nothing to do with the proposed September-March Draft Objective for the Interior South Delta.

d. Assimilative capacity at Vernalis should not be a method of implementation if other effective methods are available.

Regardless of what other actions may be available and effective in implementing the Proposed EC Objectives for the Interior South Delta, establishing the Vernalis Salinity Objective based on the desire for assimilative capacity for the Interior South Delta inevitably imposes responsibility on upstream parties.

The SWRCB previously addressed this issue in D-1641. It concluded that, although high quality water diverted from the upstream tributaries to the lower San Joaquin River substantially reduced the San Joaquin River's assimilative capacity, water users in the San Joaquin basin upstream of the Delta were not necessarily responsible for implementation of the southern Delta salinity objectives solely by virtue of their depletions. (SWRCB 2000, p. 80.) Water diverted by the upstream parties is put to beneficial use for purposes such as irrigation, hydropower generation, recreation, and fish and wildlife enhancement. (Id.) These are reasonable and beneficial uses that contribute to ensuring that the State's water resources are put to beneficial use to the fullest extent of which they are capable. (Id.) Since it is reasonable to expect that upstream development will eventually reduce the amounts of water available downstream, a riparian water user or senior appropriator has no right to insist that junior appropriators curtail their upstream use so that a sufficient flow remains to hold back tidal intrusion. (Town of Antioch v. Williams Irrig. Dist. (1922) 188 Cal. 451.) The SWRCB therefore concluded that it was not necessarily reasonable to require junior water right holders, solely because of their depletions, to release or bypass extra water to dilute downstream salinity. (U.S. v. St. Water Resources Control Bd. (1987) 182 Cal.App.3d 82, 117; Town of Antioch v. Williams Irr. Dist. (1922) 188 Cal. 451, 465.) Since water quality objectives were attainable by regulating other controllable factors it would have been both unreasonable and unnecessary to require diversion reductions upstream. (SWRCB 2000, p. 80.) Similarly, to the degree objectives in the Interior South Delta can be attained through the regulation of other controllable factors, they should not be attained by curtailing diversions of junior appropriators. By building the Vernalis Salinity Objective on assimilative capacity the SWRCB eliminates its discretion to attain objectives in the Interior South Delta by regulating other controllable factors

Unlike the fact pattern described in D-1641, many water users upstream are senior appropriators. D-1641did not address whether it had the authority to require senior water right holders, solely because of their depletions, to release or bypass extra water to dilute downstream salinity for the benefit of junior appropriators. However, physical solutions cannot unreasonably and adversely affect a prior appropriator's vested right or compel a prior appropriator to incur any expense in order to accommodate a subsequent appropriator. (City of Barstow v. Mojave Water Agency (2000) 23 Cal.4th 1224, 1250.)

Consequently, before requiring assimilative capacity as a method of implementing the Interior South Delta salinity objectives, the SWRCB should first consider other methods, especially since such an implementation action could inevitably become the responsibility of upstream water users, even those with prior rights. Many parties responsible for such causes of salinity in the Interior South Delta, such as the CVP, SWP, and in-Delta discharges of salt have junior rights (or in some cases no rights), but if the Vernalis Salinity Objective cannot be implemented by upstream junior appropriators alone, the SWRCB would have to look to senior appropriators, even though physical solutions cannot unreasonably and adversely affect a prior appropriator's vested right or compel a prior appropriator to incur any expense in order to accommodate a junior appropriator. The USBR is currently responsible for the flow-based actions implementing the Vernalis Salinity Objective. Although it is the major junior water right holder upstream of Vernalis, it is facing increasingly heavy burdens through Endangered Species Act and flow

e. A Total Maximum Daily Load is required.

Under section 303(d) of the Clean Water Act, for all waters identified as not meeting objectives, the SWRCB must establish the total maximum daily load necessary to implement the objectives. (33 U.S.C. §1313(d)(1)(C).) The Interior South Delta waters are currently on California's list of Water Quality Limited Segments. A TMDL is therefore required. Consistent with the TMDL listing, the SWRCB, in response to the South Delta Water Agency's argument that it did not add to the Interior South Delta salt load, state that "agricultural activity does increase the salinity of the water in the Delta channels" and that "Irrigators within the Delta could implement water management measures as a means of controlling salt impacts within the Delta channels." (SWRCB 2000, p. 87.) Then, in the 2006 Bay-Delta Plan, ordered the CVRWQCB to "impose discharge controls on in-Delta discharges of salts by agricultural, domestic, and municipal dischargers." (SWRCB 2006, p. 28.)

The SWRCB cannot determine the amount of assimilative capacity required at Vernalis until it establishes a TMDL, assesses the salt loads, and determines the amount of assimilative capacity necessary to offset the load. Using the Vernalis Salinity Objective as a measure of necessary assimilative capacity makes it more like a TMDL target than an objective, because the "objective" at Vernalis is not being used for the reasonable protection of beneficial uses in any particular area, instead to assist in the implementation of the Interior South Delta objectives by monitoring whether there is sufficient assimilative capacity in the San Joaquin River at the point it enters the Delta. If the SWRCB needs a regulatory target to establish necessary assimilative capacity for the Interior South Delta, then it should establish a TMDL and, if necessary, set a TMDL target at Vernalis based on the assimilative capacity necessary to offset salt loading within the Interior South Delta. Only when loads from point sources, agriculture, groundwater accretions, and other sources have been assessed can the SWRCB determine how much assimilative capacity is necessary and reasonable. So far, however, nothing has occurred.

10. Delete Objective for Southern Delta Water Levels and Circulation; Retain in Implementation and Water Right Conditions.

The narrative water level and circulation objective is intended to prevent "poor flow/circulation patterns in the southern Delta waterways" from causing localized increases in salinity concentration. (Revised NOP, p. 3.) The narrative water level and circulation objective therefore is not criteria directly providing reasonable protection of South Delta irrigated agriculture, but a method of implementing Interior South Delta Salinity Objectives. The narrative objective suffers not only from problems inherent in using an implementation action as an objective or in basing an objective on an implementation action (discussed *supra*); it suffers from other problems as well.

First, it potentially creates a new right for Interior South Delta diverters. The Delta is a tidal marsh and, especially in Critical years, seawater intruded far into the South Delta. (SWRCB 1978, p. II-5.) Even if water levels remained "adequate" at such times, it would have had much higher concentrations of total dissolved solids. The DWR and the USBR are responsible for implementing the Interior South Delta objectives, because, in D-1641, the SWRCB found their actions the cause of null zones. (SWRCB 2000, p. 87, 159, 161, 163.) If, however, null zones occurred naturally or under pre-project conditions, in order to fully implement the narrative water level and circulation objective the SWRCB would be required to order other parties, even those whose actions do not cause null zones, to nonetheless assist in implementing the objective.

Additionally, even under "natural" conditions there was inadequate flow to fully support Southern Delta agricultural beneficial uses. D-1641 determined, using unimpaired flow as a surrogate for natural flow, that only Wet year types, about 33 percent of years, had adequate year-round flow to fully support Southern Delta agricultural beneficial uses.[11] In all other years Southern Delta agricultural beneficial uses were less than fully supported, because adequate natural flow was not always available. (*see* Table 3, below.)

[11] In the 107 years from 1904 through 2009, there were 35 Wet year types, 20 Above Normal year types, 18 Below Normal year types, 15 Dry year types, and 19 Critical year types.

Table 3. Southern Delta Water Availability Analysis[12]

Southern Delta Diversion Requirement (cfs)

Jul	Aug	Sept	Oct
1,400	1,334	1,057	902

Natural Flow Minus South Delta Diversion Requirement (cfs)

Year Type	Jul	Aug	Sept	Oct
W	12,685	2,274	634	601
AN	4,567	94	-476	26
BN	2,915	-410	-672	-373
D	488	-741	-406	-118
C	176	-804	-725	-402

Riparian water levels only have a right to natural flow. (U.S. v. St. Water Resources Control Bd. (1987) 182 Cal.App.3d 82, 104.) When sufficient natural flow is unavailable, riparian users must reduce their diversions and take their correlative share. (Id.) Furthermore, riparian water users (and appropriators) have no right to divert flows previously stored that have not been abandoned. (St. Water Resources Control Bd. Cases (2006) 136 Cal.App.4th 674, 738.) The only way for the narrative water level and circulation objective to fully support Southern Delta agricultural beneficial uses at all times would be to require the release of stored water, but since riparian water users do not have the right to require the release of stored water the narrative water level and circulation objective would be creating a new right and reallocate water from one group of users to another.

A better approach would be to eliminate the narrative water level and circulation objective as an objective and retain it in the program of implementation, with a discussion that the DWR and USBR are currently responsible for mitigating for the impacts on water levels and circulation caused by the activities of the CVP and SWP.

11. CEQA Requires the Evaluation of a Reasonable Range of Alternatives; so far There are No "Alternatives."

As lead agency, the SWRCB has the duty to identify and evaluate a reasonable range of project alternatives for the SED. (Laurel Heights Improvement Assoc. of S.F. v. Regents of the University of Cal. (1988) 47 Cal.3d 376, 406; Citizens of Goleta Valley v. Bd. of Supervisors of Santa Barbara County (1990)52 Cal.3d 553, 568.) Other than the range of objectives proposed for September through March for the Interior South Delta, the range of alternatives is limited or non-existent. Since the only proposed objective for the Interior South Delta for April through August would change the existing objective, the only alternative is the No Project/No Action alternative. For Vernalis, since no change is proposed, there are no alternatives. Having only a No Project/No Action alternative and the Preferred Alternative is "take it or leave" and proposing only the No Project/No Action proposes no alternatives at all. Neither is a reasonable range of alternatives.

[12] *See* SWRCB 2000, p. 32.

There are a multitude of potential alternatives based on season, leaching fraction, precipitation, and other facts. Developing and proposing a reasonable range of alternatives should be no problem.

12. Recommended Alternatives.

Based on the modeling conducted in the Hoffman Report with exponential crop water uptake distributions, L=0.20, and again using beans and alfalfa as representative crops, a salinity water quality objective of 1.1 dS/m would protect agricultural beneficial uses in the Southern Delta from April through August. In September, bean irrigation sometimes continues, but, because it is more salt tolerant due to lower temperatures, the objective could be higher and still protect Southern Delta agricultural beneficial uses. From mid-March and through mid-October, the primary salt-sensitive crop irrigated is alfalfa, which, even in some of the worst leaching fractions in the Southern Delta and with minimal precipitation, would still produce yields unimpeded at 1.7 dS/m. (*see* Table 4, below.) A lower objective, such as 0.7 dS/m, may be desirable in the early part of the irrigation season, April 1 through June 15, to accommodate the risk of crop damage due to rapid evapotranspiration during early growth stages.

Table 4. Potential Objectives Based on Minimum Precipitation and Leaching Fraction.[13]

Precipitation/LF	Jan-Mar 14	Mar 15-Mar 31[14]	Apr-Sep	Oct 1-Oct 15[15]	Oct 16-Dec
Minimum/0.15		1.7	0.8	1.7	
Minimum/0.20		>1.7	1.1	>1.7	
Median/0.15		1.9	1.0	1.9	
Median/0.20		>1.9	1.4	>1.9	

No representative crop reviewed in the Hoffman Report is irrigated from late October through early March. As a result, available information does not support the existence of agricultural beneficial uses at that time. Therefore, no objective is recommended for November through February for the protection of irrigated Southern Delta agricultural beneficial uses. Although other beneficial uses may exist for which salinity objectives may be required for reasonable protection, information presently available has not identified such uses or described what criteria may be necessary to reasonably protect them. As a result, there is insufficient information to propose any objectives for the period of October 16 through March 14.

[13] The Hoffman Report did not model alternatives for LF in between 0.15 and 0.20 or precipitation in between the minimum and the median, at least not in a manner easy to translate from the report to recommendations. As a result, such alternatives have not been presented, although the availability of information as to such alternatives would be useful.

[14] Would begin March 15th and run until the end of March.

[15] Would begin October 1st and run until October 15th.

References

Department of Water Resources (DWR) 1995. *Sacramento-San Joaquin Delta Atlas*. http://baydeltaoffice.water.ca.gov/DeltaAtlas/04-WaterQuality.pdf

Hoffman, G. J. 2010. Salt Tolerance of Crops in the Southern Sacramento-San Joaquin Delta. January 2010. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/docs/final_study_report.pdf

Letey, John et al. 2011. Evaluation of soil leaching requirements. *Agricultural Water Management*, vol. 95. http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6T3X-51BP6J9-1-1&_cdi=4958&_user=10&_pii=S0378377410002763&_origin=search&_zone=rslt_list_item&_coverDate=02%2F28%2F2011&_sk=999019995&wchp=dGLzVlb-zSkzS&md5=f3a3b89fb6ac9d5e9a74ec85dbf33b03&ie=/sdarticle.pdf

San Joaquin River Group Authority (SJRGA) 2010. SJR Technical Report Workshop. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/comments120610/tim_olaughlin2.pdf

State Water Resources Control Board (SWRCB). 1978. Water Quality Control Plan Sacramento-San Joaquin Delta and Suisun Marsh. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/docs/1978wqcp.pdf

State Water Resources Control Board (SWRCB). 1995a. Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/1995wqcp/1995_plan.shtml

State Water Resources Control Board (SWRCB). 1995b. In the Matter of Petition for Changes in the Water Rights Authorizing Diversion and Use of Waters in the Watershed of the Sacramento-San Joaquin Delta, held by California Department of Water Resources and United States Bureau of Reclamation. http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/1995/wro95-06.pdf

State Water Resources Control Board (SWRCB). 2000. Water Right Decision 1641 (revised) In the matter of implementation of water quality objectives for the San Francisco Bay/Sacramento-San Joaquin Delta; petition to change the POD for the Central Valley Project and State Water Project in the southern delta; petition for change in place of use and purpose of use of the Central Valley project. http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649.shtml

State Water Resources Control Board (SWRCB). 2006. Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/2006wqcp/docs/2006_plan_final.pdf

State Water Resources Control Board (SWRCB). 2008. Strategic Workplan for Activities in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/strategic_plan/docs/baydelta_workplan_final.pdf

State Water Resources Control Board (SWRCB). 2009. In the Matter of the Petition of Environmental Law Foundation and California Sportfishing Protection Alliance for review of Waste Discharge Requirements Order No. R5-2007-0136 and Time Schedule Order No. R5-2007-0037 [NPDES No. CA0079154] for the City of Tracy Wastewater Treatment Plant, San Joaquin County issued by the California Regional Water Quality Control Board,Central Valley Region SWRCB/OCC FILE A-1846(a) and A-1846(b). http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2009/wqo/wqo2009_0003.pdf

State Water Resources Control Board (SWRCB). 2010a. Draft Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives. http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/docs/techrpt102910.pdf

State Water Resources Control Board (SWRCB). 2010b. Order WR 2010-0002. In the Matter of Cease and Desist Order WR 2006-0006 against the Department of Water Resources and the United States Bureau of Reclamation in Connection with Water Right Permits and License for the State Water Project and Central Valley Project. http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/2010/wro2010_0002.pdf

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SENT VIA E-MAIL/FIRST-CLASS MAIL

May 23, 2011

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1011 I Street
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commentletters@waterboards.ca.gov

RE: Comments of the San Joaquin Tributaries Association to the April 1, 2011 Revised Notice of Preparation and Notice of Additional Scoping Meeting

Dear Ms. Townsend:

These comments are submitted on behalf of the San Joaquin Tributaries Association, comprised of the Oakdale Irrigation District, South San Joaquin Irrigation District, Modesto Irrigation District, Turlock Irrigation District and Merced Irrigation District ("SJTA").

1. The State Water Board Has Improperly Pre-Determined the Major Elements of Its Plan of Implementation.

A. State Water Board's Pre-Determination Violates Principles of Administrative Law.

The State Water Board's findings cannot be *post hoc* rationalizations for a decision it has already made. (Bam, Inc. v. Board of Police Com'rs (1992) 7 Cal. App. 4th 1343, 1346). As part of the administrative process in determining the program of implementation for the Draft San Joaquin River Fish and Wildlife Flow Objectives, the State Water Board cannot randomly leap from evidence to conclusions, but rather must explain in the record the legally relevant findings and sub-conclusions it has drawn in support of its ultimate determination. Therefore, the basis of the State Water Board's determination of how the narrative San Joaquin River flow objective will be implemented must be based exclusively on **evidence in the record** in the proceeding and on matters officially noticed in the proceeding. (*See* Cal. Govt. Code § 11425.50). Additionally the State Water Board is required to provide findings to bridge the analytic gap between the raw evidence and its ultimate determination and thus, the record must **show the steps** the State Water Board took in reaching its decision. (*See* Dore v. County of Ventura (1994) 23 Cal. App. 4th 320, 327; Topanga Assn. for a Scenic Community v. County of Los Angeles (1974) 11 Cal.3d 506, 515).

In the Draft San Joaquin River Fish and Wildlife Flow Objectives Program of Implementation, however, the State Water Board has **already determined** that in order to achieve the narrative San Joaquin River flow objective, more flow of a more natural pattern is needed. Specifically, the State Water Board determined:

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(1) X percent of unimpaired flow is required
(2) from February through June
(3) from the Merced, Stanislaus and Tuolumne Rivers
(4) on an X day average
(5) to a maximum of X cubic-feet per second at Vernalis
(6) to mimic the natural hydrographic conditions; and
(7) a base flow of X cfs is required
(8) on an X-day average
(9) from February through June
(10) to be obtained proportionately
(11) from the Merced, Stanislaus and Tuolumne Rivers.
(12) The flow objective will be implemented through water right actions
(13) through water quality actions
(14) through Federal Energy Regulatory Commission (FERC) hydropower licensing, and
(15) through actions by other agencies
(16) in an adaptive management framework
(17) adaptive management flows cannot be less than X percent of unimpaired flow
(18) from each of the Merced, Stanislaus and Tuolumne Rivers
(19) over the entire February through June period
(20) up to a maximum of X cfs at Vernalis.
(21) modifications shall not result in a change of more than X percent of unimpaired flows
(22) from any one tributary (Merced, Stanislaus and Tuolumne Rivers)
(23) over the entire February through June period
(24) modifications shall not result in a change of more than plus or minus X cfs at Vernalis for base flow
(25) modifications shall not result in a change of plus or minus X cfs for the upper end of the flow requirement at Vernalis, and
(26) these modifications will not require modification to the program of implementation in accordance with applicable water quality control planning processes.

The only remaining item yet to be determined is X, i.e. the amount. The draft notice states that X is used as a placeholder and that the final program of implementation will have a fixed value based on subsequent analysis. Therefore, the State Water Board has stated that the subsequent analysis will merely consist of considering various values of X only, and will not consider any other factors. This is because the State Water Board has already determined all those other factors, namely, what is required, when it is required, from where it will be obtained, from whom it will be obtained, how it will be obtained, how it will be executed, and how it will be modified.

While it may appear that there is still something left for the State Water Board to consider, that the State Water Board may review the information and comments that are to be submitted in response to this notice, and that it may even rely on that information and those comments as the basis for its determination of what X will be, this is hardly sufficient to demonstrate that the State Water Board is truly following the legal process as required for the quasi-judicial functions that it is performing. The State Water Board has pre-determined the way in which it wishes to implement the flow objective and although it will be accepting information and comments with regard to X, it is not open to suggestions, information, or comments regarding the way in which it wishes to implement the flow objective.

Clearly, the State Water Board has taken that illegal, random leap from evidence to conclusion without bridging the analytic gap between the evidence and its ultimate determination because the State Water Board has made a determination before all the information it is legally required to review has even been submitted.

First, the process is still ongoing and the State Water Board is still soliciting information. In fact, the notice to which these comments respond specifically states that "the State Water Board **is requesting additional comments** from responsible and trustee agencies and interested persons … ." The point of this process is to generate information upon which the State Water Board could use in its discretion to determine whether new flow objectives are necessary and if so, why. The State Water Board must take into consideration all the information and comments **before** it makes its decision. With regard to the program of implementation for the Draft San Joaquin River Fish and Wildlife Flow Objectives, however, the State Water Board has already made its decision before the requested information and comments are even due to be submitted.

Second, no administrative record exists yet. While an administrative record typically is a collection of documents that form the basis for an agency's decision, in this case the decision has already been made. The State Water Board is unable to point to any documents in the record to explain its findings, nor can it point to any evidence in the record to show the steps it took in reaching its ultimate determination because, at present, there is no record. The documents to be submitted, which will eventually be included in the administrative record, will not be reviewed in order to assist the State Water Board in making its decision. Rather, the State Water Board will point to them later, selecting the ones supporting the decision it has already made as those documents upon which it relied. Therefore, any steps the State Water Board may eventually point to in the administrative record to justify its determination, once such administrative record is eventually complied, will be nothing more than *post hoc* rationalizations for the decision it has already made.

Providing such information and comments in response to the Draft San Joaquin River Fish and Wildlife Flow Objectives Program of Implementation, however, which are supposed to be reviewed by the State Water Board, considered by the State Water Board in making its determination, and to become part of the administrative record, is nothing more than worthless exercise in futility as the State Water Board has already made up its mind.

B. The State Water Board is in Violation of the California Environmental Quality Act ("CEQA") Because It Has Already Committed Itself to a Definitive Course of Action.

The CEQA process is intended to be a careful examination, fully open to the public, of the environmental consequences of a given project, covering the entire project, from start to finish. This examination is intended to provide the fullest information reasonably available upon which the decision makers and the public they serve can rely in determining whether to start the project at all, not merely to decide whether to finish it. (*See* Natural Resources Defense Council, Inc. v. City of Los Angeles (2002) 103 Cal.App.4th 268, 271). CEQA is "to provide decision makers with information they can use in deciding *whether* to approve a proposed project, not to inform them of the environmental effects of projects that they have already approved." (Laurel Heights Improvement

Assn. v. Regents of University of California (1988) 47 Cal. 3d 376, 394). Thus, an analysis of the environmental impact of a proposed project under CEQA must be conducted **before** an agency commits itself to a definitive course of action. (14 CCR § 15352(b)).

The State Water Board's purpose for conducting a CEQA analysis of the impacts the plan of implementation of the San Joaquin River flow object is to evaluate information regarding the various impacts that may occur and then conclude whether to approve the project. The State Water Board is required to time the CEQA analysis such that the proposed project is far enough along to be definitive and the subject of meaningful review, but not so far along that it cannot be amended, shaped and changed by the environmental review. (*See*, *e.g.*, Laurel Heights Improvement (*supra*) 47 Cal.3d at 396-399; Save Tara v. City of West Hollywood (2008) 45 Cal.4th 116, 138-139).

The CEQA analysis should have been conducted already because the State Water Board has committed itself to a definitive course of action that cannot be amended, shaped and changed by the environmental review. While "X" and the environmental impacts of various options for "X" may still be considered and evaluated, the State Water Board has already committed to the following:

(1) X percent of unimpaired flow is required
(2) from February through June
(3) from the Merced, Stanislaus and Tuolumne Rivers
(4) on an X day average
(5) to a maximum of X cubic-feet per second at Vernalis
(6) to mimic the natural hydrographic conditions;
(7) a base flow of X cfs is required
(8) on an X-day average
(9) from February through June
(10) to be obtained proportionately
(11) from the Merced, Stanislaus and Tuolumne Rivers.
(12) The flow objective will be implemented through water right actions
(13) through water quality actions
(14) through Federal Energy Regulatory Commission (FERC) hydropower licensing, and
(15) through actions by other agencies
(16) in an adaptive management framework
(17) adaptive management flows cannot be less than X percent of unimpaired flow
(18) from each of the Merced, Stanislaus and Tuolumne Rivers
(19) over the entire February through June period
(20) up to a maximum of X cfs at Vernalis.
(21) modifications shall not result in a change of more than X percent of unimpaired flows
(22) from any one tributary (Merced, Stanislaus and Tuolumne Rivers)
(23) over the entire February through June period
(24) modifications shall not result in a change of more than plus or minus X cfs at Vernalis for base flow
(25) modifications shall not result in a change of plus or minus X cfs for the upper end of the flow requirement at Vernalis, and

(26) these modifications will not require modification to the program of implementation in accordance with applicable water quality control planning processes.

Such commitment to the utilization of the above listed factors to implement the San Joaquin River flow objectives by the State Water Board, despite requesting additional information and comments regarding the scope and content for the Substitute Environmental Document ("SED"), violates CEQA because the State Water Board has failed to fully considered the environmental consequences of its plan of implementation. (Save Tara, *supra*, 45 Cal.4th at 136 (citation omitted)). In this case, the State Water Board has reduced CEQA to a perfunctory process whose result will produce a SED "that describes a journey whose destination is already predetermined … before the public has any chance to see either the road map or the full price tag," (Natural Resources Defense Council, *supra*, 103 Cal.App.4th at 271) and thus will be nothing more than a document of *post hoc* rationalization. (Save Tara, *supra*, 45 Cal.4th at 136 (citation omitted)).

2. The State Water Board's Intended Use of the Federal Energy Regulatory Commission ("FERC") Process to Implement Objectives Will Violate Equal Protection.

The equal protection clause of both the federal (U.S. Const., 14th Amend.) and state (Cal.Const., art. I, § 7(a)) constitutions require that persons similarly situated with respect to the legitimate purpose of a law must be treated alike under the law. (Cleburne v. Cleburne Living Center, Inc., 473 US 432, 439 (1985); Cooley v. Superior Court (2002) 29 Cal.4th 228, 253). The constitutional right to equal protection under the law applies both to groups and individuals who are said to comprise a "class of one." (Village of Willowbrook v. Olech, 528 US 562, 564 (2000)). To succeed on a "class of one" claim, a party must demonstrate that the government has (1) treated the party differently than other similarly situated parties, (2) such disparate treatment was intentional, and (3) there is no rational basis for the distinction in treatment. (Gerhart v. Lake County, Montana, __ F.3d __ (9th Cir. 2011) [2011 WL 923381, p. 7]; Las Lomas Land Co., LLC v. City of Los Angeles (2009) 177 Cal.App.4th 837, 858). The State Water Board's Revised Notice clearly suggests that the State Water Board plans on violating the equal protection rights of the Merced, Modesto and Turlock Irrigation Districts.

The Merced Irrigation District ("MeID") owns and operates the Merced River Hydroelectric Project (FERC Project No. 2179) on the Merced River in accordance with the terms and conditions of a license issued by FERC which expires in 2014. MeID has filed a notice of its intent to apply for a new license, and plans on filing its application for a new license with FERC by February 2012. Although formal application for a new license has not yet been filed, the relicensing process has been commenced and various studies are being planned and performed to assist FERC in establishing appropriate license conditions.

The Modesto and Turlock Irrigation Districts ("MID" and "TID") jointly own and operate the Don Pedro Hydroelectric Project (FERC Project No. 2299) on the Tuolumne River in accordance with the terms and conditions of a license issued by FERC which expires in 2016. MID and TID filed a notice of intent to apply for a new license in 2011, and plan on filing an application for a new license with FERC by 2014. As with the MeID, although a formal application has not yet been filed, the relicensing process for the Don Pedro Project has begun.

The State Water Board is acutely aware of the status of the relicensing efforts before FERC described above, and is participating in both. While such participation is entirely appropriate for purposes of developing a water quality certification under Section 401, the Revised Notice indicates that the State Water Board intends to use the above-mentioned FERC processes inappropriately. That is, the Revised Notice plainly states that the State Water Board intends to use "water right and FERC proceedings to implement the narrative San Joaquin River flow objective." (Revised Notice, p. 6). In fact, the SWRCB intends to rely so heavily on the FERC processes to implement the flow objectives that it has indicated that it will act to "coordinate" the water right and FERC processes, and that implementation of the objectives may be phased to achieve compliance "with the narrative objective by the completion of the FERC proceedings on the Merced and Tuolumne Rivers, or no later than 2020, whichever occurs first." Such blatant intent to rely upon and use the FERC proceedings to implement the objectives has no rational basis and violates the equal protection rights of MeID, MID and TID.

The principal enforcement mechanism available to the State Water Board for insuring compliance with its water quality control plans and objectives is the regulation of water rights (U.S. v. SWRCB (1986) 182 Cal.App. 3d 82, 125). Absent a finding that a specific water right holder is violating the terms and conditions of its water right, or violating the provisions of Article X, Section 2 of the California Constitution, the State Water Board must utilize the water right priority system to implement any new San Joaquin River flow objectives. The use of such system has been recognized as the central principle in California water law, is built-in to the water rights of all parties, and the State Water Board retains jurisdiction over all post-1914 water rights issues to amend, reduce or eliminate such rights based upon the application of the priority system. As such, there is simply no rational basis for the State Water Board to rely upon the FERC process to implement, in whole or in part, any new flow objectives.

To use the FERC processes, which affect only MeID, MID and TID, will violate their rights to equal protection under the law under the established legal principles discussed above. First, the use of the FERC process will treat MeID, MID and TID differently than any other water right holder on the Tuolumne and Merced Rivers specifically, and within the San Joaquin River Basin generally. All other water right holders will have their rights amended, reduced or eliminated based upon the priority system, while the rights of MeID, MID and TID will be amended, reduced or eliminated based upon the State Water Board's plenary power under Section 401 (Dept. of Interior v. FERC, 952 F.2d 538, 548 (CADC 1992)), which has nothing to do with and can be exercised separate and apart from the water right priority system. Theoretically, the State Water Board could impose a condition upon any new licenses issued by FERC that MeID, MID and TID provide 100 percent of the flows needed to achieve the flow objectives.

Second, the disparate treatment is intentional. Indeed, the State Water Board has announced its intention to use the "FERC proceedings to implement the narrative San Joaquin River flow objective." (Revised Notice, p. 6). Since the State Water Board is a participant in the FERC proceedings, and therefore has knowledge that such proceedings only affect MeID, MID and TID, it cannot be argued that the State Water Board's disparate treatment of MeID, MID and TID is accidental or unintentional.

Third, there is no rational basis for the State Water Board's disparate treatment. As noted above, the State Water Board retains jurisdiction over all post-1914 water rights issued, and the application of the water right priority system to such rights for purposes of implementing any properly established water quality objectives is indisputable. As such, the State Water Board already retains all of the necessary legal authority it requires to implement any new objectives, and there can be no rational basis for treating MeID, MID and TID differently. And while MeID, MID and TID do not have to demonstrate that the State Water Board's disparate treatment of them was generated by subjective ill will (Willowbrook, *supra*, 528 U.S. at 565), it is easy to surmise that the State Water Board's disparate treatment may well be rooted in a desire to single out or punish MeID, MID and TID, or to obtain jurisdiction over the pre-1914 rights of MeID, MID and TID, or to simply avoid the negative connotations of entirely eliminating the water rights of several smaller rights holders that happen to be junior to MeID, MID and TID. None of these potential motivations is sufficient to justify the State Water Board's intentional disparate treatment of MeID, MID and TID.

Each of these water right holders has certain rights and expectations under the law, including that in times of shortage or other unavailability of sufficient water to meet the needs of all rights holders, the available water will be allocated in accordance with the water right priority system. Likewise, MeID, MID and TID expect that the State Water Board will respect its jurisdictional limitations, and not abuse its authority under Section 401 or elsewhere to require indirectly what it has no power to require directly. The State Water Board's intended use of the FERC processes to implement any new San Joaquin River basin flow objectives is improper and violates the equal protection rights of MeID, MJID and TID, and those entities will vigorously oppose any such effort. The State Water Board must revise its intended course of action to achieve implementation of any new flow objectives by and through the use of the water right priority system.

3. State Water Board Must Use Water Right Priority to Implement Any Amended San Joaquin River Flow Objectives.

The Draft San Joaquin River Fish and Wildlife Flow Objectives Program of Implementation, which is Attachment 2 of the Revised Notice of Preparation and Notice of Additional Scoping Meeting states that the State Water Board seeks to obtain the flow required to satisfy the Draft San Joaquin River Flow Objective by apportioning the amount of additional flows amongst the existing salmon and steelhead bearing tributaries in the San Joaquin River watershed, namely, the Merced, Tuolumne, and Stanislaus Rivers. (*See* Draft San Joaquin River Fish and Wildlife Flow Objectives Program of Implementation ["Water needed to achieve the base flows at Vernalis should be provided on a generally proportional basis from the Merced, Tuolumne, and Stanislaus Rivers (page 3); "the State Water Board has determined that approximately X percent (e.g. 20-60 percent) of unimpaired flow is required from February through June from the Merced, Tuolumne, and Stanislaus Rivers…" (page 3); "Any adaptive management of flows must not result in flows of less than approximately X percent (e.g. 10 percent) of unimpaired flow from each of the Merced, Tuolumne, and Stanislaus Rivers…" (page 4)]).

In numerous, previous correspondence to and filings with the State Water Board, the SJTA has pointed out the problem with such an approach. Unless the State Water Board is willing to risk putting forth a novel legal theory, there is no precedent for apportioning the water deficit among the existing water right holders. The law in California is clear that in resolving water allocation issues, the State Water Board must consider the underlying legal rights of each user and apply the water right priority system. (*See*, *e.g.*, Pleasant Valley Canal Company v. Borror (1998) 61 Cal.App.4^{th} 742, 770; City of Barstow v. Mojave Water Agency (2000) 23 Cal.4^{th} 1224, 1243; *see also* El Dorado Irrigation District v. State Water Resources Control Board (2006) 142 Cal.App.4^{th} 937, 961). The State Water Board may not attempt to resolve such issues by equitable or other formulaic apportionment that fails to take into consideration the underlying water rights of each affected user. (Mojave, *supra*, 23 Cal.4th at 1242-1249).

Although parties in Mojave argued to the Court that Article X, Section 2 of the California Constitution authorized an equitable apportionment of all water rights "regardless of preexisting priorities," the Court disagreed. (Mojave, *supra*, 23 Cal. 4th at 1243). The Court stated that the water right priority system "has long been the central principle in California water law" (Id. at 1243) and found that there was no

> "precedent for wholly disregarding the priorities of existing water rights in favor of equitable apportionment in this state, where water allocation has been based on an initial consideration of owners' legal water rights. **Case law simply does not support applying an equitable apportionment to water use claims** unless all claimants have correlative rights; for example, when parties establish mutual prescription." (Id. at. 2148-1249)(emphasis added).

The Court went on to say that even under the physical solution doctrine, water rights could not be allocated equitably, as it would impermissibly ignore the priorities of the various water right holders. (Id. at 1250). After an exhaustive review of caselaw, theories and doctrines, the Court ultimately concluded that there is no "compelling authority for th[e] argument that courts can avoid prioritizing water rights and instead allocate water based entirely on equitable principles." (Id. at 1251). While the State Water Board does have the power to allocate the burden of meeting water quality objectives based on more than priorities alone, it cannot disregard priorities without substantial justification such as protecting public trust uses under the public trust doctrine or enforcing the Constitutional prohibition against waste and unreasonable use. (El Dorado, *supra*, 142 Cal.App.4th at 967 n21). This proceeding is neither a Public Trust proceeding nor a waste and unreasonable use proceeding. It is a water quality proceeding. **Even then, every effort must be made to preserve water right priorities**. (Id. at 967).

The SJTA reminds the State Water Board that there is no mechanism by which it can allocate any additional flows other than the mechanism of water right priority. Describing the needed flows as "natural," "unimpaired," or some other characterization will not be sufficient to justify the use of an apportionment mechanism based upon a formula that does not take into consideration the rights of the affected users. Under application of the water right priority system, it is not at all clear that water to meet the selected flow objective will come from any particular waterway or tributary, or that such water will be divided roughly equally or proportionally among such waterways and tributaries, therefore, the State Water Board must evaluate the water supply impacts of the range of proposed San Joaquin River flow objectives upon the water right holders under the priority system.

The application of the water rights priority system does not occur in a vacuum. As was stated in the State Water Resources Control Board Cases (2006) 136 Cal.App. 4th 674, the State Water Board must review and analyze the impacts of the plan of implementation. Without understanding the impacts of implementation, one cannot begin to understand whether the objective set by the State Water Board in the Basin Plan are reasonable or not. It is clear that impacts will not be equitably or proportionally distributed between the various tributaries or water right holders in the San Joaquin River Basin. The first step in any such analysis is to look at the water right priority system. Even after an initial water right priority analysis for CEQA purposes, the State Water Board and its staff must realize that their job is not completed. The plan of implementation would then look to legal or constitutional issues such as waste, unreasonable use and other legal theories to determine if water right priority should be strictly followed in every specific instance.

A. To Accurately Evaluate the Impacts of the Draft/Proposed San Joaquin River Flow Objective, The State Water Board Must Compile a Complete List of All Water Right Holders in the San Joaquin River Basin, Rank them By Priority and Evaluate the Impacts to The Water Right Holders in Order of Priority Beginning with the Most Junior Right Holder.

The application of the water right priority system provides that the holder of a senior appropriative right is entitled to use his full allotment before a junior appropriative right holder may use the water to which he is entitled. Thus, in times of shortage or drought, a junior appropriator must reduce and/or cease his water use before any senior appropriative right holder must reduce or cease his use. (United States, *supra*, 182 Cal. App. 3d at 131, fn. 25), Additionally, while the senior rights holders can be prevented from waste or unreasonable use of water, they are under no obligation to alter or reduce their reasonable and beneficial uses to meet the needs of junior rights holders. Indeed, the reduction in the rights of the junior rights holders is a function of their lack of rights, not in the reasonable or unreasonableness of their water use, or the water use of any other water right holder. (See Moskowitz, "*Conflicts Between Water Rights and Water Quality*," 174 California Envtl. Law Reporter 216, 218 (1994)).

The "impacts" of the San Joaquin River flow objectives will not be equally or proportionately distributed among waterways or water right holders in the San Joaquin River basin because under the application of the water right priority system, junior water right holders will be required to reduce or even completely cease their water use before senior appropriators have to reduce theirs. (United States, *supra*,182 Cal.App.3d 82, 131, fn. 25).

In determining impacts on the water right holders in the San Joaquin River Basin pursuant to the water right priority system, the State Water Board must first identify the priority of each water right holder on the tributaries and then evaluate the impacts of reducing the rights of the most junior right holders (as many as necessary until the flow objective is met) by as much water as is required to meet the SJR Flow objective. Thus the SJTA urges the State Water Board to prepare a list, ranking each right holder by priority, which will be used to identify from whom water would be made available under various flow conditions.[1] Evaluation of the water supply impacts of the range of proposed San Joaquin River flow objectives upon the water right holders under the priority system would be far more accurate than the "proportional basis" analysis provided in the Draft San Joaquin River Fish and Wildlife Flow Objectives Program of Implementation.

Upon review of the incomplete table prepared in 1999 for D-1641, the most junior right in the San Joaquin River Basin is the United States Bureau of Reclamation's ("USBR") 1988 application for

[1] As part of D-1641, the State Water Board prepared a table of appropriations, albeit incomplete, ranking each right holder by priority, that was to be used to identify from whom water would be made available under various flow conditions. (Final EIR for Implementation of the 1995 WQCP, Technical App. Vol. 2 (Nov. 1999), p. A3-14 – A3-16).

New Melones (A014858B July 18, 1988), and four (4) of the 12 most junior rights are held by the USBR (two for New Melones (A014858B and A019304), one for Hidden Lake (A018733) and one for Eastman Lake (A018714)). Thus, it is reasonable to conclude that the USBR, based on these junior rights, will be required to provide the lion's share of any identified deficit. Since the State Water Board will not be able to avoid compliance with its objectives once it gets to the implementation phase, it must begin to make this type of analysis now to insure that its objectives can and will be met.[2]

Therefore, the State Water Board should do now what it should have done earlier, which is curtail and/or eliminate the use of the junior water right holders until such time as the needs of the environmental resources are met.

4. State Water Board Must Address Illegal Downstream Diversions.

A major problem that was not addressed in D-1641 but will need to be addressed this time is the right for junior appropriators downstream of the releases of senior/stored water to divert water whose specific designated purpose is to meet objectives set by the State Water Board. The SJTA is concerned that the State Water Board will not adequately police the diversions of those who are physically downstream of any user bypassing water to meet the flow objectives. To deprive a senior water right holder upstream of Vernalis of its water to meet a beneficial use in the Delta, only to have such bypassed water be diverted by a junior appropriator and never achieve its intended benefit is contrary to law because it reverses the water right priority and thus senior rights become junior rights.

Under the 2006 Bay-Delta Plan, "Unless otherwise indicated, water quality objectives cited for a general area such as the southern Delta, are applicable for all locations in that general area and compliance locations will be used to determine compliance with the cited objectives." The San Joaquin River Flow objectives are water quality objectives and, under the Bay-Delta Plan, must be met throughout the San Joaquin River in the Delta. As a result, diversion and consumptive use below Vernalis, even when the flow objectives are met at Vernalis, would result in a violation of the objectives. This problem manifested itself throughout the performance of the VAMP experiment under the San Joaquin River Agreement, as authorized by D-1641, and simply must be addressed by the State Water Board in these proceedings to ensure that the water bypassed achieves its intended purpose and is not simply diverted by someone else.

While the Draft San Joaquin River Fish and Wildlife Flow Objectives Program of Implementation states that the State Water Board **may** take water right and other actions to assure that the flows required to meet the San Joaquin River flow objective are used for their intended purpose and are not rediverted downstream for other purposes, such assurance is meaningless. Therefore, it is the SJTA's position that riparian diversions should cease when stored water is being released to meet objectives. Likewise, any junior appropriator should cease diversion at any time a senior appropriator is releasing water to meet the objectives.

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[2] In compiling such a list, the State Water Board must include all water right holders in the San Joaquin River Basin. First, the appropriate baseline for the SED requires inclusion of all users, including those upstream of the Merced River. Second, these users need to be included in any defensible plan of implementation. (El Dorado Irr. Dist., *supra*, 142 Cal.App.4th at 963).

A. The State Water Board Does Not Know Who Diverts What Water/Cannot Presume to Know How Much Additional Water the San Joaquin River Tributaries Should Provide to Meet the Proposed Objective.

Little data exists regarding the nature, extent, and location of diversions within the Delta because none of the in–Delta riparian and/or pre-1914 appropriative water right holders were required to measure and report their water diversion and use until the enactment of SBX7-8 in 2009. At present, Statements of Water Diversion and Use are to be filed with the State Water Board by riparian and pre-1914 appropriative right holders in order to create a central repository for records of diversions and uses of water.

Initial Statements of Water Diversion and Use filed with the State Water Board by a riparian and pre-1914 appropriative water user in the Delta pursuant to SBX7-8, however, were only to report 2009 diversions and were only just due July 1, 2010. The State Water Board has hardly had time to review the data. Additionally, the State Water Board has not pursued any actions against those who have not filed Initial Statements of Water Diversion and Use, nor has the State Water Board conducted any investigations into alleged unauthorized diversions and uses of water in the Delta. Even assuming all of the reported in-Delta diversions were lawful and authorized, the reported data is only for one year and is not fully reflective of diversions that may occur during other various water year types.

It is imperative that the State Water Board first review several years of reported data regarding all in-Delta riparian and pre-1914 appropriative diversions, as well as permitted diversions, and take enforcement action as necessary before amending the San Joaquin River Flow Objective because, at present, it is obvious that the State Water Board has no idea what the needs of the in-Delta water users actually are. Without knowing how much water is actually used in the Delta to satisfy all of the in-Delta diversions, or how much can be obtained from junior appropriators, the State Water Board cannot presume to know how much additional water the San Joaquin River tributaries should provide to meet a proposed objective.

B. The State Water Board is Reluctant to Take Actions Necessary to Prevent Illegal Diversions and Protect Water for the Fish.

Not only has the State Water Board failed to pursue actions against those who did not file Initial Statements of Water Diversion and Use and failed to investigate any alleged unauthorized diversions and uses of water in the Delta, but also, the State Water Board has neglected to follow through on its current enforcement actions involving in-Delta diversions.

Over a year and a half ago, the State Water Board issued 11 Draft Cease and Desist Orders against in-Delta water users for their alleged unauthorized diversion or use of water or threat of unauthorized diversion or use of water in violation of the Water Code. To date, the State Water Board has only made a determination in three of those 11 Draft Cease and Desist Order cases, despite adopting the Strategic Workplan for Activities within the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, which emphasized the State Water Board's responsibility to vigorously enforce water rights by preventing unauthorized diversions of water, violations of the terms of water right permits and licenses, and violations of the prohibition against waste or unreasonable use of water in the Delta.

Resolving only 27 percent of the water right issues regarding alleged unauthorized diversion in the Delta in over a year and a half hardly constitutes "vigorous enforcement." Absent severe, dire consequences for those illegally diverting in the Delta, any threat of enforcement action by the State Water Board is merely akin to crying wolf.

5. Any pre-1914 Appropriative and/or Riparian Water Over Which the State Water Board Attempts to Exercise Jurisdiction in an Effort to Meet the San Joaquin River Flow Objective Constitutes a Taking.

The State Water Board has no jurisdiction to regulate pre-1914 appropriative water rights and riparian rights. This is critically important, not just in terms of priorities discussed above, but also because even if the State Water Board attempts to bypass the water right priority system and assign a percentage of flow to particular users or waterways, the State Water Board must consider the pre-1914 appropriative water rights and riparian rights held by those particular water users and on those particular waterways. Absent consideration of pre-1914 appropriative water rights and riparian rights, the desired flow results may not be achievable. Any pre-1914 appropriative and/or riparian water over which the State Water Board attempts to exercise jurisdiction in an effort to meet the San Joaquin River flow objective constitutes a taking. Thus, any CEQA analysis that focuses solely on releases from the three tributaries as a percentage of unimpaired flow without accounting for pre-1914 appropriative water rights and riparian rights, or applying water right priority will be inadequate.

The Merced, Tuolumne, and Stanislaus Rivers each have a mix of pre-1914 and post-1914 water rights.[3] While clearly the State Water Board has jurisdiction over the post-1914 water rights, it has no jurisdiction or authority over pre-1914 water rights. If the flow of a particular waterway is 100 cfs, for example, and the State Water Board attempts to assign a 60 percent bypass, yet the existing pre-1914 appropriative water rights and riparian rights associated with that waterway are for 80 cfs, the State Water Board would not be able to obtain the full 60 percent flow desired.

The SJTA suggests that instead of conducting the CEQA analysis as a proportion of unimpaired flow, the State Water Board analyze a proportion of unimpaired flow over which the State Water Board has jurisdiction, which would eliminate riparian and pre-1914 rights. To do otherwise would take all the superior pre-1914 appropriative and riparian water rights on those three rivers and make them junior to all other rights in the Basin.

6. The State Water Board Must Include Upper San Joaquin River and Its Tributaries in Its Scope of Inquiry and Action.

The State Water Board's Revised Notice specifically amends the geographic scope of its inquiry and action pursuant to Water Code Section13050(j)) to include "the watersheds of the three salmon bearing tributaries to the San Joaquin River: the Stanislaus, Tuolumne and Merced Rivers down to the San Joaquin River near Vernalis." (Revised Notice, p. 3; *see also* map on cover page). This newly identified geographic scope represents a significant change from that used by the State Water Board in the 2006 and 1995 WQCPs, which were focused specifically on "the waters of the San

[3] The Tuolumne River also has the Raker Act, 38 Stat. 242 (1913).

Francisco Bay and the legal Sacramento-San Joaquin Delta." (2006 WQCP, p. 10 and p. 2, Fig. 1; 1995 WQCP, p. 14).

This change is notable since, in likely response to the SJTA's December 6, 2010 comments on the Draft Technical Report ("DTR") and the SJTA's January 31, 2011 letter to Chairman Hoppin regarding the information presented at the State Water Board's January 6-7 workshop, the State Water Board has acknowledged the need to expand the legal scope of its inquiry to enable it to consider making flow recommendations in the east side tributaries and other areas upstream of Vernalis. Yet, the State Water Board's attempt at curing the problems associated with the legal scope of its inquiry and actions under Water Code Section 13050(j) remain incomplete and insufficient. In particular, the State Water Board's decision to exclude those portions of the San Joaquin River and its tributaries upstream of the confluence of the Merced River based upon the claim that they are not presently supporting salmon is disturbing and inappropriate.

A. Inconsistent with "Natural" Approach.

The State Water Board determined in Chapter 3 of the DTR that, as a general matter, there is a scientific consensus that a more natural flow regime is essential to protecting native aquatic species and promoting natural ecological functions. The State Water Board cited scientific literature, studies and data to support its finding that a more natural flow regime will improve fish populations by improving temperatures, benefitting the food web, increasing connectivity with the floodplain, increasing turbidity and creating less homogenous channels, and encouraging native communities while discouraging non-native communities. (DTR, Chpt. 3, p. 60-67).

When the State Water Board looked at the San Joaquin River watershed, and compared current flows and conditions with those associated with unimpaired flows, it found that the Upper San Joaquin River, defined as that portion located between the headwaters in the Sierras and the confluence of the Merced River, would have been responsible for approximately 29 percent of the annual unimpaired flow in the San Joaquin River for the period between 1984 and 2009. (DTR, p. 23, Table 2-9). Using that same time frame, the State Water Board determined that the unimpaired flow of the upper San Joaquin River would have comprised as much as 45 percent of the total unimpaired flow for the basin in July, August and September, and between 23 percent and 31 percent of the total unimpaired flow for the months of February through June. (DTR, p. 24). No other tributary had an unimpaired flow for any month that exceeded 33 percent of the total unimpaired flow measured at Vernalis. (DTR, p. 24 [Tuolumne River calculated at 33 percent in October and November]). This information demonstrates that the Upper San Joaquin River, in its "natural" state, provided a large percentage of the Basin's overall flow.

Looking beyond the hydrological importance of the Upper San Joaquin River, the State Water Board found that the operation of Friant Dam "blocked access to about one-third of the [salmon] spawning habitat in the main stem SJR and eliminated perennial flows below the dam. (DTR, p. 40 [citing Mesick 2001]). As a result, spring run salmon, whose runs ranged from 2,000 to 56,000 fish between 1943 and 1948, have been extirpated from the San Joaquin River Basin, and fall run populations have declined. (Id.). Fall run salmon do continue to enter, or attempt to enter, the Upper San Joaquin River. Prior to 1992, an estimated 38 percent of fall run from the Merced River strayed into the Upper San Joaquin River. (SJRRP, Fisheries Management Plan, App. F, p. 59). To prevent such straying, DFG has installed and operated a barrier just upstream of the confluence of the Merced

River since 1992. (Id.; *see also* Draft PEIS/R, p. 5-9). While normally successful, it is not 100 percent effective, particularly at flows higher than 1000 cfs. (SJRRP, Fisheries Management Plan, App. F, p. 59-60). News reports indicate that in November of 2010, fall run salmon from the Merced River were able to migrate as far as Sack Dam. (Fresno Bee, November 22, 2010).

Thus, from both a hydrologic and fisheries perspective, it is clear that the Upper San Joaquin River played a huge role in its unimpaired state in the overall health of the San Joaquin River Basin. As such, it is completely disingenuous for the State Water Board to tout the virtues of a return to some type of flow regime that is based upon the natural hydrograph, yet then fail to apply that policy to the Upper San Joaquin River. As our other comments make clear, the SJTA contends that there is no good reason for the State Water Board to adopt and attempt to implement a set of new flow objectives based upon the natural hydrograph. However, if the State Water Board is nonetheless going to do that, it must do so fairly and evenhandedly, and cannot announce the policy and while simultaneously exempting the Upper San Joaquin River and its tributaries.[4]

B. Determination that Upper San Joaquin River Does Not Support Salmon Is False.

The State Water Board has attempted to justify its decision to exclude the Upper San Joaquin River based upon the conclusion that the Upper San Joaquin River does not presently support salmon. (Revised Notice, p. 3, fn. 1). This justification cannot withstand scrutiny for a host of reasons.

First, it is simply not accurate. As noted above, significant numbers of salmon from the Merced River presently attempt to enter the Upper San Joaquin River and fail to do so based only upon the active, annual efforts of the DFG to prevent them.

Second, the State Water Board's decision ignores the reality of the San Joaquin River Restoration Program ("SJRRP"). That program specifically calls for the reestablishment of both fall and spring run Chinook salmon in the Upper San Joaquin River, with reintroduction in the upper reaches beginning no later than December 31, 2012. The SJRRP also calls for both additional flows and other physical improvements within or near the SJR to restore both the riverine habitat and the salmon fishery in the Upper San Joaquin River. (September 13, 2006 Settlement, ¶¶ 11-16). The goal of the SJRRP is to establish natural populations of both spring and fall run salmon in the Upper San Joaquin River, with a three-year target of a minimum of 2,500 naturally produced adults of both races, and a long-term target of a naturally produced population of 30,000 spring run and 10,000 fall run. (SJRRP, Fisheries Management Plan, p. ES-3).

The reintroduction of the fall run Chinook salmon, while a lesser priority than the reintroduction of the spring run (SJRRP, Reintroduction Strategy for Spring Run Chinook Salmon, p. 57), is more likely to be successful. Whereas the reintroduction of spring run is requiring the importation of Sacramento River stock as an experimental population, the fall run population of the Upper San Joaquin River will rely upon fall run from the Merced and Tuolumne Rivers (SJRRP, Fisheries Management Plan, p. 3) – that is, the very fish that are already straying or attempting to stray into the Upper San Joaquin River.

[4] The State Water Board should note that TBI/NRDC called for inclusion of the Upper San Joaquin in its comments to the DTR on December 6, 2010 (see p. 10-18).

Further, the timeline for the restoration of the Upper San Joaquin River and the reintroduction of spring and fall run salmon falls well within the timeline established by the State Water Board. The SJRRP has already resulted in the release of Interim flows, and full restoration flows are scheduled to begin no later than January, 2014. (www.restoresjr.net/activities/if/index.html).As noted earlier, the reintroduction of salmon will begin no later than December 31, 2012. Thus, the Upper San Joaquin River will be a salmon bearing segment around 2014. The State Water Board has indicated that implementation of its objectives will be phased, and will conclude upon the earlier of the completion of FERC proceedings on the Tuolumne and Merced Rivers or 2020. (Revised Notice, p. 4). Since the FERC licenses on the Merced River do not expire until 2014, and those on the Tuolumne do not expire until 2016, there is no reason that the State Water Board cannot phase its implementation to include the Upper San Joaquin River and its tributaries and the elements of the SJRRP.[5]

Finally, the State Water Board's rationale simply ignores the fact that flows from the Upper San Joaquin River contribute to flow at Vernalis, which will be of benefit to the salmon migrating through the Delta regardless of their stream of origin. The narrative standard driving the State Water Board's proposed actions is the "doubling of natural production of Chinook salmon" in the San Joaquin River watershed. (Revised Notice, p. 1, Table 3). This objective does not specify that a stream needs to be salmon-bearing to be included within the State Water Board's inquiry and actions since the overall objective is not to increase the salmon population in any specific tributary but rather in the watershed as a whole. Since additional flow from the Upper San Joaquin River would contribute to the flow at Vernalis, and could be managed to mimic the natural hydrograph thus generating all of the expected benefits to the food web, temperatures and other critical functions, the fact that the Upper San Joaquin River may not presently have any salmon has nothing to do with whether or not it should be included within the State Water Board's scope.

C. To the Extent the State Water Board is Accepting the SJRRP, Such Acceptance Contradicts its Attempt to Rely Upon the Natural Hydrograph and Calls Into Question the Application of Such Reliance on the Other Tributaries.

Whatever the merits of the SJRRP, it is not based upon re-creating or mimicking the natural hydrograph. To the extent that the State Water Board's inaction as to the Upper San Joaquin River and its tributaries is directly or implicitly approving the appropriateness of the SJRRP, such approval directly contradicts the State Water Board's stated purpose of using the natural hydrograph as a basis for establishing the flow objectives. While one solution would be to include the Upper San Joaquin River and its tributaries within the scope of the SWRCB's current effort, and establish flows for that region based upon the natural hydrograph even if such flows were additional to those called for in the SJRRP, this is not the only solution or even the best solution. Rather, the State Water Board's express or implied approval of the SJRRP reveals that flow regimes on the other tributaries should be specifically tailored as well and not just be some percentage of natural flow. The SJTA recommends that, to the extent the State Water Board wants flow regimes specific to each tributary, it should halt the current effort and engage in a tributary specific process to generate a flow regime that is specifically designed to fit each particular tributary.

[5] The National Marine Fisheries Service ("NMFS"), one of the implementing agencies of the SJRRP, specifically recommended that the SWRCB include the Upper San Joaquin River and the elements of the SJRRP in its scope. (NMFS' December 6, 2010 comment letter on DTR, p. 4).

Again, without discussing the merits of the SJRRP, even a cursory review demonstrates that the SJRRP has looked seriously at the ecological functions (food, temperature, etc.) as well as the specific physical limitations unique to the Upper San Joaquin River. While the SJRRP may never achieve its intended goals, such failure would certainly not be the result of a lack of planning or of understanding the physical limitations affecting the Upper San Joaquin River. The State Water Board would do well to look at the other tributaries in the same way, and determine whether or not increased flow will, for example, reconnect with the floodplain and, if not, what other actions will need to take place to assure such reconnection. In the absence of any holistic look at each specific tributary to determine whether or not the proposed flows will achieve the desired goal and function, the State Water Board risks continuing in the same failed policy of the last 30 years of simply throwing flow at the fisheries problem and hoping that more flow will arrest the decline. After 30 years, the SJTA contends that "hope" is no longer an adequate basis for making decisions.

D. <u>The Current SWRCB Proposed Plan will Redirect Impacts from the Upper San Joaquin River in Violation of the Agreement/Legislation to Implement SJRRP.</u>

In the negotiations leading up to the agreement/legislation to enact and implement the SJRRP, certain third parties (including some individual members of the SJTA) (Third Parties) requested and received a commitment of no redirected impacts from the Settling Parties and Senator Dianne Feinstein. A "blood oath" was taken in Senator Feinstein's office on the express condition of no redirected impacts. The proposed Basin Plan amendments would eviscerate the agreement by redirecting Basin flows that should be coming from the upper San Joaquin River to meet a Vernalis flow objective to the lower San Joaquin River. This is unacceptable.

The SJTA supports the implementation of the SJRRP so long as it is in accordance with the Settlement Act. The Third Parties have been working with the Friant Water Authority, USBR, non-governmental organizations, NMFS, and the United States Fish and Wildlife Service to get the program operational. The Third Parties are actively involved in the review of the PEIR/PEIS, the United States Fish and Wildlife Service's application to reintroduce spring-run salmon, reducing seepage impacts to landowners along the river, integration of SJRRP flows into the VAMP pulse flow, and the actual restoration of the river. The list is long and exhaustive. All of the agencies along the San Joaquin River are working to make the SJRRP a success. Part of the purpose of the SJRRP is to restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River, including naturally-reproducing and self-sustaining populations of salmon and other fish. Is this not also part of the objective of the Basin Plan?

Unfortunately, the State Water Board's Basin Plan proposal will completely undermine those efforts. If Vernalis continues to be the compliance point, then everyone in the San Joaquin River Basin will need to be involved in the analysis. No one gets a hall pass as each will need to contribute their appropriate share. We have made this point to the State Water Board and its staff, but it continues to be ignored. If water users in the Friant Division of the Central Valley Project are forced to contribute flows above those required in the SJRRP, and the ability to recover that water is illusory, their support of the Settlement would erode significantly. They are already struggling with the water supply impacts from the SJRRP, especially given little ability to recapture and recirculate that water. If we continue down this road, the State Water Board will need to explain to Senator Feinstein and the non-governmental organizations why it was so important to destroy the SJRRP.

If the State Water Board removes Vernalis as a compliance point, then each river will be responsible for its own instream flow needs. The SJTA supports this approach. This is consistent with the basis for the SJRRP settlement. Each river system is unique. Each has its own hydrology, storage, hydro-generation, recreation, and ag-urban and environmental uses and demands. The SJTA has and will continue to advocate a tributary watershed approach to the flow issues, given the uniqueness of each tributary system.

The State Water Board seems to be focused on a path to deal with flow on a watershed based on a mistaken and myopic belief that meeting Vernalis flow objectives is the best and only way to achieve the desired objectives. The upcoming FERC process and instream flow analysis on the Merced and Tuolumne Rivers are two processes whereby a tributary watershed approach process could be successful. The entities on those rivers will not, however, be leveraged to the negotiation table by an unscientific and unsupportable Basin Plan Vernalis flow objective being used as leverage throughout a 401 Water Quality Certification process, for the reasons stated above. Likewise, there will be no San Joaquin River Basin settlement proposed by the entities in the Basin if the State Water Board continues down this regulatory path.

Reading between the lines of the proposed Basin Plan Vernalis flow objectives, it appears that the State Water Board supports the SJRRP. The Basin Plan that the State Water Board proposes, however, will redirect impacts to downstream third parties. These parties, who currently support the SJRRP, will then be put in a position to oppose it. It was clearly understood by MID, the San Joaquin River Exchange Contractors Water Authority and MeID representatives (who are among the Third Parties and were in the room negotiating the implementing legislation) that the SJRRP was a settlement of the litigation. It was not a settlement of Friant's potential contribution to a Basin Plan flow objective at Vernalis.[6] If the State Water Board wants to support the SJRRP, then it must do away with the Vernalis flow objective and address the flow issues, watershed by watershed.

7. Insufficient Justification to Rely Upon Semblance of Natural Flows When No Other Element of the Bay-Delta System is Natural.

In the DTR, the State Water Board identified numerous studies and other scholarly works that, in its view, supported the idea that establishment of a more natural flow regime is critical to support the biological and ecosystem processes needed to protect fish and wildlife beneficial uses. (*See* DTR, Chpt. 3). The State Water Board found that such studies indicated that a more natural flow regime would improve the food web, increase habitat connectivity, support natural hydrogeomorphological processes and improve temperatures, among other things. Even assuming that a more natural flow regime could support all of the expected improvements in a theoretical sense, the State Water Board has failed to demonstrate how the use of a more natural flow regime, comprised of X percent of unimpaired flow, can support such improvements in the San Joaquin River Basin and Bay-Delta specifically.

It is undisputed that the San Joaquin River Basin and the Bay-Delta are highly altered, extremely unnatural areas. In addition to the existence of the rim dams that capture much of the natural

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[6] *See* Alternative 2-6 in D-1641 SED.

flow, the system has been altered via dredging, levees, filling in of sloughs and other natural channels, reclamation of land, use of natural channels for water delivery, removal of native riparian habitat, installation of permanent structures related to navigation, commerce, flood control and water supply, and discharge of contaminants and pollutants. As the SJTA's fishery biologists pointed out in response to the DTR (December 6, 2010 comments submitted by Michele Palmer on behalf of SJTA) and reiterate in their comments filed herewith, the State Water Board has failed, and continues to fail, to demonstrate if or how a more natural flow regime will achieve any of its intended goals.[7]

It is worth remembering, too, that while these alterations are now identified and spoken of as impediments to restoring the fishery, most are not only intentional but also beneficial. The rim dams provide vital flood control, not to mention recreational opportunities. The Stockton Deep Water Ship channel enables significant commerce, and the much of the various dredging and levee building has resulted in the reclamation of the land in the Delta that supports towns, businesses, agriculture and recreation. It is because these alterations were, are and will likely remain so vitally important that Section 13241of the Water Code requires the SWRCB to consider them when it establishes new water quality objectives. The narrow focus on "what the fish need" and all of the physical and other alterations that make restoration of the fishery difficult is not appropriate.

The entire premise underlying the State Water Board's intention to require a more natural flow regime comprised of a percentage of unimpaired flow is to achieve certain functions critical to the health of the fisheries, including habitat, food and temperature. In the absence of any evidence demonstrating or suggesting that such flows will, in the San Joaquin River Basin and Bay-Delta Estuary, actually achieve such functions, the State Water Board's insistence that a more natural flow regime be met is arbitrary and capricious. The State Water Board must do more than "hope" that a natural flow regime will be successful before requiring it.

8. Requirement of a Base Flow Inconsistent With State Water Board's Findings That Natural Flow Conditions Provide The Types of Flows Needed to Support The Biological and Ecosystem Processes Needed to Protect Fish and Wildlife Beneficial Uses.

Despite extolling the virtues of "a more natural flow pattern" in the DTR and deciding that the new objectives will be based primarily upon a percentage of unimpaired flow, the State Water Board's Revised Notice nonetheless makes it clear that a percentage of unimparied flow will not, in all circumstances, be sufficient. As a result, the State Water Board has indicated that it will require "base flows" of X cfs be met at Vernalis at all times during the February-June period. (Revised Notice, p. 3). There is, however, no information, data, science or other support provided for the notion that a base flow is needed.

While it should be obvious, the identification of a base flow in the total absence of any scientific or scholarly justification is completely arbitrary and capricious. Yet, the State Water Board's need of a base flow is so much worse when confronted with the fact that the DTR and the reports cited therein all discuss the importance of a more natural flow pattern. That is, the State Water Board's

[7] As a result of all of these alterations, it is inappropriate to even discuss "natural flow" or the "natural hydrograph." While "unimpaired flow" may be equivalent or close to "natural flow" at the various rim dams, the alterations to the system below the rims dams renders any flow incapable of being referred to as "natural." The very idea of a "natural flow regime" in the San Joaquin River Basin is a completely artificial construct.

requirement of a base flow is not only not supported, but is contradictory to the very evidence and data that it relies upon to support the establishment of a more natural flow regime comprised of a percentage of natural unimpaired flow.

The State Water Board's requirement of a base flow is itself evidence that this entire exercise is not designed to obtain more water to meet or serve any specific purpose, but rather to simply obtain more water. A more natural flow regime is apparently just what is needed to support the various functions contributing to a healthy fishery, except when such regime results in flows that the State Water Board has determined are too low, in which case the "more natural" flow regime is not enough and a "base flow," higher than the percentage of unimpaired flow, is needed. The parties and the system require more from the State Water Board than some sort of *ad hoc* approach that relies upon science and data where they support the State Water Board's desired result of more flow, and ignores them when they do not.

9. The Substitute Equivalent Document Must Identify a Baseline, Identify Project Alternatives and Evaluate Impacts Specific to the Merced, Stanislaus and Tuolumne Rivers.

A. State Water Board has not identified a project baseline.

CEQA requires identification of the significant effects a project will have on the environment, identification of alternatives to the project, and an indication of the manner in which those significant effects can be mitigated or avoided. (*See* Cal. Pub. Res. Code § 21002.1). In order to identify the significant effects a project will have, a baseline, which is the existing physical conditions in the area that will be affected by the project, should first be established. (Sunnyvale West Neighborhood Assn. v. City of Sunnyvale City Council (2010) 190 Cal. App. 4th 1351, 1377). Therefore, as part of the San Joaquin River Flow objective SED process, the State Water Board must first identify the current existing physical conditions in the Delta as well as the San Joaquin River watershed, which includes not only the current flow rates, water temperatures, dissolved oxygen levels, fishery statistics, exports, bubble barrier, etc., but also includes a detailed evaluation of the current in-Delta diversion by the individual water right holders claiming to have riparian and or pre-1914 appropriative water rights.

B. State Water Board has failed to identify/evaluate project alternatives.

Additionally, feasible project alternatives must be evaluated. Thus, the State Water Board needs to describe a range of reasonable alternatives, which "would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives." (Watsonville Pilots Ass'n v. City of Watsonville (2010) 183 Cal. App. 4th 1059, 1086). Other than the mysteriously flexible value of X, which is yet to be determined, no other alternatives have been provided by the State Water Board for consideration and public review. The State Water Board has not considered any alternatives to "more flow." Nor has it considered alternatives for the means by which it intends to obtain the additional flow. Thus, the State Water Board has failed to comply with CEQA because it has failed to consider and evaluate a reasonable range of alternatives.

C. <u>State Water Board must evaluate specific project impacts in the SED</u>.

As the State Water Board has identified a project so specific as to know exactly what environmental impacts to evaluate, it must complete a specifically detailed analysis of the environmental impacts of its specific project. (14 CCR § 15161; cf. 14 CCR § 15168). The State Water Board cannot conduct a general programmatic evaluation of the environmental impacts of the proposed San Joaquin River flow objective because, other than the value of X, there are no other undetermined project details. The State Water Board has already determined what it needs: more flow; where it will get the additional flow: the Stanislaus, Merced and Tuolumne Rivers; when it needs it: February through June; how it will get it: water right actions, water quality actions, FERC, and other agency actions; and how it will implement it: adaptive management plan. Therefore, any environmental analysis the State Water Board conducts must be specific to the Stanislaus, Merced and Tuolumne Rivers.

Thus, the specific environmental impacts to the Stanislaus, Merced and Tuolumne Rivers must be evaluated for the following:

1. Global Warming:
   a. Water Temperature
   b. Change in Runoff (timing, magnitude and frequency)

2. Sea Level Rise

3. SJRR Program:
   a. EIR-EIS
   b. Water Temperature
   c. Change in Hydrology
   d. Change in Water Quality
   e. Changes in fishery density (predators)

4. Hydrology Modeling:
   a. Daily, Monthly
   b. Theoretical/Reality
   c. System Constraints
   d. ACOE Requirements
   e. Forecasting

5. Impacts to Hydropower:
   a. Economics, Transmission, Carbon, Energy Production Shift from Summer to Spring

6. Economic Impacts:
   a. Land Fallowing
   b. Farm Businesses
   c. Hydro-power
   d. Unemployment
   e. Land Value

f. Crop Production
g. Recreation/fishing

7. Impacts to Reservoir Operations:
   a. Recreation
   b. Coldwater Pool for Salmonids and *O.mykiss*

8. Impacts to M&I:
   a. Reliability
   b. Economics
   c. Production/Manufacturing
   d. Alternative Supply Costs

9. Impacts to Groundwater:
   a. If Surface Water is not applied and Groundwater is Substituted, What Happens? (both quality and quantity)

10. PCFMC-Ocean Harvest Regulations
11. Species listed pursuant to the State and Federal Endangered Species Acts
12. Aquatic Biological Resources
13. Wetlands and Terrestrial Habitat
14. Surface Hydrology including Water Rights
15. Groundwater Hydrology
16. Geology and Soils
17. Water Quality
18. Seismic Stability
19. Aesthetics
20. Air Quality, Including Greenhouse Gas Emissions
21. Land Use (e.g. Urban, Agricultural and Industrial Uses)
22. Historic and Cultural Resources
23. Environmental Health and Safety
24. Public Services and Utilities
25. Energy and Natural Resources
26. Recreation
27. Population/Housing
28. Transportation/Traffic

Very truly yours,
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